

# **The Impact of Liberalization on Wage Levels: Considerations Raised by Strategic Bargaining Analysis\***

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## **1. Overview**

Strategic or noncooperative bargaining theory provides potentially fruitful microfoundations for the analysis of exchanges in which both sides enjoy price-setting power. As Rubinstein (1980) demonstrated in his pioneering contribution, invoking a plausible refinement of Cournot-Nash equilibrium makes it possible to derive unique and often intuitively compelling outcomes from given specifications with respect to preferences, technology, and institutional framework. As such, for example, this approach offers a promising basis for the “Nash program” of grounding axiomatic approaches to cooperative games (such as the Nash bargaining solution) in a well-articulated strategic framework.

More concretely, strategic bargaining theory provides political economists the wherewithal to investigate possible distributional and efficiency consequences of changes in the prevailing economic environment. Of particular contemporary relevance are the changes associated with the so-called “new economy,” which features liberalization of trade relations and increased capital mobility (both in absolute terms and relative to the mobility of labor).

In this brief paper, I summarize the implications of some basic results in strategic bargaining theory for the link between increased market openness and capital mobility and labor market outcomes. This is a “nanoeconomic” or “partial partial” equilibrium analysis, in that market conditions surrounding a representative bargaining relationship are for the most part taken as given. The paper thus provides a starting point for more comprehensive market analyses of the sort pursued in the conference paper by Reddy and Dube. For the sake of brevity and focus I also limit attention to bargaining under conditions of complete information.

Broadly speaking, strategic bargaining analysis suggests that bargaining outcomes are determined by three sets of considerations: individual bargaining costs (both absolute and relative), the nature and magnitude of payoffs encountered “outside” given bargaining relationships (both absolutely and relative to the gross rent to be shared), and the rules governing the bargaining process. Taking the former to be dictated primarily by individual preferences and the “technology” of bargaining in addition to procedural rules, and the latter to be determined primarily by the legal rules undergirding exchange, this leaves “outside payoffs” as the key variable influenced by trade liberalization and increased capital mobility.

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As I'll demonstrate below, strategic bargaining analysis makes two key predictions concerning the impact of (changing) outside payoffs on bargaining outcomes. The first concerns a fundamental asymmetry between outside payoffs understood as default payoffs in the (probabilistic) event of *exogenously imposed* termination in a bargaining relationship, and these same payoffs understood as *voluntarily chosen* "exit options" available to the transacting parties at regular intervals in the bargaining process. The former interpretation, under suitable simplifying assumptions, yields the *Nash bargaining solution*, which indicates that changes in outside options *always* affect bargaining payoffs at the margin.

In contrast, outside payoffs understood as *exit options* matter only if the threat to exercise the exit option is credible in the sense of subgame perfect equilibrium. This implies that changes in outside payoffs affect bargaining equilibria only if they are "sufficiently high" relative to the bargaining outcomes that would obtain in the absence of the exit option. More precisely, given the requirement that non-negative rents must arise for exchange to be viable, bargaining outcomes will be determined by the *highest* outside payoff given that it exceeds the bargaining share received by the player with that outside option, had it not been available.

This outcome suggests *two* potential asymmetries in the determination of bargaining outcomes in the presence of outside payoffs: one depending on the magnitude of outside payoffs relative to the gross rent to be bargained over, and one related to the relative magnitude of the outside payoffs themselves. One reading of these asymmetries is that the Nash bargaining solution is applicable when workers bargain collectively and outside payoffs of both employer and employees are small relative to the gross rent to be shared; in contrast, its application is problematic to the extent workers do not bargain collectively and/or exit options are relatively high for one or the other side of the bargaining table.

The second key prediction gives nanoeconomic content to the notion of outside payoff by linking it to the cost of replacing given bargaining partners. This is a salient consideration in the presence of significant costs of hiring or firing workers. Referring to a simple strategic bargaining model with an employer and multiple employees, I'll link the individual payoffs of workers who do not bargain collectively to the marginal cost of replacing them in the firm's production process.

## **2. Alternative Bargaining Scenarios**

### *The basic bargaining framework*

Suppose there are two players, L and K, who bargain over a gross surplus  $V$ , denominated in monetary units. Bargaining rounds proceed in discrete time periods beginning with period 0, and continue indefinitely until bargaining is concluded. In each round of bargaining, one player makes an offer for distributing the surplus, and the other player responds by accepting or rejecting the offer. Players alternate offers (beginning,

arbitrarily but unimportantly, with player L), and bargaining concludes only once a given player's offer has been accepted; in that case, the available surplus is divided according to the accepted offer.

Each player's payoff is simply equal to the (present) value of his or her bargaining share, net of bargaining costs. A number of different forms of bargaining costs have been considered in the literature; in this paper I'll be concerned with three types, associated respectively with discounting of future payoffs, fixed per-round bargaining costs, and exogenously given probability of termination. The key to the derivation of unique equilibria in strategic bargaining analysis is the requirement of sequentially *credible*, or subgame-perfect, play in light of anticipated costs of bargaining.

*First scenario: exogenously determined probability of breakdown*

Suppose that bargaining proceeds as indicated above, but the only source of bargaining cost is derived from the positive probability  $q \in (0, 1)$  that the bargaining relationship will break down at the conclusion of any bargaining round in which agreement is not reached. In the event of breakdown, the payoffs to L and K are taken to be  $w_0$  and  $\mathbf{p}_0$ , respectively. Players cannot choose to exit the relationship voluntarily.

It is straightforward to show that under the stated conditions there is a unique subgame perfect equilibrium to the bargaining game, yielding a payoff to player L of

$$(1) \quad w_1^* = \frac{V - \mathbf{p}_0 + (1 - q)w_0}{2 - q},$$

with player K receiving  $\mathbf{p}_1^* = V - w_1^*$ . The limiting payoffs as  $q \rightarrow 0$  are readily seen to equal the *Nash bargaining solution* to the Nash cooperative bargaining game with corresponding utility possibilities frontier and threat points.

Note that in this solution, changes in the value of *either* outside payoff *always* effect equilibrium payoffs at the margin: if the outside payoffs sum to less than the gross surplus, each player receives a rent, and each player's payoff is increasing in her outside payoff and decreasing in her opponent's.

*Second scenario: exit options*

Now let the bargaining game outlined above be modified in two ways: first, suppose that there is no chance of exogenous breakdown (i.e.,  $q = 0$ ), and bargaining costs derive rather from the fact that players discount future payoffs by the factor  $\mathbf{d}_i \in (0, 1)$  per period,  $i = L, K$ . Second, suppose that the respondent in each bargaining round has the option of responding to the prevailing offer by either *rejecting* it, as before, or *exiting* the relationship. The current-period payoffs from exit are taken to be just the outside payoffs specified in the first bargaining scenario. As before, assume that the bargaining relationship is *viable* in the sense that  $V \geq w_0 + \mathbf{p}_0$ .

For simplicity's sake, let the discount factors of the two players be equal, and consider the limit as the common value of these factors approach one (that is, derived bargaining costs approach zero). It is readily shown that payoffs depend non-linearly on the values of outside options; specifically, L receives

$$(2) \quad w_2^* = \begin{cases} V/2 & \text{if } w_0, p_0 < V/2; \\ w_0 & \text{if } w_0 > V/2; \\ V - p_0 & \text{if } p_0 > V/2, \end{cases}$$

with player K receiving  $p_2^* = V - w_2^*$ .

Note the asymmetric impact of outside payoffs on bargaining outcomes. First, exit option values do not affect payoffs at all unless one or the other (viability precludes both) exceeds the respective player's bargaining payoff in the absence of exit (half of the gross surplus, in this case). Second, if a player's outside option exceeds that margin, then he or she just receives the value of her outside option, with the other player getting the remainder. The intuition behind this result is basic: a player's threat to exit the relationship is not credible if the resulting payoff is lower than what he or she could expect to receive by continuing the bargaining process.

*Third scenario: exit options and endogenous employment levels*

Finally, let's extend the model to the case of one employer,  $n$  employees, and correspondingly let the gross surplus be given by  $V(n, I)$ , where  $n$  represents the number of incumbent employees and  $I$  represents the degree of trade liberalization. Employer and employees alternate offers, with employees making *simultaneous* offers in their bargaining rounds. The employer bargains *individually* with each employee; there is no collective bargaining. In each individual bargaining relationship, there are exit options as before, but in this case there are only *fixed* per-round bargaining costs  $c_i$ .

Skillman and Ryder (1993) consider such a model and derive the following equilibrium payoffs for the case in which employees have some bargaining power (i.e., their fixed bargaining costs are each lower than the employer's) and there are diminishing returns to  $V$  in  $n$  (for example, gains from firm-specific human capital are decreasing in the number of incumbents):

$$(3) \quad \begin{aligned} p_3^* &= V(n, I) - n(V_n(n, I) + w_0(I)), \\ w_3^* &= w_0(I) + V_n(n, I), \end{aligned}$$

where the latter is the individual wage per employee, and  $w_0$  is also taken to depend on the degree of trade liberalization.

Note what this result says: the magnitude of (quasi-)rents enjoyed per employee depends on the marginal cost of replacing that employee in the production process. If we now imagine that the employer chooses  $n$  to maximize profit in light of this bargaining outcome, and apply the envelope theorem to the optimized objective function that results, we get an outcome equivalent to equation (5) in Reddy and Dube, but with somewhat different articulation of the impact of trade liberalization on equilibrium wages. As in their paper, however, it is possible that net profits might *increase* even if firm revenues *decline* due to increased competition.