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The Agricultural Labor Market and Participation in U.S. Social Benefit Programs

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1 Introduction

Agricultural laborers are one of the poorest populations of workers in the United States (US DOL, 2010). Estimates of the percentage of agricultural laborers below the U.S. poverty line range from 25 to 57 percent (NAWS FY2011-2012, Gabbard et al., 2002). Despite this, participation by agricultural workers in social assistance programs is well below national averages. This paper studies the role of income and eligibility criteria on participation in federal poverty programs by U.S. agricultural workers and how program benefits affect the U.S. agricultural labor supply.

Historically, the agricultural sector has had below average participation rates in social assistance programs. Participation rates of eligible non-farm households reached 50 percent from 1988-2003, almost double the rates for eligible farm households, at about 20 percent (Gundersen and Offutt, 2005). Participation rates among agricultural laborers remain lower than among many other low-wage workers. For example, in 2012, public program enrollment for agricultural workers was around 15%, for restaurant and food service workers enrollment was around 52%, and for construction workers enrollment was around 30% (NAWS FY2011-2012, and Allegretto et al., 2013). While prior work has analyzed social program participation rates and characteristics for farm households and agricultural laborers (e.g. Gundersen and Offutt, 2005, and Findeis et al., 2005), this paper adds to the literature by focusing on the effects of specific program eligibility requirements on participation among agricultural workers.

This paper makes three main contributions to the current literature. First, we demonstrate how program benefits interact with legal status to motivate the importance of controlling for both when constructing supply elasticity estimates. To do this, we provide relevant background information on a well-used public aid program: the Supplemental Nutrition Assistance Program (SNAP). Based on the program eligibility criteria and benefit equations, we show how the slope of the benefit curves

differ for households with varying legal compositions.

Second, using the National Agricultural Workers Survey (NAWS), we estimate the elasticity of supply for agricultural laborers, separately for workers of four distinct legal-statuses: citizens, green card holders, other authorized work visa holders, and undocumented immigrants. Given the recent shortages in the supply of agricultural labor, an accurate depiction of the elasticity of supply for various worker types can shed light on the root causes of the labor shortage. We estimate these elasticities with and without controlling for program benefits to quantify the omitted variable bias.

Finally, we use the resulting elasticity estimates to predict the potential effects of Deferred Action for Parents of Americans (DAPA) on the U.S. agricultural labor market. To do this, we give minimal background on the policy and contribute a hypothetical analysis of its effects by combining previous work that identifies DAPA-eligible NAWS workers with our elasticity estimates.

In the next section, we give an overview of SNAP, discussing the specific eligibility criteria and the benefit calculations. In section 3, we demonstrate the program benefit kinks for families of different legal-compositions. In section 4, we provide a brief description of the data and some relevant summary statistics. In section 5, we provide our measures of the elasticity of labor supply for hourly-paid crop workers by gender and legal status. In section 6, we discuss the policy implications of these findings and conclude.

2 Background: SNAP

2.1 Program Eligibility

The Supplemental Nutrition Assistance Program (SNAP) is a federal safety net program that provides nutrition assistance to low-income families. The program issues

need-based electronic benefit transfers that can be used to purchase food at grocery stores and markets.

Eligibility for SNAP benefits has two main components: (1) a restriction on total household income, and (2) specific immigration status requirements. Generally, if a household meets these requirements they are eligible for SNAP, and benefits are calculated as described later in this section.¹

Table 1: Deductions for Net Income Calculations

Deduction Type	Deduction Amount	Description
Earned Income	20%	e.g. Wages and salaries
Standard Deduction	\$155 HH size 1-3 \$168 HH size 4 \$197 HH size 5 \$226 HH size 6+	Deduction allowed per person per month
Excess Shelter	Any shelter cost in excess of 50% of HH income	Cannot exceed maximum (currently \$504). Excess of HH income after earned income and standard deductions
Homeless Shelter	Maximum \$143	Available to homeless persons who are not receiving free shelter for entire month
Standard Utility	Maximum \$385	HH that incurs utility costs
Limited Utility	Maximum \$118	For households that incur at least two separate utility costs

The income test for SNAP benefits has two components: gross and net income tests. The gross income test is straight forward— households meet this requirement if their total monthly income is at or below 130% of the poverty guideline for their household size. If households meet the gross income test, then the net income test is also computed. The household’s monthly net income must be at or below 100% of

¹There are additional specific requirements (e.g. work requirements) and special cases related to applicants with household members who are elderly or disabled that are not immediately relevant for the agricultural labor population.

the poverty line for the household size; where net income= gross income– deductions. Some relevant deductions for the net income test are shown in table 1. The current gross and net income tests for SNAP applicants are shown in table 2.

SNAP recipients are expected to report any changes to their income or other relevant circumstances (e.g. household size) within 10 days of the adjustment. In addition, the program requires households to submit a Semi-Annual Reporting form once a year, followed by a recertification form 6 months later. These forms require households to submit an income statement from all income earned in the relevant report month, as well as medical and dependent care expenses. While these follow-up forms are mailed to participating households, to initially apply for SNAP benefits, applicants must either go to their county SNAP office, or (in some states) apply online.

Table 2: SNAP Income Thresholds

HH size	Gross Monthly Income (\$)	Net Monthly Income (\$)
	130% of Poverty Line	100% of Poverty Line
1	1,287	981
2	1,736	1,328
3	2,184	1,675
4	2,633	2,021
5	3,081	2,368
6	3,530	2,715
7	3,980	3,061
8	4,431	3,408
Each Additional	+452	+347

Generally, citizens and lawfully-present permanent residents are eligible for SNAP benefits. Immigrants who are lawfully-present permanent residents (green card holders) must additionally meet one of the following conditions to be eligible for SNAP benefits:

1. Have lived in the country for 5 years

2. Are receiving disability-related assistance or benefits, regardless of entry date
3. Are under 18 years old

Relevant to the agricultural workforce, those who are not eligible for SNAP benefits include: (i) illegal immigrants, (ii) temporary agricultural workers (H-2A visa holders), (iii) students, and (iv) lawful residents who have not lived in the U.S. for 5 years. Households that contain some eligible members (i.e. citizens and green card holders) and some ineligible (i.e. (i)-(iv) above) are considered mixed-status households.

The SNAP income and benefit calculations have an adjustment for mixed-status households, called income pro-rating. In this process, income from ineligible household members is divided equally among all household members. Then, to determine SNAP benefits, the number of household members is counted as the number of eligible household members. After the income pro-rating, all but the ineligible member's share is counted as income for the household of eligible members. In section 3, we demonstrate the effects of this system of income proration on the gross income test as well as the benefit amounts for mixed-status households.

2.2 Program Benefits

The primary benefit to SNAP is the monthly electronic payment that recipients can spend on most food items in grocery stores. The size of these monthly allotments are determined by the total household income and the number of household members. The benefits are calculated by subtracting 30% of net monthly income from the USDA maximum monthly allotment. The maximum monthly allotment is updated annually by the USDA to account for changing food prices, and is periodically revised to include different bundles of food (Carlson, et al., 2007). The maximum monthly allotments for October 1, 2015 through September 30, 2016 are shown in table 3. So,

for example, a household of 4 people with a net income of \$1000 will receive monthly benefits of: $649 - .3 \cdot 1000 = \$349$.

Table 3: Maximum Monthly Allotments by Household Size

People in HH	Maximum Monthly Allotment (\$)
1	194
2	357
3	511
4	649
5	771
6	925
7	1022
8	1169
Each Additional	146

This benefit formula assumes that households will spend 30% of their net income on food, and previous literature equates this with a 30% benefit reduction rate. However, as we demonstrate in the next section, this benefit reduction rate is not fixed at 30%, but rather it varies based on the legal-composition of recipient households.

3 Benefit Kinks

As discussed at length in the previous section, benefits from SNAP are dependent on many household characteristics. Most importantly, benefits are determined by: income, household size, and citizenship. Benefit kinks will occur at varying levels of earned income for SNAP recipients, based on these household attributes. To demonstrate how these different factors affect where benefit kinks occur, in this section, we construct graphs of total household income (including SNAP benefits) and total earned income based on household size and legal composition.

To begin, figure 1 demonstrates the effects of SNAP benefits for a baseline recipient family; a household with four members who are all citizens, paying \$700 per month

in rent, receiving the standard utility allowance, and with no childcare or medical deductions. For this family, the benefit kink occurs at the gross monthly income limit of \$2,633 per month.

Figure 1: Earned Income and Total Income for a Household of 4

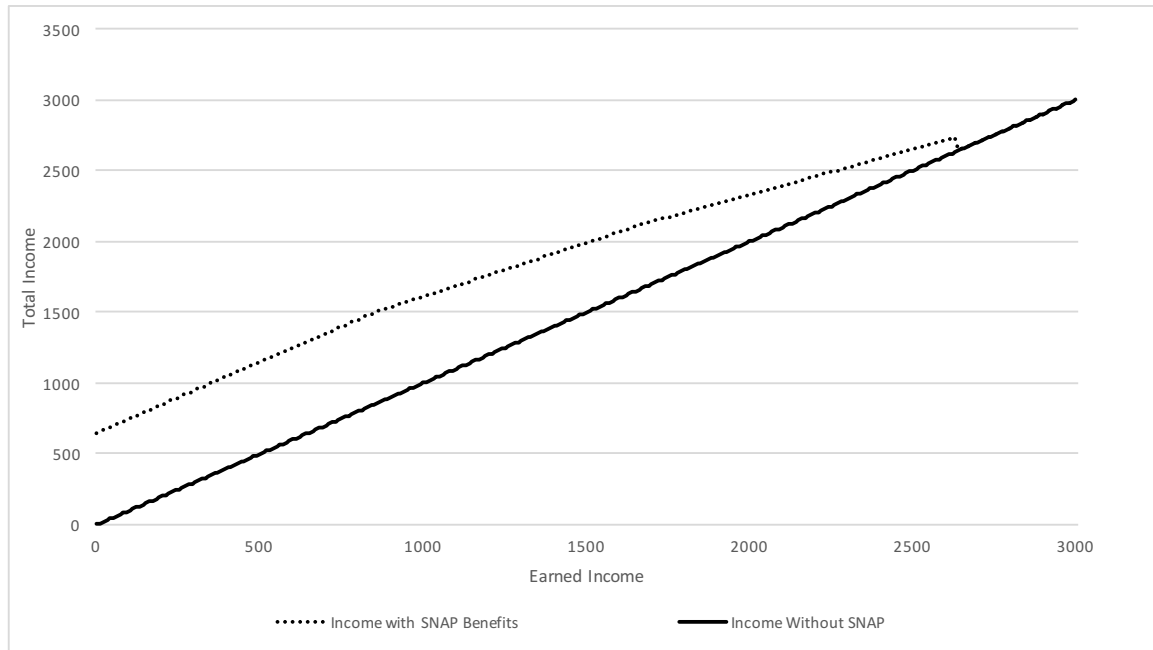


Figure 2 demonstrates benefit kinks for different household sizes. This component of SNAP benefits is well known, and a logical program attribute. Larger families require more food and income, so as family size increases, program benefits at all levels of earned income increase, and the benefit kinks shift further out on the earned income line. While benefit amounts and the income-eligibility threshold increase, the slopes of the total income lines remain the same across family sizes. These families, comprised of all citizens, exemplify the 30% benefit reduction rate of SNAP.

Comparing figures 2 and 3 demonstrates the unique interactions between legal status and program benefits. While households of different sizes have parallel shifts in their total income curves, households with different legal-status compositions have shifts and pivots, indicating a departure from the 30% benefit reduction rate. Figure 3 shows the SNAP benefit kinks for two types of mixed-status households, and provides

Figure 2: Earned Income and Total Income for Different Household Sizes

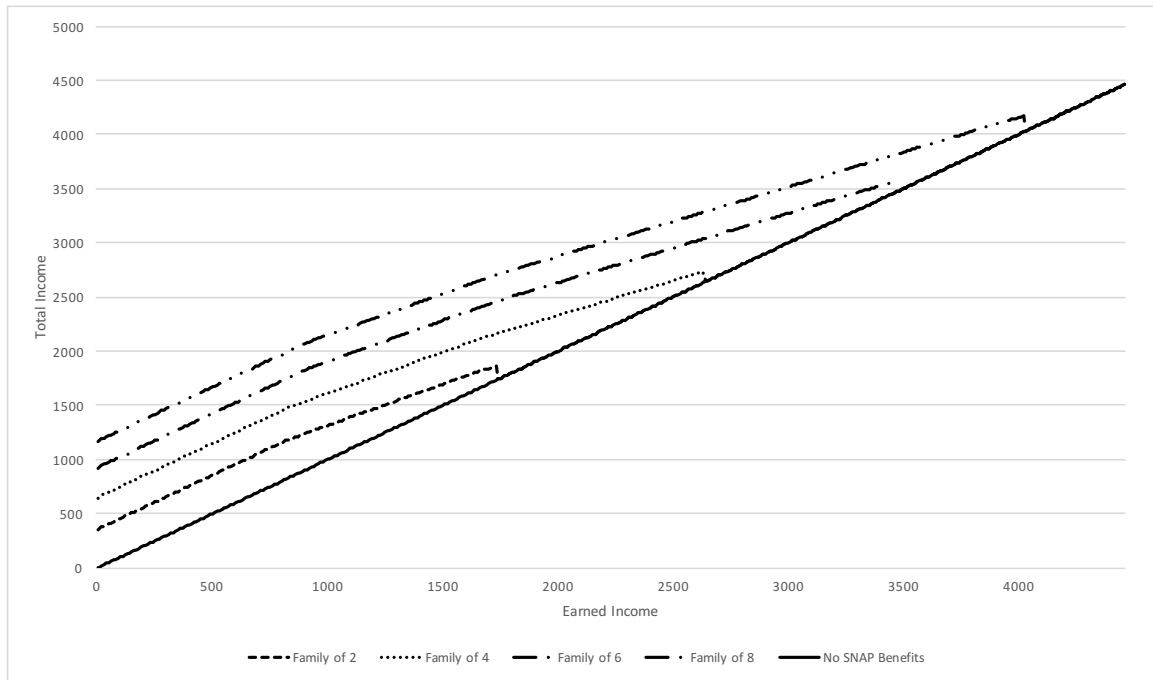
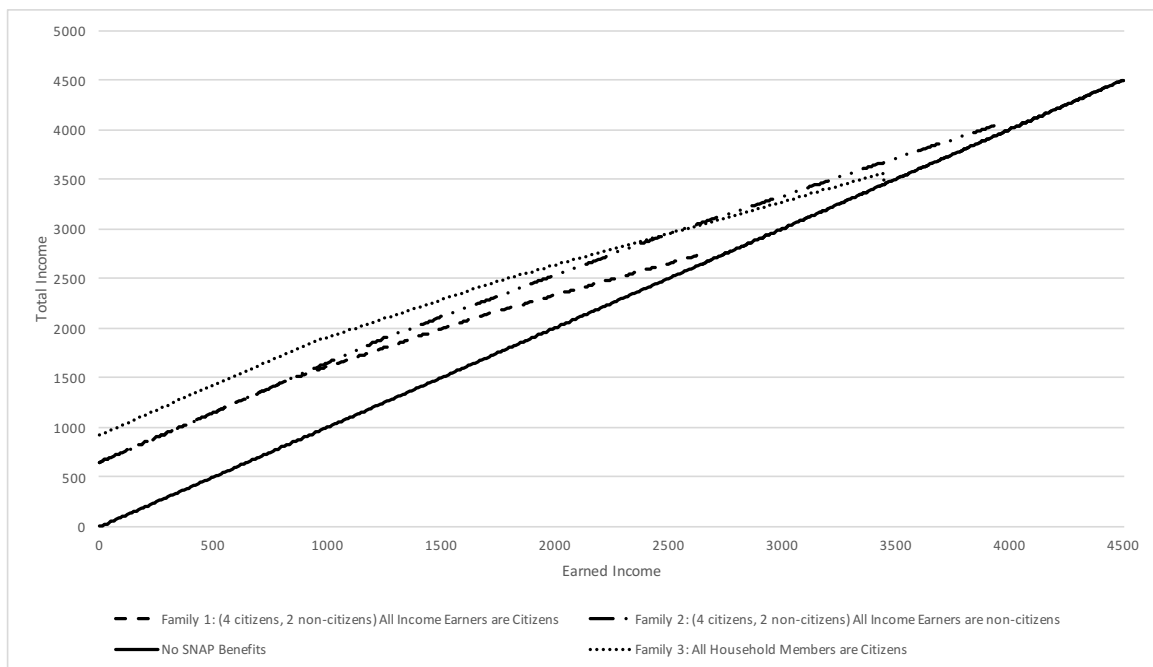


Figure 3: Earned Income and Total Income for Mixed-Status Households



a comparison with a household of the same size where all household members are citizens.

The mixed-status household with all income earners as citizens may be thought of as a family comprised of two citizen children, two citizen parents, and two non-citizen grandparents; where the grandparents are not working. The second mixed-status household, with all income earners as non-citizens, may be thought of as a family comprised of four citizen children, and two non-citizen parents; where both parents are agricultural workers. Both of these family types are easily conceivable in the agricultural labor setting.

From figure 3, we can see that for family 2, where income earners are non-citizens, the slope of the total income curve increases relative to the other family types. This indicates that for these families, the SNAP benefit reduction rate is less than 30%. This interesting component of SNAP could cause non-citizens receiving SNAP for their children to be less adverse to income increases than similar families with citizen income earners.

As a result of the income proration formula that SNAP uses for mixed-status households, the legal status of the income earners plays a large role, not only in the location of the benefit kink, but also in the slope of their total income line. At extremely low levels of income, households with all citizen members reap the highest benefits from SNAP. However, as total household earned income increases, mixed-status households with non-citizen income earners can retain SNAP benefits longer and receive higher benefits than either of the other household types. The mixed-status households with citizen income earners have the lowest returns to program participation, while the households with non-citizen income earners receive the highest benefit amounts at higher earned income levels.

4 Data

The data we use for this paper comes from the National Agricultural Workers Survey (NAWS); an annual survey administered by the U.S. Department of Labor. The survey began in 1989, and data is currently available through the 2012 survey round. The survey covers 545 counties and 43 states, however, the respondent's location is only available as the coded region of the survey. To date, NAWS contains data from a total of 56,976 interviews with agricultural laborers throughout the United States. The survey includes questions on household demographics, income, program-use, country/state of origin, legal-status, wages, hours worked, worker type (e.g. migrant or seasonal), language, and many more. NAWS is the only nationally representative survey of agricultural workers, and because it provides detailed information on incomes, program participation, and legal-status, it is the ideal dataset for this analysis.

4.1 Descriptive Statistics

Overall, the agricultural workers surveyed in NAWS have very low participation rates in public aid programs, with even lower rates of participation in SNAP. Table 4 shows reported participation in means-tested public aid programs, generally, as well as specific program participation rates for SNAP. Compared with the U.S. (2012) averages, the NAWS respondents have a much higher poverty rate, but significantly lower program participation rates. The participation rate for means-tested programs among NAWS respondents is three percentage points lower than the U.S. average, while the participation rate for SNAP is seven percentage points lower.

To better compare program participation rates for agricultural laborers with rates for the general population, figure 4 shows means-tested program participation rates based on poverty status. Figure 4 demonstrates that compared to the U.S. average, agricultural workers below the poverty line have lower participation rates, and

Table 4: NAWS and U.S. Program Participation

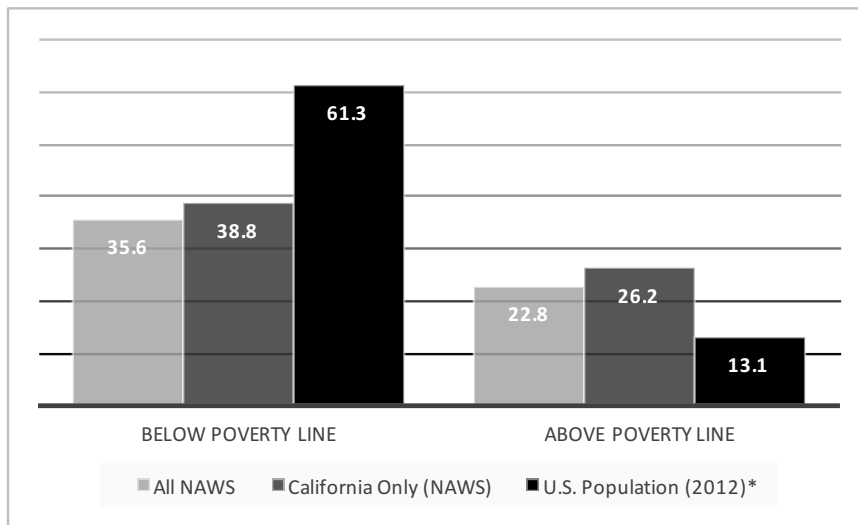
	NAWS Region						All NAWS	(2012) U.S. Average**
	East	Southeast	Midwest	Southwest	Northwest	California		
% Below Poverty Line	37.84	37.78	31.94	42.61	32.89	28.88	33.54	15.0
% Using Means-tested Public Aid*	16.89	20.91	24.12	26.86	29.69	25.54	24.06	27.1
% Using SNAP	7.27	10.93	13.74	16.81	15.85	6.39	10.38	17.4

* The means-tested public aid programs included are: Medicaid, SNAP, Housing Assistance, Supplemental Security Income, Temporary Assistance for Needy Families, and General Assistance.

** U.S. poverty rate and public aid use estimates come from the U.S. Census Bureau (Irving and Loveless, 2015; and DeNavas-Walt and Proctor, 2014)

workers above the poverty line have higher participation rates. This discrepancy in participation rates based on poverty status may be caused by more frequent program ineligibility based on non-income factors, e.g. legal status and seasonal employment.

Figure 4: Program Participation Rates in Means-Tested Programs by Poverty Status



*U.S. public aid use estimates come from the U.S. Census Bureau (Irving and Loveless, 2015).

Table 5 shows the differences between the average SNAP participants and non-participants for four general characteristics: demographic characteristics, legal status, seasonal employment, and living situations. These statistics demonstrate that SNAP participants differ significantly from non-participants in many of these

attributes. SNAP participants have significantly larger household sizes, with more children living in the house. They have significantly lower proportions of foreign born, indigenous, and unauthorized workers. They are also comprised of significantly more citizens, green card holders, and seasonally employed workers. Finally, SNAP participants are more likely to be living in free housing, and less likely to be living in housing owned by a family member.

Table 5: Comparative Statistics

Variable (mean)	SNAP Participants	SNAP Non-Participants	Difference
N	5,894	50,896	--
Demographics			
Farmworker Age	34.87	34.37	0.51***
Household Size	4.20	3.02	1.18***
Number of Kids in Household Age <18	1.85	0.60	1.25***
% Foreign Born	72.92	79.43	-6.51***
% Indigenous	3.66	7.16	-3.49***
Annual Household Income (median, categorical)	\$10,000 – \$12,499	\$12,500 – \$14,999	--
Legal Status			
% Citizens	31.44	23.87	7.57***
% Green Card	30.48	23.90	6.58***
% Other Work Authorization	7.40	6.73	0.67*
% Unauthorized	30.67	45.50	-14.82***
Seasonality of Employment			
% Migrant Workers	35.02	35.74	-0.71
% Currently Seasonally Employed	67.61	57.82	9.78***
Living Situation			
% Living On Farm	18.22	18.60	-0.38
% Free Housing	21.82	17.52	4.30***
% Renting	58.86	59.93	-1.08
% Own Housing	17.53	21.14	-3.61***

***, **, and * denote the 1, 5, and 10 percent, respectively, significance levels for a two sample t-test of the difference in means with unequal variances.

5 Elasticity of Supply of Labor

The previous sections of this paper discuss specific program eligibility criteria and document how benefits vary by legal status for one social welfare program, SNAP. In this section, we utilize the unique, detailed, work data from NAWS to construct the elasticity of labor supply for agricultural workers with four different legal-statuses. Then, in light of our previous discussion of the important role of citizenship in determining program eligibility for SNAP, we document the bias from not including proxies for program benefits on our elasticity estimates for each legal-status.

NAWS contains information on current (at the time of the interview) farm wages, non-farm wages, and weekly hours worked on farm. Additionally, the survey contains numerous useful control variables related to worker and household characteristics (discussed in section 4). However, there are clear limitations to the interpretability of the estimates of elasticity of supply using NAWS. First, NAWS is a survey of currently working farmworkers, so the final measure of elasticity will not include unemployed workers. Second, NAWS exclusively interviews crop workers, and does not include H-2A (agricultural work) visa holders. Finally, I only include workers who are paid hourly (79% of the survey respondents) to avoid complications in estimating an hourly equivalent of piece-rate compensation.

To determine the elasticity of labor supply for farm workers surveyed in NAWS, we estimate:

$$\begin{aligned}
 h_i &= \phi_t + \phi_r + \phi_e \\
 &+ \sigma_C(\log w_i^{fw} \cdot C) + \sigma_G(\log w_i^{fw} \cdot G) + \sigma_O(\log w_i^{fw} \cdot O) + \sigma_U(\log w_i^{fw} \cdot U) \\
 &+ \eta_C(\log w_i^{nfw} \cdot C) + \eta_G(\log w_i^{nfw} \cdot G) + \eta_O(\log w_i^{nfw} \cdot O) + \eta_U(\log w_i^{nfw} \cdot U) \\
 &+ \beta \mathbf{Z} + \alpha_0 \mathbf{P} + \alpha_1 (\mathbf{P} \times \phi_t) + \alpha_1 (\mathbf{P} \times N) + \epsilon_i,
 \end{aligned}$$

where h_i is the weekly hours worked by individual i . ϕ_t , ϕ_r , and ϕ_e represent year, region, and education fixed effects, respectively. $\log w_i^{fw}$ and $\log w_i^{nfw}$ are individual i 's logged hourly wage rate for farm work and non-farm work, respectively. C , G , O , and U are indicator variables for the farmworker's legal status, divided into: citizens, green card holders, other authorized workers, and unauthorized workers. The vector \mathbf{Z} contains individual worker and household characteristics such as: age, number of years working in U.S. agriculture, household size, number of minors living in the household, and total annual income of other household members. Finally, \mathbf{P} contains a vector of indicator variables for whether the worker reports participating in an individual welfare program among: SNAP, WIC, TANF, Medicaid, SSI, General Assistance, and Low Income Housing. Based on the program eligibility and benefits criteria, we additionally include interactions between family size and year to proxy the potential program benefit amounts the worker is eligible.

Table 6 shows the results from this regression; columns (1)-(3) give the estimates of elasticity of farm labor supply among NAWS respondents, and columns (4)-(6) give the non-farm wage cross elasticities. Column (2) gives the elasticity estimates with all control variables and fixed effects except the indicators for program participation. Comparing columns (2) and (3), we can immediately see the importance of controlling for welfare program receipts in estimating the labor supply equation. For male agricultural workers, we tend to over estimate the labor responsiveness to wage changes by not including program benefits. For female agricultural workers, on the other hand, by not including program benefits we tend to underestimate the elasticity of labor supply.

To better depict this relationship, table 7 gives the omitted variable bias from not including program benefits as a predictor of weekly hours worked. For men, the bias is positive and ranges from .025 for citizens and green card holders to .030 for those with other work authorization. For women, the bias is negative and ranges from

-.034 for undocumented workers to -.040 for citizens and other authorized workers. We would expect the bias to be negative for both women and men, because program benefits are inversely related to earnings.

To further investigate these results, our next step is to construct a variable that estimates the household's distance from the income-eligibility threshold for programs they use. From here, we can examine differences in the elasticity estimates based on distance from the threshold; this specification will determine whether the gender differential we are observing is actually due to the degree to which households need to protect their income to remain eligible, rather than an actual gender effect.

Comparing elasticities across legal-statuses, we find that the non-farm wage cross elasticities are significant only for citizens (for both females and males). This is likely because the citizen workers are more likely to have non-farm employment opportunities than non-citizen workers. Aside from this, we find some difference between farm wage elasticities over the different legal statuses, however, we do not get close to the nearly inelastic supply recently found by Borjas (2016). For both men and women, we find that workers with green cards have the highest elasticity of supply of labor. For men, undocumented workers have the lowest elasticity; and for women, citizens and 'other work authorized' workers have the lowest elasticity.

The next step to verify these elasticities based on legal status is to incorporate tax rates. NAWS includes a question that asks for the amount of the respondent's last paycheck both before and after taxes. We can use this to back out an implicit tax rate for each worker, and incorporate this into the reported hourly wage rate. This could have substantial effects on the elasticity measures, particularly because tax rates likely vary substantially based on legal status, i.e. undocumented workers likely have much lower tax rates than citizens.

Table 6: Estimates of Labor Short-Run Supply Elasticities

Dependent Variable: Log Weekly Hours Worked on Farm						
	Farm Wage Elasticity			Non-Farm Wage Cross Elasticity		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Men						
Citizen	.252***	.137***	.112***	-.014***	-.013***	-.013***
Green Card Holders	.285***	.148***	.123***	-.007***	-.005	-.005
Other Work Authorization	.281***	.137***	.107***	.001	-.001	-.001
Undocumented	.259***	.129***	.101***	-.004*	-.001	-.001
B. Women						
Citizen	.237***	.222***	.262***	-.016***	-.014***	-.015***
Green Card Holders	.283***	.240***	.278***	-.005	-.003	-.004
Other Work Authorization	.276***	.222***	.262***	.007	.033	.035
Undocumented	.273***	.235***	.269***	-.004	.004	.004
Fixed Effects	No	Yes	Yes	No	Yes	Yes
Control Variables	No	Yes	Yes	No	Yes	Yes
Program Participation	No	No	Yes	No	No	Yes

***, **, and * denote the 1, 5, and 10 percent significance levels, respectively

6 Policy Implications

Current research estimates that about one-third of the undocumented U.S. farmworkers would be eligible for administrative relief under DAPA (Kissam, 2014). Through DAPA, these farmworkers will gain access to several public welfare programs that they were previously ineligible for (e.g. SNAP, Medicaid, Unemployment Insurance, and the Earned Income Tax Credit). In addition, the workers are likely to have more farm and non-farm employment opportunities, and could be more likely to move into better, higher paying positions at their current farm job (Orrenius and Zavodny, 2015).

More specifically, DAPA will provide eligible undocumented immigrants with a temporary, renewable work permit and a social security number. Effectively, this will allow these workers the same benefits currently available to green card holders. Given this, we expect that roughly one-third of the undocumented workforce will effectively switch to green card holders. Relying on our elasticity estimates from the previous

Table 7: Estimates of the Omitted Variable Bias

Dependent Variable: Log Weekly Hours Worked on Farm			Bias
	Without Benefits	With Benefits	
A. Men			
Citizen	.137***	.112***	.025
Green Card Holders	.148***	.123***	.025
Other Work Authorization	.137***	.107***	.030
Undocumented	.129***	.101***	.028
B. Women			
Citizen	.222***	.262***	-.040
Green Card Holders	.240***	.278***	-.038
Other Work Authorization	.222***	.262***	-.040
Undocumented	.235***	.269***	-.034
Fixed Effects	Yes	Yes	–
Control Variables	Yes	Yes	–
Program Participation	Yes	Yes	–

***, **, and * denote the 1, 5, and 10 percent significance levels, respectively

section, this equates to an increase in the elasticity of supply for those workers; on average for men, the elasticity will increase from 0.101 to 0.123, and for women it will increase from 0.269 to 0.278. With such a large portion of U.S. agricultural laborers affected by DAPA, this increase in the overall average wage-responsiveness of the workers could have substantial effects on both the labor market and labor-intensive crop markets (e.g. berries).

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