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RULES, COORDINATION AND MANIPULABILITY AMONG ARBITRATORS

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ABSTRACT

This paper provides evidence that the variance of arbitrated wage settlements is systematically lower than the variance of wage settlements negotiated without arbitration using a panel of contracts between teachers and school boards in the Canadian province of British Columbia. This finding is interpreted as evidence that arbitrators coordinate their decisions. However, coordination on a rule leaves arbitrators as a group vulnerable to manipulation by coalitions of employers or employees that understand the rule. Because successful manipulation of arbitrators undermines the credibility of the institution, arbitrators as a group have incentives to change their rules from time to time. Evidence is presented that in BC, school boards were more successful than teachers at manipulating arbitrators, and that arbitrators responded by changing their rule.

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There are many examples in the home, in courts, and at work, of disputes between two parties which are resolved by appeal to a third party. The third party must maintain an appearance of neutrality if his or her decisions are to be viewed as legitimate by the disputing parties. Arbitrators who decide the terms and conditions of labor contracts (interest arbitration)[1] must be particularly careful to maintain an appearance of neutrality because interest arbitration statutes give unions and management a say in the selection of their "judge". For example, parties may be presented with a list of randomly chosen names from a pool of arbitrators and asked to take turns striking names off the list, or to rank order the names on the list. An arbitrator who is perceived to be biased risks being vetoed by one of the parties to the dispute. Thus, professional arbitrators have a strong incentive to make decisions which look like those that other arbitrators would make, since those who deviate noticeably from the norms established by their peers are likely to be punished by a loss of business.[2]

Arbitrators can ensure that their decisions do not deviate too much from those of their peers by coordinating using a simple rule. There has been much discussion in the interest arbitration literature about exactly what form arbitrators' rules take, although for the purposes of coordination a wide range of simple rules will do.[3] Ashenfelter (1987), Ashenfelter and Bloom (1984), and Ashenfelter, Dow, and Gallagher (1986) argue that in interest arbitration cases, arbitrators are swayed only by the "facts of the case" and not by the stated positions of the parties. On the other hand, Bloom (1986) and Bazerman and Farber (1986) find that arbitrators are influenced by stated positions more than by the facts.

This emphasis on the positions of the parties is inspired in part by the

older industrial relations literature which asks whether arbitrators "split the difference" between the positions of the parties. Industrial relations scholars also argue that arbitrators are influenced by comparisons to freely negotiated settlements (Anderson, 1981 and Ehrenberg and Schwartz, 1986).[4] Indeed, "comparability" with other settlements is often specified in arbitration statutes as a criteria that arbitrators should use. At the same time, there is good reason to believe that settlements that are not arbitrated are influenced by beliefs about what an arbitrator is likely to do if the negotiation goes to arbitration (Farber and Katz, 1979 and Crawford, 1981). Hence it is not surprising to find that there is generally little difference within a jurisdiction between the mean of wages set by arbitrators and the mean of wages set without arbitration. The similarity between wages set with and without arbitration makes it particularly difficult to find evidence that arbitrators coordinate using a rule, or to find the form of that rule if they do.

This paper examines the question of whether arbitrators coordinate on a rule using a sample of teachers' contracts from the Canadian province of British Columbia. I find that both the raw and residual variances of wages set by arbitrators are lower than the variances of wages set without arbitration.[5] I interpret this finding as evidence that arbitrators do coordinate.

An implication of coordination by arbitrators is that although parties acting individually cannot manipulate the outcome of an arbitration hearing through their choice of arbitrator, arbitrators as a group can be manipulated by a coalition that understands the rule. For example, if arbitrators are known to place a high weight on settlements negotiated early in the bargaining season, then employers acting as a group can try to manipulate the bargaining calendar so that bargaining pairs that are expected to settle low without invoking

arbitration will come up early. Of course unions can employ the same tactic and attempt to have bargaining pairs that are expected to settle high without invoking arbitration come up early. Even though there is no difference between mean arbitrated and mean negotiated wage rates in a given year, in British Columbia high numbers of arbitrations are associated with lower average wages. This finding suggests that on the whole, employers as a group have been more successful than teachers at manipulating arbitral outcomes.

Successful manipulation of arbitrators by either side will tend over time to undermine the legitimacy of arbitration as a dispute resolution procedure. Hence, arbitrators as a group have incentives to change their rule from time to time in order to make it more difficult for coalitions of the disputing parties to manipulate them. I show that there is evidence of a sharp change in the rule used by arbitrators of British Columbia teacher disputes which occurred around 1970.

If arbitrators as a group have incentives to change their rules from time to time, and coordination on any of a range of simple rules allows arbitrators to avoid being penalized for making decisions which are "outliers", then it is likely that there is no one rule of arbitrator behavior which will always be followed. Hence, all of the alternative descriptions of arbitrator behavior which have been offered in the literature may in fact be correct for some groups of arbitrators at some points in time.

The rest of the paper is laid out as follows. In section 2 there is a brief description of the data. Evidence that arbitrators coordinate on a rule is given in section 3. Section 4 continues with a discussion of the manipulability of arbitrators and with evidence that arbitrators changed their rule over the sample period. A discussion and conclusions are given in Section 5.

2: The Data

The data consist of information about 1554 annual contract negotiations between teachers and school boards in the Canadian province of British Columbia (BC). All data sources are listed in the data appendix.[6] There are 74 bargaining pairs with complete information between 1961 and 1981.[7] Hence there are 21 negotiations per pair. All public school teachers were required to belong to the British Columbia Teacher's Federation (BCTF), but each "local" bargained independently with its own school board. The BCTF supplied information and negotiating assistance if such help was requested by the local teacher's organization. The school boards were also organized into an association with its own central office and information gathering capabilities.

Teacher/school board negotiations were the only ones specifically covered by compulsory arbitration legislation in British Columbia over the sample period.[8] This legislation was embodied in the Public School Act of 1937. By statute, contracts were renegotiated annually and only compensation could be negotiated. Other aspects of the employer/employee relationship were decided directly by the provincial government. Negotiations began in September and arbitration proceedings were automatically initiated if no agreement had been reached by November 14. Arbitral decisions were due by January 5.[9] The Act specified that only conventional arbitration, a proceeding in which the arbitrator's decision is not constrained in any way by the positions of the parties, would be used.

Data about whether or not each contract was decided by arbitration are available from 1947. Unfortunately, information about the name of the arbitrator, the stated positions of the parties, or the exact date of the contract settlement are not available. The sample ends in 1981 because in 1982

and 1983 negotiations were disrupted by provincial inflation restraint legislation[10] and the bargaining calendar was changed in 1984.

Wage data are only available from 1961. Teachers in BC were divided into six pay categories depending on the number of years of post-secondary education they had received (one to six). Within each group, teachers with more experience were paid more up to a maximum rate.[11] Nominal wage rates have been deflated using the Vancouver Consumer Price Index as no provincial price deflator is available. The number of teachers in each pay category is also unavailable, so it is not possible to compute an average wage. Instead, maximum wages for teachers with four years of post-secondary education are used as the dependent variable in the wage equations reported below. This choice is based on the fact that wage data for this group are the most complete. This real wage measure increased from $8.50 to $12.00 1981 Canadian dollars over the twenty year sample period. The use of other points on the salary scale as the wage measure does not change the results reported below.

The Act did not specify the criteria that arbitrators were to use in determining wages. However the industrial relations literature discussed above suggests that comparability to similar settlements is one of the most important criteria used by arbitrators. Province-level data about mean teacher wages settled with and without arbitration from the previous round of negotiations are included in the wage equations estimated below to capture this effect. In addition, representatives of the BCTF[12] suggested that general provincial economic conditions were important determinants of arbitral awards. Province-level data about unemployment, provincial gross domestic product, and average provincial weekly wages and salaries are included in the wage equations in order to control for these conditions. I also included information about the number

of children in two age categories as a proxy for the demand for primary and secondary education. Finally, fixed effects for each school board are included in order to control for any unobserved determinants of the wage which are constant over time, and the lagged wage is included to capture unobserved factors which might cause the wage to be above or below the board-specific mean for some period of time.

The wage in effect in year t was decided in year t-1. Since the macroeconomic variables were only available from 1961, the first year of the regressions reported below is 1962. "Lagged" variables refer to the negotiation which took place in the year before the negotiation which determined the current wage. All variables except for the Consumer Price Index and the unemployment rate are measured in logarithms.

3: Coordination on a Rule? Wage Equations and Residual Variances

Mean negotiated and arbitrated wage rates, and the number of settlements of each type are shown in Table 1. Mean negotiated wages tend to exceed mean arbitrated wages in the raw data — the former are higher than the later in 15 of the 22 years. A comparison of the standard deviations shows that the variance of negotiated wages is higher than the variance of arbitrated wages in all but 5 years.

In order to control for differences in the observable and unobservable characteristics of bargaining pairs that used arbitration and those which did not, I estimate wage equations using the independent variables discussed above, divide the residuals according to whether the settlement was arbitrated or negotiated, and then compare the residual means and variances. These wage equations are shown in Table 2.

The estimates in the first column of Table 2 show that the lagged wage is the most important determinant of the current wage. The absence of serial correlation in the residuals suggests that further lags are not empirically important. Lags of mean negotiated and arbitrated wages enter with approximately equal and opposite signs. The restriction that only their difference matters cannot be rejected at the 95 percent level of confidence.

The total number of arbitrations in the province has a small but statistically significant negative effect on the wage as does the unemployment rate. Inflation as measured by the Vancouver CPI has a small positive impact on the wage. The average real provincial weekly wages and salaries is not statistically significant. However, real provincial GDP is highly correlated with average provincial weekly wages and salaries and is estimated to have a large negative effect on wages. This result may indicate that trends in teachers' wages follow the business cycle only with a lag. Wages rise with the number of older children in the province and fall with the number of younger children. Presumably, these estimates reflect the wage differential between elementary and secondary school teachers.

In column 2 of Table 2 the restriction that only the difference between mean arbitrated and negotiated wage rates matters is imposed. The estimated coefficient implies that the wage increases by .29 percent for each one percent increase in the difference in mean wage rates. In the third column of Table 2, the number of arbitrations in the school board in the last four years is included as an additional control for bargaining-pair specific heterogeneity.[13] This variable is not statistically significant, which provides some assurance that relevant bargaining-pair specific heterogeneity has been adequately controlled for.

Mean residuals from the wage equation shown in column 1 of Table 2 are shown separately for arbitrated and negotiated settlements in columns 1 and 2 of Table 3. Once fixed effects and observable characteristics of bargaining pairs are controlled for, there are no statistically significant differences in any year between the mean residuals for arbitrated and negotiated settlements. This result confirms the conventional wisdom that one should not expect to see differences in negotiated and arbitrated wage rates within a jurisdiction. However, controlling for observables does not change the result that the variance of negotiated settlements is greater than the variance of arbitrated settlements. The former still exceeds the latter in all but 5 years.

The third column of Table 3 shows F-tests of the null hypothesis that the residual variances of arbitrated and negotiated settlements are the same in each year against the alternative hypothesis that the residual variance of negotiated settlements is greater. The null hypothesis can be rejected at the 95 percent level of confidence in 12 out of 20 years. The null hypothesis of equal variances can also be tested against the alternative hypothesis that the residual variance of arbitrated settlements is greater. In a comparison against this alternative, the null hypothesis cannot be rejected in any year.

These results are robust to several changes in specification including 1) dropping mean arbitrated and negotiated wages from the estimated wage equation entirely, 2) estimating separate equations for arbitrated and negotiated wages, and 3) including year dummies rather than province-level variables.

These results are consistent with the interpretation that arbitrators coordinate, yet they hardly constitute a "smoking gun". At this point it is worth considering whether coordination is plausible, and whether there are alternative explanations which do a better job explaining the data.

There are several features of arbitration systems which make coordination likely. First, there is evidence that the vast majority of arbitrations are done by a few experienced arbitrators and that it is very difficult for inexperienced arbitrators to break into this group (Ashenfelter and Currie, 1990). Moreover, these arbitrators usually belong to a professional association which has regular meetings. Hence coordination is plausible.

The most attractive alternative explanation for the smaller variance of arbitrated settlements is that cases that go to arbitration are somehow selected to be those which have fairly certain outcomes given the observables. This explanation seems unlikely given the strict arbitration time-table in the province: Why would those cases whose outcomes were most certain take the longest time to settle, and ultimately require a decision by a third party?[14]

A final reason for accepting the coordination hypothesis, at least provisionally, is that it provides an explanation of other features of the British Columbia arbitration data which I now turn to.

4: Manipulability of Arbitrators and Changes in the Rules

The results presented above show that although arbitrated and negotiated wages do not differ once fixed effects and observable characteristics of bargaining pairs are controlled for, teacher wages are lower in years with many arbitrations. This result may reflect a successful bid by employers acting as a group to manipulate arbitral decisions.

Recall that the bargaining calendar specified that any negotiation which had not been resolved by November 14th would go to arbitration. Hence, arbitrators had the opportunity to observe all of the negotiated settlements which would be made in a given year before making any decisions themselves. If

arbitrators' were influenced by settlements negotiated earlier in the year, then school boards would have an incentive to arrange the bargaining calendar so that bargaining pairs that were expected to negotiate low wages without invoking arbitration came up first. After a few low settlements had been observed, other school boards could refuse to settle and force the remaining negotiations into arbitration.[15] One factor which made such strategic behavior feasible was an absence of "pattern bargaining". That is, there was no one bargaining pair or group of bargaining pairs that usually went first and established a pattern of wage settlements.[16]

Of course teachers would attempt to arrange the bargaining calendar in the opposite way, so that bargaining units which were expected to negotiate high wages came up first. If both teachers and school boards had been equally successful, then there would not have been any relationship between the number of arbitrations and average wages. One reason why school boards may have been more successful than teachers at manipulating arbitrators, is that school boards were usually represented by an official who participated in negotiations over a period of years. Teachers were more likely to be represented by a team of teachers which changed from year to year.[17]

The scenario sketched above is only plausible if mean negotiated wages from the current round of negotiations have a positive effect on arbitrated settlements, even when the difference between mean negotiated and arbitrated wage rates from the previous round of negotiations is controlled for. This question is investigated in the first two columns of Table 4. The first column shows a wage regression of the same form as column 2 of Table 2, estimated using the subset of arbitrated settlements. The results are quite similar to those in Table 2, except that the average wage in BC has a positive and significant effect

on arbitrated wages, while the total number of arbitrations in BC is not statistically significant.

The model shown in the second column of Table 4 indicates that mean negotiated wages in the current round of negotiations have a large positive effect on arbitrated wages. A comparison of columns 1 and 2 shows the close relationship between the mean negotiated wage in the current round of negotiations and the total number of negotiations which end in arbitration. Once the former is controlled for, the latter has a statistically significant negative effect. The average wage in BC becomes statistically insignificant.

The fact that the population of arbitrators can be manipulated tends to undermine the institution of arbitration by casting doubt on the neutrality of arbitrators. Hence, arbitrators as a group have incentives to change their rule from time to time so that it will be more difficult for coalitions to manipulate them. The total number of arbitrations per year over the entire 1947 to 1981 period is plotted in figure 1. The number of arbitrations ranged from a low of 2 in 1962 and 1971 to a high of 58 in 1976. On average one third of negotiations ended in arbitration. This average did not change over time, but the figure shows that there was a dramatic increase in the variance of this series starting about 1970.

These sharp swings in the number of arbitrations cannot be explained using levels or coefficients of variation of the macroeconomic and demographic variables included in the wage equations, the percent of provincial negotiations ending in strikes, teacher wages, or changes in legislation governing collective bargaining in the province (Currie, 1989).[18] The question of whether this change in variance coincided with a change in the rules followed by arbitrators is investigated in the last three columns of Table 4.

Column 3 shows interactions of the independent variables with a dummy variable equal to one if the year was less than 1970. Column 4 shows interactions of the same variables with a dummy variable equal to one if the year was greater than or equal to 1970. The last column gives F-tests for the equality of each pair of interaction terms. The table shows that there were three changes in the process governing wages which took place after 1970: 1) The effect of inflation changed from negative to positive. It may be that as inflation accelerated in the 1970's, teachers began demanding compensation for expected inflation over the life of their contract rather than relying on *ex poste* adjustments; 2) the wage penalty associated with large numbers of young children fell; and most interestingly 3) the lagged difference between mean negotiated and arbitrated wages changed from an insignificant to a statistically significant determinant of wages.

Because of the similarity between arbitrated and negotiated wage rates, it is not possible to show definitively that the increases in the estimated coefficients on inflation or on the numbers of young children reflect changes in the behavior of arbitrators rather than changes in the behavior of bargaining pairs which the arbitrators then adopted. However, the fact that the lagged difference between mean negotiated and mean arbitrated wage rates became a significant determinant of current wages in the 1970's is certainly consistent with a reaction by arbitrators to attempts by employers and employees to manipulate the bargaining calendar.

One could argue that regardless of the success of these attempts, even the public perception that arbitral decisions could be affected by manipulating the bargaining calendar would be harmful to the credibility of arbitrators. Arbitrators may have responded by compensating for differences between mean

negotiated and arbitrated wage rates in the next round of negotiations. Such behavior on the part of arbitrators would make it undesirable for employers or employees to "stone-wall" in consecutive years, and might be responsible for the saw-tooth pattern of a year with many arbitrations being followed by a year with few arbitrations which emerged after 1970.

Although the difference is not statistically significant, it is also interesting to note that the point estimate on the total number of arbitrations declined between the 1960's and the 1970's, which may indicate that the arbitrators' change in the rule had the intended effect of reducing the extent to which arbitrators were manipulated.

5: Discussion and Conclusions

Perhaps the strongest piece of evidence that arbitrators coordinate is that the variance of arbitral wage rates is systematically lower than the variance of wage rates which were freely negotiated. This observation implies that some bargaining pairs agreed on settlements which were not likely to be imposed by an arbitrator. Such behavior is rational if the costs of arbitration are high,[19] or if parties are risk averse and *for a particular bargaining pair*, the uncertainty associated with arbitration is greater than the uncertainty associated with negotiating a settlement.

The role of uncertainty has been neglected in the preceding discussion because the focus was on coordination by arbitrators. It should be emphasized however, that it is not in arbitrators' interests to adopt completely deterministic rules. First, given a completely deterministic rule, anyone could be an arbitrator. In practice, it takes years of experience to build up a practice and to be accredited by a national association. Second, it is unlikely

that bargaining pairs would pay to have their disputes settled using a deterministic rule. Instead, one would expect bargaining pairs to agree on the settlement dictated by the rule and arbitration would never be observed (Crawford, 1981). Hence, the kind of rules that are likely to be observed in practice are heuristic ones which identify the factors which are important but leave the precise weights up to the individual arbitrators.

It is ironic then that many jurisdictions have attempted to make the rules used by arbitrators more deterministic by specifying the criteria to be used by arbitrators in the legislation that establishes the institution. The evidence in this paper suggests that if it is successful, such legislation may in the long run undermine the legitimacy of arbitration by making it easier for coalitions of employers or employees to use the rules to manipulate arbitral decisions. The case of the BC teachers suggests that strict bargaining time-tables may also have this undesirable effect.

However, the evidence discussed above indicates that arbitrators themselves respond to attempts to manipulate them by changing their rules from time to time. This observation suggests a resolution to the debate in the literature about whether arbitrators rate the facts of the case or the positions of the party more highly. It is quite possible that both conclusions are correct for different populations of arbitrators at different times. And it is likely that if specific populations of arbitrators could be followed for a long enough period of time, as they can be in BC, that changes in their rules over time would be evident.

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1. The other type of arbitration which is widely used in labor-management disputes is grievance arbitration, which refers to the interpretation of the terms and conditions of an existing contract.

2. Ashenfelter (1987) calls this property of arbitrators statistical exchangeability. Bloom and Cavanagh (1986) provide evidence that parties do take account of an arbitrator's "track record" when choosing an arbitrator.

3. A rule that produces "outrageous" decisions will discredit the arbitration process, but there are will be many rules which will give outcomes within some range that is deemed "reasonable".

4. Anderson, and Ehrenberg and Schwartz provide excellent surveys of the industrial relations literature about interest arbitration.

5. Gunderson (1983) notes that the introduction of arbitration into a jurisdiction tends to reduce the variance of all wage settlements. Olson (1991) finds that the variance in negotiated settlements falls in the bargaining round following arbitration. I am not aware of other work which has examined the variance of wage settlements.

6. The critical information about wage scales and usage of arbitration came from the BCTF. If the school board had more than 500 employees, the information from the BCTF could be checked using information available in the Collective Bargaining Review, and on a magnetic tape with contract information provided by Labor Canada.

7. Eight boards which merged with a larger one in the early seventies have been omitted. For details see Currie (1989). Three very small boards were also omitted because wage data were not available.

8. Other public servants were covered by a succession of essential services laws which allowed the provincial government to intervene in a labor dispute which threatened provision of an essential service on an *ad hoc* basis.

9. The exact timetable was as follows: Notice to negotiate had to be given by September 20 and negotiations had to begin by September 30. If no agreement had been reached by October 15, a conciliator was appointed. If no agreement had been reached by November 14 the dispute went to an arbitration board. Teachers and school boards had to choose their representatives on the arbitration board by November 27, and agree on a chair by December 2. If no agreement on a chair had been reached by December 7, the Minister of Labor could appoint a chair. If no decision had been reached by the arbitration board by December 31, the chair was given the authority to decide the settlement. The chair's decision was due by January 5 (Marcotte, 1980).

10. Passage of the Compensation and Stabilization Act of 1982 (Bill 128) severely disrupted collective bargaining in British Columbia. For example, the entire Vancouver school board was dismissed when it refused to submit a budget within the new provincial guidelines in 1982.

11. Each contract contained a wage scale which defined a bracket for each of the six educational groups as well as defining the number of experience categories within each group. The number of experience categories ranged from eight to fourteen within each group, depending on the contract.

12. Personal communication with John Malcolmson of the BCTF.

13. Currie (1989) shows using the same data that if a bargaining pair used arbitration within the last four years, it is significantly more likely to use arbitration in the current negotiation. Arbitrations which occurred more than four years ago have no statistically significant effect on the probability that an arbitration occurs in the current negotiation.

14. One answer to this question is suggested by McCall (1990) who assumes that unions suffer from a principal-agent problem which results in the use of arbitration. Currie (1989) examines the implcations of this model for the relationship between arbitration and wages and finds no support for it in these data.

15. This strategy was first suggested to me by Richard Lester. According to Lester, attorneys who represent municipalities in negotiations with police and firefighters in New Jersey sequence negotiations so that the lowest wage cases come up first. New Jersey has compulsory arbitration of police and firefighter disputes.

16. Personal communication with Mark Thompson of the University of British Columbia's School of Industrial Relations. Professor Thompson served as an arbitrator of teacher-school board contract disputes during part of the sample period.

17. Personal communication with representatives of the BCTF and individual school boards.

18. Potentially relevant changes in the laws include the adoption of a new provincial labor code in 1972, the existence of the federal anti-inflation board from 1975 to 1977, and passage of a new essential services disputes act in 1977. I was able to show that the three year moving average of the number of arbitrations was procyclical and varied positively with the number of school age children (Currie, 1989).

19. According to John Malcolmson of the BCTF, the cost of an arbitration hearing could reach $30,000 1985 dollars. The costs are normally divided between the parties. Fifteen thousand dollars might represent a large amount in a small school district.

Table 1

Mean Negotiated and Arbitrated Wages and Number of Settlements, by Year

Year	# Negotiated Settlements	Mean Negotiated Wages	# Arbitrated Settlements	Mean Arbitrated Wages
1960	56	8273.32 (205.00)[1]	16	8272.29 (176.94)
1961	41	8491.80 (306.05)	32	8334.46 (226.26)
1962	71	8497.50 (258.48)	2	8275.32 (67.13)
1963	60	8697.53 (280.61)	13	8593.42 (113.01)
1964	55	8949.37 (271.46)	18	8881.33 (205.52)
1965	39	9315.87 (344.33)	34	9218.21 (228.62)
1966	56	9633.09 (281.83)	17	9689.83 (377.81)
1967	49	10042.12 (319.77)	25	9893.14 (196.06)
1968	53	10212.36 (267.44)	21	10317.78 (316.27)
1969	48	10483.77 (215.41)	26	10555.29 (322.12)
1970	26	10870.60 (241.63)	48	10919.70 (291.88)
1971	72	11348.29 (277.78)	2	11920.00 (226.27)
1972	26	11518.18 (304.24)	48	11423.07 (285.32)
1973	37	11831.45 (389.97)	37	11797.07 (288.58)
1974	25	11806.29 (349.16)	49	11699.76 (330.437)

1975	68	12269.97 (342.17)	6	12367.92 (242.82)
1976	17	12578.80 (603.45)	57	12211.66 (234.13)
1977	40	12270.74 (318.70)	34	12454.25 (444.61)
1978	63	12153.05 (392.29)	11	12064.49 (273.61)
1979	29	12335.86 (485.95)	45	12008.02 (218.89)
1980	51	12182.43 (422.81)	23	12091.46 (237.80)
1981	58	12003.95 (347.85)	16	11926.03 (210.75)

Notes:

[1] Standard errors in parentheses.

Table 2

Wage Equations, 1962 to 1981

Dependent Variable=Log Real Annual Wage

Independent Variables:	(1)	(2)	(3)
Wages:			
Lag log own wage	.662 (.021)[1]	.655 (.021)	.660 (.021)
Lag log mean negotiated teacher wage	.216 (.051)	-	.222 (.051)
Lag log mean arbitrated teacher wage	-.317 (.033)	-	-.318 (.033)
Lag difference log mean negotiated and arbitrated wages	-	.288 (.028)	-
Log average BC weekly wages and salaries	.093 (.047)	.043 (.037)	.091 (.047)
Numbers of Arbitrations:			
Log # arbitrations of the bargaining pair, last 4 negotiations	-	-	-.0006 (.0004)
Log total # arbitrations BC	-.005 (.0004)	-.005 (.0004)	-.005 (.0004)
Macroeconomic and Demographic:			
BC unemployment rate	-.007 (.001)	-.008 (.001)	-.007 (.001)
Log BC GDP	-.214 (.023)	-.223 (.022)	-.212 (.023)
Vancouver CPI	.0008 (.0001)	.0009 (.0001)	.0008 (.0001)
log # children age 0 to 9	-.239 (.039)	-.252 (.038)	-.239 (.039)
log # children age 10 to 19	.588 (.030)	.573 (.028)	.587 (.030)

Intercept	3.465 (.323)	3.090 (.238)	3.442 (.323)
Degrees of freedom	1390	1391	1389
Sum of squared errors	.242	.242	.241
Durbin Watson statistic	2.134	2.125	2.130

Notes:

[1] Standard errors in parentheses.

Table 3

Residual Means and Variances from Column 2 of Table 2, by Year

Year	Mean Residual Arbitrated Settlements	Mean Residual Negotiated Settlements	F Tests: HO[1] vs. HA Neg>Arb	HA Arb>Neg
1962	-.014	-.001	46.521*	.022
	(.002)[2]	(.017)		
1963	-.004	-.005	.994	1.007
	(.015)	(.015)		
1964	.005	-.003	.794	1.259
	(.016)	(.014)		
1965	.009	.006	2.083*	.480
	(.012)	(.018)		
1966	.005	.003	1.542	.648
	(.010)	(.013)		
1967	.008	.009	.786	1.273
	(.010)	(.009)		
1968	-.006	-.013	3.767*	.265
	(.007)	(.014)		
1969	-.004	-.003	1.713	.584
	(.006)	(.008)		
1970	.003	.002	1.200	.834
	(.008)	(.009)		
1971	.005	.002	6.723*	.149
	(.003)	(.008)		
1972	.002	.004	2.074*	.482
	(.005)	(.007)		
1973	.000	.002	4.427*	.226
	(.005)	(.011)		
1974	-.019	-.015	5.168*	.193
	(.004)	(.010)		
1975	.013	.008	8.157*	.123
	(.003)	(.008)		
1976	-.002	.003	5.210*	.191
	(.009)	(.020)		

1977	.005 (.005)	.001 (.012)	7.229*	.138
1978	-.004 (.005)	-.004 (.005)	.914	1.094
1979	.009 (.004)	.013 (.008)	3.946*	.253
1980	.008 (.005)	.010 (.005)	.912	1.097
1981	-.016 (.006)	-.014 (.011)	3.171*	.315

Notes:

[1] The null hypothesis is that there is no difference in the variance of the residuals of arbitrated and negotiated settlements.

[2] Standard errors in parentheses.

Table 4

Wage Equations for Arbitrated Settlements Only, and with Interactions for the 1960's and 1970's

Independent Variables:	Arbitrated Settlements Only (1)	(2)	Full Sample Interactions: yr lt 1970 (3)	yr ge 1970 (4)	F-tests[1] (5)
Wages:					
Lag log own wage	.760 (.029)[2]	.726 (.026)	.656 (.022)	.653 (.024)	.014 [.906]
Lag difference log mean negotiated and arbitrated wages	.380 (.036)	.376 (.033)	-.357 (.207)	.375 (.034)	12.270 [.001]
Log mean negotiated teacher wage	-	.492 (.047)	-	-	-
Log average BC weekly wages and salaries	.175 (.054)	.084 (.050)	-.091 (.636)	.027 (.053)	.034 [.853]
Numbers of Arbitrations:					
Log total # arbitrations BC	-.001 (.001)	-.004 (.001)	-.010 (.003)	-.006 (.0005)	1.664 [.197]
Macroeconomic and Demographic:					
BC unemployment rate	-.009 (.002)	-.007 (.002)	-.015 (.004)	-.010 (.001)	1.301 [.254]
Log BC GDP	-.332 (.030)	-.210 (.030)	.025 (.408)	-.276 (.025)	.544 [.461]
Vancouver CPI	.001 (.0001)	.0005 (.0001)	-.007 (.003)	.001 (.0001)	8.511 [.004]
Log # children age 0 to 9	-.180 (.068)	.045 (.065)	-1.295 (.170)	-.791 (.070)	16.869 [.0001]
Log # children age 10 to 19	.531 (.041)	.120 (.054)	.690 (.212)	.431 (.039)	1.422 (.233)
Intercept	2.245 (.257)	1.560 (.242)	7.746 (1.559)		
Degrees of freedom	522	521	1382		

Sum of squared errors	.060	.050	.201
Durbin Watson statistic	1.963	1.868	2.097

Notes:

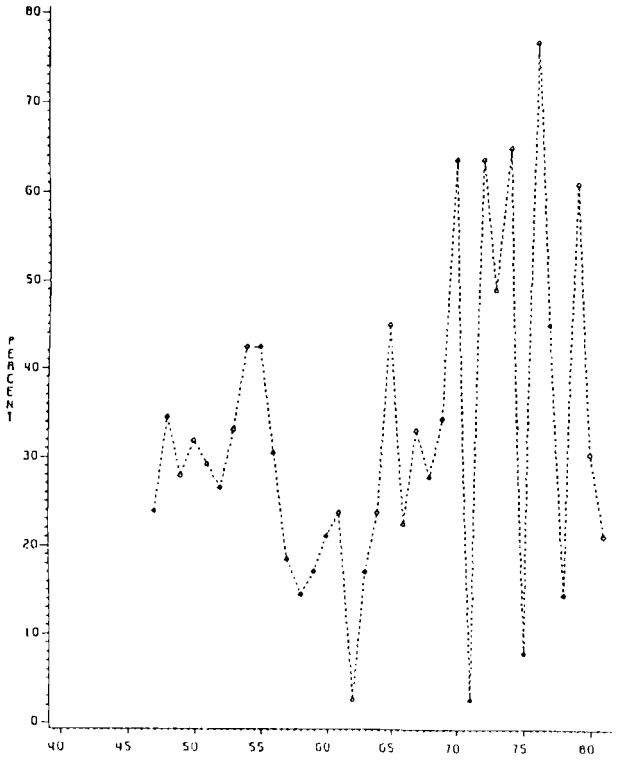
[1] All independent variables (except the intercept) are interacted with a dummy variable equal to one if the year was less than 1970 (in column 3) and with a dummy variable equal to one if the year was greater than or equal to 1970 (in column 4). F tests for the null hypothesis that the two coefficients are the same are shown in column 5. The probability that the F-statistic would be observed if the null were true is shown in square brackets.

[2] Standard errors in parentheses.

Figure 1

Percent of Teacher/School Board Negotiations Going to Arbitration

1947-1981



Data Appendix

Data Description	Source	Period[a]
Whether or not each board used arbitration in each year for 75 boards	British Columbia Teacher's Federation	47-81 annual
Salary grids. Minimum and maximum salaries for each of 6 teacher grades, and number of increments	BCTF	60-82 annual
Duration of negotiations, size, stage settled, min/max salary for some teacher grades for > than 500 employees	Collective Bargaining Review (monthly)	72-82 annual
B.C. Unemployment Rate[b]	Labour Force Survey Division, Statistics Canada	46-65 annual
B.C. Unemployment Rate[c]	CANSIM 1984 D769170	66-82 monthly
Population by four age groups (0-4, 5-9, 10-14, 15-19) and sex	CANSIM 1984 D125470-3 D125490-3	51-82 annual
Vancouver Consumer Price Index[d]	Prices Division Statistics Canada	40-82 annual
Average Weekly Wage and Salaries, B.C.	CANSIM 1984 D5246	53-84 monthly
Contract data including negotiated wage, union affiliation, length of negotiations, stage of settlement, COLA information for > 500 employees	Labour Canada tape	65-82 for each contract

Notes:

[a]Monthly series were converted to annual by averaging.
[b]Unemployment rate for 14 years and up.
[c]Unemployment rate for 15 years and up. The labour force survey definition of unemployment was changed in 1966.
[d]The treatment of shelter in the regional CPI was changed in 1978 and series were only revised back to 1971. I use the old definition of the CPI, which has been extended forward by Statistics Canada on an unofficial basis.