Labor Strikes and the Price of Lettuce

Colin A. Carter, Darrell L. Hueth, John W. Mamer and Andrew Schmitz

This paper examines the economic impact of the 1979 labor strike against lettuce producer-shippers in the Imperial Valley of California. The theory presented suggests that formidable problems are encountered by agricultural labor unions in obtaining higher wages for farm workers. During the 1979 strike, ironically the returns to many of the lettuce producers in the Imperial Valley increased substantially.

Relative to many other parts of the United States, California agriculture employs a large amount of farm labor. This is due, in part, to the large number of specialty crops produced. As in the labor-intensive nonagricultural industries, farm labor strikes also have been common; but relatively little work has been done on analyzing their effects. This paper focuses on the 1979 strike by the United Farm Workers (UFW) against lettuce producers in a major lettuce-producing area in the United States — the Imperial Valley of California. The enactment of the California Agricultural Relations Act of 1975 protects the right of California farm workers to form a union, engage in collective bargaining, and strike in pursuit of collective bargaining goals. The legislation does not restrict the time at which a strike may be called, including the harvest period. On December 15, 1978, there was a termination of the UFW contracts with most of the major lettuce grower-shippers in the Imperial Valley. Contracts were renewed for two weeks while negotiations took place, but no agreement between the union and the grower-shippers was reached. As a result, on January 22, 1979, a strike — which is analyzed in this paper — was sanctioned against lettuce producers.

Our results show that lettuce prices, as well as short-term profits to certain growers, increased substantially as a result of the strike. We demonstrate that if a union is to strike against the entire industry (i.e., all growers simultaneously), it must reduce output substantially below competitive levels in order to reduce industry profits so that growers will have an economic incentive to negotiate with union leaders. This is largely because of the number of lettuce producers and shippers and the relative abundance of farm workers available in the Imperial Valley during the winter season. Reducing output sufficiently is especially difficult to do when the number of firms is large, as in the case of lettuce. Hence, a union may pursue a policy of selective striking (i.e., striking one or more of its firms sequentially) where it only has to reduce the output (at the extreme to zero) of the struck firm or firms rather than the entire industry. However, it does not necessarily follow that this strategy will be any more successful for a union than striking the entire industry. The success of selective striking is crucially dependent upon whether

Colin A. Carter is Assistant Professor in the Department of Agricultural Economics at the University of Manitoba. Darrell L. Hueth is Professor in the Department of Agricultural and Resource Economics at Oregon State University. John Mamer is Cooperative Extension Specialist and Andrew Schmitz is Professor in the Department of Agricultural and Resource Economics, both at the University of California, Berkeley.

Giannini Foundation Paper No. 611 (reprint identification only.) We would like to thank Professors Milton Friedman, E. Phillip LeVeen, L. L. Sammet, B. Delworth Gardner, Bill Martin, Tom Clevenger, and anonymous referees for comments on an earlier draft. The authors' names appear in alplabetical order, and no senior authorship is assigend.

or not compensation among growers is feasible.

The Theoretical Model

The general framework of analysis for this paper is displayed in Figure 1 where S is a short-run industry supply curve made up of more than a few firms, D is the market demand curve, and MR is the marginal revenue curve. The competitive industry produces $\bar{Q}$ at price $\bar{P}$. Interpreting the short-run supply curve for the industry as the usual summation of the marginal cost curves of individual firms, the quasi rents for the industry are given by $\bar{P}dg$. A monopolist in the industry would, of course, equate marginal revenue with marginal costs (assumed to be the same under competition and monopoly in this case), reduce the output to Q*, and sell at P*. Monopoly profits would be given by P*acg. The gain to the monopolist can be expressed as the difference between monopoly rents or earnings and the competitive rents, $P^*ab\bar{P} - bcd$, which is the lined area minus the stippled area in Figure 1.[1] This discussion of the monopoly solution is relevant in that it established the point of maximum industry profits.

Suppose a strike against the entire competitive industry results in producers reducing output from $\bar{Q}$ to Q*. The effect of such a strike — if, as a result, the aggregate marginal cost curve does not shift to the left — is to obtain the monopoly rents for producers; that is, producers can gain $P^*ab\bar{P} - bdc$. Thus, rather than imposing hardship on growers, the growers can collectively benefit from a strike.[2] The more inelastic the demand at equilibrium, the greater the required reduction in output needed to obtain the monopoly solution for the industry. This is shown in Figure 1 where the demand curve D is rotated about $\bar{P}\bar{Q}$ to the more elastic demand curve D′. Since both MR and MR′ must pass through the midpoint between $\bar{P}$ and d, the monopoly output implied by D′, namely Q*′, is greater than Q*. Since monopoly rents are increasing from $\bar{P}\bar{Q}$ to the monopoly solution, this suggests that a strike which would be effective in the sense of reducing net grower returns to a level below that which obtains under competition must reduce output more in the case of inelastic demand than in the case of elastic demand.

From the foregoing, it follows that producers in aggregate can obtain substantial potential gains from strike-induced reductions in output even if the result is not exactly the monopoly solution. As long as the industry marginal revenue curve, MR(Q), is downward sloping and the industry supply curve, S(Q), is upward sloping, the profit function for the industry,

$$(1) \qquad \pi(Q) = P(Q)Q - \int_0^Q S(\tau)\, d\tau,$$

is concave in Q and has a maximum at Q*,

[1]What the monopolist gains, the consumer loses — and more. That is, consumer losses are given by P*adP in Figure 1. In the lettuce case, however, some ambiguity arises since the demand curve D is a derived demand curve. Fortunately, however, the lettuce industry appears to satisfy the definition of a vertical market sequence as defined by Just and Hueth. On the basis of their work, changes in areas under the demand curve can be interpreted as the sum of changes in producers' profits for shippers and retailers plus the change in compensating or equivalent variation to lettuce consumers.

[2]The above analysis assumes that consumers bid up the market price until the market clears and that the marketing margin remains constant. The data suggest that marketing margins of lettuce wholesalers and retailers did not increase during the period of the strike. The distribution of bargaining power between buyers and sellers ultimately determines the distribution of any gains. Another consideration which arises with lettuce is that producers have incurred nonharvesting production costs on the amount $\bar{Q}$. Thus, if S′ is the marginal cost curve exclusive of harvesting costs in Figure 1, the costs of producing and harvesting Q* are given by the area under S from 0 to Q* plus the area under S′ from Q* to $\bar{Q}$. The increase in producer rents to the lettuce industry in going from $\bar{P}\bar{Q}$ to P*Q* is then given by the monopoly rents minus the area $ef\bar{Q}Q^*$.

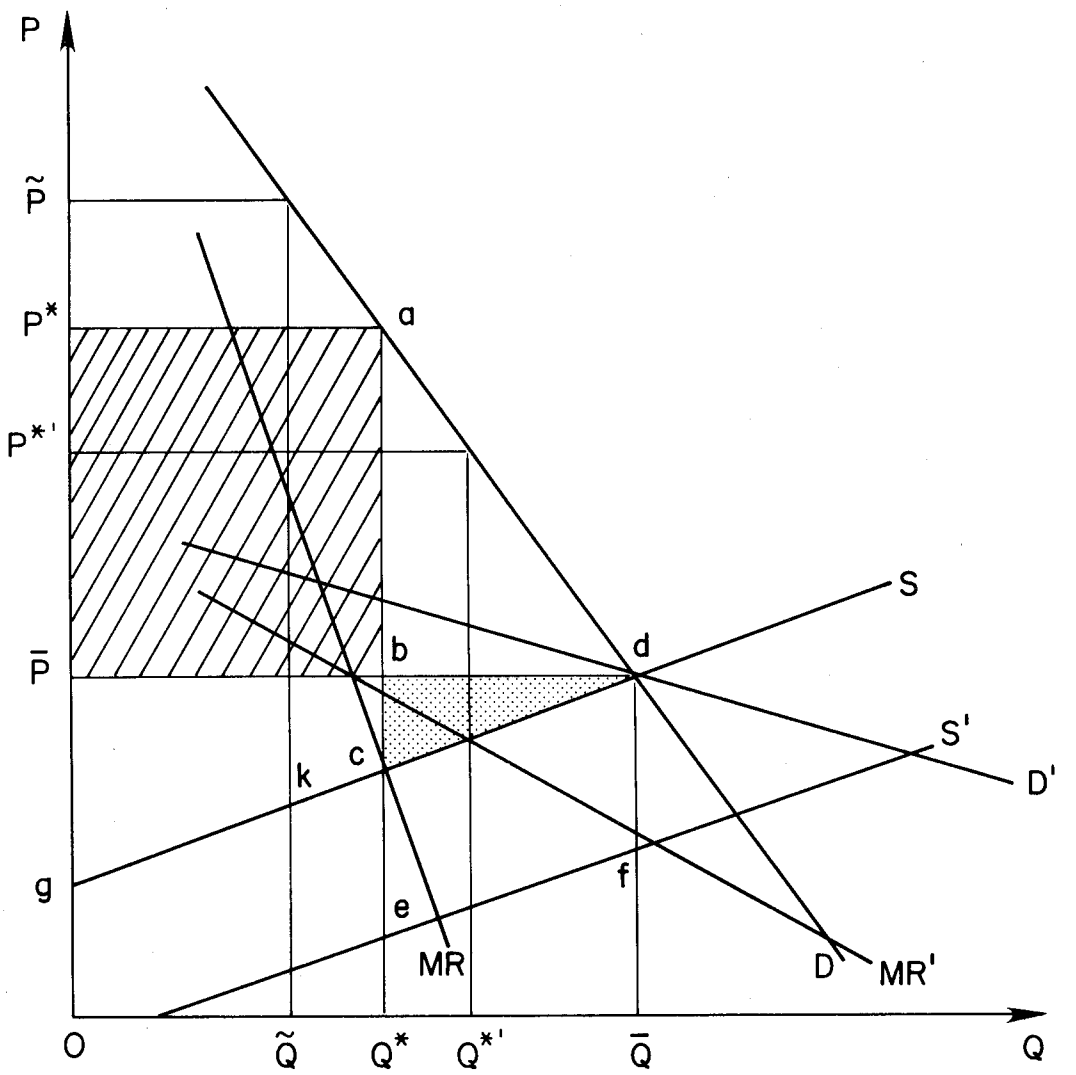

Figure 1. Monopoly Solutions Under Different Demand and Supply Sitations.

the monopoly output. Assuming that $\pi(0) \leq 0$, one can further observe that concavity implies the existence of a $\tilde{Q} < Q^*$ in Figure 1 such that $\pi(\tilde{Q}) = \pi(\bar{Q})$. That is, *there exists a break-even point at some quantity less than the monopoly output level where industry profits are equal to competitive profits. For a strike to be truly successful in the sense of reducing the collective profits of producers, it must curtail industry output to less than this break-even point.* In Figure 1, any level of output between $\bar{Q}$ and $\tilde{Q}$ generates greater profits to lettuce producers than that generated under competition.

The above model of an industrywide strike assumes that producer costs are not affected by the strike. In other words, the labor supply curve facing the industry is perfectly wage elastic. In this case the workers on strike can be replaced by nonunion workers at no extra cost to the employers. If this is not the case, the marginal cost curve under strike conditions will lie above S. From Figure 1, it is clear that, if the strike supply curve is to the left of S, the output reduction needed to impose losses on producers will be less. In terms of the labor supply available for lettuce harvesting in the Imperial Valley, we assume it is wage elastic for several reasons:

1. The farm-labor, demand-supply situation that commonly prevails in the Imperial Valley during the winter months is generally one of labor surplus. Although farm employment is the Imperial Valley reaches a peak during the winter months, labor supplies tend to be ample during that season of the year because, in part, total employment of hired workers in California agriculture is highest during the period from June through October. During that period, on average, about 100,000 more workers are employed than during the low period of December, January, and February [California Employment Development Department]. Also, because of the mild climate in the Imperial Valley and the low ebb in farm employment in other regions of the state during the winter months, thousands of farm workers who normally follow crop activity tend to spend much of the winter in the Imperial Valley, thus augmenting the number of workers who reside in the Valley year-round. In addition, workers cross the border legally each day to work in the Imperial Valley. Some of these are Americans who chose to live in Mexico, and some are Mexican nationals who possess U.S. permanent immigration visas which permit the holders to work in this country. Furthermore, there are some citizens of Mexico who succeed in crossing the border and in obtaining work in the United States without appropriate legal documents.

2. Proficiency of the lettuce crews tends to increase as the members of the crew gain experience in working together and in coordinating their specialized harvest activities. A newly organized, inexperienced crew is likely to be less efficient; but the decrease in efficiency is minimal. In fact, the use of the hiring hall in recruiting crews implies that there is a good deal of substitution between experienced and inexperienced labor crews.

3. There is available a mechanical lettuce harvester which is not yet being used. The cost data assembled by Johnson and Zahara suggest that machines would already have replaced workers if very little substitution between union and nonunion workers existed.

In the above context, one has to justify why costs would not increase substantially, if at all, as a result of the strike. This is because the model assumes the strike is industrywide. However, suppose instead that the union selects to strike only a few of the relatively large producers and manages to curtail their output to the level where they will negotiate a wage settlement. In this case the nonstruck producers capture the added profits in Figure 1 if output falls between $\bar{Q}$ and $\tilde{Q}$ and if the struck firms are not compensated by the nonstruck producers. In essence, the nonstruck firms gain by behaving as "free riders." In addition, the costs to the nonstruck producers would not rise as a result of the selective strike since their labor supply is unaffected.[3] Thus, the notion of a shifting marginal cost curve for the nonstruck firms due to the strike activity is irrelevant in this context since labor costs are unaffected.

To add a further complication to the model, we must consider the seasonal nature of the lettuce industry in the context of a worker strike. Supply and demand price elasticities in the lettuce industry are presented by seasons in Table 1. Referring to Figure 1 where the importance of price elasticities of demand and supply was suggested, probably the worst season for the union to strike (if the

[3]Of course, costs could rise if other inputs were not used as efficiently as a result of the strike.

TABLE 1. Seasonal Demand and Supply Price Elasticities in the Lettuce Industry

Season	Estimated Demand Elasticity (η_d)	Estimated Supply (η_s)
	1	2
Winter	−0.18	0.73
Spring	−0.10	0.26
Summer	−1.43	0.48
Fall	−0.33	0.33

Source: Thomas S. Clevenger and W. Vernon Shelley, "Intraseasonal Demand-Supply Relationships for Lettuce," *Proceedings of the Western Agricultural Economics Association*, 1974, pp. 18-21.

action is against all of the growers) is — contrary to intuition — the winter season. That is, compared to any other season, the winter season (because of the combined supply and demand price elasticities illustrated in Table 1) requires the largest reduction in industry output for a successful strike. Thus, the conditions for the union to be effective vary from season to season since, for example, the demand during the winter season is more price inelastic than during other seasons except spring. Particularly for the winter season, serious questions are raised about the usefulness of an industrywide strike as a tool in this industry to bargain for higher wages.

The Lettuce Industry

The above model points out a problem for union leaders. If the union strikes the entire industry (i.e., all producers simultaneously), it has to reduce output substantially before grower profits fall. This is difficult to do if the union has many producers to deal with because a strike against a large number of firms creates organizational problems for union leaders. On the other hand, while a strike against a few producers is much easier, the potential gains could well be smaller since each firm's demand curve is more price elastic than the industry demand curve. (Of course, the success of a strike eventually depends on whether or not the wage increases it might achieve from striking a few firms spread to all of the growers).

To aid in interpreting the empirical results in the next section and to determine whether or not the 1979 strike was industrywide, a brief description of the lettuce industry is presented. Theory itself does not tell us this but does suggest that an industrywide strike may be futile. The model in Figure 1 can lend itself to either an industrywide strike or a selective strike against a few growers, but the interpretation of the results is quite different as are the implications for a successful union strategy.

While the focus of this paper, because of recent events, is on the effects of a strike by lettuce pickers on grower returns, at one time the important issues revolved around the monopoly power of lettuce shed workers. Prior to the 1950s, lettuce was packed in packing sheds and loaded in railroad cars. After being loaded into the railroad cars, it was covered with a substantial quantity of chopped ice and then dispatched to eastern markets. Under collective bargaining contracts, the shed workers obtained substantially higher wages than the fieldworkers who were not organized.

While the tightly knit labor organization was of great benefit to certain groups of lettuce workers, it also served to keep the rights to production, shipment, and marketing in the hands of certain ice companies and certain lumber and labeling companies. According to Padfield and Martin, the shed-technology industry became a highly organized group; thus, there was an incentive for a technological breakthrough that would enable growers to bypass the shed complex.

Two technological changes provided the basis for circumventing the system — cardboard cartons and the vaccum-cooling process. Using cartons and the vacuum-cooling process, it was possible for growers and shippers to pack lettuce in the field by utilizing workers who were paid lower wage rates than the shed workers. Equally impor-

tant, it was possible to avoid the relatively high overhead costs of the packing shed and ice manufacturing process. This technology opened up new areas for lettuce cultivation previously locked out by the shed-centered technology. As the shed complex lost its power due to the new technology, the technical elite class (i.e., the shed workers) was displaced.

Currently, lettuce is selectively cut and packed into a carton that is stapled shut and transported to the shipping point where it is placed in a large vacuum chamber and cooled. It is then removed and placed in refrigerated trucks or railroad cars for shipment to market. It can also be retained for a short period in cold storage. More than half of the lettuce is wrapped in film before it is placed in the carton. The wrapping and packing are done by workers riding along on a machine in the field, but the cooling process is the same in both cases.[4]

The production and sale of lettuce can be divided into the brokerage and commission business and the integrated production-marketing category. An example of the first is Blue Anchor Company located in Sacramento, California, which sells to wholesalers and retailers. It acts only as an agent and receives a commission for its services. Examples of the integrated production and marketing businesses are Bud Antle, Inc., of Salinas, California (owned by Castle and Cooke); Sun Harvest (owned by United Brands of Boston, Massachusetts, and also of Salinas); and Bruce Church, Inc., an independent grower-shipper also based in Salinas.

Table 2 gives the number of shippers of California lettuce by volume handled. Approximately 40 shippers handle about 75-78 percent of the California lettuce. Thirteen shippers handle about 56 percent, and the three largest shippers (Bud Antle, Inc., Bruce Church, Inc.; and Sun Harvest) handle roughly 30 percent of the volume. To illustrate the complexity of the structure of the industry, Sun Harvest, for example, markets primarily the lettuce which it produces. On the other hand, Bud Antle, Inc., largely contracts with individual growers to harvest and market their lettuce [Schaffner, Garoyan].

The above data are important because they suggest that the handlers are not of uniform size and that a few firms control a large share of the market. Also, the data in Table 2 should be compared with the number of lettuce growers. The 1974 Census of Agriculture estimated the number of lettuce farmers in California at 333 [Schaffner]. There were roughly 250 commercial producers of lettuce in 1979 [Schaffner], which is about three times more than the number of producer handlers. Hence, because of the fewer numbers of handlers who have influence over a large number of growers, the union only has to focus on this subset. By putting, for example, Bruce Church out of business for a short period, a number of producers who market through this company are also adversely affected. In addition, for the union to achieve higher wages, it may not have to strike all of the grower handlers because of the size distribution of these firms. As Table 2 suggests, 13 firms out of the 87 have over 50 percent of the volume.

The Impact of the 1979 Winter Lettuce Strike

Empirical Results

The various accounts of the 1979 lettuce strike suggests that the strike was selective in that not all firms in the industry were struck. (Perhaps the UFW understood the implications, presented earlier, of an attempted industrywide strike. Furthermore, as discussed in the previous section, a few large firms control a substantial portion of the lettuce industry which makes selective striking appear on the surface easier.) The largest

[4]The process of technological change in the lettuce industry probably has not run its course. One change on the horizon is the utilization of lettuce-harvesting machines which are well beyond the prototype stage. Their acceptance and utilization will no doubt be influenced by costs, collective bargaining agreements, the market situation, and other factors.

TABLE 2. Number of Shippers of California Lettuce by Volume Handled, 1978

Cartons Handled	Number of Handlers	Carton[a] Volume	Total Volume
thousand		thousand	percent
1- 249	20	3,600	3
250- 999	26	22,800	19
999-1,999	28	26,400	22
2,000-2,999	10	31,200	26
3,000+	3	36,000	30
Total	87	210,000	100

[a]Includes bulk handling converted to carton equivalents — based on 50 pounds per carton.

Sources: David Schaffner, "Structure of the California Lettuce Industry," Ph.D. dissertation in progress, University of California, Berkeley, 1980.

S. S. Johnson, T. Clevenger, and M. Zahara, "The United States Lettuce Subsector: Its Structure, Conduct, and Performance," Working Paper, ESCS, USDA, 1979.

lettuce producer-shipper, Bud Antle Inc., was not struck since it has labor contracts with the Teamsters' Union. Such large firms as Sun Harvest were struck, but no statements can be found that a strike also occured against small growers [San Francisco Chronicle, February 24, 1979; March 4, 1979].

The fact that the strike seemed to be selective should be kept in mind in interpreting the following results. In this section, the hypothesis is tested that lettuce producers in both California and Arizona earned increased profits as a result of the labor strike in the Imperial Valley. The issue of the distribution of these gains is discussed later. The hypothesis is tested by computing competitive prices and quantities and monopolistic prices and quantities (i.e., $\bar{P}\bar{Q}$ and P^*Q^* in Figure 1) and comparing P^*Q^* in Figure 1 with the actual prices and quantities. The time period studied is the month of February, 1979.

The farm-level supply and demand parameters of the U.S. winter crop have been empirically estimated by Clevenger and Shelley. The two-stage, least-squares procedure utilized for their parameter estimates is presented in Table 3. These 1974 results are used because, unlike the model recently estimated by Hammig and Mittelhammer, they are estimated for different seasons. This is important since the analysis presented in this paper focuses on the winter lettuce crop. Hammig and Mittelhammer obtained (1) a price and income elasticity of domestic demand of $-.1223$ and .1827, respectively; (2) a price and income elasticity of export demand of $-.1016$ and .675, respectively; and (3) a price elasticity of supply of .417. These average elasticities fall within the range of seasonal elasticities estimated by Clevenger and Shelley.

By substituting relevant 1978 data for the variables DI, AP, Y, and M, the intercept terms for the supply and demand equations in Table 1 were adjusted to correspond to the 1979 winter season; and the equations were expressed as functions of P and Q only. These adjusted equations serve as the basis for the empirical estimates of the welfare effects of the lettuce strike. The adjusted supply equation is

$$(2) \qquad P_s = -3.15983 + .0005828Q,$$

and the demand equation is

$$(3) \qquad P_d = 45.8996 - .0023Q.$$

For competitive equilibrium, a single price, $\bar{P}$, must prevail since the commodity is assumed to be homogeneous. The quantity demanded, $\bar{Q}$, for the winter season must

TABLE 3. Estimated Coefficients of a Supply and Demand Model of the U.S. Winter Lettuce Crop

Demand: $P_t = 7.9283 - .0023\ Q_t + .0057\ DI_{t-¼} + .6165 M_{t-1}$
$(-2.68)^a \quad (2.65) \quad (2.15)$

Supply: $Q_t = -12{,}857.3813 + 1{,}715.8502\ P_t + .1177\ AP_t + 48.9457\ Y_{t-1}$
$(5.94) \quad (5.04) \quad (4.52)$

where:

Q = quantity of U.S. lettuce supplied (100,000 pounds)
DI = U.S. disposable personal income per capita (dollars)
M = average retail marketing margin for lettuce (dollars per head)
Y = average lettuce yield per harvested acre (100 pounds)
AP = acres planted to lettuce (acres)
P = average farm price per hundredweight of lettuce (dollars)
t = present lettuce season

[a]Figures in parentheses are t ratios.

Source: Thomas S. Clevenger and W. Vernon Shelley, "Intraseasonal Demand-Supply Relationships for Lettuce," *Proceedings of the Western Agricultural Economics Association,* 1974, pp. 18-21.

equal the quantity supplied at the equilibrium price, $\bar{P}$. From (2) and (3), this implies

(4) $\quad \bar{P} = 6.758$ and $\bar{Q} = 17{,}017.$

Evaluated at the perfectly competitive solution (4), the demand elasticity for winter lettuce is estimated to be $-.17$ and the supply elasticity to be .68.

Consider a market with inverse supply and demand curves,

(5) $\quad P_d = \alpha - \beta Q$ and $P_s = \gamma + \delta Q.$

Now suppose that one firm takes control of the production of lettuce and chooses to act as a monopolistic firm. From (5), the monopolist's profit function can be expressed as $\pi(Q) = (\alpha - \gamma)\, Q - (\beta + \delta/2)\, Q^2$. The first-order condition is that marginal revenue equals marginal cost which implies

(6) $\quad P^* = 24.123$ and $Q^* = 9{,}465.$

To test the hypothesis that the union has yielded substantial monopoly rents to growers, P* and Q* should be compared with the actual prices and quantities which prevailed in the lettuce market in February, 1979. However, since Q* corresponds to the optimum monopoly shipments for the entire 1979 winter season, this figure must be adjusted to represent an estimate of the optimum February shipments. Since the February lettuce shipments have averaged 33 percent of winter shipments for the past three years, Q* was deflated to 33 percent of its value shown in (6). Therefore, if the lettuce monopoly had formed in February, 1979, it would have shipped 312 million pounds of lettuce and would have charged $24.10 per hundredweight. Assuming market shares remain constant under the monopolist, 93 percent of this output or 290 million pounds would be shipped from California and Arizona. This result is very similar to the actual marketing statistics in Table 4. During the last week of February, the market price was virtually identical to the monopoly price estimated from equations (2) and (3). Presumably, as a result of the strike, the California and Arizona producers were forced to reduce their shipments in February, 1979, to 329 million pounds.[5] However, due to the

[5]The reduction in lettuce shipments in February, 1979, from both California and Arizona producers over the same period in 1978 may have been partially due to factors other than the strike, such as the weather. However, the contention here that the strike did not impinge hardship on the producers still holds.

TABLE 4. Comparative Lettuce Marketing Statistics, February, 1978 and 1979

	Rail and Truck Shipments of Lettuce California and Arizona		Price of Lettuce	
	1978	1979	1978	1979
	1,000 pounds		$/cwt. f.o.b. Imperial Valley	
February				
1	21,760	23,540	12	20-24
2	21,720	18,378	10	20
3	26,340	6,888	10	a
4	17,180	4,250		
5	2,120	15,010		20
6	22,730	14,816	10	20
7	24,690	14,802	9-10	20
8	20,040	15,574	8-9	16-20
9	22,370	17,150	8-9	16-20
10	21,300	9,188	8-9	
11	15,040	1,080		
12	590	6,100		--b
13	19,400	16,852	8-9	24
14	21,450	5,300	7-8	--
15	20,870	18,202	6-7	24
16	23,180	17,474	6-7	20
17	22,990	11,488	6-7	
18	14,200	1,620		
19	50	9,150		
20	15,830	11,812		16
21	20,420	11,422	6	20-24
22	21,790	14,702	6	24
23	24,120	16,852	6	24
24	24,940	9,626	6	
25	14,990	800		
26	100	13,332		24
27	22,590	9,978	6	24
28	22,820	13,654	5-6	24

[a]Blanks indicate no price quoted for weekend or holiday

[b]Dashes indicate that supplies were insufficient to quote.

Source: California Bureau of Market News, Federal-State Market News Service, "Central California Vegetable Report" (Salinas, February, 1978 and 1979).

relatively inelastic demand for lettuce, they were able to obtain an average of $21.40 per hundredweight for this period.

An estimate of the welfare gain accruing to the California and Arizona lettuce producers during the February part of the strike is shown in Table 5 to be $41.6 million.[6] This estimate corresponds to the area $(P^*ab\bar{P}) - (bdc) - (ef\bar{Q}Q^*)$ in Figure 1 and was computed using the observed prices and quantities reported in Table 4.

If the industry were monopolistic, the maximum net producer benefit obtainable for this period would have been $45.4 million for California and Arizona producers. Even though the actual producer returns were $41.6 million and were thus less than the monopoly optimum, they still represent very substantial short-run returns for producers in the lettuce industry. Since California producers supplied 79 percent of the U.S. lettuce market during February and Arizona producers supplied, on the average, 14 percent over

[6]In terms of the impact of the strike among growers, it is clear that part of the estimated gains went to Arizona lettuce producers since they received the higher price without having to cut output. Since Arizona producers were outside the affected strike area, they benefited solely as free riders.

the past three years, the estimated producer "monopoly" returns, in the time period studied, are $34.5 million in California and $7.1 million in Arizona.

Data in Table 5 indicate that output was reduced by roughly 35 percent from the competitive quantities that would have prevailed under normal yield assumptions. This is entirely consistent with the data in Table 2. The struck firms, such as Sun Harvest, make up a large percent of the industry partly because of their capacity as handlers. In addition, plantings were lower in 1978 due to weather conditions which yielded a lower crop in 1979. Lettuce acreage in the Imperial Valley was 43,900, 41,170, and 40,860, respectively, in 1976, 1977, and 1978 [Agricultural Commissioner, Imperial County, California]. Therefore, our estimates of increased profits as a result of the strike should be viewed as an upper bound because part of the reduction may well have been due to reduced plantings. In addition, when interpreting the empirical results, the following assumptions are important: (1) previously estimated linear supply and demand equations were used and extrapolated outside of the data range; (2) the short-run supply curve used is quite elastic (it may well be, given the harvesting practices in lettuce); (3) the harvesting and marketing costs used per carton of lettuce did not change as a result of the strike; and (4) the lettuce industry was competitive prior to the strike. Several of the assumptions may exaggerate the effect of the increase in grower returns due to the labor strike. For example, costs were probably raised during the strike because, typically, grocery retailers and other handlers increase their marketing margins when supply is short. In addition, the issue of the competitive nature of the lettuce industry has been raised in the past [e.g., *Northern California Supermarkets* v. *Central California Lettuce Producers* et al.] and is still controversial. However, even if the industry is noncompetitive, increased returns still could accrue to growers due to a labor strike; but the magnitude would be far less.

The Distributional Issue

Because the lettuce strike was selective (not all of the grower-shippers were struck), producers were affected differently. Firms such as Sun Harvest may actually have lost from the strike [Schaffner]. If this were the case, then the profits earned due to the strike (i.e., those which resulted because output was reduced by the strike below competitive levels, causing lettuce prices to rise sharply) accrued to the free riders. These were the Arizona producers and the nonstruck California producers. However, one should view

TABLE 5. Estimated Strike Gains to the California and Arizona Lettuce Producers for the Month of February, 1979

	Prices	Quantities	Net Producer Gain
	$/cwt.	100,000 pounds	million dollars
Optimal Competitive Values	6.7 ($\bar{P}$)	5,222.8 ($\bar{Q}$)[a]	0
Optimal Monopoly Values	24.1 (P^*)	2,905.0 (Q^*)[a]	45.4
Observed Statistics	21.4	3,290.3	41.6

[a]These estimated quantities have been twice deflated. First, they were deflated by 67 percent in order to represent February quantities. Secondly, they were deflated by 7 percent in order to represent California and Arizona quantities.

this interpretation with caution. It rules out the possibility that nonstruck firms actually compensated the struck firms. Also, since strike insurance was available, firms struck may not have been made worse off in that they had not received direct compensation from growers. If growers contribute to a strike fund, it is clear that our theoretical analysis of an industrywide strike still holds. That is, the reduction in output of the struck firms resulted in an increase in industry profits of sufficient magnitude to allow compensation so that all producers could have been made better off. It follows that, *with a compensation scheme among growers, the empirical analysis presented above is independent of the striking strategy of the union considered in this paper (i.e., entire industry versus selective strikes), given the assumptions made.*

There may be one interesting difference between an industrywide strike and a selective strike when compensation is possible among growers through such devices as strike insurance. This relates to the discussion earlier about the supply curve of labor facing the industry. If there is not a high degree of substitution between union and nonunion lettuce pickers (even though this analysis argues that there is), then an industrywide strike causes costs to rise in producers. However, as already pointed out, a selective strike does not cause this problem since the supply curve of labor for the nonstruck firms is unaffected. Thus, profits to all producers could actually be higher under a selective strike as opposed to an industrywide strike. If compensation is not possible, some producers will gain and others will lose in the short run. Net industry gains are still positive for the same reasons as above. Therefore, in terms of our empircial results, the only change implied under our assumptions is that the profits are going to fewer firms in the industry. That is, the magnitude of profits is not affected — only their distribution. It must be emphasized, however, that these results are of a short-run nature and may not apply to the long run.

A Consumer Boycott As an Alternative to a Worker Strike

In addition to strikes, the lettuce industry has commonly experienced consumer boycotts [San Francisco Chronicle, April 27, 1979]. As a result, it is interesting to compare theoretically the effects of a strike with those of a consumer boycott. A strike essentially focuses on restricting producer output directly, whereas a consumer boycott is concerned with shifting the demand curve for the final product to the "left." Suppose that consumers boycott the market, as displayed in Figure 2, to such an extent that the demand curve shifts from αD back to $\alpha' D'$. The effects of such a boycott, *ceteris paribus*, are detrimental to the producers of the product in question. Suppose, however, that in response to the boycott, the producers collectively decide to monopolize the industry setting $\alpha' MR' = \gamma S$ to yield P'_d and $\bar{Q}'$ as the new equilibrium.[7] At the new equilibrium solution, the producers have lost rents equal to the area GFJ (Figure 2) and gained rents equal to $P'_d\ EGP_c$ *vis-à-vis* the competitive solution. Their net welfare gain is, therefore, $P'_d\ EGP_c - GFJ = Z$.

From the diagram, it is clear that producers "lose" as a result of a boycott if area $Z < 0$ (i.e., if $GFJ > P'_d\ EGP_c$) even if they retaliate and subsequently form a monopoly. Producers are worse off with the "boycott monopoly" situation if consumers choose to shift the demand curve far enough to the left to yield a negative value for Z. In the analysis, $Z = 0$ is analogous to the notion of the strike break-even point raised earlier in this paper. Thus, a boycott can be equally harmful, or even more harmful, to producers than a strike. Whether or not one is preferable to the other is a function of the parameters of the market supply and demand curves and the objectives of the union-consumer coalition.

[7]The suggestion of a producer monopoly in the lettuce industry is not entirely unrealistic. This possibility has been alluded to by Hammig and Mittelhammer who state that this industry presents an opportunity for the extraction of above-normal profits.

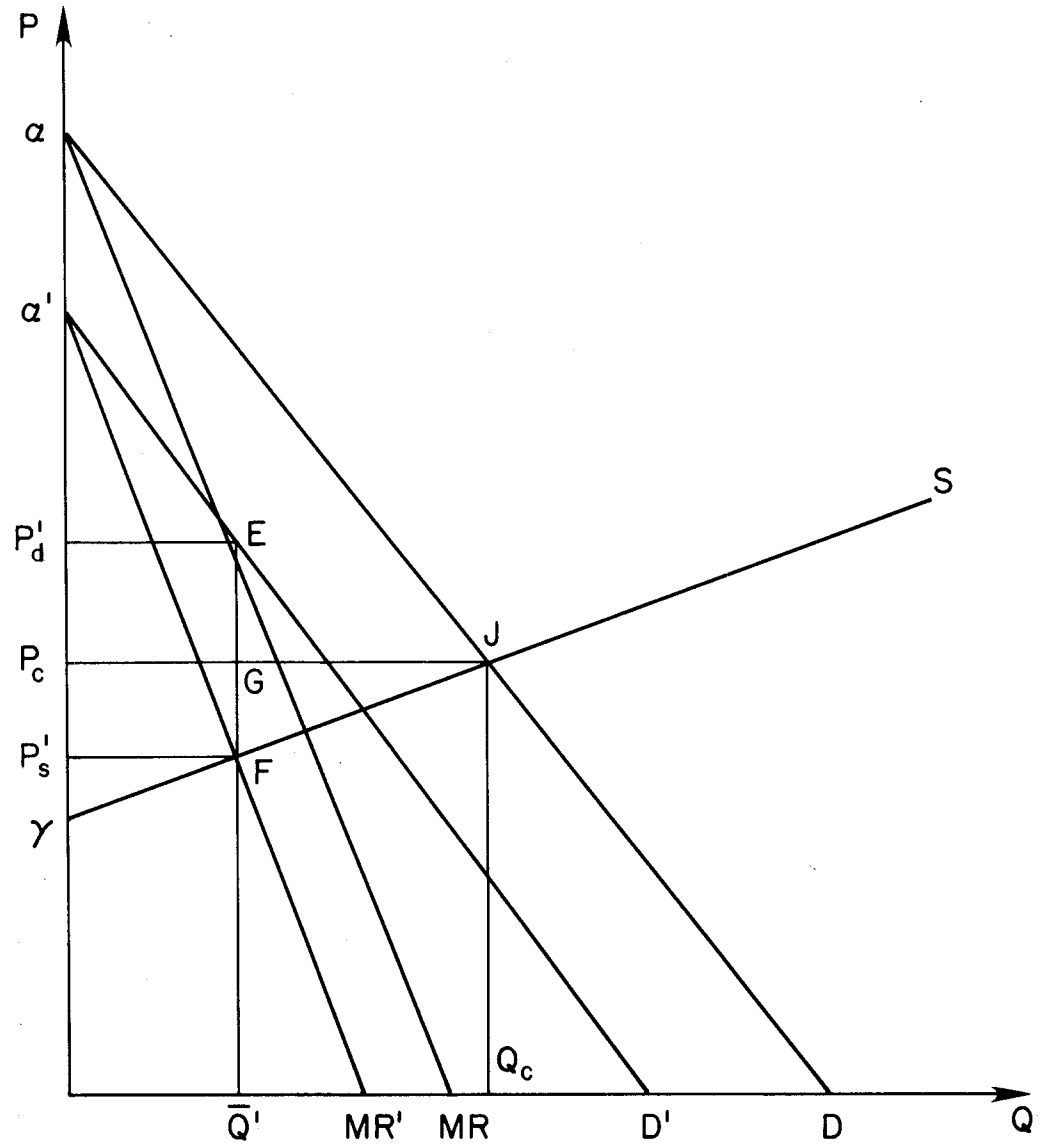

Figure 2. A Work Strike and Boycott Compared.

Conclusions

This analysis shows that substantial increases in revenue were generated to lettuce producers in aggregate during the 1979 lettuce strike in the Imperial Valley of California even though some of the producers may have experienced reduced sales. In essence, a strike — by reducing output — does not necessarily hurt all producers in the industry. The reduction in output during the strike was comparable to the action a monopolist facing an inelastic demand would take — namely, reduce output from competitive levels and increase price. The reduction in output during the strike was in part due to the union strategy of striking a few large

lettuce-producer shippers rather than the entire industry. It is clear that the free riders benefited from this reduction in output, at least in the short run. What is not clear is the effect of the strike on the firms that were actually struck.

To contend, as this analysis suggests, that UFW strike action resulted in economic adjustments similar to those that might be made by a monopolist would seem to many somewhat unreal. Yet, as has been demonstrated in this paper, if the struck firms had ways of being compensated for their losses (e.g., strike insurance), then all producers gained from the strike; and the analysis would be comparable to the behavior of one or two large oligopolistic firms (the strike in essence then serves as a vehicle for monopolistic-type economic adjustments). Explicit compensation is illegal among growers; hence, it may be unreasonable to argue that compensation schemes exist so that the struck firms can recoup their losses. Yet, it is interesting to observe the length of time that elapsed between the strike and the negotiation of new wage contracts by such firms as Sun Harvest [Imperial Valley Press; Sacramento Bee]. In fact, the account of September, 1980, suggests that only 2 of the 11 firms struck agreed on a new wage settlement. As this paper shows, the UFW is in an extremely difficult position to bargain for higher wages because of the structure of the lettuce industry, including the nature of demand for the product.

In addition to the problems faced by the UFW, as alluded to in this paper, there are additional elements in the bargaining situation which make it difficult for labor to demand higher wages even if no compensation scheme exists among growers.

1. The large lettuce growers produce lettuce during other times of the year in areas outside the Imperial Valley. Thus, they are likely to find that the pattern of wage costs established in the Imperial Valley also faces them in Salinas and other regions of the state, increasing their resistance to union demands.

2. In periods of excess production, market prices may fall so low that fields remain unharvested and/or are disced up because market prices will not cover harvest and transportation costs. The result is reduced supplies going to market.

3. Some of the large lettuce firms produce other vegetable crops and hence spread their risks over several commodities and activities. This enables them to take a tougher stand against union demands since they can cover short-term losses on lettuce from other sources.

4. Because of their access to captial, the relatively large firms are in a more favorable position to adopt a new laborsaving technology — the mechanical lettuce harvester. This possibility certainly puts an upper limit on the bargaining strength of unions. Of course, a union that included other workers in the harvesting process — particularly cooler operators and truck drivers — would be in a position to restrict the introduction of new technology, at least in the short run.

In conclusion, the analysis in this paper is static and of a very short-run nature. As a result, it cannot predict the long-run implications of the effects of union strategy on union wages and grower returns (e.g., because of the multiproduct nature of the firms, a shift in the share of returns to workers from lettuce production would make less labor-intensive crops relatively more attractive). The short-run focus of this paper possibly overstates the benefits to growers from worker strikes. In the long run it is possible for the strike-related profits calculated in this paper (appropriately discounted) to go to producers and workers jointly; this will have an adverse effect on consumers because the combined producers and workers will have secured a monopoly position. (The analysis in this paper suggests there are rents for workers to obtain from growers, but the question is how to obtain them.) However, in spite of its short-run nature, it is hoped that the framework presented here can be used as a first step in analyzing the impacts of labor strikes in agriculture and that this type of analysis

will be extended to consider long-run effects on consumers, where the relative strengths of growers versus unions is considered. Results from such analysis would be interesting and are urgently needed.

References

Agricultural Commissioner, Imperial County, California, *Agricultural Crop Reports*, various issues, 1961-1979.

California Bureau of Market News. Federal-State Market News Service. "Central California Vegetable Report," Salinas, February, 1978 and 1979.

California Employment Development Department. "Midmonth Estimates of Agricultural Employment by Type of Worker," December 13, 1980.

Clevenger, Thomas S. and W. Vernon Shelley. "Intraseasonal Demand-Supply Relationships for Lettuce." *Proceedings of the Western Agricultural Economics Association*, Moscow, Idaho, 1974, pp. 18-21.

Garoyan, Leon. "Some Economic Considerations of the California Iceberg Lettuce Industry." Testimony presented at a public hearing to consider a proposed California Iceberg Lettuce Promotion Program, El Centro, California, 1974.

Hammig, M. D. and R. C. Mittelhammer. "An Imperfectly Competitive Model of the U.S. Lettuce Industy." Paper presented at the Annual AAEA Meetings, Pullman, Washington, 1979.

Imperial Valley Press. "UFW Admits Defeat, Loses Some Impact." September 25, 1980, p. 19.

Johnson, S. S. and M. Zahara. "Lettuce Harvesting and Packing: Hand and Machine Harvest Alternative." *Vegetable Situation*. ERS, USDA, May 1976.

Johnson, S. S., T. Clevenger, and M. Zahara. "The United States Lettuce Subsector: Its Structure, Conduct, and Performance." Working Paper, ESCS, USDA, 1979.

Just, Richard E. and Darrell L. Hueth. "Welfare Measures in a Multimarket Framework," *American Economic Review*, 69 (1979): 947-954.

Northern California Supermarkets v. *Central California Lettuce Producers; Admiral Packing Co.; Green Valley Produce Co-op, Growers Exchange, Inc.; Let-Us-Pak; Pacific Lettuce; Royal Packing Co.; Salinas Marketing Cooperative, The Garin Co.;* and *United Brands Company*.

Padfield, Harlan and William E. Martin. *Farmers, Workers and Machines*. University of Arizona Press, Tuscon, 1965.

Sacramento Bee. "United Farm Workers' Poor Harvest." Sacramento, California, September 21, 1980, p. A10.

Schaffner, David. "Structure of the California Lettuce Industry." Ph.D. dissertation in progress, University of California, Berkeley, 1980.

San Francisco Chronicle. "Relating the Strike to Lettuce Prices." San Francisco, California, February 24, 1979, p. 8.

San Francisco Chronicle. "Lettuce Strikes in Both South and North." San Francisco, California, March 4, 1979, p. 5.

San Francisco Chronicle. "New Chavez Lettuce Boycott." San Francisco, California, April 27, 1979, p. 8.