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More Evidence on the Puzzle of Interindustry Wage Differentials: The Case of West Germany

By

Joachim Fels and **Erich Gundlach**

Contents: I. Introduction. – II. The Evidence. – III. Qualifications and Outlook.

I. Introduction

Standard neoclassical labor market models predict that workers with identical skills will receive the same wage independent of the industry in which they are employed. To maximize profit, firms expand employment to the point where the wage rate equals the value of labor's marginal product. With full information and zero transaction costs, factor mobility ensures that the wage rates and simultaneously the marginal products of workers with identical abilities are equalized across industries.

Yet, recent empirical evidence from the U.S. labor market casts doubt on the explanatory power of the standard competitive model. Several studies [Dickens and Katz, 1987a; 1987b; Katz and Summers, 1989; Krueger and Summers, 1987; 1988][1] find substantial interindustry wage differentials for workers with similar individual characteristics doing apparently similar jobs. The interindustry wage structure is reported to be remarkably stable over time, thus ruling out an explanation of the observed wage differentials based on transitory sectoral demand shifts or a short-run immobility of labor.

Furthermore, the U.S. interindustry wage structure seems to be positively correlated with the interindustry wage structures of other countries like, e.g., West Germany. This international similarity of the industry wage structures in West Germany and in the U.S. appears to

Remark: We have benefited from helpful comments by seminar participants at the Kiel Institute of World Economics and by Barbara Kauffmann, Karl-Heinz Paqué, Stefan Sinn and Frank D. Weiss. A shorter version of this article was presented at the 5th Annual Congress of the European Economic Association at Lisboa, Portugal, August 31–September 2, 1990.

[1] See Thaler [1989] for a short survey of these and related studies.

be a puzzle since these countries exhibit totally different labor market institutions. The results, however, suggest that country-specific institutional factors may not possess a high explanatory power. To test this a priori implausible hypothesis properly, we shall try to replicate the results for the U.S. with data from West Germany in more detail in this paper.

In contrast to the studies for the U.S., which are based on individual survey data from the Current Population Survey (CPS), our analysis is based on aggregate wage data. Another difference is that our sample of industries consists of manufacturing plus mining, construction, and public utilities, whereas the U.S. studies analyze the economy-wide spectrum of industries. The high level of aggregation and the exclusion of the more heterogeneous service sector from the analysis should bias our results in favor of the acceptance of the law of one price for workers with identical skills. Therefore, our analysis can be interpreted as a rather strong test of the hypothesis that the interindustry wage structure is similar accross countries since we employ a totally different set of data and only investigate an (albeit important) subsector of the West German economy.

II. The Evidence

To gain an overall impression of the interindustry earnings structure in West Germany, it is sufficient to limit the analysis to one year (1986) because the West German interindustry wage hierarchies for different qualification groups are reported as having been remarkably stable (correlation coefficients higher than 0.9) since 1970 [Gundlach, 1986].[2] Table 1 presents average earnings differentials for blue-collar and white-collar workers for both men and women.[3] Following these

[2] Krueger and Summers [1987, p. 24] find a high correlation of the wage structure in nine major U.S. industries during the 1900–1984 period. For selected years after 1915, they report correlation coefficients with the wage structure in 1984 ranging from 0.76 to 0.98.

[3] The statistical sources for our empirical analysis are the "Arbeiterverdienste in der Industrie" and the "Angestelltenverdienste in Industrie und Handel" published by the Statistisches Bundesamt [a; b]. These statistics contain the effective hourly wages for three qualification groups of blue-collar workers (Arbeiterverdienste) and the effective monthly salaries for four qualification groups of white-collar workers at the two-digit industry level as well as employment-weighted average wages and salaries. We concentrate our analysis on those industries for which data for all qualification groups are available for most of the years since 1960 because we want to analyze the widest possible range of qualification differences across industries. For the exact definitions of the seven qualification groups see Statistisches Bundesamt [a; b]. In short, we have three

estimates, the petroleum refining and motor vehicle industries pay the highest wages for all worker groups, while leather industries, footwear, apparel, and precision ceramics pay the lowest wages for all worker groups. But this high-wage/low-wage pattern does not hold uniformly for all industries. For example, in ship building, only blue-collar workers receive above average earnings, and in precision mechanics only female blue-collar workers earn more than the respective industry average. That is to say, our four worker groups do not display the same degree of interindustry earnings variation.

It is reasonable to expect relatively low interindustry earnings differentials for relatively homogeneous qualification groups and for employees with a comparatively high degree of regional mobility. Alternatively, high interindustry earnings differences are more likely to be found among the more heterogeneous blue-collar workers of different industries where ability differences not captured by our set of data may explain more of the variation than among the white-collar workers. Higher interindustry earnings differentials are also more likely to be found for employees with a relatively low mobility such as women, especially women with children at home. Traditionally, a married couple chooses to live near the working place of the main income earner, and so far, as a general rule, this has been the husband. Therefore, women might only be mobile across industries near their home which in turn is determined by job opportunities for the husband. Another reason for the lower interindustry mobility of married women with children at home can be that in most cases they and not their husbands take care of the children when they become sick. Therefore, a relatively short distance between the place of work and the home might be a further restriction which can explain interindustry wage differentials between men and women. Higher wages in more distant industries, then, are a smaller incentive to change the job for women than for men.

In general, our findings are consistent with these considerations. The employment-weighted standard deviation of the interindustry earnings differences is higher for blue-collar workers than for white-

groups of skilled workers (white-collar workers, groups 2, 3, and 4), one group of specialized workers (blue-collar workers, group 1), and three groups of unskilled workers (white-collar workers, group 5, and blue-collar workers, groups 2 and 3). Since all wages and salaries are published for both men and women we get a total of 14 quasi different qualification groups. From the original data for the months January, April, July, and October we calculate average wages and salaries for each qualification group in each industry for selected years. In the remainder of the paper the term "earnings" refers to wages for blue-collar workers and to salaries for white-collar workers.

Table 1 – *Interindustry Earnings Differentials for Selected German Industries, 1986 (percent)* [a]

Industry [b]	Men		Women	
	Blue-collar workers (1)	White-collar workers (2)	Blue-collar workers (3)	White-collar workers (4)
Mining	7.5	9.1	–	6.4
Stone and clay	−6.7	−6.9	5.3	−5.0
Iron and steel	1.0	−2.5	8.1	−4.0
Nonferrous metals	−1.0	−0.8	3.8	−0.2
Chemicals	6.8	4.3	8.4	12.6
Petroleum refining	27.6	25.8	25.2	32.1
Rubber	−1.9	−3.2	6.2	0.9
Lumber	−14.2	−13.3	−3.9	−18.1
Pulp, paper, paperboard	1.0	8.1	−0.5	2.4
Structural engineering	3.2	2.4	4.4	−2.1
Machinery, exc. electrical	1.6	−0.1	7.1	−3.6
Computer equipment	−1.4	13.5	10.4	17.9
Motor vehicles and equipment	10.5	9.0	24.2	8.8
Ship building	4.0	−7.7	13.3	−11.1
Aircraft	8.2	6.6	12.6	7.3
Electrical engineering	−3.0	2.9	3.1	3.0
Precision mechanics, optics	−4.8	−5.7	3.6	−3.4
Metal products	−6.8	−6.2	−1.2	−7.6
Precision ceramics	−15.9	−18.7	−6.5	−13.1
Glass	−4.0	−9.2	−6.5	−9.5
Furniture	−7.1	−12.0	−0.6	−15.9
Musical instruments, toys, jewelry	−11.4	−11.7	−7.3	−11.6
Paper and paperboard products	−10.3	−7.9	−11.0	−10.5
Printing	9.4	−2.4	10.1	−2.3
Plastics products	−9.1	−6.2	−7.4	−8.2
Leather	−17.6	−11.3	−9.9	−12.2
Leather products	−21.2	−20.1	−18.6	−20.7
Footwear	−19.4	−18.1	−10.0	−20.7
Textiles	−15.1	−13.6	−6.3	−10.2
Apparel	−16.0	−15.4	−11.6	−10.2
Food, beverages, tobacco	−8.1	−9.2	−11.1	−4.8
Construction	−3.8	−0.2	–	−7.9
Public utilities	11.0	−4.3	14.3	3.0
Employment-weighted standard deviation	0.304	0.219	0.450	0.375
Note: Correlation coefficient with U.S. wage differentials				
in 1984 [c]	0.886	0.872	0.808	0.830
in 1939 [d]	0.815	–	–	–

[a] Percentage deviation of employment-weighted average wages (salaries) from the industry average total. – [b] Classification according to the West German wage and salary statistics. – [c] Correlation coefficients with labor-quality adjusted U.S. wage differentials; 21 observations for columns (1), (2) and (4), 19 observations for column (3). – [d] 14 observations.

Source: Krueger and Summers [1988]; Slichter [1950]; Statistisches Bundesamt [a; b]; own calculations.

collar workers and it is higher for women than for men. That is to say, interindustry earnings differentials are smallest (the standard deviation is 0.219) for the most homogeneous and most mobile employee group, namely male white-collar workers, and they are highest (the standard deviation is 0.450) for the most heterogeneous and most immobile employee group, namely female blue-collar workers.[4]

We find a rather strong positive correlation between each of our (subgroup) earnings structures (columns (1) through (4) in Table 1) and the labor-quality adjusted U.S. wage structure in 1984 in spite of our estimated group-specific differences.[5] Even the U.S. interindustry wage structure of 1939[6] is correlated positively with the West German interindustry wage structure of 1986 (correlation coefficient of 0.82). Our finding seems to confirm the hypothesis that wage structures are similar across countries independent of the time period under consideration. Taken at face value, however, the high correlation coefficient between the U.S. and the West German interindustry wage structure as measured by our first rather broad concept is not sufficient to reject the hypothesis of equal wages for equally qualified workers across industries in West Germany, especially since our results seem to indicate absolutely smaller interindustry wage differentials than in the U.S. [Krueger and Summers, 1988, p. 265]. But in contrast to the methodology used in the recent U.S. studies, we cannot simultaneously test for the magnitude and the statistical significance of interindustry wage differentials. Therefore, we try to test for the existence of high-wage and low-wage industries in West Germany with a different approach in more detail.

Here we use an F-test to decide whether the wage and salary structure of a given industry differs from the average wage and salary structure of our sample. The test criterion is given by [Maddala, 1977]

$$F = \frac{(RRSS - URSS)/(k+1)}{URSS/(n_1 + n_2 - 2k - 2)}$$

with RRSS = restricted sum of squared residuals, URSS = unrestricted sum of squared residuals, $k+1$ = number of parameters, and n_1, n_2 = number of observations in different samples.

[4] For the U.S. the quality adjusted, employment-weighted standard deviation of the estimated wage differentials reported to be 24 percent [Krueger and Summers, 1987, p. 21] and 28 percent [Katz and Summers, 1989, p. 219] for 1984.

[5] The correlation between wage differentials for a single occupational group, namely operatives in West Germany and in the U.S. is reported to be as high as 0.95 in 1983 [Katz and Summers, 1989, p. 225].

[6] Data are taken from Slichter [1950].

We run regressions of the form

$$\ln w = C + \sum_{i=1}^{6} Q_i + G + u$$

to estimate the squared sum of residuals from an analysis of variance. Our observations are the effective monthly wages and the effective monthly salaries (ln w) of the previously-mentioned 14 qualification groups, namely three blue-collar worker and four white-collar worker groups, for men and women, respectively. Q and G are dummy variables for the different qualification groups (Q) and for women (G). The regression constant C captures the impact of the (omitted) seventh qualification group (for men), and u denotes the error term. The procedure to calculate the F-value for each industry involves three regressions of the form described. The first regression which combines the 14 industry-specific wages and salaries and the 14 average industry wages and salaries in one sample with 28 observations generates the restricted residual sum of squares (RRSS). The unrestricted residual sum of squares (URSS) is estimated from the two samples which add up to the first regression sample: the residual sum of squares following from a regression on the 14 average industry wages and salaries is added to the residual sum of squares following from a regression on the industry-specific wages and salaries.

The critical F-value for 8 parameters and 12 degrees of freedom, which follows from our sample of 28 observations and 7 (exogenous) dummy variables is 2.85 for the 5 percent statistical significance level. That is, a computed F-value higher than 2.85 indicates the inequality of the coefficients in our two regression sets. With such a result we reject the null hypothesis of indifferent wages and salaries for equal qualifications between the industry under consideration and the computed industry average. With an estimated F-value lower than the critical F-value we accept the "indifferent wage structure" hypothesis. The detailed results of the F-test for different years are presented in Table 2. The general picture emerges that for West German industries there is a statistically significant interindustry earnings dispersion for employees classified within the same qualification group. Recession years such as 1982 and 1975 seem to have no major impact on this result, thus ruling out explanations based on cyclical behavior. From the year 1960 to 1986 the interindustry wage dispersion apparently grew in terms of the number of industries whose wages and salaries significantly deviate from the industry average: from 15 industries out

of a sample of 31, to 26 industries out of a sample of 33.[7] Even for the last years this is less than what has been observed for the U.S., where wages in nearly all the industries are reported to deviate significantly from the industry average. However, this small difference in the findings for West Germany and the U.S. may partly have a technical reason.

One basic assumption of the F-test is equal error variances in the different subsamples. In this case the probability of rejecting a true hypothesis is minimized. But in the case of heteroscedasticity the true level of significance always becomes larger than the nominal level presupposed under homoscedasticity [Toyoda, 1974]. Although Toyoda's quantitative results have been shown to be generally too pessimistic about the effect of heteroscedasticity on the F-test, his qualitative result about the true level of significance, especially in the case of equal and small subsample sizes, is worth considering [Schmidt and Sickles, 1977]. With respect to our results this implies that with heteroscedasticity the "true" F-value for the 5 percent level will be somewhat lower than indicated by the F-table. Therefore, judged by the F-test an increase in the number of industries whose wage and salary structure statistically differs from the industry average is the likely outcome if heteroscedasticity is present.

Our results for the Breusch-Pagan test[8] for heteroscedasticity (see "q" in Table 2) confirm this expectation. For each year there are some industries where the estimated F-value may be small only because of unequal error terms in the two regression subsets[9] implying that the hypothesis of no interindustry wage differences has to be rejected more frequently than indicated at the presented 5 percent level. This finding brings us closer to the reported U.S. result in terms of the number of industries whose wages deviate significantly from the average industry wage.

Our results suggest that on average a high (low)-wage industry is a high (low)-wage industry for all qualification groups of employees. In that case, the correlation of average industry wages and qualification-specific wages should be rather strong. As reported for the U.S., the correlation coefficient between the interindustry wage differentials estimated with and without labor-quality control variables is 0.95 [see

[7] An increase in the interindustry wage differentials especially in manufacturing industries has also been reported for the U.S. since 1970 [Bell and Freeman, 1985].

[8] Breusch and Pagan [1979]; see Judge et al. [1982] and Johnston [1984] for a textbook version.

[9] Precision mechanics and glass are examples for the year 1986.

Table 2 – *F-Test Results on Interindustry Wage Differentials*

Industry	F	q	F	q	F	q
	1986		*1982*		*1980*	
Mining	25.47*	17.11+	28.75*	11.51	30.83*	10.83
Stone and clay	1.01	2.92	1.32	9.72	1.22	5.08
Iron and steel	12.46*	1.11	5.61*	9.28	4.14*	11.27+
Nonferrous metals	12.28*	18.94+	1.31	12.31+	4.91*	17.88+
Chemicals	21.82*	2.45	13.36*	3.04	14.30*	3.84
Petroleum	54.79*	4.31	60.07*	0.49	57.13*	1.07
Rubber	0.83	10.09	1.23	12.71+	2.11	10.03
Lumber	7.05*	4.74	4.75*	1.80	4.66*	11.03
Pulp, paper, paperboard	7.64*	9.37	4.45*	6.87	3.89*	3.42
Structural engineering	2.33	2.41	0.55	7.33	1.46	15.39+
Machinery, exc. electrical	3.60*	23.66+	1.24	12.24+	1.48	13.26+
Computer equipment	6.18*	7.76	2.74	10.58	2.55	7.82
Motor vehicles and equipment	55.12*	8.01	20.00*	4.58	31.01*	7.26
Ship building	1.79	9.53	0.82	9.20	0.75	6.16
Aircraft	4.76*	6.01	5.34*	3.28	4.91*	1.91
Electrical engineering	3.93*	11.39	0.76	18.71+	1.00	10.62
Precision mechanics, optics	0.91	21.79+	0.58	11.92	0.51	13.25+
Metal products	1.04	4.40	1.63	7.33	1.07	7.10
Precision ceramics	15.22*	7.32	4.51*	13.56+	1.73	9.66
Glass	1.97	15.27+	1.99	17.12+	2.06	14.22+
Furniture	3.44*	10.80	3.24*	10.17	2.24	16.67+
Musical instruments, toys, jewelry	9.93*	13.67+	5.26*	4.61	5.95*	3.13
Paper and paperboard products	10.93*	10.20	7.89*	10.37	15.22*	13.88+
Printing	6.32*	17.79+	3.49*	8.84	3.67*	9.01
Plastics products	5.58*	14.18+	5.91*	16.23+	4.65*	20.76+
Leather	11.53*	5.58	3.89*	3.75	7.07*	9.25
Leather products	36.63*	1.19	40.26*	2.05	7.80*	2.14
Footwear	10.58*	1.69	7.10*	3.45	11.48*	4.19
Textiles	7.52*	7.63	15.74*	7.00	15.99*	5.97
Apparel	17.65*	3.69	19.94*	5.27	18.59*	4.77
Food, beverages, tobacco	8.91*	17.51+	3.94*	14.21+	7.02*	15.55+
Construction	29.52*	31.17+	5.30*	25.19+	5.04*	16.48+
Public utilities	7.99*	4.78	6.93*	4.74	6.86*	4.00
Number of industries deviating from the industry average	26		22		21	

(Table continued on next page)

Krueger and Summers, 1987, p. 19; Katz and Summers, 1989, p. 218]. We try a similar, though weaker test with the West German data. In a cross-section analysis we correlate the average blue-collar worker wages with the blue-collar worker wages for the different qualification groups, and we use the same procedure for the white-collar worker

(Table 2 continued)

Industry	F	q	F	q	F	q
	1975		*1970*		*1960*	
Mining	17.15*	11.35	2.01	33.65^{+}	17.66*	8.90
Stone and clay	0.70	10.06	0.81	24.70^{+}	1.38	10.67
Iron and steel	2.74	14.39^{+}	3.67*	10.31	3.80*	4.99
Nonferrous metals	1.88	16.08^{+}	1.64	22.09^{+}	1.07	12.58^{+}
Chemicals	9.81*	3.05	13.39*	7.23	3.82*	20.88^{+}
Petroleum	44.98*	1.26	42.35*	1.41	10.47*	8.49
Rubber	2.21	15.89^{+}	5.02*	7.77	7.84*	5.14
Lumber	5.43*	4.64	4.20*	11.39	14.33*	8.09
Pulp, paper, paperboard	1.76	18.62^{+}	4.17*	14.41^{+}	2.08	8.76
Structural engineering	2.67	9.19	2.40	8.39	0.64	2.87
Machinery, exc. electrical	1.17	10.22	0.76	17.43^{+}	2.17	14.49^{+}
Computer equipment	1.57	8.24	n.a.	n.a.	n.a.	n.a.
Motor vehicles and equipment	24.29*	6.70	7.88*	7.18	6.38*	14.71^{+}
Ship building	2.18	7.17	0.65	9.49	1.41	6.13
Aircraft	3.22*	4.86	3.13*	13.55^{+}	n.a.	n.a.
Electrical engineering	0.96	1.94	1.97	6.72	0.85	4.43
Precision mechanics, optics	2.62	9.27	1.34	8.95	1.72	3.69
Metal products	1.38	6.37	1.68	0.99	0.15	9.54
Precision ceramics	2.71	11.61	3.28*	7.37	1.01	11.79
Glass	1.77	5.76	0.74	29.90^{+}	0.72	8.71
Furniture	3.42*	6.76	3.23*	6.54	26.47*	6.66
Musical instruments, toys, jewelry	1.84	3.37	11.87*	9.91	10.68*	7.17
Paper and paperboard products	9.28*	10.63	3.35*	15.37^{+}	2.17	13.16^{+}
Printing	3.20*	14.25^{+}	4.71*	11.22	2.47	3.17
Plastics products	4.09*	5.28	1.90	14.88^{+}	1.66	5.08
Leather	3.59*	3.07	2.14	8.74	7.10*	7.85
Leather products	16.57*	1.96	10.26*	6.20	4.43*	8.53
Footwear	9.64*	3.65	7.00*	15.95^{+}	3.85*	53.27^{+}
Textiles	3.66*	3.02	2.67	13.24^{+}	2.23	16.90^{+}
Apparel	18.61*	3.78	17.88*	3.62	6.09*	2.95
Food, beverages, tobacco	5.24*	15.32^{+}	4.20*	37.71^{+}	2.20	43.98^{+}
Construction	2.83	32.88^{+}	1.25	9.20	20.77*	27.42^{+}
Public utilities	19.06*	3.40	11.13*	9.38	3.20*	5.13
Number of industries deviating from the industry average	17		18		15	

Note: Classification according to the German wage and salary statistic. – F = estimated F-value. q = Breusch-Pagan test results for heteroscedasticity. * = statistically significant deviation from the interindustry average wages and salaries at the 5 percent level. $^{+}$ = rejection of homoscedasticity at the 5 percent level.

Source: Statistisches Bundesamt [a; b]; own calculations.

salaries (Table 3). In contrast to the wide range of control variables used in the U.S. studies, which a priori allow a low or no correlation to be expected, it is more likely to find some correlation in our data

Table 3 – *Correlation Coefficients between Selected Wages and Salaries, 1986*[a]

	Blue-collar worker wages				White-collar worker salaries				
	average[b]	group 1	group 2	group 3	average[b]	group 2	group 3	group 4	group 5
Blue-collar worker wages									
average[b]	1.00	*0.94*	*0.91*	*0.75*	x	x	x	x	x
group 1	0.91	1.00	*0.88*	*0.70*	x	*0.84*	*0.82*	*0.65*	*0.64*
group 2	0.94	0.88	1.00	*0.86*	x	*0.72*	*0.75*	*0.51*	*0.56*
group 3	0.89	0.78	0.90	1.00	x	*0.45*	*0.58*	*0.28*	*0.35*
White-collar worker salaries									
average[b]	x	x	x	x	1.00	*0.97*	*0.90*	*0.85*	*0.71*
group 2	x	0.78	0.74	0.62	0.88	1.00	*0.89*	*0.74*	*0.55*
group 3	x	0.80	0.78	0.71	0.94	0.94	1.00	*0.83*	*0.61*
group 4	x	0.71	0.72	0.73	0.92	0.85	0.92	1.00	*0.75*
group 5	x	0.58	0.60	0.61	0.85	0.67	0.72	0.88	1.00

[a] The figures in the upper triangle (in italics) refer to men, those in the lower triangle to women. – [b] Unweighted average.

Source: Statistisches Bundesamt [a; b]; own calculations.

because we correlate an average wage (salary) with one of its components. Therefore, we should at least find a similarly high correlation coefficient, if the underlying hypothesis of substantial interindustry wage differentials even after controlling for a number of variables (where qualification and sex may be the most important) is also true for West Germany.

Our results cast some doubt on this consideration. Firstly, the correlation coefficients are lower than expected. Secondly, the correlation coefficients for high qualification groups are higher than the correlation coefficients for low qualification groups. This pattern emerges for both men and women and for white-collar workers as well as for blue-collar workers (see the colums and rows entitled "average").

Furthermore, directly correlating the wages and salaries of the different qualification groups with each other reveals that our hypothesis that wage and salary levels between industries differ across all qualification groups may be somewhat overstated. All qualification

groups are significantly correlated with each other in a statistical sense, but the degree of correlation substantially declines the more different the qualification groups are (Table 3).[10] This means that there is no uniform pattern in the interindustry wages and salaries of our set of data. Not every high (low)-wage industry seems to pay high (low) wages for all qualification groups. It is tempting to conclude from these results that interindustry qualification and sex differences of the employees explain more of the interindustry wage variation in West Germany than in the United States. Following neoclassical labor market theory one would have expected just the opposite result given Germany's labor market institutions and the high degree of labor market regulations on the one hand and given the high mobility and the low degree of unionization in the U.S. labor market on the other.[11] However, this interpretation is subject to a strong caveat.

So far, we have neglected an important aspect in our discussion of the interindustry wage structure, namely the employment shares of the different qualification groups. Table 4 offers two insights. Firstly, the structure of the skill pattern of industrial employment did not change between 1973 and 1986; the correlation coefficient of these skill patterns is 0.98. Secondly, the employees of four qualification groups account for more than 70 percent and male workers account for some 80 percent of total industrial employment.

Especially the second point is important for the interpretation of our results because industrial employment is apparently concentrated on skilled and specialized male workers. In other words, industry-specific wages and salaries for unskilled workers and for women in general may partly reflect regional wage and salary variation due to their small employment share. That is, the probability for a specific wage or salary in a given industry to reflect regional labor market conditions increases as the employment share of this specific wage or salary group declines. If we accept this hypothesis the implications with respect to our findings are twofold.

Firstly, our finding of a relatively small correlation coefficient between the wages (salaries) of more distant qualification groups indicates the presence of the regional variation effect. For male workers, for example, the lowest correlation coefficients are found for the

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[10] In contrast to this finding Dickens and Katz [1987b, p. 9] report "...large correlations between average wages in any two occupations within an industry" for private sector non-union workers in the U.S.

[11] For an account of the inflexibilities of the West German labor market see Soltwedel and Trapp [1988].

Table 4 – *Percentage Shares of Different Qualification Groups in Total Industrial Employment*[a], *1973 and 1986*

	1973	1986
Blue-collar workers	75.8	70.7
men group 1	31.4	33.9
men group 2	20.2	18.2
men group 3	7.7	5.3
women group 1	1.0	0.8
women group 2	7.7	5.8
women group 3	7.9	6.7
White-collar workers	24.2	29.3
men group 2	6.0	9.7
men group 3	8.8	10.1
men group 4	2.1	1.8
men group 5	0.2	0.1
women group 2	0.4	0.7
women group 3	2.7	3.4
women group 4	3.4	3.3
women group 5	0.6	0.4
Note: women total	*23.7*	*21.0*

[a] Mining, manufacturing, construction, and public utilities.

Source: Statistisches Bundesamt [a; b]; own calculations.

white-collar groups 4 and 5 (see Table 3), and these groups show the lowest employment share for male workers (see Table 4). Therefore, one can speculate that the correlation coefficients between more distant wage and salary groups would be higher in the absence of the regional variation effect in the data. Secondly, the number of industries whose wages and salaries deviate significantly from the industry average for all qualification groups (see Table 2) would presumably increase if the test procedure were able to control for regional variation effects.

To sum up, if the existence of the supposed regional variation effects is accepted, our results for West Germany are in line with two basic hypotheses: the West German and the U.S. interindustry wage structures are remarkably similar, and high (low)-wage industries are high (low)-wage industries for all qualification groups.

III. Qualifications and Outlook

One can attempt to rationalize this interindustry wage pattern in the framework of the standard competitive model in two ways. Firstly, the interindustry differences in wages for workers with similar characteristics may be necessary to compensate for differences in working conditions. In this case the international similarity of interindustry wage structures would be no surprise. But if the observed wage premia were merely compensating payments for harder working conditions, then we would expect quit rates in the high-wage industries to be about as high as in the low-wage industries. However, the empirical evidence for the U.S. suggests that quit rates and labor-quality adjusted industry wage differentials are negatively correlated [Katz and Summers, 1989]; that is, workers in high-wage industries are less inclined to quit than workers in low-wage industries. Therefore, industry wage premiums seem to reflect rents to "good" jobs and are not merely compensating payments. Furthermore, while it may be reasonable to expect large differences in working conditions for some occupational groups across industries, it is unlikely that these large differences exist for all other employee groups (e.g., secretaries or janitors) as well. But our correlation results (Table 3) point just to this phenomenon. If one occupational group in an industry is highly paid relative to the industry average, all categories of workers in that industry tend to be highly paid. Thus compensating wage differentials offer no overall explanation of the observed interindustry wage pattern.

A second and more promising way to rationalize the observed wage differentials within the framework of the competitive model is to account for worker's abilities not captured by the available data. Obviously, the available controls for differences in worker's abilities are not exhaustive in our set of data for West Germany, to say the least. Therefore, it is reasonable to expect interindustry wage differentials following from unobserved productivity differences between workers of the same broad qualification group. For the U.S. the empirical evidence on unobserved labor-quality differences is ambiguous, however. Some researchers find it very difficult to attribute interindustry wage differences to unobserved labor-quality differences [Krueger and Summers, 1988; Gibbons and Katz, 1989; Katz and Summers, 1989]. Others argue that productivity-based sorting is an important determinant of interindustry wage differences, since it is plausible that observable and unobservable ability measures are pos-

itively correlated and controlling for the observable ability variables reduces the magnitude of the interindustry wage variations [Topel, 1989; Murphy and Topel, 1987]. But even the existence of unobserved abilities cannot explain the large correlations between wages in any two qualification groups.

So far, the most prominent candidate among alternative approaches explaining the interindustry wage differentials is the efficiency wage theory.[12] Its basic hypothesis is that the productivity of workers is a function of the wage paid. Thus, it may be profitable for firms to raise wages above market-clearing levels in order to increase workers' effort. Since the relationship between productivity and wages may differ between industries, profit-maximizing behavior by firms may lead to wage differentials between industries. Stiglitz [1986] categorizes five versions of the efficiency wage model, each featuring a different reason why higher wages may increase effort. But only one type of efficiency wage models – namely sociological models based on workers' fairness considerations – may be compatible with the empirical evidence because all the other versions cannot account for the previously-mentioned high correlations between the wages of any two qualification groups within an industry. In the sociological models productivity is assumed to depend on workers' perceptions as to whether they are being paid fairly. Perceived fairness in turn depends on firms' characteristics like production technologies and monopoly rents. These characteristics differ between industries and may thus explain wage differentials. In fact, Dickens and Katz [1987a] find that wage premia are positively correlated with profits and the capital-intensity of production, while Kahneman et al. [1986] present empirical evidence that fairness considerations influence the behavior of firms in setting prices and wages. In addition, it is possible to combine the fairness models with other efficiency wage models. For example, some workers in specific industries may be able to exert much damage to their firm by shirking. Thus, they may receive high wages in order to prevent them from doing so. That is, the costs of shirking may differ between industries due to industry-specific production technologies. Internal fairness considerations may then lead to high wages for all workers in industries with production costs sensitive to potential shirking.

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[12] For surveys of efficiency wage models see Yellen [1984], Stiglitz [1986], and Katz [1986].

Interpretations like these are robust with respect to the available data cited so far, although they are not necessarily exclusive. All these more or less theoretical considerations are waiting for an empirical test, at least for West Germany. Testing these hypotheses seems to be an important task for further research since an explanation of the observed interindustry wage pattern within the framework of efficiency wage models would have far-reaching consequences for economic policy prescriptions regarding the labor market.

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Zusammenfassung: Mehr Evidenz zur interindustriellen Lohnstruktur in der Bundesrepublik Deutschland. – Die Verfasser zeigen, daß in der Bundesrepublik Deutschland für Arbeitskräfte mit ähnlichen Qualifikationsmerkmalen branchenspezifische Lohnunterschiede existieren und daß die interindustrielle Lohnstruktur in der Bundesrepublik der interindustriellen Lohnstruktur in den Vereinigten Staaten gleicht. So sind der Straßenfahrzeugbau und die Mineralölverarbeitung in beiden Ländern typische Hochlohnbranchen, das Bekleidungsgewerbe und das Ledergewerbe dagegen typische Niedriglohnbranchen. Diese Ähnlichkeit der interindustriellen Lohnstrukturen muß überraschen, da sich die institutionellen Rahmenbedingungen des Arbeitsmarktes in beiden Ländern sehr stark unterscheiden. Darüber hinaus zeigt sich, daß im Branchenquerschnitt die Verdienste von Beschäftigten mit unterschiedlicher Qualifikation eng miteinander korreliert sind. Diese Ergebnisse sind nicht ohne weiteres mit den herkömmlichen neoklassischen Arbeitsmarktmodellen zu vereinbaren.

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Résumé: Plus d'évidence des différences inter-industrielles de salaire: Le cas de la RFA. – Cette étude représente l'évidence empirique de l'existence des différences inter-industrielles de salaire pour les ouvriers avec des qualifications similaires en RFA. La structure de salaire inter-industriel en RFA semble à celle aux Etats Unis. Dans tous les deux pays ce sont l'industrie d'automobiles et les raffineries de pétrol qui ont un typiquement haut niveau de salaire, tandis que les industries des textiles et de cuir ont un niveau bas. La similarité des structures inter-industrielles de salaire est un puzzle parce que ces deux pays ont des institutions complètement différentes en ce qui concerne le marché du travail. De plus, on a trouvé des corrélations fortes de salaire entre aucun de deux groupes d'ouvriers qualifiés sur toutes les branches en RFA. Ces résultats sont un défi pour les théories néoclassiques du marché du travail.

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Resumen: Más evidencia empírica sobre el rompecabezas de las diferencias salariales interindustriales en Alemania Occidental. – En este trabajo se presenta evidencia empírica sobre la existencia de diferencias interindustriales en el nivel de salarios para trabajadores con calificación similar en Alemania Occidental. La estructura interindustrial de salarios de Alemania Occidental presenta el mismo perfil que la de los EE UU. En ambos países las ramas de salarios altos comúnmente son las de vehículos y refinación de petróleo, mientras que las ramas de salarios más bajos incluyen las de la vestimenta y cuero. La similitud de las estructuras interindustriales de ingresos indica la existencia de un rompecabezas, debido a que estos países exhiben un marco institucional para el mercado laboral totalmente diferente. Además, se encuentra una correlación alta entre los salarios de dos grupos cualesquiera de trabajadores calificados pertenecientes a una misma industria. Estos resultados constituyen un reto a las teorías neoclásicas tradicionales del mercado laboral.