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Learning from Other People's Actions: Environmental Variation and Diffusion in French Coal Mining Strikes, 1890–1935¹

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This study shows the role of imitation in producing social protests. Resource mobilization theories tend to underestimate workers' need for information. The fact that conditions are right for striking needs to be communicated through news of other strikes. Thus (a) strikes stimulate other strikes, net of objective bargaining conditions, (b) unionization increases the rate of strike imitation, (c) successful strikes generate more imitation than unsuccessful strikes, (d) unionization changes the locus of strike imitation from strike beginnings to endings, and (e) long average strike length changes the locus of imitation from endings to beginnings. These predictions are supported by evidence on Third Republic French coal mine strikes.

Traditionally, social movement activists have argued that protests can stimulate further protests (Thorne 1983; Hobsbawm 1984, p. 274). Rosa Luxemburg is one of the most famous exponents of the widely held 19th-century view that the news of strikes and uprisings can radicalize the working class and produce subsequent conflicts that otherwise would not have occurred (Luxemburg [1925] 1970; LeBon 1896; Tarde 1962). Recent research on the social movements of the 1960s has supported this hypothesis empirically. Heirich (1971; also McAdam 1988) illustrates viv-

¹ This research was partially funded by grants from the National Science Foundation and the University of Wisconsin Graduate School. Charles Tilly generously provided most of the strike data. We have benefited from his comments and from comments by Ben Aguirre, Larry Griffin, Pamela Oliver, Susan Olzak, Christopher Price, David Strang, Nancy Tuma, Marc Ventresca, Kim Voss, Buzz Zelditch, and the participants in the Stanford Social Science History Workshop. Direct correspondence to Samuel Cohn, Department of Sociology, Texas A & M University, College Station, Texas 77843.

idly how ongoing action encourages sympathetic onlookers to participate. In addition, Chong (1991, pp. 141–65) and others (Oberschall 1980; Rule 1988, p. 51; Granovetter and Soong 1982) have shown that small groups of militants can catalyze action, because their protests and the reactions to them reveal critical information. This information makes mobilization appear economically feasible, reveals popular support for change, and convinces fence-sitters that the movement can succeed.

Yet, despite the fact that such arguments can be made consistent with resource mobilization theories of collective action (Oberschall 1989; Perrot 1987, p. 313–34) contemporary academic discussions of mass mobilization and class formation assign exemplary action a very limited role. Quantitative studies demonstrate that strike rates rise when workers' bargaining power increases (Shorter and Tilly 1974; Hibbs 1976; Edwards 1979). Shorter and Tilly admit that novel tactics can encourage movement activity, but they still claim that structural or organizational changes account for most changes in strike rates (cf. Morris 1984; Killian 1984; Heirich 1968). Even analysts who interpret strike waves as evidence that no organization can entirely contain labor's mass energy assume that contagion is rare in established movements (Crouch and Pizzorno 1978; Cronin 1979, 1989).

We argue that strikes create further strikes in both established and unestablished labor movements. We argue that strikes transmit information about grievances, opportunities for striking, and the favorability of bargaining conditions. Furthermore, whether or not strikes are the primary vehicle for communicating this information has direct effects on actual patterns of strike clustering.

We use event history methods to determine whether strikes encouraged further strike activity and how their influence changed over a 50-year period in French coal mining. The choice of method is important because inappropriate methodology can change findings. For example, we believe that past studies that found no diffusion in collective action, such as Spilerman's (1971), relied on misleading aggregated event counts (Tuma and Hannan 1984; Olzak 1989, p. 136; Strang 1990).

THE NEGLECT OF IMITATION IN MODELS OF STRIKES

Labor movement theorists typically downplay the role of imitation in strikes because they associate contagion with an assertion that participation in social protest is irrational. Before the advent of resource mobilization theory, contagion was viewed by authors such as Lebon (1896), Tarde (1962), and Kornhauser (1959) as a pathological transmission of maladaptive aggressive impulses. The materialist social movements literature of the 1970s and 1980s commendably sought to correct this misfocus

by explaining collective action in terms of rational responses to external economic and political realities. Cultural explanations gave way to structural explanations, with formal organization in particular playing a central role (Tilly 1978; Oberschall 1980).

This emphasis on organizational structure and rationality has been desirable. But it is one thing to say protest is a calculated response to economic circumstances and another to argue that workers are omniscient. The assumption of perfect rationality is untenable, either for the working class or for capitalists.

Decision theorists have shown that irrationality is an important component in the decision making of employers, even when those employers are attempting to maximize profits. Poor business decisions can be the result of outright miscalculation or the pursuit of nonprofit-related goals such as minimizing executive workloads (Cyert and March 1963; March and Olsen 1976; Simon 1957). However, an especially important contributor to managerial error is a lack of adequate information concerning the firm's environment. Kenneth Arrow (1974) has argued compellingly that information is not cost free. Because of this, firms invest a limited amount of resources in search behavior and then make decisions based on partial data.

The literature on organizational uses of information suggests three propositions about the rationality of firms.

PROPOSITION 1.—*Firms often fail to respond to significant changes in their environment due to lack of awareness* (Cyert and March 1963). The slow response of the American automobile industry to Japanese competition is a well-known example of this phenomenon.

PROPOSITION 2.—*Significant events serve to bring environmental changes to the attention of management*. Dramatic events such as mergers can provide information that the firm was lacking or can stimulate the firm to increase its search activity (Nelson and Winter 1982; Schelling 1960). Most of the information searches documented in Cyert and March's case studies on changes in organizational expectations were stimulated by either crises (such as accidents) or external stimuli (such as major proposals from vendors).

PROPOSITION 3.—*Firms respond to limited information by imitating other successful firms*, a process DiMaggio and Powell (1983) refer to as "mimetic isomorphism." Mimetic isomorphism is less rational than a considered examination of all alternatives; however, imitation can approximate rationality if both firms share similar environments.

We argue that what applies to firms applies to organized workers. Specifically,

COROLLARY 1.—*Workers often fail to strike because they lack information of potentially favorable environmental changes*.

COROLLARY 2.—*Strikes in other workplaces provide information that such positive changes have occurred.*

COROLLARY 3.—*Strikes produce imitative striking, because the information carried in the stimuli strike induces workers to think about their own strategic opportunities.*

HOW STRIKES STIMULATE FURTHER MOBILIZATION

There are at least three mechanisms by which strikes stimulate further strikes. All of these involve some form of transfer of information.

1. *Consciousness-raising.*—Protests can raise workers' consciousness by making them aware of new potential grievances. Strikes encourage those who could benefit from change to rethink their situation. News of a strike can open up debate and offer the interpretive frameworks required to transform amorphous dissatisfaction into concrete, articulated demands (Perrot 1987; Oberschall 1989; Chong 1991). Hypothetically, news that strikers elsewhere have won limitations on work hours may encourage workers who have limited their demands to wage gains to start a campaign newly focused on shop floor disputes. More concretely, Mann (1973) argues that the 1968 French strike wave reflected the rapid reorientation that strikes triggered among those who harbored "latent" revolutionary consciousness.

2. *Date setting.*—Protests can define an occasion for action. Both Schelling (1960) and Spilerman (1971) have noted that protests are both short and rare, while the institutional conditions that create protests exist for long periods of time. An upswing in a business cycle can last six months or several years.² Any one of the 180 days within that period might be appropriate for a strike. Workers often need an arbitrary date to represent a focus point for collective action; May first has served this function in many European countries. Stimuli strikes can serve to notify the rest of the labor force that the time to strike is now; other unionists coordinate their protests in sympathy or in support of the lead-off action.

3. *Tactical guidance.*—Strikes provide information on the relative strength of workers and authorities. Other workers' protests provide demonstrations of the tactical opportunities that are available in parallel settings. Gamson (1992) argues that protests are frequently inhibited by perceptions of powerlessness. Successful strikes can overcome this inertia by demonstrating particular employer vulnerabilities.

² In the case study being considered, Third Republic French coal mining, the average boom or bust lasted 3.24 years. Some economic cycles lasted considerably longer; the department of Pas-de-Calais enjoyed a 24-year period of uninterrupted growth between 1890 and 1914; Savoie suffered an unbroken 10-year decline between 1924 and 1935.

This is particularly the case if strikes introduce new tactics. Doug McAdam (1983) and Pitcher, Hamblin, and Miller (1978) showed that waves of civil rights agitation and other forms of protest correlated with the diffusion of information concerning the success of new forms of protest such as boycotts.³ Innovative strikes provide information about the viability of new strategies. These can include the introduction of novel demands, innovations in bargaining itself, attempts to form coalitions with unusual outsiders, or the use of atypical defenses of the integrity of the picket line. The enormous influence of the introduction of the sitdown strike in the 1930s by the Congress of Industrial Organizations (CIO) is a well-known example of this process (Fine 1969).

All three of these arguments suggest that, in contexts where strikes serve as occasions for mobilization, one should expect the following hypothesis.

HYPOTHESIS 1.—Strikes will stimulate further strikes, net of the objective bargaining strength of labor.

DETERMINANTS OF THE RATE OF STRIKE IMITATION

Not all strikes should produce the same degree of imitative action. We argue that the extent and speed of imitation depends on two factors: the extent of unionization and the success of the stimuli strike.

Unions and formal organization.—Unionization should increase the rate at which workers imitate strikes. Unions increase the flow of information about stimuli strikes. One of the most important activities of union organizers is to obtain support for strikers by communicating with other workers and with interested third parties. Militants' attempts to widen the struggle involve telling the story of the strike to related workers. Through direct appeals to potential strikers, contacts with other union leaders, and publicity campaigns using leaflets and mass media, organizers spread the word about the existence of the strike, the grievances that motivated it, the relative vulnerability of the employer, and the positive contribution of the union. Mobilization in its essence involves the broadcasting of data, often with the explicit purpose of generating an imitative response (Jenkins 1983; Tilly 1978; Klandermans 1984).

HYPOTHESIS 2.—Unionized areas will be more likely to imitate stimuli strikes than will nonunionized areas.

Strike success.—We expect that successful strikes will produce more imitation than failed strikes. Much of the information that strikes trans-

³ Direct evidence for the role of new information was directly provided in McAdam (1983); Pitcher et al. (1978) inferred such a role from the mathematical forms of the curves they were able to fit to their data.

mit involves the relative likelihood that workers will win their strikes. A failed strike may still communicate new grievances, identify an occasion for action, or even teach strategic lessons (by showing what not to do). Successes, however, also demonstrate favorable environmental change and directly illustrate presently existing employer vulnerabilities. Strikes can provide evidence of favorable bargaining conditions. Strikes are not the only source of information on current economic conditions, but without evidence from other strikes workers may not know whether firms can obtain supplies of replacement labor, nor may they be able to measure firms' actual vulnerability to deadline pressure. Workers do not need strikes to know when an ostensibly liberal government has been voted into power. Without strikes, however, they may not know whether the new regime will actually prosecute strikers (Hicks 1932; Cousineau and Lacroix 1986).⁴

HYPOTHESIS 3.—Successful strikes will stimulate more strikes than unsuccessful strikes.

IDENTIFYING THE EXACT STIMULUS OF STRIKE IMITATION

Social factors not only affect the overall probability that imitation will occur; they also affect the exact stimulus that produces the secondary strike. What is particularly of interest is whether this stimulus is the beginning or ending of the initial strike. The predictions that follow are based on a consideration of precisely when various types of information become available to workers. Some data are transmitted at the beginning of strikes; other data are delayed until the end of strikes. Information relevant to the consciousness-raising and date-setting information should be broadcast at the beginning of strikes. Tactical information, in contrast, tends to come at the termination of the conflict.

The beginning of a strike generates the news that a strike has occurred. This news can serve the date-setting function by giving workers an occasion to strike in solidarity; alternatively, the strike may stimulate workers to proceed with a previously planned action. The beginning of a strike also commences the consciousness-raising process. With the news that a strike has occurred comes the news of "what the issues are." Strike issues are the articulated demands made by unions specifying why their wages or working conditions are inadequate. The broadcasting of these

⁴ It could be asked why failed strikes ever generate imitation. In some cases, workers may be able to avoid the causes that caused the stimuli strike to fail. Union tactical errors are an example of a strategic liability that could lose a strike in one setting but suggest possibilities for victories in other settings.

grievances is a reminder to other workers that they too may face similar circumstances.⁵

Tactical information is more likely to be transmitted by the conclusion of strikes. Workers need to know what worked and what did not work. To understand this, they need to know whether the strike was won or lost. To be sure, some intermediate information may become available during the course of the strike, such as news of arrests of strikers, or cancelled contracts from customers. These developments, however, are only meaningful in the light of whether workers finally achieved their demands; this can only be known from the strike settlement that occurs at termination.

These considerations lead us to argue that workers will begin imitative striking after the beginning of stimuli strikes when rates of unionization are low and average strike durations are long. Workers will defer imitating strikes until the conclusion of the stimulus when rates of unionization are high and average strike durations are short.

Unionization and Waiting for the Conclusion of Strikes

Why should high unionization be associated with strike imitation at the conclusion of stimuli strikes? We previously argued that unionization raises the overall rate of strike imitation by spreading information about strikes. Balancing this function, however, is the fact that the increased institutionalization of the labor movement increases the amount of information available overall through routine administrative channels. This makes strikes less capable by themselves of provoking imitative striking. In particular, formal organization obviates the consciousness-raising and date-setting functions of stimuli strikes. In contrast, the tactical information function of strikes continues to be important.

Union activities can provide alternative forums for consciousness-raising. Routine union communication serves the function of raising workers' concerns over potential grievances; union meetings and publications can sensitize workers to issues concerning workplace hazards or adverse technological change. Centralized union governance can also solve the problem of date selection: union leaders select strike dates themselves.

In contrast, no form of routine union action provides accurate measures of workers' strength relative to unions; it is necessary to see the

⁵ The beginning of stimuli strikes also represents the commencement of campaigns by militants seeking public support for the strikers. Mass media appearances, pamphlets, interviews, and presentations to unionists all helped to convey the salience of the strikers' grievances to other workers.

results of actual strikes to get strength estimates. It has been argued that collective bargaining can serve this tactical information function by allowing union and management to share economic data (Hicks 1932; Ross and Hartman 1960; Kerr et al. 1960; Dahrendorf 1959). The exchange of strategically relevant information in collective bargaining, however, is rarely frank or complete. Both parties have an interest in overrepresenting their strengths in the hope of intimidating their opponent into premature concessions (Walton and McKersie 1965). Furthermore, management will continue to have superior access to information on the profitability of the firm, while the union will have superior access to information on its own capacity to generate a high turnout. In addition, certain key data, such as the availability of replacement labor or the favorability of government response, may be unknown to both parties until a strike commences. As a result, bargaining theorists have obtained greater predictive power with models that assume incomplete, asymmetric stocks of information during the negotiating process that become equalized only with data that becomes available during the course of actual strikes (Tracy 1986; Hayes 1984; Cousineau and Lacroix 1986).

Note that the strike functions that have withered away, consciousness-raising and date setting, involved transfers of information that occurred at the beginning of strikes. In contrast, the function that remains, tactical guidance, entails information obtained from the end of strikes. This suggests the following hypothesis.

HYPOTHESIS 4.—As unionization increases, strikes are more likely to be triggered by the termination rather than the inception of stimuli strikes.

Short Average Strike Duration and Waiting for the Conclusion of Strikes

Strike imitation should be more likely to occur at the termination rather than the inception of stimuli strikes when the average length of similar strikes has been short. Not all the information carried by a strike is readily available at the strike's inception. In order to know the result, one must wait until the strike's conclusion. To know if the state will intervene, one might have to wait between a week and a month. National governments rarely intervene in one day strikes; once the political process starts, preliminary administrative and legislative procedures consume substantial amounts of time. One may be able to know within a day or two of strike inception whether other workers will enter the action. One may have to wait longer to find out how long merchants will extend credit to strikers.

Strikes are more likely to be triggered by the termination of stimuli

strikes when it is feasible for workers to wait until the strike has been completed; that is, when strikes tend to be short. Ideally, unions would like to have complete information on stimuli strikes before deciding whether to imitate such action. When strikes last only a day or two, waiting for final results becomes feasible. If, however, the stimulus is likely to last a month or more, if workers wait for strike completion, they may lose all of the strategic advantages associated with striking at the present moment. Therefore, workers can decide whether to imitate a stimulus soon after the strike's beginning because no further information is likely to be forthcoming in the near future.

HYPOTHESIS 5.—Strikes are more likely to be triggered by the termination rather than the inception of stimuli strikes when mean strike lengths are short.

STRIKE CLUSTERING IN SYNDICALIST-ERA FRENCH COAL MINING

Case Selection

Hypotheses 1–5 will be tested with data on French coal mining strikes that took place from 1890 to 1935, a population selected for four reasons. First, there are high-quality data on both French coal mining strikes and on the economic and political factors that produced these strikes. Since one purpose of this article is to demonstrate that strikes cluster to a greater extent than would be expected from social structural factors, it is essential that the relevant environmental determinants of strikes be modeled accurately. There are very few data sets that contain both the strike materials and the highly disaggregated economic predictors that are required for this analysis. French coal mining is a happy exception.

Second, the data on French coal miners allows the precise dating of every strike that occurred within a 45-year period. The significance of the seemingly trivial matter of the availability of start and finish dates should not be underestimated—it is essential if one wishes to predict the effects of strike beginnings and endings on other strike activity. Most published strike data is aggregated by year. The unavailability of finer data has produced the large body of time-series analyses of annual data that is the mainstay of quantitative strike analysis (Isaac and Griffin 1989). One of the reasons why the interrelation of strikes has received so little scholarly attention thus far is the relative absence of materials with which one could test or demonstrate this relationship.

Third, French coal miners in the Third Republic were extremely militant and participated in a large number of strikes. Having a large N facilitates the use of multivariate analysis to identify the multiple causes of strike activity.

Fourth, we hypothesized that changes in unionization and average strike length would produce changes in the amount and pattern of clustering. French coal mining experienced a modest increase in formal unionization during this period and a more substantial decrease in the average length of strikes.

The Conservative Nature of the Present Test

As will be shown below, French coal mining strikes show a great deal of clustering. However, clustering can be due to a number of factors, such as common strike causes or participation in a centrally planned general strike, which have little to do with diffusion or imitation per se. In this analysis, we have taken a number of steps to purge these nondiffusive causes of clustering from the analysis. However, we have also gone farther and intentionally eliminated some of the legitimate sources of diffusion as well. The purpose of purging sources of bona fide diffusion is to minimize the likelihood of finding an imitative model fitting the data and thus provide a conservative bias to the analysis.

Avoiding Confusion about the Timing of Events

In particular, we treat all coal mining actions initiated in a single department on the same or consecutive days as a single "strike" incident.⁶ The only strikes that are viewed as having diffused are those that have occurred at least two days after the stimulus strike. In reality, a great deal of important diffusion occurs before the two-day measure used here. Among the important implications of this decision are the following:

1. *Common strikes.*—All strikes emerging from a common strike call in a general strike are merged into one incident if they started on the announced strike date or one day thereafter. *Thus, most of the strike clustering associated with general strikes is here treated as being nonimitative.*⁷ This decision is particularly important for the study of French coal miners who participated in no fewer than 11 national general strikes during this period.

2. *Event-related strikes.*—Strikes related to a common single event such as a mining disaster or a major pay day are merged in a similar fashion, that is, if they start on the day or the day after the stimulus. *Thus most of the strike clustering associated with common short-term causes is also treated as being nonimitative.*

⁶ Department (*département*) is, in France, the province- or state-level division of government.

⁷ A one-day threshold is adequate for this purpose, because there are no cases of the miner's union intentionally staggering the beginning of joint strikes over several days.

Avoiding Confusion about Spatial Relationships

We exclusively consider diffusion within single departments, without any concern for imitation across provincial lines. This is in contrast to studies such as those by Spilerman (1971) and Pitcher et al. (1978), who studied diffusion of conflicts over great geographical distances.

Limiting the Data to a Single Occupation

We exclusively consider diffusion within coal mining strikes, without any concern for imitation across occupational lines. This is in contrast to most of the literature on strike waves, which concerns itself with parallel actions among workers in different occupations and industries (Shorter and Tilly 1974; Cronin 1979).

Decisions about limiting spatial and occupational factors were originally made for methodological simplicity. However, excluding many of the important sources of imitation that could be considered provides a strong bias against supporting our theory by finding diffusion. Undoubtedly workers really react to the strikes of neighboring provinces and industries. If we allowed for the diffusion across departmental lines and across occupations (let alone the effects of general strikes and common one-day causes) the estimates of diffusion reported here (which are already sizable) would in fact be much higher.

Descriptive Analysis

French coal mining strikes show clear patterns of clustering that seem crudely consistent with the models of contagion that we have presented. This can be seen in figure 1 and table 1. Figure 1 plots the mean number of strikes per department-year for 1890–1913 and 1920–35. The basic data are from Shorter and Tilly's (1974) compilation of strike statistics from the *Statistiques des grèves*. We have corrected errors in this source with supplementary reports presented in the appendices to the *Statistiques*.⁸ All estimates are based on periods when at least one strike has occurred in the department since the last major disruption of labor relations—whether by war or by production interruptions of a year or more—so that we can include information on the length of time since the most recent potential trigger for action.⁹ Nineteen departments pro-

⁸ Alsace-Lorraine is excluded, since it was part of Germany rather than France in the prewar years. Since period effects are important to the analysis, it is important that the composition of cases be roughly comparable before and after the war.

⁹ Although this procedure theoretically biases the estimates of the strike rate upward, reestimating the basic clustering model on an enlarged data set that included all periods when normal production lasted at least two years (i.e., all periods when

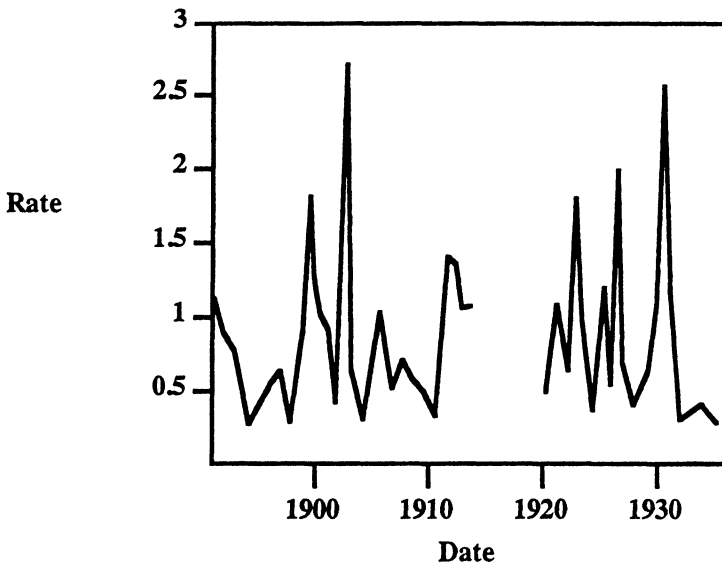


FIG. 1.—Medium-term temporal variation in observed strike initiation rate

duced coal continuously from 1890 to 1935, and 17 more did so intermittently, giving a total of 1,307 eligible department-years of industrial experience in which 654 strikes occurred. To obtain reasonably reliable estimates of long-term changes in the strike rate, we constructed intervals consisting of one or more consecutive quarter years during which at least 15 separate strikes occurred.¹⁰

Figure 1 shows substantial peaks in the levels of French coal mining strike activity. Strike rates varied between one strike per department-year to over three strikes per department-year without showing any obvious trend.¹¹ Table 1 lists 11 major national mobilizations that correspond

observed rates of dissipation imply negligible remaining perturbations from prior strikes) produced almost the same estimates.

¹⁰ See Cox and Oates (1984) and Wu (1989) for further discussion of the empirical hazard function.

¹¹ It has been suggested that these strike peaks correspond to the timing of national contract expirations in a fashion similar to the correspondence between postwar Italian strikes and contract expirations (Franzosi 1989). This is not entirely true. Before 1919, there were no national contracts. The expiration of big contracts in two big regions were associated with the strikes in 1902, 1906, and 1912. However, 17 of the 20 departments in the study were not covered by these contracts. In the postwar period, contracts lasted between six months and a year; therefore, national wage rates were renegotiated virtually every year between 1919 and 1930. To be sure, every strike wave during this period was associated with a contract expiration, but all the nonwave years had contract expirations as well.

TABLE 1

DURATION AND REGIONAL COORDINATION OF GENERAL STRIKE CALLS

Period	Name/Issue	Description
1890-1901	None	None
1902	Pension reform campaign	From September 24-November 15, beginning in Nord, with Pas de Calais joining on October 1, three additional departments on October 8, two departments on October 9, Alliers on October 10, and Aveyron on October 13.
1906	Courrièes disaster salary offensive	From March 14 to July 23, beginning in Pas-de-Calais, with Nord joining on March 19, Maine-et-Loire on April 5, Gard on April 9, Loire on April 10, Puy-de-Dome on April 17, Creuse on May 2, and Saone-Haute on May 7.
1912	Pension and eight-hour day	Thirteen departments struck, March 11-12.
1914	Pension reform	Twenty-three departments struck, February 23-March 3.
1919	Eight-hour day defense	Fifteen departments struck, February 23-March 3.
1921	Minoritaire salary defensive	Twenty-three departments struck, December 12-13.
1923	First communist salary offensive	Thirteen departments struck on February 16.
1923	Second communist salary offensive	Six departments struck, November 15-21.
1926	Communist strike in sympathy with English coal miners	Thirteen departments struck, August 9-10.
1930	Reformist paid vacation strike	Fifteen departments struck, October 6-7.
1933	Communist work hour reduction	Ten departments struck, April 3-6.

NOTE.—Regional general strikes and strikes unrelated to national offensives are excluded. Duration dates are calculated from the beginning of the first strike in the wave to the end of the last strike.

to some of the peaks that are noticeable in the diagram. The joint national mobilizations associated with creating these large-scale political strikes produce much of the clustering visible in figure 1. However, even if the effect of national mobilizations is removed, significant strike clustering can still be observed.

Figure 2 displays the gross empirical risk of French coal miners' strik-

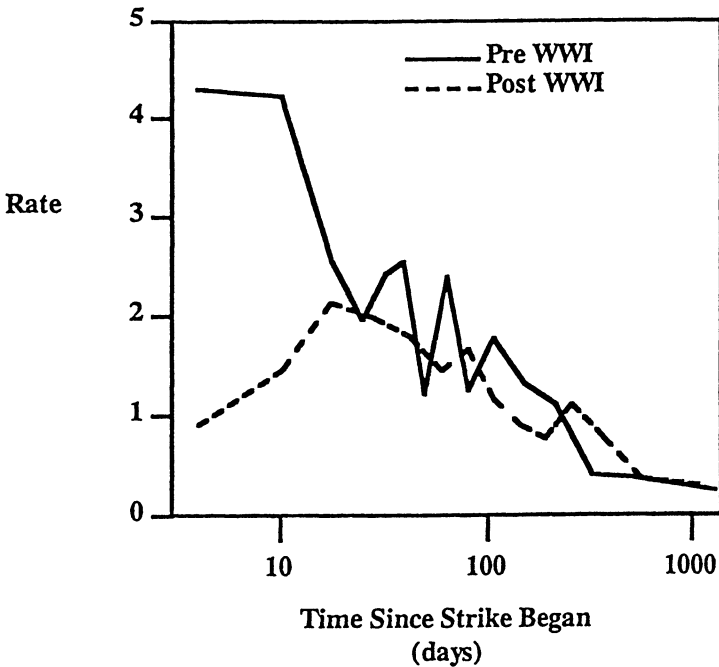


FIG. 2.—Observed strike initiation rate by time since strike began

ing for 1890–1913 and for 1920–35 as a function of the number of days it has been since a strike was last initiated in the department.¹² This provides a simple intuitive illustration of the degree to which coal mining strikes tend to immediately follow other coal mining strikes in the immediate area.

The findings displayed in figure 2 are quite strong. Before World War I, the odds of a strike occurring were the highest in the first week after a strike occurred; they then dropped precipitously thereafter. The strike rate in the first week after a stimulus was more than twice the rate a

¹² For each interval (u, v) , we calculate the rate as $S(u, v)/D(u, v)$ where $S(u, v)$ is the number of strikes and $D(u, v)$ summed over all departments the number of days during which the department was at risk of a strike and the most recent previous strike in that department that had occurred between u and v days previously. This procedure produces similar results to fitting a series of simple descriptive models with piecewise constant strike rates that depend solely on how long the department was strike free, i.e., models in which we partition the observed spell after each strike into a set of intervals $\{[t_0(p), t_1(p)]\}$ based on how long it has been since the most recent strike and estimate $r(x) = \sum b_p Z_p$ $p \in P$, where $Z_p = 0$ except on the interval $[t_0(p), t_1(p)]$, and $Z_p = 1$ for this p th interval.

month later. After World War I, strikers seem to have waited about a week after the start of a stimulus strike before commencing striking. Strike rates rose up to the one-month mark and then declined gradually thereafter.

We argue that these clusters are due to imitation, this imitation was caused by information transfer, and that the changing pattern of the two periods reflects a transition from the use of strike beginnings to the use of strike endings as the basis for imitation. Our primary support for this comes from event history analysis. It is useful, however, to consider the historical context to interpret the statistical results that follow.

HISTORICAL CONTEXT

Labor relations in Third Republic French coal mining underwent very significant change, moving from virtually complete union nonrecognition in 1890 to a relatively high level of labor institutionalization by 1935. This evolution was neither smooth, linear, nor homogenous across regions. The coal miners were able to win union acceptance first in the northern coalfields. In 1891, the Nord and Pas-de-Calais coal miners obtained the Convention of Arras, the first regional collective contract bargain negotiated in France. Thereafter, in the north, salaries were set by tripartite collective bargaining involving employers, the union, and the state. Between 1892 and 1902, most of the other major coalfields in France obtained similar concessions, with the majority of changes occurring after 1898. Before World War I, most regions had separate unions or, if they belonged to the national union, maintained significant regional autonomy. Local factional disputes were the norm. After the war, the national union obtained more control over its membership. However, the labor movement split into communist and noncommunist halves, and the noncommunists were debarred from participating in collective bargaining. In both periods, the north had more reformists than anarchists or communists and more stable tripartite bargaining. The south had more anarchists or communists than reformists and significant challenges to collective bargaining from both management and labor. Even with all these complexities, however, a certain basic picture emerges. Over time, participation in unions increased and collective bargaining increased. Over time, formal unions, as opposed to informal collectivities of workers, took on the task of educating workers about working conditions and strategic opportunities to improve them. Unions of all persuasions become more formalized and centralized. Thus, unions would have steadily replaced strikes as the primary carriers of information about industrial conflict (Cohn 1993; Trempe 1971; Gillet 1957; Amdur 1986).

Workers had very good reason to watch events at other coal mines

before planning their own industrial actions. Although the companies fought institutionalization with every resource at their disposal, in practice, informal national pattern bargaining became the norm, with wage settlements being set first in the North of France (Nord and Pas-de-Calais), then in a prominent central coalfield (Loire), and then elsewhere. However, because employers resisted every settlement regionally, inattentive miners risked obtaining settlements that were much worse than what was being obtained elsewhere (Cohn 1993; Gillet 1957; Bartuel and Ruillere 1923).

Interdependence was further fostered by a series of national political strikes. The French state intervened on many occasions on the miners' behalf, notably at Carmaux in 1892, at Montceau-les-Mines in 1899 and throughout the country as a whole in 1902 (Trempe 1971; Beaubernard 1981; Cohn 1993). The state was not entirely a dependable ally; the government crushed the Second Montceau-les-Mines Strike in 1900, the French Railway Nationalization Strike in 1919, and nearly every strike sponsored by communists (Beaubernard 1981; Gallie 1983; Reid 1985; Cohn 1993). The threat of large-scale political strikes, however, frequently produced short-term economic concessions and middle-term welfare state concessions. The Federation des Travailleurs de Sous-sol struck for and obtained restrictions on the length of the work day, an end to employer abuses of disability funds, and the institution of state-supervised pension plans, winning significant pay increases at the same time (de la Taille 1939; Hatzfeld 1971; Trempe 1984; Friedman 1990). After World War I, the national government became much more hostile to labor (Gallie 1983). Even in this period, however, there are numerous documented cases for French coal mining in which individual local prefects put substantial pressure on employers to make concessions in the wake of either reformist or communist strike agitation (Cohn 1993).¹³ Distant strikes increased the private concerns of regulators which in turn produced discreet measures on local miners' behalf.

As shown in figure 2, strike clusters occurred not only nationally but within departments as well. Many of these clusters can be attributed to the three types of information flow suggested in the discussion of theory at the opening of this article.

Consciousness-raising is particularly likely to have occurred in settings where relatively rare grievances occur in strikes in close proximity to

¹³ Examples include the 1925 wage negotiations in Decazeville, where a strike threat was averted by the prefect who, fearing a repeat of communist agitation elsewhere in the country, pressured management into raising a wage offer, and wage negotiations in Pas-de-Calais in 1932 where local officials lobbied for concessions at other mines after a communist-reformist joint strike in Ostricourt.

each other. One such rare grievance is over *longue coupes*, surprise assignments of overtime. These demands appear in fewer than 3% of all strikes. Nevertheless, in 1912, two such strikes occurred within 23 days of each other in two mines in Pas-de-Calais. In Gard in 1896, three separate mines held strikes demanding that a fired worker be replaced on October 3, October 12, and November 16. This cluster is likely to have been due to consciousness-raising rather than tactical instruction because all three demands were lost. In 1935, the only strikes in the country concerning job security occurred at two separate companies, one in the center and one in a suburb of Saint-Étienne. These occurred within 15 days of each other.

Date setting was a particular issue in the early days of the union. Central control over strike strategy was almost nonexistent. Strike decisions were made at the regional or even the company level. Although deliberations occurred at the national level, militants went out on their own initiative and then attempted to get other miners to join in. Table 1 above shows the start date for all of the national strike campaigns that occurred between 1890 and 1935. Note that between 1890 and 1901, although there were several major strikes, central leadership was too weak (and too conservative) to even consider making a national strike call. In 1902 and 1906, the local regions each joined the national strike on their own idiosyncratically chosen date. Table 1 actually underestimates the irregularities, because within departments individual mines went out on their own schedules. In 1902 for instance, there were no fewer than four starting dates in Nord.

The 1902 strike was a political strike to support legislation to win pension reforms and an eight-hour day. The relevant legislation had introduced in 1900. Because French lawmaking even on urgent matters was a very slow process, the bill was passed in 1905. Throughout this whole period, the union was actively lobbying for the bill and planning a strike to demonstrate workers' support. In 1902, it was known that some sort of strike was going to occur in combination with a salary offensive. When the miners of Douai went out on September 24, this was the date-setting occasion that miners throughout France were waiting for. Within three weeks, French coal miners everywhere were out on parallel strikes.

The diffusion of tactical information is likely in cases where conspicuous successes produced attempts at replicating those successes. In 1912 at Grand Croix, a mine in an isolated northern section of the Loire, workers obtained a relatively atypical victory in which they were able to overturn the firing of a worker with a four-hour strike. Forty days later, in one of the two other mines in the district, another four-hour strike was held that also overturned a firing decision (*Statistiques des grèves* 1912). In 1890, in the Loire, there was a long string of salary offensives.

Within a five-week period, two northern mines ran successful salary strikes. This produced a flurry of three strikes in three weeks among other North Loire mines. In the next three week-period, there were two salary offensives in southern Loire. When these lost, there was only one more offensive, in far South Loire, and the miners waited over six weeks before starting it.

We argued that unionization would both increase the rate of imitation and would make strike endings rather than strike beginnings the basis of imitation by eliminating the consciousness-raising and date-setting functions of strikes. In the 1890s, where unions existed, union meetings were somewhat irregular occurrences. Between 1893 and 1898, union meetings nearly disappeared in some departments as a result of a major defeat in 1893. Although the national union would see many defeats in later periods, the organization became sufficiently strong after 1898 that routine meetings continued to occur both during and between major organizational campaigns. This growing union activity, if not necessarily union membership, helped to provide a steady flow of consciousness-raising activity that would have reduced the special role of strikes in this regard. Likewise, as table 1 showed, the growing centralization of decision making concerning strikes eliminated the need to use strikes as a date-setting occasion. After World War I, the date of major strike offensives was known and publicized for weeks in advance.

We argued that successful strikes would be more likely to promote imitation. There was a slight tendency for strikes to become less successful in the postwar era. While the prewar years were characterized by booming demand for coal, the postwar years experienced more irregular demand. While coal sales were brisk in the rebuilding years after World War I, the late 1920s saw increasing global competition and were followed by the collapse of demand with the Great Depression in the 1930s (Peyerimhoff 1931; Sauvy 1972; Lafitte-Laplace 1933; Trempe 1971). The state before the war was, with exceptions, relatively supportive of strikers (Trempe 1971; Perrot 1974; Friedman 1990).¹⁴ In the aftermath of the Russian Revolution, the failed 1920 Communist Railway Nationalization Strike, and French governmental ownership of the mines of the Saar, the French state became significantly more sympathetic to the social and economic concerns of coal employers. The union movement was further weakened by a split within organized labor between the reformists and the communists.

¹⁴ Actually, a more accurate statement would be that the state supported strikers who were orderly. Coal strikes routinely brought out large contingents of troops to protect the physical property of the mines. Strikers who merely picketed were allowed to protest in peace. Those who engaged in sabotage or violence, which many did, were repressed in force (Perrot 1974; Trempe 1971; Stearns 1968).

A further change was that strike duration shortened after World War I. The average strike lasted 12.8 days in the period 1890–1913, but only 6.3 days in the period 1920–35. This change occurred for many reasons, one of which was the growing hostility of the government. Strikes need to be long in order to attract national attention; with the state no longer a dependable ally, strikers were more inclined to settle their disputes locally. Another reason for the shortening was the coal surplus of the 1930s, as it ended the cutting off of customers' energy supplies as a viable strike tactic. With shorter strikes, it became more feasible to wait to see the results of the strike before committing oneself to action. Such caution was especially important in the postwar period because bargaining conditions did not favor labor.

MATHEMATICAL MODELS

The primary statistical methodology used is event-history analysis. The dependent variable throughout this article is the strike rate, defined as the instantaneous probability of workers in one or more coal mines within a department initiating a strike.¹⁵ This is given as

$$r(\tau) \equiv \lim_{\epsilon}^0 \frac{\text{prob}(\text{strike during}[\tau, \tau + \epsilon])}{\epsilon}, \quad (1)$$

for any time τ . We predict this rate from three types of factors: (a) the population of mines in the department that are at risk of striking; (b) a set of department-level control variables that measure traditional economic and sociological determinants of strikes; and (c) a set of variables that reflect the beginnings, ends, and properties of the stimuli strikes.

Controlling for the number of mines in the department is necessary because departments with many mines will generally have more strikes. This could create an artifactual correlation between stimuli strikes and response strikes because large departments will have more of each.

We use the following control variables: employment, pay level, price change, pay variability, and unionization. The first three variables are orthodox measures of the business cycle used by bargaining power theorists such as Ashenfelter and Johnson (1969), Rees (1952), and Hibbs (1976). It is now generally accepted that strikes are likely to correlate with the upturn of the business cycle, even in settings supposedly charac-

¹⁵ In principle, it would be interesting also to model the size of these strikes to determine if stimuli generate a large or a small response. Methodologically, it is difficult to incorporate such a continuous dependent variable into an events history analysis which requires discrete events. Theoretically, such a task would involve the generation and testing of a theory of the local organizational and social determinants of strike turnout. Even if all the data for such an endeavor were available, such a large project would be beyond the scope of this article.

terized by low levels of institutionalization of labor conflict (Franzosi 1989). Pay variability is a measure of instability of the bargaining environment; such a concept is central to neoclassical theories of strikes (Hicks 1932; Cousineau and Lacroix 1986; Tracy 1987).¹⁶ Following resource mobilization theory, we include unionization; workers who are better organized should have greater capacities to participate in social conflict.¹⁷

We include data on the following aspects of stimuli strikes: their beginning, their resolution, whether they were a success or a failure, their expected duration, and the percentage of mines involved in the strike. All except percentage of mines involved were explicitly invoked in the hypotheses. The percentage of mines involved is a control variable. Neoclassical strike theory (Schnell and Gramm 1987; Cousineau and Lacroix 1986) and power balance models (Korpi and Shalev 1980) all imply that strikes will be less likely to recur in firms that have recently experienced a strike. Also, any sensible model of clustering needs to allow for some damping mechanism. In some models these are interacted with period to test for the effects of historical eras.

Our models have the general form

$$r = D(x) [A(x) + B_i(x)e^{C_i(x)t_i}], \quad (2)$$

during the strike, and

$$r = D(x) [A(x) + B_i(x)e^{C_i(x)t_i}], \quad (3)$$

after the strike, where x is the vector of independent variables, be they population at risk, control, or stimuli strike related, t_i is the time since the strike started, and t_j is the time since the last strike ended. Also, $A(x) \equiv e^{a \cdot x}$ models the asymptotic, or "baseline," strike rate.¹⁸ This is the rate once earlier strikes are no longer influential, and it depends on other conditions that affect the ease of mobilizing and the likelihood of success. The economic control variables are included here because they operate independently of the behavior of the stimuli strikes. Thus, $B_i(x) \equiv e^{b_i \cdot x}$

¹⁶ Korpi's (1978) theory of strikes suggests that the relationship between bargaining power and strikes is curvilinear and that a quadratic relationship might be fitted to these data. Cohn and Eaton (1989) show that the relationship between bargaining power and French coal mining strikes tends to be fairly linear, with strikes being concentrated among miners with high rather than intermediate levels of strategic resources.

¹⁷ It has been suggested that since there were important ethnic splits in the French mining labor force, namely Poles vs. natives, that controls for this should be applied to the analysis. A previously published analysis (Cohn 1993) found negligible effects of ethnicity on either coal wages or coal strike rates.

¹⁸ The dot product of the coefficient vector and the vector of independent variables is given by $a \cdot x$.

and $B_r(x) \equiv e^{br \cdot x}$ model the initial rise in the rate after a strike begins and ends, respectively. Here, $C_i(x) \equiv c_i \cdot x$ and $C_r(x) \equiv c_r \cdot x$ model the gradual dissipation of the impact of strike initiation or resolution on the rate. They give the time constant of the exponential decay of the rate back to the asymptotic level. The effects of stimuli strikes appear in these B and C components.

The vector $D(x) \equiv e^{d \cdot x}$ is an overall multiplicative factor that allows us to control for the scale of the population at risk. In this analysis, the vector d has only one nonzero element, d_M , which is the coefficient of M or the number of mines operating normally in the department.

In order to obtain estimates with RATE, which does not directly support the simultaneous use of two time intervals as specified in equation (3), we actually estimated and report coefficients for the following general form

$$r = D(x) [A(x) + B(x)e^{C(x)t}], \quad (4)$$

where t is the time since the last strike began or ended. In order to capture the separate effects of the initiation and resolution of the previous strike, we defined the dummy variables *initiation* and *resolution*. Including these, plus the product of strike duration and resolution, as components of x with nonzero B and C coefficients allows us to estimate the model specified by equation (3).

DATA AND SOURCES

The sources and codings for the dependent variable were discussed previously. The number of mines is calculated as the number of mines in production in a department at the beginning of the calendar year minus those currently on strike. This data comes from the *Statistiques de l'industrie minière*. The number of mines on strike came from the *Statistiques des grèves*.¹⁹

All of the controls except for *Fraction involved* come from the *Statistiques de l'industrie minière*. *Employment* is defined as the number of workers in the coal mining industry for each department. *Pay level* is the total wages in real francs paid to coal employees during the current calendar year divided by the total days of employment in that year. Using daily rates eliminates the impact of work reductions caused by strikes. *Price change* is the difference between contemporary coal prices and the average price of coal over a five-year period divided by the variance in coal prices for this period. *Pay variability* is the variance in the pay level

¹⁹ In some cases, the number of mines on strike had to be estimated from the percentage of miners on strike and the miner-to-mine ratio in parallel work stoppages.

over a five-year period (after standardizing the mean pay level for each observation to be coded "1").

Unionization is a dummy variable coded "1" for departments in which union membership averaged over 5% of all coal miners. This threshold may seem low to American readers, but in French coal mining, this represents a significant level of unionization. Unlike contemporary U.S. unions, French unions had significant free ridership problems with a large percentage of union supporters neither paying dues nor formally joining the syndicate (Lorwin 1954; Friedman 1988). These workers did however support strikes, and settings with official union membership of 5% could experience walkouts involving the vast majority of workers. Union membership estimates come from the *Annuaire des syndicats* for 1898, 1901–3, 1905, 1909, 1911 and 1912, and from annual reports issued by the Federation des Travailleurs Sous-Sol for 1931 and the Federation Unitaire des Travailleurs Sous-Sol for 1922–8. This dummy variable is admittedly crude. Union membership data for France is unusually bad, making detailed measures of changes in union density impracticable. Prost (1964) has shown that variations in union membership statistics are frequently artifacts of record keeping rather than substantive differences. The present measure confines itself to gross long-term differences between departments, which are more likely than annual differentials to be robust.²⁰

Initiation is a dummy variable that is coded "1" if the most recent strike in the department is still in progress. *Resolution* is a dummy variable that is coded "1" if the most recent strike in the department has ended. Note that both initiation and resolution only refer to strikes within the department; no attempt is made to model imitation across department lines. This too provides a conservative bias to the analysis by ignoring all interregional diffusion processes.

Fraction involved is the proportion of currently active mines in the department mobilized by the most recent strike. *Success* is coded as "1" if employers made concessions in response to strike demands during the most recent strike in the department and "0" otherwise. Compromises are thus treated as victories. Like the other strike measures, success comes from the *Statistiques des grèves*.

Expected duration is a moving average of the duration of strikes that occurred in the department over the previous year where the contribution of each strike to the average varies inversely with the number of days ago that the strike occurred. In departments where no strikes occurred

²⁰ Note that the prewar data are of a higher quality than the postwar data, since the prewar data are public and somewhat objective, while the postwar data are private and inflated. This is another reason for using crude dummy measures that minimize sensitivity to period differences in reporting accuracy.

TABLE 2

MAXIMUM-LIKELIHOOD ESTIMATES OF THE IMPACT OF THE MOST RECENT STRIKE ON THE STRIKE RATE

VARIABLE	MODEL 1		Model 2		Model 3	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Multiplier (<i>D</i>):						
Mines	4.56***	.25	1.83***	.32	1.83***	.32
Asymptote (<i>A</i>):						
Pre-WWI	-1.00***	.07	-1.63***	.17	-1.54***	.13
Post-WWI	-.85***	.07	-1.31***	.16	-1.59***	.32
Initial rise after trigger event (<i>B</i>):						
Initiation			1.19***	.31		
Pre-WWI					1.68***	.38
Post-WWI					-1.50	1.36
Resolution .....			.82***	.17		
Pre-WWI					1.04***	.18
Post-WWI .....					.51**	.17
Duration			-.042	.024		
Pre-WWI					-.072**	.026
Post-WWI					-.012	.014
Involvement			-1.65	.34	-1.46***	.30
Rate of decline after trigger event (<i>C</i>):						
Initiation			-13.59	7.35		
Pre-WWI					-25.64	13.33
Post-WWI					36.88*	17.21
Resolution			-1.24***	.21		
Pre-WWI					-1.57***	.32
Post-WWI					-.71**	.23
Model χ^2 (<i>df</i>)	266.38 (2)		569.84 (8)		587.29 (13)	

NOTE.—Based on 654 strikes that occurred during 1,307 department-years of industrial experience. Pre-WWI = before World War I (1890–1913); post-WWI = after World War I (1920–35). “Initiation” refers to strike beginnings, “resolution” to endings. Involvement = fraction involvement.

- * $P < .05$.
- ** $P < .01$.
- *** $P < .001$.

during the previous year, the moving average for strikes in neighboring departments within the same coalfield is substituted.

FINDINGS

Table 2 reports three models designed to test the first part of hypothesis 1: strikes will stimulate further strikes. The table also confirms the graphical analyses presented in figure 2. Table 2 and all subsequent tables report

coefficients and asymptotic standard errors based on maximum-likelihood estimation. Model 1 is a baseline model. It assumes that all mines are equally prone to strikes and successive strikes are independent, so that only the number of mines in operation and the period affect the departmental rate. The summary χ^2 statistics reported for all subsequent models should be compared to this baseline χ^2 statistic. Model 2 allows for the possibility that strikes temporarily encourage additional activity but does not allow for any difference between the pre- and postwar periods as to the form of this effect. Such a model would seem implausible given the period effects noted in figure 2. Model 2 does represent, however, the simplest possible test for clustering or imitative striking. The improvement in fit over model 1 ($\chi^2 = 303.46$; 6 *df*; $P < .0001$) provides evidence of clustering. Finally, model 3 improves on 2 by the form of reaction to strike initiations or resolutions to vary by period. This is the best fitting model in the table with an improvement over model 2 ($\chi^2 = 17.45$; 5 *df*; $P < .01$).

There are important differences between the coefficients for the two periods. Strikes are stimulated by both strike initiations and strike resolutions before World War I; however, after World War I only strike resolutions stimulated further strike activity. Model 3 suggests, however, that before the war the annualized departmental strike rate rose by over seven strikes as soon as a stimuli strike was initiated. It rose by only one-half as much when a strike was settled. After the war, initiating a strike reduced the strike rate, but the rate increased by over two strikes when a strike was settled. The prewar period showed greater sensitivity to *both* initiations and resolutions than did the postwar period, a finding which is consistent with our claim that strikes carried more information in the less institutionalized era. However, that said, in the early period strike initiations were twice as important as resolutions, while in the postwar period resolutions were over seven times more important than initiations. This supports our claim that institutionalization and the shortening of strikes made strike endings less important than strike beginnings in producing imitative conflict.

Minor findings that can be obtained from model 3 include the following: the high sensitivity of strike rates to the number of mines in the department (a population-at-risk effect), the relative stability of strike rates before and after the war once the number of mines has been taken into account (note the similarity of the coefficients for the asymptotes for the two periods), and the tendency for stimuli strikes that involve a small percentage of the local labor force to stimulate more imitation than those that involve a larger percentage (note the negative coefficient for fraction involvement). This suggests that strikes spread to other mines rather than simply promoting repeat strikes in the same establishments. This is

consistent with a process of diffusion.²¹ Note that in this and in all other equations, the duration term and the various interactions associated with duration do not have a substantive interpretation. They are merely included to mathematically facilitate the estimation of separate initiation and resolution effects.

An objection could be made to the findings in table 2 (and in table 3 below): perhaps the clustering that is observed is the function of unmeasured interfirm similarities in grievances. To the extent that these grievances would be of long duration, such as overwork or low pay, it is hard to see why common grievances that last over a long period would produce strikes within days of each other, unless the first strike raised the consciousness of workers in the second location about the grievance. It is theoretically possible, however, that a short-term grievance could occur simultaneously in two places, with the strikes coinciding with this joint grievance. It is hard to imagine an empirically plausible example of such a phenomenon. Mining disasters are concentrated in one place. (Furthermore, more than 1,000 miners a year died in French coal mines from disasters. Few of these collapses produced strikes; less than 1% of all mining strikes made a safety claim.) Layoffs were generally plant specific; they were furthermore generally rare in coal mining until the Great Depression. Most mining strikes were about wages, the struggle for the eight-hour day, or improvements in pensions, all of which involved grievances of very long standing.

Table 3 completes the test of hypothesis 1 by assessing whether strikes stimulate further strikes *net of the objective bargaining strength of labor*. Models 4 and 5 have the same functional form as models 1 and 3, respectively, but the former pair allows for the influence of control variables on the baseline strike rate. These and subsequent models treat economic factors as affecting strike rates homogeneously throughout the period from 1890 to 1935, in the interests of efficiency. When we generalized model 4 to allow differences between the periods, the estimates of economic effects became much less stable, reflecting the high multicollinearity within the set of economic predictors.

The most important finding is that the addition of controls does not change the fundamental patterns observed in table 2. Once again, allowing for diffusion improves the fit substantially (model 5 vs. model 4, $\chi^2 = 133.7$; 11 *df*). Likewise, the relative importance of initiations and resolutions reverse themselves in the two periods. Initiations raised

²¹ We also checked for pure suppression or enhancement effects during strikes, but we have not reported coefficient estimates since these resulting models did not fit significantly better than model 3. These effects might be more important in contexts where strikes lasted longer.

French Coal Mining Strikes

TABLE 3

MAXIMUM-LIKELIHOOD ESTIMATES OF THE MOST RECENT STRIKE AND CONTROL
VARIABLES ON THE STRIKE RATE

VARIABLE	MODEL 3		MODEL 4	
	Coefficient	S.E.	Coefficient	S.E.
Multiplier (<i>D</i>):				
Mines	2.13***	.33	1.30***	.35
Asymptote (<i>A</i>):				
Pre-WWI	-12.63***	2.32	-16.03***	3.63
Post-WWI	-12.99***	2.39	-16.85***	3.76
Employment .....	.294***	.040	.349***	.067
Pay level	1.50***	.41	1.90**	.63
Pay variability .....	.168***	.040	.237***	.057
Price change .....	.223***	.042	.279***	.067
Unionization	-.03	.19	-.42	.42
Initial rise after				
trigger event (<i>B</i>):				
Initiation pre-WWI			2.13***	.63
Initiation post-WWI			-1.55	1.47
Resolution pre-WWI .....			.91**	.28
Resolution post-WWI			-.03	.24
Duration pre-WWI			-.174**	.060
Duration post-WWI			-.003	.010
Involvement			-1.09***	.29
Rate of decline after				
trigger event (<i>C</i>):				
Initiation pre-WWI			-59.26	39.80
Initiation post-WWI			-36.76**	17.83
Resolution pre-WWI			2.07*	.68
Resolution post-WWI			-1.09**	.17
Model χ^2 (<i>df</i>)	603.50 (7)		737.21 (18)	

NOTE.—See note to table 2.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

the strike rate three times more than did strike endings before the war, an effect not observed in the postwar period. Controlling for environmental variation improves the fit substantially (for the difference between model 3 and model 5, $\chi^2 = 149.52$; 5 *df*). It does not alter the earlier impression that strikes encouraged additional activity both before and after World War I. It is interesting that controlling for environmental factors actually increases the estimated impact of strike initiation before World War I. Controlling environmental conditions, however, reduces the estimated impact of strike resolution after World War I by about one-third.

The control variables behave largely as expected. Economic situations

that enhanced workers' bargaining power encouraged strikes throughout the period. Plentiful jobs had the greatest effect of encouraging strikes, but high wages and rising coal prices had effects of similar magnitude. We estimate, according to model 5, that workers who benefited from high employment, high wages, and rising coal prices simultaneously were about 15 times as likely to strike on their own initiative as were workers without these conditions.²²

Economic uncertainty also encouraged strikes. The 50% increase in baseline strike rates induced by volatile wages suggests that some strikes occurred because employers and workers had trouble predicting each other's responses accurately. However, the fact that economic uncertainty had a much smaller impact than did increases in workers' bargaining power supports orthodox sociological resource mobilization theories over the volatility driven theories of neoclassical labor economists. Nevertheless, both factors seem to have been important.

Neither unionization nor period seems to have significantly affected the overall likelihood of striking if we judge by the gross change in strike rates controlling for other environmental factors (model 4). Neither the impact of period nor the impact of higher departmental unionization was significant (.05 level). Notably, allowing for diffusion leads to higher rather than lower estimates of the extent to which environmental factors influenced strikes. All of the economic variables show greater effects in model 5 with the exception of number of mines.

Table 4 tests hypotheses 2 and 3, that unionization and success each increase the rate of imitation after a stimulus strike. Model 6 allows strike success and unionization to affect strike wave propagation differently before and after World War I improves significantly on model 5. The χ^2 statistic for the difference is 9.55 ($P < .05$; 4 *df*). However, the equation also suggests that unionization had the same effect in both periods since the difference in coefficients was not significant ($P < .05$). Only the coefficient for the postwar period differs significantly ($P < .1$) from zero, whereas the estimated coefficient is actually higher for the prewar period. The equation also demonstrates that success made no difference before the war, which is hardly surprising, given that strike initiation triggered most of the contagion in this period. However, success produced a strong and significant increase in the strike imitation rate after the war.

Consequently, we report a simpler model, model 7, which reflects these findings. Since there is no loss in predictive power when we replace

²² We gauged relative impacts by calculating the ratio of the strike rate associated with "high" and "low" levels of each factor. High and low levels are defined as one standard deviation above or below the mean for continuous variables. For dummies, values of "1" and "0" are used.

TABLE 4

MAXIMUM-LIKELIHOOD ESTIMATES OF THE IMPACT OF UNIONIZATION AND STRIKE OUTCOME ON THE STRIKE RATE

VARIABLE	MODEL 5		MODEL 6	
	Coefficient	S.E.	Coefficient	S.E.
Multiplier (<i>D</i>):				
Mines	1.32***	.35	1.32***	.35
Asymptote (<i>A</i>):				
Pre-WWI	-16.62***	3.82	-16.61***	3.81
Post-WWI	-17.61***	3.97	-17.62***	3.96
Employment .....	.367***	.070	.367***	.070
Pay level	2.00***	.67	2.00**	.67
Pay variability .....	.254***	.065	.255***	.065
Price change .....	.272***	.071	.227***	.070
Unionization .....	.18	.33	.19	.33
Initial rise after				
trigger event (<i>B</i>):				
Initiation pre-WWI	1.43	.87	1.54*	.71
Initiation post-WWI	-2.01	1.47	-2.04	1.46
Resolution pre-WWI .....	.14	.66	.29	.39
Resolution post-WWI	-.67	.38	-.69	.35
Duration pre-WWI	-.161**	.057	-.163**	.057
Duration post-WWI	-.009	.010	.009	.010
Involvement	-.91***	.27	-.91***	.27
Unionization .....			.60*	.29
Pre-WWI .....	.71	.60		
Post-WWI .....	.57	.23		
Success pre-WWI .....	.06	.29		
Success post-WWI .....	.44	.23	.44*	.23
Rate of decline after				
trigger event (<i>C</i>):				
Initiation pre-WWI	-56.6	40.3	-56.8	40.3
Initiation post-WWI	37.7*	17.6	37.8*	17.6
Resolution pre-WWI	1.99**	.72	2.00**	.71
Resolution post-WWI .....	.41**	.15	-.40**	.157
Model χ^2 (<i>df</i>)	745.72 (22)		745.64 (20)	

NOTES.—See note to table 2.

- * $P < .05$.
- ** $P < .01$.
- *** $P < .001$.

model 4 with model 5, and the union effect on clustering seems more reliably measured, we have used model 5 to explore how different situations affected strike activity.

Figures 3 and 4 plot estimated strike rates (based on model 5) as a function of elapsed time since the last strike in order to explore how success and unionization affected rates. Figure 3 shows how rates after

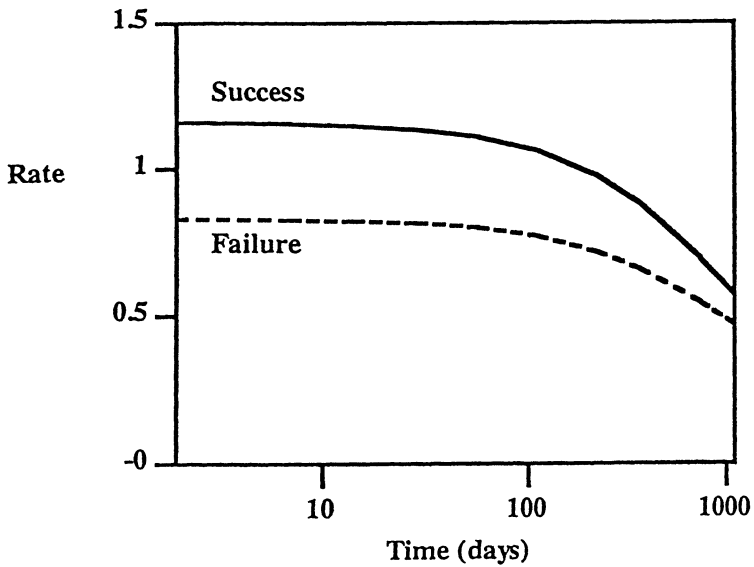


FIG. 3.—Estimated strike rate by time since last strike ended, success versus failure (rate refers to strikes per department-year).

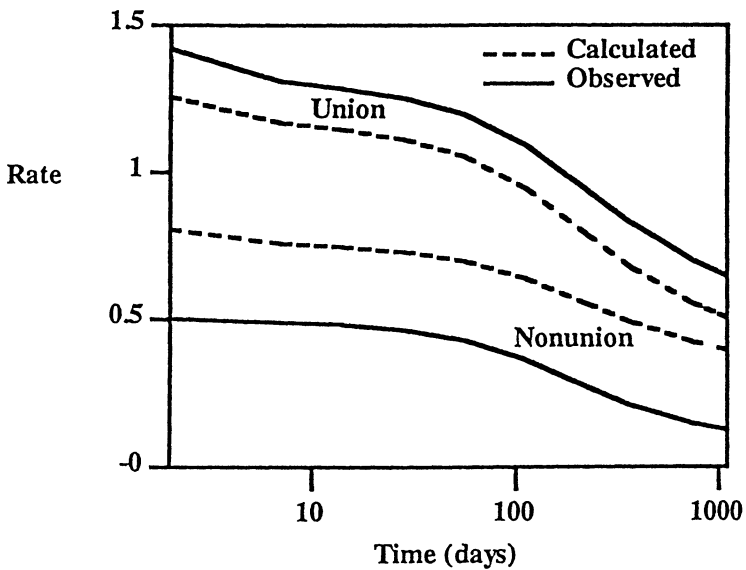


FIG. 4.—Estimated strike rate by time since last strike ended, observed versus calculated, union and nonunion (rate refers to strikes per department-year).

successful postwar strikes would have compared to the rates after failures if there had been no differences in the conditions under which these strikes occurred. Figure 4 shows both the direct effect of unionization and the gross impact of unionization. The latter includes the indirect effects due to the association of unionization with other conditions that encourage strikes.

Table 4 and figures 3 and 4 and show that strikes before World War I tended to spread as soon as they began and that resolving strikes probably did not enhance the likelihood of imitation. This is consistent with strikes raising consciousness about grievances and serving the function of setting dates for common action, but not with strikes being a measure of the relative strength of workers and employers. As such, this pattern fits the portrait of decentralized unionism that we suggested for the coal miners of the prewar period. The finding is also consistent with rapid strike imitation in the face of favorable bargaining conditions or strikes being too long to warrant waiting for resolution.

After World War I, the crucial information-triggering imitation apparently changed. Initiating a strike did not encourage other workers to strike. However, even resolving a strike unsuccessfully produced a rise about four-fifths as large as the prewar impact of strike initiation, and winning a strike induced rate increases over 50% greater than those produced by imitation in the prewar period. This may have been due to the salience of strike results in workers' strike decisions.

We have also estimated generalizations of this model: one in which the impact of unionization on the baseline activity differed by period, and one in which we allowed for the possibility that the baseline strike rate was suppressed or enhanced during strikes with the effects determined by the period. We have not reported coefficient estimates for these models, since none of the effects were significant.

Table 5 tests hypotheses 4 and 5, that is, whether unionization promotes further imitation and whether short expected strike duration shifts the stimulus for strike imitation from strike initiations to strike resolutions. Model 8 adds interactions between (a) unionization and (b) expected length of strikes and the initiation, resolution, and duration of strikes to the variables in model 7. Remember that expected duration is the average length of previous strikes in the department (or, where no strikes have previously occurred, region) while duration is the duration of the present strike. What is primarily of interest here are two contrasts: that between the union \times initiation and the union \times resolution terms, and the contrast between the expected duration \times initiation and the expected duration \times resolution terms. These contrasts tell us whether unionization or long expected duration have a greater effect on initiation or resolution in creating further strikes.

TABLE 5

MAXIMUM-LIKELIHOOD ESTIMATES OF THE IMPACT OF UNIONIZATION AND EXPECTED STRIKE LENGTH ON THE RELATIVE IMPORTANCE OF STRIKE INITIATIONS AND RESOLUTIONS IN STIMULATING STRIKE IMITATION

VARIABLE	MODEL 7	
	Coefficient	S.E.
Multiplier (<i>D</i>):		
Mines	1.40***	.40
Asymptote (<i>A</i>):		
Pre-WWI	-16.23***	3.85
Post-WWI	-17.37***	4.03
Employment .....	.37***	.060
Pay level	1.97**	.67
Pay variability .....	.28***	.070
Price change .....	.25***	.070
Initial rise after trigger event (<i>B</i>):		
Initiation pre-WWI .....	.38	1.18
Initiation post-WWI	-2.34	1.55
Resolution pre-WWI	-.28	.57
Resolution post-WWI	-.92	.49
Duration pre-WWI	-.11	.060
Duration post-WWI .....	.02	.020
Involvement	-.98***	.26
Success pre-WWI .....	.07	.28
Success post-WWI .....	.33	.21
Union × Initiation .....	.55	.99
Union × Resolution	1.38**	.45
Union × Duration	-.66	.02
Expected Duration × Initiation ..	.46*	.19
Expected Duration × Resolution	-.22*	.10
Expected Duration × Duration .....	.02	.01
Rate of decline after trigger event (<i>C</i>):		
Initiation pre-WWI	-38.6	24.9
Initiation post-WWI	35.4**	16.8
Resolution pre-WWI	-2.16**	.74
Resolution post-WWI	-.37**	.14
Model χ^2 (<i>df</i>)	758.67 (25)	

NOTE.—Bold entries constitute the key rates of unionization and expected duration.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

The results here are quite strong. Model 8 fits the data well and provides a statistically significant improvement in goodness of fit over model 7 ($\chi^2 = 12.96$; 5 *df*; $P < .05$). The unionization resolution term is nearly two and one-half times as large as the unionization \times initiation term. The resolution term is statistically greater than zero; the initiation term is not. This suggests that in unionized settings, strikes were far more likely to be stimulated by strike endings rather than strike beginnings. This reinforces our earlier suggestion that unions obviated the consciousness raising and date setting function of strikes, which work primarily through strike beginnings, but maintained the importance of strikes as providing tactical information, a function which works primarily through strike conclusions.

The expected duration \times initiation term is statistically significant and positive, while the expected duration \times resolution term is statistically significant and negative. This suggests that in settings where strikes tended to be long, strike imitation was stimulated by the beginnings of stimuli strikes and actually somewhat suppressed by the resolution of stimuli strikes. Where strikes were long, people did not wait for the final outcome of stimuli strikes; they started striking as soon as the news of the stimulus strike became available. When strikes were short, resolutions would have stimulated imitative striking, the relationship between expected duration and resolution being inverse. Workers waited for the full tactical information available from strike conclusions before acting.

Note that in this model, the period differences in the role of strike initiations and strike resolutions have now become insignificant. These differences were robust to the inclusion of control variables in table 3, and that the period effect for initiation (but not resolution) survived the inclusion of the analytical variables in table 4. This suggests that the tendency for strikes to be stimulated by strike initiations in the prewar period, but by strike resolutions in the postwar period is explained largely by the differential unionization and expected strike durations of the two periods.²³

CONCLUSION

Let us review the extent to which the preceding empirical analysis supports or does not support the hypotheses listed in the theory section.

²³ Unfortunately, we were unable to identify the detailed timing of these changes because of the data limitations discussed earlier. However, the evidence suggests a fairly rapid shift in the critical parameters. Allowing for trends in the importance of strike resolution and initiation, and in the impact of strike outcome and unionization within the prewar period or within the postwar period did not result in significantly better predictions of strike rates. Moreover, the trend estimates we calculated suggested that none of the parameters changed by more than about 1% during either period.

Hypothesis 1, the claim that strikes trigger other strikes, is overwhelmingly supported. The strongest evidence is the superior performance of model 5, which includes both control variables and clustering, over model 4, which includes control variables alone. Further support comes from the strong performance of strike initiation and resolution variables in models 2, 3, 6 and 7.

Hypothesis 2, that union areas had more strike imitation, is supported. This is shown in model 7, where unionization significantly increases the amount of strike activity that occurs after a stimulus strike. Note that this imitative gain completely accounts for the role of unions in increasing militancy. In no equation considered (models 4, 5, 6, and 7) did unionization increase baseline levels of militancy. Unionization is only significant in the *B* vector, not the *A* vector. This is likely to be an artifact of French unionism of the period. Given the informality of Third Republic unions, the reliance on spontaneous mobilization, and the neglect of developing either union membership or union bureaucratic resources per se, it is not surprising that the baseline effects of unionism are so limited. During peaceful periods, French unions did very little. Unionism only seems to have mattered when there was a strike that militants wanted to extend to other job sites. This is consistent with the informal syndicalist approach to strike organization that has been documented by Friedman (1985), Prost (1964), and Perrot (1987).

Hypothesis 3, that successful strikes generated higher rates of imitation than did failed strikes, is supported to some extent. Success of strikes in prompting other strikes seems to have mattered only in the postwar years. Model 7 shows a significantly greater increase in the strike rate for successful strikes than failed strikes for the postwar years. In the prewar years, the effect of strike success was zero. There are two possible explanations for this period effect. It could have been that, in the ebullient favorable bargaining environment of the prewar years, that workers were willing to discount news of failed strikes. A more likely explanation is that imitative strikes were instigated by strike initiations rather than conclusions. In the prewar years, workers had already struck before the results of the stimulus were known, making the effect of strike resolutions moot. In general, these findings show that workers were rational, and when they did consider strike results, they responded more favorably to victories.

Hypotheses 4, that unionization made strike endings the stimulus for strike imitation, which was addressed in table 5, showed in a fairly direct manner that unionization increased the rate of strike imitation induced by resolutions rather than initiations and that expected strike duration increased the rate of imitation induced by initiations rather than resolutions.

Hypothesis 5, that short average strike length made termination the

stimulus of imitation strikes, also had a similar effect. This suggests that, as unionization increased in France, strike waves would have become less tightly clustered. Greater levels of union mobilization of workers between strikes through routine union activities and the increased setting of common strike dates through central coordination would have lowered the salience of strike initiations as a basis for further striking. If workers began to wait for strike results of others before engaging in strikes themselves, this would produce strike waves that were less peaked, that is, longer and flatter. Note however, that unionization also raised the general rate of imitation. Once the results of strikes were in, unionized workers acted quickly.

The declining length of strikes would have had a similar effect. Shorter strikes gave workers the option of watching stimuli strikes in their entirety before casting their own strike votes. The cause of the decreasing length of French strikes over the 20th century is complex and could have had many causes, such as the growing use of strikes as political tactics or the increasing weakness of French unions at the shop floor (Shorter and Tilly 1974; Gallie 1983). In French coal mining, a critical issue seems to have been the institutionalization of coal mining strikes. Prewar strikes were often fundamental disputes over the class control of both the mines and the towns in which the mines were located; with employers resisting both union influence and state intermediation, these battles were often severely protracted. By World War I, institutional mechanisms of strike conciliation had been implemented with the full participation of employers. Even with complications, such as schisms in the labor movement and a state that vacillated between supporting workers and management, both collective bargaining and striking often became nearly ritual affairs, with the control over the terms of remuneration and the labor process resting squarely with management.²⁴ Strikes became short, as industrial stoppages became symbolic and routine; short strikes probably induced longer, flatter strike waves.²⁵

This research has implications for the general study of labor institutionalization. Most accounts of labor movement institutionalization emphasize the imposition of organizational discipline. They imply that union development and the growth of collective bargaining will reduce strike imitation because widespread disruption threatens organizational power (Piven and Cloward 1977; Marx 1989; Perlman 1928; Tilly 1978; Ingham 1974; Gamson 1990; McAdam et al. 1989). Bureaucratic unions made white-hot mobilization all but impossible by requiring extensive informa-

²⁴ For an extended discussion of these issues, see Cohn (1993).

²⁵ This comfortable pattern of routinized managerially dominated industrial relations came to a crashing halt in the explosive uprisings of the Popular Front of 1936.

tion gathering and consultation before strike calls (Perrot 1987; Michels 1962; Goodstein 1984).

There may be some truth to these assertions. We would argue, however, that even if bureaucratic unionism lowers overall strike rates, it concentrates the strikes that remain into short bursts of imitation and produces the potential for large, concentrated peaks. The centralized communication function of bureaucratic unionism insures that, once permission for striking is obtained from leaders, the diffusion of the relevant tactical information will occur quickly. In this century, the labor peace of the 1950s and 1960s is not inconsistent with the explosive bursts of 1968, when those strikes that occurred all took place in a very short time.

This study has extremely important implications as well for neoclassical strike theorists. Labor economists working within the neo-Hicksian tradition have explicitly argued that stimuli strikes inhibit rather than promote further striking (Cousineau and Lacroix 1986; Tracy 1989). The most forthright statement of this position comes from Schnell and Gramm (1987). They claim that strikes are a result of the inability of rational negotiators to foresee strike outcomes. Stimuli strikes serve the function of illustrating to noncombatants what the probable outcomes of their own strikes are likely to be, obviating the need for them to participate in conflict themselves.

If this argument were true, it would be hard to see why strike waves would exist at all; first strikes would eliminate all other striking in a nation. Total information could eliminate the need for striking; however, perfect information only exists in economic models. Strikes cluster because information from stimuli strikes is partial. Workers always strike in uncertainty. They are more likely to strike if the scraps of data at their disposal suggest that victory is likely.

There are lessons here for resource mobilization theorists as well. Access to economic and organization resources clearly promote conflict. The economic control variables in the model, such as wage and employment levels, have substantial predictive power. Information and ideas, however, played a role as well. Knowledge about social structure was at least as important as social structure itself. Economic and political factors are essential to the understanding of social conflict; however, unless one is willing to make unrealistic assumptions about perfect omniscience, no model of rational utility maximization is complete without some hard-boiled assessment of what actors do or do not know as they make decisions about fundamental matters in their life. For social movement theorists and sociologists in general, debates should not be about "culture versus economic structure." Discussions should concern how flows of information intermeditate the relationship between objective social realities and individual reactions to those realities.

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