Working Paper Series

WORKING PAPER NO. 527

Labor Contracting and a Theory of Contract Choice in California Agriculture

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DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

BERKELEY

CALIFORNIA AGRICULTURAL EXPERIMENT STATION

University of California

DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS
DIVISION OF AGRICULTURE AND NATURAL RESOURCES
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1. Introduction

Labor contracting is an old institution in California agriculture. Contractors have supplied crews to plant, hoe, thin, and harvest labor-intensive fruit and vegetable crops in the state for over 100 years. It is also a persistent institution. Although advocates of farm labor unionization predicted that contracting would disappear after the passage of collective bargaining legislation for California agriculture, contractors have continued to increase their share of the seasonal labor market. Currently, about one-third of the production jobs on California farms are performed by workers supplied by contractors.

Labor contractors are independent intermediaries who, for a fee, recruit, hire, and supervise seasonal farm workers. The work force which they supply is composed primarily of immigrant workers with limited knowledge of their rights or ability to exercise them. Workers are often dependent on the contractor for transportation, housing, or access to services such as health care in addition to a paycheck. High levels of unemployment among this category of workers, resulting from labor demand seasonality and from the constant replenishment of the labor pool through immigration, foster this dependence. Abuse of this relationship has resulted in a rather unsavory reputation for contractors (Vaupel and Martin). Accounts of promised jobs that do not materialize; wages due that fail to be paid; and workers that are overcharged for transportation, food, and housing are common. Growers can also fall victim to abusive contractors who pad the payroll with phantom workers or exaggerate production figures. Reports of fraud and abuse have led the state of California to require licensing and bonding of contractors beginning in 1939. Federal law followed suit in 1963.

What accounts for the persistence of this antiquated and apparently primitive institution in agriculture? Contractors were originally employed to bring Chinese immigrant workers into agriculture, where the lack of a common language was a barrier to direct employment and supervision (Fisher). Today, most foremen and field supervisors, and many growers themselves, are bilingual. Thus, while the work force is still composed primarily of immigrant workers, language is no longer the barrier it once was between employer and employee. Contractors are providing growers with functions other than those of interpreters and foremen. How they contribute to the functioning of the labor market and to labor management are the focus of this paper.

Economic analyses of the labor process have sought to explain patterns in the organization of agricultural production by applying the theory of transactions costs to problems of tenancy and labor contract choice. These models focus on particular aspects of labor contracts, such as the payment of piece versus time rates (Stiglitz, Roumasset and Uy), permanent versus casual labor contracts (Bardhan, Eswaran and Kotwal 1985a), and alternative forms of tenancy (Eswaran and Kotwal 1985b). This paper employs this theory to examine the role of the contracting system in labor intensive agriculture. It focuses on the determinants of the grower's choice between direct hiring and using a labor contractor to provide seasonal labor and the effects of this decision on the wage structure in seasonal farm work. The analysis reveals some of the implications of recent changes in immigration and labor relations policies for the structure of the farm labor market.

Previous studies of seasonal farm labor have identified labor demand seasonality as the source of low returns to farm work and problems of unstable labor supply (e.g., Holt, p. 11). Schemes designed to stabilize employment have not been adopted widely, however. We argue that the contracting system is advantageous to growers precisely because it preserves the casual nature of seasonal farm work. Contractors possess an advantage in recruiting workers for seasonal jobs because

they can spread their recruitment costs over a number of short-term contracts. They are also more efficient than growers in the recruitment of new entrants to farm work, of workers with little knowledge of the farm labor market or labor standards, and of workers whose alternatives inside and outside of farm work are limited by their illegal status. Hiring workers with these characteristics enables contractors to achieve higher levels of work intensity in certain types of jobs while paying lower wages than growers who hire labor services directly.

Contracting is, however, not appropriate to meet all of agriculture's labor needs as we will show. In particular, growers have an advantage in direct hiring for jobs which are less seasonal and which require greater care and knowledge of production. The resulting pattern of labor use restricts contract labor to the least stable and lowest paying jobs.

In the next section we develop a formal model of the grower's contract decision and wage determination, where the contract alternatives are direct hiring and contracting for labor. The model is used in section 3 to infer a distribution of contracts across types of jobs. In section 4 we reverse the use of the model to derive the conditional distribution of workers between contract types in a given job and the predicted wages expressed as a function of contract type. Section 5 presents empirical results for these two equations. They are used in section 6 to calculate expected wages under alternative policy scenarios.

2. Labor Contracts and Labor Extraction

We consider the functions of the contracting system at two levels: in the labor market and within the labor process. Its function in the labor market is the recruitment and hiring of workers. In the labor process, its function is to induce workers to work at a high level of effort and in ways which will produce output of the desired quality. The

quantity and quality of output produced is dependent on the quantity of labor time, modified by the level of effort and quality of work.

The grower thus faces two problems. First, he must have access to a sufficiently large supply of workers with the desired attributes for the job to be done. Then, he must employ a structure of incentives and supervision to extract labor effort from them. There are two basic solutions to these problems. One is the direct hiring and management of workers. The alternative is to purchase labor from a labor contractor. We assume that growers make decisions on these alternatives at each stage of the production process of each crop and that each decision is independent. Thus, they may choose to employ labor directly for one task and to contract for labor at a later stage of production. The choice of contract will depend on the activity to be performed and on the relative efficiencies of growers and labor contractors in the recruitment of workers and the extraction of work in that particular activity.

2.1. Supervision and Cost of Job Loss

Employers, both growers and contractors, have two means of extracting work from workers. One is by direct supervision, which primarily influences the quality of the work performed, and the other is to apply pressure to increase the quantity of work by the threat of job loss.

Supervision involves directing and coordinating the labor process; making the day-to-day production decisions regarding the timing and levels of input use, including labor inputs, and their methods of application. The effectiveness of supervision depends upon the supervisor's ability to manage production. The importance of supervision to an activity, whether it be pruning vines, applying fertilizer, or harvesting garlic, will vary with the sensitivity of output quality to the labor process.

Growers have a comparative advantage in supervision over contractors because of their greater knowledge of the production process as a whole. The

grower's proprietary interest in maintaining the yield potential of fixed inputs such as land, trees and vines, and in protecting investments in equipment, also give him greater incentive to supervise effectively those activities requiring greater care. Let S be the cost of supervision per unit of labor time and γ_i a parameter representing the efficiency of supervision under contract i. Because growers are relatively more efficient in supervision that contractors, $\gamma_1 > \gamma_2$ (throughout, we use i = 1 for direct hiring and i = 2 for contracting labor).

The other means of extracting work is by controlling the cost of job loss, defined as the difference between the actual wage and the worker's opportunity wage (Shapiro and Stiglitz, Bowles). The cost of job loss affects work effort (Stiglitz). The threat of job loss is more effective, and hence effort increases, the greater is the cost of job loss that the employer can impose on the worker. Thus, high costs of job loss are implied by the common observation that farm workers work "hard and scared." Compared to direct supervision, this indirect control of the worker's performance is more useful in influencing the quantity of work rather than the quality of work. We discuss the components and manipulation of the cost of job loss in more detail at the end of this section.

Given the other inputs, the output of each activity is a function of labor time, L, modified by the level of supervision, and by the work effort E which is influenced by the cost of job loss. Let $\alpha_2(j)$ and $\alpha_3(j)$ represent the importance of labor time and supervision to the output of activity j. For a given contract type i, the output of activity j is

$$(1) \qquad Q_{ji} = E_{ji}(\gamma_i S)^{\alpha_3(j)} L^{\alpha_2(j)},$$

where E_{ji} represents the average level of work effort among the workers hired which is affected by the cost of job loss.

The cost of job loss to a worker is the difference between two components: the actual wage paid and the opportunity wage of that worker. Therefore, employers have two means of controlling the cost of job loss. One is to recruit and hire workers with low opportunity wages and the other is to increase their wage. However, both of these actions, recruitment and wage strategies, are not done selectively for individual workers. They are overall strategies that apply to the whole pool of workers. The employer chooses an overall strategy of recruitment (characterized here by an overall expenditure on recruitment) that will give him access to a certain pool of workers from which he will employ, applying no further selection among the individuals. Similarly, he chooses an overall level of incentive bonus B on the wage, which is then applied to the structure of individual wages. Since workers in the recruited pool are not homogenous, their individual wages, opportunity costs, and work efforts will differ. The outcome of the recruitment and wage policies will then be measured by an average intensity of work among the pool of recruited workers. We discuss successively the recruitment and wage policy before aggregating them in an average level of work intensity.

A worker's opportunity wage is determined in part by his or her individual characteristics with the result that employers can manipulate the cost of job loss by targeting groups of workers with particular characteristics for recruitment and hiring. Let X be a vector of characteristics describing the worker, R be the per worker cost of recruitment, and δ_i be the relative efficiency of recruitment under contract i. The level of recruitment expenditure determines the pool from which workers are hired. The pool is identified by a frequency distribution of characteristics $f(X; \delta_i R)$. It may consist of a local community of settled farm workers, a migrant stream within the United States, a cross-border migration network, or a combination of these groups.

Farm labor contractors specialize in the delivery and management of a labor supply for seasonal farm work. This gives them two advantages. First, their more

extensive contacts within farm worker communities and migration networks provide them greater access to those segments of the labor force with lower average opportunity wages. These consist of high proportions of undocumented workers, nonunion workers, and workers with little or no farm work experience in the United States. Their second advantage is their ability to reduce recruitment costs per unit of labor time by spreading these costs over several contracts. Because contractor's are relatively more efficient in recruitment, $\delta_2 > \delta_1$.

The second means available to growers of increasing the cost of job loss is to increase the wage. Both growers and labor contractors exercise some control over wage rates. However, growers have greater flexibility with respect to wage setting than do contractors who must compete for contracts. Competition among contractors leads to the result that the grower effectively sets the maximum wage that contractors can pay. Growers also face a greater union threat and, hence, greater pressure to increase wages in order to preserve an effective threat of job loss. They are identified with fields that can be picketed and in some cases with a product susceptible to boycott. In contrast, contractors have not been successfully unionized, and their mobility and lack of capital make it virtually impossible to enforce collective bargaining agreements. These were, in fact, the arguments made to support the exclusion of contractors from collective bargaining legislation.

The cost of job loss and, in turn, the average work intensity of the pool of workers are dependent both on the recruitment expenditure, determining the opportunity wages of workers in the pool, and on the wage. The determination of the wage and the cost of job loss are specified formally in the following way. Let w_o be the prevailing minimum wage rate for farm work. The actual wage paid by an employer to a worker X is $w_o g(X, B)^{\epsilon_i}$, where $g(X, B)^{\epsilon_i}$ is the ratio of the actual wage to the minimum wage for workers X and contract type i. This ratio is a function of three components: X, the vector of worker characteristics; B, the average wage bonus for

the labor pool; and ε_i, the parameter representing the difference in wage flexibility and pressure under the two contract types. The greater wage flexibility and the greater pressure to increase wages under direct hiring imply that $\varepsilon_1 > \varepsilon_2$. In the extreme, the contract wage rate would be driven to the minimum wage such that $\varepsilon_2 = 0$.

The worker's opportunity wage is expressed as a function of individual characteristics and contract type, $w_i^\circ(X)$. Opportunity wages are dependent on contract type because preferences of growers and contractors influence the worker's reservation wage in one contract or the other, independently of his probability of employment under that contract. Thus, unionized workers have a higher opportunity wage under direct hiring, as they benefit from the union's bargaining power but a lower opportunity wage under contracting as growers explicitly seek nonunionized workers when obtaining workers through a labor contractor. Similarly, years of experience in farm work raise the worker's opportunity cost for direct hiring but lower it for contracting, as contractors prefer cheaper and more docile workers. The cost of job loss for the individual worker X is

$$(2) \qquad C_i = w_o\, g(X, B)^{\varepsilon_i} - w_i^\circ(X).$$

Aggregating over the pool of workers, levels of R and B in a given activity j and contract type i produce the following average labor effort:

$$(3) \qquad E_{ji} = \int_R [w_o\, g(X, B)^{\varepsilon_i} - w_i^\circ(X)]^{\alpha_1(j)} f(X; \delta_i\, R)\, dX.$$

The parameter $\alpha_1(j)$ represents the impact of work effort on the output of activity j.

The concept of the cost of job loss provides a link between the contractor's roles in the labor market and the labor process. The contractor's ability to recruit and hire workers with limited employment alternatives facilitates the process of labor extraction by increasing the average cost of job loss, and therefore work effort.

2.2. Choice of Contract

The process of labor hiring thus can be summarized in the choices of four variables which determine the proceeds and the costs of labor in the considered activity: (a) the level of employment L; (b) a supervision cost per unit of labor S; (c) a recruitment cost per worker R; and (d) an average bonus in wages B. The proceeds of work are measured by the production of activity j under contract i:

$$(4) \qquad Q_{ji} = \int_x [w_o g(X, B)^{\varepsilon_i} - w_i^*(X)]^{\alpha_1(j)} f(X; \delta_i R)\, dX \cdot (\gamma_i S)^{\alpha_3(j)} L^{\alpha_2(j)},$$

where $\alpha(j) = [\alpha_1(j), \alpha_2(j), \alpha_3(j)]$ is the vector of characteristics of activity j and $\beta(i) = [\varepsilon_i, w_i^*(X), \delta_i, \gamma_i]$ is the vector of characteristics of the contract type i.

The average wage of the pool of workers hired under contract i is

$$(5) \qquad \overline{w}_i = \int_x w_o g(X, B)^{\varepsilon_i} f(X; \delta_i R)\, dX.$$

The overall cost of labor, including supervision and recruitment, is

$$(6) \qquad [\overline{w}_i + S + R / \alpha_4(j)]\, L,$$

where the quantity $R/\alpha_4(j)$ is the recruitment cost per unit of labor time and $\alpha_4(j)$ is the average length of job j.

Under direct hiring, the grower takes all the decisions and will choose levels of L, S, R, and B that maximize his profit:

$$\underset{L,S,R,B}{\text{Max}}\ \Pi_{1j} = p_j Q_{1j} - (\overline{w}_1 + S + R / \alpha_4(j))\, L.$$

Under the most common form of indirect contracts, these decisions are taken by the contractor who is paid a fixed fee for a given task. His objective function in deciding on

levels of L, S, R, and B is thus to minimize the overall labor costs, including recruitment and supervision, to perform the task $\overline{Q}_j$ specified by the grower:

$$\begin{cases} \underset{L,S,R,B}{\text{Min}} \left(\overline{w}_2 + S + R/\alpha_4(j)\right) L, \\ \text{s.t. } Q_{2j} = \overline{Q}_j. \end{cases}$$

Competition among contractors ensures that their fees are set to just cover their costs, equal to the sum of the labor costs, and a nominal fee for their service. This leaves the grower with a profit:

$$\Pi_{2j} = p_j \overline{Q}_j - \left(\overline{w}_2 + S + R/\alpha_4(j)\right) L - \overline{CF},$$

where CF is the contractor's service fee, and L, S, R, and B are set at their optimal levels.

As the contractor's cost minimizing problem is formally equivalent to a profit maximizing problem, the optimal choice of L, S, R, and B under indirect contract can also be written as a solution of the grower's profit maximization problem:

$$\underset{L,S,R,B}{\text{Max}}\ \Pi_{2j} = p_j Q_{2j} - \left(\overline{w}_2 + S + R/\alpha_4(j)\right) L - \overline{CF},$$

with the decision taken, however, by the contractor with his comparative characteristics ε_2, w_2^*, δ_2, and γ_2.

The final decision as to which of these contracts will be used in the hiring of labor rests on the grower, who chooses the contract which yields him the highest profit. In a world of certainty, with identical growers, the same optimal contract will always be chosen for the same activity. However, in the real world of differentiated growers, the profitability of a given contract is not identical for all growers and, thus, the optimal contract is not the same for all growers. This is confirmed by the observation that, for each activity, there is a distribution of contracts and not a unique

dominant contract. It is to the analysis of this distribution of contracts that we now turn.

3. The Distribution on Contracts by Job Types

Let $\tilde{\pi}_i$ be the expected maximum profit for contract i in a given activity (the activity subscript j is omitted). Because growers differ in management ability, their profit expectations will be distributed around $\tilde{\pi}_i$. Thus, any particular grower's contract choice will be based on his expected profits expressed as

$$(6) \qquad \pi_i = \tilde{\pi}_i + u_i,$$

where u_1 and u_2 are random variables. The probability that a grower chosen at random will choose contract 1 is

$$(7) \qquad P(1) = 1 - P(u < \tilde{\pi}_2 - \tilde{\pi}_1),$$

where $u = u_1 - u_2$. The probability that contract 2 is chosen is similarly defined:

$$(8) \qquad P(2) = P(u < \tilde{\pi}_2 - \tilde{\pi}_1)$$

which is equal to the value of the cumulative distribution of u at $(\tilde{\pi}_2 - \tilde{\pi}_1)$, or $F(\tilde{\pi}_2 - \tilde{\pi}_1)$.

Profits are calculated for each activity, so the characteristics of the job—the importance of the quality and quantity of labor to output—ultimately determine which contract is chosen. These characteristics differ by crop and task. In our empirical analysis, we use jobs defined specifically by crop and task rather than the characteristics themselves to predict contract choice.

Table 1 illustrates the effects of job type on contract choice among growers in California. The data are taken from a statewide survey of farm workers conducted in 1983. Whereas overall 28 percent of the jobs in this sample were performed by

Table 1. The Distribution of Contracts by Job Type and Average Job Length for Agricultural Jobs in California, 1983 Sample

Job	Direct Hiring		Contracting		Average Job Length
	number	percent	number	percent	weeks
Harvest	290	65.2	155	34.8	11.5
Prune	53	84.1	10	15.9	12.7
Thin	14	82.4	3	17.6	16.8
Hoe	47	50.5	46	49.5	10.1
Irrigate	68	93.2	5	6.8	25.3
Sort	53	69.7	23	30.3	6.3
Plant	16	84.2	3	15.8	26.3
Machine operator	107	92.2	9	7.8	21.0
Sample total	648	71.8	254	28.2	13.8

Source: 1983 UC/EDD California Farmworker Survey.

contract labor, contracting accounts for 35 percent of all harvesting jobs, 50 percent of hoeing (weeding and thinning row crops), and 30 percent of sorting. In contrast, growers hire directly for over 90 percent of all irrigator and machine operator positions.

Two factors are at work in determining this distribution of contracts. First, where the payoff to supervision is high because of the key role of work quality, as in irrigating or operating machinery, we observe more direct hiring. Where work intensity has the greater effect on output, as in the most routine and repetitive tasks, contract hiring is more prevalent. Timing and the effect of recruitment costs on contract choice are also evident in these results. Growers more often contract out the short season jobs, such as harvesting and sorting, where their unit costs of direct recruitment and hiring are greatest. The lower unit costs of recruitment and hiring in more permanent positions are thus another reason why we see growers directly hiring most irrigators and machine operators.

4. The Distribution of Workers Between Contract Types

The fact that, for a given activity, there is both direct hiring and contract hiring means that potentially the same task could be performed by the same worker under either one of the contracts. However, with different comparative advantage in recruitment and supervision, we have seen that growers and contractors do not recruit in the same pools of workers. For that reason, some workers are more likely to be hired directly and some others to work under labor contractors. We now examine the resulting distribution of similar workers between the two contracts. We will see that it depends not only on the type of job but also on individual characteristics that determine the pool from which the worker is most likely to be recruited.

For a given job j, if contract i is chosen and R and B are set at their optimum levels, then the distribution of workers hired under that contract is $f(X \mid i, j)$. The total distribution of workers for a given activity j is

(9) $f(X|j) = [1 - F(\tilde{\pi}_2 - \tilde{\pi}_1)]\, f(X|1, j) + F(\tilde{\pi}_2 - \tilde{\pi}_1)\, f(X|2, j).$

The probability that a worker selected at random from a given activity and with characteristics X is hired under a labor contractor is

(10) $f(2|X, j) = f(X|2, j)\, F(\tilde{\pi}_2 - \tilde{\pi}_1) / f(X|j).$

For a given job j and worker k, these probabilities are dependent on the characteristics $\alpha(j)$ of the *j*th job and the characteristics X of the *k*th worker. The distributions depend on the job specifications because of their effect on the relative profitability of the two contract types and, hence, on the choice of contract. They also depend on the worker's characteristics because of the differences in the optimal levels of recruitment and in the relative efficiencies of recruitment between contracts. Finally, these distributions depend on the relative efficiency of supervision and use of the wage incentive by growers and labor contractors. Therefore, the reduced form for the probability of contract i is

(11) $f(i \mid X, j) = h(X, \alpha(j)).$

Wages are also endogenous and jointly determined along with the choice of contract as a function of job type and worker characteristics. The theoretical form was written $w_o g(X,B)^{\epsilon_i}$, where B, set at its optimal level, depends on the job characteristics $\alpha(j)$ and the contract characteristics $\beta(i)$. Hence, a reduced form expression for wages is

(12) $w = f[\alpha(j), X_k, \beta(i)].$

Because the cost of job loss is defined as the difference between the wage paid and the opportunity wage, observed wages should increase with opportunity wages which depend on alternative sources of wage and nonwage income and on the contract type.

Wages should be relatively higher in direct hiring, where recruitment costs are higher and the threat of unionization reduces the cost of job loss.

5. Econometric Results

We now turn to the estimation of the reduced form equations for the probability of labor contracting and for the wage and to the empirical verification of the assertions derived from the theoretical model. Linear approximations of the probability distribution of contracts (11) and of the wage (12) are as follows:

$$(13) \quad P(LC_h = 1) = a_1 Z_j + b_1 X_k + c_1 N_r + u_h,$$

and

$$(14) \quad w_h = a_2 Z_j + b_2 X_k + c_2 N_r + eLC_h + v_h,$$

where $P(LC_h = 1)$ is the probability that worker k, in job j, and region r is employed by a labor contractor ($h = [j, k, r]$ is an index of the observation), LC_h is a dummy variable equal to 1 if, in the observation h, hiring is done through a labor contractor and 0 if there is direct hiring, w_h is the wage, Z_j is a vector of job specification, X_k is a vector describing the worker's characteristics, and N_r is a vector of regional variables. The random variables u_h and v_h are assumed to be distributed normally with zero means and variances σ_u^2 and σ_v^2, respectively.

The farm worker survey data referred to above are used to estimate the model. Table 2 contains a complete list of the variables and their definitions. Only observations on workers employed in nonsupervisory positions in their current job by either a labor contractor or a grower are included. Foremen, those working in off-farm jobs, and those employed by a packing house or sharecropper at the time of the interview were excluded from the sample. The latter two types of contracts cover only a small fraction of jobs and are restricted to particular crops and regions.

Table 2. Variable Definitions

Dependent Variables	
Wage rate:	the hourly wage rate for the worker (hourly earning for piece rate jobs).
LC:	a dummy variable for contract type = 1 if the worker is employed by a labor contractor, 0 if he or she is employed directly by a grower.
Worker's Characteristics (X)	
Age:	the worker's age in years.
Sex:	a dummy variable = 1 for males, 0 for females.
Farm work experience:	years of farm work experience in the United States.
Farm work experience squared:	years of farm work experience in the United States, squared.
Union membership:	a dummy variable for union membership = 1 if the worker has been a union member in the last 3 years, 0 if not.
Legal status:	a dummy variable = 1 if the worker is undocumented, 0 if he or she is legally working in the United States.
Migrant:	a dummy variable for migrancy status = 1 if the worker is away from home on their current job, 0 if not.
Auto:	a dummy variable = 1 if the worker owns a car or truck, 0 if not.
Job Specifications (Z)	
Harvest citrus:	a dummy variable = 1 for citrus harvesting jobs, 0 otherwise.
Harvest grape:	a dummy variable = 1 for grape harvesting jobs, 0 otherwise.
Harvest vegetable:	a dummy variable = 1 for vegetable harvesting jobs, 0 otherwise.
Harvest field fruit:	a dummy variable = 1 for field fruit harvesting jobs, such as strawberries or melons, 0 otherwise.
Prune vines:	a dummy variable = 1 if the job is pruning vines, 0 otherwise.
Hoe:	a dummy variable = 1 if the job is hoeing, all crops, 0 otherwise.
Irrigate:	a dummy variable = 1 if the job is irrigating, all crops, 0 otherwise.
Sort:	a dummy variable = 1 if the job is sorting, all crops, 0 otherwise.
Machine operator:	a dummy variable = 1 for machine operator jobs, all crops, 0 otherwise.

Table 2—continued

Time rate:	a dummy variable = 1 if the worker is paid by the hour, 0 if by the piece.
Peak employment:	a dummy variable = 1 if worker's employer hires more than 50 workers at peak, 0 otherwise.
Regions (N)	
Southern California:	a regional dummy variable = 1 for workers in Southern California (including Los Angeles, San Bernardino, Orange, Riverside, San Diego, and Imperial Counties), 0 otherwise.
Coastal Region:	a regional dummy variable = 1 for workers in the Coastal Region (including Contra Costa, Alameda, San Mateo, Santa Cruz, Santa Clara, San Benito, Monterey, San Luis Obispo, Santa Barbara, and Ventura Counties), 0 otherwise.
Sacramento Valley:	a regional dummy variable = 1 for workers in the Sacramento Valley (including Sacramento, Yolo, Yuba, Sutter, Colusa, Butte, Glenn, and Tehama Counties), 0 otherwise.

The personal characteristics variables included in the model are age, sex, years of farm work experience in the United States, union membership, legal status, migrancy status, and car ownership. We discussed above the effects of experience, union membership, and legal status on a worker's opportunity wage and probability of contract employment. Contractors draw from a "hidden" labor pool that includes undocumented workers, new migrants lacking experience and knowledge of the farm labor market, workers who migrate, and those who are nonunion. Age is included as another indicator of experience.

The job types included in the model are harvesting jobs, pruning, hoeing, irrigating, sorting, and machine operation. Job effects are compared to the deciduous fruit harvest. The jobs requiring greater care in their performance and, hence, greater supervision are pruning, equipment operation, and irrigating. These jobs also last longer than other farm jobs. For these reasons, growers should find it more profitable to fill these positions through direct hiring. In contrast, because work intensity is the primary factor determining output in most harvesting operations, we should find a higher probability of contractor employment in these jobs. Peak employment is included in the model to account for variation in the level of union threat by farm size. The experiences of the last two decades have shown that larger growers are more likely to be targets of union organizing drives.

The method of payment follows from the grower's choice of crop and is, therefore, exogenous. The relationship between the wage and method of payment results from the fact that, when piece rates are used, hourly earnings increase with work intensity. Stiglitz explains the use of piece rates as a device to screen workers according to their abilities (p. 562). Thus, piece work should yield higher hourly earnings as the more productive workers will choose jobs that pay on a piece rate.

The regional variables include dummies for Southern California, the Coastal Region, and the Sacramento Valley. Regional effects are normalized on the Central

Valley. These variables represent regional differences in recruitment costs, the effect of crop mix on labor demand seasonality, and regional variations in the strength of farm labor unions.

All the parameters in the wage equation are not expected to be equal across contracts. Interaction terms are consequently included to allow parameters to vary by contract type. These parameters will not be equal where worker characteristics are valued differently by growers and labor contractors (the $w_i^{\circ}(X)$ in equation (2)). For example, some contractors develop a reputation on the basis of supplying anti-union crews. This lowers the probability of contractor employment for union members, lowering their opportunity wage under direct hiring. Also, where the labor process in a given activity differs by contract type, such as in the level of mechanization, this will affect the optimal incentive wage.

The coefficient estimates for the probit estimation of contract choice are reported in Table 3.[1] The values of the coefficients for farm work experience, legal status, and union membership all are consistent with the theoretical model. Even though legal sanctions only applied to contractors at the time of this survey in 1983, the results confirm that undocumented workers are more likely to be employed by a contractor than directly by a grower. The contractor is able to channel undocumented workers into the farm labor market and to absorb the cost of replacing workers who are picked up in Immigration and Naturalization Service (INS) raids. Now that the sanction has been extended to include growers as well, we may see more growers choosing to contract for labor rather than risking the cost of a violation. This is, in fact, one of the most criticized sections of the 1986 Immigration Reform and Control Act.

As hypothesized, union membership has a significant negative effect on an individual's probability of contractor employment. Union membership entitles a worker to the job placement services provided by his union and provides him with an exclusive right to jobs covered by union contract. The question is then, why would

Table 3. Probit Equation Estimates for Contractor Employment

Variable Name	Estimated Coefficient	Asymptotic Standard Error	t-Ratio
Constant term	-0.18	0.17	-1.06
Worker Characteristics			
Union membership	-0.60	0.18	-3.35
Farm work experience	-0.018	0.006	-3.01
Legal status	0.43	0.14	2.96
Job Characteristics			
Harvest citrus	0.73	0.27	2.68
Harvest vegetable	0.63	0.16	3.88
Prune vines	-0.46	0.25	-1.82
Hoe	0.87	0.18	4.91
Irrigate	-0.76	0.26	-2.91
Machine operator	-0.70	0.22	-3.11
Peak employment	0.31	0.12	2.61
Time rate	-0.26	0.14	-1.93
Region			
Southern California	-0.44	0.18	-2.42
Coastal Region	-0.67	0.16	-4.30
Sacramento Valley	-0.34	0.18	-1.94

Total observations = 699.
Observations at one = 211.
Observations at zero = 488.
Likelihood ratio test = 187.99 with 20 degrees of freedom.
Chow R-square = 0.25.

union members work for contractors at all? Although union contracts provide some job security, union jobs make up only a small fraction of all farm jobs, and they are subject to seasonal fluctuations in labor demand that are characteristic of agriculture. Therefore, during seasonal layoffs, union workers may choose employment with a contractor over unemployment.

Crop and task variables distinguish labor requirements on the basis of seasonality, work quality, and optimal work intensity. The negative and significant coefficients for pruning, irrigating, and equipment operators in all crops confirm the hypothesis that growers are more likely to hire employees directly for jobs requiring greater levels of supervision. The positive coefficient for hoeing is also consistent with the hypothesized effects of skill and timing on labor demand decisions. Hoeing row crops is unskilled work performed intermittently during the growing season. Citrus harvesting is more likely to be contracted, contrary to expectations. This result provides evidence of the adverse impact of union organizing efforts in citrus during the late 1970s. Many growers responded to successful union organizing by withdrawing from the commodity associations whose members were bound by union contracts and substituting much cheaper contract labor (Mines and Anzaldúa).

Before discussing the results of the wage estimation, it will be useful to review the derivation of the reduced form. Recall that personal characteristics enter the grower's objective function through the cost of job loss, $w_0\, g(X, B)^{\varepsilon_i} - w_i^{\circ}(X)$, where the second term is the worker's opportunity wage and the first is the worker's efficiency wage, defined by the optimal level of incentive bonus for a given activity, B, and the contract type indicated by the parameter ε_i. Thus, in the structural model, the characteristics of the worker determine both the opportunity wage and the efficiency wage. Likewise, in the reduced form, there are two components to the wage effects of contracting. First, the opportunity wage of a given worker will vary with the type of contract. Second, even for a given opportunity cost and job, observed wages will vary

by contract type because growers and labor contractors will use different levels of supervision and incentive bonus, reflecting differences between contracts in the optimal means of extracting the desired quantity and quality of labor.

The results of the wage equation are reported in Table 4. The signs of the coefficients are consistent with the model, and most of the coefficients do not vary by contract type. Thus, the results show that, under both contracts, wages are higher in the citrus and field fruit harvests and in the irrigator and machine operator positions than in the deciduous tree fruit harvest. Also, larger peak time employers pay higher wages under both contracts, as expected.

The effects of some variables do depend significantly on the contract type, however, as the interaction variables show. As hypothesized, the effect of union membership is positive for grower employees and negative under contracting. Among contractor employees, union members are estimated to earn $.37 less per hour than nonunion workers, compared to a positive union differential of $1.01 per hour under direct hiring. Experience has no effect on the wages of grower employees and a small but significantly negative impact on contractor employee wages. These results imply that contractors view both union membership and experience as negative attributes.

The wage differences by job type were equal for both contracts in all but vegetable harvesting jobs. Contractor employees in these jobs earn an estimated $.56 less per hour than deciduous harvest workers while, under direct hiring, hourly earnings in the vegetable harvest are $.70 greater than in the deciduous harvest. This result is, in part, a reflection of the concentration of contracting in the short duration, lower wage vegetable crop harvests such as garlic, peppers and onions, whereas direct hiring is most common in the high-paying vegetable harvests such as lettuce and celery. It is also an indication that contractors pay less than growers for the same work, supporting the hypothesis that growers who hire directly are more dependent on a positive wage incentive to discourage unionization than are growers who contract for

Table 4. OLS Wage Estimates

Variable Name	Estimated Coefficient	Standard Error	t-Ratio 683 DF
Constant term	5.87	0.23	25.43
Worker Characteristics			
Union membership	1.01	0.24	4.16
Job Characteristics			
Harvest citrus	1.51	0.38	4.00
Harvest vegetable	0.70	0.30	2.38
Harvest field fruit	0.88	0.33	2.67
Irrigate	0.52	0.27	1.91
Machine operator	0.74	0.23	3.19
Peak employment	0.40	0.16	2.54
Time rate	-2.16	0.23	-9.55
Region			
Coastal Region	1.00	0.22	4.55
Contract Type			
LC	-0.88	0.36	-2.47
Interaction Variables			
LC*Union membership	-1.38	0.53	-2.59
LC*Farm work experience	-0.034	0.016	-2.22
LC*Time rate	1.20	0.36	3.29
LC* Harvest vegetable	-1.26	0.44	-2.85
LC*Coastal Region	0.83	0.43	1.95

Total observations = 699.
R-square = 0.33.
Adjusted R-square = 0.32.
Variance of the estimate = 3.75.
Standard error of the estimate = 1.94.
Mean of dependent variable = 5.09.

labor. Contractors are excluded from the definition of employer under the laws governing collective bargaining in agriculture. Because, from the workers' point of view, the contractors exercise authority over the terms of the employment contract, they provide an effective buffer between growers and workers that reduces the likelihood of unionization.

Wages under both contracts are significantly higher in the Coastal Region than in other parts of the state. Production conditions are unique in the coastal valleys that make up this region, where high value vegetable crops are grown under the control of a relatively few large produce companies. This region became the center of the farm labor movement beginning in 1970, and a series of long strikes led to substantial increases in wage rates. The positive coefficient on the interactive term implies that the regional wage differential is even larger among contractor employees than in direct hiring. Thus, factors that have increased wages on the coast relative to other regions also have tended to equalize wages across contract types (the contract differential in the coast region is only $.05 compared to $.88 per hour elsewhere in the state).

As expected, workers paid by the piece earn higher hourly earnings than workers who are paid a time rate regardless of contract type. However, the difference between piece and hourly rate earnings under direct hiring is more than twice that under contracting—a difference of $2.16 per hour compared to $.96. This result may be attributable to self-selection of the most productive workers into the piece rate jobs for which growers hire directly. A tendency to employ contract labor in the least productive piece work positions may also account for this result. The hourly earnings of piece rate workers vary according to field and crop conditions. Low yields, for example, will slow harvesting and reduce piece rate earnings for all workers.

Finally, even for a given job and opportunity cost, the results show that wages are consistently lower under contracting than under direct hiring. Contractors extract an equivalent amount of work from their employees at a lower direct labor cost than

growers are able to achieve. On the one hand, they are compelled by competitive pressure to keep wages low. On the other, their ability to recruit workers with a lower opportunity wage and their greater immunity from unionization reduce the contractor's need to rely on positive wage incentives to increase the level of work effort.

6. Labor Policy, Contracting, and Expected Wages

Some of the factors determining the probability of contracting and the level of wages, discussed above, are subject to influence by state policies. State and federal governments, in fact, have a history of involvement in shaping employment contracts in agriculture, most notably through the administration of the Bracero Program during and after the Second World War. California is also unique as one of the few states with legislation establishing collective bargaining rights for agricultural workers who are not covered by the National Labor Relations Act.

We now explore the implications of immigration and labor relations policies for the contract and wage structure of the farm labor market. This is done by comparing the expected wages of workers who differ in one or more of the characteristics shown above that affect the probability of contracting in a given job and the wage for a given job and contract type. A reduction in illegal immigration, for example, would shrink the labor pool that contractors draw from and, thus, disproportionately increase recruitment costs under contracting. Also, unionization can directly displace the contracting system by subjecting labor recruitment, hiring, and management to collective bargaining. Thus, if policies designed to facilitate farm labor organizing result in increasing the proportion of farm jobs that are unionized, this would reduce labor contracting.

We use the results of the estimation to calculate expected wages for workers under different scenarios. For a given job type j, the conditional wage expectation is calculated as

$$(15) \quad E[\hat{w}(X \mid job_j)] = \sum_i \hat{w}(contract_i \mid job_j, X) * \hat{Pr}(contract_i \mid job_j, X).$$

The first term on the right side is the predicted wage from the wage equation and the second term is the predicted probability of working for a contractor from the probit equation.

Expected wages are presented in Table 5. The worker characteristics that vary in the table are union status and legal status. The jobs examined are deciduous tree fruit harvesting, vegetable harvesting, and hoeing, with varying payment methods and locations.

In each of the jobs examined in the table, expected wages are lowest for undocumented workers who are not unionized. It follows that the Immigration Reform and Control Act of 1986 should have the effect of increasing wages for several reasons. First, undocumented workers qualifying for amnesty under the act should see their wages increase as a result of the positive wage effect of legal status. Second, their legal status will increase their probability of working for a grower, which also will increase their expected wage. Third, assuming effective enforcement, a decline in the supply of undocumented workers will eliminate the contractors' advantage in drawing from this labor pool, thereby increasing relative per worker costs of recruitment and reducing the relative efficiency of contracting.

Unionization increases expected wages in each of the jobs examined, regardless of legal status. This is the combined result of a greater probability of direct hiring for unionized workers and the positive union wage effect among grower employees. These factors overcome the negative wage effect of union membership

Table 5. Expected Wages for Workers with Selected Jobs and Characteristics[1]

	Union		Nonunion	
	Legal	Illegal	Legal	Illegal
	(dollars)			
Vegetable Harvest, Piece Rate				
Central Valley	6.68	6.23	6.05	5.89
Coastal Region	8.53	8.26	7.76	7.69
Vegetable Harvest, Hourly Rate				
Central Valley	4.33	3.68	3.26	2.90
Coastal Region	6.31	5.92	5.21	4.94
Deciduous Harvest, Piece Rate				
Central Valley	6.61	6.21	5.68	5.48
Hoe, Hourly Rate				
Central Valley	3.86	3.43	3.24	3.08
Coastal Region	5.70	5.43	4.93	4.86

[1] Calculated for a worker with 10 years of farm work experience and working for a large employer (peak employment = 1).

among contractor employees. Moreover, collective bargaining agreements usually restrict the use of contract labor even during seasonal peaks by obligating growers to hire through the union first. Thus, we would expect policies that promote farm labor unionization to reduce contracting and increase wages in farm work.

Such policies are embodied in California's Agricultural Labor Relations Act (ALRA), which establishes the right to collective bargaining and provides an institutional framework for governing labor/management relations in agriculture. The United Farm Workers, the largest farm worker union, anticipated that the contracting system would disappear after passage of the act in 1975. However, interpretation and enforcement of the ALRA are matters of political will, requiring support from powerful employer organizations and labor to bring about acceptance of collective bargaining. In the absence of such support, it is unlikely that the share of union relative to contract labor will increase.

7. Conclusion

Three main findings support the theoretical model of labor contract choice presented in this paper. First, the effects of supervision and seasonality are confirmed by the finding that the probability of contracting is lower in jobs such as irrigating or equipment operator positions where work quality has a greater effect on output and where the length of employment is greater. Second, the higher probability of contract employment for workers who are more easily intimidated—undocumented workers, nonunion workers, and those with fewer years of farm work experience—demonstrates the advantage of contractors in recruitment of workers whose opportunity costs of seasonal farm work are low. It also reveals their preference for workers who are least likely to pose a threat to management control of the labor process. Finally, we have shown that wages paid by contractors are lower than

wages in direct hiring, net of differences in the distribution of jobs or workers between contract types.

The production process for most crops involves activities of short and long duration and requires varying levels of labor quality. Growers can, and the model predicts that they would be likely to, combine contract types over the growing season. Such a strategy would offer a further means of decreasing unity among workers, as differences in their wages, working conditions, and relationship to the grower would tend to isolate contracted from directly hired employees. Much more could be learned regarding contract choice by observing these patterns of labor use on farms.

The history of labor relations in agriculture has been marked by a sometimes intense struggle for unionization. This movement has challenged management's exclusive control of the labor process. The outcomes of the conflict are evident in the passage of the ALRA, improvements in working conditions, and the introduction of benefits and higher wages for agricultural workers. However, they are also evident in increasing mechanization to displace workers, continuing political pressures from grower organizations to weaken the ALRA, and increasing use of the contracting system to reduce the threat of unionization. Neither the union movement nor the contracting system are likely to disappear from California agriculture. However, state policies that affect labor supply, such as immigration reform, and policies that determine the rights and protections afforded organized farm labor affect the relative efficiency of contracting and, hence, have the potential to reduce contracting's share of the farm labor market.

Footnotes

[1]Only restricted model results are reported. Insignificant variables (age, sex, and migrant status in the probit equation; legal status, pruning, hoeing, regional dummy variables for Southern California and the Sacramento Valley, and several interactive terms in the wage equation) are excluded from the restricted model.

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