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ABSTRACT

This study was designed to investigate the impact that collective negotiations have had on teachers' salaries in Ohio; and the relationships between the incidence of work stoppages and the characteristics of Ohio school districts. Since the focus of this was twofold, it was found necessary to employ several statistical techniques to accomplish the objectives of the study. The first part of this report deals with the model and data base used to explain the variance of average salaries for public school teachers in Ohio. Another section sets forth the research design used in ascertaining the characteristics of school districts that had strikes. Empirical data presented in the report show the results of the factor and discriminant analysis. Conclusions and recommendations are also presented. (Author/JF)

FINAL REPORT

Collective Negotiations, Work Stoppages, and the Effects of Negotiations on Teachers' Salaries in Ohio's Public Schools

National Institute of Education Project No. 3-2221

Project Directors
Dr. John J. Treacy
Dr. Charles H. Blake, Jr.

Wright State University
Dayton, Ohio
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COLLECTIVE NEGOTIATIONS, WORK STOPPAGES, AND THE EFFECTS OF NEGOTIATIONS ON TEACHERS' SALARIES IN OHIO'S PUBLIC SCHOOLS

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I. Introduction

During the past twelve years teacher militancy has been expressed by 1) increased use of collective bargaining and 2) the use of the strike to improve their salaries and to advance their job security. Nationally, and especially in Ohio, public school teachers have resorted to economic action to improve their welfare.

The purpose of this study is to investigate 1) the impact that collective negotiations have had on teachers' salaries in Ohio; and 2) the relationships between the incidence of work stoppages and the characteristics of Ohio school districts.

II. Objectives

Our research was designed to analyze the impact that collective bargaining has had on teachers' salaries in Ohio where public employees do not have the legal right to engage in collective negotiations as exist in the private sector. Nevertheless, 66 percent of Ohio's school districts are represented at the collective bargaining table by the Ohio Education Association (406) or the American Federation of Labor (6). Teachers are definitely on the move to improve the quality of their working environment and their income.

Nationally, the incidence of work stoppages in the public schools has increased at an alarming rate during the past year. A study by the Department of Labor[1] revealed there were 88 teacher strikes in 1968, but 97 in the last six months of 1972. Strikes by teachers in Ohio have also been increasing since 1969 even though Ohio's Ferguson Act prohibits any public

employee from participating in a walkout.

Strikes and the use of collective action raise important economic and social issues concerning the future financing of public education in the nation. Can school districts continue to raise property taxes or must new sources of taxation be developed to finance public education? Increased demand for higher salaries are adding to the tax burden in most cities and states. Moreover, should teachers and other public employees have the legal right to engage in collective bargaining?

III. Review of Literature

Earlier studies by Kasper,[2] Thorton,[3] Baird and Landon,[4] and Hall and Carrol[5] attempted to shed light on the effect that teacher organizations have had on salaries. One of the major difficulties these studies encountered was either such an aggregated data base for their variables or restricted their sample to include school districts from many states or from a very restricted area of one state, that their results have to be treated with caution. Only the Lipsky and Droting[6] study of the effects of collective bargaining on teacher salaries in New York state deals with a large number of school districts within a given state having the same tax laws, state aid programs, requirements for teacher certification, and etc.

Since the design and model of each of the previous studies differ, the results vary on the effects that collective bargaining has had on teacher salaries. Kasper's[7] pioneering study revealed that collective negotiations have had an insignificant effect on teachers' salaries. Baird and Landon[8] concluded that the percentage

increase in salaries that was negotiated by National Education Association (NEA) chapters was barely significant and the contracts negotiated by American Federation of Labor (AFT) locals had an insignificant effect on adjusting salaries. In the Thorton[9] study, which analyzed school districts in cities with a population of over 100,000, the effect of collective negotiations was significant and added 2.3 to 2.8 percent in salaries. Likewise, Hall and Carrol[10] found that teacher organizations in 125 school districts of suburban Cook county significantly added about 1.8 percent to salaries.

The Lipsky and Droting[11] study, which tested the effect of unionization after the Taylor Law permitted teachers and other public employees to engage in collective bargaining, concluded that negotiations had no effect on the salary levels of teachers for all (excluding those in New York City) school districts. However, the union did have a significant impact on salaries in small towns. In addition, after unionization was legalized, the effect on salaries from 1967 to 1968 was both positive and significant.

IV. Procedures

The focus of this study being two-fold, it was found necessary to employ several statistical techniques to accomplish the objectives of this study. Part A of Section IV deals with the model and data base used to explain the variance of average salaries for public school teachers in Ohio. Part B of Section IV sets forth

the research design used in ascertaining the characteristics of school districts that had strikes. Section V contains the empirical results from the model used in Part A of Section IV on the effect of collective bargaining and Part B of Section IV shows the results of the factor and discriminant analysis.

Part A: The Model and Data Sources

Theory

Our model to test the effects of collective organization on Ohio teacher average salaries is posited in the form:

$$AVGS = + {}_1\underline{AGI} + {}_2\underline{TVPP} + {}_3\underline{STM} + {}_4\underline{ADM} + {}_5\underline{OD} + {}_6\underline{AGRE} + {}_7\underline{PTR} + e$$

where AVGS = Average Salary

AGI = Adjusted Gross Income Per Pupil (1966)

TVPP = Property Tax Valuation Per Pupil

STM = Local School Tax Millage

ADM = Average Daily Membership (attendance)

OD = Organized District Bivariate Variable

AGRE = Existence of a Written Contract Bivariate Variable

PTR = Pupil Teacher Ratio

Alpha, Beta and Epsilon, respectively, represent the constant term, slope coefficients and the error term found in the conventional linear regression models.

The first two independent variables may be viewed as measuring the financial well being of the school district from the perspective of the voter and in terms of the available tax base. While it has been commonly assumed in the literature that these two are closely linked, an examination of the Correlation Matrix in Table I for our sample data shows otherwise. AGI measures adjusted gross income as defined on line 18 of the Internal Revenue Service Personal Income Tax form aggregated to include all returns filed in the district divided by school attendance.[12] This variable might be viewed as a measure of voters' ability to pay and an index of their taste for expenditures on education. In addition, AGI probably represents regional factor price differences. We used AGI measured for 1966 in our cross section model because 1970 census data by school district was not available at the time we made our initial runs. Subsequent tests established the high degree of association between AGI and the 1970 census income estimates (r = .93). Our preliminary assessment of this variable also determined that a very large percent of the variance that occurred in this variable was within county groupings of districts rather than between counties.

This means that local differences in AGI within a county reflect income segregation of voters and not just regional cost differences while TVPP differences represent varying percentages of industrial and commercial property in a district's tax base. In Ohio it is possible to have relatively high income levels for the voters and low amounts of tax base in a district so that the term rich, or poor, must specify either the voters or the tax base for purposes of clarity. The existence of a rich tax base makes

it easier for a district to achieve its program needs with a given tax millage.

STM is a measure of the voters willingness to tax the base available in the district. Size of the school district, as measured by ADM, would tend to be associated with the degree of urbanization in the area where the school district was located. Higher salaries were posited for higher ADM districts on the grounds that more higher paying positions associated with special education would occur in the larger districts. Such larger districts in urban areas might also be viewed as undesirable by teachers who might view the loss of professional autonomy in the more complex districts and perhaps the presence of social tensions as requiring higher pay to attract their services.

OD was a dummy variable assigned a value of one if the district had a teacher organization advocating collective bargaining and zero if it did not. Since many districts had such organizations, but had not achieved a written contract, we introduced another dummy variable AGRE which indicates the existence of a written contract between teachers and the administration if coded one and zero for no agreement. We expected that the presence of an organization advocating collective bargaining might induce the administration to grant higher salaries in the hopes of allaying pressures to collectively bargain.

Since Hall and Carrol[13] indicated that they had found evidence to indicate some trade off between salary levels and class size[14] we include PTR in our model expecting that larger ratios would be positively associated with higher average salaries. Other

variables were considered but were rejected on grounds that empirical data were not available to measure them or because they introduced obvious two-way causality into the model. An example of the first type variable was labeled the demonstration effect which hypothesized that successful wage negotiations by one organization in a county might spur other nearby districts to pay higher salaries to increase their efforts. We had no means of dating contracts and were not certain that the county was a meaningful geographic context and so abandoned this variable. A more promising variable was a measure of fringe benefits. Data on this subject, however, is reported in such a manner that we were not able to construct an index of their economic value for the individual districts to include in this analysis.

An example of the second type problem is a measure of the level of training via a Master Degree/Baccalaurate Degree ratio. This variable was initially appealing but was rejected on grounds that higher than average salaries may have attracted higher credentialed teachers into the district, thus introducing two-way causality into the model.

The model posited in its final form expected positive regression coefficients for all independent variables so that higher salaries were expected in high income, high property value, high tax districts that had an organization pressing for collective bargaining. The existence of a collective bargaining agreement and large class size were also expected to account for higher salaries.

The Data

Our sample contained 225 out of the 624 Ohio School Districts for 1970-71 school year. All data in our sample is for 1971 except AGI which was calculated off an Internal Revenue Service tape file of 1966 personal income. The organization (OD) and agreement (AGRE) dummies were obtained of a mail questionnaire[15] that followed up the initial mailing by polling the non-responding school districts. The 225 usable responses produced a very representative sample which was distributed between SMSA center city, suburban and exurban (none SMSA) districts in proposition to their distribution in the state.

Table I gives the two-way tabulation of the sample between urban and organizational characteristics in the sample indicating that 57% of the districts had some form of organization. What was surprising was that 60% of the center cities in the sample were not organized while a majority of both suburban and exurban respondents were organized. The largest group of our school districts were located in the suburbs of Ohio's 14 Standard Metropolitan Statistical Areas.

All other data was drawn from our Financing Education Group tape files. The interrelations between the variables are given in the correlation matrix in Table I.

TABLE I

Correlation Matrix of Ohio Public School Variables in the 225 District Sample (1971)

	AGI*	TVPP	STM	ADM	AGRE	OD	PTR	AVGS
AGI	1.00	.35	.17	.28	.14	.17	-.22	.55
TVPP		1.00	-.32	.06	.07	.12	-.46	.43
STM			1.00	.16	.07	.04	-.03	.24
ADM				1.00	.03	-.02	.003	.33
AGRE					1.00	.31	-.07	.16
OD						1.00	-.08	.07
PTR							1.00	-.25
AVGS								1.00

*AGI was available for 1966 only.

Part B: Research Design for Strikes

In order to examine the characteristics of Ohio School Districts so that some meaningful distinction can be drawn between districts that had strikes and those that did not, an R-type factor analysis and a linear discriminant analysis were performed. What follows is a non-analytic discussion of both these techniques to familiarize the reader with what is being attempted.

Factor Analysis

Factor analysis is a statistical technique or scientific method for mathematically analyzing data. Its single most distinctive feature is its capability of reducing the data to several empirical constructs called factors. The factors, assuming that some meaningful variation exists in the data, can be interpreted as dimensions or theoretical constructs bridging diverse phenomena which exhibit mathematical relationships. They can be used to describe actual data regularities or to estimate universal patterns from a sample. The factors may also be employed to uncover causal order, explain uniformities, or classify correlations. In addition to their employment as a typology, factors may be considered characteristics or variables which can be used in other research techniques; regression, for example. Factor analysis may be used deductively as part of a formal theory or, inductively, to determine unknown patterns of phenomena or unsuspected influences in the data base.

There are many specific uses of factor analysis although as mentioned above, it is primarily used as a data-reduction technique

which will (hopefully) result in the delineation or clarification of meaningful patterns of interrelationships or structural dimensions in the data. It can also be used to classify or describe "groups" of variables on the basis of their similar profile values. It may be used in scaling, using weights which are derived from the common variation between variables and their related factors. Hypothesis-testing, data transformation, mapping and exploration for purposes of simplification are additional uses.

There are essentially five factor analysis models. Classical or common factoring is the most popular method. Others are principle components, image, canonical and alpha factoring. Common factor analysis assumes that only a few factors will be significant since, theoretically, there can be as many factors as there are characteristics. Therefore, a criterion (an eigen value) is employed to discontinue the factoring once the predetermined value is reached. This value may be considered to be representative of the minimum allowable variation in the data that is explained by a factor. That is, factors explaining less variation than the minimum acceptable eigen value will be rejected. The principle components method, being purely mathematical, results in as many factors as there are characteristics (or variables). The other methods are more similar to common factor analysis in this respect.

There are three major steps in factor analysis: 1) Preparation of the correlation matrix; 2) extraction of the initial factors; and 3) rotation to terminal factors. Once the researcher has selected the relevant variables to be included in the analysis, the appropriate measures of association must be selected; most

factor analyses require product-moment correlation coefficients. If the correlation coefficients between characteristics (variables) are calculated, the analysis is called R-factor analysis. If a correlation matrix of units (objects) is factor analyzed, the procedure is called Q-factor analysis. Of the two the R-type is most common.

The second step in the analysis is the construction of new variables on the basis of interrelationships in the data. Normally it is assumed that the resulting factors are independent or orthogonal. It is also assumed that there exists common determinants which influence observed variables and that the variation in the variables that is common is much greater than the non-determinant or unique variation. In other words, the correlations between variables are considered to be due to common factors. Communalities are estimates of the amount of common variances in the data. The procedure used to estimate the communalities, which are inserted in the main diagonal of the correlation matrix, determines the particular factoring technique. The last major step is the rotation of the factors to their terminal solutions. In essence, this is a simplification of the original factors which may be accomplished in various ways, none of which is considered absolutely superior to the others--it depends on the theoretical needs of the researcher. A major decision to be made is whether orthogonal (independent) or oblique (correlated) factors are desired. The oblique solution is empirically more realistic while orthogonal factors are mathematically simpler to handle. Regardless of the techniques employed, the resulting terminal factors are designated dimensions or patterns

of interrelationships and, hopefully, contribute to a better understanding of the general structure of the data.

Discriminant Analysis

The basic problem we are facing in discriminant analysis is to classify an individual into one or more groups on the basis of properties held by those individuals. If we express this in mathamatical terms we would say that we are trying to classify an individual w into one of k populations W_1, W_2, ...W_k on the basis of measurements x_1, x_2, ...x_p on P characteristics.

In linear discriminant analysis we are concerned with only two populations, therefore k = 2 and our populations are symbolized by W_1 and W_2. What becomes important in linear discriminant analysis is to find a linear combination of our x_1, x_2 ....x_p measurements on P characteristics that will yield a critical value. The critical value is then used to 'discriminate' between the two populations W_1 and W_2. If the discriminant function that has been found is above the critical value then we can classify the x_1, x_2 ....x_p measurement of an individual into population W_1 if it is below the critical value that has been found we classify the individual into population W_2. The linear discriminant function takes the form:

$$z = a_1x_1 + a_2x_2 + ...a_px_p$$

where a_1, a_2, ...a_p are constants known as discriminant coefficients. From this function we classify an x_1, x_2, ...x_p (which represents a vector) into a W_1 or W_2 depending on whether or not the function yields a value greater than or less than the critical z value.

The problem now reduces to choosing the constants a_1, a_2, ...a_p and our critical value c such that we will minimize the risk of classifying an individual from population W_1 in W_2 and an individual from W_2 in W_1. The method used to do this is to choose our constants a_1, a_2, ...a_p so that we obtain the farthest separation possible between the mean of W_1 and the mean of W_2. In order for this procedure to be valid the variances of the two populations must be the same, otherwise the overlap of the two populations may be so great that no classification procedure will work. The c value is chosen to be halfway between the means of the two populations $(u_1 + u_2/2)$.

Logically what is happening is similar to stepwise regression. The difference being that the F statistic used in stepwise regression is based on partial correlation whereas in stepwise discriminant analysis the F statistic is based on a one-way analysis of variance.

The program chooses the variable which has the highest F statistic, which in our case denotes the variable with the highest separation of means relative to the variance. On each successive step the variable with the highest F statistic is chosen relative to the variables previously chosen. This process continues until all the variables are entered or until all those variables remaining to be entered add nothing to our ability to discriminate between the two populations.

From this procedure we chose the variables that 'best' discriminate by comparing our computed F to the tabular F relative to some level of significance that we desire.

The variables used in an attempt to distinguish between school districts that have strikes and those that do not are as follows:

X_1 = AGI Adjusted gross income per pupil

X_2 = TVPP Tax valuation per pupil

X_3 = APM All purpose millage

X_4 = TSM Total school millage

X_5 = CPP Cost per pupil

X_6 = ADM Average Daily Membership (attendance)

X_7 = AVHO Aggregate value of housing owner occupied

X_8 = AVHB Aggregate value of housing owner black

X_9 = AVHV Aggregate value of housing owner vacant

X_{10} = RO Renter occupied

X_{11} = RB Renter black

X_{12} = RV Renter vacant

X_{13} = RW Race white

X_{14} = RN Race negro

The basic assumption underlying the use of linear discriminate analysis is that we are in fact dealing with two separate populations. This requires a wide separation of means between the populations under consideration. As can be seen from Table II there is some validity to the assumption that we are dealing with two distinct sets of school districts in the state of Ohio.

TABLE II

DISCRIMINANT ANALYSIS MEANS FOR POPULATIONS W_1 AND W_2

	W_1	W_2
AGI	8848	10458
TVPP	14492	15703
APM	0.42	0.47
TSM	0.31	0.34
CPP	613	652
ADM	2897	7820
AVHO	188284	587162
AVHB	4450	44676
AVHV	1625	4188
RO	95501	528939
RB	5671	114819
RV	6435	40540
RW	12433	37198
RN	633	8674

V. Empirical Results

Part A: Teacher Salaries

We ran two versions of the model because of the suspected differences between urban and rural school districts. In the first we included all the variables in an OLS regression with the following results:

$$AVGS = 5285 + \underset{(.013)*}{.069AGI} + \underset{(.007)*}{.045TVPP} + \underset{(.081)*}{.4045STM} + \underset{(.010)*}{.032ADM} + \underset{(154.81)**}{232.89AGRE} - \underset{(100.84)***}{111.22OD} + \underset{(19.75)}{6.14PTR}$$

$$R^2 = .47$$

*Significant at .01
**Significant at .05 (Standard Errors)
***Significant at .15

Average salaries went up almost seven cents for every dollar increase in AGI and over four cents for every additional dollar of TVPP in a school district. A forty cent increase for each mill of school tax along with the foregoing demonstrated that the financial condition of the voters, the district tax base and voter willingness to tax themselves are the major explainers of the variability in average salaries. Adding small but significant amounts of explanatory power was the size of the district.

While the existence of an agreement was responsible for $232 in average salary variance the existence of a collective bargaining organization was associated with a negative coefficient. The OD variable did not enter the equation at a high level of significance but there was less than 15% chance that its' coefficient did not estimate the value for the population parameter. Our AGRE coefficient was similar in sign and size to Holland and Carrol's[16]

variables denoting the existence of a collective bargaining agreement. We would accordingly conclude that collective bargaining units that have won a contract have succeeded in winning salaries above the mean but that the mere existence of an organization advocating collective bargaining did not explain higher salaries. Indeed, the unexpected sign on OD plus the slight degree of collinearity between it and AGRE introduces the possibility that two-way causality exists.

Low average salaries may have caused teachers in the district to organize in an attempt to remedy their plight. PTR was not significant indicating that the pupil-teacher ratio, in association with the variables delineated in our model, was not different than zero in terms of its effects. The relatively low amount of explained variance (R_2 = .47) in this model stemmed from the lack of homegenity in the school districts included in the statewide sample. In attempting to determine if our model would be more appropriate for explaining the behavior of salaries in urban area school districts we reduced the size of our sample to include only the 133 SMSA districts. These included 5 center city and 128 suburban districts noted in Table III as being located in a county in one of Ohio's fourteen SMSA's. Table IV gives the simple correlation coefficients for the urban sample.

TABLE III

Cross Tabulation of Organized
and Unorganized Ohio School Districts
by Urban Characteristics

Count Row % Col % Tot %	No Organization	Organization	Row Total
Center City	3 60.0 3.1 1.3	2 40.0 1.6 .9	5 2.2
Suburban	52 40.6 54.2 23.1	76 59.4 58.9 33.8	128 56.9
Exurban	41 44.6 42.7 18.2	51 55.4 39.5 22.7	92 40.9
Col Tot.	96 42.7	129 57.3	

Source: Mailed Questionnaire by Charles Blake, WSU 1972.

Our regression equation was estimated as follows:

$$\text{Urban } \underline{AVGS} = 5614 + \underset{(.016)*}{.068AGI} + \underset{(.007)*}{.043TVPP} + \underset{(.1109)*}{.4136STM} +$$

$$\underset{(.011)*}{.025ADM} - \underset{(140.00)**}{224.4800D} + \underset{(210.11)}{196.26AGRE}$$

$R^2 = .45$

*Significant at .01
**Significant at .05

When this estimate is compared with our complete sample estimate we find that the intercept value for urban districts is higher but that the slope coefficients for AGI, TVPP, STM and ADM remain similar in magnitude. However, the existence of an organization dummy enters the regression equation before AGRE and takes on a relatively smaller standard error. The existence of an agreement becomes statistically insignificant from zero indicating that the multicollinearity present has caused the estimate to become unstable for the urban sample. In addition, the lower R^2 demonstrates that our hypothesis of SMSA districts being a more homogeneous group with regard to salary variance is false. Increased significance and the larger slope coefficient for OD reinforces the idea that the direction of causality may be that low salaries are a major reason the existence of collective bargaining organizations occur in those districts.

In response to the question concerning the effects of collective bargaining on salaries, we may answer that union agreements appear to have won small gains at best after allowing for the financial condition of the school district. AFT efforts have been limited to encompass such a small number of districts that their bargaining

TABLE IV

Correlation Matrix of Ohio Urban Public School Variables
(n = 133)

	AGI	TVPP	STM	ADM	OD	AGRE	PTR	AVGS
AGI	1.00	.368	-.017	.190	.243	.189	-.185	.513
TVPP		1.00	-.446	.028	.157	.084	-.469	.456
STM			1.00	.060	.048	.142	.075	.082
ADM				1.00	-.040	.047	.079	.257
OD					1.00	.310	-.088	.067
AGRE						1.00	-.010	.181
PTR							1.00	-.237
AVGS								1.00

results could not be treated for statistical significance as compared with the OEA efforts. PTR did not meet the criterion level to enter the stepwise regression program. The relatively high degree of negative association that this variable has with TVPP, as seen in Table IV, indicates that higher pupil-teacher ratios may be related to problems of an adequate tax base in the district. This examination of the urban sample indicates that organizational activity had not produced larger economic gains in urbanized areas than in the state as a whole.

The results of this section were presented in a paper entitled, "Effects of Collective Bargaining on Ohio Public School Teacher Salaries" by John Treacy, Russell Harris and Charles Blake at a March 29, 1974 meeting of the Ohio Association of Economists and Political Scientists at Kent State University. A copy of this paper is attached. Note that the paper as presented acknowledges support of the National Institute of Education.

Part B: Teacher Strikes

Factor Analysis

In order to better understand the data base that is being used a common factor analysis (R-type) was run assuming orthogonal determinants. From the unrotated factor matrix five factors were selected on the basis of their eigen values.

The maximum eigen value (first factor) is 6.61 with the minimum (fifth factor) being 0.61. The first factor summarizes 51.3 percent of the variance in the data; the second, 18.4 percent;

the third, 13.9 percent; the fourth, 11.7 percent; the last, 4.7 percent. The communalities ranged from approximately 95 percent for the aggregate housing and rental variables to less than 5 percent for houses vacant for sale. Most of the variables have communalities of 25 percent or greater with many above 75 percent.

The first factor, since it summarizes 51 percent of the variance in the data, is by far the most predominant. The six aggregate housing and rental variables, average daily membership, and race variables have high loadings on this factor. The housing variables all having loadings of at least .80 with average daily membership at .72 and race variables at .48. The common feature of these variables is that they imply a concentration or density of population with a fairly high propostion of non-white members. Consequently we may describe this factor as being representative of urbanization.

The second factor is also meaningful. Here, there are fairly high loadings for residential tax valuation (.59), total school millage (.93), all purpose millage (.85) and tax valuation per pupil (-.39). This factor may be labeled "bedroom" suburban as housing tax valuation is likely to be high in such an area. Also, having no other resources (such as industry) to draw from in terms of taxes, these people would likely vote themselves higher millage rates in order to acquire satisfactory public services as well as proper education for their children.

The third factor is also indicative of suburbia -- but of a quite different nature. Here high loading occurred for adjusted gross income (.57), tax valuation per pupil (.78) and cost per

pupil (.89). This factor can be said to imply "industrial" sub-urbanization for several reasons. First in an industrial area one would expect higher incomes and thus a relatively larger size working force. Second, tax valuation per pupil is likely to be higher in such an area as industries are forced to contribute a sizable amount of funds for public purposes. Third, cost per pupil is likely to be high in such an area as superior educational facilities are demanded since they can be had (largely) at industries' expense.

While the first three factors are consistent with results obtained in previous research (see appendix A) in this area, the fourth and fifth factors are obscure and provide little insight into the structure of the data.

Discriminant Analysis

Of the fourteen variables used in the program Discriminant Analysis only 9 of them entered with a significance level of .10 or greater. See Table V for the order the variables entered and their respective F values. The discriminant function is:

$$z = -611.7(ADM)^{*} - 113.5(RV)^{**} - 127.1(AVHB)^{**} - 131.8(RB)^{**} + 2405.1(RN)^{**} + 16.8(RO)^{**} - 182.1(RW)^{**} - 1.0(AVHO)^{**} + 674.8(AVHV)^{**}$$

*Significant at .01
**Significant at .10

TABLE V

DISCRIMINANT ANALYSIS F SCORES

STEP #	VARIABLE	F TO ENTER	v_1	v_2	TABULAR F(95)	TABULAR F(90)
1	ADM	19.27	3	624	2.65	2.10
2	RV	2.39	3	623	2.65	2.10
3	AVHB	17.24	3	622	2.65	2.10
4	RB	3.72	3	621	2.65	2.10
5	RN.	80.66	3	620	n/a	2.10
6	RO	10.19	3	619		2.10
7	RW	5.55	3	618		2.10
8	AVHO	8.91	3	617		2.10
9	AVHV	6.35	3	616		2.10
10	APM	2.02	3	615		2.10
11	AGI	1.60	3	614		2.10
12	TSM	1.73	3	613		2.10
13	CPP	0.50	3	612		2.10
14	TVPP	0.27	3	611		2.10

STEP # - The step number in which the variable was entered in the program.

F TO ENTER - The computed F based on a one way analysis of variance.

v_1 - The number of degrees of freedom in the numerator.

v_2 - The number of degrees of freedom in the denominator.

TABULAR F(95) - The F value needed for being 95% sure that the variables we have discriminate correctly.

TABULAR F(90) - The F value needed for 90% surety.

The relevant critical value of z was found by substituting the means of W_1 and W_2 for the 9 variables entered such that:

$$z_1 = - 611.7(2897) - 113.5(6435) - 127.1(4450) - 131.8(5671) + 2405.1(633) + 16.8(95501) - 182.1(12433) - 1.0(188284) + 674.8(1625)$$

$$\therefore z_1 = - 2,046,223$$

$$z_2 = - 611.7(7820) - 113.5(40540) - 127.1(44676) - 131.8(114819) + 2405.1(8674) + 16.8(528939) - 182.1(37198) - 1.0(587162) + 674.8(4188)$$

$$\therefore z_2 = - 4,987,678$$

The critical value of z is found by $\frac{z_1 + z_2}{2} = - 3,516,950.5$.

From the linear discriminant function coupled with the critical z value we are able, with 90 percent surety, to classify a school district into either a strike or a non-strike school district.

The implication of the discriminant function derived is that the 'size' factor is of most importance in distinguishing school districts that have strikes from those that do not. It must be remembered that all variables that discriminate significantly are variables that loaded high on factor one which was characterized as the urbanization factor. This is certainly consistent with the facts, for in Ohio 47.1 percent of all urban areas have had work stoppages whereas 13.9 percent of suburban areas have had strikes and only 7.2 percent of exurban areas have had strikes.

Since RN(race negro) was highly positive, meaning that the

more negros in a school district the more likely that district is to be classified into W_1 or non-strike districts.

VI. Conclusions and Recommendations

In our cross-sectional analysis, we have specified the average salary for a large sample of Ohio's school districts. Our model has overcome a major weakness that was found in the Hall and Carroll, Kasper and Baird and Landon studies. The results show that collective bargaining has had a positive but minor impact on teacher salaries.

Other demographic and socioeconomic variables that probably could improve our analysis of the impact that collective bargaining is having on teachers' salaries would be: 1) the ratio of male-female teachers in each school district; 2) the type of collective bargaining contract in each school district; and 3) the average age of male-female teachers in each school district. Moreover, a longitudinal study would shed considerable information on this issue since collective bargaining among teachers is relatively new in the nation.

A hypothesis that racial tensions were a major contributor to strikes would have to be rejected. This lends credence to the arguments that economic motives are the primary source of unrest in school district labor relations. The deteriorating financial position of bedroom type suburbs would lead us to forecase greater labor strife in suburban districts in future periods. With increased teacher militancy for more job security, we can anticipate more conflict in teacher-school board labor relations.

Results of the discriminate function analysis might yield more stable results if we had added in the 1973-74 school year 28 strikes to the file. However, the validity of cross-section techniques on time influences variables is increasingly doubtful, particularly with the inflation rates experienced in the past year.

Since our findings show that the Ferguson Act is ineffective in prohibiting strikes, Ohio and other states should legalize public employees' rights to engage in collective bargaining. Teacher labor relations could be improved in the nation providing teachers are given the legal right to engage in free collective bargaining. Once collective bargaining is established in public education, local school districts could begin to develop labor relation models that could improve human relations in the field of education.

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APPENDIX A

PUBLIC EMPLOYEE LABOR RELATIONS SURVEY IN OHIO

Dr. Charles H. Blake, Jr.
Department of Economics
Wright State University
Dayton, Ohio 45431

November 1, 1972

1. Names of Public employee organizations in your district:

Name of Organization	Year Organized	Is there a written contract? Yes	No
a.			
b.			
c.			
d.			

2. Specify nature of issues, if any, leading to organization of employees.

3. Number of employees in each bargaining unit:

	1969	1970	1971	1972
a. Professional teaching staff				
b. Non-teaching staff (clerical, custodial, lunchroom and maintenance)				

4. Percent of eligible employees belonging to each bargaining unit in 1972:

	1972
a. Professional teaching staff	
b. Non-teaching staff	

5. Are principals and superintendents in the professional teaching staff, and supervisors for the non-teaching staff excluded from the respective bargaining units?

a. Professional teaching staff		
b. Non-teaching staff		

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6. Do your contracts provide for dues deduction?

	Yes	No
a. Professional teaching staff	____	____
b. Non-teaching staff	____	____

7. Is a grievance procedure provided for in your existing contracts?

	Yes	No
a. Professional teaching staff	____	____
b. Non-teaching staff	____	____

8. Which of the following are provided in the grievance procedure to resolve any day-to-day issure that may develop?

Professional teaching staff	Non-teaching staff
a. arbitration ________	a. arbitration ________
b. mediation ________	b. mediation ________
c. fact-finding ________	c. fact-finding ________
d. other (specify) ________	d. other (specify) ________

9. Have there been any impasses or work stoppages (strikes, "sick-days" or "days off") by your employees in recent years? If so, please indicate.

a. Professional teaching staff

b. Non-teaching staff

10. How were these issues resolved?

	Prof. teaching staff				Non-teaching staff			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
a. Fact-finding with recommendations								
b. Fact-finding without recommendations								
c. Binding fact-finding								
d. Mediation with recommendations								
e. Mediation to a finality								
f. Compulsory arbitration								
g. Voluntary arbitration								
h. Binding arbitration								
i. Advisory arbitration								
j. Prolonged or extended negotiations								
k. Other (if appropriate please explain)								

11. What penalties, if any, were imposed upon the bargaining unit or individuals for violation of the Ferguson Act or other "no strike" legislation?

12. What procedures were used to reinstate any of the individuals or the bargaining unit for violating a "no strike" agreement? specify.

13. Which of the procedures listed in Question 10 are provided in each existing contract to resolve work stoppages, strikes or any impasse that may occur?

	Specify Procedures
a. Professional teaching staff	
b. Non-teaching staff	

14. Specify any changes you would recommend to the Ferguson Act.

15. Please send a copy of each contract with your employees' labor organization, if one exists.

16. Do you want a copy of the survey report? To whom should it be sent?

17. Name of your school district: _____

Thank you for completing this survey for us.