The Workers of Nations

Industrial Relations in a Global Economy

Edited by
SANFORD M. JACOBY

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5

Strikes Around the World: A Game Theoretic Approach

GEORGE TSEBELIS and PETER LANGE

The bargaining power of labor vis-à-vis capital declined in the 1980s. A series of conditions contributed to this decline. Unemployment rose in most OECD countries; left-wing governments were replaced by the political right; internal differentiation weakened labor in negotiations; increased capital mobility strengthened the bargaining position of capital. However, these generalized conditions did not have a consistent impact on a central feature of the interaction between labor and capital in industrialized countries: strike activity. Days lost to strikes increased substantially in some OECD (Organization for Economic Cooperation and Development) countries, declined in others, and remained stable in still others (see Table 5.1). Why did similar trends in underlying conditions (decline of labor strength) produce different outcomes in strike activity?

Existing theories do not provide an adequate response to this question; some theories would expect increases and others would predict decreases in strikes, but none of them would expect differences in the direction of response. For example, while the literature on neocorporatist systems correctly foresees labor quiescence—". . . infrequent strike activity and wage restraint" (Cameron, 1984: 170; also Hibbs, 1978)—it remains silent as to why strike rates in corporatist countries like Norway and Sweden would increase in the 1980s.

Another literature expects strike activity to decline with bargaining centralization (Roomkin, 1976). Thus, a generalized increase in strike activity in the 1980s would be anticipated (due to the increase in labor differentiation).

Other theories drawn from economics (Ashenfelter and Johnson, 1969) and political sociology (Tilly, 1978; Snyder, 1975; Shorter and Tilly, 1974) expect a positive association between the strength of unions, and worker militancy and strikes. Such theories would expect a generalized decline in strike activity in the 1980s.

In fact, most existing theories hypothesize a monotonic relation between labor strength and strike activity. Thus, they lead one to expect a movement of strike

Table 5.1. Strikes in the 1970s and 1980s, Corporatism, and Government by the Left in OECD Countries

	Workdays lost[a]		Corporatism[b]			Left[c]
Country	1970s	1980s	C&D	S	C	W
Austria	23	6	1	1	3	49
Australia	3,146	2,050	10	—	10	34
Belgium	826	216	8	7	4	43
Canada	7,321	5,772	16	10	13	0
Denmark	507	450	4	4	6	90
Finland	1,062	976	5	4	5	59
France	3,374	1,207	11	11	14	9
Germany	1,165	744	6	8	8	35
Italy	20,490	11,103	13	13	12	0
Japan	4,443	465	14	—	15	2
Netherlands	166	78	7	6	7	32
New Zealand	292	542	9	—	—	60
Norway	64	204	2	2	2	83
Sweden	161	745	3	2	1	112
Switzerland	5	2	15	9	11	12
U.K.	12,870	8,037	12	12	9	44

[a] Average of thousands of workdays lost due to strikes or lockouts (source: *Yearbook of Labor Statistics*). The United States is omitted because in the 1980s data, strikes involving fewer than 1,000 people are excluded, so the numbers are not comparable.
[b] According to Calmfors and Driffill (C&D) (1988), Schmitter (S) (1981), and Cameron (C) (1984), respectively. The overall index of corporatism is the average of the three indicators. The ranking of some noncorporatist countries may have changed to reflect the omission of the United States from our data set.
[c] According to Wallerstein (W) (1989).

activity in the same direction for all countries in association with uniform changes in political and economic conditions.

Finally, variations in the direction of change of strike activity would be produced by simply hypothesizing that strike rates regress to the mean. If strike activity is random or has a strongly random component, then high or low measurements are less likely to be repeated than intermediate ones. Consequently, countries with high strike activity in the 1970s (like Italy) had nowhere to go but down, and countries with low strike activity (like Norway) were bound to experience an increase in strikes. If such an explanation were consistent with the data, it would eliminate the puzzle. Yet, as the data in Table 5.1 show, other countries do not follow the regression to the mean pattern. Despite the plethora of theories, therefore, we are left without a systematic explanation of the differences in the level and direction of change in strike activity.

This chapter presents a model of bargaining between labor and management that explains the differences in the trends in strike activity for different countries under

consistent changes in the underlying conditions. The bargaining model we propose produces a curvilinear relationship between labor bargaining power and strikes. Countries with strong or weak labor have low strike rates, while countries with intermediate levels of labor strength have high levels of strikes. A uniform reduction of labor strength moves countries formerly in the zone of high strength to the intermediate level, leading to an increase in strike activity, while countries from the intermediate level now move to the level of weak labor strength, producing a decline in strikes. Initially low-strength labor movements suffer a further decline in strength, and in strikes.

The argument that strike patterns vary in a curvilinear fashion with the bargaining power of labor has a general, and possibly controversial, policy implication: such a relationship challenges the conventional notion that conflict in democratic capitalist political economies is a direct function of the strength of the workers' movement. This notion underlies many of the commonplace assumptions about the kinds of policies toward labor and the union movement which can be expected of parties of the Left and Right when in government and should be pursued by such parties. In fact, to the extent that such governments are ultimately concerned with their own reelection and, as a result, with the performance of the economy and the negative impact of strikes, it may well be that, under certain conditions defining the strategic interaction between labor and capital, governments of the Right would do better to strengthen labor and governments of the Left to weaken it. Whether political pressures from their core constituencies will permit them to undertake such policies is, of course, another matter. To the extent they cannot, however, our analysis highlights the contradictory situation in which they find themselves, and why such a situation exists.

The chapter is organized into three sections. Section 1 reviews the relevant theoretical literature and compares its predictions regarding strike activity with the actual strike levels of the 1970s and 1980s. Section 2 presents a bargaining game with incomplete information between labor and management. The model predicts high strike activity at intermediate levels of labor strength and low levels at high and low levels of labor strength. Section 3 compares the expectations generated by this model to the actual record of strike activity in OECD countries.

POWER AND INFORMATION: A REVIEW OF SOME LITERATURE

There are primarily three theoretical approaches to the explanation of strikes in the existing literature.[1] The *bargaining power* approach[2] stresses the relative resources unions and employers can bring to bear as they bargain. The *information* approach focuses on the role of information in reaching efficient (and possibly strike-free) agreements. The *game theory* approach stresses the interaction between bargaining parties in an equilibrium context, but it has not been systematically applied to the analysis of labor-capital relations with the possibility of strikes. All three lines of analysis provide useful insights into why strikes occur, but each has theoretical and/or empirical limitations. We discuss each of these in turn.

Bargaining Power

The bargaining power approach, as we define it, includes all those theories of strikes that explain them as a function of the relative balance of resources (defined differently by different theories) which labor and capital bring to the process and through which they define the wage and other terms of the labor contract.[3] These theories develop hypotheses—sometimes relatively *ad hoc* or inductive—about how different states of the world—economic, political, social—affect the expectations and/or tactical opportunities of the bargaining adversaries. These hypotheses are then tested through time series regression analyses of aggregate strike behavior. The better of these models explain very high degrees of the variance in strike frequency.

Shalev (1980) makes an important distinction between two streams of theory, both of which fall within the bargaining power approach as we define it. First, some theories—predominantly in economics, which we refer to as "bargaining strength" theories—stress the role of economic variables and their effects on wage expectations and employers' willingness to pay. Strikes result from failures in bargaining due to workers' demands that exceed the employers' willingness to pay.

The *locus classicus* of this type of theory is that of Ashenfelter and Johnson (1969). In their model, workers pressure their leaders—who must be responsive for organizational reasons—for a wage increase which exceeds, and which the leaders understand to exceed, the level of wages their employers are willing to offer. If the employer judges the costs of a strike to be less onerous than paying the union's demand, a strike results. But the strike leads to a gradual reduction of the minimum wage workers are willing to accept until it reaches the level at which the strike can be brought to a close. Thus, strikes are the result of a "misalignment" between what workers expect from a contract and what employers are willing to give.

Operationally, strikes are expected to vary with unemployment levels, recent employer profitability, and past changes in real wages, all of which affect workers' wage expectations and/or employers' willingness to pay.[4] Strikes result from economic conditions which make labor more aggressive, leading it to make demands which employers cannot accept. The role of strikes is to realign workers' demands. The power of labor matters, but only because it leads to demands which are economically excessive, given the economic condition of employers.

The second stream of bargaining power explanations of strikes is found primarily in sociology and political science. It emphasizes a far broader range of variables affecting the "power resources" of labor and capital. In some of these theories, manifest conflict becomes more likely as the power resources of labor increase (Tilly, 1978; Snyder, 1975; Shorter and Tilly, 1974). In others, as the balance of power becomes more favorable, unions are expected to exploit their tactical advantages to improve their economic situation. Whether this is done through strikes, however, depends on the relative advantage of using the market versus political means to achieve the greatest gains. As the political arena becomes more advantageous as a result of the strength of workers' parties, a shift of the distributional conflict from the market to politics is anticipated. Thus, labor strength, as manifested in both the labor market and in politics, is expected to give rise to low strike rates (Korpi and Shalev, 1980; Cameron, 1984; Hibbs, 1978; Shalev, 1980; Korpi, 1978, 1983).[5]

Some of the factors considered in this broader conception of the distribution of power resources overlap with the explanatory variables used in the narrower bargaining strength models. However, political and institutional conditions enter fully into the set of explanatory variables so that factors such as the stance of government toward unions and employers and toward strike action, the density of unionization, the capacity of the unions for collective action, the ability of the government to repress, etc., need to be incorporated. More important from a theoretical standpoint, open conflict and strikes are explained as a manifestation of the "continuous struggle for influence and advantage" (Shalev, 1980: 154) between labor and capital, rather than just as an indicator of the alignment of wage expectations with employers' willingness to pay. Moreover, the approach stresses the relative advantages for unions and employers of pursuing their goals through struggle in the political institutions and/or market.

This broader formulation seems to be the more satisfactory line of analysis, for it is more theoretically sound to recognize that it is not only what workers expect or would like to get from wage negotiations but their ability to pursue those expectations which should be considered (Shalev, 1980: 155). This is all the more the case given that wage expectations themselves are likely to be influenced by workers' perceptions of the balance of power between themselves and their employers. Finally, a number of quantitative and more qualitative studies have demonstrated the power of such political and institutional variables in explaining variances in aggregate strike frequency, especially in contexts outside the United States (Shalev, 1980; Korpi and Shalev, 1980; Hibbs, 1978; Snyder, 1975). Thus, political and institutional—and not just economic—variables should certainly be included in any model of strike behavior.

Despite its empirical success, even the more expansive power resources approach to strikes has both empirical and theoretical limitations. Empirically, all existing arguments posit a monotonic relationship between resources and strikes. This relationship is either decreasing (in the neocorporatist literature) or increasing (particularly for single country studies). The authors have good results because they have restricted the universe of countries to which they apply their theories (those at either the high or low end of the scale of labor strength).[6]

The more serious problem with the power resources literature is theoretical: it is rooted in what has been dubbed the "Hicks paradox" (Kennan, 1986), a direct outgrowth of the theory of wage bargaining developed by John Hicks (1963). Hicks argued that the wage settlements arrived at through bargaining are entirely predictable. Using a simple deductive model that relies exclusively on the economic considerations of the union and the employer operating as a bilateral monopoly, he showed that wage settlements are the product of the interaction of the employer's desire to minimize the wage bill but willingness to make wage concessions in the face of a strike threat, and the union's desire to maximize some wage function and consequent resistance to wage concessions, counterbalanced by the costs of a strike. The intersection of two curves, one expressing the union's and the other the employer's tradeoffs, produces a determinate outcome on which the bargaining parties cannot simultaneously improve. The problem with this explanation of strikes, however, is that, given any determinate solution, if the actors are rational and fully informed, strikes should never occur:

> . . . if one has a theory which predicts when a strike will occur and what the outcome will be, the parties can agree to this outcome in advance, and so avoid the costs of a strike. If they do this, the theory ceases to hold . . . strikes are apparently not Pareto optimal, since a strike means that the pie shrinks as the employer and the workers argue over how it should be divided. If the parties are rational, it is difficult to see why they would fail to negotiate a Pareto optimal outcome (Kennan, 1986: 1091).

Thus, if strikes occur, it must be "the result of faulty negotiation . . . adequate knowledge will always make a settlement—without a strike—possible" (Hicks, 1963: 147).[7] As this suggests, when labor and capital are considered as rational, fully informed actors, it is not clear why their relative power however measured and however changed from the preceding negotiation should affect the probability of strikes. Bargaining outcomes reflecting the prevailing balance of power resources should be attained without recourse to a strike[8] which can only reduce joint net utility without improving relative payoffs. So, bargaining power theory lacks a fully credible theory of the behavior of the actors—that is, microfoundations. It seems likely that political and institutional, and not just economic, variables affect the likelihood of strikes, but we do not have a satisfactory explanation of why and how.

Information Models

Information models take the Hicks paradox as their starting point, but seek to resolve it by loosening the perfect information assumption. They have principally argued that strikes become more likely either when the "informational environment" within which bargaining takes place becomes more uncertain or less tractable (Cousineau and Lacroix, 1986);[9] or when one or both of the bargaining actors have private information to which the other actor does not have easy or immediate access (Hayes, 1984; Mauro, 1982).

While these theories are significantly dissimilar in many of their details,[10] they share some important features. First, all the theories within this approach seek to build up from microfoundations. The issue in evaluating these models, therefore, is the adequacy of their microfoundations, empirically (how well do they incorporate real world variables) and theoretically (how well do they capture the processes they are trying to model).

Second, all of these theories consider a relatively narrow range of variables in discussing the kinds of misinformation which lead to strikes, focusing on "the collective bargaining dynamics internal to the firm" (Cohn and Eaton, 1988:24). They, therefore, ignore any uncertainty or incomplete information which arises from changes in the political or institutional environment.[11] This is unsatisfactory in an effort to build a cross-nationally generalizable theory of strikes.

Third, information models share the view that strikes "result essentially from misjudgment in a world of imperfect information" (Cousineau and Lacroix, 1986: 385). This approach, then, recognizes that the relative level, or changes in the relative level of power resources cannot, if the actors are fully rational and informed, explain strikes (Cousineau and Lacroix, 1986: 382).[12]

Yet, information-based theories cannot address the empirical puzzle of this chapter and fail fully to meet the requirements of a satisfactory theoretical treatment of strikes. They do not incorporate what seem to be empirically important variables

relating to the political and institutional environment in which collective bargaining takes place, nor do they provide an argument connecting uniform change in conditions with both increase and decrease of information (and therefore strikes).

They contain as well an underlying theoretical weakness, for they are premised on the idea that the function of the strike is to transmit information and correct the misperceptions of one or both parties about the other (Mauro, 1982: 536). Strikes, therefore, are treated as mistakes, the result of misjudgment in the presence of incomplete information.

Such an explanation, however, is itself incomplete for it fails to capture a critical distinction between nonstrategic and strategic bargaining. Strikes in the incomplete information models presented thus far are "mistakes" in the sense that each actor would prefer that they did not occur and would act differently if confronted with the same situation again. They are not equilibrium outcomes produced by the actors undertaking appropriate strategic behavior given the information available to them at the time they had to make their decision.

The difference may seem relatively minor, even linguistic, but it is not. Two points illustrate why this is so. First, in the information theories, imperfect information of the actors is treated solely as a source of error and suboptimal outcomes. In a more strategic understanding of the problem, however, the uncertainty or partial information of the adversary is not only a source of potential suboptimality; it can also become a resource in bargaining. For instance, knowing that the opponent does not know with certainty whether one is strong or weak can provide a strategic opportunity better to advance one's interests. A clear example is the bluff in poker with a potentially good hand showing in one's face-up cards. What this suggests is that in a more fully strategic and interactive framework strikes would not be assumed to be the result of "faulty negotiation" or a way to communicate the truth.

Moreover, a strikes-as-equilibria approach has the ability to answer conditional questions, like what would be the effect on the behavior of rational agents if some condition were altered and, thus, to lead to empirically testable predictions. If strikes are mistakes, it is difficult to specify the conditions that lead to these mistakes, and even more difficult to predict what would have happened if some of the parameters of the model were different. The advantages of an equilibrium approach to strikes, therefore, are considerable. Discussion of some contemporary developments in game theory allow us to pursue this approach.

Game Theoretic Models

The third stream of literature relevant to the explanation of strikes includes noncooperative game theoretic models of bargaining. As in Hicks' argument, under complete information, that is, if the players know each others' payoffs (or, more precisely, if the payoffs are common knowledge), there is no possibility of strikes,[13] and the outcomes are efficient. It is impossible to improve the situation of one player without making the other worse off. The reason is that only reasonable demands (justified by the payoffs of the players) are made, and so, the demands are perfectly anticipated and met. The possibility of strikes or disagreements and inefficient outcomes exists only if one or both of the players does not know some of the opponents' payoffs. The situation then is resolved by trial offers, which are sometimes turned down, or

sometimes, in the case of labor-management negotiations, by strikes. All of these game theoretic models share with our model the characteristic that they focus on the micro level, and that trial offers (or by extension strikes) are not mistakes, but part of the equilibrium strategies of the players.

These models are precise in the description of the institutional features of the bargaining game itself (who makes the offer, who knows what at each point in time, etc.). They remain, however, abstract in terms of the contextual and empirically relevant factors which, as the empirical literature indicates, influence the outcomes of the bargaining game.[14] Furthermore, most of these models speak about bargaining in general, or about the interaction between seller and buyer, and, therefore, do not include explicitly the possibility of strikes.

The archetypical models of noncooperative bargaining are two models by Rubinstein (1982, 1985, 1986), the first with complete information, the second with one-sided incomplete information (one player knows only his/her own payoffs, while the other knows the payoffs of both). Rubinstein (1986) solved the problem of the division of one dollar between two players. He noted that any division of the dollar is a Nash equilibrium (that is, that any unilateral deviation from the partition is either nonfeasible, or nondesirable). Since there is an infinite number of equilibria in the "divide the dollar" game, Rubinstein tried to find a partition with some characteristics of stability. He considered that each player is impatient, and that this impatience would drive the process of bargaining to its final outcome. Each player makes an offer, which is either accepted or rejected by the opponent. If the offer is accepted, the game ends; if the offer is rejected, the other player makes a new offer which is in turn either accepted (game ends) or rejected (game continues). Rubinstein modeled impatience by a discount factor: in each period of time, the dollar shrinks by a different percentage for each player. He proved that under perfect information this process converges to a unique perfect equilibrium. The first player (whoever it may be) makes an offer which is immediately accepted.

In another paper, Rubinstein (1985) introduced incomplete information (one of the players did not know the other's discount rate). In this case, the first player's offer was not always accepted, and the negotiations could continue for several rounds. Crampton (1983) and Sobel and Takahashi (1983) produced similar bargaining models with one-sided complete information, where only one player could make offers. Fudenberg and Tirole (1983) introduced a model with two-sided uncertainty, but with a finite number (two) of rounds.

We will briefly discuss only two other models which provide important ideas for our own model which follows. Shaked and Sutton (1984) introduce the idea of an "outside option." Their model is a bargaining model with complete information, where one or the other player has the possibility, if he/she wants, to choose an "outside option." If one player chooses the outside option, then with some probability p the game ends, and prespecified payoffs are distributed to the players; with a probability $(1-p)$ the bargaining continues, and a player makes an offer which gets accepted (game ends) or rejected (the game continues), another outside option becomes available, it is taken or not, etc. We will use the concept of outside option to model strikes explicitly. In our model, labor will have the outside option of a strike. If the option is taken, the government steps into the negotiation process with probability p, and gives some payoffs to the players. Empirically, this does not require that the government actually dictate the terms of the agreement between capital and labor but only that with probability p the government will intervene and thereby assure an agreement that will be more, or less, favorable to labor. The agreement itself could still be reached between the bargainers for capital and labor. If the government does not step in to terminate the game, the negotiations continue.

A second model, that of Grossman and Perry (1986), is very similar to the one we subsequently present. Its major innovation over the game theoretic models already presented is that it not only presents a bargaining problem with infinite rounds, but it also introduces the possibility of one-sided or asymmetric information. The situation is that of a seller and a buyer, where the buyer's valuation of the transaction object is unknown. Grossman and Perry's model presents all the desirable properties for a labor-management negotiation game, except for two: (1) it does not include the possibility of strikes and the strategic alternatives generated by this option; (2) it includes only one-sided uncertainty.

As we will see, the model we propose resolves only the first of these problems. Labor and capital bargain over the division of their economic output through negotiations at the factory level, the branch, or the whole country. Strikes are possible and therefore, the actors, especially labor, have expanded possibilities for strategic action. Furthermore, capital is considered to have incomplete information about the strength of labor. To simplify the presentation, we rescale the output so that the negotiation is, in the model, over one dollar.

We present the model in two steps, in order to facilitate understanding. The first discusses a bargaining model with complete information and an outside option (the strike); in this model, strikes never occur. The second step introduces incomplete information which makes strikes possible and helps us understand the reasons why bargaining between capital and labor may lead to strikes.

A MODEL OF STRIKES

Step 1. Bargaining with Complete Information and an Outside Option

There are two players, Labor and Capital. Capital makes a proposal of how to split the dollar; if the offer is accepted, the game ends; if not, Labor has an outside option available. Labor may interrupt bargaining and choose an outside option (the strike). If labor makes this choice, then the bargaining game stops, and each player receives, with probability p, a prespecified payoff of which both are aware; call these payoffs o_C for Capital and o_L for Labor.[15] The bargaining continues with probability $(1-p)$ and Labor makes an offer. Capital can accept, and the game ends; or refuse, and make a new offer.[16] The game repeats until it is terminated by the choice of the outside option, or until there is an agreement.

Both players are impatient, which means that the dollar shrinks in the eyes of each one of them in each period of time by different amounts. Call d_C and d_L the time discount factors of Capital and Labor, respectively. It means that one dollar in period one is worth only d_C to Capital and only d_L to Labor in the next period.

The political meaning of these time discount factors is what generates the impatience of the actors, and, therefore, what drives the negotiation process to its end.

Capital is pressed because of the potential loss of profits with the passage of time, so d_C of a firm can be conceptualized as such a potential due, for instance, to intense competition in the presence of high demand or the absence of inventories in the presence of the prospect of sales. In the case of national bargaining, d_C could represent the level of international competition: the more competitive international markets and the greater the possibility of lost sales if negotiation is prolonged, the more Capital is eager to conclude bargaining. Labor, on the other hand, is pressed to present tangible results to its internal organizational structure. Leaders who do not produce desirable outcomes can face internal challenges and the possibility of replacement or organizational decay. Thus, Labor has a time discount factor. As this implies, the discount factor can be conceptualized in terms of the level of control the leadership possesses over the organization. The higher this level, the less Labor leaders feel pressed to conclude negotiations rapidly.

This rendering of time discount factors permits us to introduce other arenas, and thereby other actors into the model.[17] When Labor, for example, increases its organizational discipline, or solidifies its jurisdictional boundaries, or, in Hirschman's (1970) terms, when there is a reduction in the potential for exit or voice without a commensurate increase in the other, its time discount factor increases and, therefore, *ceteris paribus,* its share of the output (of the dollar) rises. Or, when Capital faces a more competitive economic environment, its time discount factor decreases; it feels pressure to conclude an agreement more quickly, and, consequently, is willing to give up more in order to finish sooner rather than later.

Appendix 1 calculates the equilibrium of the bargaining model between Capital and Labor with outside options. Here we will explain the logic of the outcomes. Labor will choose the outside option only if o_L is greater than the share it would otherwise receive. So, although a strike is always an available outside option for Labor, it will be chosen only if its value is over a certain threshold. Knowing that, Capital will not be affected if the value of the outside option is less than this threshold. If, however, the value of the outside option is greater than the threshold, Capital has to make an offer which will be at least as attractive to Labor as the (discounted for impatience) combination of strike and possible counteroffer.

Here we can report the results and introduce terminology which will be useful in the next and final step. We will call "Strong Labor" (SL) the Labor player with an outside option big enough to be taken whenever the opportunity arises. We will call "Weak Labor" (WL) the Labor player with an outside offer smaller than what would result from the bargaining process (and who, therefore, never selects the outside offer). The outcomes will be reported in the following way: x is the equilibrium share of Capital, and it will be indexed by the order in which the two players take turns in making offers.[18] The first line indicates Capital's share when it goes first and plays against Weak Labor (1). The second line indicates Capital's share when it starts the negotiation process against Strong Labor (2).

$$x_{C,WL} = (1-d_L)/(1-d_Ld_C) \quad (1)$$

$$x_{C,SL} = [1-po_L-(1-p)d_L]/[1-(1-p)d_Ld_C] \quad (2)$$

Note that in every case, despite the fact that there is the possibility of infinite bargaining, the players' impatience, on the one hand, and complete information on

the other, terminate the process in one period: the first offer is such that it is immediately accepted, and the game ends. If Labor is weak, it does not have a credible threat to strike; if it is strong, its strength is anticipated and Capital makes an offer which preempts a strike. Moreover, the value of the outside option does not figure into the solution of the bargaining game between Capital and Weak Labor because under perfect information both players know that such an option will not be exercised, so they disregard it.

Step 2 introduces incomplete information and not only the possibility but also the occurrence of strikes. Moreover, as we shall see, the value of Weak Labor's outside option figures into the solution since it determines the possibility for Weak Labor to bluff and pretend that it is strong in order to extract more from Capital.

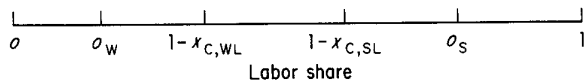
Step 2. Bargaining with Incomplete Information

Consider now the case where Capital does not know the value of the outside option for Labor. That is, discount factors are common knowledge, and Labor knows the value of striking, but Capital knows the value of the outside option only as a probability. Labor has a probability w of being weak (value of outside option o_W) and $(1-w)$ of being strong (value of outside option o_S). The model will examine in detail the case where o_W is less than, and o_S is more than, the value indicated by (1). So, Strong Labor would always strike, while Weak Labor would never strike. This is by far the most interesting case. In the final discussion, we will examine several variations of the model, where some of the assumptions we make here will be relaxed.

The situation can be conceptualized as in Figure 5.1. Labor and Capital must divide the dollar. Labor's share is measured from left to right, while Capital's share is the remainder and is measured from right to left. Strong Labor will strike a deal which is toward the right of Figure 5.1, while Weak Labor will not be able to push the outcome very much to the right. According to our assumptions, o_W, the outside option of Weak Labor, is less than it would obtain through negotiation $(1-x_{C,WL})$. On the other hand, Strong Labor can obtain more $(1-x_{C,SL})$ than Weak Labor through negotiation, and the value of its outside option o_S is even higher.

Appendix 2 presents the analytic solution to the problem. Here we will present only the logic of the model. Let us study the problem that each one of the actors faces. As we said, Capital does not know whether it deals with Strong or Weak Labor. However, there is a probability w that Labor is weak, and this probability is common knowledge. Capital knows that any offer which gives Labor less than $(1-x_{C,WL})$ will be rejected by both Weak and Strong Labor. Thus, because it is pressed for time, it will not make such offers. On the other hand, Capital knows that any offer giving Labor more than what Strong Labor would get (that is, more than $(1-x_{C,SL})$) would be accepted by both Weak and Strong Labor. Moreover, Capital

Figure 5.1.



knows that if it has to deal with Strong Labor, it will not be able to concede less than $(1-x_{C,SL})$. In fact, if Capital's offer is any less than $(1-x_{C,SL})$, Strong Labor will immediately go on strike. So, Capital has to make an offer somewhere in between the two extremes, so that the offer will be accepted by both possible types of Labor, or at least by Weak Labor.

Strong Labor has easy choices. It knows that it can get $(1-x_{C,SL})$, so it will accept nothing less. If an offer is made, it will accept it only if it grants this share, and go on strike otherwise.

Weak Labor faces a more complicated problem. If Capital knows that it is facing Weak Labor, it will give only $(1-x_{C,WL})$. However, Capital does not know which opponent it is facing, so there is a possibility for Weak Labor to bluff and behave as if it were strong. That is, if it is offered anything which is considered unacceptable, it will strike first and then make the same counteroffer that Strong Labor would make. One could imagine that Weak Labor could behave exactly as Strong Labor and always strike unless it is offered $(1-x_{C,SL})$. However, there are costs of such behavior. As we have stated, if the outside option is taken, there is a probability p that the outcome for Weak Labor will be o_W, which is less than it could get through negotiation under perfect information. Hence, Weak Labor's bluffing capacity is limited. If the offer is big enough, Weak Labor will be better off accepting it rather than bluffing and striking.

Knowing all that, Capital will be able to make an offer that makes bluffing by Weak Labor costly. In other words, Capital will be able to make an offer attractive enough to be immediately accepted by Weak Labor. Such an offer is

$$1-x_{C,L} = \max\{[po_W+(1-p)d_L(1-d_Cx_{C,SL})],\ (1-x_{C,WL})\} \tag{3}$$

which will be accepted by Weak Labor and rejected by Strong Labor. This is the *separating equilibrium* offer of Capital. It manages to separate between the two possible types of Labor. Weak Labor immediately accepts it, while Strong Labor rejects it, strikes, and either receives the outside option (with probability p), or makes a counteroffer (with probability $(1-p)$).

An alternative strategy for Capital would be to make an offer acceptable to both types of Labor. The *pooling equilibrium* offer:

$$1-x_{C,SL}=1-\{[1-po_L-(1-p)d_L]/[1-(1-p)d_Ld_C]\} \tag{4}$$

will be immediately accepted by Labor whether weak or strong. Equation (4) leads to a partition of the dollar identical to that in equation (2); that is, the equilibrium that results when Capital is facing Strong Labor and makes an offer first. The calculation of equation (3) is given in Appendix 2. The logic that leads to this equation is to dissuade Weak Labor from bluffing. Weak Labor might be tempted to bluff if the first quantity in the right hand of (3) is greater than the second. In this case, Weak Labor is willing to take the risk of a strike (which is likely to produce unfavorable results since o_W is by definition less than $(1-x_{C,WL})$) in order to persuade Capital that it is strong and receive $(1-x_{C,SL})$ in the next round. If the second quantity in the right hand side of equation (3) is greater than the first, then Weak Labor has no bluffing potential. If Weak Labor has no bluffing capacity and Capital wants to probe whether its opponent is strong or weak, it will make the offer $(1-x_{C,WL})$.

Now it is time to spell out the implications of the model for strike activity. It is

obvious from the previous account that strikes occur with probability $1-w$ only when Capital chooses a separating equilibrium strategy. In pooling equilibria, strikes do not occur. Therefore, we are able to calculate the overall probability of strikes by multiplying the probability that Capital will select the separating equilibrium strategy by $(1-w)$ (the probability of a strike conditional upon the selection of a separating equilibrium). So, the question of strikes is closely connected to the question of when Capital selects a separating equilibrium.

The logic of equilibrium selection from Capital's viewpoint is the following: The pooling equilibrium strategy gives a sure (low) payoff to Capital. The separating equilibrium offers a gamble. If Labor is weak, it will accept the lower offer. If, however, Capital is facing Strong Labor, it will have to pay the higher price along with the additional penalty of the strike. So, in the face of uncertainty, Capital makes a calculated choice (not at all a "mistake"); it selects the outcome with the highest payoff:

$$x_{C,SL} \geq wx_{C,L}+(1-w)d_Cx_{C,SL} \tag{5}$$

If (5) holds, Capital will select the pooling equilibrium (no strike). If (5) is false, Capital will select the separating equilibrium which produces strikes with probability $(1-w)$.

Equation (5) should be read in the following way: If the probability that Labor is strong is high, or if the time discount factor for Capital is low, that is, if Capital is pressed for time, it will give in immediately, and make a proposal acceptable by both Weak and Strong Labor. If, on the contrary, the time discount factor is high, and/or the probability of facing a strong Labor is low, then Capital will pay the price to probe whether the opponent is strong or weak.

To recapitulate:

1. If (5) holds, Capital will treat Labor as if it were strong with probability 1. It will offer $(1-x_{C,SL})$, and the offer will be accepted immediately. Equation (5) indicates that an immediately acceptable offer becomes more likely when the probability that Labor is strong is high, and when Capital is pressed for time.
2. If (5) does not hold, Capital will make an offer which will be accepted by Weak Labor and rejected by Strong Labor, which will immediately strike. There are two possibilities:
   - 2a. If the second term in the right-hand side of (3) is greater than the first, then Weak Labor has no bluffing capacity, so the offer will be $(1-x_{C,WL})$. Weak Labor will accept immediately.
   - 2b. Otherwise, Weak Labor has bluffing capacity, so it has to be bought by a higher offer. Capital will make the offer $(1-x_{C,L})$ of equation (3), which will be accepted immediately by Weak Labor.

In this model, strikes occur only when Strong Labor faces an offer which is less than $(1-x_{C,SL})$. The reason that Capital may make such offers is not due to some miscalculation, but rather to the fact that Capital's time discount factor is sufficiently high, or the probability that Labor is strong sufficiently low, so that it is in the interest of Capital to probe the strength of its opponent. Note also that in this model, Weak Labor never strikes. Its bluffing potential is anticipated and neutralized by Capital.

These formal characteristics of the model prompt some more general observations which serve as preliminaries to an examination of the model's empirical relevance. First, the distributional impact of incomplete information should be underlined. Because Capital is incompletely informed, it has to pay a price. Its offer has to prevent Weak Labor from pretending that it is strong; and if Capital's discount factor is low, or the probability of facing Strong Labor is high, it has to make an offer acceptable to Strong Labor, regardless of whether it is facing a strong or a weak opponent. No such conclusions about the distributional impact of misinformation can be drawn from the information theory discussed earlier.

Second, because of incomplete information, Weak Labor is sometimes able to bluff and pretend it is strong, and extract more concessions from Capital. Equation (3) is crucial in determining the bluffing potential of Weak Labor. If the first term in the right-hand side is greater than the second, Capital has to worry about the bluffs of Weak Labor. If Weak Labor can bluff, then the outside option can be used, and the solution of the game includes the value of this outside option. Note that in equilibrium, Weak Labor never bluffs, because Capital makes a higher offer, precisely in order to prevent it from bluffing. But the absence of evidence of bluffing does not mean that the potential for bluffing, with its distributional consequences, does not exist. Both this potential and its distributional implications are entirely absent from the information theories.

Third, the game does not necessarily end after the first offer, as was the case in the complete information model. It is possible that Capital finds it more profitable to take the risk and probe the identity of its opponent. If it is facing a weak opponent, the offer will be accepted; if the opponent is strong, then a strike will result, and the bargaining game will end in the next round. Therefore, if Capital decides to probe, a strike results with probability $(1-w)$. As we have already said, such behavior is not a mistake, or a miscalculation, or the result of misinformation. It is the best course of action for each one of the actors, given the information that he/she possesses.

Fourth, when a strike occurs, there is a resulting loss of welfare for both actors. In the models of perfect information, the first offer is immediately accepted, so the two actors divide the whole dollar between them. In the model of incomplete information, there are three possible cases: (1) Capital makes an offer acceptable by both Weak and Strong Labor; (2) Capital makes an offer acceptable only by Weak Labor, and is actually facing Weak Labor; (3) Capital makes an offer acceptable only to Weak Labor, while it is actually facing Strong Labor. Only in the first two cases do the players share the whole dollar. In the third case, there is a strike, which may end by the government stepping in and giving to both players their outside option (with probability p), or by continuation of bargaining and loss to both actors because of their time preferences. So, in the third case, one way or the other there is a loss in aggregate welfare. Again, this results from both players pursuing the best course of action available to them in the given situation.

Fifth, it will be useful to our discussion below to offer comments here about the impact of variations in the six parameters of the model (d_L, d_C, o_S, o_W, p, and w) on three characteristics of the outcome of the model: the share of Capital, the bluffing capacity of Weak Labor, and the first offer made by Capital. We remind the reader that Capital's first offer determines whether there will be a strike (with probability $(1-w)$ or not.

The bluffing potential of Weak Labor is directly related to Labor's discount factor (d_L) and the value of the outside options of both Strong and Weak Labor (o_S and o_W); it is inversely related to the time discount factor of Capital (d_C) and the probability that the outside option will be materialized (p).

When the bluffing potential of Weak Labor increases, the share of Capital shrinks, because it has to make an offer acceptable at least to Weak Labor. Moreover, when this potential becomes very high, it may be profitable for Capital to make an offer acceptable to both Weak and Strong Labor instead of probing.

The share of Capital in general increases when its time discount factor (d_C) increases, and when the probability that Labor is weak (w) increases; it decreases with increases in all the other parameters of the model.

Whether Capital will make an offer acceptable to just Weak Labor (which results in a strike with probability $(1-w)$), or to both Weak and Strong Labor, depends on how close the two offers are to each other, the time discount factor of Capital (d_C), and the probability (w) that Labor is weak. Capital is more likely to make the offer that ends the game immediately rather than wait the closer the two offers are to each other, the lower its discount factor (d_C), and the lower the probability that it faces Weak Labor (w).

Strikes are a function of the probability that Labor is weak w. As we said in the previous paragraph, the selection of the separating equilibrium is an increasing function of w (the probability that Labor is weak). However, once this strategy is selected, the probability that a strike will follow is $(1-w)$. Combination of these two propositions indicates that strikes will be more likely for intermediate values of w. Indeed, when w is high, separating equilibria will be frequently selected, but Labor will not strike because it is weak. Similarly, when w is low, the strength of Labor will be anticipated and higher offers (preventing strikes) will be made.

As the share of Strong Labor $(1-x_{C,SL})$ increases, Capital becomes less tempted to test Labor, and therefore, the probability of strikes decreases. Conversely, as the share of Weak Labor $(1-x_{C,WL})$ increases, Capital becomes more tempted to test Labor, so the probability of strikes increases.

The above discussion indicates that in cases of high Labor strength—whether this is indicated by a low w (a high probability that Labor is strong), a high outside option (o_S), or a high share in the negotiations $(1-x_{C,SL})$—reduction of labor strength leads to an increase in strikes. On the contrary, in cases of low labor strength—whether this is indicated by a high w (a high probability that Labor is weak), a low outside option (o_W), or a low share in the negotiations $(1-x_{C,WL})$—reduction of labor strength leads to a decrease in strikes. This is the proposition we will test empirically.

STRIKES IN THE 1970s AND 1980s

The game theoretic model presented in the previous section predicts a curvilinear relationship between labor strength and strikes, and is therefore consistent with both

lines of analysis found in the corpus of the bargaining power theories— the one that, focusing on noncorporatist countries, predicts an increase in strike activities when labor power increases; and the literature on corporatism that predicts a decrease in strikes in countries where labor is very strong both politically and in the market. In fact, our model provides a synthesis of the two lines of analysis found in the bargaining power literature.

In addition, parts of this model are consistent with the predictions of information theories, which maintain that strikes will increase with lack of information. Consider the curvilinear relation between w (the probability that Labor is weak) and strikes that was discovered in the previous section. Now assume that the two different types of Labor derive from a binomial distribution with probability w. The highest variance of this distribution (that is, the lowest level of information) comes from intermediate values of w. Our findings thus provide a rationale for applying information theories to the empirical question of strikes in the 1970s and 1980s. The difference in our account, however, is that nothing is regarded as a mistake: both actors are rational and attempt to achieve their best outcome in the situation. In particular, Weak Labor tries to make strategic use of Capital's lack of information, and Capital selects its equilibrium strategy in order to prevent such maneuvers from Weak Labor. Similarly, the selection of a separating equilibrium (which leads to strikes) or a pooling one (which avoids them) is made as a maximizing decision by Capital.

One test of our theory would be to try to explain the level of strike activity in different countries. Our theory would predict a curvilinear relationship between strike activity and labor power such as the one presented in equation (6):

$$s = a + cP - dP^2 + e \tag{6}$$

where s is the level of strike activity, c and d are positive constants, and P is some measure of the power of Labor in different countries. The form of the equation (quadratic) captures the curvilinear form of the hypothesis: countries with Strong or Weak Labor (a high or low probability that Labor will be weak) will have low levels of strike activity; countries with intermediate strength (an intermediate probability that Labor will be weak) will have high levels of strike activity.

Figure 5.2 presents two different quadratic curves of strikes. If our theory were a unicausal explanation of strikes, different countries would be placed along one of the parabolas of Figure 5.2 (parabola 1). However, we do not claim to have explained all aspects of strike activity and discovered all its determinants. It is possible that high strike activity in Italy and France can be explained by the existence of strong Communist parties, in the United Kingdom by political conditions, in Canada by labor decentralization, etc. In order to control for such possible explanatory variables one would have to include all the factors operating at the national level in one equation of the form:

$$s = a + \Sigma b_i X_i + cP - dP^2 + e \tag{7}$$

where X_i are (the many) factors we have not included in our model, and for some of which data are not available, and the rest of the equation is the same as in (6). Equation (7) would have countries bounce all around parabola 1 of Figure 5.2. In fact, these other factors influence strike activity so much that the actual plot of strike activity as a function of power does not look like a parabola at all, and regressions do not produce significant results. However, this test does not necessarily suggest that our theory is wrong, but rather that the omitted factors are many and important.

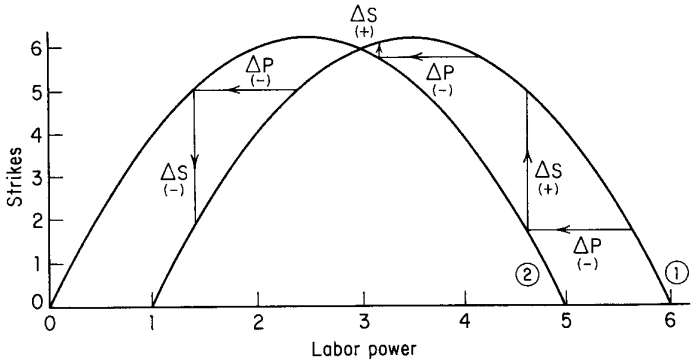


Figure 5.2.

Consider now the same equation (7) applied in the 1970s and 1980s, and take the differences in the left- and right-hand sides. In this case, if we assume that the variables X_i that are omitted from our theory have the same value for each country (which is in itself a heroic assumption), they cancel each other out, and we are left with an equation of the form

$$ds = k - 1(dP) + e \tag{8}$$

A visual representation of the argument is offered in Figure 5.2: we select three points on parabola 1, and trace the change in strikes when labor power decreases. The uniform reduction of labor power P is represented by the horizontal lines connecting parabola 1 with parabola 2; the corresponding change in strikes is represented by the vertical segments connecting parabola 2 with parabola 1. The figure illustrates that this change is positive and significant in the first case (Strong Labor), positive but not significant in the second (intermediate labor power), and negative in the third (Weak Labor).

We will test equation (8). In fact, in Table 5.2 we use a series of different specifications of the dependent variable. We consider the difference in strikes (strikes of the

Table 5.2. Change in Strikes and Labor Power: Regression Results

Dependent variable	Labor strength	t-stat	p	R^2
str80 - str70	444	2.1	.05	.24
str80/str70	.33	4.82	.000	.62
ln(str80/str70)	.09	3.6	.003	.48
(str80-str70)/str70	.32	4.83	.000	.62

1980s minus strikes in the 1970s), the ratio of strikes (strikes in the 1980s over strikes in the 1970s), the relative difference of strikes (strikes in the 1980s minus strikes in the 1970s divided by strikes in the 1970s), and the natural logarithm of the ratio of strikes.[19] It is easy to see that all of these specifications produce qualitatively the same results: Strikes increase in countries with high strength of labor, decrease in countries with low strength of labor, and remain the same in countries in between. Those models that have relative change in strikes as the dependent variable produce better results. The probable cause is that they control for the size of the workforce of a country.

We used the interaction between two indicators to approximate labor strength. The first is the level of corporatism.[20] It is widely believed that labor is stronger the more centralized and concentrated it is, so societal corporatism is a measure of the strength of labor in wage negotiations.[21] The second is the strength of the Left in the political arena.[22] Regressions including only one of these variables come to the same qualitative results with lower fit and are omitted, although participation of the Left in government is a better predictor of strike activity than corporatism.

Of all these specifications, the best, for theoretical and empirical reasons, is the relative difference of strikes: for theoretical reasons, because it eliminates the influence of other variables, such as size of the country or strong influence of particular organized groups (communists, anarchists, etc.) on the dependent variable; for empirical reasons, because the residuals of this regression come closest to a normal distribution (standard assumption for application of least squares models).

The results of the model with relative difference of strikes are plotted in Figure 5.3. The R^2 of the model is .65 (adjusted $R^2 = .62$). The probability that the overall results are due to chance (F-statistic) is less than .0005 and so is the positive coefficient between strength of the Left and increase in strikes (t-statistic = 4.77).

CONCLUSIONS

We presented and preliminarily tested a game theoretic model of strike activity. We showed that the existing literatures on strikes have important strengths and weaknesses. Bargaining theories have a very good fit with the countries they study, but their observations are often skewed to cases most likely to fit their arguments. However, they do not explain the mechanisms by which strikes occur, nor do they have strong theoretical foundations. Our model improved upon both features: it explained the contradictions in the bargaining power literature through a curvilinear relation between labor power and strikes; and more importantly, this curvilinear relationship was *derived* out of the assumption of rationality of the actors involved instead of being posited, as is often the case in the bargaining power literature.

Information theories possess much better theoretical foundations than bargaining power theories, but they ignore important institutional variables and consider strikes as mistakes. Because of the first flaw, it is difficult to formulate expectations about the differential impact of a uniform reduction in labor power on strike activity. Our model improved upon these theories by considering the strategic features of incomplete information, and by presenting an explanation which incorporates a broad set of political, economic, and institutional variables.

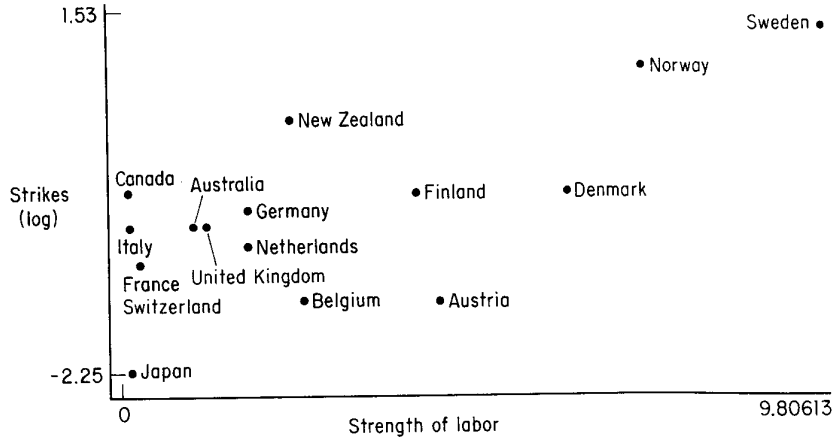


Figure 5.3.

Game theoretic applications to macropolitical economy issues are relatively rare. Most of the models also remain abstract and their connection with actual situations questionable. Our model is part of this game theoretic literature and demonstrates the potential empirical relevance of such models. We do so by investigating possible empirical referents to abstract mathematical concepts and by using the model to resolve the puzzle of differential responses of both capital and labor to uniform reduction of labor power in the 1980s.

Further empirical research along the lines indicated in this chapter is necessary. Most important is the relaxation of the very restrictive assumption that there was a uniform reduction of labor power in the 1980s. While the direction of this change is the same for all countries, the magnitude may have been different. For example, in some countries (like the United Kingdom), the Left lost power in the 1980s; whereas in others (like Sweden), labor power decreased because of decentralization of bargaining. We are in the process of re-estimating the model in order to eliminate this simplifying assumption. The enterprise presents a series of theoretical and empirical difficulties. Some of the indicators of change in labor strength such as changes in unemployment or left-wing government readily exist, but others such as change in decentralization of bargaining remain to be measured.[23] Moreover, assumptions about normal distribution of error terms are much more difficult to satisfy. Our preliminary results with changes in unemployment and left-wing government produce a model with four independent variables and all coefficients with the correct sign but not significant (which is to be expected since the independent variables are highly colinear). Consequently, the qualitative results of our model are quite robust and indicate strong support for the curvilinear relationship between labor strength and strikes. However, further data gathering and empirical research are necessary in order to raise the power of the empirical tests for our model.

Nonetheless, some of the policy implications of our initial findings should be

underlined. The most general is that little in the potentially conflictual, but also potentially cooperative, world of capital-labor relations can be fully understood without paying close heed to the strategic character of the relationship and how it is affected by the institutional setting in which it is played out. To base policies on ideological predispositions which generally prescribe unique policies without attending to the strategic setting is to invite policy failure.

Second, it means that policy makers seeking to divine the implications of contextual changes affecting the relative strength of capital and labor should not assume linearity, either nationally or cross-nationally. In fact, such changes are likely to have different effects depending on the particular strategic situation in the bargaining unit with which the analyst/policy maker is concerned. This implication of our findings is particularly relevant in the 1990s when many have argued that the increasing interdependence of the world economy has been weakening the power of labor in national economies and specific sectoral or other markets. Many have drawn the conclusion that such trends, if true, should decrease the frequency and intensity of strikes and other forms of labor militancy. This certainly has broadly been the case, but as we have shown, it is not universal and is a strategically contingent, rather than "necessary," outcome. To the extent that policy makers at the firm, sectoral, or national levels choose the course to follow based on expectations about how contextual changes are affecting the relative power of capital and labor, they would do well to recognize this contingency and adopt policy—whatever their goals—to it.

Finally, as we indicated at the outset, once we recognize that strikes and, more generally, the tenor of capital-labor relations are a function of institutionally embedded strategic interactions, simple nostrums about the appropriate policies for governments of the Left and Right lose their power. Instead, to the extent such governments are interested in their own reelection and thus in the stability and health of the national economy, they will have to pursue policies which may not fit conventional expectations but which are, instead, adapted to the national setting and the strategic balance between capital and labor. Failure to do so, we would suggest, may not only make their policies ineffective for, but even damaging to, their ultimate goals.

APPENDIX 1

Bargaining with outside option (strike) and perfect information

Notation

call x the share of Capital. x is indexed by the two players, with the player making the offer first.

call d_L and d_C the time discount factor of Labor and Capital, respectively.

call o_S and o_W the outside option of Strong and Weak Labor, respectively. Note that o_S is greater than the bargaining share, while o_W is less. As a result o_S is always taken by Strong Labor and appears in the formulas, while o_W is never taken and never appears.

Case 1: Capital + Weak Labor; Capital moves first.

				C ≥ (at least)	WL ≤ (at most)
time	0	C	offer	$1-d_L(1-d_Cx_{C,WL})$	
			accept		$d_L(1-d_Cx_{C,WL})$
time	1	WL	offer		$1-d_Cx_{C,WL}$
			accept	$d_Cx_{C,WL}$	
time	2	C	offer	$x_{C,WL}$	
			accept		$1-x_{C,WL}$

Assume that Capital at time 2 receives at least $x_{C,WL}$. This share is equal to $d_Cx_{C,WL}$ at the previous time period. So, Weak Labor can receive at most $1-d_Cx_{C,WL}$ at time 1. Therefore, in the previous time period, Weak Labor can receive at most $d_L(1-d_Cx_{C,WL})$, which leaves at least $1-d_L(1-d_Cx_{C,WL})$ for Capital.

The same argument can be made by interchanging the terms "at least" and "at most." So, Capital at equilibrium receives exactly $x_{C,WL}$. To calculate $x_{C,WL}$, we equate Capital's share at time 2 with time 0, and solve for $x_{C,WL}$:

$$x_{C,WL} = 1-d_L(1-d_Cx_{C,WL}) \geq x_{C,WL} = (1-d_L)/(1-d_Ld_C)$$

Note: In the next case, the table will be presented, and the repetition of the argument will be left to the reader.

Case 2: Capital + Strong Labor; Capital moves first

		C	SL
C	offer	$1-[po_S+(1-p)d_L(1-d_Cx_{C,SL})]$	
	accept		$[po_S+(1-p)d_L(1-d_Cx_{C,SL})]$ (strike)
SL	offer		$1-d_Cx_{C,SL}$
	accept	$d_Cx_{C,SL}$	
C	offer	$x_{C,SL}$	
	accept		$1-x_{C,SL}$

In equilibrium the initial offer of Capital should be equal with the offer after one round of negotiation. Solving for $x_{C,SL}$ gives:

$$x_{C,SL} = [1-po_S-(1-p)d_L] / [1-(1-p)d_Ld_C]$$

Note: Capital and Strong Labor could have such attractive outside options that they are tempted to make unacceptable offers to each other, waiting for the government to intervene. In this case, the expected value for Labor will be:

$$po_S + pd_L(po_S) + p^2d_L{}^2(po_S) + \ldots = po_S/(1-pd_L) = o_S$$

and

$$po_C + pd_C(po_C) + p^2d_{C2}(po_C) \ldots = po_C/(1-pd_C) = o_C$$

in order to eliminate this implausible possibility, we assume

$$o_S + o_C < 1$$

Moreover, we assume that $o_C < x_{C,SL}$ (otherwise Capital would choose to have a lockout before making its next offer).

APPENDIX 2

Bargaining with outside option (strike) and incomplete information

Notation. In addition to the notation of Appendix 1, there is probability w that Labor is weak and $(1-w)$ that it is strong.

The solution concept applied here is that of sequential equilibrium (Kreps and Wilson, 1982). Application of this concept requires that strategies are optimal responses to each other for the remainder of the game (subgame perfection) given the players' beliefs; and beliefs are updated along the equilibrium path by Bayes' rule. This concept is not restrictive enough (it leads to too many equilibria), because how a player updates his beliefs off the equilibrium path is not specified. We will assume optimistic conjectures (Rubinstein, 1986). That is, any time Capital sees Labor making a choice off the equilibrium path, it infers that it is confronting Weak Labor. This restriction leads to a unique outcome.

Lemma 1: Any offer greater or equal to $1-x_{C,SL}$ is immediately accepted by Labor.

Proof: See Case 2 in Appendix 1.

Lemma 2: Any offer less than $1-x_{C,WL}$ is rejected by Labor.

Proof: See Case 1 in Appendix 1.

Lemma 3: Strong Labor rejects any offer less than $1-x_{C,SL}$, strikes, and makes a counteroffer of $1-d_Cx_{C,SL}$ which is accepted.

Proof: See Case 2 in Appendix 1.

Lemma 4: If Weak Labor rejects an offer, it strikes first, and makes the counteroffer $1-d_Cx_{C,SL}$.

Proof: The offer will be at least $1-x_{C,WL}$ by Lemma 2. If Weak Labor rejects and reacts differently from Strong Labor (either does not strike first, or does not counteroffer $x_{SL,C}$ afterwards), Capital identifies the opponent as weak with probability 1. Consequently, it will never offer more than $1-x_{C,WL}$. However, several rounds have gone and the share is accordingly discounted.

Lemma 5: An offer which is rejected by both Strong and Weak Labor is a dominated strategy for Capital.

Proof: If both Strong and Weak Labor reject, Capital gains no information, and when it is its turn to make an offer, it finds itself in the initial situation while the dollar has been discounted by $d_C{}^2$.

Lemma 6: There are only two undominated equilibrium strategies for Capital.

1. Make the offer $1-x_{C,SL}$ (pooling equilibrium).
2. Make an offer $1-x_{C,L}$ which is acceptable by Weak Labor but not by Strong Labor (separating equilibrium).

Proof:

1. An offer more than $1-x_{C,SL}$ is dominated because $1-x_{C,SL}$ is accepted by Labor (Lemma 1).
2. An offer in the $[(1-x_{C,L}), (1-x_{C,SL})]$ interval is dominated by $(1-x_{C,L})$. Indeed both of these offers are accepted by Weak Labor and rejected by Strong Labor.
3. Any offer in the $(0,1-x_{C,L})$ interval is rejected by both Weak and Strong Labor (Lemma 5).

Theorem 1: The value of $x_{C,L}$ is given by

$$x_{C,L} = \max\{[po_W+(1-p)d_L(1-d_Cx_{C,SL})], (1-x_{C,WL})\}$$

Proof:

	C	WL
C	$1-po_W-(1-p)d_L(1-d_Cx_{C,SL})$	
L		$d-d_Cx_{C,SL}$
C	$x_{C,SL}$	

From the table it follows that the share of Weak Labor is

$$po_W+(1-p)d_L(1-d_Cx_{C,SL})$$

The rest of the theorem follows from Lemmas 2 and 5.

Theorem 2: Capital offers $1-x_{C,SL}$ if

$$wx_{C,L}+(1-w)d_C x_{C,SL}<x_{C,SL} \text{ (pooling); } 1-x_{C,L} \text{ otherwise (separating).}$$

Proof: Capital has the option of making an offer $(1-x_{C,SL})$ which will be accepted immediately; or an offer $(1-x_{C,L})$ which will be accepted by Weak Labor (that is, with probability w), and rejected, followed by a strike and a counteroffer by Strong Labor (with probability $(1-w)$). Capital chooses the expected utility maximizing option.

Note: The belief of Capital is that Labor is strong with probability $(1-w)$ in the beginning of the game; if Capital makes a separating equilibrium offer, it immediately infers with probability 1 what type of Labor it faces. Off-equilibrium beliefs act as a deterrent here so that no player deviates from his equilibrium strategy. Alternative off-equilibrium belief formation would lead to less intuitive equilibria. For example, if Capital has pessimistic beliefs (inferred from an off-equilibrium path move that the opponent is Strong Labor), then Weak Labor will have an incentive to deviate all the time, and therefore, the only equilibrium would be the pooling one.

NOTES

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1. We concentrate much of our attention on the relevant literature in economics. We are entirely ignoring the "pluralistic industrialism" approach to strikes which represented the mainstream only ten years ago. Our reason for doing so is that recent work such as that of Hibbs (1978) and Korpi and Shalev (1980) has shown that the arguments found in this literature concerning strikes cannot be sustained.

2. We have adopted a descriptive title for each approach.

3. In keeping with other discussions (Cousineau and Lacroix, 1986), we are including the strike theory of Ashenfelter and Johnson (1969) within the bargaining power approach, despite the fact that it is more deductive and the range of relevant variables is narrow.

4. At the end of their article, Ashenfelter and Johnson (1969) recognize the possible effects of changes in the institutional framework within which bargaining takes place.

5. Lange and Garrett (1985) make a different argument which is, however, congruent with the corporatist literature: that as unions become encompassing (Olson, 1982), they have the interest to contribute to the public good through regulating their wages, but that this will only occur where the government is also favorable to labor.

6. When Paldam and Pedersen (1982) compare seventeen OECD countries, they find both positive and negative coefficients (particularly for unemployment) and divergences from the expectations of the corporatist literature (left-wing governments are sometimes associated with more conflict) *and* of Ashenfelter and Johnson (1969). However, Paldam and Pedersen do not propose a theoretical explanation for their findings. Even Korpi and Shalev (1980) who present a table (Table 3) with a curvilinear relation between labor power and strikes fail to provide an argument for such a relationship. They focus rather on the high end of the scale, underlining the importance of left-wing governments for lower strike rates.

7. Actually, Hicks (1963: 146–47) proposed two basic explanations for strikes in light of his model: imperfect or private information or reputation building. We will not discuss the latter.

8. Cousineau and Lacroix (1986: 377) make the same point when they write that if one assumes that ". . . the parties involved in wage negotiations are informed about changes in the relative bargaining power . . . it would be reasonable to expect changes in relative bargaining power to be reflected in the terms of the wage agreements rather than in strikes."

9. Cousineau and Lacroix (1986: 377) stress that "both the quantity and reliability of information needed to assess relative bargaining power do have significant value in predicting strike incidence."

10. Although all are basically deductive in their construction, Hayes (1984), for instance, relies exclusively on extensive formal modeling while most of the others construct models which are then given empirical referents and tested through regression techniques.

11. It should be underlined that there is nothing inherent in these models which should restrict the range of variables which they consider. For a critique of the narrowness of these models, see Cohn and Eaton (1988).

12. Cousineau and Lacroix (1986: 385) provide evidence showing that economic variables reflecting instability in the informational environment of collective bargaining significantly explain interindustry differences in strike frequency "better than do interindustry differences in relative bargaining power or union militancy."

13. For a model where strikes occur without incomplete information, see Fernandez and Glazer (1991).

14. For a review see Kennan and Wilson (1989).

15. The payoff o_L of Labor includes costs of strike. Such costs are variable, depending on Labor organization, strike funds, etc.

16. One can introduce the possibility of a lockout, but without any additional analytic power. In order to simplify calculations, we introduce a lockout option for Capital which gives lower payoff than the bargaining game, so it is never taken. The calculations replicate Sutton (1986). The reader should consult that article for more details.

17. In other words, we can study strikes as a game "nested" inside broader political games (Tsebelis, 1990).

18. One can replicate the calculations in Appendix 1 and see that the outcome of the game is not the same if Labor makes an offer first. In fact, there is an advantage to having the first move in this game. We will not pursue the issue further. (For discussion of this issue in a different institutional setting, see Money and Tsebelis, 1992).

19. The reader can verify that three of these specifications produce similar results. It is not accidental. The second and fourth models produce virtually identical results because the relative difference is equal to the ratio minus 1; the second and third produce similar results because $d(\ln x)/dx = dx/x$.

20. As measured by the average of three different measures: Schmitter (1981), Cameron (1984), and Calmfors and Driffill (1988).

21. For a criticism of this point of view, see Golden (1992).

22. As measured by Wallerstein (1989). Wallerstein considers only government participation, so scores countries like Italy and France extremely low. An alternative measure would take into account political strength of the Left even when it is in the opposition.

23. See Lange, Wallerstein, and Golden (Chapter 4, this volume) for such an attempt.

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6

The Impact of Foreign Investment on U.S. Industrial Relations: The Case of California's Japanese-Owned Plants

RUTH MILKMAN

The workers of the world are less united today than a century ago, when labor was international and capital national in orientation. Labor movements around the world now operate primarily on a national (or, in some cases, local) basis, even though capital has become increasingly internationalized. In recent years, as transportation and communication costs have dropped and barriers to international trade and investment have collapsed in nation after nation, capital's increased mobility has dramatically weakened organized labor in virtually every country.

The United States, which did so much to foster economic globalization, has become increasingly dependent on the reinvigorated economies of Western Europe and Japan. With relatively few barriers to foreign trade and even fewer to investment (the legacy of its former economic hegemony), the United States has been flooded with imports and with both direct and indirect foreign investment in the last two decades.[1] Once the world's largest creditor, it is now justly famous for its enormous trade and budget deficits; and total foreign direct investment inside the United States now exceeds U.S. direct investment abroad.[2]

This chapter explores a critical aspect of the changed position of the United States in the age of economic globalization: the growth of Japanese direct investment (JDI) and its impact on American workers and organized labor. Although still considerably smaller than direct investment from Western Europe, JDI in the United States has attracted disproportionate attention, both because of its high visibility, linked to persistent anti-Japanese racial prejudice, and because of its spectacular recent growth. From less than $5 billion in 1980, or 6 percent of worldwide direct investment in the United States, JDI skyrocketed to $83.5 billion (21 percent of the total) in 1990, the most recent year for which figures are available. Japan is now second only to Britain