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THE EFFECT OF MARKET POWER ON THE FRINGE BENEFIT SHARE OF LABOR COMPENSATION*

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I. INTRODUCTION

Fringe benefits have been increasing steadily as a percentage of total labor compensation in the U.S. since the 1940s, with the increase being particularly rapid during the past twenty years [9, 11, 20]. Research efforts to explain this phenomenon, however, have been limited. Rice discusses four factors thought to be important in explaining the incidence and growth of fringe benefits: (1) rising incomes, in combination with the preferential tax treatment of benefits vis-a-vis cash wages; (2) the savings associated with the group purchase of benefits; (3) the extent of unionization; and (4) efforts to reduce labor turnover in the face of rising turnover costs [14].

Subsequent research has been devoted largely to modeling and testing empirically hypothesized relationships between the above factors and the share of fringe benefits in total compensation. Freeman emphasizes the role of unions [4], while Long and Scott focus attention on the preferential tax treatment of fringe benefits [11]. In a different approach, Woodbury uses the translog indirect utility function to estimate that both the income elasticity of demand for fringes and the elasticity of substitution between wages and fringes exceed unity [20]. The various studies utilize different data and different variables and, as may be expected, do not always produce consistent results. On balance, however, they tend to support Rice's original hypotheses.

In a recent paper, Alpert adds a new dimension to this line of inquiry, suggesting that product market power (proxied by the four firm concentra-

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tion ratio) also may play a role in explaining the fringe share and presenting empirical results which support this view [2, 1]. These findings have a number of interesting implications for research and public policy. For one thing, numerous empirical studies have estimated the effects of concentration on wages, but ignore fringe benefits. If concentration affects fringes to a relatively greater extent than it affects wages, as Alpert's findings imply, the effect of market power on total compensation has been understated in such studies. Furthermore, an additional source of inefficiency would be associated with the distortion of the wage fringe mix itself. Finally, since the bulk of fringe benefits are given favorable tax treatment, Alpert's findings suggest that market power promotes a form of tax avoidance, raising concerns about the efficiency and equity of our tax system.

There are, however, several reasons for regarding Alpert's results as tentative. First, his data on concentration, fringe benefits, and other variables come from different sources and are compiled in different ways, raising possible concerns about data comparability. Second, his concentration variable is aggregated to the SIC three digit major industry level, whereas the narrower four digit industry generally is considered to be the most appropriate level of aggregation for measuring concentration and market power [15]. Finally, Alpert follows the common practice of using unadjusted Census concentration data, although it is widely recognized that these data are subject to errors because (1) the SIC industry classifications do not correspond always to meaningful economic markets and (2) the compilation of these data on a national basis does not reflect always the geographic scope of the market. Thus, additional tests clearly are warranted.

This paper provides further empirical evidence on the effects of market power on the fringe benefit share in total compensation. In light of the potential problems mentioned above, Bureau of the Census four digit data are used for all but one of the included variables and adjusted concentration data are used in the multiple regression analysis of the fringe share. The results provide important corroboration at the individual industry level for some of the earlier findings, including Alpert's findings with respect to concentration.

The next section briefly reviews the principal theoretical determinants of the fringe share as developed in previous research. In addition to concentration, these include income, group size, the extent of unionization, and efforts to reduce labor turnover in the face of rising turnover costs.

II. DETERMINANTS OF THE WAGE FRINGE MIX

Rising incomes may lead to the growth of fringe benefits for two distinct reasons. First, if fringe benefits are normal goods and if they also have an income elasticity exceeding unity (as seems reasonable), the share of total compensation taken in the form of fringe benefits will rise with income. Second, the rising marginal tax rates on increased cash earnings embodied in the progressive tax structure produce a gradual reduction as earnings rise in the effective price of fringe benefits; they are typically either untaxed (e.g., group health and life insurance premiums) or taxed only on a deferred basis (e.g., pension contributions). This price effect should result in a substitution of fringes for cash wages, thereby also increasing the share of fringe benefits in total compensation.[1]

The differential between the individual price and the group price for many benefits also should encourage the growth of fringe benefits. As Rice observes [14], group prices tend to vary inversely with the size of the group for which the purchase is made, suggesting that the effect of this price differential may be captured empirically by a variable related to size.

Freeman provides several possible rationales for a positive impact of unions on fringe benefit growth [4]. Stressing the political nature of unions, he uses a median voter model in which the union represents the tastes of the median rather than the marginal worker. Given that the median worker likely is older and less mobile than the marginal worker, he/she presumably has a greater demand for fringes. Freeman also notes that union wage effects tend to result in increased job tenure and lower quit rates, which increase the likelihood that workers actually will receive deferred fringes such as nonvested pensions and life insurance benefits. This would tend to increase the value of such benefits to union members. Finally, Freeman stresses the role of the union as a credible source of information for employ-

[1]For further discussion, see [11, 20]. In their empirical work, Long and Scott and Woodbury find the price effect more important than the income effect. Alpert [2], however, reaches the opposite conclusion.

ees concerning benefits and as a transmitter of accurate information on employee preferences to the employer.[2]

An alternative and purely economic analysis of the role of unions is provided by Mincer [12], who argues that unions push for a greater fringe share as a way of protecting members from one of the adverse consequences of demanding higher wages. According to Mincer, the well documented tendency for unionized workers to obtain higher wages could be expected to cause employers to reduce hours, thus limiting any gain in weekly earnings arising from the increased wages. To blunt this response, unions attempt to increase quasi-fixed costs, such as fringes, more rapidly than wages. Higher fixed costs encourage employers to respond to rising wages with layoffs rather than with reduced hours. Layoffs, Mincer says, are preferred by unions because they imply a smaller loss of income than reduced hours, given the existence of unemployment compensation and other unemployment benefits.

It also has been generally recognized that deferred fringe benefits (and other benefits that increase with tenure) may be used by employers as a device for strengthening the attachment of employees to the firm, thereby reducing turnover. As on the job training costs have increased, the costs of turnover correspondingly have risen. Fringe benefits that tie workers to the firm are a way of reducing such costs, and industries which have greater investments in specific human capital reasonably may be expected to have greater fringe shares.[3]

The possibility that product market power also may affect the fringe share had not been considered prior to Alpert's paper. Considerable research has been devoted to the question, however, of whether product market power affects hourly wage rates.[4] Long and Link's recent findings show a positive impact of product market power on annual fringe benefits [10]. Therefore,

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[2]Lester [9] has uncovered data suggesting that employers tend to underestimate the value placed on benefits by their employees.

[3]Some recent research suggests that fringe benefits, particularly pension and health insurance plans, can be effective in discouraging turnover. See [13].

[4]The results have been mixed. See [18, 6, 3, 7].

it is reasonable to look for a possible impact of product market power on the fringe benefit share.

Alpert offers a variety of intuitive explanations why product market power may affect the fringe share. He cites the Weiss argument that firms in concentrated industries may pay higher wage rates "to buy public favor and/or to limit union power" [18, p. 97]. He then states [2, pp. 183-184]:

> If supplements are superior to money wages at attaining these objectives, firms possessing market power may pay larger proportions of supplements, compensation constant, than firms without market power. Another complementary rationale for higher proportions of supplements being paid by firms possessing market power is that such firms may be relatively strong bargaining opponents, and hence they may act independently to alter the composition of compensation so that remuneration of a given market value to the worker is less costly to the firm. Such a package would contain a relatively large proportion of wage supplements.

Although these explanations are speculative, they are buttressed by Alpert's arguments for interaction between product market power and unionization [2]. Market power and unionization may interact positively to increase the proportion of fringe benefits in total compensation for either of two reasons. First, both unions and firms may attempt to increase the proportion of fringe benefits in the compensation package because the market value of such a package will be higher. (This may be due to the favorable tax treatment of fringe benefits.) Alternatively, the presence of product market power may enhance the union's ability to increase the fringe share because firms in concentrated industries may be less resistant to the demands of unions. This is because such firms tend to be more profitable and also better able to pass on cost increases to their customers than other firms. Consequently, it is reasonable to expect that the union effect on the fringe share will be stronger in high concentration industries.

A variety of other factors have been recognized as potentially significant in explaining the incidence and growth of fringe benefits. For example, various demographic characteristics of workers, such as age distribution, sex, marital status, and number of dependents also may be important. The four factors identified by Rice, however, have dominated subsequent research and discussion. Therefore, attention will be focused on these factors and on market concentration in the empirical tests below.

III. THE DATA AND VARIABLES

The principal sources of data are the Annual Survey of Manufactures and the Census of Manufacturers [16, 17], which provide data by four digit industry on total labor costs (TLC). Total labor costs are broken down into the following three components: (1) Payroll (PAY), or the total wages and salaries paid; (2) Legally mandated fringe benefits (LMB), consisting primarily of employer contributions for social security, unemployment compensation, and workman's compensation; and (3) Nonmandated fringe benefits (NMB), those benefits paid for voluntarily by employers. Most other data used in this study are derived from these same sources.

Table 1 shows aggregate data on fringe benefit trends for the entire U.S. manufacturing sector. Part A shows the three way breakdown of total labor costs as described above for 1967, 1972, 1977, and 1981. Part B shows the two way breakdown of total voluntary labor costs between payroll and nonmandated benefits for the same years. From these figures, it is clear that the shares of both legally mandated and nonmandated benefits in total labor costs have increased significantly over the period 1967-1981, with the latter share nearly doubling.

The dependent variable FRINGE, which is calculated for both 1967 and 1977, is defined as NMB/(NMB + PAY), where NMB is nonmandated benefits and PAY is payroll. The independent variables employed in this study are defined as follows:

(1) COMP is the level of average annual compensation in the industry, computed by dividing the sum of payroll (PAY) and nonmandated fringe benefits (NMB) for the industry by total industry employment. This variable is specific to the years 1967 or 1977, as appropriate. As in several prior studies, this single variable is used to capture both the real income

TABLE 1
Distribution of Total Labor Costs in U.S. Manufacturing

	Percent of Total Labor Costs			
	1967	1972	1977	1981
Payroll	89.0	86.7	82.9	81.6
Legally Mandated Benefits	4.7	5.2	6.6	7.2
Nonmandated Benefits	6.3	8.1	10.5	11.2
Totals	100.0	100.0	100.0	100.0

	Percent of Voluntary Labor Costs			
	1967	1972	1977	1981
Payroll	93.3	91.5	88.8	87.9
Nonmandated Benefits	6.7	8.5	11.2	12.1
Totals	100.0	100.0	100.0	100.0

Source: data in *Annual Survey of Manufactures*, 1968, 1974, and 1981 and *Census of Manufactures 1977*

effect of rising income and the substitution effect of the declining effective price of fringe benefits resulting from the progressive tax structure.[5]

(2) SIZE is the fraction of the industry's total employment which was employed in establishments with 500 or more workers, again specific to 1967 or 1977 as appropriate [17]. Consistent with prior studies, this variable serves as a proxy for the savings possible from the group purchase of

[5]There are several difficulties in attempting to separate the tax effect from the income effect in studies of this kind. Alpert uses as a separate variable the federal marginal tax rate which would apply to a worker who receives the industry's average annual earnings and who uses the standard deduction while claiming the average number of exemptions. Sources of measurement error include: 1. use of an average income figure, which may hide considerable variation in income and marginal tax rates among an industry's workers; 2. failure to take into account state income taxes, which vary widely; 3. failure to take into account other household income, including spouses' income, which can vary considerably among industries and will affect the marginal tax rates. Alpert recognizes that measurement problems may explain why he did not find a sizable tax effect.

benefits. This measure seems preferable to a measure of the average size of establishments, which may be unduly sensitive to the presence of numerous small establishments in some industries.

(3) KLRATIO is the capital labor ratio, more specifically the ratio of gross assets to employment for either 1967 or 1977. Following Long and Scott, this measure serves as a proxy for potential turnover costs, since more capital intensive industries are presumed to require a more highly trained work force.[6]

(4) UNION, for 1967, is the fraction of the industry's employees covered by collective bargaining agreements, from Freeman and Medoff [5]. These data relate to 1968-1972 and are available only on the three digit level of aggregation. Therefore, each four digit industry in the sample takes the value of the three digit industry group of which it is a part. Since comparable data on unionization are not available for 1967 and 1977, it is necessary to use a different, albeit similar, measure for 1977. For 1977, UNION is the fraction of the industry's employees who belonged to unions averaged over the three years 1976-1978, from Kokkelenberg and Sockell [8]. These data also are available at roughly the three digit level. UNION is the only variable employed for which the data are not matched to a Census four digit code. Consistent with previous studies, the union fraction serves as a proxy for union power.

(5) CONC is the adjusted Census four firm concentration ratio, defined as the proportion of total industry shipments accounted for by the four largest sellers. Although the Census concentration ratio is the most frequently used measure of product market power in empirical work, its shortcomings are well known [15]. These problems may be reduced, how-

[6] [11]. Capital intensity is probably not an ideal proxy for turnover costs, but it seems the best alternative available.

ever, by using adjusted figures from Weiss and Pascoe[7] which correct for improper product market boundaries for the presence of regional and local markets and for foreign trade. The concentration data originate in the same source and are compiled on the same consistent four digit basis as are all other data used in this study except the unionization data, thus ensuring a high degree of comparability.

(6) INTER is an interaction term, the product of UNION and CONC. The inclusion of an interaction term is consistent with earlier discussion and will facilitate comparisons with Alpert.

The sample consists of all four digit manufacturing industries for which the requisite data were available, except for those industries with "miscellaneous" or "not elsewhere classified" in their titles. For 1967, the sample consists of 208 industries. For 1977, the sample is reduced to 177 industries, primarily because data for the SIZE variable were lacking for a number of industries included in the 1967 sample. For purposes of comparison, results with this smaller sample will be presented for both 1967 and 1977.

IV. THE REGRESSION RESULTS

Equation 2-1 in Table 2 shows the results for 1967 for the 208 industry sample. The coefficient of determination (R^2, adjusted for degrees of freedom) indicates that approximately two-thirds of the interindustry variation in the fringe share is explained by independent variables. The coefficients on COMP, SIZE, and KLRATIO all have the expected signs and are highly significant. The coefficients on CONC and UNION are negative, but are not significantly different from zero. The coefficient on INTER is positive and statistically significant. As is evidently the case in Alpert's

[7]See [19]. The Weiss Pascoe data are for 1972. The 1967 CONC variable is the Weiss Pascoe measure multiplied by the ratio of the 1967 and 1972 official Census concentration ratios. The 1977 CONC variable is the Weiss Pascoe measure multiplied by the ratio of the 1977 and 1972 official Census concentration ratios. This procedure assumes that the appropriate adjustments for 1967 and 1977 are proportional to the 1972 adjustment. Given the high degree of stability of the official concentration ratios from one Census year to another, this seems reasonable. For the sample, the simple correlation between the 1967 and 1972 Census concentration ratios is +0.96. The 1972-1977 correlation is +0.92.

TABLE 2
Regression Equations Explaining the Fringe Share
1967 and 1977

Equation	(2-1)	(2-2)	(2-3)
Year	1967	1967	1977
Industries	208	177	177
Intercept	0.00316 (0.57)	0.00081 (0.14)	0.00211 (0.24)
COMP	0.00508** (7.92)	0.00564** (7.98)	0.00442** (8.65)
SIZE	0.02200** (6.86)	0.02029** (5.50)	0.02596** (4.59)
KLRATIO	0.00013** (2.36)	0.00006 (0.98)	-0.00003 (-0.57)
UNION	-0.00092 (-0.09)	-0.00029 (-0.03)	0.02821 (1.32)
CONC	-0.00201 (-0.18)	-0.00117 (-0.10)	0.02429 (1.33)
INTER	0.05031* (2.28)	0.04842* (2.02)	0.04164 (0.89)
R^2	0.66	0.66	0.73
F-ratio	67.06	56.69	78.58

t-values in parentheses
*statistically significant at .95 level of confidence
**statistically significant at .99 level of confidence

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study also, the separate effects of UNION, CONC and INTER in equation 2-1 may be obscured by multicollinearity. For 1967, the simple correlations between UNION and INTER and between CONC and INTER are +0.67 and

+0.76, respectively.[8] Overall, however, the regression results clearly suggest that product market power and unionization interact positively to raise the fringe share.

Equation 2-2 in Table 2 also shows results for 1967, but for the smaller 1977 sample. The results are similar to those portrayed in equation 2-1, except KLRATIO ceases to be statistically significant. The performance of KLRATIO in the regression equation is sensitive to the exact composition of the sample.

The results for 1977 are shown in equation 2-3. The overall level of explanation is even higher than that obtained for 1967, with the adjusted R^2 climbing to 0.73. In general, the coefficients of determination in the study compare favorably with the maximum R^2 obtained by Alpert of 0.43 [2]. This improvement can be attributed primarily to measurement of the different variables on a consistent and comparable basis at the appropriate level of aggregation.[9] For 1977, the coefficients on COMP and SIZE continue to be positive and highly significant, while KLRATIO is again insignificant for this sample. The UNION, CONC, and INTER variables show positive, but statistically insignificant, coefficients. The fact that all three variables are insignificant, however, appears to be due to multicollinearity. The quantitative impact of concentration and unionization on the fringe share is similar in 1967 and 1977, with these variables jointly producing a strong positive effect both years.

Although all of the independent variables, with the possible exception of KLRATIO, appear to explain partially the share of fringe benefits in

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[8]Other correlations among the independent variables may also be of interest. The simple correlation matrix for the 208 industry sample is:

FRINGE	1.00						
COMP	0.66	1.00					
SIZE	0.58	0.38	1.00				
KLRATIO	0.36	0.34	0.06	1.00			
UNION	0.34	0.20	0.06	0.28	1.00		
CONC	0.55	0.40	0.43	0.22	0.12	1.00	
INTER	0.61	0.38	0.34	0.33	0.67	0.76	1.00
	FRINGE	COMP	SIZE	KLRATIO	UNION	CONC	INTER

While simple correlations are not decisive, these figures do not suggest any other serious problems with multicollinearity.

[9]Experiments with the official Census concentration ratios suggest that the use of adjusted ratios is not a major source of the improvement.

total compensation, it is important also to consider the quantitative magnitudes of their effects. The coefficients on COMP are fairly stable across the three equations in Table 2 and indicate that this variable has a sizable effect, with each $1000 increase in income raising the fringe share by roughly one-half a percentage point. Using equation 2-1 to illustrate, an increase in COMP from its approximate 1967 mean value of $7000 to $8000, with all other variables held constant at their means, would result in an approximate increase in the fringe share from .058 to .063.

For SIZE, the coefficients are also relatively stable and indicate that each ten percentage point rise in the proportion of an industry's employees who are employed in large plants leads to an increase in the fringe share of roughly two-tenths of a percentage point. At the extreme, an industry with nothing but large plants would have a fringe share more than two full percentage points higher than an industry with no large plants. Given the magnitude of the fringe share in 1967 and 1977 (with means of approximately six and ten percent, respectively), this is a fairly noticeable effect.

It is difficult to generalize on the quantitative impact of KLRATIO, given the instability of its coefficients across the equations of Table 2. It appears to be less important than either COMP or SIZE.

The specifications of the equations in Table 2 imply that the quantitative impact of unionization will vary with the level of concentration and vice versa. Therefore, it is appropriate to consider the effects of these variables jointly. The combined effects are illustrated in Tables 3 and 4, which show the results of using equations 2-1 and 2-3, respectively, of Table 2 to calculate the value of the fringe share for various levels of union coverage/membership and concentration, with other variables held constant at their mean values. In both tables, the results are approximately symmetrical with respect to unionization and concentration. Rising unionization appears to have a larger positive impact on the fringe share in high concentration industries that it does in low concentration industries, while the impact of rising concentration also appears to be greater when unionization is high. Together, concentration and unionization appear to have an important impact.

In 1967 (Table 3), an industry for which UNION and CONC are both 80 percent would have a fringe share of .079, 55 percent higher than the share of .051 for an industry for which both variables are 20 percent. In 1977

TABLE 3
Fringe Share for Various Levels
of Union Coverage and Concentration, 1967

Concentration Percentage	Union Coverage (Percentage)				
	20	40	60	80	100
20	.051	.052	.054	.056	.058
40	.052	.056	.060	.064	.067
60	.054	.060	.066	.071	.077
80	.055	.063	.071	.079	.087
100	.057	.067	.077	.087	.097

Source: Computed using Equation 2-1 of Table 2, assuming mean values for COMP, SIZE, and KLRATIO

TABLE 4
Fringe Share for Various Levels of Union Membership
and Concentration, 1977

Concentration Percentage	Union Membership (Percentage)				
	20	40	60	80	100
20	.087	.094	.102	.109	.116
40	.093	.102	.111	.120	.129
60	.100	.111	.121	.132	.142
80	.106	.119	.131	.143	.156
100	.113	.127	.141	.155	.169

Source: Computed using Equation 2-3 of Table 2, assuming mean values for COMP, SIZE, and KLRATIO

(Table 4), an industry for which UNION and CONC are both 80 percent would have a fringe share of .143, 64 percent higher than the share of .087 for an industry for which both variables are 20 percent. Concentration and unionization appear to have strong effects on the fringe share in both 1967 and 1977,[10] although interactive effects are less pronounced in 1977.

V. CONCLUSIONS

Cross section regression results for a large sample of four digit manufacturing industries corroborate at the individual industry level earlier findings indicating that the share of fringe benefits in total compensation is affected positively by higher income and employer size. The results with turnover costs were mixed which may be due to the fact that capital intensity is not an ideal indicator of the importance of turnover costs. The most important finding is that unionization and concentration together produce strong, positive effects on the fringe share. This finding should be of some interest to policy makers in the fields of antitrust and taxation.

This is only the second study to investigate the possible impact of product market power on the fringe share. Use of an alternative data set in regression analysis resulted in much higher coefficients of determination than were found in Alpert's study. This apparently is due to the fact that the alternative data set allows for better data comparability among the variables employed, while also allowing for the empirical work to be carried out at the four digit level of aggregation . This suggests that these matters should be given greater consideration in future research.

[10] It must be recognized that the 1967 and 1977 results are not precisely comparable, since the 1967 UNION measure is based on coverage, while the 1977 UNION measure is based on membership.

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