Explorations in Economic History **39,** 315–354 (2002)
doi:10.1006/exeh.2002.0787

Hope against Hope: Strike Activity in Canada, 1920–1939[1]

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The received view is that, across countries and time, strike dimensions trace an empirical regularity. The incidence and duration of contract strikes move in opposite directions over the business cycle: incidence is procyclical and duration countercyclical. The Canadian experience in the interwar years was different. Strike incidence was independent of the business cycle and strike durations fell steadily over the period. A distinct pattern emerged. The 1920s saw a decline in strike activity and steady losses for workers; in the 1930s strike activity gained momentum and there were more worker wins. Our interpretation of this extraordinary episode is based on a new data set collected for the period 1920 to 1939. We evaluate strikes in the context of a war-of-attrition model and estimate the probability of strike outcomes (success, failure, or compromise) and capitulation times (for firms and workers) as functions of firm and striker characteristics. We find that workers capitulated first in the 1920s because firms used replacement workers as part of a larger strategy to break the union movement. In the 1930s, it was firms' turn to capitulate first because they had cut back on resources to fight strikes, even as workers became more belligerent.

Key Words: labor history; Canadian economic history; strike activity; war-of-attrition model.

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[1] *Hope Against Hope* is the title of Nadezhda ('Hope') Mandelstam's biography of Osip Mandelstam, the Soviet dissident poet of the interwar years. An earlier version of this article was prepared for the Fourth World Congress of Cliometrics, Montréal, 2000, and the Canadian Network in Economic History Meetings, Stratford, Ontario, 2000, and presented at seminars at the Université de Montréal and Queen's University. We thank participants at these meetings and seminars, as well as the comments of anonymous referees and Eugene White. The usual disclaimer applies. We also acknowledge the research assistance of Charles Gaa and Sophie Lefebvre. Huberman's research was funded by the Social Sciences and Humanities Research Council of Canada (Grant 410-98-0125).

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0014-4983/02 $35.00

Series E-191 and E-196 of the *Historical Statistics of Canada* (Urquhart and Buckley, 1983)—the number of strikes and lockouts and the duration of strikes—present a puzzle for economic and labor historians of the interwar years.[3] The received view is that across countries and time strike dimensions trace an "intriguing empirical regularity. The incidence and duration of contract strikes move in opposite directions over the business cycle: incidence is procyclical, and duration contercyclical (Kennan, 1986, p. 1128)." Economists have built elaborate models to fit these facts, but the problem is that there are episodes of strike activity that do not conform to the "empirical regularity."

The Canadian experience in the interwar years is a case in point. From a peak in 1919 and 1920, the number of strikes declined rapidly. Contrary to the received view, in 1925, a year of strong economic activity (Safarian, 1970), the average strike lasted about 41 days, longer than in any other time in the interwar period. Beginning in 1926 strike durations declined and by 1930 they averaged slightly less than seven days. In the early 1930s, the number of strikes began to rise. Again, the common view of strikes would predict otherwise: fewer but longer strikes during economic downturns. In 1934, there were 191 strikes, even though unemployment was about 20%. With economic expansion, the number of strikes increased as expected, but in 1937 the average length of a strike equaled that of 1934, about 12.5 days, when in fact the received view would have predicted that it would have been shorter. During the same period in the United States, strike incidence appears to have been more sensitive to the business cycle (Jurkat and Jurkat, 1949). Finally, Canadian strike dimensions in the interwar years are different than those for the period before 1914 (Huberman and Young, 1999) and after 1945 (Harrison and Stewart, 1989) when strike activity did conform to the "empirical regularity."

The objective of this article is to explain the peculiar nature of Canadian strikes between the wars. In particular, we advance an explanation of the central paradox of these years: in the 1920s strike activity declined with durations, while in the 1930s militancy increased as durations continued to decline. Our interpretation is based on a new data set collected for the period 1920 to 1939. We evaluate strikes in the context of a war-of-attrition model and estimate the probability of strike outcomes (success, failure, or compromise) and capitulation times (for firms and workers) as functions of firm and striker characteristics.[4] Our major findings are as follows:

1. Strike activity in Canada in the interwar years was different than in the period before 1914. Workers lost more disputes; strike incidence and durations were less responsive to the business cycle.

[3] These series are reproduced in Table 1.

[4] Throughout the article, successful (failed) strikes are disputes that workers won (lost). The data are limited to strikes after they have been called. Since we do not have evidence on when bargaining did not lead to strikes, we can offer only a partial explanation of strike incidence.

2. It is best to analyze the interwar years in three subperiods, 1920–1929, 1930–1934, and 1935–1939. Each of these periods had its own distinct dynamic with regard to the balance of forces in the war-of-attrition that determine strike outcomes and durations.

3. In the first phase, 1920–1929, employers put in place strategies to weaken the union movement and during strikes they often brought in replacement workers. Faced by a high probability of failure and a shrinking prize—the wage gain in the attrition model—strike activity declined. From 1921 on, the trend in strike durations was downward.

4. In the Depression years, 1930–1934, the union movement was weakened and as the prize got smaller, strike durations became shorter still.

5. In the final period, 1935–1939, workers began to win more strikes because they had found ways to outlast employers. Firms seem to have been unprepared for workers' renewed offensive since they had cut back on their human resource departments in the Depression, thus lowering their delay or capitulation times. As a result, durations declined, even as the prize increased.

6. Our explanation of the period's central paradox is that in the 1920s, because of employer pressure, workers capitulated first and this translated into shorter average durations. But against all hope, workers were able to hang onto their organizations and some degree of worker militancy persisted throughout the period. Beginning in the 1930s, the balance swung in favor of workers. Faced by worker resistance, employers now capitulated first. As a result, shorter durations in the 1930s went hand in hand with more worker wins.

Canada's experience in these years—although certainly meriting an explanation in its own right—is instructive because it raises issue with models of industrial relations. Based on the decline in worker militancy after 1920, certain contemporary analysts forecasted bleak prospects for trade unionism, and in the same fashion many industrial relations experts today predict a dire future for unions in the new century. But the union movement did survive the interwar years. In the United States, the Wagner Act and the foundation of the Congress of Industrial Organizations (CIO), the *deus ex machina* in many labor histories, revived the union movement in the 1930s. But Canada saw no legislative changes in the period, and strike numbers and union density rates rose before the coming of the CIO. Thus Canadian experience in the interwar years provides a test of standard interpretations of U.S. labor history: What happened to industrial relations in the absence of the New Deal and the CIO? In support of our claims, Freeman (1998) has recently advanced a general model of endogenous spurts in union activity. If this is the case, then predictions regarding the end of trade unions in the 21st century may prove to be premature.

The paper is organized as follows. The next section compares U.S. and Canadian strike dimensions in the interwar years and summarizes economists and

labor historians' treatment of strike activity north of the border. We then situate the changing strategies of workers and firms in a war-of-attrition model. The following section introduces the data set constructed to evaluate industrial relations. We present next the results of our estimation of the attrition model. A concluding section places the findings in the larger debate about the future of trade unions.

STRIKE ACTIVITY IN CANADA IN THE INTERWAR YEARS

As elsewhere after the war, militancy in Canada rose, culminating in the Winnipeg General Strike of 1919. In line with trends in the United States, the number of strikes in Canada fell after 1919 (Table 1). The number of strikes remained low into the Depression and then started to increase. The U.S. peak was in 1937, but in Canada there was an initial surge in 1934, followed by a second peak in 1937. The pattern of durations also exhibited some differences between the countries. Durations in the United States declined after 1928 and rose again in the mid-1930s; in Canada, durations fell steadily from the mid-1920s.[5]

Strikes and the Business Cycle

Economists and labor historians have offered different accounts of strike trends in the interwar years. Economists' preferred explanations are based on the relation between strike activity and the business cycle. In the screening model, unions are assumed to be poorly informed about profits and they use strikes to discriminate among firms of different types. High-profit firms will be more impatient than lower profit firms and they will settle quickly. Strike incidence should be procyclical because it is associated with greater uncertainty about firms' profits, say due to inflation. Wage settlements should fall as durations increase. The first generation of screening models predicted procyclical durations, but, allowing the timing of offers to vary, Kennan and Wilson (1989) adjust the basic model to generate countercyclical durations.[6]

Using 1919 as the base year, Fig. 1 traces the relation between GDP per capita, strike frequency, and strike duration in Canada. At first pass, there appears to be little relation between strike dimensions and the business cycle.[7] Strike numbers

[5] Cross-country comparisons of strike activity are not straightforward because national authorities used different definitions and measures of strike activity. With regard to duration, both Canadian and U.S. authorities did include short strikes lasting 1 day. Overall, for the 1920s Canadian data are more reliable than U.S. statistics (Griffin, 1939, p. 192).

[6] The effect of shortened periods is known as the Coase property. In boom times, unions have the incentive to make repeated offers, that is make the clock run faster. This will speed up acceptance. Hence, we expect increasing settlement rates as the time between offers shrinks.

[7] Safarian (1970) gave the basic outline of the business cycle in Canada: There was a downswing in 1920 and the early part of 1921, and then 2 years of stability that gave way to "specialized setbacks (ibid., p. 32)" in 1924. A period of rapid expansion began in 1925 that, despite some modest setbacks

TABLE 1
Union Membership and Strikes in Canada and the United States, 1919–1939

	Canada					United States	
			Strikes and lockouts			Strikes and lockouts	
	Total union membership	Union density rate (%)[a]	Number	Strike duration[b]	Time loss[c] (%)	Number	Strike duration
1919	378	—	336	22.8	.60	3630	
1920	374	—	322	13.3	.14	3411	
1921	313	16.0	168	37.1	.22	2385	
1922	277	13.6	104	34.9	.32	1112	
1923	278	13.2	86	19.6	.13	1553	
1924	261	13.2	70	37.7	.26	1249	
1925	271	12.3	87	41.2	.23	1301	
1926	275	12.0	77	11.2	.05	1035	
1927	290	12.1	74	6.8	.03	707	26.5
1928	301	12.1	98	12.8	.04	604	27.6
1929	320	12.6	90	11.8	.02	921	22.6
1930	322	13.1	67	6.7	.01	637	22.3
1931	311	15.3	88	19.0	.04	810	18.8
1932	283	15.3	116	10.9	.05	841	19.6
1933	286	16.7	125	12.0	.07	1695	16.9
1934	281	14.6	191	12.5	.11	1856	19.5
1935	281	14.5	120	8.7	.05	2014	23.8
1936	323	16.2	156	8.0	.05	2172	23.3
1937	384	18.2	278	12.3	.15	4740	20.3
1938	382	18.4	147	7.3	.02	2772	23.6
1939	359	17.3	122	5.5	.04	2613	23.4

[a] Percentage of nonagricultural paid workers in unions.
[b] Average days per worker involved.
[c] Percentage of estimated working time.
Sources. Canada—Urquhart and Buckley (1983); United States—Peterson (1937); Griffin (1939); U.S. Bureau of the Census (1975).

fell in the upswing of the mid-1920s, but rose before the end of the Depression. Duration remained high in the mid-1920s, instead of declining. Time series analyses of strikes and durations have confirmed this picture. For Canada, Vanderkamp (1970) found no relation between the business cycle and strike dimensions; similarly, for the United States, Skeels (1982; see also Kaufman 1982) reported that, although economic variables are highly significant determinants of strike activity in the first half of the 20th century, for the subperiod 1921–1929 noneconomic factors played a role as well.

in 1926 and 1927, reached its peak in the first quarter of 1929. Industrial production began to fall in the second half of 1929; the bottom was in early 1933. There was a rapid recovery in 1935 and 1936 (Safarian, p. 145) that peaked in 1937; 1938 and 1939 saw modest advances.

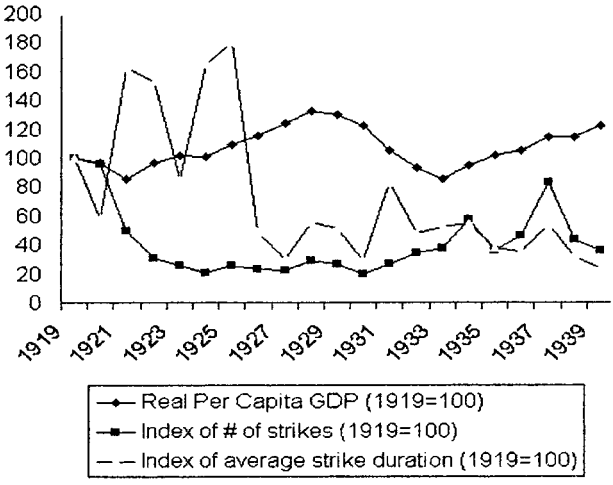

FIG. 1. Strike dimensions and GDP, Canada 1919–1939. Sources: Real per capita GDP—Urquhart (1998); number of strikes and strike durations—Urquhart and Buckley (1983).

Kennan (1986) has criticized the econometrics of these studies, pointing out the inherent problems of multicollinearity and of small sample sizes.[8] He recommends the traditional Burns–Mitchell method of analyzing strike frequency and the business cycle. Jurkat and Jurkat (1949) exploited this approach for the United States and their results are reproduced in the top panel of Table 2; we have used the same method for Canadian data in the bottom panel. The first three columns gives the business cycle reference dates in the two countries. The Canadian and U.S. business cycles moved together, except that the trough of the Depression in Canada was in 1933. The entries in columns 4 to 6 are index numbers. In the terminal trough of the first Canadian cycle (1921) there were 168 disputes; the average number of strikes over the first cycle was 275. The index entry is 168/275 or 61%. If strikes were procyclical then the index numbers should be higher in phase II (peak) than in phases I and III (troughs). For both countries, strike incidence in the 1920s is irregular, except for the cycle that begins in Canada in 1924.[9] There are differences in the last two cycles. For the

[8] "... [A] negative regression coefficient associated with the unemployment rate does not necessarily mean that strike numbers are procyclical, if the regression also includes variables such as prices, wages and profits which may vary systematically with the cycle (Kennan, 1986, pp. 1120–1121)." These problems are compounded in historical studies like that for Canada because macroeconomic data before and after 1914 are not always comparable. There is also confusion over what is the correct dependent variable. Some studies use the absolute number of strikes; others the ratio of strikes to the labor force. Finally, Kennan comments that, since the underlying theory seeks to explain why strikes occur, the appropriate source to handle this type of question is contract data and not time series.

[9] Note that using monthly data for the United States, Jurkat and Jurkat (1949) found that the cycle beginning in 1924 and lasting until 1927 conformed to the business cycle as in Canada.

TABLE 2
Reference Cycles and Strikes in Canada and the United States, 1919–1938

Dates of reference cycles			Reference cycle relatives at stage			Average number of strikes during cycle
Trough	Peak	Trough	Initial trough	Peak	Terminal trough	
			United States			
1919	1920	1921	113	106	74	3209
1921	1923	1924	160	104	84	1494
1924	1926	1927	113	94	64	1105
1927	1929	1932	94	123	112	749
1932	1937	1938	35	169	116	2381
Average			103	119	89	
			Canada			
1919	1920	1921	122	117	61	275
1921	1923	1924	157	80	65	107
1924	1926	1927	90	100	96	77
1927	1929	1933	79	96	133	94
1933	1937	1938	72	172	91	161
Average			104	113	89	

Note. United States—Jurkat and Jurkat (1949). Because of smoothing, Jurkat and Jurkat's figures of annual strikes differ slightly from those found in Table 1. Canada—Reference dates are from Rosenbluth (1957). Strikes numbers are from Table 1.

United States, beginning in 1927, strike patterns do conform to the cycle; this is true for the last Canadian cycle. But the cycle that covers the Depression in Canada breaks with this pattern and in a large way. The index actually peaks in the trough of 1933.[10] The last line in the top and bottom panels gives the averages of the strike indices. Commenting on these figures for the for the United States, Kennan (p. 1119) wrote: "the pattern of strike activity fits the business cycle perfectly." In Canada, the absolute differences between the average index values of the three phases are smaller. Taking into account the exceptional pattern of Canadian strikes in the Depression, it appears that Canadian disputes were less sensitive to the business cycle than those in the United States.

Labor History and the Interwar Years

Canadian labor historians (Heron, 1998; Jamieson, 1968; Logan, 1948; Morton, 1995; Palmer, 1992) have focused on trends in resource mobilization to explain why strike activity did not always conform to the business cycle.[11]

[10] The results do not differ much if we use 1932 as the trough in Canada.

[11] On the relation between strikes and unionization, see Friedman (1999). The relationship between strike activity and unionization is not necessarily reciprocal. As Cronin (1989, p. 98) observed for Great Britain before 1914: "Strike movements built unions, but unions did not overall do a great deal

Studying individual disputes and strike waves, they have identified three subperiods in the history of the union movement: the 1920s, the Depression years, and the mid- to late 1930s.

The 1920s have been referred to as the as the union movement's Armageddon (McKay and Morton, 1998, pp. 63–76). A fragmented movement and renewed employer resistance put a check on strike activity. National unions (organizations based in Canada) led by the Canadian Brotherhood of Railway Employees formed the All-Canadian Congress of Labour in 1926 as an alternative to the Trades and Labour Congress, an association dominated by the more conservative international unions. Quebec was the *chasse gardée* of the Catholic church, which organized confessional unions to isolate workers from the influence of internationals and their militants. Communists founded their own group, the Workers' Unity League, in 1927. Finally, ethnic and gender divisions compounded regional and ideological segmentation.

In the wake of the Winnipeg General Strike, employers formulated new policies to undermine unionization and confront worker militancy. As in the United States (Doughty, 1932; Jacoby, 1997), firms created and expanded human resource departments that, ostensibly put in place to reduce turnover, were responsible as well for devising initiatives, such as rudimentary health and unemployment insurance schemes, to moderate worker demands for unionization (McCallum, 1990). The sponsorship of company unions was a complementary strategy. There is some evidence to suggest that the drive to oust unions was more intense in Canada. Grant (1998) observed that, owing to the "predominance in manufacturing industries of American corporations," company unions and welfare schemes were in fact more prevalent in Canada than in the United States. Firms also sought out strikebreakers in order to break unions and contain militancy.[12] The use of replacements was a tried-and-true method of suppressing unions and it appears to have been as common before the war as after. Often strikebreakers were poor replacements because of the inferior skills. However, firms in the 1920s appear to have corrected for this. The recruitment of strikebreakers had become part of a comprehensive strategy of human resource departments to manage and train labor.[13] Employers' strategy seems to have paid

to increase strike propensity." Note as well that Swidinsky (1974) found no correspondence between the business cycle and union growth in Canada.

[12] Rosenbloom (1998) evaluated the use of strikebreakers in the United States for the period before WWI.

[13] Hiring strikebreakers was not restricted by law. In fact, the legal environment of the period was in a state of transition. The federal government had withdrawn from policy making in industrial relations after a legal decision in 1926 gave the provinces constitutional jurisdiction over labor issues. Ottawa retained control over countrywide activities, such as transportation. The provinces initiated their own policies but their effectiveness varied considerably (Jamieson, 1986). In the period before the war, industrial relations in key sectors such as transport were governed by the Industrial Disputes Investigation Act. The Act provided for a period of arbitration before a strike was called. But in 1925 a British Privy council decision found the Act *ultra vires.*

off. In the first half of the 1920s, the use of strike breakers led to long and bitter disputes, and because workers tended to lose lengthy disputes union membership declined, falling by a third from 1920 to 1926 (see Table 1).

In most surveys, the Depression years are treated separately. The rise in unemployment was an effective stick to suppress strike activity and it made the task of finding replacements all the easier. For the United States, Jacoby (1985) reported that as the Depression persisted firms cut back on their human resource departments as there was simply less for them to do. Derby (1957) believed that the Depression had seriously moderated the moral authority of the U.S. business class who were less inclined to confront militancy in the 1930s. All said, these changes may have spilled over to Canada, where workers were able to maintain a degree of strike activity, some of which occurred among unemployed workers, mainly single and male, who had been directed to isolated work camps.

U.S. labor historians (Taft, 1964; Goldfield, 1989) have attributed the revival of the union movement and strike activity to the enactment of the National Industrial Relations and Wagner Acts and the leadership provided by John L. Lewis in forming the CIO. These events coincided with the business-cycle upswing after 1934. There were no comparable legal changes in the Canada, but the "old" labor history does ascribe a key role to the arrival of the CIO in Canada in 1937, a year that saw a peak in strike activity (Table 1). As was the case in the United States, the new organization provided workers with much needed resources to go on strike. The spark plug was the General Motors strike in Oshawa, Ontario. Before 1937 there existed at the auto plant only a "clandestine committee" of workers that according to the historian of the dispute, Irving Abella (1975, pp. 95–96), achieved nothing.[14] In early 1937, the company announced a speed-up of the assembly line. The workers responded. "One of the workers in the plant phoned the UAW office in Detroit for help." Abella continues:

> The UAW organizer sent from Detroit . . . outlined to the men the success of the UAW below the border, and the necessity of organizing in order to improve their situation. His speech must have been effective. All the men in the room voted to join the UAW . . . . Within three days the union had enrolled 650 workers. Within a week, over a thousand had joined and after a month it had four thousand, making it the largest local in Canada.[15]

The "new" Canadian labor history has challenged the view that strike activity was dependent on the arrival of the CIO. As the rise in strike numbers in the early to mid-1930s makes clear (Table 1), workers had various options to mobilize scarce resources. Rouillard (1979) observed that in Quebec local Catholic unions

[14] A similar account is Crawley's (1997) study of the coming of the CIO in the Nova Scotian steel industry.

[15] Resistance to the CIO came as much from the government of Ontario as from the company. Most observers concluded that workers obtained many of their demands.

and internationals joined forces in strike activity.[16] Across the country, many disputes occurred in strike waves (Cruikshank and Kealey, 1987). Bandwagon or contagion effects gave workers, especially those who at the margin were uncertain whether to go out, added bargaining power. Moreover, strike waves provided individual bargaining units with information about firms' delay costs in their sector or region of activity. Sometimes workers would hijack employer-sponsored associations, remaking them into aggressive unions. Political affiliation was another source of material support in the early 1930s. Recent scholarship has made much of the role of communist organizers in many of the periods' successful strikes.[17] Communists had their setbacks, as in their failed attempt to organize the auto industry before the arrival of the CIO (Manley, 1986), but on the shop floor, ideology was not the sole motivating issue. In a detailed study of the Workers' Unity League between 1929 and 1935, Manley (1994, p. 167) observed that local organizers tended to operate as " 'good trade unionists' rather than 'good bolsheviks,' " paying close attention to the wage and working-condition demands of their membership. Exploiting these and related tactics, Alberta miners, Ontario lumber workers, and textile workers in Montreal, Toronto, and Winnipeg, among others, participated in key confrontations in the Depression years and later. Strike successes in this period, Manley (1986) concluded, laid the groundwork for future organizing drives by the CIO.

Where all else failed, and seemingly against all hope, workers resorted to violent tactics. Violence was not new to Canadian industrial relations, but Palmer (1992, p. 253) observed that the number of violent episodes increased in the early to mid-1930s compared to levels found in the 1920s. "As women workers faced scabs, hostile foremen, police and hired thugs," he (Palmer, p. 238) wrote, "they were not reluctant to use physical force." Many violent episodes occurred in strikes where the survival of the bargaining unit was at issue or where deeply frustrated workers had accumulated grievances. In cases where the state had intervened on employers' behalf, violence erupted because workers felt they had no other defense. In isolated communities in the West and in Nova Scotia, violence was a recurrent feature. Elsewhere, violence was unleashed by a single act, as in 1937 when Quebec workers kidnapped an American silk-mill manager who was playing golf and drove him across the U.S. border, telling him to stay in his own country (Jamieson, 1968, p. 261). Violent episodes most often led to long and bitter and costly disputes—but there was another side to violence. In situations of mutual distrust it often served to enhance workers' bargaining position. The use of violence in a current strike had the potential benefit of empowering unions in later conflicts because it made the threat of violence credible (Fishback, 1995).

[16] Dansereau (2000) made the same point in his study of Montreal unions in the 1920s. He observed a convergence in union tactics among Catholic, international, and national unions in the textile and machine sectors.

[17] At its peak in 1933, communists had organized about 10–15% of union members (Taylor and Dow, 1988, p. 4).

In sum, labor historians have suggested several reasons why Canadian strike activity did not conform to the business cycle. Although they have not ignored economic factors, relying on event analysis they do not provide a comprehensive account of trends in strike activity and duration over the entire period. In the 1920s, the union movement, divided along industrial, regional, ideological, and gendered lines, came under attack from employers' initiatives to use replacement workers. The Depression, which defined the second period, pushed workers harder against the wall. The period after 1934 saw renewed strike activity. Even in the absence of leadership comparable to F.D.R. and John Lewis (Freeman, 1998, p. 279), the Canadian union movement succeeded in turning things around. Workers managed their scarce resources and used a variety of tactics to improve their bargaining position. In the remainder of this article, we situate the insights of labor historians in a war-of-attrition context to provide a general portrait of strike activity in the interwar years.

WAR OF ATTRITION: MODEL AND COMPARATIVE STATICS

Labor historians have drawn attention to the fact that that the survival of the bargaining unit was at stake in many of the period's disputes. A war-of-attrition model (Card and Olson, 1995; Maynard Smith, 1974) best captures the nature of conflict in the period. The screening model is limited to situations where unions have been accepted as the voice of the bargaining unit and where wage settlements can be negotiated owing to a divisible surplus. In the interwar years these conditions did not always hold. As in the war of attrition, outcomes were of the winner-take-all sort. If a strike succeeded, workers could be assured of a sizeable wage gain or a significant improvement in working conditions; if they lost, they would receive nothing and their union would be in jeopardy.[18]

The basic attrition model assumes that there is some surplus, owing perhaps to market power or firm-specific skills, that generates a quasi-rent per worker that is at the source of the dispute.[19] If a strike fails, workers get paid the market wage; if they win they get a share of the profits, where the rent splitting parameter is fixed. Strikes impose costs on the parties, but information about each party's delay costs is not known to the other side. The decision or stopping rules of the two sides depend on the value of the prize relative to their delay costs. One party can always decide to settle before a strike is launched. Once a strike is called, each party continues in a dispute as long as its privately known cost of continuation is less than the expected gain. A firm with a higher expected gain will hold out longer than its workers, and vice versa. An increase in rents, the prize, would lead to longer delay times or an increase in capitulation times of both parties.[20]

[18] We give further support for the attrition model in the next section.

[19] Card and Olson (1995) present a full version of the formal model used here. A summary is found in Huberman and Young (1999).

[20] This result holds in situations where the distribution functions of the value of the prize relative to the delay costs are identical for workers and firms.

As the dispute continues, each party's assessment that the other will capitulate declines; eventually one of them acquiesces to stop the rising costs of delay. This class of models thus predicts that the probability of settlement declines as the duration of the dispute increases. The probability of a successful strike (from workers' perspective) is just the probability that workers' capitulation time exceeds that of the firm's; a failed strike implies that workers' capitulation time is less than that of the firm. In other words, duration and outcome are determined simultaneously.

To derive comparative statics, assume that for both parties the position of their distributions of expected gains relative to delay costs are contingent upon a shift parameter. For workers, an increase in this parameter corresponds to a rightward shift in the distribution of their delay costs (and hence a leftward shift in their delay times) and conversely for firms. A small change in costs could alter the balance between holding on and winning or capitulating and losing a dispute. The response of workers and firms to shocks is therefore an empirical issue. Moreover, because strike activity in the war-of-attrition depends on the extent of uncertainties about delay costs, this class of models, unlike the screening approach, predicts no particular relation between strikes and the business cycle.

Consider now the comparative statics of changes in factors isolated by labor historians on durations and outcomes. A disintegrated union movement in the 1920s would have reduced the delay times of workers, leading to more firm victories and shorter durations. As the Depression hit, the size of the prize diminished and this would have reduced expected gains and delay times for both parties, but workers would have capitulated first because of the weakness of the union movement. As workers reorganized themselves and mobilized resources in the 1930s, they may have been able to extend their capitulation times. In these years, firms' delay times fell because, as we have previously remarked, they cut back on their investments in human resources departments. A small change in relative delay costs could have tilted the balance in favor of workers. Thus durations would have fallen and worker wins would have increased in the 1930s.

The comparative statics of the use of strikebreakers in the 1920s and the rise of violence in the 1930s are more difficult to identify. We need to distinguish the effects of replacements and violence in the subset of strikes where they actually occurred, as opposed to their effects on all strikes in the period. For all disputes, Kennan and Wilson (1989) argue that, in the absence of a "no-scab" law, the size of the pie available to workers would have shrunk.[21] Wage settlements would have been smaller and strikes would have ended more quickly—and generally against workers. But studies (Singh and Jain, 2001) of strikes in which replacements were actually used have found longer than average strike durations. This

[21] Assume that when a firm is prohibited from hiring replacements its valuation is v. The availability of replacement workers at a wage, w, puts an upper bound on the firm's valuation of union labor. With replacements, the firm's valuation is $\min[w, v]$, since w is an opportunity wage that can be no less than the firm's reservation wage. It follows that in the presence of strikebreakers the distribution of the firm's valuation is truncated as compared to the distribution with a "no-scab" law.

may arise because in the presence of strikebreakers the parties in the war of attrition have difficulty in ascertaining each other's stopping times. Firms may decide to use strikebreakers as the dispute lengthens. Workers may or may not dig in a last ditch effort and the probability that they would resort to violence would force firms to extend their capitulation times. Cramton, Gunderson, and Tracy (1999; see also Cramton and Tracy, 1995) found that strike violence in Canada after 1945 tended to escalate when replacement workers were used. Whether in the presence of replacements or not, the use of violence would only increase uncertainty and lower settlement probabilities. But there is also the possibility, as we have noted, that the use of violence will improve workers' bargaining power in future disputes, thereby bringing down employers' capitulation times.

In the next section, we provide evidence that strike activity in the interwar years is consistent with the attrition model.

THE STRIKES AND LOCKOUTS FILE: A PRELIMINARY ANALYSIS

Our analysis of strike activity is based on samples of disputes from the Strikes and Lockouts File of the Canadian Department of Labour.[22] Drawing on reports by its representatives in the field, the file contains detailed information on individual disputes: duration, number of workers involved, cause and outcome, whether an international or national union led the strike, whether the dispute was violent and if replacement workers were used. Huberman and Young analyzed a data set from the same source for the period before 1914, but in contrast to the earlier period the file after 1920 sometimes contains information on wage gains and losses at the end of the dispute. The reporters also coded strike outcomes: success (for workers), compromise, and failure. Our evaluation of the correspondence between strike decisions, wage gains, and other results suggests that the reporters, in conjunction with the Department of Labour, used a scale to rank outcomes. This scaling has implications for the method of estimation we have selected in the next section.

We collected evidence on 3225 disputes for the period 1920–1939. Strike results were not recorded for 543 of these disputes or 17% of our initial sample. There were an additional 375 disputes (11.6%), which we omitted owing to missing information about key elements of the dispute, such as length. Thus, for purposes of estimation we had 2307 strikes that give detail on both duration and outcome. However, since information on unionization was not available for all of

[22] Strikes and Lockouts File, RG27. The file includes disputes of less than 1 day and with small numbers of strikers. A full description of the file is found in Cruikshank and Kealey (1987). The file is by no means complete and Cruikshank and Kealey have added to it. That said, the correlation between the annual number of disputes they report and that from the sample used in this article is 0.89. Note as well that the correlation coefficient between the number of strikes in Table 1 and the corresponding series from our data set is 0.93 ($p = 0.001$); the correlation between strike duration in Table 1 and that from our data set is 0.57 ($p = 0.008$).

the observations in the sample, two other subsamples were considered: a medium-sized sample ($N = 2104$), which indicated whether a union was involved, and a smaller sample ($N = 1755$), which contained detail on whether an international union was implicated in the dispute.[23] To simplify presentation, we give the descriptive statistics of the small sample only in Table 3, which breaks down the interwar years into three subperiods: 1920–1929, 1930–1934, and 1935–1939. This breakdown corresponds to the division found in the labor history literature discussed in the previous section.[24] We have also provided a comparison with Huberman and Young's sample for the period before 1914. Appendix 1 gives further definitions of variables and information on industries involved.

Table 3 provides evidence of the distinct nature of strike activity in the interwar years and confirms the differences among the three subperiods. The average size of disputes was, with the exception of 1920–1929, slightly smaller in the interwar years. All subperiods saw a higher proportion of strikes involving women than before the war, and the percentage of these disputes increased over the interwar years. There were more disputes after 1914 in the Maritimes and in the metal, mining, wood, and manufacturing industries and among skilled workers.[25] With regard to strike issue, there were fewer strikes about miscellaneous issues after the war, perhaps a result of more accurate reporting. Over the interwar period there was a decline in strikes exclusively about wages and a rise in strikes about multiple issues. Multiple-issue strikes were disputes about the use of replacement workers, union issues, and the rest, and the rise in their number indicates the volume of accumulated grievances workers had built up over the years.[26] National unions, at first weakened by the internal divisions we have noted, become more militant over the years, achieving levels of strike activity in 1935–1939 found in the years prior to 1914. As for outcomes, there are differences across periods and between subperiods. The percentage of compromise outcomes was down after the war, illustrating the winner-take-all nature of disputes in the period, while the number of successful outcomes rose and that of

[23] There were only minor differences between the samples. At the 10% level of significance, tests indicate that western strikes and disputes in the building trades were underrepresented in the small compared to the large sample; mining strikes are overrepresented in the small sample at the 5% level. Union presence (no affiliation) is underrepresented in the small sample, at the 1% level, which is to be expected since a subset of the strikes with union presence is discarded when going from the medium to small sample. Table and analysis available from the authors.

[24] The choice of the end year of the depression is somewhat arbitrary. Unemployment from 1933 to 1935 was 20.6, 19.1, and 16.1%. At best, it can be said that unemployment in 1935 was declining; unemployment in 1937, 12.5%, was still higher than in any year in the 1920s (Struthers, 1983, p. 215). We thank Mary MacKinnon for discussions on this issue.

[25] Palmer (1992, p. 222) reported that 17% of strikes in the 1920s were in mining; our figure from Table 3 is 21%.

[26] Union issues, such as the survival of the union as a bargaining unit, were at stake in about 17% of single and multiple-issue disputes for the period 1920–1939.

TABLE 3
Means of Key Variables

Variable	1920–1939 (N = 1755)	1920–1929 (N = 623)	1930–1934 (N = 461)	1935–1939 (N = 671)	1901–1914 (N = 532)
Strikers	233.20	262.79	212.46	219.97	215.99
Female striker	0.2598	0.2071	0.3232[a]	0.2653[a,b]	0.0959[a,b,c]
Firms	4.44	5.22	5.15	3.22[a,b]	n.a.[(1)]
Strike issues					
Multiple	0.2501	0.1782	0.2712[a]	0.3025[a]	0.3327[a,b]
Wage	0.4296	0.4767	0.4382	0.3800[a]	0.4361[c]
Union	0.0512	0.0514	0.0477	0.0537	0.0789[b]
Work conditions	0.0495	0.0642	0.0477	0.0373[a]	0.0526
Miscellaneous	0.2193	0.2295	0.1952	0.2265	0.0997[a,b,c]
Result					
Win	0.3356	0.3002	0.3254	0.3356[a]	0.2425[a,b,c]
Compromise	0.2701	0.2311	0.2321	0.2701[a,b]	0.4192[a,b,c]
Lose	0.3943	0.4687	0.4425	0.3943[a,b]	0.3384[a,b,c]
Region					
West	0.2598	0.3098	0.2777	0.2012[a,b]	0.2406[a]
Ontario	0.3972	0.3371	0.3644	0.4754[a,b]	n.a.[(2)]
Quebec	0.1863	0.2183	0.2061	0.1431[a,b]	n.a.[(2)]
East	0.1618	0.1429	0.1532	0.1833[a]	0.0902[a,b,c]
Union involvement	0.7453	0.8523	0.6377[a]	0.7198[a,b]	0.7387[a,b]
Union type					
International	0.5926	0.7480	0.4208[a]	0.5663[a,b]	0.6109[a,b]
Canadian	0.4074	0.2520	0.5792[a]	0.4337[a,b]	0.3891[a,b]
Violence	0.0348	0.0144	0.0282	0.0581[a,b]	0.0508[a]
Lockout	0.0251	0.0273	0.0325	0.0179	n.a.
Replacements	0.1231	0.1284	0.1215	0.1192	n.a.
Industry					
Apparel	0.1926	0.1396	0.2798[a]	0.1818[a,b]	0.1053[b,c]
Building	0.0929	0.1605	0.0803[a]	0.0387[a,b]	0.0827[a,c]
Unskilled	0.0387	0.0465	0.0347	0.0343	0.3045[a,b,c]
Food & tobacco	0.0382	0.0385	0.0152[a]	0.0537[b]	0.0357[b]
Machine	0.0085	0.0193	0.0000[a]	0.0045[a]	0.0169[b,c]
Metals	0.0353	0.0498	0.0152[a]	0.0358[b]	0.0959[a,b,c]
Mining	0.1983	0.2119	0.1996	0.1848	0.0827[a,b,c]
Shoes	0.0399	0.0433	0.0325	0.0417	0.0338
Transport	0.0792	0.0722	0.0456	0.1088[b]	0.1184[a,b]
Wood	0.0729	0.0722	0.0998	0.0551[b]	0.0263[a,b,c]
Service	0.0672	0.0498	0.0542	0.0924[a,b]	0.0357[c]
Manufacturing	0.0929	0.0851	0.0781	0.1103	0.0376[a,b,c]
Unemp relief	0.0154	0.0000	0.0412[a]	0.0119[a,b]	n.a.

Note. Strikes and Lockouts File RG27, Department of Labour, Canada, 1901–1914, 1920–1939. Win (loss) indicates success (failure) for workers. n.a. indicates that comparable information is not available for the 1901–1914 data set.

(1) Indicates 42.29% of strikes involved two or more firms.

(2) Indicates 67.29% of strikes were in Ontario or Quebec.

[a] A significant difference of the mean, at a 5% level, from the 1920–1929 mean.

[b] A significant difference of the mean, at a 5% level, from the 1930–1934 mean.

[c] A significant difference of the mean, at a 5% level, from the 1935–1939 mean.

failures fell over the three subperiods.[27] In the Depression years, Canadian workers won more strikes than their U.S. counterparts. Taken all together, strike activity was different before and after the war, and 1935–1939 was different than the two other subperiods.

Our review of the labor history of the period gave attention to strikes with replacement workers and those with violent episodes. The data we have collected shed some light on these types of strikes and the relation between them. The use of replacement workers was more widespread in the West, Ontario, and Quebec, than in the Maritimes.[28] Net immigration, a time-honored source of replacement workers, was smaller in the Maritimes than elsewhere. The fewer number of disputes with strikebreakers in the East is also consistent with Grant's assertion that there was a correlation between U.S. branch plants and the presence of company unions. These branch plants were more often found in the manufacturing sector, which was concentrated in central Canada (Easterbrook and Aitken, 1956). The sectoral breakdown of the use of replacement follows the regional trend as well. Mining had the fewest number of disputes using strikebreakers, which may have to do with the isolated nature of the industry.[29] As reported in Table 3, the proportion of strikes involving replacement workers, about 12%, did not vary over the period, but the use of violence increased over the interwar years, reaching a level in the last subperiod comparable to that found before 1914.[30] Violent strikes followed a similar pattern to strikes with replacements, less common in the Maritimes, as well as across sectors.[31] Violence in mining, however, seems to have been as prevalent as elsewhere. We have also calculated the probability estimates of violence in strikes with and without replacement workers. For the entire period, the probability of violence in strikes with replacement workers was 8.4%; the probability of violence without replacements was 5.4%.[32] However, within subperiods, only in 1920–1929 was there a significant difference between the probability of violence in replacement and

[27] For the entire period, the breakdown of outcomes for U.S. strikes was similar (in percentages): success = 34.7; compromise = 27.9; failure = 37.3 The U.S. figures for the Depression years were (in percentages): success = 29.9; compromise = 29.5; failure = 40.6 (Peterson, 1937, p. 71).

[28] The proportion of strikes in each region with replacements was (in percentages): East, 5; Quebec, 16; Ontario, 14; and West, 12. The proportion of strikes in each industry with replacements was (in percentages): textile, 12; building, 8; machine, 9; metals, 14; mining, 5; transportation, 17; shoes, 16; wood, 14; and other, 12. Note: we analyze the determinants of strikes with replacements and violence in a separate article.

[29] Because there were fewer replacements in the East, strikes were on average shorter there but this did not translate into more worker wins. In the Maritimes, 46% of strikes ended in worker defeat; the (unweighted) average in other regions was 39%.

[30] There is no comparable figure regarding replacement workers for the period before 1914.

[31] The proportion of strikes in each region with violent episodes was (in percentages): East, 3.7; Quebec, 7.5; Ontario, 5.1; and West, 6.1. The proportion of violent strikes in each industry was (in percentages): textile, 6.4; building, 2.1; machine, 0; metals, 1.9; mining, 3.0; transportation, 4.4; shoes 3.6; wood, 6.5; and other, 9.8.

[32] This difference is significant at the 10% level.

nonreplacement strikes. Consistent with Palmer's observations, violence was becoming more common in all types of disputes over the period.

For the large sample ($N = 2307$), Table 4 reports the duration of disputes by issue, industry, region, strike characteristic (the presence of violence and replacements), and outcome. Again, there were significant differences between the pre- and postwar years as well as between subperiods. Strike durations declined over the interwar years and by 1935–1939 average duration was about half the length of disputes before 1914. Consistent with Kennan and Wilson's model of strikes in the absence of "no-scab" legislation, the length of most categories of strikes by issue, industry, region, union type, and outcome declined as well, including those with replacements. There are some exceptions. Union-issue, nonwage, and miscellaneous strikes lasted about as long as those did before 1914. Another outlier is violent disputes after 1935; still they are about half as long as those found in 1901–1914. Within subperiods, replacement and violent strikes were very long—about twice or more the average—suggesting that these types of strikes had a grater degree of uncertainty. Union-issue strikes were both longer than wage disputes and the average. The opposite held in the period before 1914. After 1914, it appears that when the survival of the bargaining unit was at issue firms and/or workers would extend their capitulation times.

In a previous section, we gave evidence from the *Historical Statistics of Canada* that strike dimensions did not conform to the business cycle. Figures 2 and 3, which present visual representations of the trends in durations and outcome from our sample of strikes, are consistent with this line of argument. The underlying numbers in these figures are reported in Table 5 ($N = 2307$). Figure 2 traces the downward trend of strike durations with the exception of violent disputes. The relation between strike outcomes and duration is traced in Figure 3.[33] The standard view of strikes is that strike durations are countercyclical. The interwar years were different. There was a sharp recession in 1920–1921 and smaller downturns in 1923 and 1924, but the duration of disputes declined steadily. Worker wins did not move with the cycle either. In the 10 years after Winnipeg, the proportion of losses tended to exceed that of wins, except for 1925, and for 1928 and 1929 when they were about equal. In the 1930s the pattern was different and herein lies the central paradox of this article. The proportion of successful strikes increased even as durations declined further. The number of wins by international unions (second to last column in Table 5) actually peaked in 1936, 1 year before the coming of the CIO.

The trend in average wage gains (last column in Table 5)—this figure is the average of gains and losses in each year—meshes with this picture. In the attrition model, the parties will hold out longer when the prize or surplus is larger.

[33] We have prepared figures for various strike categories. Most categories reveal the same pattern as in Fig. 3. Strikes with replacements were different: Workers were bound to lose these in all periods. In most years, failure rates were over 90%, although 1936 breaks this trend. These figures are available from the authors.

TABLE 4
Number of Strikes, Mean, and Median Duration by Category

	1920–1939			1920–1929			1930–1934			1935–1939			1901–1914		
	No.	Mean	Median	No.	Mean	Median	No.	Mean	Median	No.	Mean	Median	No.	Mean	Median
All	2307	20.76	6	907	33.52	10	608	14.39[a]	6	792	11.05[a,b]	4	1101	22.79[a,b,c]	8
Issue															
Single issue	1727	17.04	5	745	25.16	9	431	12.79[a]	5	551	9.39[a,b]	2.5	809	20.11[b,c]	7
Multiple issue	580	31.84	9	162	71.94	14.5	177	18.30[a]	9	241	14.82[a]	6.5	292	30.20[a,b,c]	12
Wage (single issue)	1019	14.94	6	450	22.10	10	264	12.95[a]	5	305	6.10[a,b]	2	500	22.19[c]	7
Wage (mult issue)	524	31.62	9	143	75.96	13	164	17.31[a]	9	217	13.22[a]	6	258	28.04[a,b,c]	11
Wage (all)	1543	20.61	6.5	593	35.09	10.5	428	14.62[a]	6	522	9.06[a,b]	4	758	24.18[a,b,c]	8
Nonwage	764	21.08	5	314	30.54	7	180	13.86[a]	5	270	14.89[a]	3.75	343	19.71	7
Union (single issue)	109	27.15	9	45	37.28	17	22	22.20	6	42	18.88[a]	5.5	105	19.08[a]	9
Union (mult issue)	276	23.63	10	51	51.09	21	85	18.69[a]	10	140	16.63[a]	8	112	43.92[b,c]	16
Union (all)	385	24.63	9.5	96	44.62	17	107	19.41[a]	8.5	182	17.15[a]	7.25	217	31.90[b,c]	12
Nonunion	1922	19.99	5.5	811	32.20	9	501	13.32[a]	5.5	610	9.23[a,b]	3	884	20.55[a,b,c]	7
Work (single issue)	106	36.75	4.75	49	66.87	9	27	7.06[a]	3	30	14.29	2.75	59	25.00[b]	10
Misc. (single issue)	493	14.92	4	201	19.12	4	118	11.99	4	174	12.04	3	145	11.72	5
Industry															
Apparel & textile	398	23.97	7	107	44.78	12	156	15.06[a]	7	135	17.79[a]	6	121	21.40[a]	9
Building trades	251	18.26	9	169	22.55	11	51	13.09[a]	8	31	3.41[a,b]	2	71	26.61[b,c]	11
Unskilled	90	4.62	2	42	7.36	4	17	1.91[a]	1	31	2.39[a]	1	300	14.85[a,b,c]	7
Food & tobacco	103	13.15	4.5	37	19.57	9	19	7.07[a]	5	47	10.55	2	46	37.04[b,c]	12
Machine	22	56.78	13.5	19	65.00	35	0	—	—	3	4.75	5	23	58.43[c]	9
Metals	85	28.43	9	44	46.08	16.5	10	13.20[a]	12	31	8.30[a]	5	102	24.61[b,c]	9.5
Mining	391	12.11	4	161	13.16	5	98	16.51	5	132	7.56[a,b]	3.25	92	26.16[a,c]	9

Shoe & other skilled	90	20.44	9.5	33	34.70	13	27	13.10[a]	8	30	11.37[a]	7.5	42	20.29	8.5
Transport & utilities	198	10.19	3	76	12.39	5.75	33	6.84	1	89	9.54	2	146	10.35	4
Wood products	200	16.46	8.25	75	25.23	14	70	13.88[a]	7	55	7.79[a,b]	4	48	18.69[c]	7
Services/public sector	162	18.27	6	49	23.76	9	34	17.05	6.5	79	15.39	4	36	11.44	5
Manufacturing (misc.)	218	58.03	7.25	82	124.08	14	53	25.01[a]	6	83	13.85[a]	4.5	51	70.73	7
Other	69	9.22	4	13	4.96	3.5	19	13.48	6	37	8.53	3	22	37.41[a,c]	12.5
Unemployment relief	30	6.97	3	0	—	—	21	5.07	3	9	11.40	9	n.a.	n.a.	n.a.
Region															
West	660	19.04	8	300	21.52	10	191	17.61	6	169	16.26	5	232	21.64	10
Ontario	932	22.32	6	324	39.10	10.5	226	16.45[a]	6.5	382	11.55[a,b]	4	n.a.[(1)]	n.a.	n.a.
Quebec	389	27.53	7	172	48.41	10.5	112	12.24[a]	6	105	9.62[a]	4	n.a.[(1)]	n.a.	n.a.
East	339	13.02	3	120	25.97	4	81	8.77	4	138	4.24[a,b]	2	117	20.46[b,c]	7
Union type															
International	1040	24.93	8	466	37.59	12	194	17.07[a]	6	380	13.43[a]	4.25	325	33.56[b,c]	12
Canadian	268	21.32	8	65	30.27	8	100	22.28	11.5	103	14.74	6	68	60.12	9
Other factors															
Violence	81	30.99	12	14	51.39	26.5	21	15.57[a]	12	46	31.82[b]	10.75	30	77.90[b,c]	29.5
Replacement workers	289	41.69	13	119	62.77	20	73	28.67[a]	12	97	25.62[a]	5	n.a.	n.a.	n.a.
Result															
Win	803	13.68	4	279	27.65	6	221	7.41[a]	4	303	5.40[a,b]	2	316	11.92[a,b,c]	5
Compromise	595	20.54	8	192	35.83	11	142	16.79[a]	8	261	11.32[a,b]	6	441	20.93[c]	9
Lose	909	27.16	9	436	36.25	12	245	19.31[a]	7	228	18.24[a]	4	344	35.16[c]	9

Note. n.a. indicates that comparable information is not available for the 1901–1914 data set.

[(1)] The mean (median) duration for the 756 strikes in central Canada was 23.75 (7).

[a] A significant difference of the mean, at a 5% level, from the 1920–1929 mean.

[b] A significant difference of the mean, at a 5% level, from the 1930–1934 mean.

[c] A significant difference of the mean, at a 5% level, from the 1935–1939 mean.

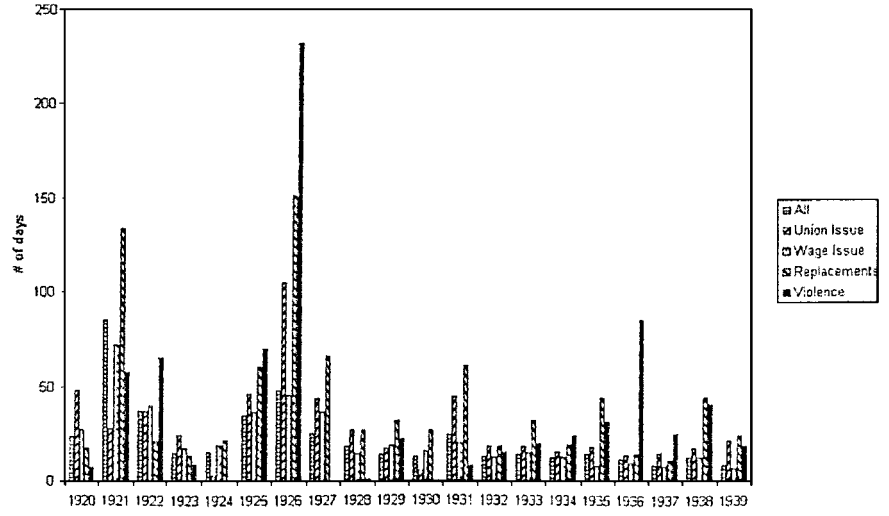

FIG. 2. Strike duration by category. Source: For Figs. 2 to 4—Strikes and Lockouts File RG27, Department of Labour, Canada, 1920–1939.

However, we are limited to evidence on observed gains that may tell us little about the potential surplus available. Our assumption is that the actual prize was correlated with the surplus. For the three subperiods, wage gains were (in percentages) as follows: 1920–1929, 2.0; 1930–1934, 6.9; and 1935–1939,

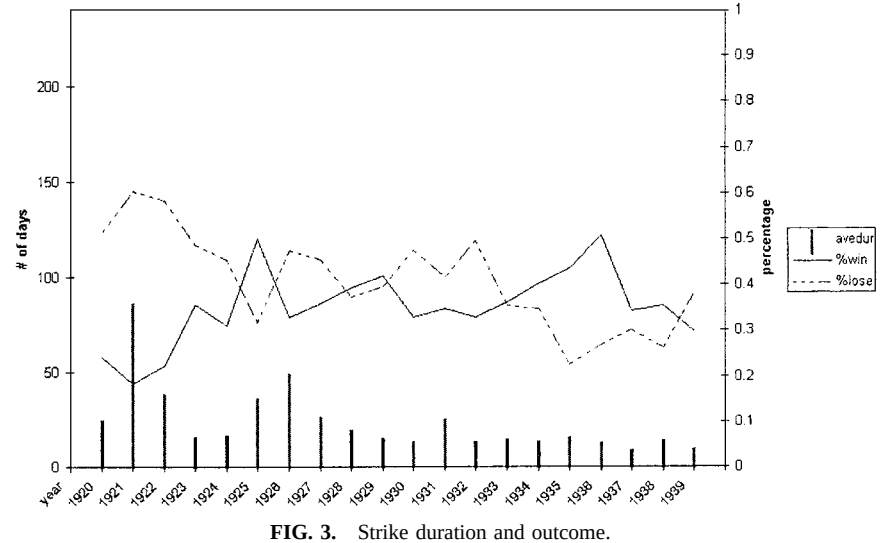

FIG. 3. Strike duration and outcome.

TABLE 5
Trends in Key Strike Dimensions

Year	Number of strikes	Duration		Result			% of strikes		International union strikes		Wage gains
		Mean	Median	% win	% comp	% lose	Replacement	Violent	Number	(% win)	Avg change %
1920	224	23.70	11	24.11	24.55	51.34	8.25	0.66	131	(23.66)	16.4
1921	126	85.74[a]	15	18.25	21.43	60.32	15.58	1.30	62	(19.36)	−7.7
1922	72	37.71	11	22.22	19.44	58.33	14.29	1.10	32	(37.50)	−6.1
1923	70	15.17	7.25	35.71	15.71	48.57	13.75	5.00	33	(33.33)	10.2
1924	55	16.00	8	30.91	23.64	45.45	13.64	0.00	28	(25.00)	3.4
1925	60	35.41	9	50.00	18.33	31.67	15.29	7.06	37	(54.05)	4.4
1926	61	48.21	6	32.79	19.67	47.54	20.73	4.88	21	(23.81)	10.6
1927	64	25.73	10	35.94	18.75	45.31	15.28	0.00	41	(29.27)	6.7
1928	94	18.70	7	39.36	23.40	37.23	9.43	2.83	42	(33.33)	4.6
1929	81	14.30	4	41.98	18.52	39.51	12.26	2.83	39	(38.46)	10.2
1930	76	13.03	6	32.90	19.74	47.37	10.71	0.00	36	(30.56)	0.0
1931	72	24.43	8.75	34.72	23.61	41.67	12.30	10.66	34	(41.18)	20.5
1932	125	12.96	6	32.80	17.60	49.60	13.26	5.61	41	(39.02)	−0.6
1933	127	14.02	6	36.22	28.35	35.43	4.22	9.70	34	(50.00)	−2.6
1934	208	12.51	5	40.38	25.00	34.62	6.46	8.00	49	(30.61)	17.2
1935	129	14.91	4	43.41	34.11	22.48	9.88	17.39	44	(43.18)	29.9
1936	142	11.99	4	50.70	22.54	26.76	13.19	2.75	82	(57.32)	12.8
1937	259	8.45	3.5	34.36	35.52	30.12	9.17	4.44	99	(35.35)	18.4
1938	138	13.19	3.25	35.51	38.41	26.09	8.79	1.65	70	(30.00)	24.9
1939	124	8.98	3	29.84	32.26	37.90	7.45	11.18	85	(35.29)	11.8
All	2307	20.76	6	34.81	25.79	39.40	12.53	3.51	1040	(35.00)	11.2

[a] There are nine strikes in 1921 that lasted over 1 year. Excluding these observations, average duration is 26.21 days.

18.6.[34] Worker wins went together with their ability to get a larger share of the surplus. The prize declined in the 1920s as worker losses mounted, but increased along with worker wins at the end of the depression.

All told, a war-of-attrition model best fits the data. Screening models of strike behavior predict stable, if not increasing settlement rates as strikes progress (Kennan and Wilson, 1989). The attrition model predicts declining settlement rates. For the post-1945 Canadian data, Harrison and Stewart did find very flat settlement probabilities, but in the interwar year settlement rates were falling.[35] In Fig. 4 we trace the conditional settlement probabilities for all disputes.[36] Rates

[34] Of the 526 disputes for which we can calculate the percentage change in wages 426 were over wage increases. Table 5 reports gains for all types of wage disputes. Comparing wage gains across decades, mean differences are statistically different at the 5% level. There was no difference in wage losses. The large increases in 1930 and 1934 are the result of small, seemingly unrepresentative samples. All wage figures are nominal. This follows the approach of Card and Olson (1995).

[35] From an initial settlement probability of a little more than 3%, Harrison and Stewart (1989) found a declining rate of 0.01% per day.

[36] The methodology follows Kennan (1985), Harrison and Stewart (1989), and Huberman and Young (1999).

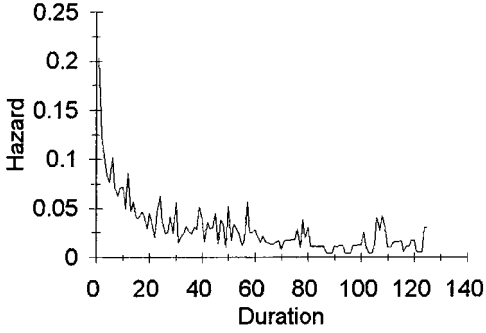

FIG. 4. Settlement probabilities. Note: These are sample estimates of the sequence of conditional settlement probabilities for all strikes ($N = 2307$). They are calculated as the ratio of the number of strikes with duration of *exactly t days* to the number of strikes with duration of *at least t days* (with smoothing when necessary for large t).

of settlement declined from an initial level of 0.20.[37] The main factor in this declining hazard is the declining probability of a successful settlement. In the top panel of Table 6, using the large sample, we break down the relation between outcome and duration. Workers clearly won shorter strikes; the percentage of strike wins declined rapidly from about 47% in the first 3 days to about half that after 21 days. For all types of strikes, average daily settlement rates declined. For successful strikes it was 5.68%/day in the first 3 days, but less than 0.76%/day for strikes lasting more than 21 days.

The bottom panel of Table 6, which traces the relation between wage settlements and duration, gives further support for the attrition model. In screening models, wage settlements decline with duration because workers revise downward their expectations of the firm's profits. McConnel (1980) has found evidence of this for the United States after 1945. In attrition models, because of their winner-take-all nature, wage settlements are independent of durations. This is what we find for the interwar years. For the sample of strikes over wages for which we have information about settlements, there is little evidence of duration dependence. For successful strikes over wage increases, workers won an almost identical prize in strikes ranging from 1 to 21 days. The invariance of the wage settlement to the duration of the strike lends further credence to the view that wins and losses were discrete outcomes.[38]

[37] We also traced the settlement probabilities of union led and all disputes. The initial settlement rate was lower for union-led disputes. There are two possible interpretations of this result. First, in the early stages of disputes workers would not give up their past achievements easily; second, it is also plausible that firms tried to delay any settlements with unions. At the very least, there appears to be a different bargaining dynamic once unions were present. Note that initial settlement rates were lower before the war and after 1945 (Huberman and Young, 1999).

[38] The wage gain of 16.7% can be considered as a type of union wage effect: the gain to workers for holding on to their union. Card and Olson (1995, p. 41) reported an effect of 13.6% for the United

TABLE 6
Strike Outcomes, Wage Settlements, and Duration

Duration	Number of strikes	Strike outcomes			Average daily settlement rate		
		% wins	% losses	% compromises	% wins	% losses	% compromises
A. Strike outcomes and settlement rates							
All	2307	34.81	39.40	25.79			
1–3 days	853	46.07	34.58	19.34	5.68	4.26	2.38
4–7 days	427	39.58	33.02	27.40	2.91	2.42	2.01
8–14 days	379	29.55	36.15	34.30	1.56	1.91	1.81
15–21 days	161	27.33	43.48	29.19	0.97	1.54	1.04
22–28 days	118	22.03	43.22	34.75	0.76	1.50	1.20
29–35 days	70	21.43	50.00	28.57	0.58	1.36	0.77
36–42 days	61	21.31	42.62	36.07	0.62	1.24	1.05
43–60 days	100	11.00	58.00	31.00	0.26	1.35	0.72
61–90 days	52	17.31	67.31	15.39	0.22	0.85	0.19
91–120 days	29	10.35	82.76	6.90	0.12	0.93	0.08
>120 days	57	14.04	64.91	21.05			

B. Wage settlements and duration

Duration	All strikes	Wins	Compromises	Losses
All	16.73	28.10	15.56	0.07
1–3 days	19.38	28.86	18.60	0.00
4–7 days	19.67	37.34	14.56	0.00
8–14 days	15.38	30.35	14.04	0.00
15–21 days	17.05	22.03	25.63	0.00
22–28 days	10.49	9.93	15.71	1.92
29–35 days	5.16	8.68	10.40	−2.28
36–42 days	10.38	9.20	10.68	
43–60 days	7.6	16.46	10.70	0.96
61–90 days	3.6		10.80	0.00
91–120 days	3.9		3.90	
Over 120 days	11.88	29.30	10.03	0.00

Note. Wage settlements for strikes over wage increases, $N = 426$. All figures in percentage change.

ESTIMATION RESULTS

Building on the descriptive evidence, we proceed to give a "structural" analysis (Card and Olsen, 1995) of strike activity. Our objective is to determine the effects of changes in worker and employer strategies on outcomes and duration over the interwar years. For each subperiod, the model comprises

States in the 1880s. The results are comparable with those for modern labor markets (Lewis, 1986). As for the absence of a relation between wage gains and duration, Card and Olson (p. 51) found a similar result.

equations for the capitulation or stopping times of the parties and an equation for the strike outcome. The presence of compromise outcomes poses an obvious problem for the attrition model of strikes, but since they are part of our information set we prefer to treat them as a third possible outcome with a separate specification for the maximum delay time to a compromise outcome.[39] Thus, the model has three equations for the latent capitulation times for success, failure, and compromise. Observed duration is the (minimum) length of a strike owing either to one party capitulating or to both parties compromising. A victor (or tied result) is then declared.

The empirical specification of the model considers the determination of duration, outcome, and wage gain as functions of firm and worker characteristics in their surrounding social and economic environment.[40] We consider first the probability of different outcomes (success, failure, and compromise) and, second, the determinants of observed strike duration for the three possible outcomes.[41] We then provide a discussion of the results.

The Determinants of Strike Success, Failure, and Compromise

The three discrete designations of strike outcomes in our data set have a natural ordering. To exploit the ordinal nature of these outcomes, we use the ordered-probit approach in our estimation of the effects of strike characteristics and the economic environment on strike outcome. The dependent variable, S, is defined such that S is set to 0 for a failed strike, 1 for a compromise, and 2 for a successful strike. The model (see Greene, 1997, p. 926ff) can be written as follows:

$$S^* = X\beta + e,$$

where S^* is an unobserved latent variable, X is a matrix of exogenous factors which impact upon strike outcome, and e is normally distributed. Actual strike outcome is determined according to the following:

$$S = 0 \quad \text{if} \quad S^* = 0;$$

$$S = 1 \quad \text{if} \quad 0 < S^* \leq \mu;$$

$$S = 2 \quad \text{if} \quad S^* > \mu,$$

[39] Huberman and Young (1999) discuss how compromise settlements can be incorporated in a war-of-attrition context.

[40] The model is analogous to that found in Huberman and Young (1999) which contains a full description of hazard-model estimation.

[41] We have also estimated a wage equation conditional on strike success with the same independent variables as in the outcome and duration equations. In general, we confronted severe multicollinearity problems in estimating equations for the three subperiods. Furthermore, given the small sample sizes involved in these regressions we are reluctant to make any generalizations based on these results. Instead, we have decided to simply report wage gains for each period. These regressions are available from the authors.

where μ is a threshold parameter to be estimated along with β, using a maximum likelihood approach.

We have estimated the model for the three subperiods of the small sample (Table 7).[42] Before considering the results, some comment on the explanatory variables is in order. We have included all the information we could retrieve from the original files on each strike. To capture business-cycle effects, we use real per capita GNP (Urquhart and Buckley, 1983; Urquhart, 1986), measured as deviations from trend.[43] To capture the possibility that workers' decision to strike was based on the mobilization and success of others (thereby spreading delay costs), we have included two measures of strike waves: the number of strikes during the year and the percentage of wins during the year. For all variables in Table 7, the first term in square brackets is the change in the probability of compromise; the second term in square brackets is the change in the probability of success. All regressions included industry dummies (which have been omitted from the table) and unless otherwise noted these were insignificant. Estimated outcome probabilities by year are reported in the bottom panel of Table 7.[44]

There are similarities and differences in the determinants of success over the subperiods. In all three periods, employers' strategy to use strikebreakers appears to have achieved its goal, substantially decreasing the probability of worker wins. In the first period, the use of replacement workers decreased the probability of success by 0.32 and decreased the probability of compromise by 0.23.[45] There is very little evidence that business-cycle effects mattered for the whole period, except for strikes about union issues in 1920–1929 and about working conditions in the Depression years. In two of the three periods, workers seem to have done better where more firms were involved and where multiple issues were at stake. When broken down into subperiods, female workers had the same probability of success as men and violence did not appear to alter outcomes either. In the first period, success was not duration dependent, evidence that when workers did hang on they could still win. This may have been an aftershock of the Winnipeg General Strike since the first period also saw contagion effects. Where other workers were successful, the probability of an individual win increased by

[42] Likelihood ratio tests were used to test for the joint significance of the "union" variables. In 1930–1934, while the union coefficients were individually nonsignificant, combined they did have an impact on outcome (they were jointly significant). Based on this finding, we opted to use the smaller data set.

[43] We have experimented with other independent variables to capture firm profitability, such as an index of export prices. Because of correlation between these variables and GNP, we have excluded them from our results.

[44] The baseline case for all regressions is a strike in Ontario over a miscellaneous issue in the "other" industrial sector. Note that in Table 7 μ has been parameterized as $H1^2$.

[45] Since the changes in probabilities across all states must sum to zero, the increase in the probability of failure in the presence of strikebreakers was 0.55.

TABLE 7
Determinants of Strike Outcomes: Ordered Probit Results

Variable	1920–1929	1930–1934	1935–1939	1920–1939
Constant	12.3950 (.81473)	−204.205 (−.3539)	−1045.18 (−.7785)	1.10384 (.7944)
		Duration and participants		
Length	−.00034 (−.5865) [−.000, −.000]	−.01438 (−3.4544) [−.001, −.005]	−.01564 (−4.6796) [.000, −.006]	−.00099 (−1.3159) [−.000, −.000]
Strikers	.00004 (.9993) [.000, .000]	.00012 (.8509) [.000, .000]	−.00012 (−1.4971) [.000, −.000]	−.00000 (−.0688) [−.000, −.000]
Female	.17158 (.9580) [.012, .056]	.14512 (.6957) [.010, .047]	.16623 (1.2534) [−.007, .060]	.16695 (1.8400) [.006, .058]
Firms	.01084 (2.7656) [.001, .003]	.00342 (.8488) [.000, .001]	.01328 (2.1354) [−.000, .005]	.00891 (3.7907) [.000, .003]
		Issue		
Multiple	.40804 (2.2849) [.020, .139]	.44500 (1.8957) [.022, .151]	.18809 (1.2690) [−.008, .068]	.20825 (2.2555) [.006, .073]
Union	−.12988 (−.4183) [−.012, −.039]	1.88742 (1.6762) [−.175, .646]	−.04874 (−.2027) [.001, −.017]	.15672 (.9551) [.004, .055]
Wages	.29204 (1.9078) [.023, .092]	.28735 (1.3378) [.021, .093]	−.01194 (−.0814) [.000, −.004]	.19548 (2.2524) [.008, .067]
Working conditions	.35940 (1.4730) [.016, .124]	.45124 (1.2062) [.010, .161]	.19237 (.6561) [−.012, .071]	.18942 (1.2271) [.004, .067]
		Union		
Union involvement	.04501 (.1987) [.004, .014]	.24350[a] (1.0416) [.021, .076]	.10920 (.6822) [−.002, .038]	.13961 (1.4558) [.008, .046]
International union	.03569 (.2161) [.003, .011]	.14850 (.8753) [.011, .048]	.13241 (.9395) [−.003, .047]	.08615 (1.0072) [.004, .029]
		Strike characteristics		
Year	−1.09208 (−.9324)	12.0688 (.3525)	59.9093 (.7761)	−.16264 (−1.6668)
Year × year	.02041 (.9434)	−.17717 (−.3511)	−.85321 (−.7735)	.00293 (1.8462)
Violence	−.37509 (−.7762) [−.044, −.103]	−.00253 (−.0072) [−.000, −.001]	.07664 (.3868) [−.003, .028]	−.22529 (−1.4652) [−.017, −.072]
Lockout	.37614 (1.2378) [.014, 0.132]	−.37549 (−.9845) [−.043, −.105]	.18657 (.4768) [−.012, .069]	.03932 (.2001) [.002, .013]
Replacement workers	−1.86696 (−8.1421) [−.233, −.318]	−2.23143 (−6.5745) [−.267, −.343]	−2.09121 (−9.7830) [−.298, −.400]	−1.94967 (−14.564) [−.257, −.360]

TABLE 7—*Continued*

Variable	1920–1929	1930–1934	1935–1939	1920–1939
		Region		
West	−.04115	.24565	.05147	.02124
	(−.3191)	(1.3875)	(.3545)	(.2611)
	[−.003, −.013]	[.015, .081]	[−.002, .018]	[.001, .007]
Quebec	.00104	−.13025	.04617	.02483
	(.0070)	(−.7728)	(.3216)	(.2922)
	[.000, .000]	[−.011, −.041]	[−0.002, 0.017]	[.001, .008]
East	−.10179	−.14238	−.40760	−.24089
	(−.5641)	(−.5694)	(−2.3748)	(−2.2896)
	[−.009, −.031]	[−.013, −.044]	[−.080, .135]	[−.017, −.078]
		Industry effects (estimated but not reported)		
		Output effects		
GNP	−.0009	.00182	.02147	−.00007
	(−.1238)	(.3777)	(.6880)	(−.1904)
	[.000, −.000]	[.000, .001]	[−.001, .008]	[−.000, −.000]
Union presence	.00007	−.00014	.00015	−.00009
× GNP	(.1913)	(−.3916)	(.2625)	(−.2705)
	[.000, .000]	[−.000, −.000]	[−.000, .000]	[−.000, −.000]
Union issue ×	.00139	.00206	.00146	.00095
GNP	(1.7059)	(1.1264)	(1.1122)	(1.3294)
	[.000, .000]	[.000, .001]	[−.000, .001]	[.000, .000]
Wage issue ×	.00025	−.00038	.00007	.00028
GNP	(.8351)	(−.9228)	(.0842)	(.9681)
	[.000, .000]	[−.000, −.000]	[−.000, .000]	[.000, .000]
Work conditions	−.00014	.00144	.00088	−.00018
× GNP	(−.2751)	(2.0134)	(.5686)	(−.3309)
	[−.000, −0.000]	[.000, .000]	[−.000, .000]	[−.000, −.000]
Multiple issue	−.00046	.00041	−.00007	−.00042
× GNP	(−1.2781)	(.9434)	(−.0819)	(−1.2025)
	[−.000, −.000]	[.000, .000]	[.000, −.000]	[−.000, −.000]
		Strike waves		
# of strikes	−.00330	−.01017	−.03490	−.00153
	(−1.0244)	(−.3538)	(−.7446)	(−2.0653)
	[−.000, −.001]	[−.001, −.003]	[−.001, −.012]	[−.000, −.001]
% winning	3.69074	Not estimated due	Not estimated	2.7211
	(2.4063)	to perfect	due to perfect	(4.8593)
	[.002, .012]	multicollinearity	multicollinearity	[.001, .009]
		in sample	in sample	
		(Square root of) threshold parameter		
H1	.844302	.86720	1.05285	.90887
	(26.645)	(23.632)	(34.192)	(49.370)
N	623	461	671	1755
Log-likelihood	−575.653	−411.652	−605.919	−1665.11

TABLE 7—*Continued*

Estimated probabilities by year from ordered probit results (evaluted at sample means)							
	Loss	Compromise	Win		Loss	Compromise	Win
1920	0.2925	0.2737	0.4338	1930	0.9775	0.0196	0.0029
1921	0.3856	0.2779	0.3365	1931	0.7715	0.1612	0.0674
1922	0.4697	0.2682	0.2622	1932	0.4351	0.2869	0.2781
1923	0.5390	0.2523	0.2088	1933	0.2369	0.2773	0.4858
1924	0.5912	0.2361	0.1727	1934	0.1801	0.2551	0.5647
1925	0.6266	0.2233	0.1502	1935	0.0000	0.0000	0.9999
1926	0.6458	0.2156	0.1385	1936	0.0000	0.0004	0.9997
1927	0.6497	0.2140	0.1362	1937	0.0170	0.1389	0.8442
1928	0.6385	0.2186	0.1430	1938	0.9751	0.0239	0.0011
1929	0.6115	0.2289	0.1596	1939	1.0000	0.0000	0.0000

Note. Values in parentheses are *t* statistics. Parameters in shaded cells are significant at a 10% (or higher) level. Values in square brackets are the estimated changes in probabilities of compromise and success, evaluated at sample means. For continuous variables, these are calculated for a marginal change. For binary variables, these are calculated for a change in the variable from 0 to 1.

[a] In the 1930–1934 period the union involvement and international union variables are jointly significant.

0.012.[46] After 1929, workers tended to win only shorter strikes and there is no evidence of contagion effects.

The results give some clues why workers won more disputes in the mid- to late 1930s, holding constant the duration of disputes. Consider the regional effects. Workers' success was about the same in all regions, except for the Maritimes in the last period. Business-cycle effects were not at play here because unemployment rates in the 1930s were roughly similar across the country (Green and MacKinnon, 1995), while the growth of per capita income in Nova Scotia in the interwar years was about the same as in Quebec (Marr and Paterson, 1983, p. 426). One possible explanation of regional strike activity is that since replacement workers were less prevalent in the East firms in the region had developed other strategies that were as effective, if not more so, in defeating workers. We return to this theme below. Another explanation lies in industrial location and distance from the East to central Canada. In Ontario and Quebec, because of the degree of industrial concentration, strikers could get more information on firms' delay costs from the success and failure of others. Huberman and Young found evidence of distance effects for the period before 1914. Finally, across the country organization did matter for success. The only significant industry effects are in the last subperiod period for the machine and transportation and utility

[46] For this variable, the figure in Table 7 is the change in probability going from the sample mean to the sample mean + 0.01. The probability of a loss goes down by 0.014 and that of compromise goes up by 0.002. For the entire period, the number of strikes and the percentage won had opposite effects on strike success. Workers had better success when others were winning.

sectors. In the latter, communist organizers played pivotal roles in certain disputes.[47]

The Determinants of Strike Duration

Table 8 reports estimates for the duration equations. As before, all results reported are for the small sample. The explanatory variables are the same as in Table 7, except those representing the use of replacements and violence. Both of these events could have transpired at any point in the strike and their likelihood of occurrence probably increased as the strike progressed. In an attempt to handle the endogeneity problem, we use an instrumental variables approach whereby fitted values of the violence and replacement worker variables are constructed via a probit model and used in place of the original variables in the hazard equation.[48]

We report results from the maximum likelihood estimation of a log-logistic hazard model.[49] As in a "competing-risks" model, the estimates can be interpreted as the capitulation times for workers (firms) leading to a success (failure), failure (success), or compromise. For each hazard estimate, the last row reports the change in the predicted duration due to (1) the change of the respective dummy variable from 0 to 1; or (2) the change of the nondummy variable from its mean value to mean $+1$.

In contrast to the period before 1914 (Huberman and Young, 1999), there is very little evidence of business-cycle effects for the entire period, except when strikes were about union recognition. For the first subperiod successful strikes were shorter and in the third subperiod failed strikes were shorter in good business years. The Depression did not alter the length of disputes, a result that gives small comfort to the received view that strike durations are countercyclical. There were some common features across the subperiods. Multiple-issue strikes were longer by 2 to 15 days across the subperiods, whether they led to success or failure. Multiple-issue strikes that ended in compromise were shorter in the first subperiod and longer in the third. As for regional effects, failure and

[47] Communists participated in the All-Canadian Congress of Labour in the late 1920s. Led by the Canadian Brotherhood of Railway Employees, this alliance of nationalists, radicals, and conservatives had a commitment, albeit fragile, to industrial unionism. Other sectors in which communists were active, like textiles, mining, and wood products, did not fare as well.

[48] With limited options in terms of the choice of instruments, we use the exogenous variables from the hazard equations in Table 8, along with the squares and cross-products of the nonbinary variables. Due to instances of quasi-complete separation and perfect multicollinearity in some of the samples, not all instruments are used in all cases.

[49] We have also estimated log duration and a log-logistic hazard model when all outcomes are combined together, but likelihood ratio tests indicate that the determinants of duration are different for successful, failed, or compromise strikes at the 5 and 1% levels of significance. The underlying model and estimation techniques are described in detail in Huberman and Young (1999, Appendix 2). Since the data set contains completed strikes only, there was no need to adjust the estimation procedures to handle truncated observations. We assume independent error terms in our model. Specification tests indicated that a log-logistic distributional assumption was appropriate. The baseline case is a strike in Ontario over a miscellaneous issue in the "other" industrial sector.

TABLE 8
Determinants of Strike Duration: Log-Logistic Hazard Results

Variable	Successful strikes			Compromise strikes			Failed strikes			All strikes
	1920–1929	1930–1934	1935–1939	1920–1929	1930–1934	1935–1939	1920–1929	1930–1934	1935–1939	1920–1939
Constant	1.83173	1.36122	.77168	2.51538	2.00070	1.67143	2.44895	1.89024	1.52254	1.7425
	(4.1574)	(1.0860)	(9.8168)	(7.2912)	(1.4212)	(7.4691)	(35.302)	(5.9424)	(3.3956)	(54.831)
Participants										
Strikers	.00015	−.00074	−.00078	.00006	.00006	−.00003	.00024	−.00004	.00021	.00013
	(1.5437)	(−1.9964)	(−1.6819)	(.6728)	(.2239)	(−.0905)	(.8277)	(−.0699)	(.8771)	(2.1898)
	[0.001]	[−0.003]	[−0.002]	[0.001]	[0.000]	[−0.000]	[0.003]	[−0.000]	[0.001]	[0.001]
Female	.11919	1.10102	.13875	.03578	−.42035	.02764	−.09404	−.25654	1.17319	.12259
	(.4029)	(3.2236)	(.4466)	(.07148)	(−.8507)	(.0864)	(−.3397)	(−.7751)	(2.5516)	(1.0437)
	[0.767]	[4.967]	[0.310]	[0.448]	[−2.900]	[0.148]	[−1.059]	[−1.601]	[8.102]	[0.726]
Firms	.00128	.02968	−.00103	.02799	.00386	−.01369	.01016	−.01060	.06903	.00338
	(.27543)	(2.7334)	(−.1036)	(2.4760)	(.4384)	(−1.2719)	(.6754)	(−.5042)	(1.2213)	(1.2092)
	[0.008]	[0.116]	[−0.002]	[0.346]	[0.029]	[−0.073]	[0.118]	[−0.070]	[0.316]	[0.019]
Issue										
Multiple	.77139	.33418	.61952	−1.64333	1.60750	.47994	.94961	.99231	.34178	.68219
	(2.2299)	(.6753)	(2.3360)	(−3.2614)	(1.5154)	(1.9113)	(3.4894)	(2.1080)	(.95338)	(6.6166)
	[6.337]	[1.422]	[1.536]	[−14.54]	[16.67]	[2.700]	[15.847]	[8.855]	[1.754]	[4.738]
Union	−.37323	−.10334	.27391	−1.26187	1.68120	.20772	1.36556	.87543	.88764	.58822
	(−.6019)	(−.1859)	(.5656)	(−.5909)	(.0097)	(.36463)	(3.6977)	(.7287)	(1.8750)	(3.6755)
	[−1.988]	[−0.386]	[0.672]	[−9.185]	[30.84]	[1.219]	[31.197]	[8.956]	[6.122]	[4.463]
Wages	.63278	.29605	−.37460	−.71308	.79417	.07148	.34760	.51687	−.34175	.29610
	(2.0396)	(.6900)	(−1.3477)	(−1.8072)	(.7142)	(.2425)	(1.8362)	(1.8206)	(−.9576)	(2.9617)
	[4.093]	[1.164]	[−0.777]	[−9.801]	[6.373]	[0.384]	[4.171]	[3.631]	[−1.523]	[1.743]
Working conditions	−.52846	.53770	−.34525	−.49759	−.37415	−.17425	−.07681	−.06586	−.01886	−.04316
	(−1.1711)	(.3315)	(−.8405)	(−.8370)	(−.1838)	(−.2866)	(−.2486)	(−.0457)	(−.0386)	(−.2798)
	[−2.674]	[2.748]	[−0.641]	[−4.934]	[−2.365]	[−0.854]	[−0.860]	[−0.424]	[−0.086]	[−0.243]

					Union					
Union involvement	.24727	.31597	.15774	1.26653	.72486	.76751	.12088	1.44663	.46440	.78923
	(.49253)	(.6757)	(.4739)	(2.0368)	(1.1539)	(2.4247)	(.3773)	(3.8030)	(1.0510)	(6.9641)
	[1.420]	[1.162]	[0.328]	[10.14]	[5.102]	[3.492]	[1.345]	[8.865]	[1.991]	[3.833]
International union	.82319	−.28096	−.05245	−.314342	.14462	−.42563	.76661	−.11548	.32103	−.05188
	(2.3930)	(−1.0554)	(−.2153)	(−.8302)	(.3441)	(−1.8110)	(2.7256)	(−.4467)	(.8021)	(−.5456)
	[4.327]	[−1.096]	[−0.114]	[−4.261]	[1.083]	[−2.323]	[7.587]	[−0.754]	[1.456]	[−0.299]
					Strike characteristics					
Year	.80663	42.0469	158.335	−3.23781	−112.550	−104.181	−1.20906	48.7872	−275.867	−.02718
	(.3093)	(.7828)	(1.2013)	(−1.0456)	(−1.5134)	(−.6507)	(−.6068)	(.9457)	(−1.6029)	(−.2645)
	[2.498]	[6.508]	[−18.02]	[−6.162]	[30.11]	[30.689]	[−2.563]	[17.02]	[81.42]	[−0.364]
Year × year	−.00832	−.62248	−2.25928	.05855	1.66338	1.48365	.02120	−.71578	3.94622	−.00058
	(−.1743)	(−.7879)	(−1.1990)	(.9892)	(1.5159)	(.6495)	(.5764)	(−.9408)	(1.6055)	(−.3398)
Violence	−.25438	2.67565	−4.85194	3.37342	−1.33212	−2.95160	1.40215	−.62579	−1.85425	−.25512
	(−.1540)	(1.4448)	(−2.9196)	(2.1875)	(−.5647)	(−1.7595)	(1.0415)	(−.4492)	(−.8713)	(−.3468)
	[−1.406]	[50.00]	[−2.363]	[340.5]	[−5.650]	[−6.570]	[34.46]	[−3.147]	[−4.414]	[−1.335]
Lockout	−.17490	.78610	3.87662	1.42581	.24388	2.14293	.89325	−.15519	1.29560	.82896
	(−.3431)	(.0538)	(4.5031)	(1.4362)	(.1668)	(1.1748)	(1.4451)	(−.2750)	(1.5482)	(3.5255)
	[−1.010]	[4.637]	[97.63]	[37.59]	[2.024]	[39.27]	[16.45]	[−0.959]	[11.612]	[7.263]
Replacement workers	1.90988	Not applicable	4.34673	−2.46907	1.31630	.66930	.41901	.21268	−2.30943	.18858
	(.9447)		(1.8174)	(−.6428)	(1.1422)	(.3303)	(.2452)	(.0891)	(−1.1885)	(.1429)
	[34.84]		[162.1]	[−11.92]	[19.69]	[4.934]	[5.418]	[1.483]	[−9.419]	[1.184]

TABLE 8—*Continued*

Variable	Successful strikes 1920–1929	Successful strikes 1930–1934	Successful strikes 1935–1939	Compromise strikes 1920–1929	Compromise strikes 1930–1934	Compromise strikes 1935–1939	Failed strikes 1920–1929	Failed strikes 1930–1934	Failed strikes 1935–1939	All strikes 1920–1939
Region										
West	−.02813	−.53780	−.03797	.18211	.62151	.39340	.20760	.69348	.47259	.28494
	(−.0967)	(−1.7885)	(−.1643)	(.7435)	(1.5335)	(1.4027)	(.9534)	(2.4508)	(1.5086)	(3.1798)
	[−0.175]	[−1.873]	[−0.081]	[2.331]	[5.353]	[2.402]	[2.493]	[5.440]	[2.515]	[1.759]
Quebec	−.03610	−.55892	1.04028	.16348	.23745	−.03037	.07019	−.33463	−.21966	−.00662
	(−.1156)	(−2.0065)	(3.3566)	(.4360)	(.6588)	(−.1117)	(.3186)	(−1.0515)	(−.5980)	(−.0655)
	[−0.223]	[−1.910]	[3.426]	[2.141]	[1.883]	[−0.160]	[0.828]	[−1.998]	[−0.931]	[−0.038]
East	−.44241	.36241	−.30528	.30772	.30668	−.57526	−.19943	−.44112	−.98555	−.26290
	(−1.0592)	(.7765)	(−.9005)	(.8127)	(.5216)	(−1.8398)	(−.7050)	(−1.2214)	(−2.7564)	(−2.0865)
	[−2.352]	[1.631]	[−0.595]	[4.271]	[2.528]	[−2.547]	[−2.161]	[−2.558]	[−3.732]	[−1.386]
Industry effects (estimated but not reported)										
Output effects										
GNP	−.00311	.00504	.06130	.00116	−.01452	−.04269	−.00051	.00661	−.11404	−.00036
	(−1.9839)	(.6665)	(1.1428)	(.5290)	(−1.3782)	(−.6765)	(−.4831)	(.9114)	(−1.6563)	(−1.4934)
	[−0.034]	[0.020]	[0.133]	[0.014]	[−0.107]	[−0.227]	[−0.006]	[0.044]	[−0.523]	[−0.002]
Union × GNP	.000767	.00056	−.00028	−.00091	−.00050	.00078	.00079	.00014	−.00004	.00003
	(1.0382)	(.6866)	(−.2237)	(−.7385)	(−.5007)	(.6629)	(1.7231)	(.2173)	(−.0275)	(.1163)
	[0.005]	[0.002]	[−0.001]	[−0.011]	[−0.004]	[0.004]	[0.009]	[0.001]	[−0.000]	[0.000]
Union issue × GNP	.00002	−.00048	.00042	.00579	.00290	.42328	.00176	.00036	.00261	.00072
	(.01983)	(−.4431)	(.1838)	(.6154)	(.0126)	(1.3012)	(1.2426)	(.1787)	(1.1004)	(1.9984)
	[0.000]	[−0.002]	[0.001]	[0.072]	[0.012]	[0.023]	[0.020]	[0.002]	[0.012]	[0.004]

Wage issue × GNP	−.00025	.00018	−.00061	.00055	−.00021	.17052	.00027	−.00024	.00180	.00021
	(−.4152)	(.2756)	(−.4914)	(.6300)	(−.0935)	(1.0084)	(.7105)	(−.4319)	(1.1685)	(1.0068)
	[−0.002]	[0.001]	[−0.001]	[0.007]	[−0.002]	[0.009]	[0.003]	[−0.002]	[0.008]	[0.001]
Work cond. × GNP	−.00093	.00272	−.00038	−.00153	−.00193	.57995	.00025	.00084	.00052	−.00040
	(−.9580)	(.5112)	(−.1726)	(−1.1043)	(−.5145)	(1.4731)	(.3314)	(.3819)	(.1984)	(−1.0910)
	[−0.006]	[0.012]	[−0.001]	[−0.019]	[−0.014]	[0.031]	[0.003]	[0.006]	[0.002]	[−0.002]
Multiple issue × GNP	−.00037	−.00028	−.00025	−.00018	.00019	.00163	.00063	−.00004	.00131	.00036
	(−.5291)	(−.3520)	(−.1994)	(−.1887)	(.0892)	(1.0120)	(1.0887)	(−.0389)	(.7757)	(1.4358)
	[−0.002]	[−0.001]	[−0.001]	[−0.002]	[0.001]	[0.009]	[0.007]	[−0.000]	[0.006]	[0.002]
					Strike waves					
# of strikes	.00408	−.032244	−.09551	−.00775	.07963	.06399	−.00240	−.04786	.16412	−.00118
	(.5768)	(−.6766)	(−1.1898)	(−1.1112)	(1.3295)	(.6702)	(−.4624)	(−1.1343)	(1.5844)	(−1.9343)
	[0.026]	[−0.126]	[−0.207]	[−0.096]	[0.589]	[0.340]	[−0.028]	[−0.317]	[0.752]	[−0.007]
% winning	−2.2229	Perfect multicollinearity		3.4444	Perfect multicollinearity		1.5406	Perfect multicollinearity		−.84331
	(−.7832)			(.7628)			(.6547)			(−1.3747)
	[−13.88]			[42.62]			[17.83]			[−4.844]
					Hazard parameter					
p	1.49633	1.82538	1.47769	1.70892	1.83256	1.61815	1.56563	1.48277	1.42558	1.30810
	(13.150)	(12.600)	(15.894)	(10.563)	(10.061)	(16.674)	(18.006)	(14.437)	(13.330)	(45.329)
N	187	150	252	144	107	223	292	204	196	1755
Log-likelihood	−641.811	−412.172	−595.379	−572.513	−357.696	−702.044	−1160.53	−711.009	−612.342	−6098.39

Note. Values in parentheses are *t* statistics. Parameters in shaded cells are significant at a 10% (or higher) level. Values in square brackets are the estimated changes in duration, evaluated at sample means. For continuous variables, these are calculated for a marginal change. For binary variables, these are calculated for a change in the variable from 0 to 1.

compromises in the East were shorter on the order of 2.5 to 3.7 days than elsewhere in the mid- and late 1930s. This is consistent with our finding of a lower probability of success in the region. The type of union did not have much impact on durations, although in the first period international unions extended capitulation times to win, giving credence to the belief that national unions were fragmented and weaker in the 1920s. One surprising common feature is the lack of a relation between durations and replacement workers. This may be due to the offsetting influences we discussed above. For the entire the sample, the absence of "no-scab" legislation would have shortened disputes, but when replacements were in fact used they may have encouraged workers not to capitulate and hang on to their union. The significant and positive relation between replacements and durations for successful strikes in the last subperiod is due to a couple of long outliers and their exclusion does not qualitatively change the other results.

Turning our attention to successful strikes, the determinants of duration varied over the period. The number of strikers reduced durations in the last two periods—after 1929 firms began to capitulate earlier when faced by larger numbers. In the Depression years, female workers and strikers embroiled in disputes with a large number of firms had to hold on longer to win. Consistent with our results of the probability of success, political affiliation did matter. In the Depression years, successful strikes in the transportation and utilities sector were shorter than elsewhere. Perhaps the most remarkable development over the period is the change in the relation between violence and duration in the last subperiod. In the first two subperiods, violence had no impact on durations of strikes leading to success, failure, or compromise.[50] But after 1935 violence led to shorter delay times for success (2.4 days) and compromise (6.6 days) outcomes. This begs the question why employers' response to violence had changed over the period.

Discussion

Before discussing the changing role of violence and employers' response, it is best to summarize our findings about durations and outcomes over the three subperiods. Recall that in the attrition model, capitulation times of both parties, holding constant their delay costs, vary with the size of the surplus. When the prize or size of wage gain was falling, as it was in 1920s, both workers and firms delay times fell, but, as evidenced by the greater number of losses, there was a higher probability of workers stopping first since the union movement was fragmented and firms in the absence of "no-scab" legislation used replacements in many disputes. The use of strikebreakers was one component of a comprehensive firm strategy to suppress militancy after the Winnipeg General Strike. Representative of strikes in this period was a 1923 dispute in Vancouver between

[50] Here again the change in duration of 340.5 days in the first subperiod, when violence is used in strikes ending in compromise, is due to a number of outliers whose exclusion does not affect the results.

longshoremen and shipping companies. The workers had demanded initially a wage increase and overtime pay, but the Shipping Federation called in strike-breakers and after 2 months the union was broken and a company union put in its place (Jameison, 1968, p. 211). Notwithstanding the early period's pressures, workers did engage in some successful strikes and they were not doomed to lose longer disputes. In the second subperiod, wage gains were zero or less in 1930, 1932, and 1933, leading to shorter durations. Again, workers tended to capitulate before firms, losing almost 50% of disputes in 1932. After 1934 a different dynamic takes over. The prize had increased and this ought to have led to longer durations. But average durations fell and workers were able to win shorter disputes. The typical conflict of the later period was a series of disputes in the Quebec textile industry. Communists had initially organized many of the industry's workers, but by the mid-1930s they had lost control of the sector to the Amalgamated Clothing Workers. Whether led by communists or not, many disputes in the textile industry had violent episodes; still, workers had their victories, as in 1934 when they won a 10% wage increase (Jameison, pp. 226, 259–263).

In the attrition model, even a small change in relative delay times could alter the balance between winning and losing a dispute, independent of macroeconomic conditions. This appears to have been the case in the 1930s. Renewed militancy beginning at the end of the Depression, promoted at times by communist organizers and manifested in violence, was not met by proportional increases in employer resource mobilization. In fact, violence shortened durations in successful strikes. Our explanation of this finding is that firms were not prepared for the worker offensive. To be sure, firms continued to use replacement workers in the mid- to late 1930s. But this may have been the only component of firms' strategy to suppress militancy that remained in place. After 1929, firms cut back on the human resource departments that they had established in the 1920s. Without continuous investments in their organizations, firms had limited resources to confront the wave of strikes and unionization that hit them beginning in 1932 and 1933. Describing the United States in 1933, Jacoby (1985, pp. 222–223) observed:

> . . . industry was poorly prepared for what lay ahead. The vast majority of companies had no direct experience with personnel management, collective bargaining or employee representation. In better shape were the firms that constituted the progressive minority of the 1920s, but even their advantage was relative. Few of them had ever treated personnel policy as a matter of primary importance. Moreover, they were at a disadvantage for having raised and then disappointed the expectations of their employees.

There is also the possibility—and more research is needed here—that changes in U.S. legislation impacted on the Canadian industrial relations environment. Section 8a of the Wagner Act defined employer support for a company union as an unfair labor practice. After 1935, U.S. corporations had to deal up front with

unions and ultimately the arrival of the CIO, and this sea change may have spilled over into their Canadian branch plants which may have simply adopted the new industrial relations policies of their U.S. head offices. Other firms may have adopted these policies because they anticipated similar legislation in Canada. But the opposing view also has merit. U.S. branch plants may have used the Canadian tariff to protect themselves from New Deal legislation. For whatever reason, the demise of company unions along with cutbacks in human resource departments meant that employers' use of replacements did not have the muscle it did in the 1920s. As a result, firms capitulated before workers did. There is a regional dimension to this story. Changes in the United States may have had more of an effect on central Canada, where branch plants were concentrated. In the Maritimes, employers had developed other tactics to suppress militancy, and the probability of worker wins was lower than elsewhere. The irony here is that the branch-plant economy in the rest of the country—the *bête noire* of Canadian labor—may have been in some part responsible for renewing strike activity and saving the union movement.

CONCLUSION: LESSONS FROM THE INTERWAR YEARS

In the periods before 1914 and after 1945 strike activity in Canada conformed to the "empirical regularity" of procyclical incidence and countercyclical duration. Strike dimensions in the interwar years were distinct. Strike activity was insensitive to the business cycle and instead was driven by another dynamic. Following the Winnipeg General Strike, employers were intent on curtailing militancy while workers wanted to preserve their organizations. Even strikes about wages were ultimately about the survival of the bargaining unit. Because of the discrete nature of outcomes, we have interpreted the central paradox of the period—short strike durations and firm wins in the 1920s followed by even shorter durations and worker wins in the 1930s—in terms of a war-of-attrition model.

The key variable in attrition models is the value of the prize relative to delay times. In principle, capitulation times vary with the value of the prize. This seems to have occurred in the 1920s and into the Depression years when the prize fell. In many of these disputes workers capitulated first because in the presence of strikebreakers (and in the absence of "no-scab" laws) their share of the prize was cut and wage settlements fell. There was little enthusiasm to go on strike even in good business years. Beginning in the mid-1930s, the prize available got larger and this should have extended delay times of both parties. Using a variety of tactics workers mustered their resources, but employers were unprepared to meet this offensive because they had cut back on their expenditures in human resource departments and company unions. We have speculated that this may have been due to the Depression and to legislative changes in the United States. In any event, firms' delay times fell and this meant more worker wins. Contrary to the

U.S. experience, Canadian workers regrouped in the absence of New Deal type legislation and the organizational drive of the CIO.

It would be hazardous on the basis of this single episode to conclude that strike activity and union growth are best described as endogenous processes. Still, the evidence for Canada illustrates that workers may not have to wait for "good times" or a more favorable legal environment to renew strike activity. In the attrition model, small changes in relative delay times can transform worker losses into wins. As long as workers are persistent, firms need to continue to expend resources to preserve their delay times and guard against capitulating. This is the lesson of the 1930s for industrial relations in the new century.

APPENDIX 1

Variable Definitions

1. Strikers: Number of strikers.
2. Female strikers: Dummy variable equal to one if some or all of the strikers were female.
3. Firms: Dummy variable equal to one if more than one firm is involved in the strike.
4. Strike issues:

Multiple: Dummy variable equal to one for strikes involving two or more issues.
Wage: Dummy variable equal to one for single issue strikes over wages.
Union: Dummy variable equal to one for single issue strikes over unionization.
Working conditions: Dummy variable equal to one for single issue strikes over working conditions.

5. Union involvement: Dummy variable equal to one if a union was involved in the strike.
6. International union: Dummy variable equal to one if an international union was involved in the strike.
7. Year: Annual time trend.
8. Violence: Dummy variable equal to one if there were violent episodes during the strike.
9. Lockout: Dummy variable equal to one if the dispute was initiated or accompanied by a lockout.
10. Replacement workers: Dummy variable equal to one if replacements workers were used.
11. Location:

East: Dummy variable equal to one if the strike took place in Nova Scotia, New Brunswick, or Prince Edward Island.
Quebec: Dummy variable equal to one if the strike took place in Quebec.

West: Dummy variable equal to one if the strike took place in Manitoba, Saskatchewan, Alberta, or British Columbia.

12. Industry effects: The baseline group is "Other." Dummy variables equal to one if the strikers worked elsewhere. Definitions of groupings:

Apparel and textiles: All textile garment workers (fur, cotton, and woolens), hatters, tailors, and jewelry workers
Building trades: Bricklayers, carpenters, engineers, marble workers, and plumbers
Unskilled: Unskilled building laborers and general laborers
Food and tobacco: Includes brewery workers
Machine: Boilermakers, machinists, and stove molders
Metals: Blacksmiths, iron molders, metal and iron workers, and wire drawers
Mining: Includes oil drillers
Shoes and other skilled: Includes leather workers and coopers
Transportation and utilities: Includes street laborers and all types of railway workers
Wood products: Includes paper workers
Service and public sector: Includes barbers, civic labor, telephone workers, and musicians
Miscellaneous manufacturing: Includes auto workers, glass and piano makers, and printers
Other: Includes fishermen, agriculture workers, and workers who could not be classified as construction laborers

13. Unemployment relief workers: Dummy variable equal to one if strikers were hired by unemployment relief agencies.

14. Output effects: Deviations of real per capita GNP from trend level in the year of the strike.

15. Strike wave: Two measures were used:

Total number of strikers from the file in the year of the dispute.
Percentage of strikes in the year of the dispute that were recorded as wins.

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