An Estimation of Producer Preferences, and the Wage, Hours, and Gross Sales Effects of
Migrant Labor in Alabama's Horticulture Industry

Moriah Bellenger, Graduate Research Assistant
Department of Agricultural Economics and Rural Sociology
202 Comer Hall
Auburn University, AL 36849
Tel: (334) 844-5600
Fax: (334) 844-3519
Email: bellemj@auburn.edu

Deacue Fields, Assistant Professor
Department of Agricultural Economics and Rural Sociology
100B Comer Hall
Auburn University, AL 36849
Tel: (334) 844-4931
Fax: (334) 844-3519
Email: fieldde@auburn.edu

Ken Tilt, Professor
Department of Horticulture
101 Funchess Hall
Tel: (334) 844-5484
Fax: (334) 844-4578
Email: tiltken@auburn.edu

Abstract

Using 2002 survey data, this study employs log-linear regression analysis to examine the effects of migrant labor on wages, hours, and gross sales in Alabama's horticulture industry. A binomial probit model is added to measure producer decisions to hire migrant workers. The presence of migrant workers is found to raise average wages within green industry firms, but exhibits no significant effects on hours and sales.

Introduction

Alabama's horticulture industry is both the largest and fastest growing crop

sector, comprising over half of total state crop sales. Despite recent economic insecurity

and the increased competitive pressure of globalization, the continued growth of

Alabama's green industry provides a bright spot in the state's economy. While

Alabama's total crops cash receipts declined from $673.1 million to $583.8 million for

the period 1980-2002, green industry sales more than doubled, from $142.7 million to

$295.6 million. Greenhouse, nursery, and sod sales combined to $251.5 million, roughly

80% of total green industry sales. For the given period, all other horticultural crops

actually declined, but the green house, sod, and nursery sectors' growth rate of over

350% enabled overall industry growth (Alabama Agricultural Statistics Service).

Due to the perishable nature of horticultural goods, a skilled and accessible labor

supply is imperative for continued industry growth. The variation in labor composition

among producers statewide, from local to migrant, highlights the need to study the use of

migrant labor in the horticulture industry. Do migrant workers depress wages, as is often

feared by local workers? Do firms employing migrant labor have higher sales? Are

migrant workers likely to work longer hours than their local counterparts? How do

producers' attitudes and concerns, regarding labor issues, influence their hiring

decisions?

Background

The United States has a long history of importing agricultural workers to meet

seasonal demands for labor. Today, producers' hiring practices are regulated by the

Immigration Reform and Control Act of 1986 (IRCA), and agricultural labor is specifically regulated by IRCA section H2-A, known as the H2-A program. IRCA grants temporary H2-A visas to foreign workers based on two conditions, intended to both insure access to labor for producers, and protect local workers from wage decline due to labor surplus. To procure H2-A visas, producers must demonstrate to the U.S. Department of Labor that:

(A) There are not sufficient workers who are able, willing, and qualified, and who are available at the time and place needed, to perform the labor or services involved in the petition, and

(B) The employment of the alien in such labor or services will not adversely affect the wages and working conditions of workers in the U.S. similarly employed

Despite the above provisions, both producers and U.S. workers voiced concerns with the passage of IRCA. Producers feared that the H2-A program would ultimately restrict their labor supply, placing upward pressure on wages, while U.S. workers feared the opposite, that the H2-A program would lead to a labor surplus, depressing both wages and working conditions (Gunter et. al., 1992; Pagan, 1998; Perloff et. al., 1998;Thompson and Wiggings, 2002).

The present study uses data from a recent survey of 2002 Alabama green industry producers, conducted through the Auburn University Department of Agricultural Economics and Rural Sociology. The research objectives are to estimate the effects of migrant labor on wages, hours worked, and gross sales. In addition, stated producer concerns contained within the survey are used to evaluate hiring decisions. Few similar studies can be found in the existing economic literature. Ise and Perloff (1995) find that documentation among migrant workers significantly influences both wages and hours.

Using data form the National Agricultural Worker's Survey, the authors find that unauthorized workers, as well as those with amnesty earn lower wages than their U.S. counterparts. In addition, unauthorized workers, as well as those with green cards and native citizens of Latino descent, work longer hours than their U.S. counterparts. The current literature lacks both an analysis of migrant workers and gross sales and an evaluation of producer decisions to hire migrant versus local labor.

Data

The present study examines data drawn from a 2002 survey of Alabama green industry producers. The survey was administered based on Dillman's tailored design methodology. Mailing lists were acquired from the Alabama Department of Agriculture and Industries (ADAI) for nursery and greenhouse growers, nursery stock dealers, and licensed lawn and landscape service providers. Membership and mailing lists from the Alabama Nurserymen's Association and Alabama Turf Grass Association were used to verify and update ADAI lists.

The instruments were developed and pre-tested based upon other instruments found in relevant literature. Support paragraphs from the Commissioner of Agriculture, Alabama Cooperative Extension System Director, Alabama Nurserymen's Association President, and Alabama Turf Grass Association President were included on the inside cover of each survey. The Dillman format was used to develop a cover letter, which was personally addressed and included in each survey.

Table 1 presents information on mailing and response rates for each sector surveyed. A pre-survey postcard was mailed to the population of all sectors. This was done as a first contact to prepare individuals for the upcoming survey and to identify

incorrect addresses before surveys were mailed. More than 100 surveys were returned

with incorrect addresses and these were excluded from the survey mail out. After the

initial survey mailing, a follow up postcard was sent as a reminder/thank you, then a

second survey was mailed. Table 1 shows that response rates ranged from 13.5% for lawn

and landscape services to 27.9% for turf grass and sod producers. Blank surveys and

surveys with limited information were excluded from the number of completed

responses. Some common responses on incomplete and/or blank surveys - were no

longer in business, involved in other activities not related to the green industry, and not

considered a commercial operation.

Table 1: Summary of Survey Administration

Sector	Pre-survey Postcard	Surveys Mailed	Total Responses	Completed Responses	Response Rate
Nursery and Greenhouse	851	822	158	114	13.9%
Lawn and Landscape Services	1,430	1403	243	190	13.5%
Turfgrass and Sod	64	61	24	17	27.9%
TOTAL	2345	2286	425	321	14.0%

The results of the survey are reported based upon the 321 completed respondents,

and they are not expanded to make inferences about the entire population. Expansions

performed on these data indicated that the nursery and greenhouse; turf grass and sod;

and the lawn and landscape sectors provide a representative sample of the population of

firms in the industry. The total number of respondents represents 14.0% of the firms

participating in green industry activities, which provides some indication of the overall

size of the industry. Table 2 summarizes a portion of the labor-related survey results.

Table 2: Summary of Survey Results

Variable	Mean	Standard Deviation
Seasonal/Part Time Wage	$10.61	9.11
Full Time Wage	$9.48	4.57
Seasonal/Part Time Hours	858.31	520.10
Full Time Hours	2072.30	398.30
Percent Migrant	9.09	22.07
Gross Sales	$627,868.64	3,466,439.05

Methodology

Five equations are estimated using the log linear, or constant elasticity model. There are two wage equations and two hours worked equations, both as a function of percent migrant, firm characteristics, and local demographics. The wage and hours equations are separated for full time and seasonal/part time employees. The final equation estimates gross sales as a function of firm characteristics, percent migrant, and local demographics. A binomial probit model is also added to measure the decision to hire migrant workers, based on producer concerns, firm characteristics, and local demographic information.

While primary data collection offers many advantages, practicality places limitations on the amount and detail of information that can be accessed, when compared to larger national samples. Wage and hour information contained within the survey represents average wage and hour levels for each firm, rather than individual employee wages and hours. Employees are classified as either full time (FT) or seasonal/part time (SPT), but the survey does not identify which employees are local and which are migrant workers. Instead, producers were asked to estimate the percent of their total employees that are local, and the percent of their total employees that are migrant workers. Producers were not asked to provide any socioeconomic information for their employees,

on either individual or aggregate levels. Instead, survey respondents were matched to county level census data to approximate socioeconomic conditions.

Wages

1) *lnSPT Wage = β1 + + β2lnPercent Migrant + β3lnSPT Employees + β4lnSPT Hours + β5lnTotal Employees + β6lnTotal Benefits + β7lnExpected Volume Change + β8lnPercent of Sales to Out of State Customers + β9lnEducation + β10lnEmployment Level + β11lnGross Sales + ε*

2) *lnFT Wage = λ1 + λ2lnPercent Migrant + λ3lnSPT Employees λ4nFT Employees + λ5lnTotal Employees + λ6lnTotal Benefits + λ7lnExpected Volume Change + λ8lnPercent of Sales to Out of State Customers + λ9lnEducation + λ10lnEmployment Level + λ11lnGross Sales + ε*

The two wage equations estimate wages as a function of four general characteristics: migrant status, employment composition, firm size, and socioeconomic status. The percent of total employees that are migrant workers is used to represent the effects of migrant status. The number of SPT employees, FT employees, total employees, and total benefits represent both the size and composition of each firm's labor force. Producers were asked to estimate their expected change in volume for the coming year, as well as the percent of their total sales reaching out of state customers. These estimations, coupled with 2002 gross sales information, are used to represent firm size. County level census data for high school graduation and employment rates serve as a proxy for local socioeconomic conditions.

Based on the results of similar studies (Ise and Perloff, 1995; Hanson et. al., 2002), Percent Migrant should be inversely related to both SPT and FT wages. It is assumed that as firm size increases, increased demand for labor will positively influence SPT and FT wage rates. The effects of employee composition are unknown. For instance, as the number of SPT employees increases, this could signal increased demand

for SPT workers, which would place upward pressure on SPT wage rates. On the other hand, an increase in SPT workers could signal a substitution away from full time workers to lower wage temporary labor. Similarly, an increase in the number of full time workers could correspond to higher demand for full time workers, and increased full time wages. Conversely, lower levels of full time workers may result from the substitution away from full time to SPT labor. This substitution could result in higher wages for the remaining full time workers, afforded by a producer's greater dependency on SPT labor. Consistent with wage model literature, education should be positively related to wages for both SPT and full time workers. However, due to the low levels of skill involved in hand harvesting, the effects of education are expected to be minimal. Local employment levels serve as a proxy for local labor supply. As employment levels increase, this should signal a restricted labor supply, which would place upward pressure on wages for both SPT and full time workers.

Hours

3) *lnSPT Hours = $\alpha 1$ + $\alpha 2$lnPercent Migrant + $\alpha 3$lnSPT Employees + $\alpha 4$lnSPT Wage+ $\alpha 5$lnTotal Employees + $\alpha 6$lnExpected Volume Change + $\alpha 7$lnPercent of Sales to Out of State Customers + $\alpha 8$lnEducation + $\alpha 9$lnEmployment Level + $\alpha 10$lnGross Sales + ε*

4) *lnFT Hours = $\psi 1$+ $\psi 2$lnPercent Migrant + $\psi 3$lnSPT Employees + $\psi 4$lnFT Employees + $\psi 5$lnFT Wage + $\psi 6$ln Total Employees + $\psi 7$lnExpected Volume Change + $\psi 8$lnPercent of Sales to Out of State Customers + $\psi 9$lnEducation + $\psi 10$lnEmployment Level + $\psi 11$lnGross Sales + ε*

The estimate for total hours worked per employee is calculated based on average hours per week and average weeks per year. This figure represents an average for each employee. The two hours equations estimate hours as a function of migrant status, employment composition, firm size, socioeconomic status, and wages.

Using national labor data from the U.S. Department of Labor's National Agricultural Worker's Survey (NAWS), Ise and Perloff (1995) find a positive relationship between documented migrant workers and hours worked. A similar relationship is expected in this study. To support increased output, firm size indicators should also be positively related to hours worked by both SPT and full time workers. Presumably, higher wage rates should serve as an incentive for SPT and full time employees to work longer hours, but higher wage rates could also cause producers to restrict hours worked to curb labor costs. Again, it is uncertain how employee composition will influence hours worked. Higher levels of SPT workers may simply be indicative of firm size, and would therefore likely have a positive effect on hours worked. Alternatively, producers may hire an abundance of SPT workers, who are less likely to have benefits. This could spread the total responsibilities, reducing hours per SPT worker. Similarly, high levels of full time workers could also be indicative of firm size, which would have a positive effect on hours worked. However, presumably full time workers require more benefits. It may be more efficient for producers to hire less full time workers, and pay them to work longer hours. It is assumed that as education levels increase, hours worked should decrease, as education should be inversely related to the availability of low-skill labor. As the local employment level rises, producers may have less access to additional workers, and may rely on existing workers to put in longer hours.

Gross Sales

5) $lnGross Sales = \delta 1 + \delta 2 lnPercent Migrant + \delta 3 lnSPT + \delta 4 lnFT + \delta 5 lnTotal Employees + \delta 6 lnExpected Volume Change + \delta 7 lnOut of State Customers + \delta 8 lnEducation + \delta 9 lnEmployment Level + \varepsilon$

The equation for gross sales estimates revenue as a function of migrant status, employment composition, firm size, and socioeconomic conditions. Because it is predicted that migrant workers will work longer hours than local workers, percent migrant is predicted to be positively related to gross sales. The effect of employment composition is uncertain. Firms hiring more SPT workers may do so because full time, year round workers are simply not needed to meet output levels. Conversely, firms hiring more SPT workers may do so to meet increased output levels. Firms hiring more full time workers may do so as a result of higher output levels. Or, lower output levels may encourage producers to hire only full time workers, without the addition of SPT workers. Firm size indicators should be positively related to gross sales. It is assumed that larger firms will have greater levels of output, and therefore higher gross sales. It is uncertain whether socioeconomic conditions will have any effect on gross sales. More educated workers presumably will have higher skill levels, and may be more productive. Thus, Education is predicted to relate positively to gross sales. Increased local employment levels could restrict access to labor supply, which could weaken firm productivity. Employment is predicted to relate negatively to gross sales.

Migrant Labor

6) *Migrant Labor = $\varphi 1$ + $\varphi 2$Federal Funding + $\varphi 3$Total Employees + $\varphi 4$Total Benefits + $\varphi 5$Expected Volume Change + $\varphi 6$Education + $\varphi 7$Employment Level + $\varphi 8$Gross Sales + $\varphi 9$Government Regulation + $\varphi 10$Lack of Professionalism + $\varphi 11$Lack of Management + $\varphi 12$Labor Shortage + $\varphi 13$Labor Cost + ε*

A unique component of the survey examines producers' attitudes and concerns regarding a variety of labor issues. Producers were asked:

A) To rate their support of a federally funded program to hire local labor, rather than migrant labor
B) To rate the level of threat to the industry posed by government regulation
C) To rate the level of threat to the industry posed by lack of professionalism
D) To rate the level of threat to the industry posed by lack of management
E) To rate the level of threat to the industry posed by labor shortage
F) To rate the level of threat to the industry posed by labor cost

Producers chose either 1) strongly disagree 2) disagree 3) neither agree nor disagree 4) agree 5) strongly agree

The firm's decision to hire migrant workers is estimated as a function of the above producer attitudes, joined with previously explained indicators for firm size and local socioeconomic conditions.

Producers who would support a federally funded program to hire local, rather than migrant labor, likely prefer local labor to migrant labor. It is predicted that producer attitudes regarding possible federal funding of local labor will be negatively related to the hiring of migrant labor. The effect of government regulation is uncertain. Producers may perceive that migrant workers are less subject to regulation than local workers, and migrant workers themselves may be less aware, or less demanding of codified working conditions. However, in order to hire workers through the H2-A program, producers must meet requirements imposed by the Department of Labor and Immigration and Naturalization Service. This necessary interaction with government agencies may discourage producers from hiring migrant workers.

Concern for lack of professionalism may prompt producers to hire more local, rather than migrant labor. Conversely, lack of professionalism may be the result of increased dependency on migrant labor, as opposed to local labor. Lack of management may prevent producers from hiring migrant labor, as migrant workers could require more

oversight than required by local workers. Or, a lack of management could stem from a disproportionate use of migrant, versus local labor.

A labor shortage provides the most explicit justification for hiring migrant, rather than local labor. It is predicted that concern for labor shortage will be positively related to Percent Migrant. Similarly, it is predicted that concern for labor costs will also be positively related to Percent Migrant. Producers may perceive that migrant workers impose fewer labor costs, such as employee benefits, than do local workers.

Indicators for firm size should relate positively to Percent Migrant. In addition to their greater demand for labor, larger firms may be better suited to the H2-A program. The H2-A application process may exact an inordinate level of resources to be worthwhile for producers seeking only marginal increases in their labor force.

It is unknown if education will have any effect on Percent Migrant. High levels of education in the local labor market may result in fewer local workers available to green industry producers. Local workers may seek more high-skill employment. The local employment level should reflect producer concerns regarding labor shortage. As the local employment level rises, labor supply may be restricted, forcing producers to seek migrant workers as a supplement to local labor. It is predicted that the employment level will be positively related to Percent Migrant.

Results

Wage Estimates for SPT and FT workers are listed in Tables 3 and 4 respectively. Hours estimates for SPT and FT workers are listed in Tables 5 and 6 respectively. Gross Sales estimates are listed in Table 7. A 0.05 critical value is used to measure

significance, and a standard null hypothesis that the coefficient is equal to zero is used for all variables.

Table 3: Log-Linear Estimates for Seasonal/ Part Time Wages

Variable	Coefficient	Standard Error	t-ratio	P-value
Constant	-0.130	0.568	-0.229	0.820
Migrant*	0.096	0.046	2.109	0.037
SPT Employees*	0.002	0.000	8.450	0.000
SPT Hours*	0.383	0.042	9.156	0.000
Total Employees*	-0.329	0.079	-4.165	0.000
Benefits	0.033	0.018	1.850	0.066
Volume Change	0.001	0.000	1.910	0.058
Out of State Sales*	0.130	0.050	2.617	0.010
Education	-0.628	0.509	-1.234	0.219
Employment	0.720	0.543	1.325	0.187
Gross Sales	0.027	0.037	0.727	0.468
R-Squared	0.268			

* Coefficient Estimates are significant at the 0.05 level.

In the log-linear model, because both the dependant and independent variables are logged, parameter estimates actually represent elasticity. For instance, the coefficient for Migrant is 0.096, meaning that a one percent increase in migrant workers corresponds to roughly a 0.10 percent raise in SPT wages.

In the SPT Wages equation, the null hypothesis is rejected for Migrant, SPT Employees, SPT Hours, Total Employees, and Out of State Sales. There is actually a positive relationship in this model for percent migrant and SPT wages. As the portion of labor composed of SPT workers increases, and as the number of hours worked by SPT workers increases, there is a corresponding increase in SPT wages. If migrant workers are more desirable to some producers, higher SPT wages may be offered to attract migrant workers. Total Employees, indicative of firm size, is negatively related to SPT wages.

Benefits and Expected Volume Change are both positive and significant at the 0.10 level. Expected volume change could signal a rise in demand for SPT labor, which

would result in higher wages. There may be a somewhat magnanimous interpretation,
rather than a substitution effect, for benefits. Firms providing greater levels of benefits
may also be more likely to provide higher wages, rather than substitute benefits for
wages. These firms may simply choose to offer higher levels of compensation than other
firms for SPT labor.

Table 4: Log-Linear Estimates for Full Time Wages

Variable	Coefficient	Standard Error	t-ratio	P-value
Constant*	-0.707	0.268	-2.632	0.009
Migrant*	0.089	0.034	2.611	0.010
SPT Employees	0.000	0.000	-1.796	0.074
FT Employees	0.005	0.107	0.051	0.960
FT Hours*	0.433	0.029	14.921	0.000
Total Employees	-0.181	0.120	-1.512	0.133
Benefits*	0.037	0.018	2.082	0.039
Volume Change	0.001	0.001	0.764	0.446
Out of State Sales	0.017	0.036	0.487	0.627
Education*	1.211	0.550	2.201	0.029
Employment*	-1.211	0.550	-2.200	0.029
Gross sales	0.042	0.024	1.795	0.075
R-Squared	0.345			

In the FT Wages equation, the null hypothesis is rejected for Percent Migrant,
Full Time Hours, Benefits, Education, and Employment. Again, the hiring of migrant
workers is positively related to wages. A one percent increase in the number of migrant
workers raises wages by roughly0.09 percent. There appears to be no substitution effect
on full time wages by employing more SPT employees, though only significant at the
0.10 level. Full time hours worked is positive and highly significant for full time wages.
The model estimates that a one percent increase in hours worked raises full time wages
by 0.43 percent. Benefits are also again positively related to wages. The demographic
indicators are significant for full time wages. Consistent with wage literature, education
is positively related to wages in this model. A one percent increase in the local high

school graduation rates corresponds to a 1.21 percent raise in full time wages.

Interestingly, the local employment rate is negatively related to full time wages. A labor

shortage should raise, rather than lower wages. On the other hand, the employment rate

is for all industries, rather than simply the green industry. There may actually be a

surplus of available labor for the green industry in these areas.

Table 5: Log-Linear Estimates for Seasonal/ Part Time Hours

Variable	Coefficient	Standard Error	t-ratio	P-value
Constant*	1.423	0.712	1.998	0.047
Migrant	-0.038	0.061	-0.624	0.533
SPT Employees*	-0.001	0.000	-2.906	0.004
SPT Wage*	0.513	0.095	5.409	0.000
Total Employees*	0.264	0.105	2.527	0.013
Volume Change	0.000	0.001	0.058	0.954
Out of State Sales	-0.072	0.054	-1.326	0.187
Education	0.583	1.197	0.487	0.627
Employment	-0.609	1.266	-0.481	0.631
Gross Sales	0.040	0.046	0.887	0.376
R-Squared	0.219			

The null hypothesis can be rejected for SPT Employees, SPT Wage, and Total

Employees in the SPT Hours equation. Percent migrant has no effect on SPT hours in the

model. As predicted, SPT WAGE is positively related to hours worked by SPT

employees. A one percent increase in the SPT wage rate corresponds to a 0.51 percent in

the number on hours worked for SPT labor. While the number of total employees is

positively related to SPT hours, the number of SPT employees is inversely related to SPT

hours. Neither the producer expectations nor the socioeconomic indicators are

significant.

Table 6: Log-Linear Estimates for Full Time Hours

Variable	Coefficient	Standard Error	t-ratio	P-value
Constant*	2.453	0.409	6.003	0.000
Migrant	-0.013	0.046	-0.289	0.773

SPT Employees*	0.000	0.000	-2.695	0.008
FT Employees	0.046	0.136	0.341	0.734
FT Wages*	0.669	0.104	6.449	0.000
Total Employment	0.141	0.157	0.898	0.370
Volume Change	-0.001	0.001	-1.682	0.094
Out of State Sales	-0.070	0.052	-1.356	0.177
Education*	-1.289	0.641	-2.012	0.046
Employment*	1.289	0.641	2.011	0.046
Gross Sales	-0.014	0.038	-0.373	0.710
R-Squared				

In the full time hours equation, the null hypothesis can be rejected for SPT employees, FT Wages, Expected Volume Change, Education, and Employment. As predicted, full time wages are positively related to full time hours worked. A one percent increase in the full time wage rate raises full time hours by 0.657 percent. Contrary to expectations, Expected Volume Change is slightly negatively related to full time hours at the 0.10 level. While the number of SPT employees is significant, its effect is virtually zero. Again, the socioeconomic indicators are significant for full time employees. As predicted, the local education level is inversely related to hours worked, while the local employment level is positively related to full time hours.

Table 7: Gross Sales

Variable	Coefficient	Standard Error	t-ratio	P-value
Constant*	10.559	0.342	30.834	0.000
Migrant	0.047	0.124	0.377	0.706
SPT Employees	-0.001	0.000	-1.455	0.147
FT Employees*	0.621	0.254	2.444	0.015
Total Employees*	0.686	0.214	3.203	0.002
Volume Change	0.000	0.000	-1.676	0.095
Out of State Sales	-0.101	0.110	-0.921	0.358
Education	1.274	2.090	0.610	0.542
Employment	-1.485	2.209	-0.672	0.502
R-Squared	0.170			

The null hypothesis can only be rejected for FT Employees and Total Employees in the Gross Sales equation. Firms hiring more full time employees have higher gross sales at the means. A one percent increase in the number of full time employees raises gross sales by 0.62 percent. The coefficient for Total Employees is positive as predicted. A one percent increase in the number of total employees raises gross sales by 0.69 percent. In contrast, the other indicators for firm size are both negative, though not significant. Percent Migrant is positive as expected, but also not significant. Neither of the socioeconomic indicators is significant. It should be noted that while Total Employees is positive, the number of SPT Employees is not significant. It is difficult to interpret this inconsistency. Total Employees includes other types of workers, such as management and sales staff. It is more indicative of firm size than employee composition. So, while it is clear that additional employees are related to higher sales, it is unclear which types of employees are driving that relationship.

A binomial Probit model is added to measure the propensity to hire migrant workers, given individual firm characteristics, stated producer concerns, and local demographic information. However, this model yields less than desirable results for the given data, and provides minimal information for additional interpretation.

Table 8: Binomial Probit Estimates for Migrant Labor

Variable	Coefficient	Marginal Effects	Std. Error**	Mean	P-value
Constant*	-2.225	0.000	0.572 (-3.888)	1.000	0.000
Federal Funding	0.051	-0.052	0.072 (0.709)	2.456	0.478
SPT Employees	0.043	-0.044	0.033 (1.328)	2.605	0.184
FT Employees	0.035	-0.036	0.036 (0.949)	3.528	0.343
Total Employees	-0.001	0.001	0.029 (-0.029)	7.656	0.977
Benefits	0.000	0.000	0.000 (-1.512)	13,886.50	0.131
Volume Change	0.001	-0.001	0.001 (1.622)	46.409	0.105
Education	0.026	-0.026	0.017 (1.571)	72.252	0.116
Employment	-0.027	0.027	0.022 (-1.229)	57.540	0.219
Gross Sales	0.000	0.000	0.000 (1.368)	622,876,83	0.171
Government Regulation*	0.226	-0.229	0.099 (2.283)	3.252	0.022
Lack of Professionalism*	-0.264	0.268	0.105 (-2.513)	3.418	0.012
Lack of Management	0.066	-0.067	0.106 (0.626)	3.135	0.531
Labor Shortage	0.154	-0.156	0.093 (1.665)	3.233	0.096
Labor Cost	-0.015	0.015	0.110 (-0.132)	3.443	0.895
Chi Squared	58.729				
P (Chi Sq)	0.000				

**t-Statistic values are in parentheses

The marginal effects can be interpreted as a change in the probability of hiring migrant workers due to the explanatory variables. For instance, the marginal effect for government regulation is equal to –0.229. This means that increased government regulation reduces the probability of hiring migrant workers by roughly 23 percent. The marginal effect for lack of professionalism, 0.268, can be interpreted analogously as a 27

percent increase in the probability of hiring migrant workers. The Chi Squared value of 58.729 indicates the model is significant at the 0.01 level.

Government Regulations and Lack of Professionalism are significant at the 0.05 level, while Labor Shortage is significant at the 0.10 level. The model estimates a negative relationship between the level of government regulation and the decision to hire migrant workers. This indicates higher levels of government regulation deter producers from hiring migrant workers. Producers may associate greater levels of government regulations for migrant workers. There is a positive relationship between a concern for lack of professionalism and the hiring of migrant workers. Producers may feel that local workers exhibit lower levels of professionalism than their migrant counterparts. Migrant workers may often be perceived to be more committed, and hard working than local workers in agriculture. It is interesting that concerns for labor shortage are negatively related to the hiring of migrant workers. This may be due to a lack of awareness and information regarding the H2-A program, or a lack of access to H2-A workers.

Conclusion

Contrary to fears expressed by local workers, in this study the presence of migrant workers appears to raise wage levels for both SPT and FT workers. The total number of hours worked by SPT and FT employees is also positively related to wage rates. However, in this study migrant labor has no significant effect on the total number of hours worked by either SPT or FT employees. Local demographics, measured by education and employment levels have significant effects for full time wages and hours, but have no significant effects for SPT wages and hours in this study. Consistent with

labor literature, education levels are positively related to wages and inversely related to hours worked for full time employees. Local employment levels are positively related to total hours worked and inversely related to wages.

This study finds that producer concerns may have some influence on their decision to hire migrant workers. Producers who perceive government regulations as a threat to their industry are less likely to hire migrant workers. This indicates that there may be a greater level of government regulation associated with hiring migrant workers, when compared to local workers. Concerns for lack of professionalism appear to raise the demand for migrant, rather than local workers. Producers may credit migrant workers with a stronger work ethic than local labor. A larger data set comprised of individual level responses, rather than average and aggregate levels, could strengthen the probit model estimates.

A survey of individual employees, containing both demographic and wage/hours information could reveal more significant relationships between migrant status, socioeconomic indicators, and wages/hours. In this study, data for migrant status and wages/hours were derived from average levels reported by producers. Information for individual workers could render greater differentials in wages/hours between migrant and local workers. Socioeconomic indicators in this study were weakly proxied using county level census data. Individual education and experience levels may be significantly related to wages/hours for SPT employees, even if local education levels are not significant.

This study could also be enhanced with the use of time series data to examine the effects of IRCA. The data used in this study provides only information for 2002.

Longitudinal data could reveal trends in wages, hours, and percent migrant before and after the implementation of IRCA. An intervention model using national data before and after 1987 could be measured for wages, hours and migrant labor. It would also be interesting to examine whether producer and local labor attitudes have changed after nearly a decade under IRCA. Such a study would have greater policy implications in evaluating the effects of and need for IRCA.

References

Dillman, Don A. *Mail and Internet Surveys: The Tailored Design Method*, John Wiley and Sons, INC, New York, 2000.

Greene, William H. LIMDEP Version 7.0, Econometric Software INC, NY, 1995.

Griffiths, William; R. Carter Hill and George G. Judge. *Learning and Practicing Econometrics*, John Wiley and Sons, INC, New York, 1993.

Gunter, Lewell F.; Joseph C. Jarrett and James A. Duffield. "Effect of U.S. Immigration Reform on Labor-Intensive Commodities", *American Journal of Agricultural Economics,* 74(4), p. 897-906, 1992.

Hanson, Gordon H.; Raymond Robertson and Antonio Spilimbergo. "Does Border Enforcement Protect U.S. Workers from Illegal Immigration?", *The Review of Economics and Statistics*, 84(1), p. 73-92, 2002.

Ise, Sabrina and Jeffrey Perloff. "Legal Status and Earnings of Agricultural Workers", *American Jurnal of Agricultural Economics*, 77, p. 375-386, 1995.

Pagan, Jose A. "Employer Sanctions on Hiring Illegal Labor: An Experimental Analysis of Firm Compliance", *Journal of Economic Behavior and Organization*, 34, p. 87-100, 1998.

Perloff, Jeffrey M.; Lori Lynch and Susan Gabbard. "Migration of Seasonal Agricultural Workers", *American Journal of Agricultural Economics*, 80, p. 154-164, 1998.

Thompson, Charles D. and Melinda F. Wiggins. *The Human Cost of Food: Farmworkers' Lives, Labor, and Advocacy*, University of Texas Press, Austin, 2002.