Domestic Farm Employment and the H-2A Visa Program

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Abstract

Many indicators suggest a potential decline in the domestic farmworker supply, which is often presumed to have driven agricultural employers towards an increased reliance on the H-2A visa program. Since hiring H-2A workers is generally more expensive than employing domestic farmworkers, it remains to be seen if reductions in domestic farm employment could be fully offset by increased H-2A employment. In this study, we first examine whether a recent downturn in the employment of U.S.-based Mexican-born workers is responsible for the recent rise in H-2A employment. Subsequently, we quantify the extent to which changes in domestic farm employment impact the employment of H-2A guest workers. Our results suggest that a structural shift in the domestic farm labor market around 2011 may be responsible for the recent increase in H-2A employment. However, the rise in H-2A worker employment has not fully compensated for the decrease in domestic farm employment.

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Introduction

Since the reintroduction of the Bracero Program during WWII,[1] Mexican nationals have played a central role in United States (US) agriculture (Clemens et al., 2018; Bracero History Archive, 2021). In recent years, however, farm labor markets have begun to show signs that they are tightening. For example, net migration from Mexico to the US has declined over the past decade (Passel et al., 2012), which has created challenges for domestic agricultural producers. This recent shift in migration is one of many indications of a decline in the number of U.S.-based foreign-born employees willing and able to work on American farms (Charlton and Taylor, 2016). There is also abundant evidence that farmers are adjusting their production and labor management practices, including raising wages, adopting labor-saving technologies, and hiring more employees through the H-2A visa program (Rutledge and Taylor, 2019; Castillo et al., 2022; Martin and Rutledge, 2022; Rutledge et al., 2022).

While the H-2A program might seem like an adequate substitute for domestic labor, employing H-2A workers is generally more expensive than hiring domestic employees because employers must provide free housing to H-2A workers, pay for transportation to and from the employees' source countries, and pay a minimum wage called the Adverse Effect Wage Rate (AEWR), which is almost always higher than federal and State minimum wages. If there is not a one-to-one replacement rate between the employment of domestic workers and those brought to the US through the H-2A program, other adaptation strategies will need to complement the use of the H-2A program to sustain current levels of labor-intensive crop production over the long run. In this study, we investigate whether a structural break in the employment of U.S.-based Mexican-born farmworkers is responsible for the rise in H-2A employment. We also provide estimates that provide insights into whether the H-2A visa program is functioning to offset the decline in domestic farm employment fully.

[1]The Bracero Program was a set of diplomatic agreements between the United States and Mexico that enabled Mexican laborers to enter the US to perform temporary contract work on U.S. farms first during World War I, and then during World War II. In both cases, the program was initiated to deal with potential farm labor shortages stemming from men leaving farm work for military service (National World War II Museum, 2023).

Our analysis builds upon the difference-in-differences (DID) empirical framework of Clemens et al. (2018) (hereafter, CLP) by using a continuous treatment variable that identifies the local labor market's exposure to labor supply shocks as measured by the share of Mexican immigrants in the local farm labor market. Clemens et al. (2018) investigate the impact of the exclusion of Bracero workers and find that it failed to improve labor market conditions for domestic workers due to an industry shift towards mechanization to replace workers. In the present study, we investigate a different adaptation strategy: the shift in labor composition brought about by substitution between U.S.-based Mexican farmworkers and non-immigrant H-2A guest workers. More specifically, our study differs from Clemens et al. (2018) in several important ways. First, our outcome of interest is the employment of H-2A workers, as opposed to the labor market outcomes of domestic workers. Second, our analysis uses a structural break in domestic labor supply, which is likely driven by a confluence of market forces, as opposed to a single policy-induced shock. While this may seem to be a disadvantage, we argue that this type of structural change is sufficient to test our hypotheses. Nonetheless, we complement our DID results by providing causal estimates of the impact of Mexican worker employment on H-2A obtained from fixed effects panel models. We estimate these models using Bartik-type instrumental variables similar to the one in (Card, 2001).

We estimate our models using data from the American Community Survey and the US Department of Labor's (DOL) H-2A disclosure data at the commuting zone-year level of aggregation. Our empirical analysis is comprised of an event study that uses 2011 as a reference year and a fixed effects panel regression approach that utilizes a shift-share instrument. Our findings indicate that a structural break in the employment of U.S.-based Mexican farmworkers in 2011 created a sharp expansion of H-2A employment that has continued to increase over time. This expansion was driven by demand for H-2A labor in commuting zones (CZs) that were more exposed to fluctuations in immigration shocks due to relatively higher exposure to Mexican immigrants in these labor markets. However, our findings indicate that the H-2A program only partially serves to offset the decline in U.S.-based Mexican

farm employment. Our preferred estimate indicates that a decrease of 100 domestic farm employees for the average CZ has caused an additional 80 H-2A jobs to be certified. This finding suggests that the H-2A program in its current state is not functioning to fully offset the decline in domestic farm employment when measured by the number of people employed at some point during the year.

Our study makes three important contributions. First, we contribute to the immigration literature, which has traditionally focused on identifying the impacts of increased immigration by, instead, estimating the impact of a negative immigrant labor supply shock. While a few studies have investigated similar types of labor shocks (e.g., Clemens et al., 2018; Rutledge and Mérel, 2023), our study differs in important ways because we focus on a sector of the economy during a recent period where immigrants generally do not compete with native-born workers. Given these facts, our research objectives and the policy implications of our findings deviate from those typically discussed in the general immigration literature.

Second, we contribute to the emerging farm labor literature focusing on the impacts of reduced labor availability in the US (Hertz and Zahniser, 2013; Richards, 2018; Zahniser et al., 2012; Rutledge and Mérel, 2023). Specifically, we focus on the impacts of a structural change in migration between Mexico and the US to understand the impacts on H-2A labor use among domestic farmers. To the best of our knowledge, only two other empirical studies aim to understand the drivers of H-2A employment (Castillo and Charlton, 2023; Arteaga and Shenoy, 2022), so our study provides new empirical evidence that contributes to this incipient area of research.

Third, we contribute to the policy discussion surrounding the H-2A visa program, which has become highly controversial. Specifically, we provide evidence that the H-2A program in its current state is not serving as a complete substitute for domestic labor, likely due, at least partially, to the higher costs of using the program. Thus, our analysis indicates that, in its current state, the use of the H-2A program may need to be complemented by other adaptation strategies (e.g., technology adoption) to maintain the current level of

domestically-produced labor-intensive crops.

The following section provides some background on recent labor trends and the H-2A program. Section 2 describes our empirical methodology and the data, Section 3 discusses our empirical results, and Section 4 provides some concluding remarks.

1 Background

Mexican immigrants initially became important to U.S. agriculture with the second Bracero program, a guest worker agreement between Mexico and the United States, conceived during World War II to tackle apparent farm labor shortages. Spanning 22 years, the program facilitated the migration of seasonal farm workers from Mexico to the U.S. until its termination in 1964. The program's dissolution primarily hinged on the belief that it suppressed agricultural wages and displaced domestic workers (Borjas and Katz, 2007; Clemens et al., 2018).[2]

Despite the Bracero program's end, U.S. farmers became increasingly dependent on Mexican labor due to heightened unauthorized migration. The Bracero program's legacy included a vast migration network which, combined with a robust U.S. economy, high fertility rates in Mexico, and lax U.S. immigration enforcement, led to a large-scale influx of undocumented Mexican workers to the U.S. starting in the 1970s (Hanson et al., 1999; Munshi, 2003; Orrenius and Zavodny, 2005; Hanson and Mcintosh, 2010). Many migrants, arriving undocumented, found employment within U.S. farms (Taylor and Charlton, 2018). Notably, the termination of the Bracero program did not introduce laws against hiring unauthorized workers.

Created in 1986 as a product of the Immigration Reform and Control Act (IRCA), the H-2A program initially experienced a low adoption rate. IRCA, which prohibited the

[2]However, Clemens et al. (2018) point out that there was little to no empirical research to back these claims. Their work shows that neither farm wages nor the employment of domestic workers rose immediately after the Bracero program ended. Rather the inward shock to the foreign-born labor supply led to a rise in mechanical innovations and the adoption of labor-saving technologies. Even production of more difficult-to-mechanize crops continued without a concurrent rise in wages.

employment of unauthorized immigrants, facilitated a pathway to legality for those in the U.S. since 1982 or prior and boosted Border Patrol funding, but seemingly did not deter high migration rates throughout the 1990s. During this period, there was a significant surge in the share of unauthorized Mexican workers in U.S. agriculture. Estimates computed using the National Agricultural Workers Survey show that unauthorized workers composed at least half of the crop workforce from the mid-1990s, though this proportion began to decline in the 2010s.

Agricultural employers have often cited the substantial costs and administrative burden of applying for H-2A visas as a second reason for the program's initial low adoption rate. To receive H-2A certification, employers must fulfill several requirements, including demonstrating insufficient U.S. workers, proving the employment of H-2A workers will not adversely affect wages and working conditions of similar workers, and providing housing, transportation, and a minimum wage for H-2A workers, which is set by the Department of Labor and is almost always higher than federal and state min wages. Following these steps, employers must navigate a complex process involving the State Workforce Agency (SWA), the U.S. Department of Labor, and the U.S. Citizenship and Immigration Services (USCIS) to achieve certification (U.S. Citizenship and Immigration Services, 2022). Despite these challenges, there has been a recent steady increase in the demand for H-2A agricultural guest workers.

1.1 Data

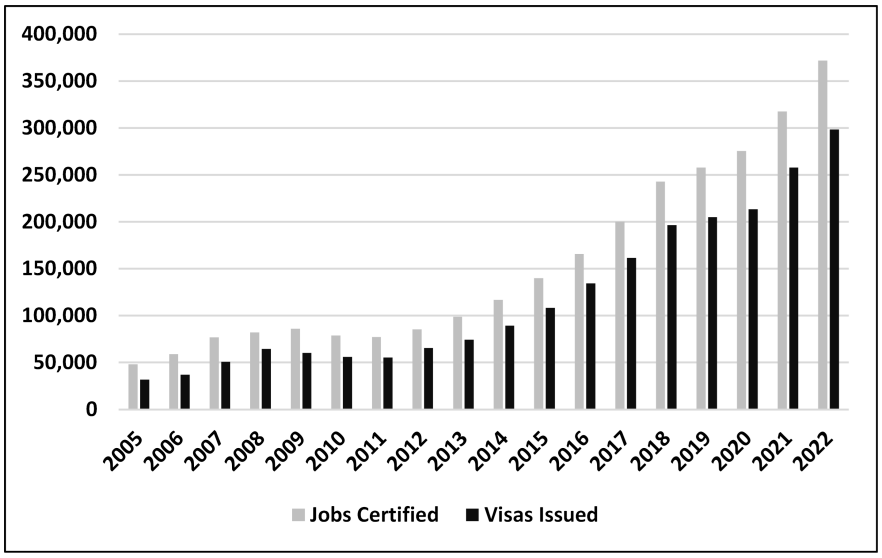
Our empirical analysis utilizes data from two public sources spanning the period from 2005 to 2017. We construct measures of H-2A employment by CZ using the U.S. Department of Labor's H-2A disclosure data (DOL (US Department of Labor)., 2023). These data contain the number of H-2A jobs certified to each H-2A employer applicant, the address where the agricultural work is to be performed, and the start and end dates of the certified contracts.[3].

[3]See Castillo et al. (2021) for a detailed description of these data.

Our second data source is the American Community Survey (ACS), which we use primarily to construct measures of immigrant employment in U.S. agriculture by CZ. The ACS contains information about each individual's birthplace, industry, occupation, length of employment during the previous 52 weeks, and citizenship status. We restrict our sample to Mexican immigrant workers who report working in the agricultural sector (crops and livestock) at some point in the previous year, report positive wage income, weeks and hours worked, and are not self-employed.

1.2 Trends in H-2A and Domestic Hired Farmworker Employment

Figure 1: Number of H-2A Visa Jobs Certified and Visas Issued: FY2005 - FY2022



Source: https://www.dol.gov/agencies/eta/foreign-labor/performance

Figure 1 shows that the number of certified H-2A jobs (visas issued) by the U.S. government has increased dramatically in recent years. The increase has been particularly pronounced since 2011. H-2A jobs have increased from 75,000 (56,000) in FY2011 to 370,000 (298,000) in FY2022 (see Figure 1).

The expansion of H-2A employment varies by region and commodity, which provides a robust source of identifying variation that can be used to examine the linkage between

changes in domestic farm employment and the employment of H-2A workers. This variation in H-2A expansion can be seen by comparing Figure 2, which shows the geographic distribution of certified H-2A jobs in FY2011, to Figure 3, which shows the number of H-2A jobs certified in FY2022. As shown in these figures, many states that historically had low H-2A employment levels have had explosive growth in the demand for H-2A workers over the past decade.

Figure 2: H-2A Certifications by State in FY2011

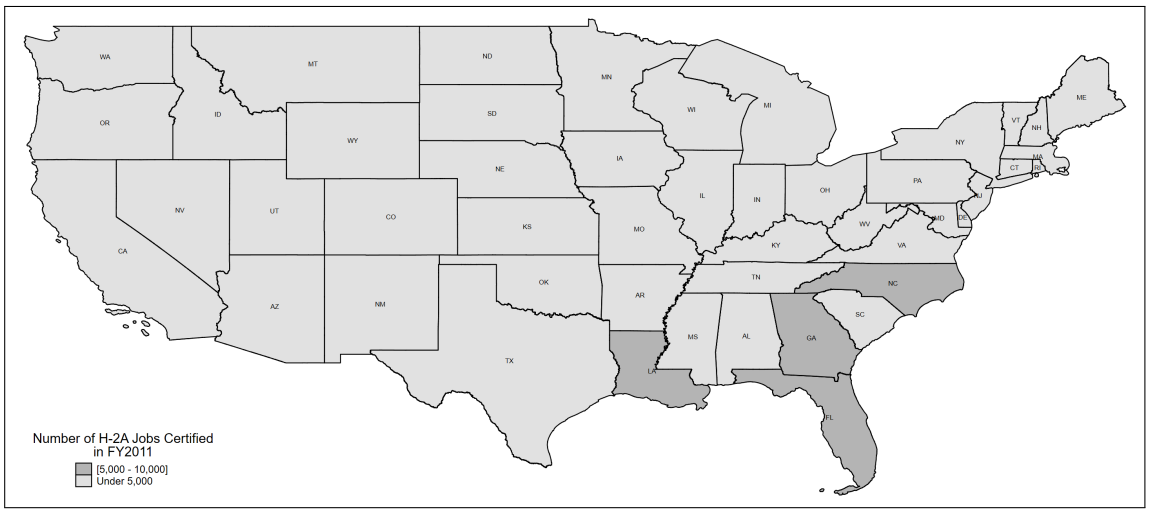
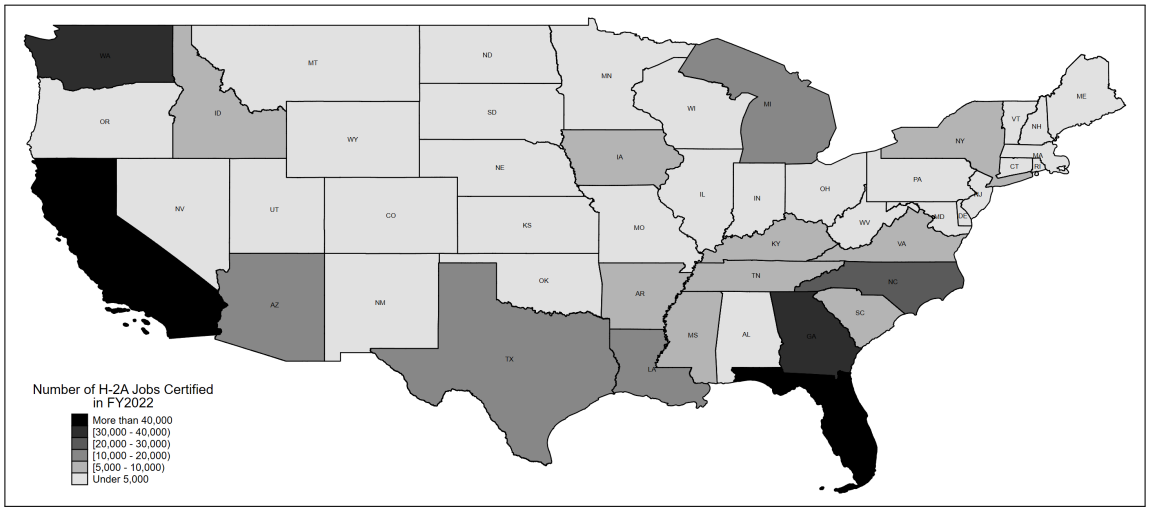


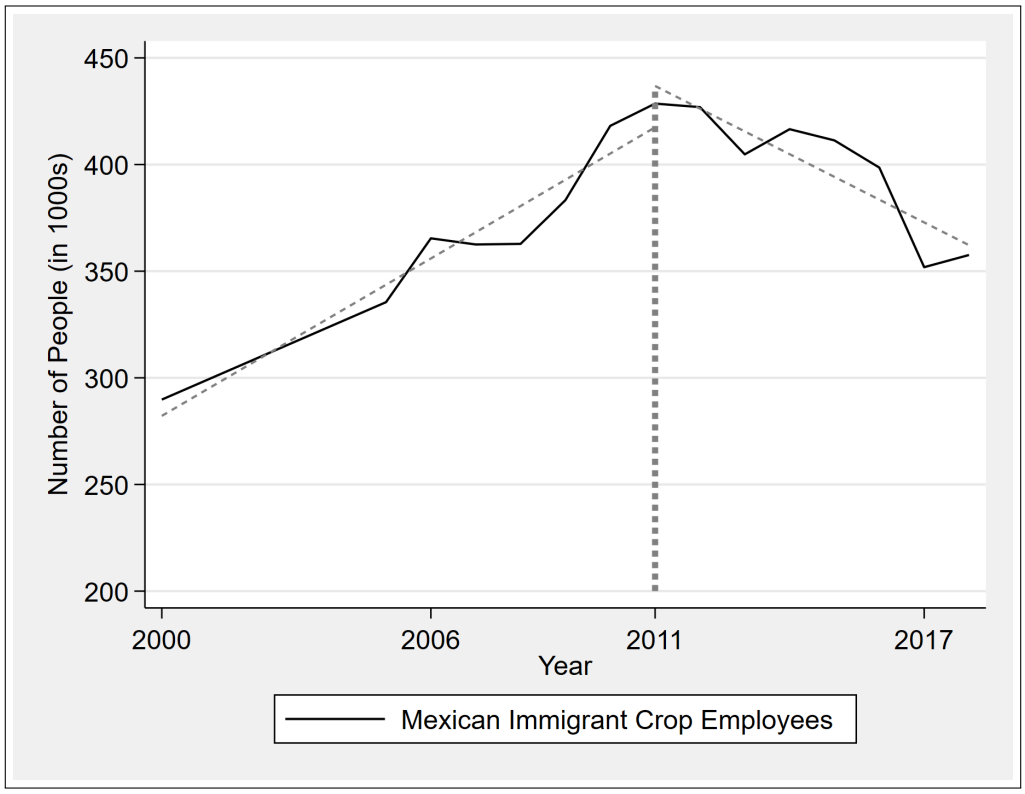
Figure 3: H-2A Certifications by State in FY2022



By some estimates, H-2A employees now comprise about 15% of the full-time equivalent (FTE) farm employment in the US, but most farmworkers are still U.S.-based Mexican-born

employees (Costa and Martin, 2020). However, all indications point to a negative trend in the employment of these U.S.-based Mexican farmworkers. Figure 4 depicts the total number of Mexican immigrant crop workers, computed using the ACS, between 2000 and 2017. The upward (resp. downward) sloping dotted line depicts a simple linear time trend between 2000 and 2011 (resp. between 2011 and 2017). As can be seen in the figure, a clear break in the trend occurred in 2011 when the number of crop hired farmworkers was at its peak of 429,000. We characterize this trend reversal as a "structural break" in the U.S.-based Mexican-born farm labor market. Importantly, this trend reversal seems to coincide with the start of the growth in H-2A shown above. In the next section, we provide formal evidence that this decline in Mexican farmworker employment is a primary cause of the expansion of the H-2A program.

Figure 4: Mexican Immigrant Crop Employees in Our Sample of Commuting Zones



2 Empirical Methodology

In this section, we describe the empirical models we use to investigate whether the structural break in the supply of Mexican immigrant farmworkers is responsible for the recent rise in H-2A employment and determine whether H-2A employment is serving to fully replace U.S.-based farm employment. Our event study model exploits the fact that the employment of U.S.-based Mexican farmworkers started declining after 2011. That is, we use 2011 as a reference period to test whether a "treatment" effect can be detected from this structural break in the farm labor market.

2.1 Methodology

Our methodological approach closely aligns with Clemens et al. (2018), who examine the effects of the 1965 termination of the Bracero program on native wages and employment. CLP begin their analysis by implementing a state-level difference-in-differences (DID) strategy with continuous treatment exposure, using wages and employment as dependent variables, and an indicator variable equal to 1 post-1965 (when the Bracero program ended) interacted with a measure of Bracero exposure. Bracero exposure is defined as the share of Mexican workers in the hired and seasonal labor force during the pre-sample period. To test the robustness of their findings, CLP implement fixed-effects (FE) panel regressions, with native outcomes as dependent variables and Bracero labor stocks as the main explanatory variable.

In our study, we begin by implementing a DID approach at the CZ level, investigating the influence of H-2A employment on Mexican farmworker exposure (a measure inspired by CLP's methodology). We implement our approach using the following regression models:

$$H2A_{ct} = \phi_c + \phi_t + \sum_{\tau=2005}^{2010} \alpha_\tau \cdot \frac{L_{c2005}^{mex}}{L_{c2005}} \cdot I(t=\tau) + \sum_{\tau=2012}^{2017} \gamma_\tau \cdot \frac{L_{c2005}^{mex}}{L_{c2005}} \cdot I(t=\tau) + \varepsilon_{ct} \quad (1)$$

where $H2A_{ct}$ is the number of H-2A jobs certified to work in commuting zone c at time t, and ϕ_c and ϕ_t are CZ and year fixed effects (FEs), respectively. $I(t=\tau)$ are indicator

variables for each year in our sample. We exclude $I(t = \tau)$ for the reference year, which is 2011.

The variable L^{mex}_{c2005} is the number of Mexican farm employees in commuting zone c in 2005, and L_{c2005} is the number of all hired farmworkers in commuting zone c in 2005. Hence, the ratio of these two variables is the share of the local farm labor force comprised of Mexican immigrants during 2005.[4] We follow Clemens et al. (2018) and use this ratio to measure each CZ's degree of exposure to Mexican immigration shocks. The coefficients of interest are γ_τ, which capture differences in average H-2A employment between high and low-exposure CZs in year τ relative to their differences in 2011. We are also interested in the (α_τ's) because we can use them to evaluate pre-trends.

We complement our DID event study analysis with fixed-effects panel regressions of H-2A employment on measures of U.S.-based Mexican worker employment, which take the form:

$$H2A_{ct} = \alpha_c + \mu_t + \gamma L^{mex}_{ct} + \varepsilon_{ct} \tag{2}$$

Our main specification measures $H2A_{ct}$ and L^{mex}_{ct} in levels. In alternative specifications, we normalize $H2A_{ct}$ and L^{mex}_{ct} by the CZ's population or the overall number of hired farmworkers.

We also estimate a separate set of long-difference models by splitting the sample into two separate 5-year intervals, taking first-differences from each year within the interval, and stacking the differences into a pooled sample:

$$\Delta H2A_{ct} = \Delta\mu_t + \gamma \Delta L^{mex}_{ct} + \Delta\varepsilon_{ct}.$$

As in most immigration studies, the main identification challenge results from the presence of unobserved local labor demand shocks. For example, suppose unobserved labor

[4]We measure exposure in 2005 because this year precedes the Great Recession and is thus not influenced by macroeconomic shocks that impacted employment during the recession years, but is recent enough to provide an informative measure of Mexican worker prevalence in the farm labor force before our "treatment year", which is 2011. Our results are robust to measuring exposure in the year 2000.

demand shocks, LD_{ct}, enter our model as follows:

$$H2A_{ct} = \alpha_c + \mu_t + \gamma L_{ct}^{mex} + \underbrace{\theta LD_{ct} + \nu_{ct}}_{\varepsilon_{ct}}$$

where $\mathrm{E}[LD_{ct}|L_{ct}^{mex}] \neq 0]$ and $\mathrm{E}[\nu_{ct}|L_{ct}^{mex}] = 0]$. Using the omitted variable bias formula, it is straightforward to show that the probability limit of the OLS estimator of γ is:

$$\gamma^{OLS} = \gamma + \overbrace{\theta \frac{\mathrm{cov}(L_{ct}^{mex}, LD_{ct})}{\mathrm{var}(L_{ct}^{mex})}}^{\text{Bias}\geq 0}.$$

Since local farm labor demand shocks should be positively correlated with both H-2A employment (i.e., $\theta \geq 0$) and U.S.-based Mexican farm employment (i.e., $\mathrm{cov}(L_{ct}^{mex}, LD_{ct}) \geq 0$), OLS estimates are likely biased upwards.

To address this bias, we instrument for L_{ct}^{mex} using variants of the widely-used Bartik instrument, which is common in the literature on Mexico-U.S. migration (e.g., Card and Lewis, 2007; Cadena and Kovak, 2016). The instrument is given by:

$$Z_{ct} = L_{c,2005}^{mex} \times L_t^{mex} \tag{3}$$

Here, L_t^{mex} represents the total Mexican farmworker employment in the US (excluding commuting zone c) in year t. In our long differences specifications, we instrument ΔL_{ct}^{mex} with $\Delta Z_{ct} = L_{c,2005} \times \Delta L_t^{mex}$.

As discussed in Goldsmith-Pinkham et al. (2020), in settings like ours that utilize these instruments, the empirical approach resembles a DID research design with differential treatment exposure. In this context, the term fixed in the cross-section ($L_{c,2005}$, in our case) measures the extent to which each unit is exposed to a common shock (L_t^{mex}, in our case). The primary identification concern is that the level of $L_{c,2005}$ might influence *changes* in $H2A_{ct}$ through channels other than the labor supply channel we propose. To address these concerns, Goldsmith-Pinkham et al. (2020) recommend testing for parallel pre-trends, which

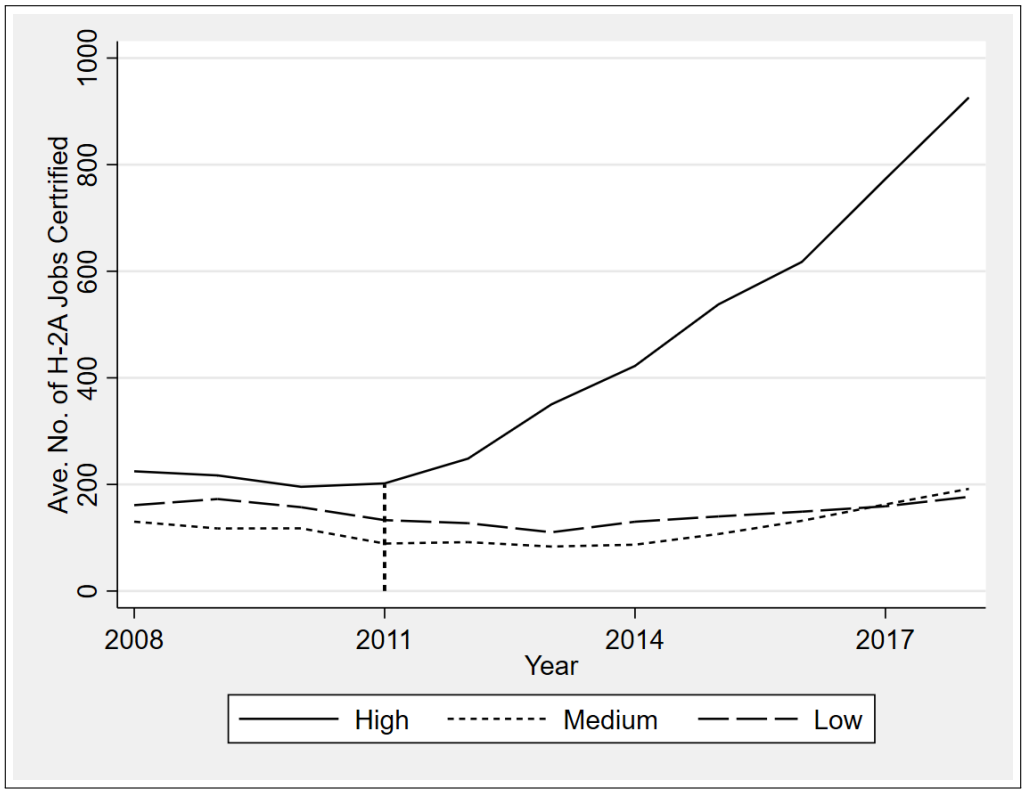
we implement in our analysis below.

3 Results

3.1 Event Study Analysis

The main identification assumption in DID analyses is the parallel pre-trends in outcomes between treatment and control groups. One informal way to verify this assumption and assess the policy's impact is to plot the outcomes for treated and control groups over time. In the context of continuous treatment exposure DID, this may involve dividing the exposure measure into discrete categories.[5]

Figure 5: Average Commuting Zone H-2A Employment by Exposure Level



In Figure 5, we present the average H-2A employment for high, medium, and low exposure

[5]For example, Figure 5 in CLP splits their measure into three groups and demonstrates no significant differences in wage pre-trends.

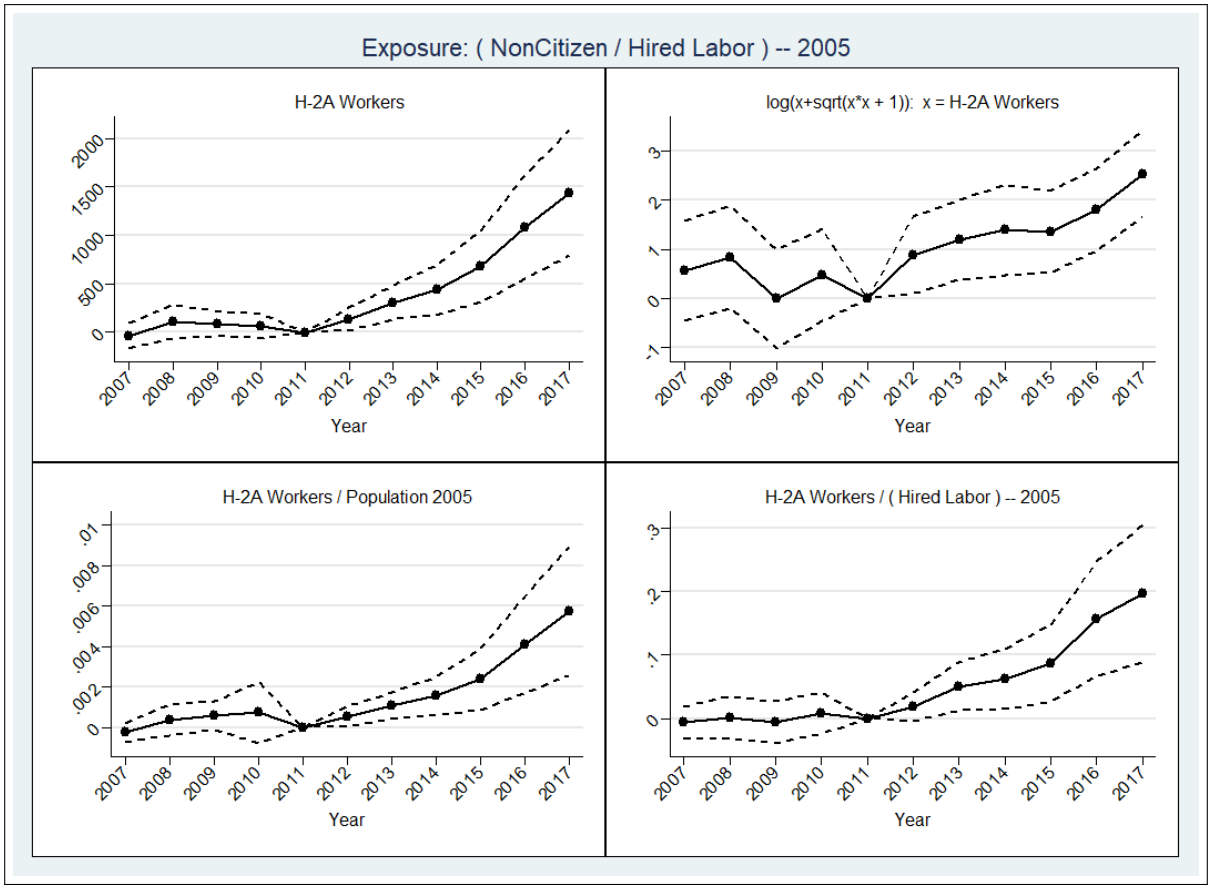
groups, categorizing CZs into groups containing similar numbers of CZs for simplicity. While average H-2A employment before 2011 is higher in the most exposed group, the difference in H-2A employment between this and the other two groups is relatively small. Figure 5 also reveals that H-2A employment differentials between high, medium, and low-exposure CZs remained stable until 2011. However, beginning in 2012, these differentials started to widen, which aligns with the hypothesis that CZs with larger shares of non-citizen Mexican farmworkers experienced more significant labor supply shocks, prompting more farmers to utilize the H-2A program.

In Figure 6, we provide more formal evidence of this divergence in trends by plotting the coefficients estimated in Equation (1), which further supports our hypothesis that negative labor supply shocks contributed to increased H-2A uptake post-2011. The top-left panel of Figure 6 shows the average H-2A employment differentials between more and less exposed CZs relative to the differentials in 2011. As seen in the figure, these differentials remain largely constant until 2011, consistent with the standard parallel trends identification assumption for a difference-in-differences model. However, following the structural break in the farm labor market in 2011, these differentials increased in subsequent years. The remaining panels of Figure 6 demonstrate the robustness of this finding to different definitions of H-2A employment. Additional robustness tests using this event study approach can be found in Appendix A.

3.2 Instrumental Variables Analysis

In this section, we present the results of the instrumental variables (IVs) analysis. Table 1 displays the estimates using the two-way fixed effects model shown above estimated using annual data for 2005-2017. Table 2 reports the estimates from the long differences computed as stacked first differences for the two sub-periods (2007-2011) and (2012-2017). Each table presents the OLS estimates in the left three columns and IV estimates in the right three columns. Each column within a panel (OLS or IV) displays results from a different

Figure 6: Event study results: H-2A employment



specification. The first specification is in levels, while the second and third specifications are normalized by the commuting zone's population or agricultural hired labor force size, respectively. We focus on a sample that excludes California[6] because it is an outlier in the sense that it is the state with the largest number of U.S.-born Mexican farm employees but has lagged in terms of H-2A uptake.[7]

The magnitudes of the negative OLS coefficients are much smaller than those from IVs regression, consistent with our theoretical expectations derived in Section 3.2. Our estimated coefficients are -0.8 for the level specification and -0.95 for the specification that includes normalization for agriculture labor force size (see Table 1). The interpretation of the coef-

[6]The results from the samples that include California can be found in Appendix B.

[7]This can be attributed to the fact that California has been a late adopter of H-2A labor. Some of the possible reasons for this may include the high cost of living and housing prices, its close proximity to the Mexican border, and having a large number of undocumented immigrants.

ficient in the level specification is that, on average, a decrease of 100 U.S.-based Mexican farm employees leads to an increase of 80 certified H-2A jobs. The specification in column (6) indicates that a ten percentage point decrease in the share of U.S.-based Mexican farm workers causes a 9.5 percentage point increase in the share of H-2A jobs certified.

The results from our long differences analysis are shown in Table 2. The coefficients from this analysis are smaller in magnitude than those presented in Table 1. One interpretation could be that, over the long run, the substitution of H-2A employees for U.S.-based Mexican farm employees is lower than in the short run. This could imply that farmers are adopting alternative long-run mitigation strategies, such as technological advancements or changes in crop mix, to reduce labor demands.

Table 1: Estimate Effects of Domestic Non-citizen Mexican Crop Employment Shocks on H-2A Employment (2007-2017 Excluding California)

	(1) H2A	(2) $\frac{H2A}{\text{Pop}_{c2005}}$	(3) $\frac{H2A}{L_{c2005}}$	(4) H2A	(5) $\frac{H2A}{\text{Pop}_{c2005}}$	(6) $\frac{H2A}{L_{c2005}}$
	OLS			IV		
L_{ct}^{mex}	-0.075**			-0.800***		
	(0.029)			(0.226)		
$\frac{L_{ct}^{mex}}{\text{Pop}_{c2005}}$		-0.091**			-1.424***	
		(0.037)			(0.492)	
$\frac{L_{ct}^{mex}}{L_{c2005}}$			-0.049			-0.946***
			(0.035)			(0.300)
Observations	1671	1671	1671	1671	1671	1671

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Estimate Effects of Domestic Non-citizen Mexican Farm Employment Shocks on H-2A Employment (2007-2017 Changes Excluding California)

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ H2A	$\frac{\Delta H2A}{\text{Pop}_{c2005}}$	$\frac{\Delta H2A}{L_{c2005}}$	Δ H2A	$\frac{\Delta H2A}{\text{Pop}_{c2005}}$	$\frac{\Delta H2A}{L_{c2005}}$
	OLS			IV		
ΔL_{ct}^{mex}	-0.059*			-0.446		
	(0.032)			(0.300)		
$\frac{\Delta L_{ct}^{mex}}{\text{Pop}_{2005}}$		-0.111**			-0.432***	
		(0.044)			(0.163)	
$\frac{\Delta L_{ct}^{mex}}{L_{c2005}}$			-0.029			-0.630**
			(0.033)			(0.310)
Observations	277	277	277	277	277	277

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4 Conclusion

Mexican immigrants serve a crucial role in the production of labor-intensive crops in the US. However, for the first time in recent history, net migration from Mexico to the US has started to decline. As the supply of unauthorized immigrant workers willing to work in agriculture decreases, the demand for H-2A guest workers has risen. However, hiring H-2A workers is generally more expensive than hiring domestic workers, which may have disincentivized the use of the program to some extent. Consequently, adoption of the H-2A program remained extremely low until 2011.

In this study, we examine whether the expansion of the H-2A visa program was driven by a structural break in the farm labor market in 2011 and investigate whether the program is meeting its intended goal of offsetting any decline in domestic farm employment. To conduct our analysis, we utilize panel data from the ACS and DOL's H-2A disclosure data at the commuting zone-year level of aggregation.

Results from our preliminary analyses suggest that the recent rise in H-2A employment was induced by a structural break in the farm labor market in 2011. Moreover, we find that the employment of H-2A workers only partially offsets the decrease in U.S.-based Mexican

immigrant farm employment. Our analysis indicates that in an average CZ, a reduction of 100 domestic farm employees is accompanied by 80 certified H-2A jobs. Not all H-2A certifications result in workers being issued visas due to various factors (see Figure 1), including travel restrictions, delays in visa processing, or changes in the global labor market, so the number of H-2A workers actually hired may be lower than our estimates suggest. This indicates that farmers may need to consider alternative strategies to address the declining farm labor supply, such as investing in labor-saving technologies. However, it's important to note that adopting new technologies can be a significant financial and time investment, which may not be a feasible option for small-scale farmers who may not have the necessary resources. This could potentially lead small farmers to exit the market and have negative impacts on local economies and rural communities that rely on the agricultural sector.

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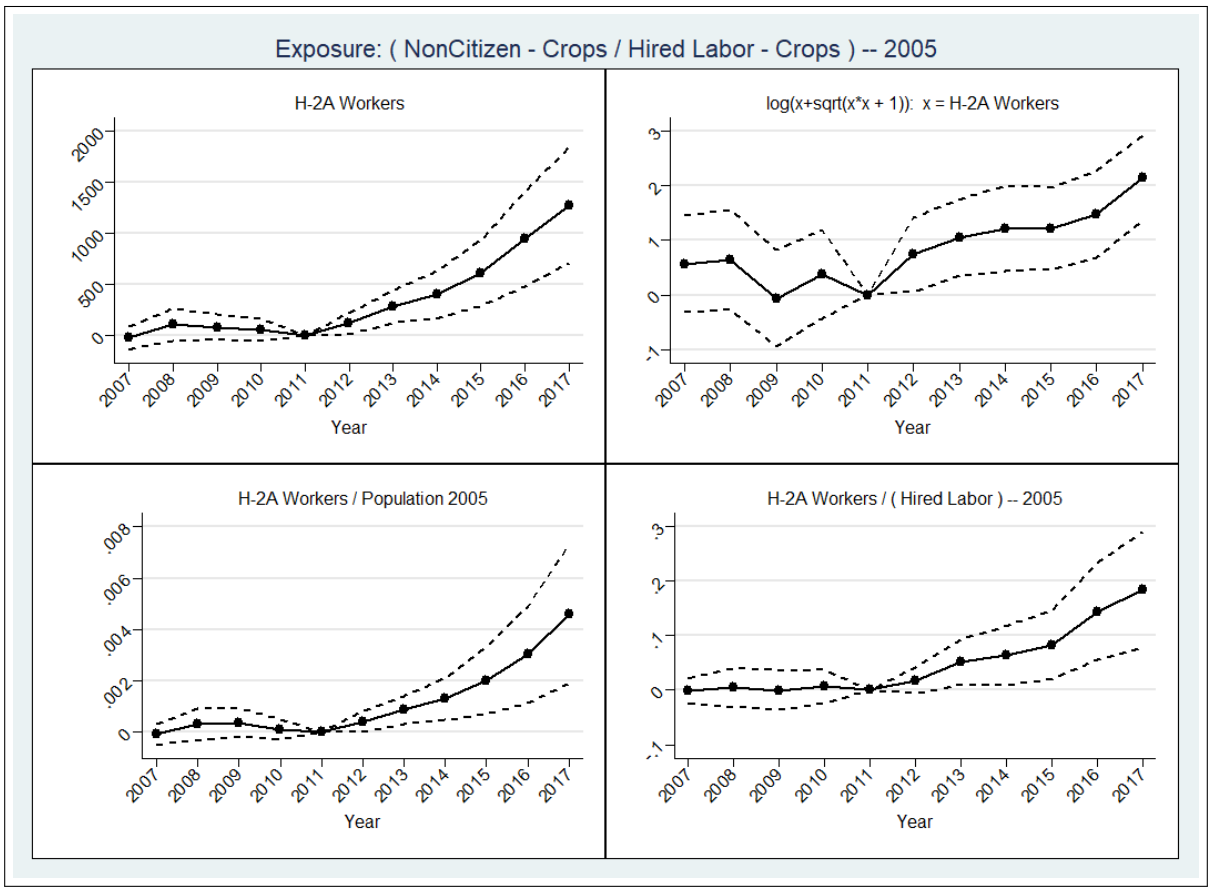
Online Apendices

A Event Study Robustness Tests

Figure A.1: H-2A Employment Differentials Using Exposure in Crop Employment



B IV Robustness Tests

Table B.1: Estimate Effects of Domestic Non-citizen Mexican Crop Employment Shocks on H-2A Employment (2007-2017)

	(1) H2A	(2) $\frac{H2A}{\text{Pop}_{c2005}}$	(3) $\frac{H2A}{L_{c2005}}$	(4) H2A	(5) $\frac{H2A}{\text{Pop}_{c2005}}$	(6) $\frac{H2A}{L_{c2005}}$
	OLS			IV		
L_{ct}^{mex}	-0.018			-0.145		
	(0.011)			(0.107)		
$\frac{L_{ct}^{mex}}{\text{Pop}_{c2005}}$		-0.074**			-1.161***	
		(0.032)			(0.411)	
$\frac{L_{ct}^{mex}}{L_{c2005}}$			-0.041			-0.781*
			(0.032)			(0.414)
Observations	1807	1807	1807	1807	1807	1807

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.2: Estimated Effects of Domestic Non-citizen Mexican Farm Employment Shocks on H-2A Employment (2007-2017 Changes)

	(1) Δ H2A	(2) $\frac{\Delta H2A}{\text{Pop}_{c2005}}$	(3) $\frac{\Delta H2A}{L_{c2005}}$	(4) Δ H2A	(5) $\frac{\Delta H2A}{\text{Pop}_{c2005}}$	(6) $\frac{\Delta H2A}{L_{c2005}}$
	OLS			IV		
ΔL_{ct}^{mex}	-0.029			-0.062		
	(0.018)			(0.041)		
$\frac{\Delta L_{ct}^{mex}}{\text{Pop}_{2005}}$		-0.097**			-0.336***	
		(0.041)			(0.116)	
$\frac{\Delta L_{ct}^{mex}}{L_{c2005}}$			-0.023			-0.258**
			(0.030)			(0.104)
Observations	301	301	301	301	301	301

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.3: H2A and nonCitizen(Crops) – (2011-2017 Changes)

	(1) H2A FTE	(2) H2A/Pop	(3) H2A/HL	(4) H2A FTE	(5) H2A/Pop	(6) H2A/HL
NonCitizen	-0.021*			-0.174		
	(0.011)			(0.133)		
NonCit/ Pop 2005		-0.155**			-1.519**	
		(0.066)			(0.591)	
NonCit/HL - 2005			-0.013			-0.704**
			(0.016)			(0.304)
Observations	1324	1324	1324	1324	1324	1324

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.4: H2A and nonCitizen(Crops) – (2011-2017 Changes) w/o California

	(1) H2A FTE	(2) H2A/Pop	(3) H2A/HL	(4) H2A FTE	(5) H2A/Pop	(6) H2A/HL
NonCitizen	-0.071***			-0.918***		
	(0.022)			(0.303)		
NonCit/Pop 2005		-0.184**			-1.802***	
		(0.074)			(0.664)	
NonCit/HL - 2005			-0.018			-0.823***
			(0.018)			(0.268)
Observations	1226	1226	1226	1226	1226	1226

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.5: H2A and nonCitizen(Crops) – (2011-2017 Changes)

	(1) H2A FTE	(2) H2A/Pop	(3) H2A/HL	(4) H2A FTE	(5) H2A/Pop	(6) H2A/HL
D.NonCitizen	-0.040			-0.097		
	(0.038)			(0.070)		
D.NonCit/Pop 2005		-0.337**			-0.638**	
		(0.172)			(0.302)	
D.NonCit/HL - 2005			0.034			-0.396***
			(0.062)			(0.143)
Observations	151	151	151	151	151	151

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.6: H2A and nonCitizen(Crops) – (2011-2017 Changes) w/o California

	(1) H2A FTE	(2) H2A/Pop	(3) H2A/HL	(4) H2A FTE	(5) H2A/Pop	(6) H2A/HL
D.NonCitizen	-0.057			-0.557		
	(0.063)			(0.342)		
D.NonCit/Pop 2005		-0.377*			-0.799*	
		(0.193)			(0.411)	
D.NonCit/HL - 2005			0.030			-0.692***
			(0.067)			(0.246)
Observations	139	139	139	139	139	139

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$