Immigration Policy and Labor Contractors: Evidence from 287(g) and Farm Labor Markets

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Abstract

Labor contractors can play an important role in matching seasonal workers to employers, particularly when labor markets are tight. In this paper, we examine the effects of county-level 287(g) immigration enforcement policies (which permitted local law enforcement officers to partner with Immigration and Customs Enforcement (ICE) to detect and detain unauthorized immigrants) on farm expenditures for workers that are hired directly and workers hired through a contractor. We also examine the effects of 287(g) on the probability that farm workers are employed by a contractor and on wages and benefits that farm workers receive by immigration status and employer type. To our knowledge this is the first paper that empirically investigates the effects of immigration policies on the roles and labor recruitment practices of labor contractors in the 21st century.

Labor contractors are becoming increasingly prevalent in global supply chains (Barrientos, 2013), yet economic research on labor contractors is still relatively sparse. Labor contractors are specialized middlemen who can match workers to employers and spread labor recruitment costs over several short-term contracts, thus improving labor market efficiency in industries with large seasonal fluctuations in labor demand. Contractors can also help employers manage large crews of immigrant workers by specializing in migration networks, language, and worker training (Vandeman, Sadoulet, and de Janvry, 1991; Vaupel and Martin, 1987). However, by increasing the degrees of separation from employer to employee, transparency typically diminishes with the use of labor contractors, and opportunities to evade enforcement of immigration laws and fair labor standards increase. In this paper, we investigate the effects of U.S. county-level 287(g) immigration policies that permitted local law enforcement agencies to partner with the Immigration Customs and Enforcement (ICE) to detect and detain unauthorized immigrants on agricultural producers' use of Farm Labor Contractors (FLCs) and the labor recruitment practices of producers and contractors from 2005-2012.

Farm Labor Contractors (FLCs) have been used in U.S. agriculture for more than a century (Vaupel and Martin, 1987). Although FLCs employ the fastest growing share of farm workers in the United States (Costa and Martin, 2020), there has been little economic research to investigate their comparative advantages since the 1990s. Several economic studies investigated the roles of Farm Labor Contractors (FLCs) in California and the United States following the passage of the 1986 Immigration Reform and Control Act (IRCA), which imposed fines and possibly even jail time on employers who knowingly hired unauthorized immigrants (see for example Taylor and Thilmany (1993); Thilmany (1996); Vaupel and Martin (1987)). Studies have found that rather than helping to reduce labor turnover in the seasonal farm labor market following IRCA, FLCs specialized in recruiting new immigrants, who quickly moved to new employers after gaining some experience working in the United States, and helped bear much of the risk of penalty for getting caught employing unauthorized immigrants (Taylor and Thilmany, 1993; Thilmany, 1996).

Farm labor markets have evolved since 1986, and the share of farm workers employed by a contractor has risen to 14% (Costa and Martin, 2020), yet there are few studies to investigate the role of FLCs in more recent years. Many FLCs have attempted to improve their public image by advertising high worker benefits, transparency, worker training, and opportunities for workers to advance.[1] Mexican immigration to U.S. farms has declined in the 2000s (Card and Lewis, 2007), and follow-the-crop migration has also declined (Fan et al., 2015). These migratory changes at the macro level might potentially jeopardize FLCs' former comparative advantage in recruiting a constantly rotating supply of farm workers who had newly migrated to the United States. Nevertheless, the share of farm workers employed by FLCs has continued to rise. In California, where FLC use is historically high, the share of farm workers employed by an FLC rose from 20 percent in 1990 to 35 percent in 2020 (Martin and Rutledge, 2022).

Implementation of 287(g) policies from 2005-2012[2] creates a quasi-experiment to investigate the primary roles that FLCs play following an inward shift in the immigrant supply of workers and change in risk that unauthorized immigrants are caught and potentially deported. 287(g) policies have been shown to reduce the immigrant population within counties directly by increasing deportations and indirectly through a "chilling" effect whereby immigrants leave due to increased fear or lack of welcome within the community (Amuedo-Dorantes, Puttitanun, and Martinez-Donate, 2019). Previous literature shows that 287(g) leads to reduced population of foreign-born immigrants, reduces agricultural production and vegetable acreage, and increases capital intensity of agricultural production within counties (Charlton and Kostandini, 2021; Ifft and Jodlowski, 2022; Kostandini, Mykerezi, and Escalante, 2014). In this paper, we primarily focus our analysis on the role FLCs in fruit production following 287(g) because frequently fruits are perennial crops that cannot easily be removed, they have high value, and they require a large seasonal workforce. If FLCs help ameliorate the negative impacts of rising labor recruitment costs, then we would expect FLC expenditures to rise on fruit farms follow-

[1] See for example California Harvester, Inc. https://www.caharvesters.com.

[2] We limit the sample to years prior to 2013 because Secure Communities, a similar, but less aggressive, policy was rolled out to nearly all counties in the country by 2013 and mostly replaced 287(g) for several years, and after 2012, 287(g) agreements were greatly restructured.

ing implementation of 287(g). However, since FLCs hire a greater share of unauthorized immigrants on average compared to growers, FLCs might be more severely negatively impacted by 287(g) policies.

We use four government datasets with county-level, farm-level, and worker-level data to investigate the effects of 287(g) on the roles and comparative advantages of FLCs. We first examine effects of 287(g) on total county-level value of agricultural production, fruit & nut production, hired farm labor expenditures, and contract labor expenditures in the Census of Agriculture. Second, we investigate whether the number of farm labor contractor establishments or employees changed within counties following implementation of 287(g) using County Business Patterns from the U.S. Census Bureau. Third, we examine effects of 287(g) policies on fruit producers' hired labor and contract labor expenditures using farm-level data from the Agricultural Resource Management Survey (ARMS). Finally, in order to better understand the effects of 287(g) on grower and FLC labor recruitment practices and potential mechanisms of county- and farm-level effects, we measure not only the effects of 287(g) on the probabilities that citizens, green card holders, and unauthorized immigrants are employed by an FLC using data from the National Agricultural Workers Survey (NAWS), but also the effects on worker wages and benefits by immigrant status and employer type. We use a difference-in-differences estimator with two-way fixed effects (county fixed effects to control for time-invariant characteristics of each county and year fixed effects to control for national economic and policy shocks). As robustness checks, we also use a synthetic difference-in-differences model to estimate effects in the county-level models, and given the potential biases of the two-way fixed effects model in the event of heterogeneous impacts over time (Callaway and Sant'Anna, 2021; Goodman-Bacon, 2018; Jakiela, 2022; Sun and Abraham, 2021), we also estimate effects using the Callaway and Sant'Anna estimator when appropriate.

Our findings show that total values of agricultural production and fruit & nut production decline in 287(g) counties, consistent with an inward labor supply shock. However, contrary to predictions, contract labor expenditures as a share of total agricultural value does not change. Only hired labor expenditures as a share of total agricultural value in

the county increases, and the log values of hired labor and contract labor expenditures both decline. The total number of FLC establishments does not change, but total FLC employment decreases, suggesting that the immigration policies negatively affected FLC labor supply.

Our findings from the farm-level data affirm that FLCs play a limited role in helping fruit growers adjust to the inward labor supply shock following implementation of 287(g). Both hired labor expenditures and contract labor expenditures as a ratio of total value of crop production on the farm increase, but the marginal effect of 287(g) on percentage change in hired labor share is more than twice as large as the marginal effect for contract labor share. Nevertheless, we find that fruit growers are more likely to hire any contract labor following 287(g), and these findings are robust to the inclusion of farm fixed effects. Our findings from worker-level data using the NAWS demonstrates that contractors increased efforts to recruit and retain citizen farm workers following 287(g). Implementation of 287(g) increases the probability that citizen farm workers are employed by an FLC, and FLCs are more likely to offer citizens money bonuses and healthcare benefits. Growers and FLCs increase wages offered to unauthorized immigrants, but we do not find differential effects across employer type.

Taken together, these findings show that 287(g) policies negatively affect total fruit production, likely by reducing the local supply of farm workers. Although FLCs have a comparative advantage in spreading labor recruitment costs over numerous short-term contracts, FLCs appear particularly impacted by inward labor supply shocks following 287(g). Our findings provide suggestive evidence that 287(g) might inhibit FLCs' ability to maintain a large, often temporary, unauthorized workforce, which was one of their primary comparative advantages following the passage of IRCA in 1986. Instead, 287(g) induces FLCs to invest in a more legal workforce.

Our findings contribute to the relatively thin literature on labor contractors with a focus on Farm Labor Contractors (FLCs) specifically. Literature examining the roles and comparative advantages of FLCs in the United States is mostly limited to the short-term impacts of the 1986 Immigration Reform and Control Act (IRCA). FLC employment in

the United States is still rising more than 3 decades after IRCA was passed, and there has been little empirical analysis to understand updated roles of FLCs. This paper begins to fill this gap. Our findings suggest that post-287(g) FLCs had to shift their comparative advantage from that of maintaining large networks of unauthorized immigrants to specializing in the recruitment of legal workers. Findings are not only relevant for policymakers, agricultural producers, labor advocates, and labor contractors in the farm sector, but can also shed light on potential effects of immigration laws on other sectors that rely on contract labor or have highly seasonal labor demand.

This paper proceeds as follows. In the next section, we describe background on U.S. farm labor markets, farm labor contractors, and immigration policy. Afterwards, we describe the data we use in our analysis and the empirical models that correspond with each data set. Next we present our results and discuss the findings. Then we describe how we test the robustness of our results, and lastly, we conclude.

Background

- I The U.S. Farm Labor Market and Comparative Advantages of FLCs

One of the primary issues in agricultural production is access to a reliable workforce. Agricultural labor markets are particularly complex because many tasks are seasonal, and the timing of peak labor demand depends on unpredictable factors such as weather and growing conditions that might vary from year to year (Taylor and Charlton, 2018). Furthermore, the majority of crop workers in the United States are immigrants, and about half the workforce is unauthorized.[3] Thus agriculture in the United States is particularly vulnerable to changes in immigration and immigration enforcement policy. Rural Mexico has been the primary source of farm workers for U.S. producers for many decades. Nevertheless, as access to education in rural Mexico and employment opportunities in the Mexican non-farm sector improve, rural Mexicans are migrating out of agricultural

[3]Estimates are based on reported immigration statuses shared in the National Agricultural Workers Survey (NAWS). The NAWS is a survey of crop workers conducted each year by the Department of Labor. Interviews are conducted in the field and are nationally representative of crop workers, excluding H-2A guest worker visa holders. However, H-2A was a small share of the crop workforce from 2005-2012.

work (Charlton and Taylor, 2016; Charlton and Kostandini, 2021). Analysis of farmworker data from California, where labor-intensive fruits and vegetables are grown in abundance, shows evidence of persistent labor shortages in recent years (Richards, 2018).

Martin (2017) identifies 4 primary methods to reduce the incidence of farm labor shortages in a tight labor market: (1) Satisfy workers by offering better wages and benefits, (2) substitute for workers by investing in labor-substituting technology, (3) supplement the current labor supply with H-2A agricultural guest workers and other labor sources, and (4) stretch workers by raising their productivity. There is evidence that farm employers have used all of these methods in response to tightening farm labor supply in recent years. Real average U.S. farm wages rose 7.7% from 2010-2016 (Charlton et al., 2019). Following the termination of the Bracero guest worker program in 1964, farms that relied more heavily on Bracero workers more rapidly invested in labor-saving technologies, thus substituting capital for Bracero workers (Clemens, Lewis, and Postel, 2018), and farming also became more capital-intensive following passage of county 287(g) policies from 2005-2012 (Charlton and Kostandini, 2021; Ifft and Jodlowski, 2022). H-2A employment grew by more than 450% from 2001-2019 with particularly rapid growth within commuting zones that were experiencing housing booms, which increase employment in construction, landscaping, and service industries that traditionally employ large shares of immigrants (Castillo and Charlton, 2022). This suggests that farms supplement the local workforce with H-2A when other industries pull immigrant workers away from agriculture, and Luo, Kostandini, and Jordan (2018) find that farms also supplement the hired labor supply with family labor following increased immigration enforcement policies that reduce immigrant labor supply.

In this paper, we focus on the effects of 287(g) policies on the labor-stretching strategy of hiring workers through a labor contractor. Farm labor contractors (FLCs) can help reduce farm labor shortages by stretching individual workers across multiple jobs at numerous farms and spread labor recruitment costs over multiple short-term contracts.

- II Farm Labor Contractors in the United States

Vandeman, Sadoulet, and de Janvry (1991) define labor contractors as "independent intermediaries who, for a fee, recruit, hire, and supervise farm workers." FLCs date back to crews of Chinese workers who worked in California fruit production in the 1800s. Since many workers did not speak English, the FLCs held a comparative advantage in communicating between employers and immigrant workers, and the FLC also took responsibility for housing and transporting workers (Vaupel and Martin, 1987). In more recent years, FLCs continue to maintain a comparative advantage through their extensive migration networks, primarily from Mexico. FLCs often provide housing, transport, and training, and other amenities that might particularly appeal to new immigrants. FLC workers currently account for roughly 14% of the farm workforce in the United States and constitute the fastest growing share of farm employment (Costa and Martin, 2020). FLCs have historically employed a relatively large share of unauthorized farm workers. From 1989-2006, 27.2% of unauthorized farm workers worked for an FLC, compared to 21.4% of green card holders, and only 11.7% of naturalized citizens and 5.9% of native-born citizens (Pena, 2012).

Since FLCs employ large shares of unauthorized farm workers, they might be particularly impacted by changes in immigration enforcement. However, following implementation of the Immigration Reform and Control Act (IRCA) in 1986, literature showed evidence that FLCs held a comparative advantage in evading immigration laws and bearing the risk of getting caught employing unauthorized workers on behalf of growers (Taylor and Thilmany, 1993; Thilmany, 1996; Vaupel and Martin, 1987). Although FLCs were expected to help stabilize the seasonal workforce by contracting workers over multiple seasonal jobs, employee turnover was higher among FLCs than amongst workers hired directly by growers following IRCA (Taylor and Thilmany, 1993). This was likely because FLCs were continually hiring new immigrants who quickly sought work elsewhere. While IRCA made it illegal to knowingly hire unauthorized immigrants, it also created a pathway to citizenship for unauthorized immigrants who had formerly worked in the

U.S. farm sector. The net effect was to increase the rate of unauthorized immigration to U.S. farms in the 1990s (Boucher et al., 2007).

Polopolus and Emerson (1991) state that labor contractors hold greater advantages where workers are likely foreign-born, migrant, illegal, unskilled, uneducated, and unorganized. Such characteristics increase workers' dependence upon informal networks to find jobs and also frequently make workers more vulnerable to abuse. FLCs have historically been known for their unscrupulous behavior, often taking large cuts of workers' pay to cover transport, housing, or other costs (Vaupel and Martin, 1987). Perhaps in response to this reputation of taking advantage of workers, FLCs were monitored for the immigration status of their workers many years prior to IRCA (Vaupel and Martin, 1987). The Labor Contractor Registration Act (FLCRA) of 1963, which went into effect in 1965, required all FLCs who, for a fee, recruit, solicit, hire, furnish, or transport ten or more migrant workers for interstate agricultural employment to obtain a certificate of registration (Vaupel and Martin, 1987). The FLC has to file a written application with the Secretary of Labor, show proof of financial responsibility or proof of insurance, and file a set of fingerprints. It appears that the FLCRA was poorly enforced by the Department of Labor for at least the first decade of its existence because there were numerous reports of FLCs abusing workers, denying workers their wages, smuggling unauthorized immigrants across the border, breaking worker strikes with crews of unauthorized workers, along with other questionable behavior (Vaupel and Martin, 1987). Thus one of the suggested comparative advantages of FLCs following passage of IRCA was their ability to evade immigration laws.

Unlike IRCA, 287(g) was not implemented nationally but was rather rolled out to only some U.S. counties, it had no effect on the legality of employing unauthorized immigrants, and it was initiated in an era when the share of new arrivals from Mexico who worked in agriculture was already on the decline (Card and Lewis, 2007). Effects of 287(g) on agricultural producers' use of contract labor and the agricultural labor recruitment practices of FLCs and producers might therefore differ substantially from the effects of IRCA in the late 1980s-1990s. Further investigation is needed to help inform farmers,

policymakers, and industry leaders of the roles of FLCs in more recent years and in response to different immigration policies.

- III 287(g) and Other Immigration Policies Implemented in the 21st Century

Beginning in 2005, county jurisdictions began implementing 287(g) policies that permitted the local law enforcement to cooperate with Immigration and Customs Enforcement (ICE) and receive training to detect and detain unauthorized immigrants and begin deportation procedures. These policies were adopted by numerous counties throughout the United States between 2005-2018. Between 2006 and the first two fiscal months of 2009, 900 officers were trained to perform ICE duties through 287(g), and more than 80,000 individuals had been arrested (Vaughan and Edwards, 2009). These policies had the effect of reducing the foreign-born population, reducing employment, and increasing wages within participating counties (Bohn and Santillano, 2017; Kostandini, Mykerezi, and Escalante, 2014). 287(g) policies might reduce the immigrant population directly by increasing the rate of deportations and indirectly by motivating foreign-born workers to move for fear of being deported or racially targeted (Amuedo-Dorantes, Puttitanun, and Martinez-Donate, 2019). Thus unauthorized as well as authorized immigrants might be affected.

The gradual adoption of 287(g) across counties creates a unique setting to evaluate the effects of increased immigration enforcement on workers, industries, and employers who hire large shares of undocumented immigrants. The adoption of 287(g) policies over time is shown in figure1. We cut our analysis off in 2012 because another immigration enforcement policy, Secure Communities, was rapidly rolled out to all jurisdictions from 2008-2013 (Miles and Cox, 2014), and in many ways, Secure Communities replaced 287(g) in the immediately following years. We control for Secure Communities in all of our analyses.

Secure Communities was similar to 287(g) in that it allowed police officers to check the fingerprints of detainees who are being held in jail in the FBI database and the

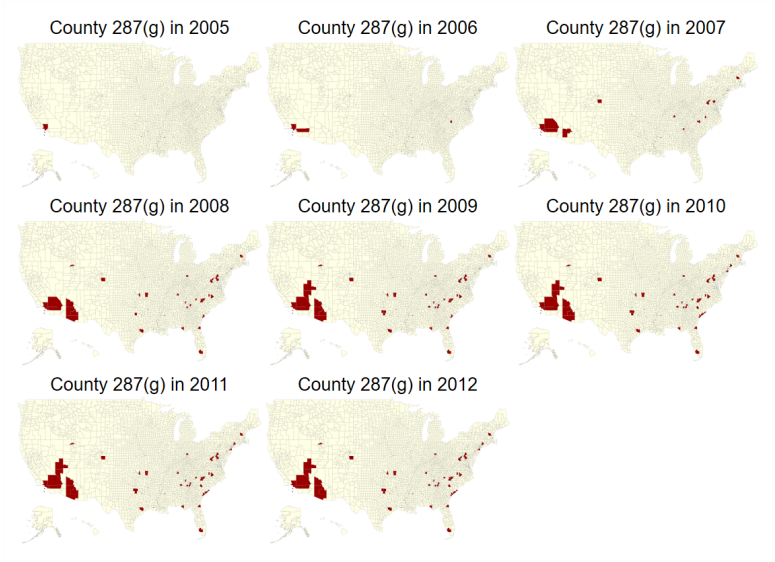

Figure 1: Implementation of county 287(g) policies over time

Department of Homeland Security (DHS) database for immigration status and whether the detainees had previously committed any crimes. Nevertheless, Secure Communities was considerably less obtrusive in that it only directly impacted those who were detained by the police for some other offense. Hines and Peri (2019) find no effect of Secure Communities on the employment of low-skill non-citizen immigrants. However, East and Velasquez (2022) find that Secure Communities led to a decrease in citizen female labor participation rates, likely by reducing the supply of non-citizen domestic workers and childcare providers. Although Secure Communities might have led to an inward shift in the local supply of unauthorized workers, 287(g) is unique in that it gave local agencies authority to perform specified tasks in place of ICE officers (Capps, Rodríguez, and Chishti, 2011). We focus on the effects of 287(g) since it is likely the most restrictive immigration enforcement policy.

We control for other immigration enforcement policies that were implemented in some, but not all, U.S. jurisdictions during the years that counties were gradually implementing 287(g).[4] These policies include E-Verify and state-level 287(g) policies. Unlike 287(g), E-Verify mandates are employment-based. E-Verify is an internet database that compares employee data to U.S. government records to verify whether an employee is authorized

[4]We additionally performed robustness checks in which we drop control counties or farms located in states that with an E-Verify mandate or state 287(g) policy, or in counties adjacent to county 287(g) counties. Results are qualitatively similar to the main results and available upon request.

to work in the United States. The database is nationally available and free to all employers. However, some states require employers to use E-Verify when hiring new employees. Arizona was the first state to implement an E-Verify mandate for private employers in 2008 and was followed by Utah (2010), Mississippi (2011), South Carolina (2012), Alabama (2012), Georgia (2013), North Carolina (2013), and Tennessee (2017). There is some evidence that E-Verify deters immigration and raises wages of workers in industries that traditionally employ unauthorized immigrants (Amuedo-Dorantes and Bansak, 2012; Bohn, Lofstrom, and Raphael, 2015; Orrenius and Zavodny, 2015) . However, it has also been suggested that unauthorized workers might actually migrate to the agricultural sector in these states since it is more difficult to enforce E-Verify mandates on farms (Amuedo-Dorantes and Bansak, 2012). We study county-level rather than state-level 287(g) policies because empirical analysis has shown greater impacts of county-level policies on the immigrant workforce (Kostandini, Mykerezi, and Escalante, 2014).

Our study follows methods similar to those of Kostandini, Mykerezi, and Escalante (2014), Charlton and Kostandini (2021), and Ifft and Jodlowski (2022), who each study various impacts of 287(g) policies on agricultural production, employment, and capital intensity of agricultural production. Kostandini, Mykerezi, and Escalante (2014) show that county-level 287(g) policies caused the population of immigrants within treated counties to decline and agricultural revenues and vegetable acreage to decline. Charlton and Kostandini (2021) find that dairies were more likely to use labor-saving technologies, like automatic take-offs, after 287(g) was implemented. However, total dairy production and number of dairies declined after implementation. Similarly, Ifft and Jodlowski (2022) find using farm-level data that agricultural revenues on farm decline and expenditures on capital inputs increase after 287(g) policies are implemented while controlling for farm-level fixed effects. We begin to fill an important gap in this literature by investigating the role of Farm Labor Contractors to "stretch" workers who remain within the county.

I. Data & Empirical Models

As mentioned previously, we firstuse the Census of Agriculture and County Business Patterns (CBP) to examine aggregate effects of 287(g) on county-level outcomes. Then we use the Agricultural Resource Management Survey (ARMS) to examine effects on fruit farms specifically since fruit production is generally characterized by high seasonality of labor demand. Finally, we use the National Agricultural Workers Survey (NAWS) to examine how 287(g) impacts the hiring and recruiting practices of growers and contractors to shed light on the mechanisms through which 287(g) affects county and farm-level labor hiring and contract practices.

I - I The U.S. Census of Agriculture

The U.S. Census of Agriculture is conducted every 5 years and contains detailed agricultural production data aggregated to the county level. We use data from 1997, 2002, 2007, and 2012. Analysis of these data demonstrate the aggregate effects of 287(g) on total agricultural production, fruit & nut production, direct hired labor expenditures, and expenditures on farm labor contractors. We supplement this analysis with analysis of annual CBP data from 2000-2012 to examine effects of 287(g) on changes in number of FLC establishments and FLC employees.

We estimate the following equation for our county-level analyses:

$$Y_{ct} = \beta_0 + \beta_1 287g_{ct} + \beta_2 \mathbf{Z_{ct}} + \gamma_{\mathbf{c}} + \eta_{\mathbf{t}} + \epsilon_{ct} \tag{1}$$

where Y_{ct} is the outcome of interest in county c and year t, $287g_{ct}$ is equal to one if county c had a 287(g) policy in year t, $\mathbf{Z_{ct}}$ is a vector of controls for county c in year t, and $\gamma_{\mathbf{c}}$ and $\eta_{\mathbf{t}}$ are vectors of county and year fixed effects respectively. The vector of county controls $\mathbf{Z_{ct}}$ includes indicator variables equal to one for location in an E-Verify state, 287(g) state, Secure Communities county, and county adjacent to a 287(g) county. Since voting preferences may change within counties over time and may correlate with

economic conditions and sentiments towards immigration, we also control for the shares of the voting population that voted for the Republican and Democratic candidates in each presidential election.[5] Since presidential elections are only held every 4 years, we use linear interpolation to proxy for the share of the population that is Republican and Democratic leaning between presidential elections. Lastly, we also control for drought conditions that may vary within counties over time using the Standardized Precipitation Index (SPI) created by the National Center for Atmospheric Research (NCAR).

The coefficient of interest is β_1. County fixed effects limit identifying variation within counties, thus eliminating time-invariant county characteristics, and year fixed effects control for national shocks or economic conditions. We weight observations by the average value of fruit & nut production in the county in 2002 and 2007, and we cluster standard errors at the county.

We examine effects of 287(g) on total value of fruit & nut production, total value of agricultural production, agricultural expenditures on hired labor, and expenditures on contract labor, FLC establishments, and FLC employees. Summary statistics are presented in table 1.

Table 1: Summary Statistics from Agricultural Census (2002, 2007 and 2012) and County Business Patterns (1999-2012)

Variable	**Mean**	**Std. Dev.**	**N**
Value of fruits and nuts (thousands)	13441.616	97206.848	4086
Value of Ag Production (000s)	109258.783	244507.264	4086
Hired labor per dollar of ag value	0.106	0.087	4086
Contract labor per dollar of ag value	0.017	0.023	4086
republican	0.573	0.125	4086
democrat	0.41	0.123	4086
Standardized Precipitation Index	-0.11	2.725	4086
COUNTY BUSINESS PATTERNS			
Number of FLC employees	30.682	124.37	3349
Number of FLC establishments	1.813	2.507	3349
FLC employees per 100K population	41.802	224.704	3349
FLC establishments per 100K population	4.372	7.708	3349

We also employ the synthetic differences-in-differences method (SDID). This is a recent method that offers a flexible modelling option that can be applied to panel data

[5]Election data come from Dave Leip's Atlas of U.S. Presidential Elections.

and bridges the DID and synthetic control procedures (Clarke et al., 2023). One of the necessary conditions for the DID method is that treatment and control have parallel trends apart from the effects of treatment. Synthetic control uses a weighting technique of underlying control units to generate a single synthetic control that closely matches the treatment unit during the pre-treatment period. The SDID, proposed by Arkhangelsky et al. (2021), is similar to DID in that it allows for treated and control units to be trending at different levels prior to the policy of interest and it is similar to synthetic controls in that it searches to optimally generate a matched control unit that significantly relaxes the need for a parallel trend assumption (Clarke et al., 2023). The SDID is not only suited for a single treatment unit at a particular point in time, but as discussed in more detail in Arkhangelsky et al. (2021), it can also be applied to different treatment units starting at different time periods. [6]

We apply the SDID method to the county level data from the Agricultural Census and the County Business Patterns. As a robustness check, we also estimate the DID method with the SDID balanced panel sample. One of the requirements of the SDID method is that it requires a balanced panel. For this reason, the results of the SDID methods contain significantly fewer observations compared to the DID method which can be implemented even if a county is present only in two different years in the data.

I - II The Agricultural Resource Management Survey (ARMS)

To examine the effects of 287(g) on fruit production specifically, we use data from the Agricultural Resource Management Survey (ARMS), which is administered by the National Agricultural Statistics Service (NASS) and provides farm level data on value of outputs and inputs. The ARMS is a repeated cross section of farms, and the survey is designed to be nationally and regionally representative of U.S. agricultural production. We focus on fruit farms because fruit production is generally labor intensive and has large seasonal variation in labor demand. Outcomes of interest include value of fruit production per acre in operation and hired labor expenditures and contract labor expenditures

[6] see Campos, Coricelli, and Franceschi (2022) for a recent application of the SDID.

as ratios of total crop value per farm. We limit the sample to farms with more than 95 percent of crop production value in fruit and then we further limit the sample to farms in the top 50th percentile of total value of fruit production. We weight variables by their sampling probabilities.

Our primary estimation equation in the ARMS is the following:

$$Y_{jt} = \beta_0 + \beta_1 287g_{jt} + \beta_2 \mathbf{Z_{jt}} + \beta_3 \mathbf{X_{jt}} + \gamma_{\mathbf{c}} + \eta_{\mathbf{t}} + \epsilon_{jt} \tag{2}$$

where Y_{jt} is the outcome of interest for farm j in year t; $287g_{jt}$ is an indicator variable equal to 1 if the farm is located in a 287(g) county; $\mathbf{Z_{jt}}$ is the same vector of time-variant county controls that were included in the county-level analysis; and $\mathbf{X_{jt}}$ is a vector of farm-level controls for operator education.[7] We additionally control for county fixed effects with the vector $\gamma_{\mathbf{c}}$ and year fixed effects with the vector $\eta_{\mathbf{t}}$. We cluster standard errors at the county. Variables of interest are summarized in table 2.

Table 2: Summary Statistics for Fruit Farms in the ARMS

Variable	**Mean**	**Std. Dev.**	**N**
Harvested Fruit Acreage	103.922	431.431	8,328
Value of Fruit Harvested	514,383.4	2,390,133	8,328
Hired Labor Expense: Crop Value	0.513	2.399	8,328
Contract Labor Expenditures: Crop Value	0.182	1.149	8,328

Since the ARMS is a repeated sample, we might be concerned that unobservable differences across farms within the same county might bias our interpretation of β_1 the coefficient on $287g_{jt}$. For example, if the ARMS randomly samples more labor-intensive farms in 287(g) counties in the years after 287(g) is implemented, we might attribute variation in sampling to the effects of the policy. To the extent that variation in sampling is random and should not systematically correlate with 287(g) status, we do not expect this to bias our estimated coefficients. However, as a robustness check, we also analyze the effects of 287(g) while controlling for farm fixed effects:

[7] We also conducted analyses in which we controlled for the value of fruit production and/or harvested fruit acreage. Findings were qualitatively similar when we included these additional controls and are available upon request.

$$Y_{jt} = \alpha_0 + \alpha_1 287g_{jt} + \alpha_2 \mathbf{Z_{jt}} + \alpha_3 \mathbf{X_{jt}} + \phi_{\mathbf{j}} + \eta_{\mathbf{t}} + \mu_{jt} \tag{3}$$

Farm fixed effects, $\phi_{\mathbf{j}}$, control for any unobserved, time-invariant farm characteristics. Thus, we would expect the inclusion of farm fixed effects to better isolate the effects of the 287(g) policies compared to the inclusion of county fixed effects. However, their inclusion also limits identifying variation to that within farms that are sampled multiple times across years. Since larger farms tend to be sampled more frequently in the ARMS, the sample is not representative of all farms in the county or region. Note that we omit sampling weights when we control for farm fixed effects, and standard errors are clustered at the county.

I - III National Agricultural Workers Survey

The National Agricultural Workers Survey (NAWS) is administered by the Department of Labor, and it is unique in that it interviews workers at their place of work so as to be nationally representative of the crop workforce. The NAWS asks workers about their immigration status, whether they are employed by a contractor, their wages, nonwage benefits, and other questions about their employment and socioeconomic characteristics. This is the only nationally representative dataset we are aware of that asks workers whether they work for a labor contractor and gathers data on their wages, benefits, and immigration status.

We estimate the following equation in the NAWS using a linear probability model:

$$FLC_{it} = \beta_0 + \beta_1 287g_{it} + \beta_2 \mathbf{Z_{it}} + \beta_3 \mathbf{X_{it}} + \gamma_{\mathbf{c}} + \eta_{\mathbf{t}} + \epsilon_{it} \tag{4}$$

where FLC_{it} is a binary variable equal to 1 if farmworker i is employed by an FLC in year t, $287g_{it}$ is a binary variable equal to 1 if worker i is employed in a 287(g) county in year t, and β_1 is the parameter of interest. We include a vector of indicator variables $\mathbf{Z_{it}}$ is the

same vector of controls included in the county-level analysis. We additionally control for a vector of individual worker characteristics X_{it} that includes the type of labor task the worker is engaged in and crop type, worker's education, whether the worker is female, age, household size, and marital status. We also include controls for state total crop cash revenue, state total number of government transfers, and state total farm production expenditures.

Since we expect 287(g) policies to differentially affect workers by their immigration status, we estimate separate equations by immigration status: citizens, Green card holders, and undocumented workers. Unauthorized immigrants might be impacted by the policy directly, and green card holders might be indirectly impacted if they are more likely to have family or friends who are unauthorized or if they are more or less fearful of being targeted by police. We cluster standard errors at the county.

Secondly, we measure the effects of 287(g) on wages, probability that workers receive a money bonus, and probability that workers receive healthcare benefits with heterogeneous impacts by employer type. We estimate the following equation:

$$Y_{it} = \alpha_0 + \alpha_1 287g_{it} + \alpha_2 287g_{it} \cdot FLC_{it} + \alpha_3 FLC_{it} + \alpha_4 \mathbf{Z_{it}} + \alpha \mathbf{X_{it}} + \gamma_{\mathbf{c}} + \eta_{\mathbf{t}} + \mu_{it} \quad (5)$$

whereFLC_{it} is an indicator variable equal to 1 if the worker is employed by an FLC and zero if employed directly by a grower.

The NAWS data are summarized in table **??**, and statistics are summarized separately by immigration status and location in a 287(g) county. We analyze the NAWS from 2000-2012.

II. Results

II - I County-Level Analysis in the Census of Agriculture

In the Census of Agriculture, we measure the effects of 287(g) on total agricultural production value, fruit & nut value, hired labor expenditures as a share of total agricultural

Summary Statistics from NAWS						
	Citizens		Documented		Undocumented	
Variable	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
FLC workers	0.044	0.205	0.158	0.365	0.193	0.395
Lnwage	2.116	0.271	2.055	0.218	1.967	0.181
Moneybonus	0.526	0.499	0.39	0.488	0.233	0.423
Healthcare	0.842	0.365	0.852	0.355	0.657	0.475
Female	0.224	0.417	0.188	0.391	0.165	0.371
Age	39.621	14.376	43.317	11.059	30.437	9.791
Education	10.789	3.137	5.628	3.529	6.369	3.321
Married	0.529	0.499	0.8	0.4	0.552	0.497
Household size	1.359	1.518	2.087	1.84	0.966	1.532
Harvest	0.14	0.347	0.212	0.409	0.302	0.459
Post harvest	0.107	0.309	0.103	0.304	0.099	0.298
Semi skilled	0.256	0.436	0.32	0.467	0.213	0.41
Supervision	0.002	0.04	0.002	0.04	0	0.016
Other task	0.284	0.451	0.165	0.371	0.171	0.376
Fruits	0.145	0.352	0.43	0.495	0.402	0.49
Vegetables	0.291	0.454	0.16	0.366	0.206	0.405
Horticulture	0.151	0.358	0.217	0.412	0.243	0.429
Other	0.064	0.245	0.054	0.225	0.05	0.217
lncashcrop	11.71	1.408	13.226	1.396	12.942	1.544
lnproduct expense	15.667	0.904	16.316	0.885	16.146	0.901
Obs	7,527		5,787		12,539	

production, contract labor expenditures as a share of total agricultural production, and the logs of hired and contract labor expenditures. Results are presented in table 3. The first panel shows results from the baseline Difference-in-Differences model. The second panel shows results using synthetic Difference-in-Differences methods, and the third panel shows results using Difference-in-Differences with the same balanced sample as in the synthetic DID model.

Our findings show that 287(g) significantly reduces the value of fruits and nuts harvested within counties. Value of agricultural production declines by 30 percentage points. The decline in fruit & nut production is even larger in magnitude, which is not surprising since fruit production is very labor-intensive. Fruit & nut production decreases by about 50-55 percentage points. Hired labor expenditures as a share of agricultural value increases by 18 percentage points in the DID model, though we do not find a statistically significant effect of 287(g) on hired labor share in the synthetic controls model. We find no discernible effect of 287(g) on contract labor share of agricultural production, but we do find that hired labor expenditures and contract labor expenditures decline by 21-27 percentage points and 24-46 percentage points respectively. Observations are weighted by total agricultural production value in the specifications in columns (5) and (6) since outcomes are not shares of agricultural production.

We also investigate the effects of 287(g) on FLC firms and employment using the County Business Patterns. Findings are presented in table 4. The first 2 columns show the results from log-linear regressions, and the third and fourth columns the results when we do not take the log-transformation of FLC establishments and employees respectively. We find no discernible effect of 287(g) on the number of FLC establishments in our preferred specifications. Only in the DID model with balanced panel do we find a statistically significant negative effect of 287(g) on the log of FLC establishments within the county. However, the number of FLC employees decreases by a statistically significant amount in all specifications.

Critical to identification in difference-in-differences analysis is that treatment and control counties follow parallel trends prior to treatment. We test for differences in trends

Table 3: Census of Agriculture (2002, 2007, 2012)

	(1) ln AgValue	(2) ln fruitV	(3) ln hired:agV	(4) ln contract:agV	(5) ln hired(W)	(6) ln contract(W)
	(1)	(2)	(3)	(4)	(5)	(6)
287 g county	-.301***	-.496***	0.183*	-.002	-.266***	-.237*
	(0.095)	(0.075)	(0.096)	(0.209)	(0.095)	(0.121)
Obs.	4086	4086	4086	4086	4086	4086
Synthetic Difference-in-Differences						
287 g county	-.295***	-.553***	0.103	-.143	-.211**	-.464***
	(0.06)	(0.102)	(0.078)	(0.123)	(0.09)	(0.122)
Obs.	1880	1880	1880	1880	1880	1880
Difference-in-Differences with same observations as the synthetic model						
287 g county	-.314***	-.419***	0.161**	-.172	-.174**	-.216**
	(0.085)	(0.051)	(0.08)	(0.153)	(0.073)	(0.089)
Obs.	1880	1880	1880	1880	1880	1880

All regressions include controls for year fixed effects, county fixed effects, indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Fruit V refers to the total county value of fruit & nut production, hired refers to the total county expenditures for hired labor on all crop and animal operations, contract the total expenditures for contract labor, and total agV the total value of agricultural production in the county including crops and animals. Columns 5-6 are weighted by the mean of total value agricultural production in the county in 2002 and 2007. Standard errors are clustered at the county.

Table 4: County Business Patterns (2000-2012)

	ln-flc-est	ln-flc-empl	flc-est	flc-empl
	(1)	(2)	(3)	(4)
287 g county	-.107	-3.612**	-.051	-49.228***
	(0.085)	(1.484)	(0.137)	(16.493)
Obs.	2710	2710	2710	2710
e(r2-a)	0.972	0.376	0.955	0.638
e(df-a)	710	710	710	710
Synthetic Difference-in-Differences				
287 g county	-.279	-5.969***	-.239	-185.790**
	(0.298)	(1.917)	(0.37)	(88.470)
Obs.	572	572	572	572
Difference-in-Differences with same observations as the synthetic model				
287 g county	-.292**	-3.453*	-.309	-160.156***
	(0.122)	(2.027)	(0.241)	(38.370)
Obs.	572	572	572	572
e(r2-a)	0.932	0.37	0.86	0.525

All regressions include controls for year fixed effects, county fixed effects, indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. flc-est refers to the total number of FLC establishments in the county, and flc-empl refers to the total number of FLC employees in the county. Standard errors are clustered at the county.

from 1997-2002 before any counties began implementing 287(g) policies. Our pre-trend analysis is presented in table 5. We find no evidence of significant differences in trends between treatment and control counties, testing for different trends in the value of fruit & nut production and the value of total agricultural production.

II - II Farm-Level Analysis in the ARMS

We supplement our findings from the Census of Agriculture using farm-level data from farms that concentrate at least 95% of their production value in fruit. Thus, we can more specifically examine whether FLCs help fruit producers adjust to the inward labor supply shock caused by 287(g). Our main findings from the ARMS analysis are reported in table 6. All regressions in table 6 include controls for county fixed effects and year fixed effects. We find that 287(g) policies cause fruit growers to increase expenditures on both hired and contract labor expenditures as shares of total crop value. Hired labor expenditure shares increase by 16.4 percentage points on average and contract labor

Table 5: Tests on Pre-Trends in Agricultural Census

Variable	287(g) Counties Change 2002-1997	Controls Change 2002-1997	P-Value Ho: Change in Treatment = Change in Control
Panel A. Full Sample			
Log value of fruits and tree nuts	0.128	0.061	0.468
Log value of total agricultural production	0.035	-0.003	0.129
Panel B. Drop Control Farms in Counties Adjacent to 287(g)			
Log value of fruits and tree nuts	0.128	0.050	0.447
Log value of total agricultural production	0.035	-0.007	0.095
Panel C. Drop Control Farms in Counties Adjacent to 287(g) counties and counties in E-Verify states and 287(g) states			
Log value of fruits and tree nuts	0.128	0.043	0.370
Log value of total agricultural production	0.035	-0.003	0.142

Counties weighted by the value of fruit and tree nuts and mean value of total agricultural production.

expenditure shares increase by 7.9 percentage points on average.[8] The marginal impact for hired labor shares is twice as large as the marginal impact for contract labor shares.

As a robustness check we repeat our analysis controlling for farm fixed effects. Results are reported in table 7 and are qualitatively similar to our main findings. However, when we control for farm fixed effects, we find that fruit value per acre in operation decreases by 61 percentage points, and this coefficient is statistically significant. Hired labor expenditures as a share of total crop value increases by 36.2 percentage points and contract labor expenditure share increases by 10.9 percentage points. However, the coefficient on 287(g) for the contract labor share is not statistically significant. Our findings provide evidence that farms reduce fruit production after 287(g) is implemented, similar to our findings at the county level.

II - III Worker-Level Analysis in the NAWS

Finally we examine how 287(g) might have impacted hiring practices by growers and FLCs using worker-level data in the NAWS. We first examine how 287(g) affects the probability that citizens, green card holders, and unauthorized immigrants are employed by an FLC. Results are presented in table 8. All specifications include county fixed effects and year fixed effects and controls for various observable individual, county, and state-

[8] We approximate marginal effects of coefficients in the inverse hyperbolic sine-linear model by taking $exp(\beta) - 1$, where β is the estimated coefficient.

Table 6: ARMS: Main Findings with County Fixed Effects

Effects of County 287(g), Fruit & Nut Producers, 2002-2012

VARIABLES	(1) ln(Fruit Value: Acres)	(2) asinh(Hired Labor: Crop Value)	(3) asinh(Contract Labor: Crop Value)	(4) Any Contract Labor
287 g county	-0.366	0.152***	0.076*** * 0.167**	
	(0.226)	(0.042)	(0.022)	(0.067)
Observations	8,311	8,311	8,311	8,311
R-squared	0.328	0.318	0.220	0.395

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All regressions include controls for year fixed effects, county fixed effects, indicator variables for operator's education level, indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Fruit Value: Acres is the ratio of value of fruit harvested to acreage in operation. asinh(Hired Labor: Crop Value) is the inverse hyperbolic sine of the ratio of hired labor expenditures to value of crop production, and asinh(Contract Labor: Crop Value) is the inverse hyperbolic sine of the ratio of contract labor expenditures to crop value. Sampling weights are used in all regressions. Standard errors are clustered at the county.

Table 7: ARMS: Analysis Controlling for Farm Fixed Effects

Effects of County 287(g), Fruit & Nut Producers, 2002-2012

VARIABLES	(1) ln(Fruit Value: Acres)	(2) asinh(Hired Labor: Crop Value)	(3) asinh(Contract Labor: Crop Value)	(4) Any Contract Labor
287 g county	-0.614**	0.309*	0.091	-0.297
	(0.270)	(0.167)	(0.073)	(0.184)
Observations	1,495	1,495	1,495	1,495
Adj. R-squared	0.029	0.009	0.003	0.004
Number of id2	706	706	706	706

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All regressions include controls for year fixed effects, farm fixed effects, indicator variables for operator's education level,indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Fruit Value: Acres is the ratio of value of fruit harvested to acreage in operation. asinh(Hired Labor: Crop Value) is the inverse hyperbolic sine of the ratio of hired labor expenditures to value of crop production, and asinh(Contract Labor: Crop Value) is the inverse hyperbolic sine of the ratio of contract labor expenditures to crop value. Sampling weights are used in all regressions. Standard errors are clustered at the county.

level controls. We find that 287(g) increases the probability that citizen farm workers are employed by an FLC by 15.9-17.5 percentage points and decreases the probability that unauthorized farm workers are employed by an FLC by 9.3-10 percentage points. These findings are surprising given that previous literature on the effects of IRCA show evidence that FLCs increased their comparative advantage in bearing the risk of hiring unauthorized workers and maintaining a network of newly arrived immigrant workers (Thilmany, 1996). Our findings instead suggest that the effects of 287(g) immigration policies differed from those of IRCA in fundamental ways and increased FLCs' dependence on citizen employees.

Table 8: NAWS: Probability Workers Are Employed by an FLC

	(1) Citizen Workers	(2) Green Card Workers	(3) Undocumented Workers
287(g)	0.216**	0.045	-0.092*
	(0.109)	(0.107)	(0.049)
N	6182	4812	12206
r2	0.431	0.330	0.383

All regressions include controls for year fixed effects, county fixed effects, indicator variables for labor task, crop, education of worker, whether the worker is female, age, household size, marital status, total crop cash revenue in the state, total number of government transfers in the state, state total farm production expenditures, and indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Standard errors are clustered at the county.

We next explore whether growers or FLCs changed their labor recruitment practices following the implementation of 287(g). We test the impacts of 287(g) on farm worker wages, probability that workers receive a money bonus from their employer, and probability that workers receive healthcare benefits. We estimate separate regressions for citizens, green card holders, and unauthorized immigrants and allow for heterogeneous effects by employer type by including an interaction term between 287(g) and FLC. Results in table 9 indicate that although FLCs generally offer lower wages to citizens than do growers, after 287(g) is implemented, FLCs are significantly more likely to offer money bonuses and healthcare benefits to citizen farm workers. This helps explain why citizen

farm workers are more likely to work for an FLC following implementation of 287(g) as we found in table 8. These findings are suggestive that FLCs attempt to recruit more citizen farm workers post-287(g) by offering nonwage benefits to citizens.

Table 9: NAWS: Effects of 287(g) on Citizen Worker Wages & Benefits by Employer Type

	Citizens		
	(1)	(2)	(3)
	Hourly wage	Money bonus	Paid health care
flc*287g	0.088	0.689***	0.322***
	(0.098)	(0.190)	(0.099)
flc	-0.191**	-0.029	-0.213
	(0.091)	(0.224)	(0.196)
287g	0.068	-0.001	-0.092
	(0.072)	(0.180)	(0.078)
N	5656	6618	7385
r2	0.646	0.425	0.406

All regressions include controls for year fixed effects, county fixed effects, indicator variables for labor task, crop, education of worker, whether the worker is female, age, household size, marital status, total crop cash revenue in the state, total number of government transfers in the state, state total farm production expenditures, and indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Standard errors are clustered at the county.

Results in table 10 show no effect of 287(g) on wages or benefits offered to green card holders.

Finally the results in table 11 examine whether 287(g) causes employers to increase wages and probability of offering healthcare benefits to unauthorized farmworkers, but we do not find evidence of differential effects for FLC employers.

Table 10: NAWS: Effects of 287(g) on Green Card Worker Wages & Benefits by Employer Type

	Green Card Holders		
	(1)	(2)	(3)
	Hourly wage	Money bonus	Paid health care
flc*287g	0.135**	0.320	0.549
	(0.061)	(0.365)	(0.398)
flc	-0.156***	0.058	-0.455***
	(0.040)	(0.160)	(0.148)
287g	0.033	0.169	0.055
	(0.053)	(0.097)	(0.077)
N	4090	4657	4805
r2	0.612	0.394	0.362

All regressions include controls for year fixed effects, county fixed effects, indicator variables for labor task, crop, education of worker, whether the worker is female, age, household size, marital status, total crop cash revenue in the state, total number of government transfers in the state, state total farm production expenditures, and indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Standard errors are clustered at the county.

Table 11: NAWS: Effects of 287(g) on Unauthorized Worker Wages & Benefits by Employer Type

	Unauthorized Workers		
	(1)	(2)	(3)
	Hourly wage	Money bonus	Paid health care
flc*287g	-0.030	-0.091	0.206
	(0.064)	(0.177)	(0.169)
flc	-0.022	-0.184**	0.255
	(0.034)	(0.085)	(0.229)
287g	0.054**	0.038	0.084
	(0.024)	(0.078)	(0.047)
N	9010	9775	10669
r2	0.671	0.335	0.317

All regressions include controls for year fixed effects, county fixed effects, indicator variables for labor task, crop, education of worker, whether the worker is female, age, household size, marital status, total crop cash revenue in the state, total number of government transfers in the state, state total farm production expenditures, and indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Standard errors are clustered at the county.

III. Discussion

Taken together, our findings show evidence consistent with an inward unauthorized labor supply shock, which is what we would expect from policies that increase immigration enforcement within the local jurisdiction. FLCs appear to have a limited role in helping fruit growers, who often require large seasonal workforces to harvest their crops, to maintain fruit production because FLCs are dependent on unauthorized workers. Total fruit & nut production within the county declines after 287(g) is implemented, and hired labor expenditures as a share of total agricultural value increases, but there is no discernible change in the FLC expenditure share. The number of FLC establishments is unchanged after 287(g) is implemented, but the number of employees declines. Using farm-level data from fruit farms specifically, we find that both hired labor and contract labor expenditures as shares of total crop value per farm increase, but the marginal effect of 287(g) on the hired labor share is twice as large as that on the contract labor share. Nevertheless, fruit growers are more likely to hire any workers through an FLC following implmentation of 287(g), suggesting that FLCs play a role in helping fruit growers adjust to the inward labor supply shock, albeit limited.

Furthermore, we find that 287(g) causes FLCs to increase their recruitment efforts to citizen farm workers by offering more money bonuses and healthcare benefits. These findings were unexpected since earlier findings from analysis of FLCs following passage of the Immigration Reform and Control Act (IRCA) in 1986 showed evidence that FLCs held a comparative advantage in recruiting unauthorized workers, maintaining networks among newly arriving immigrants, and evading immigration enforcement (Taylor and Thilmany, 1993; Thilmany, 1996). Immigration policies that increased the efficiency of detecting and detaining unauthorized immigrants might have disproportionately impacted FLCs since they generally hire a larger share of unauthorized immigrants. The effects of 287(g) policies, which were implemented many years after IRCA and increased immigration enforcement efforts without changing immigration laws, appear to have a much different effect on FLCs. To the extent that employees of FLCs travel between farms, they likely spend more time on the road and face greater risk of being stopped by or otherwise in-

teracting with law enforcement. Consequently, employees of FLCs might feel particularly vulnerable to laws that permit local law enforcement to detain unauthorized immigrants.

IV. Robustness

IV - I Estimating Marginal Effects with the Callaway and Sant'Anna Estimator

We perform several checks to test the robustness of our findings. One of the primary concerns with two-way fixed effects models is that these models impose strict assumptions about the structural relationship between outcomes and treatment. The model measures a weighted linear combination of treatment effects across treated units, and some treated units might receive negative weights (Goodman-Bacon, 2018; Jakiela, 2022; Sun and Abraham, 2021). Negative weights are appropriate when treatment effects are homogeneous and will not bias the estimated causal effects of treatment, and as long as there is a sufficiently large number of never-treated controls and pre-treatment data for the treated groups, then negative weights will not occur in the treatment data (Jakiela, 2022). Since treatment did not begin until 2005 and a relatively small share of counties adopted 287(g), negative weights should not theoretically pose a problem for our analysis. Nevertheless, as a robustness check, we estimate marginal effects using the estimator developed by Callaway and Sant'Anna (Callaway and Sant'Anna, 2021).

Marginal effects of 287(g) on outcomes of interest in the NAWS are illustrated in figure 2.[9] All of the plots in figure 2 show evidence of parallel pre-trends since estimated coefficients are generally not significantly different from zero prior to implementation of 287(g). After 287(g) is implemented the probability that citizens are employed by an FLC increases and the probability that unauthorized immigrants are employed by an FLC declines. We find no significant impact on green card holders. These findings corroborate our main findings.

[9]We perform the CSDID analysis in the NAWS because the NAWS has a longer pre-period than we have in the Agricultural Census and we cannot control for fixed effects using the CSDID estimator as we would with the ARMS.

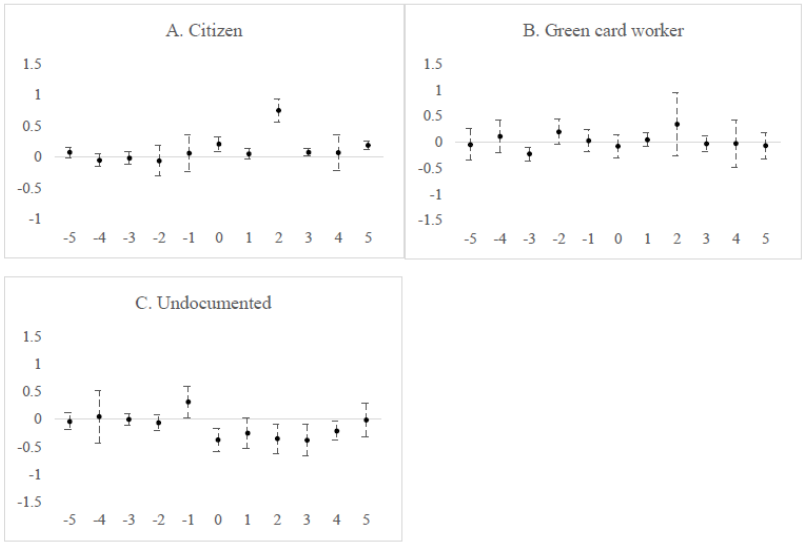

Figure 1. Callaway and Sant'Anna (2021) event study estimator of 287(g) impact on the probability of being contract labor among farm workers with different legal status

Figure 2: NAWS CSDID Plot of Probability Workers Are Employed by an FLC

IV - II Additional Robustness Checks

We conduct several additional robustness checks, which we summarize here. To see the full robustness checks, please see the Appendix. First, some might contend that it is inappropriate to use sampling weights in the ARMS when examining a policy change at the county level. Sampling weights are intended to replicate the representativeness of regions larger than counties, and sample weights represent farms inside and outside of the county (Dubman, 2000). The specification with farm fixed effects does not include sampling weights and thus arguably addresses this concern. However, as a further robustness check, we also repeat the main analysis without sampling weights. Results are qualitatively similar to those in table 6 and reported in the Appendix.

Second, since 287(g) is not randomly assigned to counties, one might be concerned that treatment is endogenous. For example, suppose counties that seek 287(g) differ systematically from counties that do not. Due to limited resources to train and equip local law enforcement officers to carry out ICE duties, not all counties that applied for 287(g) were accepted, and these counties are simply included among the control counties in our main analysis. As a robustness check, we limit the sample to counties that applied

for 287(g), and those counties that applied for but did not receive 287(g) constitute the control group. When we limit the sample to counties that applied for 287(g), the sample is considerably reduced, but findings are similar to our main findings.

V. Conclusion

Despite the growing importance of labor contractors in global supply chains there is little empirical research investigating how immigration policies affect the demand for labor contractors or labor recruitment practices. Since labor contractors have a comparative advantage in employing new immigrants, many of whom are unauthorized or may not speak the national language, employees of labor contractors are often particularly vulnerable to labor abuses. Research is needed to understand the roles that labor contractors play in tightening labor markets and how immigration policies affect labor contractors specifically, especially in light of the strengthening immigration policies that have been implemented in more recent decades.

Our findings show value of total agricultural production decreases within counties after 287(g) policies are implemented, and fruit & nut production, which is generally very labor-intensive, decreases by an even larger percentage. Theoretically, FLCs could help diminish the magnitude of negative production effects from an inward labor supply shock because FLCs help match workers across multiple seasonal jobs. However, our findings show that FLCs were harmed by the 287(g) policies since total FLC employment within counties decreased following 287(g). Using farm-level data, we find that both hired labor expenditures and contract labor expenditures as shares of total crop value on fruit farms increased after 287(g) was implemented, but magnitude of the marginal effect of 287(g) on labor expenditure shares was about twice as large for hired labor shares. This suggests that FLCs had limited capacity to help fruit farms adjust to changes in labor supply following 287(g). Nevertheless, fruit growers were 16.7 percentage points more likely to hire any contract labor following implementation of 287(g).

Although previous literature showed that FLCs appeared particularly adept at evading immigration enforcement following the passage of the Immigration Reform and Control

Act (IRCA) in 1986, our findings suggest that FLCs made efforts to recruit more citizen farm workers following implementation of 287(g) immigration enforcement policies from 2005-2012. FLCs were more likely to offer citizen farm workers money bonuses and healthcare benefits, which likely serve as mechanisms to increase recruitment. However, they were no more likely to increase wages or benefits for green card holders. More investigation is necessary to determine whether employers view the risk of employing citizens and green card holders differently. Wages paid to unauthorized farm workers increase following 287(g) regardless of whether they are employed directly by a grower or by an FLC, consistent with an inward unauthorized labor supply shock.

Our findings have important implications for the farm industry specifically and for understanding the roles of labor contractors more generally. There are relatively few opportunities to investigate the roles of labor contractors in industries with large shares of unauthorized immigrant workers due to data constraints, and there has been little empirical investigation of the role of FLCs in the 21st century. This paper begins to fill this gap in the literature using three unique datasets that include county- and farm-level data on farm labor contractor expenditures and value of production and worker-level data that include immigration status, employer type, wages, and benefits. Our findings show suggestive evidence that 287(g) policies incentivized FLCs to increase their efforts to recruit more citizen farm workers. More research is needed to understand the roles of other immigration policies on labor contractors and to understand differences in outcomes across citizens and green card holders.

VI. Appendix

Since sampling weights in the ARMS are designed to account for farms' representativeness of farms in and outside their counties, one might question the appropriateness of using sampling weights in our analysis of county-level policies. As a robustness check, we repeat our main analysis in the ARMS without sampling weights. Results are presented in table 12. The signs of coefficients are the same as those in our main results in table 6 though magnitude and statistical significance vary slightly.

Table 12: ARMS Robustness Check: County Fixed Effects and No Sampling Weights

Effects of County 287(g), Fruit Producers, 2002-2012

VARIABLES	ln(Fruit Value: Acres)	asinh(Hired Labor: Crop Value)	asinh(Contract Labor: Crop Value)
287 g county	-0.083	0.066	0.045
	(0.169)	(0.050)	(0.027)
Observations	8,311	8,311	8,311
R-squared	0.223	0.180	0.176

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All regressions include controls for year fixed effects, county fixed effects, indicator variables for operator's education level,indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Fruit Value: Acres is the ratio of value of fruit harvested to acreage in operation. asinh(Hired Labor: Crop Value) is the inverse hyperbolic sine of the ratio of hired labor expenditures to value of crop production, and asinh(Contract Labor: Crop Value) is the inverse hyperbolic sine of the ratio of contract labor expenditures to crop value. Sampling weights are used in all regressions. Standard errors are clustered at the county.

One might be concerned that counties that apply for 287(g) differ from those that do not in important ways. While it is not obvious how differences across counties that apply for 287(g) versus those that do not might correlate with fruit production and farm labor employment, we repeat our ARMS analysis using only counties that applied for 287(g) as controls. Since there was limited resources to train local law enforcement to participate in 287(g) not all counties that applied for 287(g) were granted the program. Findings in the

ARMS limiting the sample to counties that applied for 287(g) are presented in table 13 and are similar in sign, magnitude, and significance to those in the main findings.

Table 13: ARMS Robustness Check: Limit Sample to Counties that Applied for 287(g)

Effects of County 287(g), Fruit Producers, 2002-2012

VARIABLES	(1) ln(Fruit Value: Acres)	(2) asinh(Hired Labor: Crop Value)	(3) asinh(Contract Labor: Crop Value)
287 g county	-0.509**	0.117***	0.050
	(0.223)	(0.038)	(0.030)
Observations	1,067	1,067	1,067
R-squared	0.180	0.245	0.136

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All regressions include controls for year fixed effects, county fixed effects, indicator variables for operator's education level,indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Fruit Value: Acres is the ratio of value of fruit harvested to acreage in operation. asinh(Hired Labor: Crop Value) is the inverse hyperbolic sine of the ratio of hired labor expenditures to value of crop production, and asinh(Contract Labor: Crop Value) is the inverse hyperbolic sine of the ratio of contract labor expenditures to crop value. Sampling weights are used in all regressions. Standard errors are clustered at the county.

We repeat the same analysis with the Census of Agriculture. Findings are reported in table 14 and are generally similar to our main findings.

Table 14: Census of Agriculture Limiting Sample to Counties that Applied for 287(g): Analysis of Counties with more than $1 million in fruit & nut production (2002, 2007, 2012)

	logAgValue	logfruitnuts	ln-hiredperagval	ln-contractperagval	ln-hiredW	ln-contractW
	(1)	(2)	(3)	(4)	(5)	(6)
287 g county	-.348***	-.497***	-.087	0.296	-.277***	-.007
	(0.123)	(0.136)	(0.099)	(0.289)	(0.097)	(0.215)
Obs.	224	224	224	224	224	224
e(r2-a)	0.984	0.973	0.87	0.769	0.98	0.957
e(df-a)	108	108	108	108	108	108

All regressions include controls for year fixed effects, county fixed effects, indicator variables for operator's education level,indicator variables for location in a Secure Communities county, E-Verify state, 287(g) state, or county adjacent to a 287(g) county. Every specification also includes controls for the linear interpolations of the share of the county that voted Republican and the share Democrat in presidential elections and the Standardized Precipitation Index. Standard errors are clustered at the county.

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