Industrial Relations Section
Princeton University
Working Paper 122
May 1979

RELATIVE WAGE EFFECTS OF UNIONS, DICTATORSHIP AND CODETERMINATION:
ECONOMETRIC EVIDENCE FROM GERMANY

J. Svejnar*

Department of Economics
Cornell University
May 1979

- * I would like to thank Orley Ashenfelter and Albert Rees for helpful comments. I have also benefitted from discussions with John Butler, William Greene and Katherine Terrell. Any remaining errors are, of course, my own.

This research was in part supported by a grant to the Princeton University Economics Department from the Sloan Foundation.

I. Introduction

The present study estimates the relative wage effects of three institutional forms in Germany: the trade unions, Hitler's regime, and codetermination.^{1/} Following a brief discussion of each of these institutions, the analytical model is developed in Section II. The empirical results are reported in Section III. Section IV contains summary and conclusions.

Concerning the first institutional form to be considered, namely trade unions, the extensive literature on union wage effects^{2/} has focused almost exclusively on the union impact in North America and, more recently, in Great Britain.^{3/} Since the German institutions of industrial and labor relations differ considerably from their Anglo-American counterparts,^{4/} it is worthwhile exploring the magnitude of the union wage effect in a different institutional setting. In particular it has been argued that, compared

^{1/} The term codetermination refers to the German participatory system of management, as it was originally established in the Federal Republic by the 1951 Codetermination Act and the 1952 Works Constitution Act.

^{2/} The most important work and collection of references on the subject is still Lewis (1963). Among the later studies in the private sector are Ashenfelter (1972), Ashenfelter and Johnson (1972), Bloch and Kuskin (1978), Boskin (1972), de Menil (1968), Rosen (1969) and Schmidt and Strauss (1976). Public sector studies are summarized by Lewin (1977).

^{3/} See especially Pencavel (1974), Mulvey (1976) and Metcalf (1977).

^{4/} Needless to say there are important differences between the U.S. and British systems of industrial and labor relations. They exhibit considerable homogeneity, however, when compared to the systems in continental Europe. Historically, the relatively most salient features of the German system have been 1) trade union affiliation with political parties and/or religious organizations, 2) industrial unionism, 3) governmental interference in industrial and labor relations, and 4) paternalistic management. World War II led to the unification of the formerly splintered unions in the Deutsches Gewerkschafts Bund (DGB), affiliation with the Social Democratic Party (SPD) and the establishment of codetermination. For institutional references see Almasreh (1977), Furstenberg (1969, 1977), Schregle (1978) and Vollmer (1976).

to their American and British counterparts, the continental unions tend to place more emphasis on political and social, rather than economic achievements. ^{5/} If this hypothesis is correct, the estimated relative wage effect of German unions ought to be smaller than that found in the United States and Great Britain.

With the advent of Hitler's regime in 1933 there was a dramatic transformation of the existing political and economic institutions. Trade unions, which in 1932 represented over forty per cent of the industrial labor force, were speedily abolished ^{6/} and replaced by a government-operated "Labor Front" ^{7/}. Strikes and lockouts were forbidden and wages were determined centrally. ^{8/} Workers were assured of jobs, provided they accepted the new system. The effects of these changes on the cultural, political and social life have been well documented. However, very few economic studies attempted to analyze the effect of Hitler's regime on wages and incomes and those that did used a qualitative or only a loose quantitative approach. ^{9/} This paper makes use of a special data set calculated by Professor Hoffmann (1965) to derive quantitative estimates of the regime's effect on incomes during the pre-World War II period of 1933-38. ^{10/}

^{5/} See Kassalow (1969, 1978) and Windmuller (1969).

^{6/} Employers associations followed their lead in 1934.

^{7/} The Labor Front included all employees and employers. It represented the Nazi government in the factories and possessed broad powers over its member-subjects.

^{8/} In fact, the entire economy underwent strict centralization as Hitler proclaimed his first Four-Year Plan in 1933 and a second one in 1936.

^{9/} Among the most thorough and informative of these conventional studies is that of Bry (1960). The major barrier to a successful research in this area is the lack of a systematic wage data series prior to 1934. See Gerß (1977).

^{10/} The 1933-38 period, rather than the 1933-45 period, was used in order to capture the effect of Hitler's dictatorship before the wartime disruptions, which included changes in the labor force composition and in territorial boundaries, set in.

The introduction of employee participation in management through the codetermination laws of 1951 and 1952^{11/} provided employees with a potential for greater control over decisionmaking in their enterprises. Since several Western European countries have since been inspired by the German example^{12/}, the relationship between employee power and wage gains within this framework is now of general interest. A theoretical model which analyzes the link between bargaining power and wages in this context has been developed by Svejnar (1977). A partial test of that model is presented here.

^{11/} The 1951 Codetermination Act gave employees in the iron-steel and mining industries fifty per cent of the seats on the Boards of Directors of their enterprises. It also established the position of a labor director on the Management Boards. The labor director cannot be appointed or dismissed without a majority approval of the employee representatives to the Board of Directors and hence tends to be a pro-labor force. In contrast to the 1951 Act, the 1952 Works Constitution Act granted employees in all but shipping and air-transport industries one-third of the seats on the Boards of Directors. Moreover, it made no provision for the post of a labor director. For details see Furstenberg (1969, 1977) and Vollmer (1976). It is worth noting that the 1976 Codetermination Act extended a modified a version of the 1951 Act to all firms with a workforce of 2,000.

^{12/} Western European countries that have already legally established significant forms of employee participation in management are: Austria, Denmark, Luxemburg, Netherlands, Norway and Sweden. Similar legislations have been discussed in several other countries, including Great Britain.

II. The Model

Most of the literature on the union relative wage effects employs as its main analytical tool the Lewis (1963) model. A variant of this model is used as a starting point here as well. The resulting estimates are, hence, comparable to those obtained for the U.S. and Great Britain.

The general objective is to measure the relative difference between the union wage, W^u , and the wage which would exist in the absence of trade unions, W^a .^{13/} This endeavor is complicated by the fact that W^a becomes unobservable once trade unions come into existence. What is observable then, is some nonunion wage, W^n , which may differ from W^a because of spillover, threat and other effects brought about by the presence of unions. While it is relatively easy to estimate the union relative wage effect on the basis of W^n , it is more difficult, but preferable, to do so on the basis of W^a .^{14/} Define:

$$(1) \quad A = \frac{W^u - W^n}{W^n}, \quad B = \frac{W^n - W^a}{W^a} \quad \text{and} \quad D = \frac{W^u - W^a}{W^a}$$

as the union-nonunion, nonunion-"competitive", and union-"competitive" wage differentials, respectively.^{15/} For small differentials $A \approx \ln W^u - \ln W^n$, $B \approx \ln W^n - \ln W^a$, $D \approx \ln W^u - \ln W^a$, and $A + B \approx D$.

For a given industry i the overall wage W_i can be decomposed into a geometric average of the union and nonunion components as follows:

$$(2) \quad \begin{aligned} \ln W_i &= U_i \ln W_i^u + (1-U_i) \ln W_i^n \\ &= \ln W_i^n + AU_i, \end{aligned}$$

^{13/}In the case of aggregate data, W^u and W^a are industry or occupational averages. In micro-data sets they are individual wages.

^{14/}It will be shown that the two estimates coincide only under certain circumstances.

^{15/}The term competitive wage refers to the wage W^a , which would exist in the absence of trade unions.

where U_i is the percentage of the labor force in industry i which is unionized.^{16/} While (2) has often been estimated directly, it falls short of the desired objective. Coefficient A represents the union-nonunion rather than union-competitive relative wage effect. Moreover, a vector X_i of the other usual explanatory variables approximates $\ln W_i^a$ rather than $\ln W_i^n$ in (2).

These problems may possibly be overcome if (2) is reformulated for two given industries (sectors) 1 and 2 as:

$$(3) \quad \ln W_1 = \ln W_1^a + D_1 U_1 + B_1 (1-U_1)$$

and

$$(4) \quad \ln W_2 = \ln W_2^a + D_2 U_2 + B_2 (1-U_2),$$

respectively.^{17/} Letting $\Delta D = D_1 - D_2$ and subtracting (4) from (3) leads to:

$$(5) \quad \ln W_1 - \ln W_2 = \ln W_1^a - \ln W_2^a + D_1 (U_1 - U_2) + (\Delta D) U_2 + B_1 (1-U_1) - B_2 (1-U_2).^{18/}$$

^{16/}Ideally, U_i should be the percentage of total compensation unionized. However, this information is usually harder to obtain.

^{17/}To see this substitute (1) into (2) to obtain $\ln W_i = \ln W_i^u \cdot U_i + \ln W_i^n \cdot (1-U_i)$. Since from (1) $\ln W_i^u \approx D + \ln W_i^a$ and $\ln W_i^n \approx B + \ln W_i^a$, equation (2) can be closely approximated as $\ln W_i = \ln W_i^a + D_i U_i + B_i (1-U_i)$.

^{18/}In the Lewis-type approach (2) is usually written as:

$$(6) \quad \ln W_i = \ln W_i^a + A_i U_i + B_i.$$

Defining the economy-wide average index of the union effect on the union-non-union relative wage as $\bar{A}$, (6) becomes:

$$(7) \quad \ln W_i = \ln W_i^a + \bar{A} U_i + B_i + U_i (A_i - \bar{A}).$$

For given two industries (sectors) 1 and 2, one then obtains:

Given that industries (sectors) 1 and 2 are usually selected so that 2 is much less unionized than 1, it is plausible to expect $B_1(1-U_1) - B_2(1-U_2) \approx 0$. Even if B_1 happened to be substantially greater than zero, $(1-U_1)$ is small in a highly organized industry. Similarly, large $(1-U_2)$ tends to be mitigated if the nonunion-competitive wage differential, B_2 , is negligible in a sparsely unionized industry. Finally, since these two small terms are expected to be of the same sign and are subtracted from one another, the net effect ought to be negligible indeed.^{19/} The term $(\Delta D)U_2$ is a different matter, however, and the hypothesis $(\Delta D)U_2 = 0$ should be tested before it is imposed on the data.

In view of the special German circumstances, equations (3) and (4) are specified as:

$$(9) \quad \ln W_{1t} = \alpha_1^1 X_{1t} + \alpha_2^1 U_{1t} + \alpha_3^1 (\text{COD})_t + \alpha_4^1 (\text{HIT})_t + V_t + \epsilon_{1t}$$

and

$$(10) \quad \ln W_{2t} = \alpha_1^2 X_{2t} + \alpha_2^2 U_{2t} + \alpha_3^2 (\text{COD})_t + \alpha_4^2 (\text{HIT})_t + V_t + \epsilon_{2t},$$

^{18/}(continued)

$$(8) \quad \ln W_1 - \ln W_2 = \ln W_1^a - \ln W_2^a + \bar{A}(U_1 - U_2) \\ + (B_1 - B_2) + U_1(A_1 - \bar{A}) - U_2(A_2 - \bar{A})$$

and a plausible argument is made that $(B_1 - B_2) + U_1(A_1 - \bar{A}) - U_2(A_2 - \bar{A}) = 0$. Note that (6), (7), and (8) use $\ln W^a$ rather than $\ln W^n$ on the right hand side, which removes one of the problems mentioned with respect to (2). Unlike (3), (4), and (5), however, equations (6), (7), and (8) still estimate the relative union wage effect as $\bar{A}$ rather than $\bar{D}$.

^{19/}On the basis of (8) Lewis makes a similar argument with respect to $U_1(A_1 - \bar{A}) - U_2(A_2 - \bar{A})$. However, $U_1(A_1 - \bar{A})$ and $U_2(A_2 - \bar{A})$ are of the opposite sign and hence do not cancel out. Note that if the assumption $B_1(1-U_1) - B_2(1-U_2) \approx 0$ does not hold, (5) becomes (8) on the basis of Lewis' argument, and it can be assumed that the present model estimates A rather than D .

where the subscripts on variables (superscripts on coefficients) denote the industry, t denotes time, X is a vector of explanatory variables approximating $\ln W^a$, COD is a dummy variable coded zero before and one after the introduction of codetermination, HIT is a Hitler dummy which takes on the value one in 1933-38 and zero otherwise, V_t is an error term common to both industries, and ϵ_{it} is an error term specific to industry i . Now let

$$(11) \quad \Delta\alpha_i = \alpha_i^1 - \alpha_i^2 \Rightarrow \alpha_i^1 = \Delta\alpha_i + \alpha_i^2, \quad i = 1, 2, 3, 4.$$

Subtracting (10) from (9) and substituting from (11) leads to:

$$(12) \quad \ln W_{1t} - \ln W_{2t} = \alpha_1^1 (X_{1t} - X_{2t}) + \alpha_2^1 (U_{1t} - U_{2t}) + \Delta\alpha_3 (\text{COD})_t \\ + \Delta\alpha_4 (\text{HIT})_t + \Delta\alpha_1 X_{2t} + \Delta\alpha_2 U_{2t} + \epsilon_t,$$

where $\Delta\alpha_3$ is the differential wage effect of codetermination, $\Delta\alpha_4$ is the absolute wage effect of the Hitler regime,^{20/} and $\epsilon_t = \epsilon_{1t} - \epsilon_{2t}$. The term $\Delta\alpha_1 X_{2t}$ represents the possible differences in $\ln W^a$ between industries 1 and 2, while $\Delta\alpha_2 U_{2t}$ corresponds to $(\Delta D)U_2$ in (5).

The major changes, which took place when Hitler seized power in 1933, naturally raise questions about the magnitude of the relative wage effect generated by the switch from the Weimar Republic system with trade unions to the Hitler dictatorship. Let us define this differential effect on relative wages as:

$$(13) \quad \bar{H} = \Delta\alpha_4 - \alpha_2^1 [U_{1(32)} - U_{2(32)}],$$

^{20/}Since HIT_t is coded one when U_{it} becomes zero, the absolute effect $\Delta\alpha_4$ measures the deviation in the relative wage from what it would have been in the absence of trade unions.

where $U_{i(32)}$ is the degree of unionization in industry i in 1932. With $\Delta\alpha_4$ and α_2^1 estimated from (12), the model permits us to distinguish five major scenarios:

- (i) $\Delta\alpha_4 > \bar{H} > 0$: both the trade unions and the Hitler regime increased the relative wage between industries 1 and 2 from what it would otherwise have been in the absence of unions, with the Hitler regime effect being the greater of the two;
- (ii) $\Delta\alpha_4 > 0$ and $\bar{H} < 0$: the relative wage effects of unions and the Hitler regime were both positive, the union effect being larger;
- (iii) $\bar{H} < \Delta\alpha_4 < 0$: the trade unions increased and the Hitler regime decreased the relative wage between industries 1 and 2 from what it would have been in the absence of unions. As a result, the differential effect $\bar{H}$ is even more pronounced than the absolute effect $\Delta\alpha_4$;
- (iv) $\bar{H} > \Delta\alpha_4 > 0$: the Hitler regime raised and the unions depressed the relative wage between the two industries from what it would have been in the absence of unions;
- (v) $\bar{H} > 0$ and $\Delta\alpha_4 < 0$: the Hitler regime lowered the relative wage between the two industries from its "competitive" level but the unions did so even more.

In Section II equation (12) is jointly estimated for several major industries by generalized least squares (GLS), using Zellner's (1962) seemingly unrelated regression framework. In order to obtain an overall estimate of the relative wage effect of unions, Hitler's regime and codetermination, the joint GLS procedure is first applied with equality constraints imposed on the respective coefficients of each of these three variables in all the industries. These constraints are then relaxed and the industry-specific wage effects of unions, Hitler's regime and codetermination are reported.

III. The Empirical Results

Since the textile industry data are the most complete among the less unionized industries, the textile industry, tx, is selected as the point of reference against which each of the other industries, i ($i=1, \dots, n$), is compared. The complete model includes the following variables in the X vector of each industry: Q_t , the index of industrial production, E_{t-1} , the number of employed workers in the preceding year, UN_t , the unemployment rate, and CLI_t , the cost of living index. ^{21/} For time series encompassing both the pre- and post-World War I periods, a dummy variable, WEIM, is included to account for possible structural shifts that may have occurred as a result of the war and the establishment of the Weimar republic.

The joint GLS estimates reported in Tables 1-5 rest on the assumption of nonzero correlation among the contemporaneous error terms in the several industry specific equations. ^{22/} For each equation the reported R^2 is calculated from the GLS estimates and hence is not bounded by zero from below. All equations are estimated in the first difference form.

Overall Results

Estimates of the overall effects of Hitler's regime, unions, and co-determination are presented in Tables 1 and 2. These estimates are obtained by constraining the coefficient of each variable -- $\Delta(\text{HIT})$, $\Delta(U_i - U_{tx})$, and $\Delta(\text{COD})$ -- to be the same across all the industries. The two tables are differentiated by the dependent variable and the time reference. In Table 1, the natural logarithms of annual earnings in

^{21/} These variables correspond to the solution of a simple demand-supply model in Lewis (1963), pp. 208-217. The results are thus comparable to Lewis' estimates for the U.S.

^{22/} Lagged error terms are assumed to be uncorrelated. Tables 1-5 report coefficient estimates of the relevant variables only. Full tables can be found in Svejnar (1979).

TABLE 1: Selected Results from a Constrained Joint GLS Model Based on Annual Earnings: 1905-1912; 1928-1938.

Dependent Variable = $\Delta \ln (AI_i / AI_{tx})$

Coefficients Constrained on $\Delta(HIT)$ and $\Delta(U_i - U_{tx})$

(Values in Parentheses are Asymptotic Standard Errors)

$\Delta(HIT)$	$\Delta(U_i - U_{tx})$	$\bar{H} \frac{1}{\quad}$
0.0063 (0.0171)	-0.0389 (0.0506)	0.0076 ⁿ

The R^2 and Durbin-Watson statistics for the individual industry equations are: Iron-Steel & Metal Processing - $R^2 = 0.33$, D. W. = 2.57;
Mining - $R^2 = 0.51$, D. W. = 1.97; Construction - $R^2 = 0.69$, D. W. = 1.50;
Wood - $R^2 = 0.68$, D. W. = 1.68; and Food - $R^2 = 0.02$, D. W. = 2.30.

1/ Estimates of $\bar{H}$ correspond to equation (13). The significance of $\bar{H}$ is measured by a t-test.

n = Not significantly different from zero.

TABLE 2: Selected Results from a Constrained Joint GLS Model Based on Hourly Earnings: 1935-1938; 1949-1976.

Dependent Variable = $\Delta \ln(W_i / W_{tx})$

Coefficients Constrained on $\Delta(\text{COD})$ and $\Delta(U_i - U_{tx})$

(Values in Parentheses are Asymptotic Standard Errors)

$\Delta(\text{COD})$	$\Delta(U_i - U_{tx})$
0.0617 (0.0117)	-0.0285 (0.0232)

The R^2 and Durbin-Watson statistics for the individual industry equations are:
 Iron and Steel - $R^2 = 0.46$, D. W. = 1.63; Metal Processing - $R^2 = 0.14$,
 D. W. = 2.32; Bituminous Coal Mining - $R^2 = 0.08$, D. W. = 1.58,
 Wood Production - $R^2 = 0.27$, D. W. = 1.95; and Food - $R^2 = 0.38$, D. W. = 2.59.

industries i , relative to that in textiles, are used as the dependent variables. ^{23/} The periods covered are 1905-1912; 1928-1938. ^{24/} The results in Table 2 cover the periods for which hourly earnings data are available -- 1935-1938; 1949-1976. ^{25/} The dependent variables in these equations are the natural logarithms of hourly earnings in industries i , relative to that in textiles. Since the annual earnings series could not be adjusted for hours worked, the results based on hourly earnings are more meaningful.

The estimated effect of the Hitler regime on relative annual earnings is presented in Table 1. Neither the absolute effect, $\Delta\alpha_4$, reported under $\Delta(\text{HIT})$, nor the calculated differential effect, $\bar{H}$, is significantly different from zero. Thus, contrary to some beliefs, Hitler's regime appears to have had no overall effect on relative annual earnings between 1933 and 1938.

The trade union coefficient in Table 1 is also statistically insignificant, suggesting that on average the unions had no effect on relative annual earnings in pre-Hitler Germany. Moreover, in Table 2 the results based on relative hourly earnings indicate that unions had no significant overall effect during the post-World War II period either.

^{23/} The annual earnings series was derived by Professor Hoffman (1965) from the social security records. Since periodic collection of (hourly) earnings data did not start until 1934-35, the estimates for earlier periods are all based on the annual earnings series calculated by Professor Hoffmann. Unfortunately, it was impossible to standardize this series for the number of hours worked.

^{24/} The estimation across disconnected subperiods is necessitated by the lack of data for certain intervals.

^{25/} The pre-World War II data are included primarily so as to extend the pre-codetermination period.

Hence, the respective estimates in Tables 1 and 2 show a zero union impact both before and after the war. Since the annual earnings series could not be adjusted for hours worked, however, the results in Tables 1 and 2 are not fully comparable. ^{26/}

It has been argued that the 1951 establishment of codetermination in iron-steel and coalmining--the introduction of parity employee representation on the boards of directors and of a labor director on the management boards--constituted a potential increase in labor's bargaining power in these two industries. At the same time, the participatory scheme in the other industries, including textiles, was much less extensive until 1976, and does not appear to have affected hourly earnings. ^{27/} Consequently, the effect of codetermination in iron-steel and coalmining is measured by using the textile industry as a base. The overall effect on relative hourly earnings, reported in Table 2, is 6%. Hence, it appears that codetermination has had a greater overall effect on hourly earnings than the unions.

Industry-specific Results

Tables 3 and 4 contain the unconstrained joint GLS estimates, which show the industry-specific effects of Hitler's regime, codetermination and trade unions. In terms of the different dependent variable used and the time period covered, these tables correspond to the constrained results in Tables 1 and 2.

^{26/} For an attempt to deal with the question of comparability of the two earnings series see Svejnar (1979).

^{27/} See Svejnar (1977).

TABLE 3: Selected Results from an Unconstrained Joint GLS Model Based on Annual Earnings: 1905-1912; 1928-1938.

Dependent Variable = $\Delta \ln(AI_i / AI_{tx})$

(Values in Parentheses are Asymptotic Standard Errors)

i	$\Delta(\text{HIT})$	$\Delta(U_i - U_{tx})$	$\bar{H} \frac{1}{\dots}$	D. W.	R^2
Iron-Steel	0.0424 (0.0337)	0.4241 (0.1195)	-0.0048 ⁿ	1.72	0.21
Mining	-0.0512 (0.0629)	-0.8734 (0.1747)	0.1354*	1.95	-0.29
Wood	-0.0002 (0.0210)	0.0713 (0.2507)	0.0016 ⁿ	1.83	0.67
Food	0.0624 (0.0465)	-0.5640 (0.2499)	-0.0197 ⁿ	2.28	-0.77

1/ Estimates of $\bar{H}$ correspond to equation (13). The significance of $\bar{H}$ is measured by a t-test.

* Different from zero at 1% significance level.

n = Not significantly different from zero.

TABLE 4: Selected Results from an Unconstrained Joint GLS Model Based on Hourly Earnings: 1935-1938; 1949-1976

Dependent Variable = $\Delta \ln(W_i/W_{tx})$

(Values in Parentheses are Asymptotic Standard Errors)

i	$\Delta(\text{COD})$	$\Delta(U_i - U_{tx})$	D. W.	R^2
Iron-Steel	0.0653 (0.0109)	-0.3115 (0.1403)	1.52	0.47
Metal Processing		0.0044 (0.1545)	2.28	0.13
Bituminous Coal Mining	0.0126 (0.0229)	-0.0231 (0.0218)	1.35	0.01
Wood Production		-0.1175 (0.2352)	1.89	0.27
Food		0.1606 (0.1297)	2.83	0.44

With the exception of mining, the absolute and differential effects of the Hitler regime appear to be zero in all industries. In mining, the absolute effect is also insignificant but the differential effect is significant at 14%. These findings, reported in Table 3, are consistent with the constrained estimate in Table 2. Hence, the picture that emerges from Tables 1 and 3 is that, with the exception of mining, Hitler's regime did not significantly alter relative annual earnings from what they would have been in the absence of unions, nor from what they were under unions in 1932. In mining the regime appears to have increased the relative annual earnings from what they had been under trade unions in 1932. This finding partially supports the hypothesis that the regime placed more emphasis on the militarily strategic sectors. ^{28/}

The industry-specific estimates of codetermination, presented in Table 4, provide an interesting extension of the overall result in Table 2. The effect is positive (1.3%) but insignificant in mining, whereas it is 6.5% and significant in iron-steel. These results are virtually identical with Svejnar's (1977) preliminary results and imply that codetermination has had a different effect on hourly earnings in the two industries.

The estimated pre-Hitler impact of unions varies widely among individual industries. In Table 3 the estimates are 42% in iron-steel, -87% in mining, zero in the wood industry, and -56% in food. The variation among these union coefficients is very substantial, ^{29/} yet it is

^{28/} Since the annual earnings series could not be standardized for hours worked, the result for mining is consistent with both the regime's increase of miners' wages and lengthening of hours worked. As will be seen below, those results for mining, which are based on annual earnings, must be interpreted with great caution.

^{29/} It possibly arises from our inability to control for inter-industry variations in hours worked and/or inaccuracies in the indirectly derived annual earnings series.

TABLE 5: Selected Results from a Constrained Joint GLS Model Without Mining:
1905-1912; 1928-1938

Dependent Variable = $\Delta \ln(AI_i/AI_{tx})$

Coefficients Constrained on $\Delta(HIT)$ and $\Delta(U_i - U_{tx})$

(Values in Parentheses are Asymptotic Standard Errors)

$\Delta(HIT)$	$\Delta(U_i - U_{tx})$	$\bar{H}$
0.0065 (0.0160)	-0.0255 (0.0539)	0.0057 ⁿ

The R^2 and Durbin-Watson statistics for the individual industry equations are:

Iron-Steel & Metal Processing - $R^2 = 0.42$, D. W. = 2.64;

Construction - $R^2 = 0.73$, D. W. = 1.53; Wood - $R^2 = 0.71$, D. W. = 1.79; and

Food - $R^2 = 0.09$, D. W. = 2.41

n = Not significantly different from zero

centered so as to generate the zero constrained result in Table 1. Since the negative union effect in mining is incredibly extreme in comparison to the other industries,^{30/} the question naturally arises as to what extent the overall estimates of the union and Hitler's regime effects are conditioned by this particular industry. Accordingly, equations which underly the results in Table 1 were reestimated with the mining industry excluded from the system. The results, reported in Table 5, indicate that the earlier estimates of the overall effects of Hitler's regime and unionism are virtually unaffected by the exclusion of the mining equation. The new results still support the earlier findings that these institutions had no overall effect on relative annual earnings. While this is reassuring, the accuracy of the industry-specific estimates based on annual earnings is clearly very low.

The postwar union effect on relative hourly earnings, reported in Table 4, is statistically insignificant in all the industries, excepting iron-steel (-31%). To explore the similarity of these results further, the likelihood ratio test was used to ascertain whether or not the variation in the union coefficients among the individual industries is statistically significant. The result suggests that the hypothesis of an overall equality of these coefficients cannot be rejected at the 1% significance level. Hence, unlike the diverse pre-Hitler union effects, the post war union estimates demonstrate a degree of homogeneity. Unfortunately, with the available data it is impossible to discern whether the difference is due mostly to the post-World War II unification of the previously splintered unions or the inability to standardize the (pre-war) annual earnings series for hours worked.

^{30/} From the fragmentary evidence on average annual hours of work (see Hoffman, 1965) it appears that the mining industry experienced a faster decline in working hours than the other industries from the early 1900's to the early 1930's. Since in the same period the unionization rate grew faster in mining than in any other industry, the negative union coefficient found in Table 3 may be reflecting a decrease in hours worked rather than in hourly earnings.

IV. Summary and Conclusions

The aim of this empirical study is to estimate the relative wage effects of trade unions, Hitler's regime and codetermination in Germany. Using industry-level data, a constrained and an unconstrained variant of the model is estimated in order to obtain overall, as well as industry-specific, estimates of the effects of these three institutions. The pre-World War II estimates are based on annual earnings, whereas the postwar effects are estimated on hourly earnings. Since the annual earnings series is derived indirectly and could not be adjusted for hours worked, the results based on hourly earnings are more meaningful.

Contrary to some beliefs the 1933-38 estimates of the Hitler regime effect suggest that, on the whole, the regime did not alter relative annual earnings from what they would have been in the absence of unions nor from what they were under trade unions in 1932. With the exception of mining, the industry-specific estimates confirm this general result. In the mining industry, Hitler's regime seems to have increased the relative annual earnings by 14% from what they were under unions in 1932. To a limited extent, this result supports the hypothesis that the regime placed greater emphasis on the militarily strategic industries. However, since the annual earnings data are not adjusted for hours worked, empirical support of the hypothesis does not necessarily imply an increase in welfare, rather it may reflect a higher capacity utilization in the mining sector.

Overall, codetermination is estimated to have increased relative hourly earnings by 6%. As for the industry-specific results, the unconstrained GLS procedure suggests that the effect on hourly earnings in iron-steel is 6.5%, while in mining it is positive, as expected, but not significantly different from zero. The industry-specific results coincide with Svejnar's (1977) preliminary findings. Unlike that study,

however, the present approach controls explicitly for the effects of other relevant variables ^{31/} and thus provides stronger evidence that a legally identical institutional form can have a different impact in two industries.

Perhaps the most interesting result of this study is that German unions seem to have had no significant overall effect on annual (pre-World War II) and hourly (post-World War II) earnings. The zero effect on hourly earnings is also found in each of the industry-specific estimates, excepting that in iron-steel, where a negative effect is seen. In contrast, the decomposition of the overall effect on annual earnings generates a wide range of industry-specific estimates. These findings seem to support the hypothesis that the post-World War II amalgamation of the unions produced a more homogeneous union effect across industries. Unfortunately, the results of this study cannot conclusively support or reject this hypothesis as the annual earnings data could not be standardized for hours worked and hence are not directly comparable with the hourly earnings series. In fact, since the industry-specific union estimates based on annual earnings vary so widely and some of the extreme values are implausible, it appears preferable to draw conclusions mostly on the basis of the hourly earnings model.

In comparison to the 12% to 22% union effect observed by Lewis (1963) in the U.S. and the 13% to 25% effect found in Britain,^{32/} the present zero effect findings suggest that German unions are indeed different institutions than their American and British counterparts. In fact, a very plausible explanation of the observed difference in union effect can be derived from institutional studies of comparative industrial relations. Kassalow (1969, 1978), for instance, shows convincingly that "trade unionism in European history has been at least as much a social and political collective phenomenon, as it has been an economic phenomenon."^{33/} Other detailed

^{31/} They are output, employment, unemployment, inflation, and trade unions.

^{32/} For the lower estimate see Mulvey (1978) and for the higher one Metcalf (1977).

^{33/} Kassalow (1978), p. 34.

studies provide similar institutional evidence suggesting that non-economic goals are a very important part of the objective function of continental unions. The results of this study support the observed differences between the economic function of the U.S. and British unions and the primarily social and political functions of the continental unions.^{34/} It is clear that wage increases need not be the only or even the major economic goal (and measure of success) of industrial unions. After all, a zero wage effect is quite consistent with economic gains in terms of employment and job security. Interestingly enough, the observed stability of employment in Germany is impressive and the unions openly pride themselves of this result.

In concluding, it is interesting to note that as far as relative earnings are concerned, codetermination appears to have been the most influential institution considered in this study. This result is important insofar that numerous Western countries are currently contemplating the institutionalization of some form of employee participation in management.

^{34/} See ibid. (1978) for interesting examples of similarities between the British and U.S. trade unions.

REFERENCES

- Almanasreh, Z., "Institutional Forms of Worker Participation in the Federal German Republic," in Heathfield, D. (ed.), The Economics of Co-Determination, MacMillan Press, 1977.
- Ashenfelter, O.C., "Racial Discrimination and Trade Unionism," Journal of Political Economy, Vol. 80, No. 3, Part I, May/June 1972.
- Ashenfelter, O.C. and Johnson, G. E., "Unionism, Relative Wages and Labor Quality in U.S. Manufacturing Industries," International Economic Review, Vol. 13, No. 3, October 1972.
- Bloch, F. E. and Kuskin, M. S., "Wage Determination in the Union and Nonunion Sectors," Industrial and Labor Relations Review, Vol. 31, No. 2, January 1978.
- Boskin, M. J., "Unions and Relative Wages," American Economic Review, Vol. 62, No. 3, June 1972.
- Bry, G., Wages in Germany 1871-1945, Princeton University Press, Princeton, 1960.
- Fürstenberg, F., "Workers' Participation in Management in the Federal Republic of Germany," International Institute for Labour Studies Bulletin, No. 6, June 1969.
- _____, "West German Experience with Industrial Democracy," Annals of the American Academy of Politics and Social Science, May 1977.
- Gerß, W., Lohnstatistik in Deutschland, Volkswirtschaftliche Schriften, Heft 268, Duncker & Humblot, Berlin-München, 1977.
- Hoffman, W. G., Das Wachsthum der Deutschen Wirtschaft Seit der Mitte des 19. Jahrhunderts; Enzyklopadie der Rechts-und Staatswissenschaft Abteilung Staatswissenschaft, Springer-Verlag, Berlin-Heidelberg-New York, 1965.
- Kassalow, F., Trade Unions and Industrial Relations: An International Comparison, New York, Random House, 1969.
- _____, "The Closed and Union Shop in Western Europe: An American Perspective," Paper presented at the Virginia Polytechnic Institute Conference on the Free Rider Issue, Washington, D.C., September 1978.
- Lewin, D., "Public Sector Labor Relations," Labor History, Vol. 18, No. 1, Winter 1977.
- Lewis, H. G., Unionism and Relative Wages in the United States, The University of Chicago Press, Midway Reprint 1973.
- deMenil, G., Bargaining: Monopoly Power versus Union Power, The MIT Press, Cambridge, Massachusetts, 1971.
- Metcalf, D., "Unions, Incomes Policy and Relative Wages in Britain," British Journal of Industrial Relations, Vol. XV, July 1977.

Mulvey, C., "Collective Agreements and Relative Earnings in U.K. Manufacturing in 1973," Economica, Vol. 43, November 1976.

_____, "Estimating the Union/Non-Union Wage Differential: A Statistical Issue," Working Paper #108, Industrial Relations Section, Princeton University, January 1978.

Pencavel, J., "Relative Wages and Trade Unions in the United Kingdom," Economica, No. 41, 1974.

Rosen, S., "Trade Union Power, Threat Effects, and the Extent of Organization," Review of Economic Studies, Vol. 36 (2), No. 106, April 1969.

Schmidt, P. and Strauss, R. P., "The Effect of Unions on Earnings and Earnings on Unions: A Mixed Logit Approach," International Economic Review, Vol. 17, No. 1, February 1976.

Schregle, Johannes, "Co-determination in the Federal Republic of Germany: A Comparative View," International Labor Review, Vol. 117, No. 1, (January-February, 1978), pp. 81-98.

Svejnar, Jan, "The Effect of Employee Participation in Management on Bargaining Power and Wages: A Generalized Nash Solution and Econometric Evidence from Germany," Working Paper No. 106, Industrial Relations Section, Princeton University, December 1977.

_____, "Economics of Codetermination and Trade Unions: Theory and Empirical Evidence from Germany," an unpublished Ph.D. dissertation, Princeton University, 1979.

Vollmer, R. J., "Industrial Democracy in Germany," (Mimeo) Embassy of the Federal Republic of Germany, London, June 1976.

Windmuller, J. P., Labor Relations in the Netherlands, Cornell University Press, Ithaca, N.Y., 1969.

Zellner, A., "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias," Journal of the American Statistical Association, Vol. 57, June 1962.