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WAGES, EMPLOYMENT AND THE THREAT OF COLLECTIVE ACTION BY WORKERS

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Wages, Employment and the Threat of Collective Action by Workers

ABSTRACT

For many reasons a group of workers may have sufficient bargaining power to claim for themselves some share of any monopoly surplus earned by an enterprise and (in the short run) a share of the return on fixed assets. This paper explores the effect of the threat of collective action on wages and employment in firms which wish to avoid collective bargaining with their employees.

The threat of collective action analyzed here is a stylized representation of the institutional situation created by U.S. labor laws. If a firm wishes to avoid collective bargaining it must choose wages and employment so that no coalition greater than or equal to a fixed fraction of its workforce can be formed around a feasible bargaining agreement. The constraint this implies on employment and wages is analyzed for several assumptions about how bargained surplus is distributed among workers. It is found that the threat may affect only employment, or both wages and employment. For a firm with monopoly power a threat may either increase or decrease employment. Effects on wages and employment are found to be possible even in a market with price competition and free entry if firms must make fixed investments to produce output. Even when union contracts are efficient a threat of collective action can be expected to distort employment and investment decisions.

If a threat causes firms to pay a wage above the reservation wage there will be an excess supply of labor to the firm. Under certain conditions this may manifest itself as involuntary unemployment. Further, unemployed workers will be unable to bid wages down. Like efficiency wage models, the threat of collective action provides an explanation for industry wage differences and the dual structure of the labor market. The model may also be able to provide some insight into the reasons for the stability of nominal and real wages over the business cycle.

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WAGES, EMPLOYMENT AND THE THREAT

OF COLLECTIVE ACTION BY WORKERS

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Workers acting collectively exercise more bargaining power than individuals. This power can be used by groups of workers to claim for themselves some share of any monopoly surplus earned by an enterprise and (in the short run) a share of the return on fixed asset. This paper explores the effect of the threat of collective action on wages and employment in firms which wish to avoid collective bargaining with their employees.

In recent years economists have devoted a great deal of effort to the development and testing of models of union wage and employment effects. Although only a small percent of the workforce is organized by unions,[1] it is often argued that the conditions of employment in the union sector may affect those of the non-union sector via a threat effect -- employers wishing to keep unions out must match or come close to matching union wages. A primary purpose of this paper is to present a formal theoretical framework for considering this contention.[2]

Another motivation for this research is the recent interest in efficiency wage models[3]. These models have attracted attention because they provide parsimonious explanations for the existence of involuntary unemployment, and why different firms pay different wages for apparently identical workers. But, they have come under attack either because they are based on the ad hoc assumption of a normative wage or because the market imperfections which could give rise to efficiency wages could be dealt with in a pareto efficient manner with other forms of incentives such as bonding of workers or increasing age-earnings profiles. The threat model solves many of the same empirical puzzles as efficiency wage

models, but lacks some of the drawbacks. Like efficiency wage models, it can also explain the existence of dual labor markets and might help explain discrimination against minority workers in hiring in some jobs. Finally, the model may provide an explanation for inertia, or the appearance of inertia in wage setting.

The presentation proceeds in five parts. Section I describes a model of a firm facing the threat of unionization. Section II analyzes the model, demonstrates the possible effects on wages and employment in a monopolistic and a competitive industry. Section III considers how the threat of collective action may help explain the behavior of wages over the business cycle. Section IV is a conclusion which summarizes the results discusses some empirical evidence for the relevance of the model and considers policy implications.

I. THE THREAT OF COLLECTIVE ACTION.

For many reasons, including laws, social customs and diseconomies of scale in training and hiring, workers acting collectively may wield the threat to shut a business down. As a result they may be able to claim for themselves a share of any monopoly rents accruing to the firm and, in the short run, some of the return to any fixed assets owned by the firm. Consequently, firms may find it profitable to avoid having to bargain collectively with their employees. Depending on the nature of the laws and customs it may be more or less easy to do this. This section presents a model of a firm facing the threat of collective action by its workers. The model is meant to be a stylized representation of the situation faced by a modern U.S. firm. If a fraction v of a firm's workforce

wishes to bargain collectively then the firm must do so. The fraction v could be thought of as the majority that must vote to certify a union under the National Labor Relations Act. Alternatively it could be thought of as being the smaller fraction that must be mobilized and willing to work to organize the union or the larger fraction of the workforce that must be sufficiently sympathetic to the idea of collective bargaining to be willing to take part in a work stoppage or slow-down.

It will be assumed that workers will not want to take part in collective bargaining if they can not expect to negotiate a wage higher than the one they currently receive.[4] Each worker will also have to pay some cost to organize for collective bargaining. This cost could include the time it takes to organize a group of people and agree on collective goals, and/or the costs imposed by an employer on workers who attempt to organize. The latter are limited by the law and the employer's willingness to engage in and pay for anti-union actions. In the model these costs (c) will be assumed to be constant and equal for all workers.[5] The view that workers' predisposition towards the social value of unions affect their preferences for collective bargaining can also be incorporated into the model through a reinterpretation of c. If workers put a high value on solidarity and the political role of unions then c would be small, conceivably negative at some times. If workers are averse to unions or collective bargaining c would be larger. Workers and firms will be assumed to have perfect foresight about the outcome of any actions they take. Workers will choose to bargain collectively only if they know that the wage that they will be paid is greater than their current wage plus c.

The firm is assumed to maximize profits and to face an infinitely elastic supply of workers at a reservation wage r. One of the things agents are assumed to know is the exact nature of all contracts workers could negotiate with the

firm. A contract in this model will specify the level of employment, which workers are employed, and how much each worker is paid. The set of possible contracts is determined by technology, market conditions, the firm's initial choice of the amount of capital, and the bargaining power of the parties. It will be assumed to be given at the outset.[6]

By only specifying a set of possible contracts the question of how bargaining outcomes are determined can be avoided for the most part. Workers may negotiate efficient contracts or they may choose wage employment pairs on the labor demand curve. Workers collectively may behave as if they had any type of preferences. There is no need to specify a particular solution to the bargaining problem or the form of the bargaining game. Many results will only require minimal assumptions about the nature of the set of possible contracts.

The sequence of events in the model is as follows:

1.The firm chooses the number of workers it wishes to hire (L) and a wage for each of the workers (w_i, i=1,...,L).

2. If any possible contract is attractive to a coalition of a fraction of at least v of all workers then collective bargaining is commenced. A contract will be attractive to a worker if the wage offered is greater than the current wage by at least c dollars -- an amount necessary to compensate the worker for the cost he or she will have to incur to organize for collective bargaining. We will not be concerned with which contract will be chosen if more than one is attractive since we will only be examining cases where the firm acts to prevent any coalition from forming.

3. If collective bargaining is chosen the firm will earn profits π_c. If it is not the firm will earn $\pi_{nc} = R(L,K)-\Sigma w_i$, where R(L,K) represents the firms revenue net of non-labor costs as a function of the number of workers employed and the initial stock of capital.

Since all agents in the model have perfect information the firm knows when it chooses the level of employment and wages whether or not it will have to bargain collectively with its employees. It also knows what contract will be negotiated.

To finish the description of the model the general form of the set of possible contracts must be specified. Once the decision is made to allow collective bargaining the firm will care only about the level of employment and the wage-bill -- not the wage being paid to each worker. Consequently, it is possible to divide consideration of the types of contracts that will be offered into two parts.[7] First, which wage-bill/employment combinations can be negotiated will be considered followed by the constraints firms and workers may face in distributing the wage bill.

For analytical convenience two other assumptions will be made about the set of possible employment/wage-bill pairs. Defining B(E,K) as the wage-bill which can be negotiated as a function of the amount of labor employed (E), and the initial capital stock of the firm (K), it will be assumed that for the values over which B(E,K) is defined, for each value of K, B(E,K)/E and B(E,K)-rE have unique maximums. These assumptions will be used to derive the form of the constraint avoiding collective bargaining imposes on wages and employment.

With respect to how bargained agreements may distribute the wage bill there are two considerations -- can the agreement discriminate in favor of the pro-bargaining coalition and can it distribute income to unemployed coalition members.[8] Depending on the answers to each of these questions one of four sets

of contracts can be offered given the B(E,K) locus.[9] These possible contracts determine the wage/employment constraints a firm must satisfy to avoid collective bargaining. The determination of these constraints is described in the next section.

II. WAGES AND EMPLOYMENT.

First, consider the case of a firm which is a monopoly. Since the firm knows when it chooses employment and wages whether or not it will have to bargain collectively with its workforce the firm's decision can be reduced to two steps. In the first, the firm determines the maximum profit it can receive if it bargains and if it does not. To determine the latter it must compute the level of wages and employment which maximize profit subject to the constraint that no possible contract will be preferred by a fraction v of the workers it hires. In the second step the firm compares profits in the two cases and chooses to bargain or not depending on which profit is larger. Since the concern here is with threat effects only the choice of employment and wages in the case where the firm decides to avoid collective bargaining will be considerd.

The first thing to note about the firm's wage policy if it wishes to avoid bargaining is that it will always minimize its total wage bill if it pays all workers the same wage. This is because with identical workers those who are paid the least will require the lowest wage to induce them to join the coalition. The highest paid need not be included.[10]

If the firm pays all workers the same wage the firm's task is to maximize $\pi=R(L,K)-wL$ subject to $w \geq r$ and to the constraint that w is sufficiently large so that no potential contract can pay vL workers $w_c > w+c$.

The constraint that the firm pay enough, given its employment level, to avoid bargaining can be analyzed as follows. Consider first the situation where workers may discriminate against those who are not members of the founding coalition and may transfer income to members of that coalition even if they are not employed by the firm after the adoption of the contract. In this case a coalition will be able to form if there exists a feasible contract which allows vL workers to be paid c more than the wage the firm is offering them if they are employed or c-r more if they will not be employed (since if they are not employed they are assumed to be able to earn the reservation wage r). If this is possible with any contract it will be possible with the one which maximizes the difference between the total wage bill for a given capital stock, and r times the number of workers employed under that contract. By maximizing this total, the amount per member of the fixed sized coalition is also maximized. Defining L^* as the number of workers employed under that contract the value of L^* is that which maximizes $B(L^*,K)-rL^*$ given K. If the coalition negotiates this contract it can offer its members $(B(L^*,K)-rL^*)/vL + r$. If $vL < L^*$ then additional workers will be discriminated against and paid only r. If $vL > L^*$ some of the original coalition will be laid-off and paid only $(B(L^*,K)-rL^*)/vL$. Since these workers can earn r in other employment they will be indifferent between being laid-off and staying on. Thus the firm must offer

$$w \geq (B(L^*,K)-rL^*)/vL + r - c \qquad (1)$$

to avoid collective bargaining.

If the bargained agreement can neither discriminate nor transfer income to coalition members who are not employed, the contract which will be preferred if any contract is will be the one which maximizes the wage bill per employed worker subject to the constraint that all vL members of the coalition are employed.[11] In this way the agreement offers the highest possible wage to coalition members. If we define L' as the value of E for which B(E,K)/E is maximized and assume that B(E,K) is non-increasing beyond L' then the constraint on the wage the firm must satisfy to avoid collective bargaining is

$$w \geq B(E,K)/E - c \quad \text{where } E = \max(L',vL). \qquad (2)$$

The other two cases are hybrids of these two. If the agreement may discriminate but can not specify transfers to workers who are not employed by the firm the wage constraint the firm faces if it wishes to avoid bargaining is

$$w \geq (B(E,K)-rE)/vL + r - c \quad \text{where} \quad E = \max(L^{*},vL). \qquad (3)$$

If agreements can specify transfers but can not discriminate the constraint is

$$w \geq (B(E,K)-rE)/U + r - c \quad \text{where} \quad E = \min(L^{*},U) \text{ and } U = \max(L',vL). \qquad (4)$$

Figure 1 presents an example of the second type of constraint and shows its derivation from the B(E,K) frontier. The figure shows that if agreements can neither specify transfers nor discriminate the firm faces a constraint with a flat segment between the origin and L'/v on the horizontal axis, and a downward sloping segment beyond there. Of course the firm must offer a wage of at least r to hire workers so beyond some point the avoidance constraint is not binding. The posi-

tion of the constraint is found by identifying L'/v. At that point the firm must offer a wage of $B(L',K)/L' - c$ to avoid bargaining. Similar diagrams could be drawn for the other three cases.

If the firm chooses to avoid bargaining it maximizes profit subject to the constraint that the wage is greater than r and large enough to deter the formation of a coalition. Figures 2 through 6 depict five different types of solutions to this problem. Choices like point A in figure 2 will be observed when the cost of forming a coalition (c) is very large, when the firms bargaining power would keep any coalition from capturing a significant fraction of the its profits, or when there are no profits for a coalition to capture. Then the firm pays the reservation wage and sets employment so that the marginal revenue product is equal to the reservation wage. In this case there is no threat effect.

In figure 3 at point B there is a threat effect on employment but not on wages. Firms will choose wage-employment pairs of this sort when both the avoidance and the reservation wage constraint are binding. In this case the firm is paying a wage greater than the marginal revenue product of labor. Given its initial choice of K, it is also hiring more workers than it would in the absence of a threat in order to increase the size of the coalition that must form so as to reduce the wage the coalition can offer. It is even possible that independent of the initial choice of K employment is higher. For example, if the initial capital stock is not an important determinant of bargained wages in the long run (which it might not be in a growing industry) then we would expect employment to be higher in a firm facing a threat of collective action such as that depicted in figure 3 than in one which does not. Even if increasing the capital stock increases the wage bill that a coalition could expect to obtain, and the firm under invests in capital, this effect need not dominate the increased employment the firm undertakes to dilute the returns to organizing.

Point C in figure 4 depicts a situation where there is a threat effect on wages and employment. In the diagram the firm is facing the wage constraint for when the coalition may both discriminate and make transfers. First order conditions for profit maximization with this constraint substituted into the profit function are

$$R_L(L,K) = r-c$$

and

$$R_K(L,K) = (\partial S/\partial K)/v$$

where

$$S = B(L^*,K)-rL^*$$

or the marginal revenue product of labor must equal r-c, and the marginal revenue product of capital net of non-labor costs should equal the derivative of the bargained surplus, with respect to capital, divided by the fraction of workers necessary to form a coalition. Given K, employment is greater than it would be in the absence of a threat and wages are above the reservation wage. This is the situation depicted in in figure 4. The firm hires the additional workers to force any potential coalition to distribute the surplus over a larger number of members thus leaving a smaller surplus per potential member and making the formation of a coalition less attractive. Depending on the sign and size of $\partial S/\partial K$ and on the cross partial derivative of revenue function with respect to labor and capital,

employment may be either greater or less than it would be in the absence of a threat.

If the firm were facing the constraint where agreements involve neither transfers nor discrimination, choices of wages and employment on the downward sloping part of the constraint may or may not be possible depending on the nature of the B(E,K) function.[12] Point D in figure 5 depicts a situation where the tangency exists. The wage is above the reservation wage. Again, employment may be either greater or less than in the absence of a threat.

The last situation to be considered occurs when agreements may not specify transfers to unemployed workers or discriminate in distributing the wage bill. This may yield a choice such as point E in figure 6. A wage above the reservation wage is paid and the marginal revenue product of labor is set equal to the wage. The marginal net-revenue product of capital is set equal to L times the derivative of the union wage with respect to the capital stock. Unless increasing the capital stock greatly increases employment and reduces the union wage, employment will be lower with a threat than without.

In any of these cases where the wage is above the reservation wage, even those where employment is greater than in the absence of a threat, there would be an excess supply of labor and firms would refuse to hire additional workers at any wage. Workers who attempted to bid the firms wage down would be unsuccessful since the firm would fear that workers employed at a lower wage would attempt to organize to take collective action.

This excess supply of labor may or may not manifest itself as unemployment. If there were jobs in the economy which paid a competitive wage workers who could not find employment in high wage threat avoidance jobs might be employed there. However, if there was a binding minimum wage, if other jobs in the economy had to pay an efficiency wage, if unemployed search for high wage jobs was more pro-

ductive than search while employed in these competitively paid jobs, or if there were workers whose reservation wages were above those paid in the competitive sector but not those paid by some high wage employers unemployment would still be a possibility.

The preceding describes the possible effects of a threat of collective action in a firm which is earning monopoly profits. What will happen to wages and employment for firms in a competitive market? To illustrate the possibility of a collective action threat effect in this case consider the following model.

1. Any number of identical firms produce f(k) units of the same good with each unit of labor and k dollars of capital per unit of labor ($f'>0$, $f''<0$). Technology is putty-clay so that once the firm purchases its capital it's maximum output is determined

2. There is an infinitely elastic supply of labor at the reservation wage r.

3. Total market demand is a decreasing function of the minimum price charged by any of the firms. All demand goes to the firm(s) offering the lowest price. If there is more than one firm offering this price the demand is divided equally between them.

4. After the firms make their scale, price and wage decisions and purchase capital, workers decide whether or not to engage in collective bargaining. If they decide in favor of bargaining they negotiate a Nash bargain with the firm. If a bargain is not reached workers earn a fraction of the reservation wage (ar) and the firm receives the market value of its installed capital (dk) which is less

than its pre-installation purchase price ($d<1$). In this case the Nash bargain wage will be

$$w_c = b(pf(k)-dk)+(1-b)ar \qquad (5)$$

where p is the price charged by the firm and b is a constant between zero and one which measures the workers' bargaining power. Before the workers may engage in collective bargaining each must pay a cost c to organize.

With these assumptions Nash equilibrium requires that price be equal to cost since with a higher market price any one firm could earn greater profits by cutting its price slightly and increasing its market share. At lower prices firms would earn negative profits. Firms must also chose the capital/labor ratio to minimize unit costs or be driven out of business by those firms that do. Without the fourth set of considerations the only Nash equilibrium for firms choosing prices, wages, the capital/labor ratio and output is p = unit cost = $(k+r)/f(k)$. Firms choose k to minimize unit cost subject to the constraint that $w \geq r$. Consequently in equilibrium firms will choose $w = r$, $pf'=1$, and output equal to market demand divided by the number of firms. Adding the forth assumption can change this.

Avoiding collective action imposes another constraint on a firm's choice of wages and the capital/labor ratio. Now the firm minimize costs subject to the additional constraint that

$$w \geq w_c - c = bpf(k)-bdk+(1-b)ar-c \qquad (6)$$
$$= [b(1-d)k+(1-b)ar-c]/(1-b)$$

where $p=(k+w)/f(k)$ has been substituted into equation 5 to yield 6. With this additional constraint there are three types of solutions to the cost minimization problem. If the cost to workers of organizing (c) is large enough or their bargaining power (b) is sufficiently small only the reservation wage constraint will be binding and the possibility of collective action will not affect the market equilibrium.

If both constraints are binding firms will lower their capital/labor ratios so that workers hired at the reservation wage will have inadequate incentive to organize. With the lower capital/labor ratio more workers will be required to produce the same output, costs and prices will be higher, and less output will be produced. Employment can be either higher or lower depending on the relative size of the scale and substitution effects.

If only the bargaining avoidance constraint is binding then wages will be set above the reservation wage, prices will be higher and output lower. The capital/labor ratio may be either higher or lower (see appendix 1). Higher wages might lead firms to substitute capital for labor. Decreasing the capital stock decreases wages. Which effect dominates depends on a number of factors including the extent to which capital costs are recoverable if the firm and workers don't reach a bargain (d), what workers receive if no bargain is reached (ar) and the elasticity of substitution of capital for labor. If the capital/labor ratio is lower, employment may be either greater or less than it would be in the absence of a threat depending on the relative size of the scale effect of increasing prices and the substitution effect as firms use less capital and more labor to produce a unit of output. Independent of the effect on employment, with only the collective action avoidance constraint binding, the wage will be above r and workers willing to work for less will not be offered a job out of fear that they

would then have the incentive to join in organizing to bargain. As noted above this may or may not lead to the creation of involuntary unemployment.

Appendix 2 presents a numeric example where firms choose one of the three types of solutions depending on the strength of workers' bargaining power. For low values there is no threat effect. For intermediate values there is an effect on the capital/labor ratio and employment, but not on the wage. For higher values there is an effect on the wage, the capital/labor ratio and employment.

One other attribute of all the threat outcomes is worth noting. No matter whether collective bargaining agreements are efficient or not, employment in the presence of a threat can not be expected to be efficient. If threats raise prices output will be too low. In most cases the threat will also affect the capital labor ratio. Depending on the model analyzed and the nature of tastes and technology, employment can be either higher or lower in the presence of a threat than without one.

The existence of inefficiency in employment relations raises the question of whether there might not exist more efficient arrangements. If workers could commit themselves not to engage in collective action then firms could require workers to make such a commitment as a condition of employment and employment relations would be efficient. However, such a commitment would be very difficult to enforce. Defining collective action in a way such that courts could determine whether or not it was taking place might be a problem. If a group of workers all go out on strike clearly they are engaging in collective action. But, if groups of workers call in sick it might be difficult to prove that any one worker was taking part in a collective action and wasn't truly sick. The problem becomes more difficult when collective action takes the form of work slowdowns, "working to rules", or looking the other way when acts of sabotage are committed. Even if courts could judge when an individual worker had violated a commitment not to

engage in collective action, laws against involuntary service would make assessing civil or criminal penalties difficult. This is one reason why under current U.S. law "Yellow Dog" contracts, the commitment not to join a union, are not enforceable.

An alternative to having workers commit to not taking part in collective action might be requiring them to buy sufficiently large shares in the firm so that the potential gains from collective action are less than the costs. However, such an arrangement would require most workers to invest a very large amount of money in their firm. Many workers might not have enough wealth to allow them to buy large enough shares of firms with high capitalized value per worker. Those that did would still be forced to hold substantially undiversified portfolios. Thus even if workers had the capital to buy large enough shares, the firm might have to offer a compensating wage differential for the extra risk the workers would face. Given these considerations it seems possible that the least inefficient way for firms to deal with threats -- perhaps the only feasible way -- is to modify wages, capital intensity and employment in the ways described earlier in this section.

III. THE THREAT OF COLLECTIVE ACTION AND THE BUSINESS CYCLE.

Perhaps the most vexing question economists face is why unemployed workers are unable to bid down the wages of employed workers and obtain jobs. Both efficiency wage theory and the threat of collective action can explain this phenomena. Once this most compelling reason for expecting large pro-cyclical changes

in real wages is dealt with it becomes easier to explain the remaining puzzles of why wages move so little and employment moves so much over the business cycle.

The movement of both nominal and real wages over the business cycle are a puzzle.

In the medium run -- comparing wages from one year to the next -- it is real wages which seem to move very little. The aggregate time series evidence on real wage variability is mixed, but a recent study of individuals' wages suggests this conclusion. Bils (1985) finds that for people who do not change jobs, wages rise only about .6% for every 1% decrease in the unemployment rate. This would imply an extremely high short run elasticity of labor supply if it was taken to indicate movement in the reservation wage of the marginal worker. However, in the threat model that need not be the interpretation.

The model of the effect of the threat of collective action in a competitive product market gives some insight into why wages may not vary much over the business cycle. Although it is a static model and capacity is determined initially to be exactly equal to the firm's share of total demand, one could imagine a dynamic model which was a sequence of short runs like the static model. In a simple competitive model wages equal the reservation wage of the marginal worker in each period. That wage will fluctuate with market demand for labor. In the threat model reservation wages were relevant to the determination of the firm's wage only to the extent that they determined the workers' threat point in the Nash bargain. There are several reasons why the wages paid by firms which wish to avoid collective bargaining may not vary proportionaly with the reservation wage. First, from equation (6) it is aparent that if $w>r$ the elasticity of the wage with respect to the reservation wage is less than one even if workers receive the full reservation wage in the event that no bargain is reached ($a=1$). There are also

several good reasons to believe that the threat point will not vary one-for-one with the reservation wage.

If the relevant threat for the workers is a short strike then we might expect that they would not seek outside employment and their threat point would not depend on the reservation wage (a=0). Even if striking workers do eventually seek outside employment to the extent that they spend some of the time out of work or working only part time the threat point will vary less than one-for-one with the reservation wage (a<1). Alternatively, if the relevant threat is to shut down the plant or to force the firm to replace its entire workforce, workers might expect to be unemployed for some period of time. Since unemployment compensation does not change with the business cycle (or if it does it tends to be more generous when many people are unemployed) the reservatoion wage in a full model of a labor market with firms paying avoidance wages may not vary pro-cyclicaly or if it does the variation may be muted.[13]

In a monopoly firm, both the reservation wage and the firm's ability to pay will most likely be pro-cyclical. However, if the firm chooses to avoid collective bargaining by choosing a point on the downward sloping segment of the avoidance constraint then the effect of this variability on wages will be ambiguous. For example, consider the case where coalitions may discriminate and transfer and $\partial B/\partial K=0$. An increase in demand for the firms product will most likely cause the B(.) frontier to shift out, $(B(L^*,K)-rL^*)$ to increase and the threat constraint to shift out in the way shown in figure 7. Since such a firm is setting marginal revenue product equal to r-c if the change in the B(.) function is due to a change which does not affect the reservation wage, and capital isn't variable in the short run, employment will increase as the MRPL shifts out. Wages may either decrease or increase depending on the size of the changes in B and MRPL. Point F shows an increase in employment and a small increase in wages.

If the reservation wage increases the effect on employment is also indeterminate, although if employment stays the same or declines the wage must increase. This result is similar to one obtained by McDonald and Solow (1981) for the case of bargained wages. For the most part increases in demand can be expected to increase employment but not necessarily wages. Over the business cycle there may be little or no change in wages in firms choosing this sort of threat avoidance strategy.

A partial explanation for the rigidity of nominal wages in the short run can also come out of a model such as this. Experience tells us that nominal wages are seldom adjusted more than once or twice a year for nearly all jobs. In the short run of most macro-economic analysis (one quarter) most wages do not change. Adjustment costs are an inadequate explanation if one is thinking in terms of the standard competitive model of the labor market since firms which do not adjust their wages up would be unable to hire and would loose their current workforce,and firms which do not adjust their wages down would be passing up large potential profit gains. A modification of the collective action threat model can make the adjustment costs explanation more believeable.

In the standard model of the competitive labor market where firms are wage takers if a firm fails to adjust wages downward when the market wage falls it suffers a loss of potential profits which are first order in the change in the market wage. If a firm fails to adjust its wages up when the market wage increases it will not be able to hire new workers, it will loose its curent workers and it will suffer a profit loss which is of order zero in the change in the market wage. But if wages are being kept high to avoid collective bargaining and firms do not know the location of the collective action avoidance constraint with complete certainty, losses in expected profits from a failure to adjust wages are only second order in the difference between current wages and desired wages. Thus if

there are costs to adjustment, or if employers are less than perfectly rational, nominal wages need not adjust to all changes in business conditions since relatively large divergences of wages from optimal values need not result in large losses of expected profits. This is a property the threat model shares with many types of efficiency wage models and with models of monopsony labor markets. Formal models of this sort of behavior can be found in Akerlof and Yellen (1985 a,b&c) and Mankiw (1985).

IV. CONCLUSION.

This paper has analyzed the threat of collective action by workers on wages and employment. It was assumed that by forming a coalition of a fixed fraction of a firms workforce workers could negotiate a contract with the firm which specified who would be employed and the size and distribution of the wage-bill. In order to avoid collective action by its workers the firm had to pay its workers a wage equal to what they would receive under the best collective bargaining agreement minus the cost to the workers of organizing. Several solutions to this problem were illustrated. It was shown that a threat could affect only employment, or both wages and employment. A threat could either increase or decrease employment and would almost always distort investment decisions.

If wages are affected the threat of collective action may help explain why unemployed workers can not bid real wages down to obtain employment and why real wages are relatively unresponsive to changes in the level of employment over the business cycle. Firms may pay high wages to avoid collective action by their

employees. People who were hired to work for a lower wage would have no incentive not to attempt to organize to bargain collectively. That many firms do choose this solution to the threat avoidance problem is suggested by Foulkes 1980 study of the personelle policies of large nonunion firms. After noting that other aspects of employment besides pay are also important he concludes

> "...it is a fair statement to say that the companies studied do work hard to ensure that they are not vulnerable to a union organizational drive on the basis of pay or benefit issues. Labor relations considerations were found to play a key role in the setting of pay and benefit policies." (p149)

To implement this policy he notes that, "Union settlements, particularly those of direct competitors are watched very carefully," (p166). Union settlements in the local labor market might be thought to convey information about the cost of obtaining certain types of labor, but the wages paid by competitors are only relevant if workers deciding to engage in collective action are considering the firm's ability to pay.

Dickens and Katz (1985) review a wide variety of evidence on industry and occupational wage differences. They conclude that of all theories which might account for the observed patterns the threat of collective action is one of two which are most consistent with the evidence. A considerable amount of evidence is reviewed, but one finding in particular suggests the relevance of the threat model. Even after controlling for a wide variety of individual and geographic variables there are very large correlations (most in the range of .75 to 1) between the average wages for nonunion workers in any two occupations across industries. If any occupation in an industry is highly paid relative to other industries other occupations in that industry are also very likely to be highly paid. This is difficult to reconcile with theories which attribute industry wage differences to unobserved ability, compensating wage differentials, or efficiency

wages paid to prevent shirking or quiting since special skill needs, working conditions, turnover costs and monitoring problems should not be common to all occupations in an industry. However, it follows naturally from a threat theory of wage determination since all wages in an industry would depend on the common factor of profits per worker.

Besides explaining inter-industry wage differences the threat of collective action may help explain the existence of the dual labor market both across and within industries. There exists a large descriptive literature on labor market segmentation (Doeringer and Piore 1971, Edwards 1979, Berger and Piore 1980). Recently Dickens and Lang (1985a,b&c) have provided statistical evidence which supports both the descriptive value of the dual market view and the rationing of high wage jobs implied by the theory of threat effects on wages.

Given the success of the threat effect in explaining these empirical puzzles it may be worth briefly considering what some of the policy implications of such a model might be. Four aspects in particular deserve comment. Bulow and Summers (1985) and Jones (1985) have pointed out that in a dual economy resulting from one sector paying efficiency wages, employment in the efficiency wage sector is necessarily sub-optimal. Further, increased international competition in either or both of the sectors can lead to a decrease in high-wage employment -- possibly even its disappearance. The same could also be true of a union sector if unions and firms do not negotiate efficient contracts, or a sector affected by a threat of collective action if employment is being set so that the marginal product of labor is greater than the reservation wage. The threat of collective action or the existence of unions introduces the possibility that, independent of the efficiency of employment relations, the firm's choice of the capital stock will be distorted. Thus efficiency wage models, the existence of a union sector, or the possibility that the threat of collective action requires high wages in some

sectors may all provide an economic rationale for industrial and/or trade policies to subsidize employment or investment in these sectors.

Another consideration also parallels the efficiency wage literature. Akerlof and Yellen (1985a,b&c) have shown how small deviations from optimal wage setting can lead to large deviations from optimality in the aggregate. Their model shows that each firm's share of the aggregate welfare loss can be several orders of magnitude larger than its forgone gain. This suggests a way that policies which affect aggregate demand could be welfare enhancing. Their models also provide an explanation for the existence of nominal rigidities in the short run and therefore have implications for the effectiveness of monetary policy.

A third consideration is implications for policies to enhance racial equality. It has been noted that blacks and other minorities have a more difficult time finding primary sector employment (Dickens and Lang 1985a,b&c). Several studies have suggested that blacks have stronger pro-union sympathies than whites. (Farber and Saks 1980, Dickens 1983). It is argued that this is because the structure unions impose on the employment relation make it harder for supervisors to discriminate against blacks. Thus blacks may have a lower c value and primary firms may wish to avoid hiring them for that reason. If this is the case, laws prohibiting discrimination in hiring and affirmative action laws requiring primary sector employers to increase the representation of blacks among their workforce can increase racial equality with little or no loss of efficiency.

One final point deserves discussion. In the simple competitive model decreasing worker bargaining power or increasing the cost of collective action could lower wages and prices and improve economic efficiency. This might seem to suggest that changes in the law to cause such changes in labor relations are desirable. However, if firms have monopoly power the situation is considerably more complicated. Recent work by Freeman (1984) and Karier (1984) showing that unions

reduce profits in concentrated industries, and the many studies showing a correlation between market power and wages (surveyed in Long and Link, 1983) suggests that monopoly power is an important factor in wage determination. In such firms, changes in worker bargaining power and the costs of organizing may either increase or decrease efficiency. Further, they affect the distribution of income between workers, entrepreneurs and capitalists in a complicated way. They may also affect the likelihood that unions will form. If unions promote productivity, as some authors have argued, if they negotiate more efficient levels of employment than are possible in the presence of a threat, or if they are desirable for political reasons -- for the representation they give to the interests of workers -- then again the analysis is considerably more difficult. Finally, it may be possible to reduce the ease with which overt collective bargaining is initiated but difficult to increase the cost of other forms of collective action. Overt bargaining may be more costly to the firm but less costly to society if there are fewer disruptions of production. This was one rationale for the passage of the National Labor Relations Act. The analysis of such questions would seem to provide fertile ground for future research. The threat of collective action must be considered when analyzing the welfare effects of government policies towards labor unions and labor relations.

VII. FOOTNOTES.

1. In 1984 only 16.1% of the civilian labor force were members of a union or employee association (Troy and Sheflin, 1985).

2. This work builds on work by Ulman (forthcoming) which discusses the union threat effect and its potential superiority to efficiency wage models for explaining many labor market phenomena.

3. See Yellen [1984] for a review of the efficiency wage literature.

4. The wage should be interpreted as encompassing all aspects of compensation, pecuniary and non-pecuniary.

5. A more general model might allow firms to choose c subject to constraints dictated by technology and the law. For the purposes of the analysis presented here consideration of such possibilities complicates the model without substantively affecting the results.

6. It is assumed here the set of possible contracts is independent of the firms choice of wages and employment. This would not be true if the outcome of the bargaining game by which the firm and union arrive at a contract depends on the starting position.

7. The firm might wish to threaten not to allow certain wage patterns when the union is organizing. But if we assume that the contracts are perfect equilibrium of the bargaining game, workers will know when they are organizing that the firm will not carry out threats to block a wage distribution in bargaining since once the union is formed only the size of the wage-bill matters.

8. These assumptions are meant as stylized reflections of real world practices. Examples of discrimination in favor of founding coalitions may include the payment of high wages to certain types of workers (skilled workers, more senior workers, workers in certain jobs) or two tier wage systems where newly hired workers are paid less than those already employed. Examples of transfers to unemployed workers are supplemental unemployment insurance and severance pay. Fifty-one percent of all major collective bargaining agreements have income maintenance provisions such as work guarantees, severance pay or supplemental UI benefits (BNA, 1983). Although most severance pay arrangements provide only a few months salary, if the wage premium from collective bargaining is a small fraction of the reservation wage the payment could equal several years of the differential.

9. Under many assumptions about the derivation of the B(.) locus, whether or not the union discriminates and engages in transfers will affect the locus. The two considerations are separated here only for expositional purposes. This assumption does not imply that they would not be related if we were considering how the B(.) locus is determined. Also, even when it is assumed that collective bargaining

agreements do not discriminate against non-members it will still be possible for them to discriminate in favor of those to whom the employer paid a higher wage.

10. This assumes that unions can make binding commitments to more highly paid members of the pro-union coalition to continue to pay them high wages after a union is in place. This is not a problem if the coalition must be maintained to keep the union. But if it is harder to get a union out than to get it in there may be a problem with unions making commitments to high paid coalition members. In particular, such arrangements could not be a perfect equilibrium with identical workers if each union organized only one firm. Once the union got in it would have no incentive to honor its promise. However, if a union wishes to be able to continue to organize other firms its reputation of keeping its promises to past groups of workers it has organized may be a sufficient incentive to make it keep its promises.

11. By assuming perfect information we assume that all workers know who will be laid off in the event of a reduction in force. If layoffs were random and workers were risk neutral the union would choose a contract with $L=L^*$ and wage equal to $B(L^*,K)/L^*$. If workers were risk averse the ideal contract would offer a higher level of employment.

12. Assuming that the initial choice of the size of the capital stock does not influence the wage bill, first order conditions for profit maximization in this case require that

$$R'(L) = B_1(vL,K)-c.$$

For example, if negotiated employment and wage levels are on the labor demand curve and that curve is linear

$$R'(L)= A - bL.$$

then

$$B'(L) = A - 2bL$$

and first order conditions require

$$A - bL = A - 2bvL - c$$
$$\text{or}$$
$$L = c/(b(1-2v)).$$

Thus for many parameter values -- including any where $v > .5$ -- such an internal tangency between the constraint and the iso-profit curve is impossible since L would have to be negative.

On the other hand, if

$$B(L) = s(R(L)-rL) + rL,$$

that is the workers receive some constant share (s) of the surplus at any level of employment, then

$$B'(L) = (1-s)r + sR'(L),$$
first order conditions require
$$R'(L) - sR'(vL) = (1-s)r - c$$

and tangencies may be possible.

13. McDonald and Solow (1984) analyze a model of a labor market where some firms pay bargained wages and some firms pay a competitive wage. Even when they assume that laid-off workers from the high wage sector take employment in the competitve sector they still find that cyclical movements in bargained wages may be significantly damped.

REFERENCES.

Akerlof, George A. and Yellen, Janet L., "A Near Rational Model of the Business Cycle, with Wage and Price Inertia." Quarterly Journal of Economics 100 (August 1985a)

---------- "Can Small Deviations from Rationality Make a Significant Difference to Economic Equilibria?" American Economic Review 75 (September 1985b).

---------- "The Theory of Near Rationality and Small Menu Costs with Continued Shocks," mimeo., University of California-Berkeley, 1985c.

Berger, Suzanne and Piore, Michael J., Dualism and Discontinuity in Industrial Societies, New York: University of Cambridge Press, 1980.

Bils, Mark J., "Real Wages over the Business Cycle: Evidence from Panel Data," Journal of Political Economy, Vol.93, 4, (August 1985) p666-89.

Bureau of National Affairs Editors, Basic Patterns in Union Contracts, Washington, D.C.: The Bureau of National Affairs Inc. 1983.

Bulow, Jeremy I. and Summers, Lawrence H. "A Theory of Dual Labor Markets with Application to Industrial Policy, Discrimination and Keynesian Unemployment," NBER Working Paper #1666 (July, 1985).

Dickens, William T., "The Effect of Company Campaigns on Certification Elections: Law and Reality Once Again," Industrial and Labor Relations Review, July 1983, 36, 560-75

Dickens, William T. and Katz, Lawrence, "Inter-Industry Wage Differences and Theories of Wage Determination," Berkeley mimeo, 1985.

Dickens, William T. and Lang, Kevin, "A Test of Dual Labor Market Theory," American Economic Review Vol. 75, 4 (Sept. 1985a) 792-805.

----------, "Testing Dual Labor Market Theory: A Reconsideration of the Evidence," NBER working paper #1670, (July 1985b).

----------, "Labor Market Segmentation and the Union Wage Premium," mimeo., University of California-Berkeley, 1985c.

Doeringer, Peter B. and Piore, Michael J., Internal Labor Markets and Manpower Analysis Lexington: Lexington Books, 1971.

Edwards, Richard, Contested Terrain, New York: Basic Books, 1979.

Farber, Henry S. and Saks, Daniel H., "Why Workers Want Unions: The Role of Relative Wages and Job Characteristics," Journal of Political Economy, April 1980, 88, 346-69.

Foulkes, Fred K., Personnel Policies in Large Nonunion Companies, Prentice-Hall: Englewood Cliffs, N.J., 1980.

Freeman, Richard, "Unionism, Price-Cost Margins and the Return to Capital," mimeograph, Harvard University (January, 1983).

Jones, Stephen R.G. "Minimum Wage Legislation in a Dual Market," mimeo, Berkeley, May 1985.

Karier, Thomas, "Unions and Monopoly Profits," Review of Economics and Statistics Vol. 67, 1 (February, 1985) 34-42.

Long, James E., and Link, Albert N., "The Impact of Market Structure on Wages, Fringe Benefits, and Turnover," Industiral and Labor Relations Review, Vol. 36, 2, (January 1983) p239-50.

Mankiw, Gregory, "Small Menu Costs and Large Business Cycles: A Macro- economic Model of Monopoly," Quarterly Journal of Economics 100 (May 1985).

McDonald, Ian M. and Solow, Robert M. "Wage Bargaining and Employment", American Economic Review, Vol. 71, no. 5 (December, 1981) p896-908

----------, "Wages and Employment in A Segmented Labour Market," University of Cambrdige Economic Theory Discussion Paper # 76, (January 1984).

Piore, Michael J. "The Technological Foundations of Dualism," in Suzanne Berger and his Dualism and Discontinuity in Industrial Societies, New York: Cambridge University Press, 1980.

Troy, Leo and Sheflin, Neil, Union Sourcebook: Membership, Structure, Finance, Directory, First Edition, Industrial Relations Data Information Services, West Orange New Jersey, 1985.

Ulman, Lloyd "Industrial Relations," The New Palgrave MacMillien, forthcoming.

Yellen, Janet L. "Efficiency Wage Models of Unemployment," American Economic Review Vol. 74,2 (May,1984) p200-205.

APPENDIX 1

To see that going from a situation where the avoidance of collective action is not a binding constraint to a situation where it is can cause either a decrease or increase in the capital labor ratio consider the following example. The collective action avoidance constraint is just binding and increasing worker bargaining power will force the firm to pay a wage above the reservation wage. In this case the firm wishes to minimize costs $(k+w)/f(k)$ subject to the constraint that the wage is no less than c less than w_c from equation 5 in the text. Substituting this constraint into the cost function, taking the derivative with respect to the capital/labor ratio and simplifying yields the first order condition

$$(1-bd)-(1-b)pf'(k) = 0. \qquad (A1)$$

To determine how the capital/labor ratio of all firms in the market will react to an increase in worker bargaining power (b) we substitute costs for the market price in A1 and the collective action avoidance constraint (equation 6 from the text) for the wagge in costs to yield

$$\partial k/\partial b = (arf'-d(f-kf')/((1-b)(w+k)f''). \qquad (A2)$$

The denominator is negative and the term $(f-f'k)$ is positive by the assumption of diminishing returns to capital in the production function. Thus the entire expression may be either positive or negative depending on the magnitudes of the terms in the numerator. Increasing the bargaining power to create a union threat can either increase or decrease the capital labor ratio.

APPENDIX 2

The following numeric example illustrates all three of the solutions to the firm's maximization problem in the competitive model. To begin with, assume a Cobb-Douglas production function with a capital coefficient of 2/3. In addition assume a reservation wage (r) of 5, a cost of organizing (c) of .05, that workers get .6 of the reservation wage when a bargain is not reached (a) and the firm can recover half the value of its capital investment (d). In this case, if the workers' bargaining power (b) is between 0 and .293 there will be no effective threat, the capital/labor ratio (k) will be set to 10 and unit costs will be 3.23. If bargaining power is .3 or greater, but less than about .54 the firm will reduce the capital labor ratio while keeping the wage equal to the reservation wage. In this range both the reservation wage and the collective action avoidance constraints are binding. With bargaining power above .54 only the collective action avoidance constraint is binding, wages are above the reservation wage and the capital labor ratio continues to decrease as bargaining power increases.

Figures A2.1 and A2.2 illustrate the behavior of the wage and the capital/labor ratio as b increases. In figure A2.1 the X line indicates the behavior of the capital labor ratio. The line denoted by the boxes shows the capital labor ratio for the situation where only the reservation wage is binding. This is computed by solving for the first order conditions for profit maximization when the wage is given so $k=.667r/(1-.667)=10$. The line denoted by the +s shows the upper bound on the capital/labor ratio if the firm is paying the reservation wage. It is computed by solving the collective action avoidance constraint for k assuming that $w=r=5$. The line denoted by the diamonds shows the maximum value for the capital labor ratio if the firm is paying the wage specified by the collective action avoidance constraint. It is computed by solving the first order conditions for profit maximization when the firm views w as a choice variable. Substituting equation (6) from the text for w in the firm's profit function and taking the derivative with respect to k yields

$$\text{(A2.1)} \qquad \partial\pi/\partial k = pf'-\partial w/\partial k-1 = 0$$

or

$$(w+k)g/k-b(1-d)/(1-b) = 1$$

where $(w+k)/f(k)$ has been substituted in for p. To obtain the profit maximizing value for k when only the collective action avoidance constraint is binding one substitutes equation (6) in for w again and solves for k to obtain

$$\text{(A2.2)} \qquad k=2[(1-b)ar-c]/(1-bd)$$

For values of worker bargaining power below .3 the reservation wage constraint is binding and the firm chooses the optimal capital/labor ratio of 10. Above .3 but below about .54 both the collective action avoidance constraint and the reservation wage constraints are binding. When worker bargaining power is above .54 the firms are better off paying wages above the reservation wage and keeping a slightly higher capital labor ratio relative to the capital labor ratio they would have to choose if they wish to continue to pay the reservation wage and avoid collective action.

In figure A2.2 the line denoted by Xs represents the wage paid by firms as a function of worker bargaining power. The reservation wage constraint is binding up to the point where worker bargaining power is about .54. When bargaining power

is above that level it is more efficient for the firm to increase wages than to keep them equal to the reservation wage and to continue to decrease the capital/labor ratio. The line denoted by the boxes shows the wage the firm would have to pay to avoid collective bargaining if it maintained a capital/labor ratio of 10 -- the optimal capital/labor ratio in the absence of a threat it is computed using equation (6) from the text assuming k=10. The line denoted by the diamonds is the collective action avoidance wage with the capital labor ratio choosen according to equation A2.2 above.

Figure 1

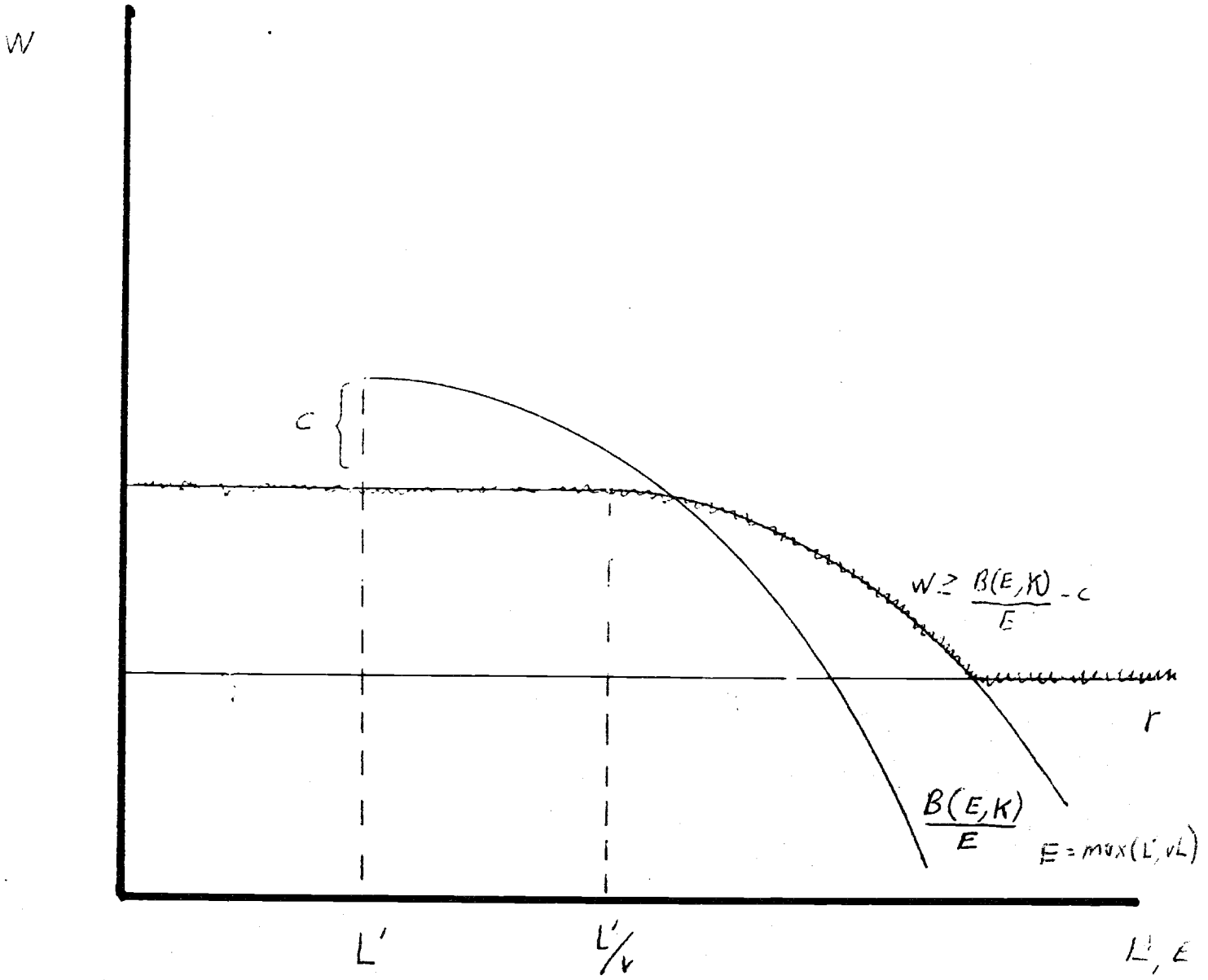


Figure 2.

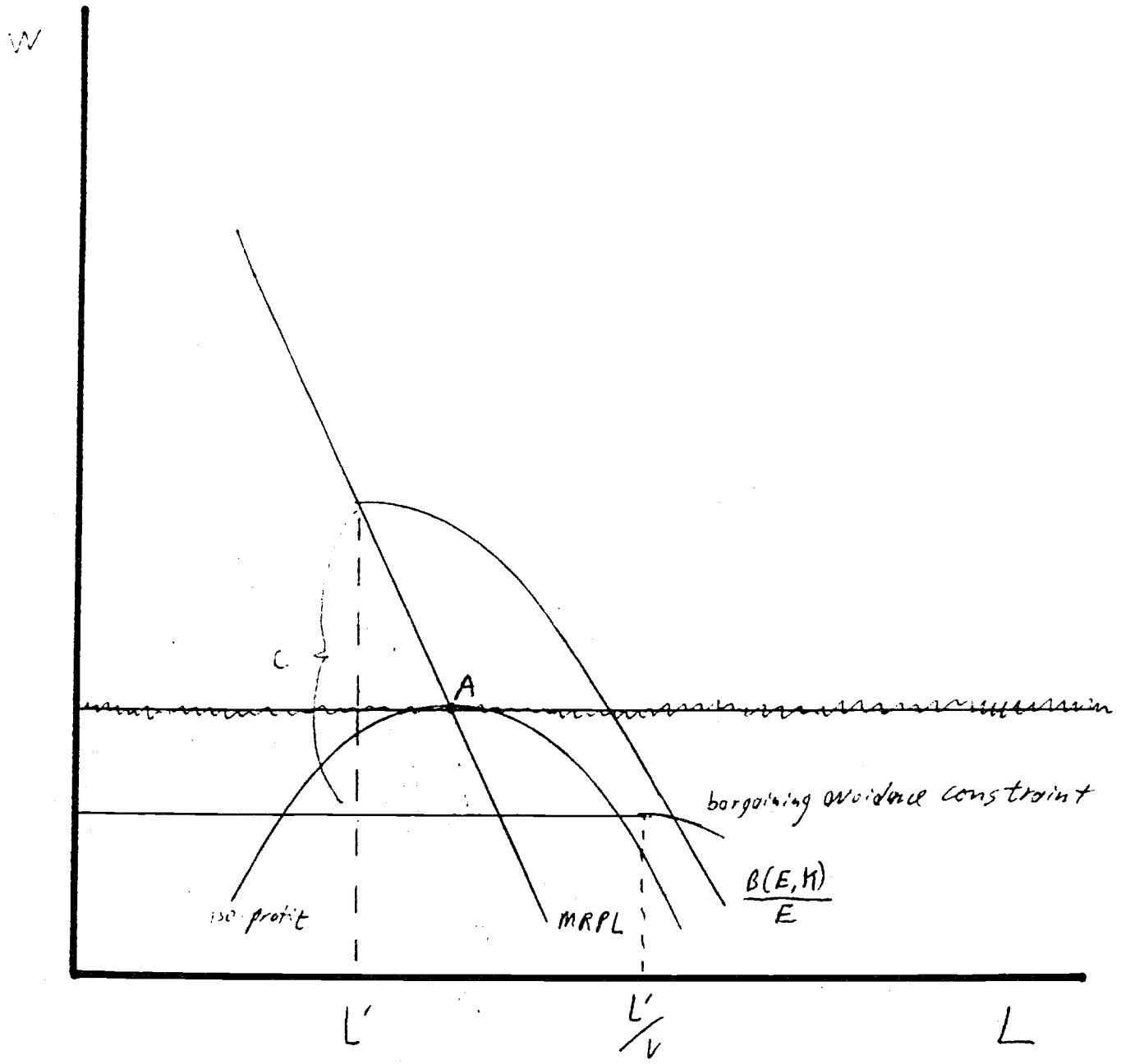

W
C
A
bargaining avoidance constraint
B(E,H)/E
iso-profit
MRPL
L'
L'/V
L

Figure 3

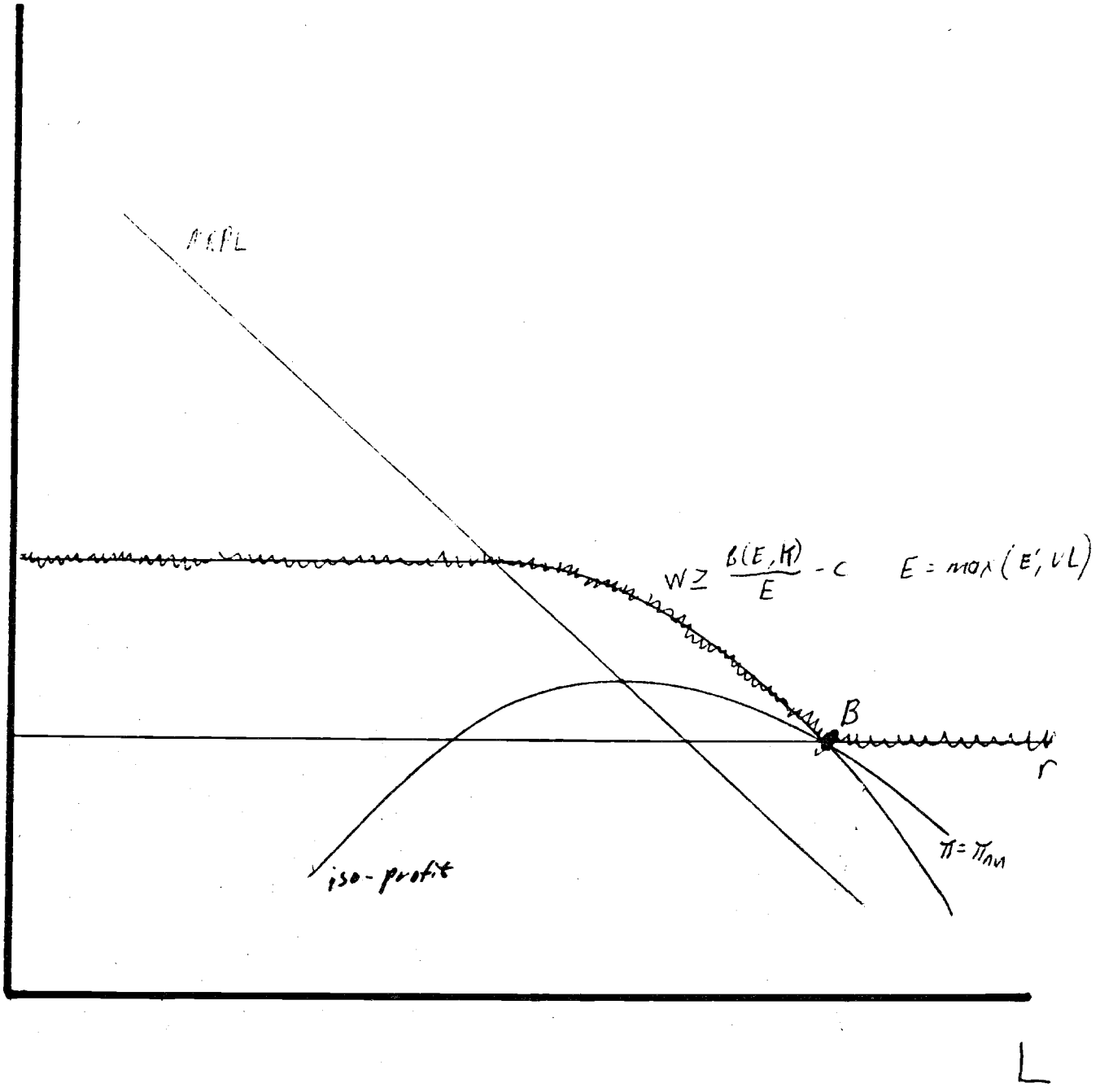


Figure 4.

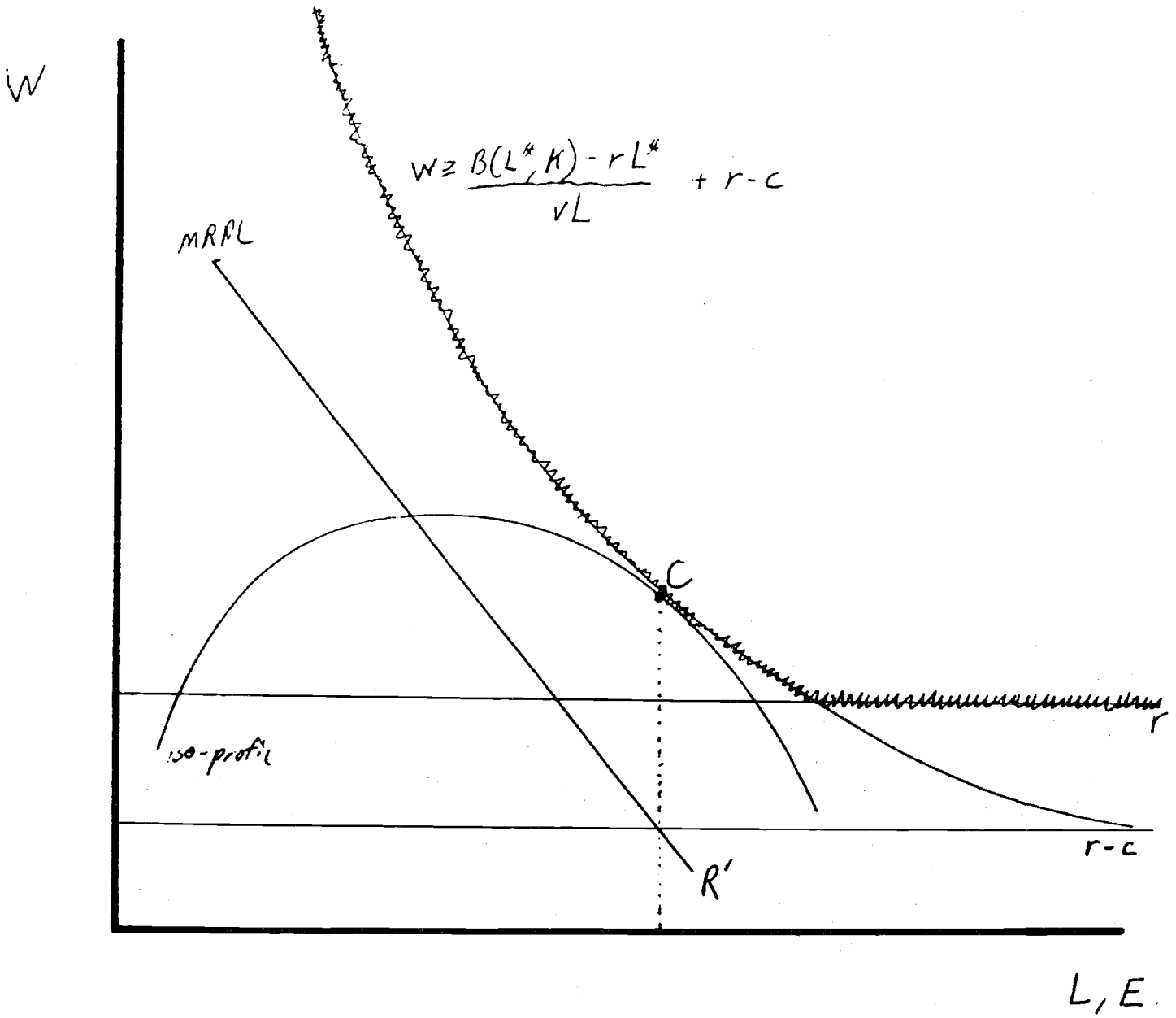


Figure 5.

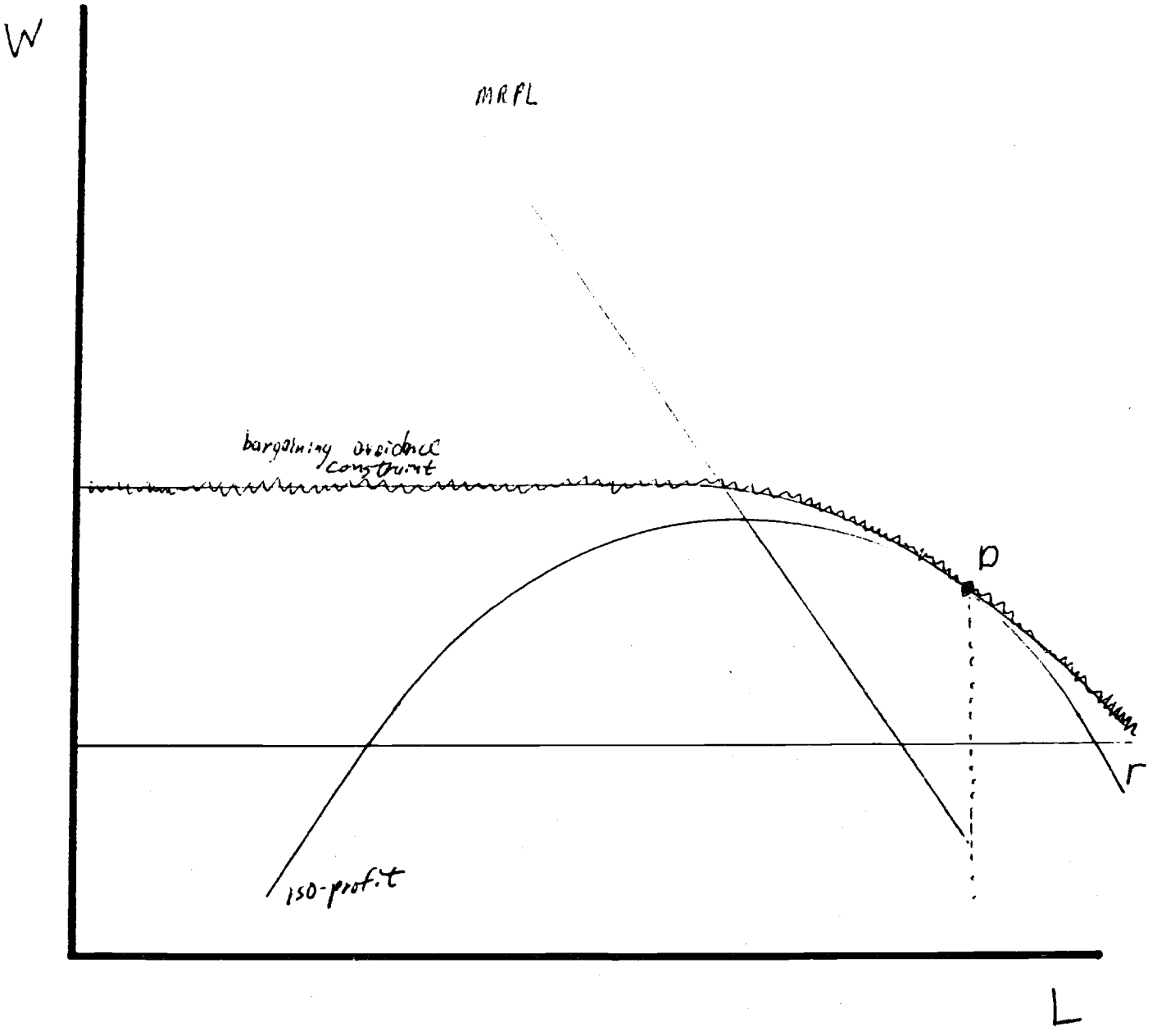


Figure 6.

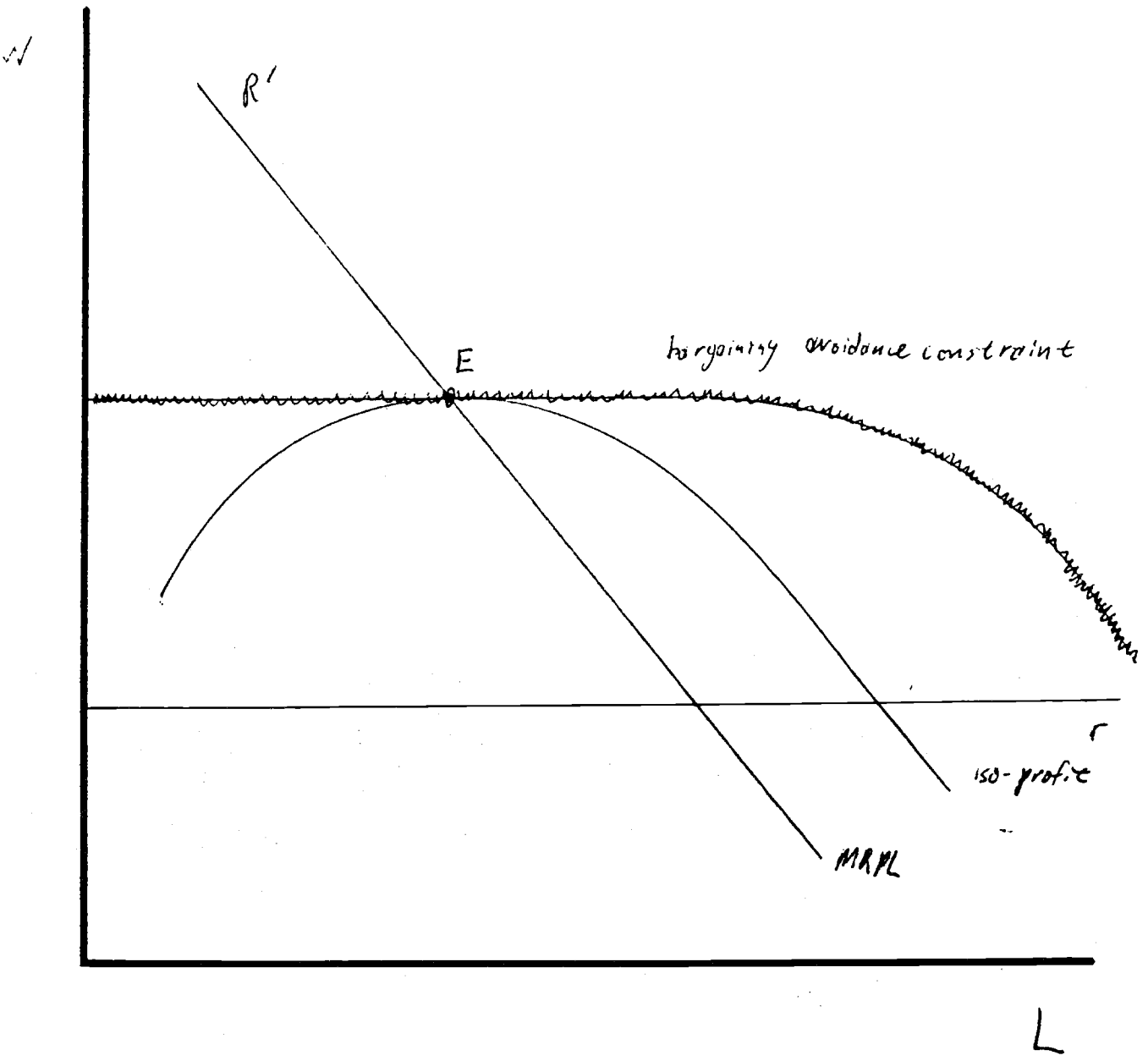


Figure 7.

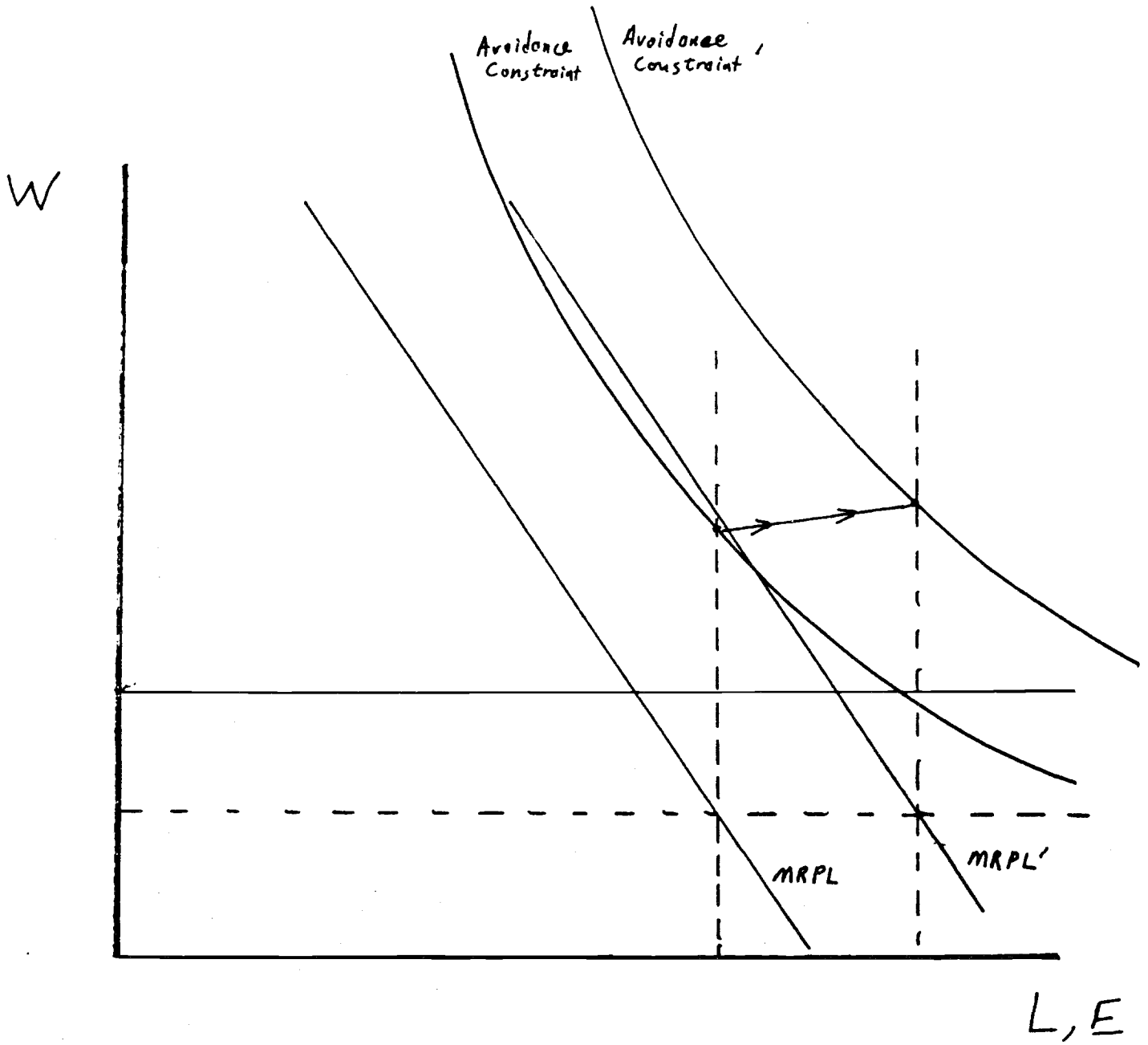
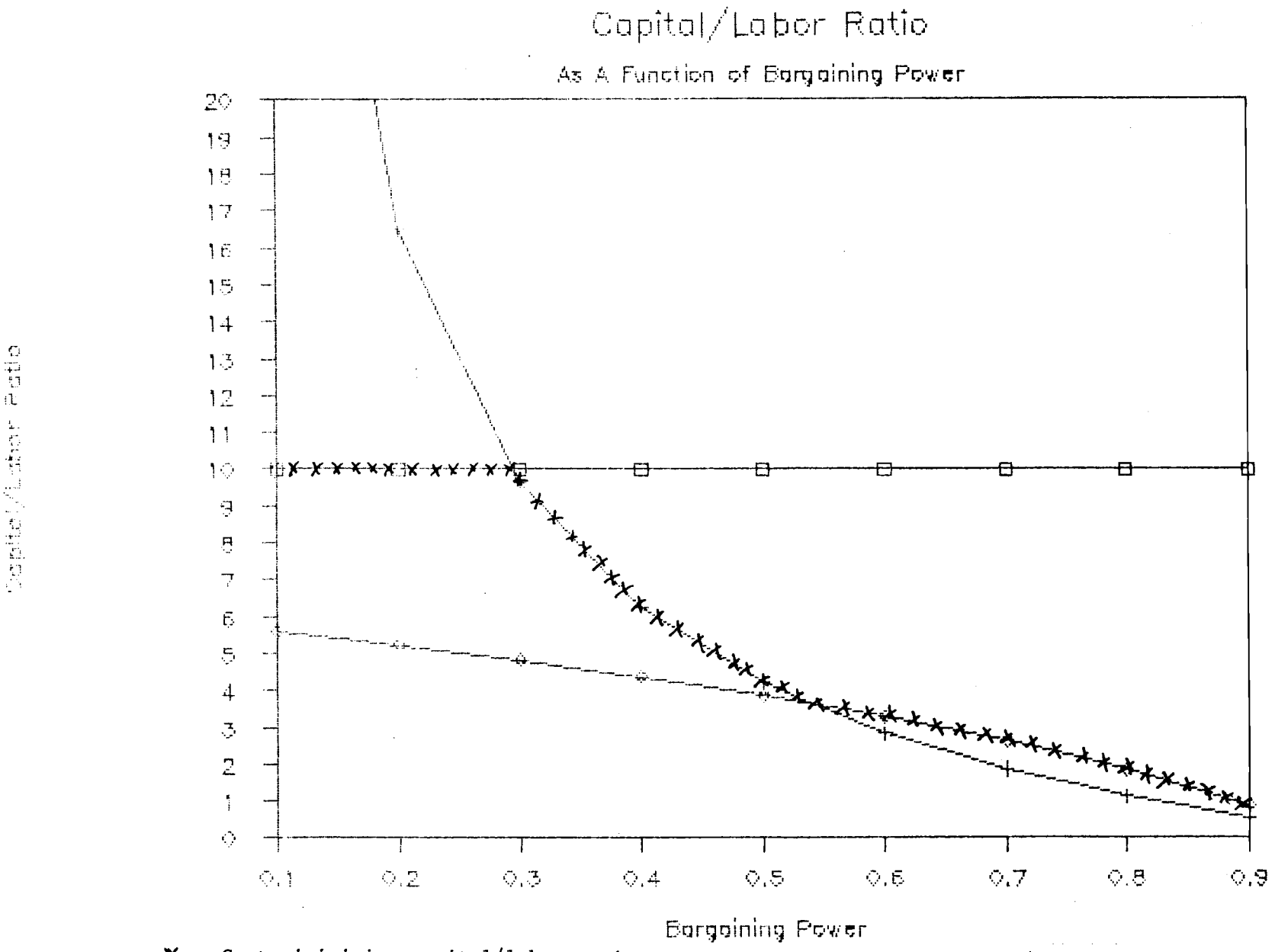
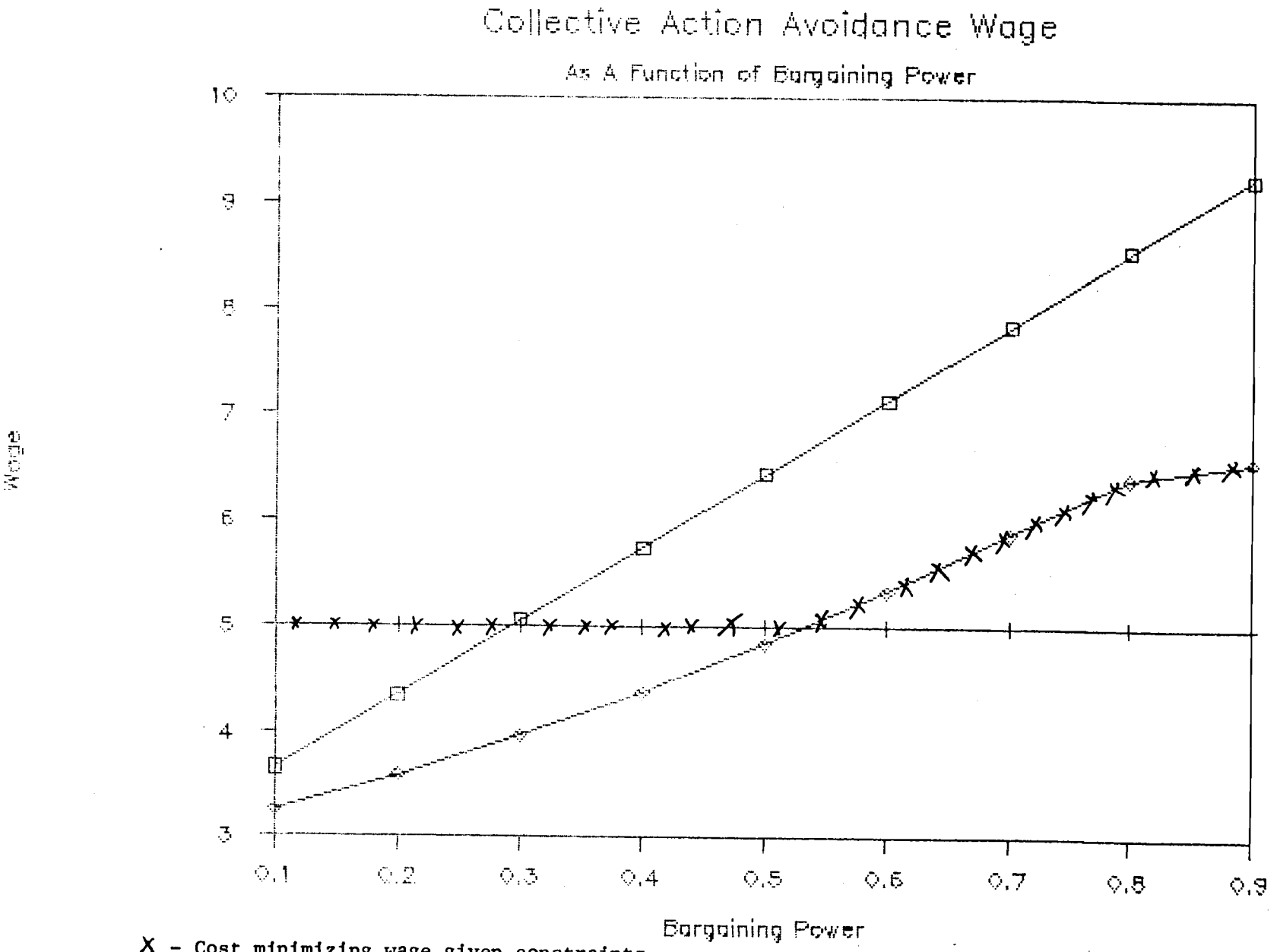


Figure A.2.1



X - Cost minimizing capital/labor ratio
□ - Cost minimizing capital/labor ratio in the absence of a threat of collective action
\+ - Capital/labor ratio for which the collective action avoidance wage equals the reservation wage
◊ - Cost minimizing capital/labor ratio with only the collective action avoidance constraint binding

Figure A.2.2



X - Cost minimizing wage given constraints
+ - Reservation wage
□ - Collective action avoidance wage with capital/labor ratio of 10 (optimal in absence of a threat)
◊ - Collective action avoidance wage with cost minimizing capital/labor ratio.