Unexpected Harvest: A Study of Californian Agricultural Wages after the IRCA

May 2015

Emily Kohn

Department of Economics
Stanford University
Stanford, CA 94305
ekohn@stanford.edu

Under the Direction of
Professor Ran Abramitzky

Abstract

The 1986 Immigration Reform and Control Act was supposed to encourage a smaller, legal agricultural workforce. However, it actually led to a larger labor force, increased by new-immigrant SAWs and unabated illegal immigration. Previous papers have failed to econometrically identify the drop in wages and increase in labor supply reported by farmers and workers, leading to a discrepancy between the economic literature and other fields' literatures on the IRCA. Using a linear spline approach between two regions in California, I find that employment of agricultural workers in the SAW-heavy Los Angeles regions increased relative to that in the North Coast region due to a relative increase in farm labor contractor employment, suggesting an increase in labor supply caused by the IRCA. I also use difference-in-difference-in-differences equations to show that wages decreased post-IRCA, particularly for labor-intensive industries and for Mexican male immigrants.

Keywords: Immigration Reform and Control Act, California agriculture, undocumented immigration, SAWs, Los Angeles, labor supply increase

Acknowledgements

I have so many people to thank for this paper. Professor Ran Abramitzky has been an incredible advisor. His encouragement and guidance with my data made my analysis far better, and his suggestions of further resources have been incredibly helpful. Professor Marcelo Clerici-Arias has been a truly invaluable mentor from the inception of this thesis in his junior honors seminar. Professor John Pencavel's thoughts on my initial proposal and his excellent course on labor economics have been very helpful. I'd also like to thank Professor Philip Martin and Dr. Linda Moeller for their expertise, which shaped my study design, and the staff of the Minnesota Population Center for their work on the IPUMS database.

The support and love of my family and friends has been invaluable. In particular, my partner-in-theses, Danielle Ola, has been a huge help in getting through long hours of writing, and Nisha Masharani's tireless willingness to listen was a godsend. My father, Michael Kohn, has offered his support and knowledge of statistical methods and study designs; without his lesson at the kitchen whiteboard, I never would have discovered the linear spline. My mother, Caroline Vosti, has always been ready with a listening ear and unconditional support. And to my brothers, GB and CS: I couldn't have done it without you.

Table of Contents

1: Introduction

America has struggled with a porous border with Mexico for decades, and attempts to fix this issue are far from new. Any immigration reform targeted at undocumented immigrants would have a profound effect on agriculture, as most studies estimate that around 50% of current agricultural workers are undocumented. Attempts to stem undocumented immigration or more strictly enforce immigration laws could reduce the supply of agricultural labor. As such, many members of the agricultural industry assert that their workers need special treatment, either through alternative legalization programs or a guest worker program. Otherwise, they warn, the highly successful U.S. agricultural industry could face a labor shortage.

However, few current discussions acknowledge that this debate has happened before. In 1986, the Immigration Reform and Control Act (IRCA) became law after six years of political negotiation between various interest groups, including farmers and agricultural labor advocates. The IRCA provided legal status to undocumented immigrants who had lived in the US for more than five years and to agricultural workers who had worked in labor-intensive crop agriculture for at least 90 days over the previous year. The latter group was referred to as the Special Agricultural Workers, or SAWs. The law also attempted to prevent a recurrence of the problem of illegal workers by increasing border patrols and requiring employers to ensure their workers had legal status. Representatives of agricultural workers hoped that cutting off the supply of undocumented immigration would decrease the overall agricultural labor force by removing seasonal, undocumented workers from the labor pool, allowing SAWs to pursue better working conditions and higher wages within agriculture. However, if too many of the SAWs took jobs elsewhere, the law provided a backup plan in the form of the Replacement Agricultural Worker

(RAW) program that allowed farmers to bring in foreign workers if they faced a labor shortage. Together, these provisions theoretically met the goals of many current possible immigration policies: lower the number of undocumented workers, improve working conditions in agriculture, and provide a safety net to prevent catastrophic shocks to the agricultural labor market.

However, the effects of the law were almost exactly the opposite of those intended. Twice as many immigrants were legalized under the SAW program as were initially believed eligible, suggesting widespread immigration fraud. Catching such fraud was particularly difficult given the poor records for agricultural labor; workers who had legitimately worked in the US often had little more than a handwritten note from an employer to prove their legitimacy. As such, many workers became "falsely documented," providing forged or fraudulent evidence claiming that they had worked in the US. Additionally, the last-minute creation of a border entry program for illegal alien farm workers, caused by concern over initial reports of minor labor shortages, also contributed to the increase in falsely documented immigrants. "Under this program, a foreigner could arrive at a US port of entry on the US-Mexican border, assert that she did farm work as an illegal alien in the US for 90 days in 1985-86, but had no records of such employment, and could enter the US with a 90-day work permit to contact the old employer and obtain the letter certifying employment" (Martin (1994), 51). Almost 100,000 immigrants entered the US under this program.

Many studies conducted after the IRCA found that growers and workers alike believed that there had been a clear increase in labor supply. This belief was most pronounced in Central California, where more than one-third of SAWs settled (*1989 Statistical Yearbook*, pg. xxiv). In 1990, the Department of Agriculture found that there was no need for further workers, and the

RAW program was never implemented. Many researchers believe that the IRCA in fact worsened wages and conditions for California's agricultural workers.

However, the economic literature on agricultural wages and employment after the IRCA is surprisingly ambiguous. Shortly after the law's enactment, different levels of government commissioned studies on the law's effects on the agricultural wages. These studies did not come to any clear consensus on the effects of the law on wages, with estimates ranging from small increases to heterogeneous decreases. Unfortunately, government investment in the subject was largely due to the uncertainty surrounding the effects of the law, and once it became clear that the U.S. agricultural industry was not facing a major labor shortage, interest in the effects of the law died out. Few economists continued to formally study the effects of the law after 1994, and discussion of the IRCA has largely died out.

Given current concerns regarding immigration and the availability of more post-IRCA data than previous studies could access, I believe that it is time to revisit the effects of the IRCA on agricultural wages and labor supply. This paper examines the impact of the law on the agricultural labor market via a difference-in-difference and linear spline analysis of wages and employment in high- and low-immigration regions in California and in more and less labor-intensive agricultural sectors. I also use a difference-in-difference-in-differences analysis to focus on the effects of the IRCA on the fruit and vegetable industries. Using data from both unemployment insurance (UI) forms and two US Censuses, I find evidence that employment increased and wages decreased after the IRCA. I also find that this wage decrease is particularly pronounced for workers facing increased substitutes post-IRCA and in labor-intensive industries.

2 Literature Review

There is a substantial body of literature on the effects of the IRCA on the agricultural workforce. However, there is one widespread issue with many of these works. While they generally provide useful qualitative information on the changes in agriculture after the IRCA, many of them were conducted in the early 1990s and are limited to data through 1990 or 1991, only two or three years after the IRCA came into full effect for agricultural employers. As such, the existing literature is useful for identifying broad trends in the post-IRCA agricultural environment but is less reliable for quantitative results.

In Section 2.1 of this literature review, I will discuss the law's changes to the agricultural labor market structure. In particular, I focus on the roles of immigration fraud and unabated undocumented immigration in increasing the agricultural labor supply. I will discuss past studies of the effect of this labor supply increase on wages in Section 2.2. I will identify a number of influential studies and their limitations, particularly focusing on issues of heterogeneous regions and insufficient data.

2.1: Changes to the Labor Supply and Labor Market

The 1986 IRCA created the Special Agricultural Workers (SAW) program, which provided legal status to those who had worked in agriculture for at least 90 days in 1985-1986. In 1986, the Department of Agriculture estimated that there were roughly 350,000 undocumented immigrants employed in agriculture nationwide. 1.3 million people applied for SAW status and roughly 1.1 million were approved, almost three times as many as expected (Martin (1994), 50). Subsequent studies have suggested that this discrepancy was not due to error by the Department

of Agriculture. Hardiman et al. (1988) used unemployment insurance to show that the pool of farmworkers eligible for SAW status in California should have been 48,000-78,000, assuming that roughly 42% of farmworkers were undocumented. Even if 100% of agricultural workers were undocumented, there would have only been 115,000-188,000 eligible SAWs. Roughly 600,000 SAWs applied for and received legal status in California by 1988. "Either California farm employers reported only a third of their 1985 employees, or two-thirds of the SAW applications [were] fraudulent" (Hardiman, et. al., pg. 5).

Where did these additional workers come from? Martin (1994) argues that the majority were either undocumented immigrants who were already living in the US but did not qualify for the program[1] or new undocumented immigrants who were able to provide false proof of past agricultural work. Anecdotal evidence from INS officials and farm owners supports this theory. Many farm owners and workers claim to have observed a labor supply increase post-IRCA, and INS officials reported many instances of repeated applicants with clearly faked qualifications. The large amount of fraud almost certainly led to the admittance of a number of people who never previously worked in U.S. agriculture. As such, Martin argues that, while some data show that many SAWs did not work in agriculture after admittance, this did not indicate a drop in the labor supply. Indeed, he claims that the opposite is likely: an increase in legalized immigrants increased the labor supply.

Concerns regarding a possible widespread and abrupt exit of SAWs from agriculture were unwarranted for several reasons besides the point regarding additional workers raised by Martin. Many SAWs reported an inability to exit agriculture due to a difficult economy and low

[1] It is possible that a number of the new workers were immigrants eligible for residency under the other legalization program but who preferred to apply under the less intensive requirements of the SAW program. However, it is unlikely that this effect can fully explain the unrealistically higher number of SAW applicants.

human capital even after legalization. SAWs in general had low education and little knowledge of English, so only those with higher human capital were likely to exit the market. Additionally, a study of Central Californian SAWs found that those with higher human capital moved to higher-paid positions in agriculture, such as driver or farm labor contractor (Alvarado et al., 1996). However, none of the SAWs interviewed planned on exiting agriculture in the foreseeable future due to the poor economy. As such, the exit of SAWs from agriculture was a gradual process, so their slow exit was offset by continuing immigration and did not offset the labor supply increase caused by the influx of falsely documented immigrants.

The IRCA failed in another one of its aims: to significantly decrease undocumented immigration in California. Johnson (1997) uses population estimates, birth and death records, estimates of legal migration, and ICS data for net migration estimates and concludes that illegal immigration sharply increased in the mid-1980s and began to decline in the early 1990s. California's undocumented immigrant population peaked around 1990. Johnson hypothesizes that the IRCA could have actually caused this increase in the undocumented immigrant population by creating new legal residents who then brought over families and increasing the difficulty of crossing the border, thus incentivizing longer stays once in the US.

The IRCA also changed the structure of the labor market by causing a shift from direct hiring to hiring through farm labor contractors (FLCs). The introduction of employer sanctions for hiring undocumented workers increased both the amount of paperwork needed for a new hire and the potential risks of hiring an illegal immigrant, knowingly or unknowingly. In order to avoid these costs, farmers began contracting FLCs to hire their field workers (Martin and Thilmany, 1995). In California, the percentage of workers hired through FLCs rose from roughly 15% in 1984 to 21% in 1990 ("Employers," 1993), with the trend continuing upwards

through the mid-1990s (Martin, 1994). The number of FLCs also increased: the California Employment Development Department found that the number of farm labor contractors more than doubled between 1982 and 1990, with most of this increase occurring between 1987 and 1988. Reasons given by farm owners for increased use of FLCs include decreased costs of immigration paperwork and lower obligations for providing workers with housing and transportation (Rosenberg, 1995).

However, while FLCs represented significant cost savings for the farm owners, they were not as beneficial for the workers. Many workers complained that the transition to FLCs led to a small decrease in wages and, more significantly, a large decrease in fringe benefits, like health insurance and transportation. Possible reasons for this decrease are increased competition from other workers and farm owners becoming less invested in retaining workers (Mason et al., 1994). The decrease in compensation is not caught by wage data, but still had a significant effect on farmworker income. For example, case studies on individual California crops, notably tomatoes, found that workers faced decreased take-home pay. Runsten et al. (1993) found that workers' main complaint about the post-IRCA employment environment was a sharp decrease in benefits, such as on-the-job provision of tools, rather than in nominal wages. Many blamed this change on the FLCs. Changes in benefits are important to keep in mind while examining studies on agricultural wages after the IRCA, as the effects of the IRCA may have been stronger on nonwage fringe benefits than on wages.

In conclusion, a number of studies strongly indicate that the IRCA led to an increase in the agricultural labor supply rather than the intended decrease. This result was particularly pronounced in California, where over half of all SAWs settled. Many workers felt the effects of the change in the labor market within the next few years. By 1993, Alvarado et al. (1996) found

that 45.6% of workers interviewed believed that finding work was harder than five years ago, and of those, 71% attributed increased difficulty in finding work to "too many workers" (pg. 11). Such an increase must have had some effect on wages. The question, then, is what that effect might be.

2.2: Wage Studies

Martin (1994) claims that there are quite a few studies supporting his claim that overall agricultural wages decreased after the IRCA due to the increase in workers. He was likely referring to the case studies of various industries conducted between 1986 and 1992. These studies were carried out at the request of Congress, which formed the Commission on Agricultural Workers (CAW) to examine the effects of the IRCA on agriculture. The resulting CAW report (1993) is widely considered the definitive source of information on the effects of the IRCA on agricultural labor. The case studies all found that workers reported that they saw either no change in nominal wages (a decrease in real wages) or a decrease in nominal wages. Many also reported that they faced significant reductions in nonwage benefits. Later qualitative studies of workers such as Alvarado et al. (1996) also found that workers reported lower pay and benefits after the IRCA.

Quantitative econometric studies did not come to the same unified conclusion. For example, different papers in the CAW report find very different effects on wages and employment. "Employers, Employment, and Wages Paid in California" found that California saw a large *increase* in both employment and wages. However, the paper failed to appropriately control for pre-existing trends and inflation. In contrast, Duffield and Vrooman (1994) controlled for time trends using NASS wage data. They found no significant effect of the IRCA

on wages on either the national level or in California specifically. They admit, however, that any effect on wages would be gradual, and could be confused with preexisting downward trends. Additionally, the NASS data ignore laborers hired by contractors. Due to the increased role of farm labor contractors (FLCs) after 1986 and the greater impact of the IRCA on contract workers, the NASS dataset is limited in its ability to assess post-IRCA wage changes (Duffield, Grunter, and Vrooman, 1995).

Other papers have found some changes, albeit small, to wages of certain demographic groups. Bean and Sorenson (1992) found that, while most groups saw no statistically significant effect of the IRCA on wages, Mexicans who had been in the US for more than 10 years saw a large wage decrease. They explained their result by arguing that, since labor is heterogeneous, it is unclear theoretically whether or not a wage increase for one form of labor will decrease demand for other types. They theorized that increased employment opportunities afforded by legal status for previously illegal immigrants offset the decrease in opportunities for other recent legal immigrants, leading to a net zero change in demand for recent immigrants. They argue that this offset was not replicated for long-term residents who now faced employer sanction-related discrimination. As such, wage differentials were only significant for one group, not for agricultural workers as a whole.

The role of racial discrimination in post-IRCA wages could also have affected agricultural wages. Bansak and Raphael (2001) argue that the lag of immigration requirements for farmers produces a natural experiment, in which they can compare the changes in employment patterns of other low-skill workers to those of agricultural workers to see if the IRCA led to any significant changes. It appears that the IRCA produced increased racial discrimination, as Hispanics faced a significant pre-post change in non-agricultural wages during

the period between 1986 and 1988 compared to the control group of agricultural workers. This suggests that manufacturers began discriminating against Hispanics due to the implementation of employer sanctions; employers likely stereotyped Hispanics as more likely to be undocumented or falsely documented and thus riskier to hire. As such, it is possible that any changes in the agricultural wage were due to the perceived increased risks of the predominantly Hispanic labor force.

Heterogeneous wage changes could also have occurred due to legal status rather than race. Pena (2010) focuses on the post-1986 wage differentials between legal and illegal immigrants in the agricultural work force. Pena uses propensity scoring to offset selection bias into legal status and examines differentials due to labor contracts (piece rate vs. direct hire). The post-IRCA wage gaps between undocumented workers and those with green cards or citizenship are 5.2% and 11.7% respectively. This gap is largely due to the increased risks of hiring undocumented immigrants and costs of forging documents to falsely document workers. These costs could be passed on to workers in a supply-heavy labor market. As the number of undocumented workers increased as more SAWs exited agriculture, a higher percentage of workers would face this penalty, and average agricultural wages would decrease.

Previous studies have not come to any universal conclusions regarding post-IRCA wage changes, though they generally indicated heterogeneous downward trends. However, there is room for new research. Most previous studies were conducted within a few years of the law's passage. As such, they had limited data and were not aware of the importance of FLCs in the post-IRCA labor market. Additionally, many studies took a national approach, leading to identical treatment of very different regions. In particular, many studies examined the IRCA on the national level and considered California identical to other states. Since around two-thirds of

all SAWs settled in California, combining data on California with data on other, less SAW-heavy states may mask the true effects of the IRCA. Of those studies that have focused specifically on California, none adopted a difference-in-differences approach. As this approach controls for exogenous changes to the state economy and public policy, it provides a way to eliminate a large number of potential omitted variables. This paper thus contributes to the literature by adding a focused difference-in-differences examination of the IRCA's wage effects on some California communities.

3 Data and Methodology

3.1 Data Sources

I used two main sources of data for this study. I used data from the 1980 and 1990 Censuses for demographic and wage data for farmworkers and unemployment insurance data from the Bureau of Labor Statistics (BLS) for wages and employment on farms and in FLCs. County-level data on these topics are surprisingly difficult to obtain, but I was able to obtain three key datasets.

To identify high and low immigration regions, I used the *1989 Statistical Yearbook of the Immigration and Naturalization Service*. While the yearbook does not provide exact number of SAWs per county, it did list the top six INS regions in which SAWs settled in California. SAWs were most heavily concentrated in the Los Angeles area. 302,000 SAWs settled in the joint Los Angeles-Riverside-San Bernardino INS region, almost half of all the SAWs in California and one-third of all SAWS in the US. The Los Angeles region's unusually high number of SAWs thus makes it a good treatment area. I use the three counties of Riverside, San Bernardino, and Orange County for this region. I do not include the Los Angeles county because its agricultural workforce is primarily horticultural, which is a higher-paid and smaller group.

Conversely, the North Coast region, a grape and pear-producing group of counties north of the San Francisco Bay, had far fewer SAWs. I use Lake, Mendocino, Napa, and Solano counties as the control region. While this method of determining a SAW-heavy treatment region is imperfect, data from the 1980 and 1990 US Censuses confirm my assumptions; counties isolated as high-immigrant had significantly more growth from immigration, particularly from Mexico, than those considered control counties ("California County Projections," 50-54). As

81.5% of all SAWs were from Mexico (*1989 Statistical Yearbook*, pg. xxv), this supports my choice of counties.

In order to examine immigration shifts and to ensure that any change in wages was due to labor market forces rather than demographic shifts, I used data taken from the 1980 and 1990 US Censuses. I obtained this dataset through the IPUMS-USA website run by the Minnesota Population Center at the University of Minnesota and identified regions of interest using Public Use Microdata Areas (PUMAs), which divide states into regions with populations between 100,000 and 200,000. Heavily populated counties, such as Los Angeles County, are divided into multiple PUMAs, while less heavily populated counties, such as those in the North Coast, may be grouped into one PUMA. I focus my study on PUMAs contained entirely within the chosen regions.

Table 1: Summary Statistics for Census Data

	Average Real Wage Income	**Number of Workers**	**Avg. Age**	**Number of Mexican Workers**	**Number of Immigrant Workers**	**Number of Noncitizen Workers**
1980 Los Angeles	8685.50	815	37.06	531	449	362
1980 North Coast	7832.17	283	33.91	129	135	109
1990 Los Angeles	7281.35	1080	36.99	902	875	758
1990 North Coast	8352.76	304	35.28	222	219	196

I limit my dataset to individuals who list their occupation as farm workers and have non-zero wage income. Unfortunately, restricting by occupation will lead to undercounting of

farmworkers, since the Census is taken outside of peak agricultural months (Martin et. al, 1995). The dataset also fails to differentiate between wages earned specifically from farm labor and those from other jobs, so total wage income may reflect a variety of jobs taken by the individual. These two factors likely offset each other to some degree, as workers in agriculture outside of peak months are more likely to work in agriculture year-round and thus only make money from agriculture. Finally, the Census undercounts migrant farm workers, since it does not reach people without a permanent home address and fails to correctly count many non-English-speaking individuals. However, these weaknesses are offset by the detail available on individual demographics for those farmworkers included in the census.

For wages and FLCs, I was able to the use the Bureau of Labor Statistic's Quarterly Census of Employment and Wages (QCEW). This dataset summarizes key statistics taken from unemployment insurance (UI) forms, sorted by industry of the employer and county. Given differences in UI laws across states, QCEW data are not useful for comparisons across states but are useful for research on regions within California. Additionally, California has more inclusive filing requirements than other states, requiring employers who pay more than $100 in wages per quarter to file. This expands the sample to small employers, who are often overlooked in nation-wide studies.

Pre-1984, county-level data are only available for broad categories of companies, such as field agriculture or farm support service. I use this dataset to analyze trends in wages and employment for all workers in agricultural production between 1980 and 1994. However, these data do not include FLCs or allow examination of specific industries. Seasonal agricultural services (SAS) tend to be more labor-intensive, and most Californian SAWs were employed in SAS (Martin, 1994). As such, SAS wages could theoretically see a larger post-IRCA change

than other agricultural industries. After 1984, the BLS divided agricultural by crop: cash grains, field crops, horticulture, vegetables and melons, or fruits and tree nuts. The latter two categories are considered labor-intensive. Using a restricted dataset containing wages and employment in fruit and vegetable farms from 1984-1992, I was able to examine the effects of the IRCA on wages and employment those industries. Additionally, FLCs are differentiated from other industries, allowing me to look at FLC wages and employment before and after the IRCA.

There are a few issues with the data that should be addressed. First, employment data only take into account workers reported on unemployment insurance forms. Any workers paid under the table or employers who fail to file for unemployment will not be taken into account. Second, the limited scope of the detailed industry data prevents full analysis of trends preceding the IRCA. However, like the census data, the BLS data's imperfections are offset by its level of precision in types of farmworkers, quarterly data, and inclusion of FLC wages and employment.

Table 2: Summary Statistics for BLS Data

	All Workers (1980-1994)	**Fruit and Vegetable Workers (1984-1992)**	**FLC Workers (1984-1992)**
Avg. real wages, Los Angeles, pre-IRCA	$186.41	$170.13	$166.64
Avg. real wages, Los Angeles, post-IRCA	$182.04	$151.44	$150.68
Avg. real wages, North Coast, pre-IRCA	$165.44	$159.29	$187.60
Avg. real wages, North Coast, post-IRCA	$167.14	$159.29	$166.49
Avg. employment, Los Angeles, pre-IRCA	5293.81	2275.91	1716.31
Avg. employment, Los Angeles, post-IRCA	5004.73	1661.02	2189.05
Avg. employment, North Coast, pre-IRCA	1412.75	904.68	330.3
Avg. employment, North Coast, post-IRCA	1361.93	978.93	358.14

Figure 1: Employment for FLCs and Direct Hires

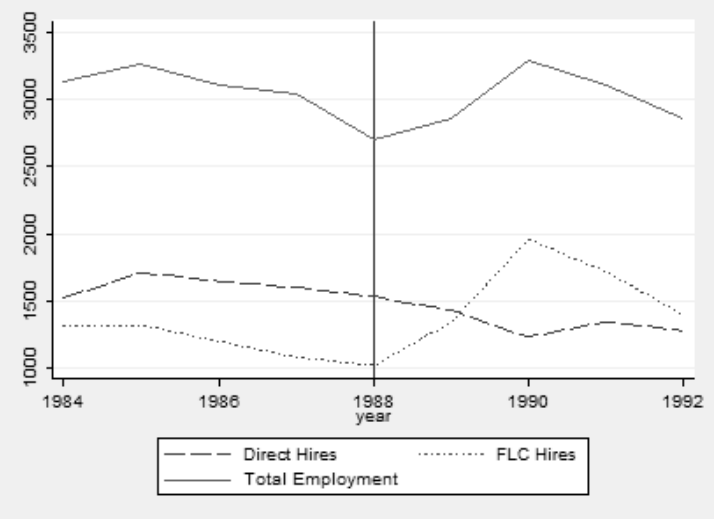


Figure 2: Real Wages for Non-FLC Agricultural Workers

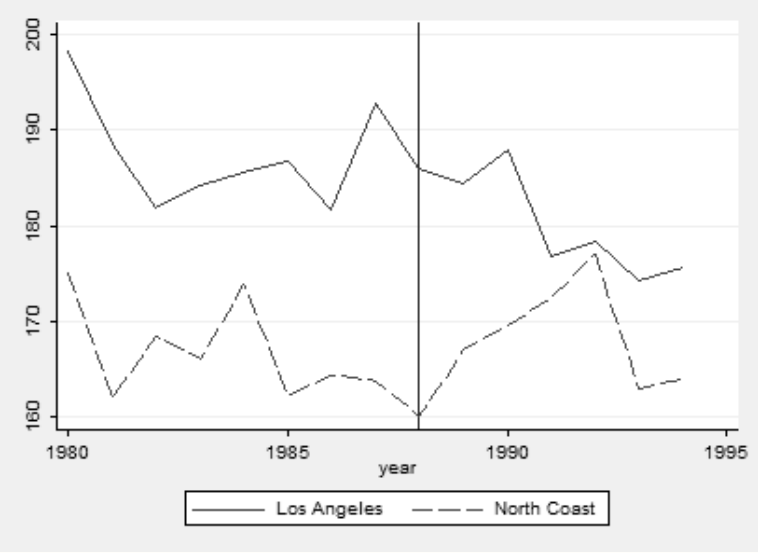
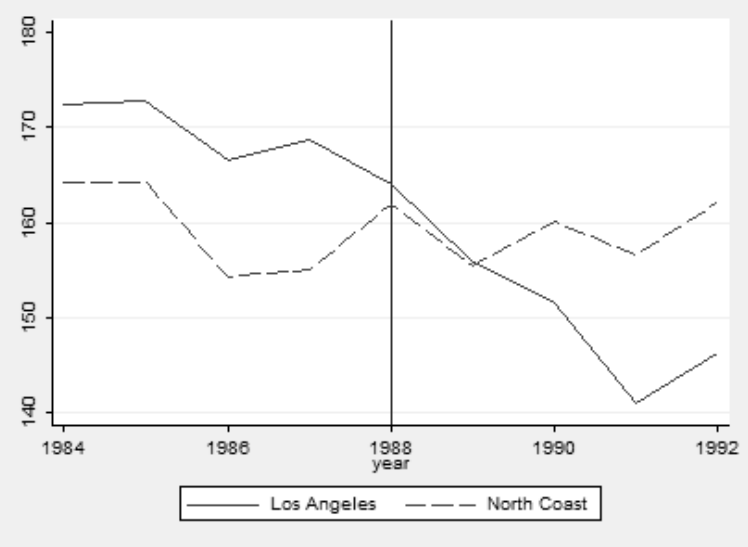


Figure 3: Real Wages of Fruit and Vegetable Workers



In conclusion, both datasets are imperfect but provide valuable insight in different ways. The Censuses shed light on post-IRCA demographic changes, while the BLS data illustrate real-time changes in wages and employment. Between the two sources, I hope to find a full picture of post-IRCA changes in wages, employment, and demographics among California's farmworkers after passage of the IRCA.

3.2 Methodology

Given the differing levels of SAW settlement across California, the IRCA created a natural experiment. Using the Los Angeles region as my treatment group and the North Coast region as my control, I conduct a difference-in-differences analysis using the model described below:

$$Y_{RLT} = \beta_0 + \beta_1 T + \beta_2 IRCA + \beta_3 R + \delta R * IRCA + \vec{x} \quad (1)$$

Y is the dependent variable in region *R* and industry *L* at time *T*. *T* is measured in quarters from the beginning of the dataset. *R* is a binary variable indicating if the county is in the Los Angeles region. *IRCA* is the binary variable for IRCA implementation, so the coefficient δ for interaction variable *R*IRCA* is the coefficient of interest. In order to control for fixed effects, $\vec{x}$ is a set of indicator variables for fixed quarter[2] and county effects and is included in all regressions. I also cluster errors by county for all regressions. This methodology is applicable to both employment levels and average wages.

I first use this equation to estimate the effects of the IRCA on wages and employment for all workers. I then isolate the fruit and vegetable industry, which tends to have lower barriers to

[2] Since most agricultural crops have highly cyclical demands for labor, employment and wages will be heavily influenced by the time of year. Including quarter fixed effects helps smooth out these fluctuations.

entry for workers and higher worker turnover, in order to examine the IRCA's effects on workers in this industry compared to those working with more capital-intensive crops. I also use a difference-in-difference-in-differences analysis to examine the difference between SAS and other workers:

$$y = \beta_0 + \beta_1 T + \beta_2 IRCA + \beta_3 LA + \beta_4 SAS + \beta_5 LA * IRCA + \beta_6 LA * SAS + \beta_7 SAS * IRCA + \beta_8 LA * SAS * IRCA + \vec{x} \quad (2)$$

As shown by the figures in Section 3.1, the change in wages may be due to a change in trends rather than a sudden drop as modeled by the difference-in-differences equation. This makes sense in the theory of a labor supply increase: if immigrants arrived slowly over the year-long application period between 1987 and 1988, the trend of wages could be changed rather than the level. This trend would further change after 1988, when the application period for legalization closed. A difference-in-differences approach would not properly model such an outcome. "A linear spline model is a sum of straight lines with a change in slope at each knot" (Desquilbet and Mariotti, 2010) and thus serves as a good model for changes in trends. By placing a knot at different points in the adaptation of the IRCA, I can model changes in the trends of employment and wages in these times. I adopt the basic linear spline function outlined by Desquilbet and Mariotti for the following equation:

$$Y = \beta_0 + \beta_1 T + \beta_2 TRANS + \beta_3 POST + \beta_4 R + \beta_5 R * T + \beta_6 R * TRANS + \beta_7 R * POST + \vec{x} \quad (3)$$

$$TRANS = \begin{cases} 0 \; if \; T \leq 12 \\ T - 13 \; if \; T > 12 \end{cases}$$

$$POST = \begin{cases} 0 \; if \; T \leq 17 \\ T - 17 \; if \; T > 17 \end{cases}$$

This linear spline model allows me to examine trends before and after the IRCA in both regions and isolate trend changes specific to the Los Angeles region. I place my first knot in the first quarter of 1987, the first quarter after the IRCA's passage, and treat the period between the IRCA's enactment and the end of the legalization application period in the first quarter of 1988 as the transition period. I then place the second knot at the end of the application period. As with the difference-in-differences model, I examine the changes for all workers and for those in fruit and vegetable crops.

I also examine demographic and income changes using the Census data. I use a difference-in-differences framework shown below to examine:

$$I = \beta_0 + \beta_1 YEAR + \beta_2 LA + \beta_3 LA_{1990} + \beta_4 SEX + \beta_5 AGE + \beta_6 EDUC + \beta_7 NONCITIZEN + \beta_8 YRSUS + \beta_9 IMMIGRANT + \overrightarrow{RACE} + \overrightarrow{HISPANIC} \quad (4)$$

LA and LA_{1990} are indicator variables respectively indicating residency in LA and residency in LA after passage of the IRCA. *EDUC* is years of education, *NONCITIZEN* is a binary variable for lack of citizenship[3], *IMMIGRANT* is a binary variable indicating if the individual is an immigrant, and *YRSUS* is the number of years since immigration if the individual is an immigrant. $\overrightarrow{RACE}$ and $\overrightarrow{HISPANIC}$ are vectors of variables indicating which race the respondent belongs to and, if the respondent is Hispanic, whether they are Mexican, Puerto Rican, or another Hispanic ethnicity. I restrict the dataset to individuals who list their occupation as farm worker.

I examine whether wages of the group that saw the greatest post-IRCA population increase, male Mexican immigrants, were significantly different from those of other individuals

[3] One important distinction is that these individuals are probably *not* undocumented. Legal permanent residents such as SAWs likely make up the majority of this population.

using a difference-in-difference-in-differences approach. The goal of this analysis is to see if Mexican men in the Los Angeles area post-IRCA saw a larger change in wages than other races in the area post-IRCA. The equation is as follows:

$$I = \beta_0 + \beta_1 YEAR_{1990} + \beta_2 LA + \beta_3 LA_{1990} + \beta_4 MMI + \beta_5 MMI * LA + \beta_6 MMI_{1990} \quad (5)$$
$$+ \beta_7 MMI_{1990} * LA + \beta_8 SEX + \beta_9 AGE + \beta_{10} AGE^2 + \beta_{11} EDUC$$
$$+ \beta_{12} NONCITIZEN + \beta_{13} YRSUS + \beta_{14} IMMIGRANT + \overrightarrow{RACE}$$

The coefficient of interest in this regression is β_7, the coefficient for the triple interaction variable between *MMI*, *YEAR=1990*, and *LA*.

4 Results and Analysis

4.1 BLS Data

The results of fitting (1) to average weekly wages and employment are shown in Table 3. In general, the results are not statistically significant, and they remain statistically insignificant even after relaxing controls on county fixed effects and quarter fixed effects. (The results of the regressions with relaxed controls can be found in Table 10 of the Appendix.) The main exception is the coefficient on *la_irca* in the regression on SAS worker wages, which is highly statistically significant without controls for county fixed effects but not statistically significant with them. However, it is interesting to note a consistent trend across all regressions: all measures of real wage decrease post-IRCA, with a larger decrease among workers in more labor-intensive crops and workers in FLCs. The coefficients suggest that, as measured by the 1980-1994 dataset, the average worker in Los Angeles earned approximately $3 per week less than their counterparts in the North Coast region. Additionally, the regression indicates a decrease in direct employment and an increase in FLC employment post-IRCA, confirming the trends shown in Figure 1.

The regression also suggests that, unlike other workers, FLC workers in Los Angeles had lower wages than North Coast workers even before the enactment of the IRCA. This difference could be why wage drop is much smaller for the 1980-1994 dataset, which does not include FLCs. It could also explain why the wage decrease was not caught in traditional econometric studies, since they generally did not take FLC employment into effect. As FLC employment rose and traditional employment fell, it is possible that more workers were both paid lower wages and excluded from most economic studies.

Table 3: Difference-in-differences for Real Wages and Employment

	All Workers (1984-1992)		Fruit and Vegetable Workers (1984-1992)		FLCs (1984-1992)	
	Real Avg_wkly_wage	**Employment**	**Real Avg_wkly_wage**	**Employment**	**Real Avg_wkly_wage**	**Employment**
time	-0.216	-1.68	-0.602	-8.43*	-0.136	7.96
	(0.284)	(2.86)	(0.461)	(3.99)	(0.441)	(9.52)
irca	6.18	-96.61	10.58	205.79	-2.22	-44.38
	(8.62)	(106.58)	(9.52)	(117.07)	(9.77)	(185.86)
los_angeles	38.69	944.22***	2.69	244.46	-7.94	97.12
	(3.83)	(174.78)	(5.96)	(145.02)	(9.78)	(272.35)
la_irca	-3.67	-247.97	-13.22	-448.97*	-12.65	328.46
	(7.16)	(174.78)	(9.11)	(213.60)	(9.10)	(486.28)
_cons	131.03***	366.97***	129.42***	534.71***	139.15***	-151.41
	(5.51)	(95.21)	(5.68)	(115.64)	(8.03)	(122.10)
N	418	418	363	363	168	168
R^2	0.690	0.896	0.308	0.594	0.719	0.822

*p(t) < 0.10, **p(t)<0.05, ***p(t) < 0.01

As shown in Table 4, the results of (2) support the general conclusion of (1). SAS workers in Los Angeles saw a $32 greater decrease in weekly wages post-IRCA compared to the post-IRCA change for similar workers in the North Coast. This change was statistically significant. If SAS workers are more sensitive to a labor supply shock due to the seasonality of their work, the larger wage decrease in the Los Angeles area would be consistent with a labor supply increase in that area. Employment shows a statistically significant decrease in employment in Los Angeles SAS farms after the IRCA. This suggests that industries with larger numbers of SAWs faced higher immigration paperwork costs and/or were more at risk for employer sanctions and thus shifted employment more to FLCs.

Table 4: Difference-in-Difference-in-Differences, BLS Data

	Real Wages	**Employment**
Time	0.214	-3.02
	(0.209)	(3.79)
Irca	-11.54	-31.27
	(10.05)	(134.57)
La	-10.43	28.87
	(9.98)	(18.33)
Sas	-79.75***	143.23
	(6.18)	(206.23)
Irca_sas	10.87	1406.23
	(4.82)	(946.33)
La_sas	27.39	1406.23
	(19.13)	(946.33)
La_irca	13.00	237.39
	(10.76)	(185.44)
La_irca_sas	-32.56**	-767.27**
	(12.50)	(226.23)
_const	199.22***	474.51***
	(3.60)	(106.30)
N	566	566
R^2	0.463	0.457

* p(t) < 0.10, **p(t)<0.05, ***p(t) < 0.01

The results of (3) are in Table 5. Note that I used the Stata mkspline function for these regressions. As such, the coefficient on each non-regional time variable is the *total* slope for each interval rather than the *change* in slope at each knot as specified in the description of the model. The region-time interaction variables represent the change in total slope from that of the baseline region. I used this format rather than the marginal one described in the model specification in Section 3.2 to make the results easier to read and analyze. I double-checked my results by repeating the regression using marginal splines, as specified in (2). These results confirm the findings of the non-marginal model, and can be seen in Table 9 the Appendix.

As with the difference-in-differences regression, most coefficients are not statistically significant. However, they have signs and magnitudes consistent with a labor supply increase concentrated in the Los Angeles region. Wages in both regions were already declining before the IRCA, but wages for all workers and for SAS workers in the Los Angeles region were decreasing more slowly than those in the North Coast. After the passage of the IRCA, both during the transition period and after full implementation, wages in Los Angeles decreased faster than those in the North Coast. This change in trend was particularly pronounced for SAS workers. Since SAS workers were more sensitive to fluctuations in the labor market due to the seasonality and low skill of their work and saw a greater level decrease in wages as shown by (2), these results further support a possible labor supply increase. Wages for FLC workers in the Los Angeles region decreased faster than those for similar workers in the North Coast region before the IRCA and during the transition period, but more slowly after the IRCA. This may be because of the large downward trend in post-IRCA FLC wages in the North Coast; as shown in the summary statistics, FLC wages in the two regions became closer during this period.

Table 5: Linear Spline of Real Wages and Employment

	All Workers (1980-1994)		Fruit and Vegetable Workers (1984-1992)		FLCs (1984-1992)	
	Real Avg_wkly_wages	Employment	Real Avg_wkly_wages	Employment	Real Avg_wkly_wage	Employment
time	-0.016	-5.39*	-1.41**	1.88	2.12	4.22
	(0.360)	(2.52)	(0.403)	(5.00)	(1.30)	(9.72)
Trans	-.008	5.09	2.03	10.42	-2.85	18.53
	(3.07)	(23.82)	(2.61)	(18.48)	(7.77)	(28.05)
Post	0.119	3.14	-0.10	2.48	-0.737	3.40
	(0.441)	(2.15)	(0.97)	(5.30)	(0.94)	(4.69)
Los_angeles	41.12***	328.25	-3.59	236.26	2.11	629.91*
	(6.39)	(244.35)	(9.74)	(205.65)	(14.07)	(272.77)
La_time	-0.076	40.98*	0.829	5.93	-1.47	-60.68
	(0.351)	(20.02)	(0.454)	(6.62)	(1.45)	(62.07)
La_trans	-0.390	-158.16	-2.42	-54.95	-1.32	37.37
	(3.19)	(91.64)	(2.69)	(48.61)	(8.07)	(113.24)
La_post	-0.554	-20.92*	-0.80	-31.14*	0.64	46.00
	(0.441)	(8.99)	(1.17)	(14.16)	(1.13)	(42.40)
_const	126.26***	449.83***	135.25***	434.69***	123.05***	-151.64
	(5.43)	(90.69)	(10.09)	(78.35)	(11.85)	(127.32)
N	417	417	363	363	168	168
R^2	0.734	0.900	0.313	0.598	0.726	0.831

* p(t) < 0.10, **p(t)<0.05, ***p(t) < 0.01

Though FLC employment grew in both regions, it grew much more post-IRCA in Los Angeles than in the North Coast. Additionally, employment of all workers and SAS workers increased at a faster rate in Los Angeles before the IRCA. However, while direct employment in the North Coast continued to increase after the IRCA, it decreased in the Los Angeles region. This result is statistically significant and open to two different interpretations. First, it could be interpreted as indicative of a decrease in agricultural demand, though this result is at odds with the negative coefficients on the wage variables. Alternatively, it could be the result of a shift from direct to FLC employment, which is consistent with the coefficient on the coefficient of interest in the FLC regression. Figure 1 strongly suggests that the latter option is correct, even if it is not fully reflected in the results of this regression.

The results of all analyses using the BLS data support the general academic consensus regarding post-IRCA employment: direct employment decreased but FLC employment increased more, creating an overall increase in employment. This is consistent with the possibility of a post-IRCA increase in labor supply as well as a change in the labor market structure. The results regarding wages are less clear. They show a post-IRCA decrease in wages that is particularly pronounced in the Los Angeles region, a result that is entirely consistent with a labor supply increased concentrated in that region. The difference-in-difference-in-differences result strongly suggests a labor supply increase given the size and statistical significance of the coefficient for the IRCA-SAS-Los Angeles interaction variable. However, the small size of the coefficients in the linear spline and their statistical insignificance limits our ability to consider the results indicative of a larger trend that would be expected under a labor supply increase. My analysis of the BLS data does not fully dispel uncertainty regarding the effects of the IRCA on the California agricultural labor market. Employment trends show strong signs of a labor increase

caused by the IRCA, but the effects on wages are slightly more ambiguous. While there is a strong suggestion of a level change in some industries, whether or not wage trends changed is unclear. To help resolve this remaining uncertainty, I turn to data from the US Censuses of 1980 and 1990.

4.2 Census Data

In contrast to the UI data, using data from the US Census to fit (3) indicates a statistically significant decrease in Los Angeles wages from 1980 to 1990 compared to those in the North Coast. This decrease is larger among Mexican men, as shown by Table 6. As shown by the estimation of (4) in Table 7, Mexican men in the Los Angeles region post-IRCA saw a much larger decrease in wages than any other demographic group. One particularly interesting element is that the coefficient on *La_1990* in Table 6 is both positive and statistically indistinguishable from zero, suggesting that other demographic groups did not see the same post-IRCA wage drop. The post-IRCA decrease in wages for all Los Angeles demographic groups may have been entirely due to decreases in the wages of Mexican men.

Table 6: Regressions on Farm Workers' Wage Income, US Census 1980-1990

	Real Wage Income (all)	Real Wage Income (Mexican men)
Year	16.20	-28.43
	(53.60)	(75.34)
Los_angeles	1250.96	637.49
	(801.65)	(1105.00)
La_1990	-1395.64*	-1787.41*
	(724.98)	(747.61)
sex	-5159.52***	--
	(171.80)	
age	757.15***	658.00***
	(36.67)	(54.61)
Age^2	-8.11***	-6.93***
	(0.520)	(0.583)
Race (as compared to white)		
Black	-3769.53***	--
	(730.89)	
American Indian	-3427.78*	--
	(1513.71)	
Chinese	-69.18.88***	--
	(1324.13)	
Japanese	-1609.62*	--
	(815.57)	
Other Asian/Pacific Islander	-3308.05***	--
	(677.05)	
Other Race	716.79**	--
	(262.28)	
Hispanic		
Mexican	-2145.10**	–
	(655.90)	
Puerto Rican	-5849.92*	--
	(2100.00)	
Other Hispanic	-1120.46	--
	(659.02)	
Years of Education	42.83***	29.98***
	(3.52)	(2.90)
Immigrant	-599.67	-768.89
	(1424.11)	(1156.40)
Years since Immigration	-0.44	-1.03***
	(0.678)	(0.197)
Lack of citizenship	-808.17**	-1521.98***
	(307.29)	(254.73)
_cons	-31979.24	53138.35
	(107272)	(150650)
N	2482	1318
R^2	0.224	0.109

*p(t) < 0.10, **P(t)<0.05, ***p(t) < 0.01

Table 7: Difference in Differences in Differences of Real Wage Income

	Real Wage Income
Year	-1.33
	(52.77)
Los_angeles	1129.66
	(629.33)
La_1990	78.74
	(682.54)
Mmi	291.22
	(1342.66)
Mmi_1990	-496.47
	(970.53)
Mmi_la	-366.03
	(1382.81)
Mmi_1990_la	-2178.35*
	(1055.72)
sex	-6270.15***
	(456.42)
age	746.93***
	(38.23)
Age^2	-7.97***
	(0.542)
Race (as compared to white)	
Black	-3297.36***
	(749.04)
American Indian	-2758.31*
	(1174.92)
Chinese	-5431.14***
	(605.38)
Japanese	-1072.62
	(1084.80)
Other Asian/Pacific Islander	-2644.19***
	(568.21)
Other Race	602.18**
	(208.20)
Years of Education	51.55***
	(4.39)
Immigrant	437.26
	(1316.15)
Years since Immigration	0.270
	(0.574)
Lack of citizenship	-804.74*
	(332.04)
_cons	1418.08
	(104991)
N	2482
R^2	0.226

This result is consistent with the possibility of an increase in labor supply caused by the IRCA, since SAWs were primarily Mexican men. However, the work of Bansak and Raphael (2001) suggests that these results could also be explained through discrimination. If employer sanctions increased the perceived risk of hiring undocumented workers, Mexican men, the demographic group stereotyped as the most likely to be undocumented, could see a wage decrease even without an increase in labor supply. This would explain why other demographic groups did not see the same wage decrease that Mexican men did. On the other hand, this explanation does not explain the change in demographic makeup shown in the summary statistics in Section 3.1. The fact that the number of non-Hispanics in agriculture halved while the number of Mexican agricultural workers nearly doubled is more indicative of an increase in labor supply than an increase in discrimination.

To account for the possibility that real wages fell in all low-skill occupations at the time, I estimated (3) for cashiers rather than agricultural workers. While cashiers are not ideal for comparison to farm workers, since they require higher human capital in the form of English language skills and math knowledge, they provide a useful look at the wage trends in other industries. Additionally, cashiers generally draw from a different labor market than agriculture (Heer et al. 1992), allowing us to look at a group that may have been less affected by the IRCA. As shown by Table 8, real wages for all cashiers did decrease between 1980 and 1990, but not by as much as with farm workers or in as statistically a significant manner. This suggests that, while wages may have stagnated or declined in a number of industries, there was an additional factor depressing wages for farm workers. Additionally, wages for male Mexican cashiers decreased more than those for similar farm workers and by far more than their counterparts.

Table 8: Regressions on Cashiers' Wage Income, US Census 1980-1990

	Real Wage Income (all)	Real Wage Income (Mexican men)
Year	228.30***	343.13***
	(11.84)	(66.44)
Los_angeles	-837.77	-816.78
	(436.30)	(642.68)
La_1990	-211.99	-2074.63**
	(269.12)	(719.33)
sex	-4515.90***	--
	(182.09)	
age	790.06***	1281.01***
	(83.21)	(162.89)
Age^2	-8.64***	-4.13***
	(0.993)	(1.95)
Race (as compared to white)		
Black	-1388.48**	--
	(427.25)	
American Indian	-1058.76**	--
	(384.25)	
Chinese	-2298.90*	--
	(1151.44)	
Japanese	-1978.81	--
	(1810.65)	
Other Asian/Pacific Islander	-2436.73**	--
	(712.44)	
Other Race	-325.98	--
	(573.19)	
Hispanic		
Mexican	-86.69	_
	(318.94)	
Puerto Rican	-81.37	--
	(585.37)	
Other Hispanic	595.95	--
	(911.55)	
Years of Education	62.63***	98.84***
	(6.95)	(11.67)
Immigrant	310.94	914.88
	(1321.73)	(2651.07)
Years since Immigration	0.077	-1.85
	(0.605)	(1.33)
Lack of citizenship	-667.32*	1652.15
	(290.45)	(899.22)
_cons	-456545.4***	-704242***
	(23305)	(133287)
N	5436	1752
R^2	0.194	0.242

There are two possible explanations for the unusually large wage decrease for Mexican male cashiers. As discussed earlier, the IRCA could have led to an increase in supply of Mexican men. If Mexican male cashiers are imperfect substitutes for cashiers from other demographic groups, their wages could be determined in a separate labor market, and an increase in supply would affect their wages far more than those of other workers. As with agricultural wages, it is also possible to attribute these changes to discrimination. However, as shown by the summary statistics, the number of Mexicans working as cashiers doubled between 1980 and 1990. While this is partially due to an overall increase in cashiers (the total number of individuals reporting their occupation as "cashier" increased by 1000 between the two censuses), it also suggests that the supply of Mexican male workers increased during this period. The latter interpretation is consistent with the hypothesis that the IRCA created a labor supply increase.

All together, the results of the regressions on the census data seem consistent with the theory that the IRCA led to an increase in low-skilled workers, primarily of Mexican origin. While there are other possible explanations for the trends seen here, notably discrimination caused by perceived risks of employer sanctions, an increase in labor supply best explains the results seen here.

4.3 Comparison and Analysis of Results

The results of the analyses of the BLS data clearly indicate that the IRCA changed labor market structures in agriculture. Out of concerns regarding the increased legal liability for hiring undocumented workers and the increased paperwork requirements for hiring at all, farmers decreased direct hiring. FLCs filled in the hiring gaps, and overall employment increased post-IRCA. However, the same regressions lack a consistent story regarding the effect of the IRCA

on wages. The results of the analyses are consistent with a labor supply increase, which would explain both the increase in employment and a decrease in wages that was particularly pronounced in Los Angeles, where most SAWs settled. The decrease in wages is larger for both SAS and FLC workers, two groups that would be more sensitive to labor supply fluctuations. Additionally, the difference-in-difference-in-differences analysis finds a highly statistically significant wage decrease for SAS workers in Los Angeles post-IRCA, exactly what would be expected under a labor supply increase. However, the results of both the linear spline and the difference-in-difference are statistically insignificant, limiting the applicability of the results.

Data from the US Census more strongly indicate a post-IRCA decrease in wages for agricultural workers. All workers in Los Angeles saw a statistically significant decrease in wages between 1980 and 1990 as compared to their counterparts in the North Coast region. This result is robust to controls for a wide variety of demographic factors. Additionally, as shown by the difference-in-difference-in-differences analysis, most of this decrease was caused by changes in the wages of Mexican men. Since Mexican men comprised about 80% of all SAWs, they are the demographic group that would have seen the greatest effect of a labor supply increase caused by the IRCA. This result also holds for an unrelated profession, cashiers, indicating that this was not simply the result of an economy-wide stagnation in real wages. In short, the Census data support the weak conclusion of a wage decrease from the BLS data.

In analyzing the results of the Census data analyses, I proposed an alternative explanation to that of a labor supply increase: discrimination against Hispanics caused by employer sanctions. However, this does not explain the BLS data, which shows an increase in employment post-IRCA consistent with a labor supply increase. Additionally, the wage decrease for Mexican men was far larger in Los Angeles than in the North Coast, but there is no reason

that discrimination would be more prevalent in Los Angeles. While it is likely that discrimination was a factor in the large difference between wages for Mexican men and other demographic groups, the combined results of the datasets are better explained by a labor supply increase concentrated in the Los Angeles area.

It is also important to address a possible reason why the standard deviations on results for the BLS analyses were larger than those for Census analyses. Note that the measure of wage income is average *weekly* wages per worker in the BLS dataset but *annual* wage income in the Census data. The effect of a change in wages will inherently be much smaller for weekly wages than for annual wages, and weekly wages are far more likely to fluctuate across quarters or between industries. The additional variance inherent in weekly versus annual wages may help explain why the results of the BLS data were generally less statistically significant than those of the Census data.

The joint examination of Census and BLS data creates a picture of a classic labor supply increase, decreasing wages for both agricultural workers living in the US before the law and for the new entrants. If anything, the data understate the effects of the IRCA on the agricultural labor market. The datasets used cannot take into account individuals paid "under the table" or most undocumented workers, the groups that are generally at risk for illegally low wages. Additionally, a number of studies have suggested that FLCs after the IRCA decreased worker pay in ways not reflected in wages. Many FLCs both took away traditional benefits, such as transportation to the fields, and added new costs, such as requiring workers to pay for their own tools. Finally, immigrants generally attempt to settle in areas where they will have the greatest economic opportunity and thus the lowest negative impact on wages. While SAWs likely had a number of reasons for settling in Los Angeles, including family connections or large Spanish-

speaking communities, there were likely many new immigrant SAWs who avoided Los Angeles because of the large increase in population. As such, while Los Angeles is by far the region with the largest segment of the new SAW population, it still may contain only a small segment of the all new immigrants. Failing to include these three elements biases post-IRCA wage estimates upwards and pushes changes due to a labor supply increase towards zero, suggesting that the change in labor supply due to the IRCA may be greater than visible in this data.

5 Conclusions

Through examinations of two separate datasets, I found evidence that post-IRCA agricultural wages and employment followed trends consistent with a labor supply increase concentrated in the Los Angeles region. In particular, I was able to show that direct employment decreased after the passage of the IRCA but increased farm labor contractor employment likely offset that decrease. As a result, overall farm worker employment increased. Additionally, while the UI data did not indicate a statistically significant wage decrease, the Census data showed a wage decrease, particularly among Mexican men. I was also able to show that non-Mexican cashiers did not see a similar wage decrease but that Mexican cashiers did, supporting Bansak and Raphael's theory of post-IRCA discrimination.

While these results cannot decisively prove whether or not the IRCA facilitated an influx of unexpected immigrants, they provide support for that theory and reflect the experience of farm workers and farm employers as reported in sociological studies on the effects of the IRCA. The analyses of this paper also suggest that this increase had significant, negative effects on the incomes of Californian farm workers, particularly men of Mexican descent. If these results are accurate, the effects of the IRCA on the agricultural labor market were the opposite of those intended: a larger, worse-paid workforce, increasingly undocumented, that remained unable to negotiate or demand improved treatment.

There is still significant room for research on the subject of the IRCA's effects on Californian agriculture. As discussed previously, the datasets used in this paper face a number of challenges. There are several government datasets that I was unable to gain access to due to privacy concerns, notably the NAWS database. Research using these data would significantly

expand my work. Additionally, further research quantifying the effects of FLC employment on non-wage benefits, such as housing, would expand our understanding of the true costs of the IRCA to workers. Finally, further discussion of the rate of exit of SAWs from agriculture would significantly enhance policy discussions of possible amnesty programs.

The lessons of the IRCA's failures are particularly relevant today. Congress, the President, and the American public are engaged in an ongoing regarding how we should fix an immigration system commonly regarded as broken. Most experts believe that the percentage of agricultural workers without documentation has surpassed the previous high, which occurred right before the passage of the IRCA. The same concerns that the agricultural industry expressed in the 1980s, worker availability and cost increases due to increased wages of legal workers, are being re-expressed today. Despite the passage of the IRCA, the need for immigration reform has not decreased. Policymakers can learn a great deal from failures of the IRCA, particularly in agriculture. As shown by this paper, any future immigration policy must be well-planned and consistently implemented in order to avoid unexpected, negative results.

Appendix of Additional Tables

Table 9: Linear Spline of Real Wages and Employment, Marginal

	All Workers (1980-1994)		Fruit and Vegetable Workers (1984-1992)		FLCs (1984-1992)	
	Real Avg_wkly_wages	Employment	Real Avg_wkly_wages	Employment	Real Avg_wkly_wage	Employment
time	-0.316	-5.39*	-1.41**	1.88	2.12	4.22
	(0.628)	(2.52)	(0.403)	(5.00)	(1.30)	(9.72)
Trans	0.984	10.48	3.44	8.55	-4.97	14.31
	(4.22)	(22.51)	(2.47)	(22.73)	(4.00)	(34.00)
Post	-0.555	-1.95	-2.13	-7.94	2.11	-15.13
	(4.02)	(23.79)	(3.50)	(16.57)	(3.43)	(27.51)
Los_angeles	35.71**	328.25	-3.59	236.26	2.11	629.91*
	(10.69)	(244.35)	(9.74)	(205.65)	(16.66)	(272.77)
La_time	0.226	40.98*	0.829	5.93	-1.47	-60.68
	(0.620)	(20.02)	(0.454)	(6.62)	(1.84)	(62.07)
La_trans	-0.527	-199.14	-3.25	-60.88	0.148	98.05
	(4.28)	(110.43)	(2.49)	(45.19)	(5.73)	(173.64)
La_post	-0.243	137.24	1.62	23.82	1.59	8.63
	(4.12)	(83.38)	(3.62)	(53.60)	(4.96)	(90.49)
_const	132.88***	449.83***	135.25***	434.69***	123.05***	-151.64
	(9.52)	(90.69)	(10.09)	(78.35)	(11.85)	(127.32)
N	417	417	363	363	168	168
R^2	0.692	0.899	0.313	0.598	0.726	0.831

Table 10: Linear Regression, No Fixed County Effects

	All Workers (1980-1994)				SAS Workers (1984-1992)				FLC Workers (1984-1992)			
	wages	**emplvl**	**wages**	**emplvl**	**wages**	**emplvl**	**wages**	**emplvl**	**wages**	**emplvl**	**wages**	**emplvl**
time	-0.132 (0.189)	-3.65 (2.99)	-0.143 (0.234)	-1.38 (3.44)	-0.618 (0.326)	-14..85 (8.33)	-0.690 (0.431)	-10.37* (4.44)	-0.719 (0.745)	8.52 (9.48)	-0.894 (0.631)	10.61 (12.46)
irca	5.64 (7.59)	58.33 (107.56)	6.00 (8.65)	-7.41 (120.15)	10.97 (7.16)	337.68 (174.76)	12.10 (9.18)	243.75* (123.08)	-8.70 (16.93)	-119.41 (185.42)	-5.27 (20.59)	-150.80 (228.51)
la	20.99 (20.88)	3981.72* (1739.61)	20.97 (20.98)	3979.98* (160.76)	10.78 (21.01)	1370.03 (788.25)	11.10 (21.12)	1368.85 (788.68)	-21.36 (41.40)	1390.69 (877.11)	-20.65 (42.17)	1396.44 (482.65)
la_irca	-6.08 (6.93)	-338.92* (161.72)	-6.07 (6.97)	-337.18* (160.76)	-18.40** (6.78)	-682.13** (267.36)	-18.20** (6.84)	-667.61** (268.81)	5.88 (15.96)	436.48 (486.46)	5.58 (18.28)	431.30 (482.65)
_cons	167.37*** (20.79)	1466.17*** (301.95)	164.60*** (19.13)	1189.13*** (285.27)	164.60*** (15.47)	1032.06** (369.81)	156.24*** (15.59)	949.54** (345.51)	193.75*** (10.32)	257.45 (164.48)	188.80 (43.01)	48.92 (231.92
Qtr controls	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
N	417	417	417	417	363	363	363	363	168	168	166	168
R^2	0.077	0.452	0.082	0.474	0.029	0.144	0.101	0.173	0.068	0.264	0.084	0.282

Table 11: Control Variation for Linear Spline, No County Effects, Total Slope Coefficients

	All Workers (1980-1994)				SAS Workers (1984-1992)				FLC Workers (1984-1992)			
	wage	**Emplvl**	**wage**	**Emplvl**	**wage**	**Emplvl**	**Wage**	**Emplvl**	**wage**	**Emplvl**	**Wage**	**Emplvl**
time	0.052	-7.35*	0.050	-5.88*	-1.33**	-1.24	-1.42**	2.68	2.55*	-1.90	2.34*	2.41
	(0.299)	(3.07)	(0.310)	(2.93)	(0.439)	(2.71)	(0.394)	(4.48)	(1.10)	(5.54)	(1.19)	(9.23)
Trans	-0.179	11.93	-0.158	6.07	2.02	4.44	2.19	-2.76)	-4.15	19.62	-3.60	17.24
	(2.88)	(21.95)	(2.94)	(23.55)	(2.44)	(14.25)	(2.72)	(15.99)	(6.99)	(25.43)	(7.06)	(27.83)
Post	0.128	2.01	0.121	3.18	-1.09	6.00	-0.164	7.05	-2.38	-4.96	-2.51	-4.63
	(0.415)	(1.56)	(0.438)	(2.14)	(0.904)	(5.14)	(0.975)	(5.60)	(1.36)	(5.14)	(1.35)	(6.49)
la	24.89	3624.94**	24.82	3618.51**	4.48	1341.90	4.60	1338.28	-0.926	1591.09	-1.08	1653.91
	(22.42)	(1356.19)	(22.57)	(1367.04)	(23.44)	(847.03)	(23.59)	(847.35)	(38.95)	(1262.24)	(39.23)	(1305.01)
La_time	-0.226	24.70	-0.222	25.01	0.849	7.10	0.880	7.46	-2.96	-26.18	-2.85	-33.30
	(0.300)	(27.40)	(0.298)	(27.13)	(0.486)	(6.35)	(0.461)	(6.42)	(1.68)	(51.96)	(1.74)	(54.64)
La_trans	0.724	-122.60	0.716	-123.27	-3.30	-76.29	-3.36	-75.61	1.97	14.61	1.66	19.71
	(3.08)	(103.97)	(3.08)	(103.90)	(2.77)	(67.51)	(2.87)	(67.30)	(7.79)	(98.71)	(7.98)	(97.14)
La_post	-0.560	-21.46**	-0.559	-21.45**	-0.994	-46.16***	-0.973	-45.23***	2.05	56.07	2.12	57.02
	(0.435)	(8.65)	(0.437)	(8.69)	(1.07)	(10.08)	(1.09)	(9.90)	(1.48)	(41.37)	(1.51)	(42.71)
_const	164.73***	1513.35***	161.97***	1237.37***	169.50***	917.67***	161.29***	831.95**	169.90***	343.27*	165.41***	102.67
	(21.07)	(317.74)	(19.27)	(289.56	(15.82)	(373.93)	(17.47	(352.55)	(32.47	(160.15)	(33.77)	(210.46)
N	417	417	417	417	363	363	363	363	168	168	168	168
R^2	0.081	0.454	0.085	0.503	0.031	0.150	0.050	0179	0.092	0.272	0.109	0.290

Bibliography

Alvarado, Andrew J., Gary L. Riley, and Herbert O. Mason. 1996. *The California Agricultural Labor Market in 1993: A Study of the Effects of the Immigration Reform and Control Act on Central California's Seasonal Agricultural Workers Between 1988 and 1993*. Fresno, CA: California Agricultural Technology Institute.

Bansak, Cynthia and Raphael, Steven. 2001. "Immigration Reform and the Earnings of Latino Workers: Do Employer Sanctions Cause Discrimination?" *Industrial and Labor Relations Review,* 54(2), pp. 275-295

Bean, Frank D. and Sorenson, Elaine. May 1992. "IRCA and Its Effects on Wages: Evidence from Current Population Surveys," Alfred P. Sloan Foundation Report.

Desquilbet, Loic and Mariotti, François. 2010. "Dose-response analyses using restricted cubic spline functions in public health research." *Statistics in Medicine*. Wiley Interscience.

Duffield, James A. and Harry Vrooman. 1993. "The Effects of IRCA on Farm Employment and Wages." *Report of the Commission on Agricultural Workers.* Washington, D.C. : Commission on Agricultural Workers.

Hardiman, Philip, Philip L. Martin, and J. Edward Taylor. 1988. "California farm workers and the SAW legalization program." *California Agriculture*, November-December, pp. 4-6.

Heer, D.M., V.Agadjanian, F. Hammad, Y Qiu, and S. Ramasundaram. 1992. "A Comparative Analysis of the Position of Undocumented Mexicans in the Los Angeles County Work Force in 1980." *International Migration,* 30(20), pp. 101-126.

Imbens, Guido and Jeffrey Wooldridge. July 30, 2007. "What's New in Econometrics? Lecture 10." NBER Summer Institute 2007. <http://www.nber.org/WNE/lect_10_diffindiffs.pdf>

Johnson, Hans. 1997. *Undocumented Immigration to California.* San Francisco, CA: Public Policy Institute of California.

Martin, Philip. 1990. "Harvest of Confusion: Immigration Reform and California Agriculture." *International Migration Review,* 24(10), pp. 69-95.

Martin, Philip. 1994. "Good intentions gone awry: IRCA and U.S. agriculture." *The Annals of the Academy of Political and Social Science*, Vol 534: July, pp. 44-57.

Martin, Philip and Dawn Thilmany. 1995. "Farm Labor Contractors Play New Roles in Agriculture." *California Agriculture,* 49(5), pp. 37-40.

Martin, Philip L., Wallace Huffman, Robert Emerson, J. Edward Taylor, and Refugio I. Rochin. 1995. *Immigration Reform and U.S. Agriculture*. Oakland, CA: University of California Division of Agriculture and Natural Resources.

Mason, Herbert O., Andrew J. Alvarado, and Gary L. Riley. "The Citrus Industry in California and Arizona: A Case Study of the Tulare County, California and Yuma County, Arizona Citrus Industries." *Report of the Commission on Agricultural Workers.* 1993. Washington, D.C.: Commission on Agricultural Workers.

Pena, Anita Alves. 2010. "Legalization and Immigrants in U.S. Agriculture," *The B.E. Journal of Economic Analysis & Policy*, 10(1), Article 7.

Rosenberg, Howard R. 1995. "IRCA and Labor Contracting in California." *Immigration Reform and U.S. Agriculture*. Ed. Philip L. Martin, Wallace Huffman, Robert Emerson, J. Edward Taylor, and Refugio I. Rochin. Oakland, CA: Division of Agriculture and Natural Resources.

Runsten, David, Roberta Cook, Anna Garcia, and Don Villarejo. 1993. "The Tomato Industry in California and Baja California: Regional Labor Markets and IRCA." *Report of the Commission on Agricultural Workers.* Washington, D.C.: Commission on Agricultural Workers.

United States Immigration and Naturalization Service. 1990. *1989 Statistical Yearbook of the Immigration and Naturalization Service.* Washington, D.C.: INS.

California County Projections. 1992. Palo Alto, CA: Center for Continuing Study of the California Economy.

"Employers, Employment, and Wages Paid in California." 1993. *Report of the Commission on Agricultural Workers.* Washington, D.C. : Commission on Agricultural Workers.