Encouraging Naturalization: The Broader Effects of DACA on U.S. Immigration

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Preliminary.

Abstract

This paper explores the potential effects of providing protection from deportation and work authorization on immigration, focusing on the impacts of Deferred Action for Childhood Arrivals (DACA). Such policies may increase immigration by enabling beneficiaries to support friends and family abroad or by acting as a "call" to prospective migrants. They may also reduce uncertainty for beneficiaries and their networks, which in turn strengthens ties to the destination country. Using a difference-in-difference design that exploits geographic variation in exposure to DACA-eligible immigrants, we find that DACA significantly increased the number of naturalized citizens without increasing the number of noncitizens. We show that this rise in naturalized citizens is driven by increased naturalization among prior noncitizens, most of whom are likely not DACA beneficiaries. Lastly, we provide evidence consistent with DACA increasing the incentives for, and reducing the barriers to, naturalization among eligible-to-naturalize noncitizens by protecting their undocumented DACA-eligible contacts. These findings indicate that temporary protections can encourage longer-term commitments and permanent residence among existing immigrants.

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1 Introduction

The recent surge in immigration to the United States has raised concerns about how to manage growing irregular migration, including both unauthorized immigrants and the increasing number of migrants who arrive at the border without valid documents seeking asylum. These arrivals have created processing backlogs and strained federal and local resources.[1] The Trump administration responded to these concerns by deporting many of these migrants, including those with ties to the U.S. or with previous forms of protections. An alternative policy would be to offer more formal temporary protections and work authorization. While such a policy could ease challenges associated with these migrants, it may also increase the incentive to migrate, leaving even some pro-immigrant policymakers cautious about its potential broader effects.

Providing immigrants temporary protection from deportation and work authorization could have several immigration-related consequences. First, beneficiaries may become more socially and economically secure which could allow them to provide resources for friends and family back home, leading to more immigration. Second, these policies could serve as a "call" for immigration. In other words, prospective migrants may believe they too will eventually receive such protections and authorization if they enter the U.S. Lastly, these policies may reduce uncertainty for the beneficiaries and their contacts, leading to greater commitments to living in the destination country. This may result in more permanent stays and increased naturalization of noncitizen immigrants.

This paper investigates the potential effects of providing protection from deportation and work authorization on immigration. We focus on the policy Deferred Action for Childhood Arrivals (DACA). Exploiting geographic variation in the pre-existing size of the DACA-eligible population and the timing of the policy, we show that DACA significantly increased the number of naturalized citizens but did not increase the number of noncitizens. We find that the increase in the number of naturalized citizens is driven by increased naturalization rates of previous noncitizens, the overwhelming majority of whom are likely not DACA beneficiaries. We provide evidence consistent with DACA increasing the incentives and decreasing the barriers to naturalization for eligible-to-naturalize noncitizens by protecting their DACA-eligible undocumented contacts.

To measure the size of the DACA-eligible population across geographies and quantify changes in immigration patterns over time, we use the IPUMS American Community Survey (ACS). The ACS provides information on birth country, citizenship, and year of immigration and naturalization for the foreign-born. Using these and other observable characteristics in the ACS, we show that there is considerable variation in the number of DACA-eligible immigrants as a share of the population across geographies several years before DACA is established. In our baseline analysis, we use the consistent public use microdata area (CPUMA) though the results are robust to alternative

[1] For example, in a letter to the Biden–Harris administration, mayors from 40 cities highlighted the strains created by recent migrant arrivals and the related challenges involving undocumented immigrants. They argued that providing secure status and work authorization would help these individuals support themselves and reduce vulnerability to exploitation. See the announcement from the office of the New York City Mayor here.

boundaries such as commuting zones (Autor and Dorn 2013; Autor et al. 2019).

Before DACA, areas with high baseline shares of DACA-eligible immigrants saw similar trends in the overall number of immigrants relative to places with low baseline shares. Almost immediately after DACA's implementation, the number of naturalized citizens increased differentially in areas with greater exposure to DACA-eligible immigrants. The number of noncitizen immigrants in these places did not increase and if anything decreased slightly, though the estimated effect size is not statistically significant. The strong, positive, and significant effect of exposure to DACA on the number of naturalized citizens combined with the small, negative, and insignificant effect on the number of noncitizens led to an overall increase in the number of immigrants. Our results suggest that for every three additional DACA-eligible immigrants, there was one additional immigrant, and this increase in immigration is driven entirely by more naturalized citizens.

How did exposure to DACA increase the number of naturalized citizens? We show that this increase is driven by increased naturalization of noncitizens using two complementary analyses. First, using ACS data on year of naturalization, we find that naturalization rates rose more in CPUMAs with higher baseline DACA-eligible shares. We also rule out changes in the migration patterns of already naturalized immigrants as a potential channel by showing that their in-migration and out-migration rates remained stable after DACA across CPUMAs with different exposure levels. Second, we conduct an accounting exercise which shows that post-DACA naturalizations fully account for the DACA-induced increase in the stock of naturalized citizens.

Despite the increase in naturalization, the number of noncitizens did not decline proportionally, leading to an overall increase in immigration. We investigate whether changes in noncitizen migration can explain this pattern. Survey-based measures suggest that exposure to DACA reduced both domestic in- and out-migration, while international inflows generally show little change, producing negative and statistically insignificant effects on net noncitizen migration. Part of the decline in domestic in-migration appears to reflect spillovers from reduced out-migration in origin areas with high DACA exposure. An adjusted measure of international inflows, which accounts for immigrants not surveyed in the year of their arrival, shows a slight increase, but still not enough to meaningfully raise net noncitizen migration. The absence of strong migration effects in the ACS leaves open the possibility of reduced international out-migration. While this cannot be observed directly, we find that the average years since migration among noncitizens increased in more exposed areas, providing suggestive evidence that DACA encouraged longer stays and may have reduced international out-migration. These results should be interpreted cautiously, however, given limitations in the ACS data, including potential undercounting of recent arrivals and the inability to directly observe international departures.

Why did DACA increase the naturalization rates of noncitizens? We argue that this is likely due to the fact that DACA increased the benefits and decreased the barriers to naturalization for eligible-to-naturalize immigrants. Of the many benefits to citizenship, one is the ability to quickly and easily sponsor relatives for legal permanent resident visas (i.e., green cards). However, most

undocumented immigrants cannot be sponsored given their immigration status. DACA eligibility opened several pathways for these immigrants thereby increasing the benefits to naturalization for their eligible-to-naturalize contacts. DACA's protection from deportation for undocumented immigrants may have also alleviated concerns about going through the process for eligible-to-naturalize immigrants living in mixed status households as the application requires providing information about one's immediate family members.

To shed light on this mechanism, we examine how exposure to DACA-eligible household members affects immigrants' likelihood of naturalization. We identify foreign-born childhood arrivals in the ACS and focus on other immigrants in their households who are noncitizens or recently naturalized citizens (naturalized in the current or previous year). We then compare naturalization behavior before and after DACA between eligible-to-naturalize individuals living with noncitizen foreign-born childhood arrivals and those living with citizen childhood arrivals. This design follows Kuka et al. (2020), who identify DACA's direct effects on education by comparing similar noncitizen and citizen groups, with only the former directly affected by the policy. We also exploit DACA's age-eligibility cutoff and conduct placebo tests among individuals living with age-ineligible childhood arrivals to verify that estimated effects are not driven by other contemporaneous shocks.

The results show large positive effects of living with DACA-eligible immigrants on the likelihood of naturalization. Our estimates suggest that living with DACA-eligible immigrants increased the likelihood of naturalizing by around 20 percent relative to baseline pre-DACA naturalization rates. These findings suggest that DACA may have increased the perceived benefits and reduced the costs or uncertainty associated with naturalization for immigrants living with potentially eligible family members.

Our research is related to work on the effects of immigration policy on chain migration and naturalization decisions. In particular, Cascio and Lewis (2023) study the chain migration impact of the Immigration Reform and Control Act of 1987 (IRCA), finding no support for out-of-control chain migration following the legalization of undocumented immigrants. In our paper, we study a contemporary policy that does not directly provide legal status for undocumented immigrants. In addition, we investigate new mechanisms relevant to our policy framework. Amuedo-Dorantes and Lopez (2021) study the effect of interior immigration enforcement on naturalization decisions. Our paper focuses on how a more pro-immigrant policy impacts naturalization.

This work is closely related to the literature looking at the impacts of DACA on immigrants and non-immigrants. Several papers investigate the impact of DACA on DACA recipients, finding improved economic outcomes (Pope (2016) and Amuedo-Dorantes and Antman (2016)) and changes in schooling decisions (Kuka et al. (2020) and Hsin and Ortega (2018)). Other work looks at the impact of DACA on recipients' well-being, such as marriage (Amuedo-Dorantes and Wang (2025)), health (Hainmueller et al. (2017)), and crime reporting (Pearson (2024)). There is also a recent and growing literature on the spillover effects of the policy on natives' economic (Battaglia (2023) and Kiser and Wilson (2024)) and educational (Ballis (2023)) outcomes. We complement this lit-

erature by considering how a temporary immigration policy may impact permanent immigration decisions.

2 Policy Background

2.1 Deferred Action for Childhood Arrivals (DACA)

Unable to pass more broad immigration reform, DACA was signed by Executive Order in 2012 by President Barack Obama. DACA provides recipients with relief from deportation for a period of two years and eligibility for a work permit. While recipients can renew these benefits, there is no direct pathway to citizenship through DACA.[2]

DACA applicants must meet certain eligibility requirements. Specifically, applicants must have been undocumented and physically present in the United States as of June 15, 2012. In addition, there is a set of requirements to ensure applicants arrived as children and are not a public safety concern. In particular, applicants must: (i) be under 31 as of June 15, 2012, (ii) have entered the United States before age 16, (iii) have been residing in the United States continuously since June 15, 2007, (iv) be at least 15 years old at the time of application, (v) be currently in school, have a high school diploma or GED, or have been honorably discharged from the armed forces, and (vi) not have been convicted of a felony, serious misdemeanor, three or more other misdemeanors, or pose a threat to national security.

The Department of Homeland Security began accepting applications in August of 2012. By May 2018, more than 900,000 initial applications had been received. The Trump administration rescinded the program in September 2017, and a series of court cases followed. The Supreme Court found Trump's rescission to be illegal, and President Joe Biden reenacted the policy. Texas courts then brought a suit against DACA and DACA's future is pending future court rulings. As of this writing, DACA recipients can continue to receive renewals, but no new applications will be processed.

2.2 Immigration Policy and Naturalization

While there are nearly 50 million foreign-born individuals in the United States as of 2023, representing almost 15% of the United States population, much of the immigration policy in the United States dates back to the 1960s to 1990s. For example, the Immigration and Nationality Act of 1965 is a key immigration policy, setting the main policies and regulations for immigration that are still used today. The 1965 INA abolished the national origins quota system and replaced it with the preference system that is currently in use. The Immigration Reform and Control Act of 1986

[2]The Dream Act, first introduced to Congress in 2001, would provide citizenship to childhood arrivals who meet certain eligibility requirements. The Dream Act has come before Congress several times since its introduction but has failed to garner the necessary support.

was a bipartisan agreement that granted amnesty for undocumented immigrants meeting certain requirements, alongside increased border enforcement and enhanced employer verification. A third key immigration policy, the Immigration Act of 1990, revised the 1965 INA to establish the H-1B visa program for skilled temporary workers. These policies shape the immigration procedures in the United States, including the process to become naturalized.

Of the foreign-born population, 49% are naturalized. Before going through the naturalization process, a foreign-born individual needs to obtain Lawful Permanent Resident (LPR) status (this status is often informally referred to as a "green card"). LPR status provides individuals with an indefinitely renewable visa to live and work in the United States. Individuals can become eligible for LPR status in several ways, such as family sponsorship, employment purposes, or refugee/asylee status. The length of time to obtain LPR status varies based on the type of visa and the origin country. There is a lot of variation in waiting time—from a few months to a few years—due to country caps and the cost can range several thousand dollars.

After being an LPR for 5 years (3 if married to a U.S. citizen), individuals become eligible-to-naturalize.[3] To naturalize, individuals must submit an application, attend a biometrics appointment, complete a citizenship interview, pass an exam testing English proficiency and U.S. civics knowledge, and take an oath of allegiance to the U.S. constitution. The processing time is several months, and the cost is around $800.[4]

Around 30% of LPRs have been eligible-to-naturalize for 20 years. Given the potential benefits of naturalization, such as voting, sponsoring family members, and receiving government benefits, why would some eligible-to-naturalize LPRs not naturalize? One reason could be financial. While the naturalization process is cheaper than the LPR process, the naturalization fee could be burdensome for some individuals. A second reason could be language or administrative barriers. Individuals need a strong grasp of the English language to pass the required examinations. Additionally, the form required for naturalization is 14 pages long, creating a barrier for individuals who may be eligible to naturalize. A third potential reason is lack of interest. Some individuals may not believe the benefits of naturalization exceed the (time and monetary) cost involved with the process. Individuals in mixed-status households may also be apprehensive of completing the naturalization process if they fear it may lead to adverse consequences for their undocumented housemates.

[3]Individuals must also maintain a continuous residence in the United States for the previous 5 years, with a physical presence in 30 months of the previous 5 years, and must have lived in their current state for the previous 3 months.

[4]The current form fee is $710 for an online filing and an additional $85 fee for the biometrics appointment. There are reduced fees for individuals meeting certain income restrictions.

3 Empirical Strategy

Our strategy for estimating the effects of DACA on immigration is similar to Cascio and Lewis (2023) who study the effects of IRCA on chain migration. Namely, we exploit the cross-sectional variation across geographies in the pre-existing size of the DACA-eligible population. We use the 2005 IPUMS ACS (Ruggles et al. (2025)) to estimate the size of the DACA-eligible population several years before DACA. We use 2005 as the baseline year because it is the earliest year in which the ACS provides granular geographic information for respondents; however, our results are robust to using other years to measure the pre-existing size of the DACA-eligible population.

We identify immigrants who will potentially be eligible for DACA if they meet the following conditions: i.) they are non-citizens, ii.) they have a high-school degree or more or are in school, iii.) they immigrated before the age of 16, and iv.) they would be 30 or younger and thus age-eligible based on their birth year and birth quarter.[5] Appendix Figure C.1 shows that the DACA-eligible counts we construct strongly predict subsequent actual DACA application numbers across metro areas.

Figure 1 shows the DACA-eligible population share across consistent public use microdata areas (CPUMAs)[6], which we use as our measure of exposure to DACA. There is considerable variation in exposure across CPUMAs, even within regions and in some cases within states.

3.1 Difference-in-differences

To identify the effects of DACA on immigration, we compare immigration patterns between geographies with high and low DACA-eligible shares before and after DACA. Specifically, we use a difference-in-difference approach and estimate the following specification:

$$y_{ct} = \alpha_c + \alpha_t + \beta \text{DACA Share}_c \times \text{Post}_t + X_{ct} + \varepsilon_{ct} \tag{1}$$

where y_{ct} is the outcome of interest in CPUMA c in year t. For the main results, the outcome of interest is the number of immigrants relative to the baseline population in 2005 ($100 \times \frac{immigrants_{ct}}{pop_{c2005}}$), which we refer to as the immigrant population share. We also estimate the effect of DACA on the number of immigrants by citizenship status (i.e., on the naturalized citizen share and the noncitizen share). DACA Share$_c$ is the DACA-eligible population share in 2005 in CPUMA c and Post$_t$ is an indicator equal to one for years $t \in [2012, 2019]$.

Exposure to DACA is correlated with other CPUMA characteristics which may shape immigration patterns over time. First, places with high DACA-eligible shares have higher levels of

[5] We classify an individual as age-eligible if they were born after 1981 or if they were born in the third or fourth quarter (after June) of 1981.

[6] The smallest geography available in the ACS is the Public Use Microdata Area (PUMA). Since PUMA boundaries change during our period of study, we use the CPUMA boundaries to ensure consistent geographic boundaries. In total, there are 1,078 CPUMAs. In Section 4.2, we show our results are robust to using alternative geographic boundaries such as commuting zones.

immigration. Following Battaglia (2023), we allow for different effects of baseline immigration by categorizing CPUMAs as high, medium, or low immigration areas based on their baseline immigrant population share tercile and interacting this categorical variable with year fixed effects. We are thus identifying the effects of exposure to DACA by comparing CPUMAs with similar immigration levels before DACA. In Section 4.2, we include additional controls to address confounding immigration shocks and obtain similar results.

In addition to immigration, we also measure the following baseline characteristics and interact them with year fixed effects: (i) Hispanic population share, (ii) Black population share, (iii) the share of the population that is male, (iv) the share of the working-age population with a college degree or more, (v) the average age, (vi) the share of the population living in poverty, and (vii) the natural log of the population. These controls allow for differential trends in immigration patterns based on these CPUMA characteristics. We include these baseline controls $\times$ year fixed effects and the immigrant population share tercile $\times$ year fixed effects in X_{ct}.

To account for time-varying labor demand, we add Bartik-style shocks. Specifically, we construct shocks for all workers (natives and immigrants combined), as well as separately for immigrants, noncitizens, and naturalized citizens. Each Bartik shock is defined as the weighted average of national industry employment growth, with weights given by the CPUMA's baseline (2005) industry employment shares for the relevant group:

$$B_{gct} = \sum_{j} \left(\frac{L_{gcj,2005}}{L_{gc,2005}} \right) \cdot \frac{L_{jt}}{L_{j,2005}}, \tag{2}$$

where $L_{gcj,2005}$ is employment of group g in industry j in CPUMA c at baseline, $L_{gc,2005}$ is total baseline employment of group g in CPUMA c, and $\frac{L_{jt}}{L_{j,2005}}$ captures national employment growth in industry j. These shocks capture local labor demand shifts arising from national industry trends.

We estimate equation 1 on the panel of CPUMAs (n=1,078) for the years 2006-2019 and cluster standard errors at the CPUMA level. Our coefficient of interest is β, which measures the average percentage change in the population driven by changes in immigration in the eight years after DACA (2012-2019).

Baseline Sample Characteristics: Table 1 presents the baseline characteristics of our CPUMA panel from 2006 to 2019. The average DACA-eligible share across CPUMAs was 0.968, meaning that, on average, there was roughly one DACA-eligible individual per 100 residents. Columns 2 and 3 divide the sample into CPUMAs above and below the median DACA-eligible share (0.595). CPUMAs with higher exposure had substantially larger immigrant populations, as well as higher shares of Hispanic, Black, and college-educated residents. Appendix Figure C.2 shows that controlling for the baseline immigrant population share substantially reduces these differences in CPUMA characteristics, though some residual variation remains. We thus include these demographic characteristics interacted with year fixed effects, allowing their effects to vary over time across CPUMAs.

Identifying Assumptions: The identifying assumption underlying our empirical strategy is that the counterfactual trends in immigration for high DACA exposure CPUMAs are parallel to trends for low DACA exposure CPUMAs, conditional on the flexible controls for the baseline CPUMA characteristics. We assess the plausibility of this assumption by regressing pre-DACA changes (2005-2011) in the immigrant, noncitizen, and naturalized citizen shares on the DACA-eligible share. Appendix Figure C.3 supports this assumption, showing that trends in immigration were not significantly different between CPUMAs with high and low DACA-eligible shares. In the next section, we present event-study versions of equation 1, which provide further evidence for the validity of this assumption.

Since our empirical strategy exploits a continuous measure of exposure to the policy change as the identifying variation, a stronger parallel trends assumption is required (Callaway et al. (2024)). The strong parallel trends assumption states that for all doses of treatment (i.e., exposure to DACA-eligible individuals), the average evolution of outcomes after DACA across all CPUMAs if they had been assigned that dose is the same as the average evolution of outcomes for all units that actually experienced that dose. We probe the validity of this assumption in three ways. First, we divide the sample into bins based on the exposure to DACA-eligible individuals, allowing us to analyze the impact across the full range of the exposure variable. Second, we exclude the top and bottom quintiles of exposure and re-estimate the treatment effects. Finally, we show that our results are robust to discretizing our measure of treatment to weaken the identifying assumptions required in the continuous difference-in-difference setting. Across all three tests, we find limited evidence of treatment effect heterogeneity and results are consistent with our baseline findings. The results of these analyses, discussed in Section 4.2.1, suggest there is limited evidence of treatment effect heterogeneity, lending support for using the continuous exposure measure in this setting.

In addition to the parallel trends assumption, for β to isolate the effects of DACA exposure, we must assume there are no other shocks that occur post-DACA that are correlated with DACA exposure. In Section 6, we exploit specific eligibility requirements to ensure that the effects we observe are indeed driven by DACA as opposed to other contemporaneous policies or shocks.

4 Effects of DACA on Immigration

4.1 Main Results

Figure 2 shows the coefficients along with 95 percent confidence intervals for the event study regression of equation 1 for the immigrant (panel (a)), noncitizen (panel (b)), and naturalized citizen (panel (c)) population shares. This regression separately estimates the interactions between the year and the DACA-eligible population share, with 2011 as the omitted year.

The estimates show similar pre-trends across CPUMAs, lending support to the identifying assumption. Turning to the post-period, the results show that a few years after the policy was

established, exposure to DACA increased the immigrant share. Interestingly, this increase in immigration was driven entirely by an increase in the number of naturalized citizens, while the number of noncitizens declined slightly but insignificantly.

Table 2 reports results of equation 1, which estimates the average effect of DACA from 2012-2019. The odd-numbered columns include our baseline controls described in Section 3.1, while the even-numbered columns additionally include Bartik labor demand controls for all workers, all immigrant workers, noncitizen workers, and naturalized citizen workers. The results suggest that a 1 percentage point increase in the DACA-eligible share increased the immigrant share by around 0.33 percentage points. Consistent with the event study results, this increase was fully accounted for by an increase in naturalized citizens, with no significant change in the number of noncitizens.

These results suggest that areas with large DACA-eligible populations did not experience an increase in the number of noncitizens, despite the possibilities of chain migration and decreased out-migration of existing noncitizens. Instead, we find striking evidence that DACA led to a significant increase in the number of naturalized citizens.

4.2 Robustness Checks

Before exploring the channels and mechanisms, we first assess the robustness of our main results to several potential confounders and report these in Table 3. We describe each in turn below.

Addressing Confounding Immigration Policy Shocks. One potential concern is that our estimates may capture the effects of other factors correlated with exposure to DACA, particularly changes in immigration policy affecting noncitizens. We address several salient concerns.

A first concern is that contemporaneous changes in interior immigration enforcement could drive our results. Amuedo-Dorantes and Lopez (2021) shows exposure to immigration enforcement spurred naturalizations, and East et al. (2023) and Pearson (2025) show such policies impacted immigration. Column 2 of Table 3 shows that our results remain robust to controlling for enforcement intensity across CPUMAs over time, using the enforcement index from Amuedo-Dorantes et al. (2021). This index counts the number of the following enforcement measures active in a CPUMA in a given year: local and state 287(g) agreements, Secure Communities, omnibus immigration laws, and employment-verification mandates. The stability of the estimates when including this index suggests that changes in enforcement do not explain our findings.

A second concern relates to sanctuary city policies. In response to increased enforcement, several cities adopted these policies, which limit local cooperation with federal immigration authorities. Using data from Alsan and Yang (2024) on the presence of these policies across counties over time, column 3 of Table 3 adds a control for whether any county in a CPUMA had a sanctuary policy in place in a given year. Including this control leaves the estimates unchanged.

Finally, changes in border enforcement could also matter. To assess this possibility, column

4 of Table 3 estimates the specification after excluding CPUMAs in states on the U.S.–Mexico border (California, Arizona, New Mexico, and Texas), where most Border Patrol resources are concentrated. The estimated effects for this subsample are similar in magnitude to those using the full sample.

Robustness to Regional and Economic Shocks. Given the geographic variation in the DACA-eligible population, we also present results that account for regional shocks. Specifically, we estimate a version of equation 1 which includes census division × year fixed effects. In addition, to address the impact of the Great Recession, which impacted immigration patterns (Cadena and Kovak (2016) and Caballero et al. (2023)), we control for the change in the employment rate from 2006 to 2010 by year fixed effects. The results when including these controls in columns 5 and 6 of Table 3 remain consistent with our core findings.

Population and Geography. The baseline analysis uses the CPUMA geography available in the IPUMS ACS given its consistency over time and weights each observation equally. In column 7 of Table 3, we show that the baseline results are similar when weighting by the baseline population. This suggests that the baseline results are similar to the population-weighted average effect and that there does not appear to be any heterogeneity by population size. Column 8 shows that the results are also not sensitive to the smallest or largest CPUMAs as dropping CPUMAs in the top and bottom ventile of baseline population leaves the estimates largely unchanged. Lastly, column 9 shows that the results are similar when using the commuting zone geography, constructed using the crosswalks provided by Autor and Dorn (2013).

Matching Exercises. Four additional checks provide strong evidence that the results are not driven by baseline differences in immigration levels. We construct matched pairs of CPUMAs using nearest neighbors based on their baseline (pre-DACA) immigrant share, noncitizen share, naturalized citizen share, and the share of childhood arrivals (foreign-born individuals who arrived before age 16; hereafter "Dreamers"). We then estimate a version of equation 1 that includes CPUMA fixed effects and pair × Post_t fixed effects, and report the results for the immigrant, noncitizen, and naturalized citizen share outcomes in panels (a), (b), and (c) of Figure 3.

This approach compares changes in immigration between CPUMAs that had nearly identical baseline immigration levels but differed in the number of DACA-eligible immigrants they happened to have. The childhood-arrival pairing is especially demanding, as it holds fixed the number of young immigrants who arrived as children and isolates exposure to DACA from only slight differences in how many met the observable eligibility criteria, providing more plausibly exogenous variation.

Taken together, these matched-pair estimates show that the results are not an artifact of CPUMAs with higher baseline immigrant shares experiencing different immigration trends or

shocks. Instead, the evidence points to the effects being driven by exposure to DACA itself.

4.2.1 Addressing Treatment Effect Heterogeneity

The validity of our identification strategy requires that the immigration-related outcomes in areas with high exposure to DACA-eligible individuals would have followed the same trends as the areas with low exposure to DACA-eligible individuals in the absence of the DACA policy. In our setting, which exploits a continuous measure of exposure to DACA-eligible individuals, a stronger parallel trends assumption is required in the presence of treatment effect heterogeneity (Callaway et al. (2024)).

To assess the extent of treatment effect heterogeneity across exposure levels, we plot estimates from along the distribution of DACA exposure. We start by splitting our DACA exposure variable into bins of 0.2 percentage points of exposure. We then combine bins in the right tail (the highest exposure areas) to ensure at least 5 CPUMAs are in each bin. Appendix Figure C.4 plots the exposure to DACA-eligible individuals on the x-axis and the corresponding value of the outcome variables (immigrant share, noncitizen share, and naturalized citizen share) on the y-axis. The figure shows a positive and linear relationship between DACA exposure and the immigrant share (panel (a)) and the naturalized citizen share (panel (c)), and a consistent null effect on noncitizen share (panel (b)). The figure suggests treatment effects are relatively constant across exposure to DACA-eligible individuals, suggesting limited scope for treatment effect heterogeneity.

We provide two additional checks to assess treatment effect heterogeneity in this setting in Appendix Table D.1. Column (1) reproduces the baseline results seen in Table 2. Column (2) re-estimates treatment effects after excluding the top and bottom quintile of exposure. Column (3) discretizes treatment into a binary indicator for CPUMAs in the top quartile of DACA exposure, thus weakening the identifying assumptions. The results in Appendix Table D.1 are qualitatively and quantitatively similar to our baseline results. Taken together with Appendix Figure C.4, these findings lend support to our main findings and highlight that treatment effect heterogeneity is not a major concern in this setting.

5 Channels and Mechanisms

How and why would DACA exposure lead to an increase in the naturalized citizen share? In this subsection we study potential channels and mechanisms.

5.1 Channels for the Increase in Number of Naturalized Citizens

We first explore the channel(s) through which DACA increases the number of naturalized citizens. The increase in the number of naturalized citizens could occur through two channels: (1) increased naturalization of noncitizens, and (2) changes in the in-migration or out-migration of naturalized

citizens. To study these channels, we estimate the effects of DACA on the naturalization rates of noncitizens and the in-migration and out-migration rates of naturalized citizens. Our results suggest the increase stems from increased naturalization of noncitizens, rather than changes in migration patterns of naturalized citizens.

Increased Naturalization of Non-Citizens. We show that the increase in the number of naturalized citizens appears to be driven by increased naturalization rates of noncitizens. To do this, we estimate a version of equation 1 at the individual-level. We follow Amuedo-Dorantes and Lopez (2021) and use the sample of individuals that could have recently naturalized using the IPUMS ACS data. Specifically, we limit the sample to noncitizens or naturalized citizens from 2008-2019[7] that naturalized in the current or previous year ages 18 or older that had been in the U.S. for at least five years.

Table 4 reports summary statistics for this sample. Columns 1–2 show means for the full sample and the Hispanic subsample, a group commonly studied in the DACA literature (Pope 2016; Kuka et al. 2020) because most DACA beneficiaries were Hispanic and Hispanics are therefore more likely to benefit or have close ties to DACA-eligible individuals. Columns 3 and 4 separately report characteristics for individuals who have not naturalized and those who naturalized in the current or previous year. Relative to those who had not naturalized, recent naturalizers are more likely to be female, have higher levels of education, and be South American, Caribbean, or Asian, and they are less likely to be Mexican or Central American. To account for these observable differences, our regressions include linear controls for age and household size, an indicator for gender, years-since-immigration bins, birth country or region fixed effects, and education fixed effects.[8]

With this sample, we estimate the general following specification:

$$y_{ict} = \alpha_c + \alpha_t + \beta \text{DACA Share}_c \times \text{Post}_t + X_{ct} + Z_{it} + \varepsilon_{ict} \tag{3}$$

where y_{ict} is an indicator (multiplied by 100) for naturalizing in the current or previous year based on their reported year of naturalization. This specification mirrors the baseline CPUMA-level event study specification, including CPUMA fixed effects (α_c) and time-varying CPUMA controls (X_{ct}) and additionally includes the individual-level controls described above (Z_{it}).

Equation 3 provides the general structure of our empirical approach. In the baseline version, Post_t, is a single indicator for the post-2012 period (2012–2019), providing a parsimonious average post-DACA effect. To characterize the timing of the response, we also estimate two alternative versions that modify only the time-interaction component while leaving all fixed effects and controls

[7]The year of naturalization variable is available starting in 2008. Appendix Figure C.5 shows that the ACS measure of recent naturalizations closely tracks the authoritative administrative counts reported by the Department of Homeland Security across states and CBSAs over time, suggesting that this variable reliably captures the timing of naturalizations.

[8]For a list of the country/region and education categories, see Appendix Section A.

unchanged. First, we replace Post_t with year-by-year indicators interacted with the DACA share to obtain a fully flexible event study. Second, we estimate an intermediate specification that interacts the DACA share with indicators for 2012–2016 and 2017–2019, distinguishing the effects during the Obama and Trump administrations as in Amuedo-Dorantes and Wang (2025) due to the uncertainty and administrative actions affecting the program during the Trump administration.

Panels (a) and (b) of Figure 4 present the results from the year-by-year event study regressions of equation 3 for the entire sample and the Hispanic subsample. The estimates show no significant differential trends in naturalization rates before DACA. Immediately after DACA, naturalization rates increased significantly in areas with a larger DACA-eligible population share relative to areas with a smaller share. In 2012 and 2013, a 1 percentage point increase in the DACA-eligible share raised naturalization rates by approximately 0.4 percentage points, a 5.5 percent increase relative to the sample mean naturalization rate. The effect begins to decline after this period. The Hispanic subsample shows similar dynamics, with slightly larger absolute and relative effects. The peak is a 0.6 percentage point increase in 2014, a 13.6 percent increase relative to the mean naturalization rate for Hispanics. These patterns are consistent with the CPUMA-level results in Figure 2, panel (c), which show a sharp initial increase in the number of naturalized citizens that slows in subsequent years before leveling off after 2017.

Table 5 reports estimates of the average effect for the post-DACA period (2012–2019) and the average effects separately for 2012–2016 and 2017–2019. The results suggest that a 1 percentage point increase in the DACA share increased the likelihood of naturalizing by between 0.24 and 0.25 percentage points.[9] As borne out in the year-by-year event studies, these estimates mask interesting dynamics. Columns 2 and 4 report the average effects separately for the Obama and Trump administrations. During the Obama administration (2012–2016), a 1 percentage point increase in the DACA-eligible share increases the likelihood of naturalization by 0.34 percentage points for the full sample (a 4.7 percent increase relative to the 7.24 percent mean naturalization rate) and 0.37 percentage points for the Hispanic subsample (a 8.4 percent increase relative to the 4.40 percent mean naturalization rate for Hispanics). Meanwhile, the estimates for the 2017–2019 period are insignificant and small in magnitude, suggesting no measurable effect during the Trump administration.

As with the baseline results, the response to DACA is nearly immediate. How could individuals respond so quickly to the policy and naturalize? First, there could be some anticipation that a pro-immigrant policy would be implemented under President Obama, leading individuals to begin the naturalization process as soon as the first hint of such a policy was discussed. Second, the process to naturalize for those eligible-to-naturalize can be only a few months. As soon as eligible-to-naturalize individuals knew of the policy, they could begin the process and be naturalized shortly after. That the effect of DACA on naturalization diminished and disappeared by 2018 also aligns

[9]The average effect is significant at the 10 percent level for the entire sample and is insignificant for the Hispanic subsample (p=0.119).

with the atmosphere of that time. President Trump rescinded DACA in 2017, which could lead to individuals being apprehensive of engaging with the immigration system.

Changes in Migration of Naturalized Citizens. Areas with large DACA-eligible populations could become more attractive destinations for naturalized citizens. If more naturalized citizens move to—or fewer move away from—these areas, this could explain the overall increase in the number of naturalized citizens.

Using information on the Migration Public Use Microdata Area (MIGPUMA) of residence one year prior, we calculate the naturalized citizen domestic (within-U.S.) in-migrant share as the number of naturalized citizens moving to CPUMA c from $t-1$ to t relative to the baseline population in 2005 ($100 \times \frac{in-migrants_{ct}}{pop_{c2005}}$), the naturalized citizen domestic out-migrant share as the number of naturalized citizens in CPUMA c in $t-1$ that moved to a different CPUMA in t ($100 \times \frac{out-migrants_{ct}}{pop_{c2005}}$), and the naturalized citizen net-migrant share as the in-migrant share less the out-migrant share.[10]

Panels (a), (b), and (c) of Figure 5 show the effect of DACA on these migration shares. The results suggest that DACA did not meaningfully increase or decrease domestic migration of naturalized citizens, indicating that the increase in the number of naturalized citizens in high DACA-exposure areas is not driven by changes in migration patterns.

It is worth noting that the out-migration share reflects migration to other destination CPUMAs in the U.S. and does not capture international migration. However, emigration among citizens is relatively low. In 2019, an estimated 3.2 million U.S. citizens (both citizens-at-birth and naturalized citizens) were living abroad (United Nations Department of Economic and Social Affairs, Population Division 2019), accounting for only 1 percent of the citizen population. Therefore, emigration cannot explain the large increase in the number of naturalized citizens resulting from DACA.

5.2 Naturalizations and Noncitizen Migration

We next examine how DACA shapes the overall immigration patterns observed in the baseline results. We first show that the increase in naturalizations after DACA fully accounts for the overall rise in the naturalized citizen share. While our evidence on changes in noncitizen migration is mixed, we find suggestive results that DACA encouraged longer stays, which we examine further below.

We begin by quantifying the relative importance of new naturalizations in driving the overall increase in the number of naturalized citizens. In any period τ, the change in the num-

[10] A MIGPUMA can map to one or multiple PUMAs. We harmonize migration counts to the PUMA level using 2000 PUMA population shares of each MIGPUMA and then aggregate these harmonized counts to the CPUMA level. Data on MIGPUMA 2000 population counts come from Basso and Peri (2020), and PUMA 2000 population counts come from IPUMS USA.

ber of naturalized citizens ($\Delta\text{Naturalized}_\tau$) can be decomposed into newly naturalized citizens (Newly Naturalized_τ) and changes in the stock of previously naturalized citizens (ΔPreviously Naturalized_τ). For the post-DACA period (2012–2019), Newly Naturalized_τ is the number of citizens in 2019 who naturalized after 2011, and ΔPreviously Naturalized_τ is the number of citizens in 2019 who naturalized in 2011 or earlier minus the number in 2011.

To assess how much new naturalizations contribute to the DACA-induced increase, we estimate:

$$\text{Naturalized flow share}_{c2011-19} = \alpha + \beta\text{DACA Share}_c + X_c + \varepsilon_c, \tag{4}$$

where Naturalized flow $\text{share}_{c2011-19}$ is either the total change in the naturalized share from 2011–2019 or one of its components, the newly naturalized share or the change in the previously naturalized share. When estimating equation 4, we report robust (heteroskedasticity-consistent) standard errors.

As shown in Section 3.1, DACA Share_c is uncorrelated with pre-DACA changes in the naturalized citizen share. Appendix Figure C.6 shows, however, that CPUMAs with higher DACA shares experienced both higher inflows of newly naturalized citizens and higher outflows of previously naturalized citizens from 2006–2011, which offset each other, leading to no significant difference in the overall naturalized citizen share. This is likely because CPUMAs with higher DACA shares had higher baseline naturalized citizen shares. We thus also estimate equation 4 controlling for both the newly naturalized share and the change in previously naturalized share in the pre-DACA period (2006-2011).

Columns 1-2 of Appendix Table D.2 show that a 1 p.p. increase in the DACA-eligible share increased the naturalized citizen share by between 0.36 and 0.42 p.p. from 2011-2019, closely matching the estimated cumulative effect from Figure 2, panel (c). Columns 3-6 show that this increase is entirely explained by post-DACA naturalizations rather than reduced net outflows of previously naturalized citizens. These results are reassuring given the findings in Section 5.1, which show that DACA has no detectable effect on the domestic migration of naturalized citizens, leaving new naturalizations as the source of the increase.

All else constant, new naturalizations in more exposed CPUMAs would reduce the number of noncitizens one-for-one. Yet, the baseline results show only small and insignificant effects on the number of noncitizens, resulting in a slightly positive effect on overall immigration. We now turn to exploring why we do not observe a one-for-one decrease.

One potential explanation is that noncitizen migration patterns changed. We first examine this using survey questions indicating whether the person had changed residence since the previous year.

Columns 1-5 of Appendix Table D.3 report results from estimating equation 1 using the noncitizen domestic in-migration, out-migration, net domestic migration, international in-migration (i.e., abroad one year prior), and net total migration shares using the IPUMS variables indicating whether the person had changed residence from a year prior, and if so, from where. Panels (a)-(e)

of Appendix Figure C.7 show the corresponding event study regressions. These results suggest DACA led to less domestic in-migration, less domestic out-migration, and little to no effect on new immigrant inflows from abroad, resulting in a negative and statistically insignificant net effect on the number of noncitizens due to migration.

Why would exposure to DACA decrease domestic in-migration of noncitizens? We show that this could be due to spillovers from declines in out-migration from other, origin CPUMAs. For each CPUMA, we calculate the noncitizen in-migrant-weighted average DACA share using the pre-DACA years 2005-2011, which reflects the average DACA exposure of the origin CPUMAs from which noncitizens arrive. Appendix Figure C.8 shows a very strong correlation between a CPUMA's own DACA share and the DACA share of its in-migrants. This correlation suggests a key mechanism: DACA reduces out-migration from origin CPUMAs with high DACA exposure, leaving fewer potential in-migrants for more exposed destination CPUMAs. In other words, the fall in domestic in-migration in high DACA share CPUMAs is largely a secondary consequence of reduced out-migration in origin CPUMAs.

A limitation of the survey questions regarding migration is that they may not capture all migrants, particularly recently arrived immigrants from abroad. Appendix Figure C.9 shows that the size of immigrant cohorts typically peaks one year after arrival. This pattern suggests that migration status based on residence one year prior may underestimate immigrant inflows as some immigrants are not captured until the following year. To address this, we construct an adjusted inflow measure which defines the inflow in year t as the number of noncitizens who arrived in t as observed in $t+1$. Column 6 of Appendix Table D.3 shows that there is a marginally significant increase in noncitizen inflows using this measure.[11] Panel (f) of Appendix Figure C.7 shows the corresponding event study regression using this adjusted international in-migration measure. However, this increase does not offset the fall in domestic in-migration, resulting in a negative and insignificant effect on net noncitizen migration in Column 7 of Appendix Table D.3.

As mentioned in Section 5.1, the out-migration measure does not capture international departures. While international out-migration of naturalized citizens is generally low, it may be particularly high for noncitizens during this period, which coincides with a rise in return migration for certain groups (e.g., Mexican migrants; see Pearson 2025; Caballero et al. 2023). In the case of DACA, this is especially relevant given one of its key features was protection from deportation. This protection likely had direct effects on beneficiaries and indirect effects on their contacts.

To capture changes in noncitizen permanence, we use the average number of years since immigration (YSI) for noncitizens in each CPUMA-year (Pew Research Center 2018). This measure reflects both the duration of stay of recent arrivals and the retention of earlier cohorts: if return migration falls, earlier cohorts remain longer, which increases the average YSI. Appendix Figure C.10 shows no differential pre-trends before DACA but a large, significant post-DACA increase in the average length of stay for noncitizens that appears to increase gradually, peaking in 2019.

[11] With this lagged observation approach, we lose observations in 2019, which results in a smaller sample size.

Taken together, these results clarify the offsetting patterns in noncitizen migration. The increase in the naturalized citizen share in more exposed CPUMAs is fully explained by new naturalizations. A 1 percentage point increase in the DACA-eligible share raised the naturalized share by roughly 0.4 percentage points, which would mechanically reduce the noncitizen share by the same amount in the absence of other changes. This mechanical reduction appears to have been partially offset by modest increases in noncitizen inflows or reduced out-migration. We find mixed evidence that DACA encouraged new noncitizen arrivals from abroad, and on net, noncitizen migration flows show no significant change. These findings should be interpreted cautiously, given limitations in measuring migration using cross-sectional ACS subsamples; in particular, recent arrivals may be undercounted if not surveyed in the year following their move. Finally, increases in the average length of stay of noncitizens in more exposed CPUMAs provide suggestive evidence that DACA may have reduced international out-migration.

6 Why did DACA Increase Naturalization?

We now turn to exploring the potential explanations as to why DACA increased naturalization.

One possibility is that DACA status led to increased naturalization. In other words, the increase in naturalization was driven by DACA beneficiaries. This possibility seems unlikely to explain our results as DACA does not offer a direct pathway to citizenship. According to the Congressional Research Service, by 2019, only 4,000 DACA beneficiaries had naturalized, which cannot explain the large increase in naturalization we observe.

A second possibility is that exposure to DACA led to changes in the economic returns to citizenship. We find that exposure to DACA did not increase the labor market returns to citizenship, suggesting this is not the likely explanation. Table 6 presents results on the effects of exposure to DACA on citizen/noncitizen gaps in log earnings (columns 1-2), log hourly wages (columns 3-4), employment rates (columns 5-6), and the number of hours worked (columns 7-8). We calculate these gaps at the CPUMA-year level. In even-numbered columns, we residualize these labor market outcomes on several characteristics including a square in age, years since immigration, a Hispanic indicator, birthplace and education level $\times$ gender fixed effects. The results show that there is no meaningful change in the returns to citizenship across any of these labor market outcomes, which suggests that the increase in naturalization is likely not driven by increased economic incentives.

Instead, we provide suggestive evidence for a third possibility: that by protecting undocumented immigrants, DACA may have encouraged DACA-eligible immigrants' contacts to naturalize. There are three potential reasons why DACA eligibility may have encouraged others to naturalize.

First, DACA may have increased the incentives to naturalize for legal permanent residents with DACA-eligible contacts. One of many benefits of citizenship is the relative ease of sponsoring relatives for green cards. However, there are difficulties in sponsoring undocumented immigrants living in the U.S., especially those who entered illegally. DACA provided new pathways for eligible

immigrants to become sponsored. DACA beneficiaries who entered the U.S. illegally were granted access to Advance Parole, which allows them to travel abroad and re-enter legally, making it possible for them to be sponsored for a green card or legal status.

Second, DACA may have also decreased the perceived barriers of naturalization. As mentioned in Section 2.2, part of the naturalization process includes submitting an application. The N-400 application requires applicants to provide information about themselves, including information on their household members. Those living in mixed-status households may fear that submitting this application could lead to their household undocumented family members being detained. By protecting eligible immigrants, DACA may have reduced these fears.

Lastly, DACA likely reduced uncertainty regarding the immigration status for eligible immigrants as well as their close contacts. This may have encouraged their close contacts to commit to living long-term in the U.S., potentially culminating in their naturalization. We explore this possibility below.

Exposure to DACA-eligible Household Members. To shed light on this mechanism, we leverage variation across households in exposure to DACA-eligible household members.

We identify households in the ACS data with foreign-born childhood arrivals (individuals who arrived in the U.S. before the age of 16 and before 2007). We then focus on immigrants in these households who are either noncitizens or recently naturalized citizens (naturalized in the current or previous year), ages 18 or older, and have resided in the U.S. for at least five years between 2008 and 2019.[12] To isolate spillover effects of living with a DACA-eligible household member, we exclude age-eligible (30 or younger as of June 2012) noncitizen childhood arrivals.

We identify the effects of living with a DACA-eligible household member by comparing the naturalization behavior of eligible-to-naturalize individuals living with age-eligible noncitizen childhood arrivals to those living with age-eligible citizen childhood arrivals, before and after DACA. This approach is similar to that in Kuka et al. (2020), who study DACA's direct effects on education by comparing noncitizens to citizens who both meet DACA's age and year-of-arrival requirements–two groups similar in age and arrival timing, but only the former directly benefit from DACA. We also take advantage of the age-eligibility condition (individuals had to be 30 or younger when DACA was established) and conduct placebo tests using individuals living with age-ineligible immigrants to support our empirical strategy and rule out other contemporaneous factors.

We model the effect of living with a DACA-eligible household member as proportional rather than additive. Individuals who are already likely to naturalize may have less room to increase their probability of naturalizing, whereas those with very low baseline propensities may respond more strongly, in relative terms, to the opportunity or incentive provided by DACA eligibility in their household. This formulation is particularly relevant given that in 2011, the year before DACA, naturalization rates were 3.3 percent for individuals living with age-eligible noncitizen childhood

[12]The year of naturalization variable is available starting in 2008.

arrivals, compared to 26.2 percent for those living with citizens.[13] Modeling the treatment effect proportionally captures this intuition by scaling effects relative to baseline naturalization rates. It also helps with identification as significant differences in the baseline levels between the treated and control group may lead to concerns about the parallel trends assumption when using raw naturalization rates (Kahn-Lang and Lang 2020). Empirically, the raw data support the validity of this multiplicative formulation, as pre-DACA trends in naturalization rates, when expressed using this proportional adjustment, are parallel across treated and comparison groups.

Formally, we model the probability of naturalization (P_{igt}) for individual i in group g in year t as:

$$P_{igt} = P_{g0}\big(1 + \lambda_t + \theta\,\text{DACA household}_g \times Post_t\big) \tag{5}$$

where P_{g0} denotes the group-specific baseline naturalization rate, λ_t captures common time effects, DACA household$_g$ is an indicator equal to one if the individual lives with a DACA-eligible immigrant, and $Post_t$ equals one in the post-DACA period. The coefficient θ represents the proportional effect of the treatment and can be interpreted as the proportional increase in naturalization associated with living with a DACA-eligible household member, relative to the group's baseline rate.

We set 2011, the year before DACA, as the baseline period ($\lambda_{2011} = 0$) and normalize the naturalization indicator by each group's 2011 pre-treatment rate. Figure 6 panel (a) plots these normalized rates for individuals living with noncitizen versus citizen childhood arrivals. Following Kuka et al. (2020), panel (b) restricts the sample to those living with Hispanic childhood arrivals, who are more likely to be DACA beneficiaries. In both panels, the normalized naturalization rates for treated and comparison groups track closely before DACA, then diverge afterward, with a larger proportional increase among those living with noncitizens, consistent with a positive household-level spillover effect.

Panels (c) and (d) replicate this analysis for households with age-ineligible childhood arrivals (31 or older when DACA was introduced). These placebo figures show parallel pre-DACA trends but no post-DACA divergence, providing evidence that the observed effects are not driven by other contemporaneous shocks affecting households with noncitizens.

Together, these patterns provide suggestive evidence of a positive proportional effect of living with DACA-eligible household members on naturalization. The raw data also support the multiplicative model and the identifying assumption, as naturalization rates for treated and control groups move proportionally in very similar ways prior to DACA, which is a common check for the plausibility of the identifying assumption. In this context, the assumption is that naturalization patterns for individuals living with citizen childhood arrivals provide an accurate counterfactual. While we cannot directly observe the counterfactual behavior for those living with age-eligible noncitizens, trends for individuals living with age-ineligible noncitizens and citizens track each

[13] See Appendix Table D.4 for each group's baseline (2011) naturalization rate.

other closely both before and after DACA. This placebo check suggests that the comparison with citizen household members provides a reliable counterfactual for estimating the effect of living with a DACA-eligible individual.

We estimate θ using the following difference-in-differences (DID) specification:

$$\tilde{P}_{igt} = \alpha_t + Z_{it} + \beta \text{DACA household}_g + \theta \text{DACA household}_g \times Post_t + \varepsilon_{ict} \tag{6}$$

where $\tilde{P}_{igt}$ is an indicator equal to one if the individual naturalized in the current or previous year, normalized by the group's pre-treatment naturalization rate in 2011; α_t are year fixed effects; and Z_{it} includes the same individual-level controls used in equation 3. The treatment indicator DACA household$_g$ equals one if the individual lives with a DACA-eligible immigrant. Because our main analysis restricts the sample to those living with immigrants who meet the age and year-of-arrival requirements, DACA household$_g$ is simply an indicator for living with a noncitizen childhood arrival. Appendix Section B shows that under the multiplicative model in equation 5 the DID estimator recovers θ. Following Kuka et al. (2020), we cluster standard errors at the state level when estimating equation 6.

The results, shown dynamically in panels (a) and (b) of Figure 7, suggest a positive and significant effect on naturalization for immigrants living in households with DACA-eligible immigrants. These dynamic results are summarized of Table 7.[14] Columns 1–3 use the full sample, while Columns 4–6 restrict to those living with Hispanic noncitizens or citizens. Specifications progressively add controls: year fixed effects only (cols. 1, 4), individual controls plus year fixed effects (cols. 2, 5), and finally CPUMA $\times$ Post fixed effects (cols. 3, 6), which absorb local post-DACA shocks. Panel (a) reports results for the main (age-eligible) sample, while panel (b) presents the placebo estimates for the age-ineligible sample.

Across specifications, we find a consistent positive and significant effect on naturalization, approximately a 20 percent increase relative to baseline rates. This evidence is consistent with DACA eligibility encouraging naturalization among recipients' contacts. Reassuringly, the placebo tests using age-ineligible childhood arrival households show no effect, confirming that the observed increase in naturalization is specific to households with DACA-eligible members.

The results of this section suggest that providing protection from deportation and access to work authorization for childhood arrivals can lead to spillovers in the immigration behavior of non-DACA beneficiaries. In particular, the evidence is consistent with DACA encouraging naturalization of DACA-eligible contacts. The increase in naturalization does not stem from individuals directly benefitting from DACA protections, but rather from their eligible-to-naturalize housemates.

[14]See Appendix Table D.5 for summary statistics for the samples used to generate these results.

7 Conclusion

This paper provides the first causal estimates on how DACA impacted immigration-related outcomes, including immigration and naturalization. We exploit geographic variation in exposure to DACA-eligible immigrants and a difference-in-differences design and find exposure to DACA-eligible immigrants led to a significant increase in the number of naturalized citizens but did not increase the number of noncitizens. This increase in the number of naturalized citizens in high exposure areas is driven by increased naturalization among previous noncitizens rather than by changes in migration patterns of already naturalized citizens.

We provide evidence supporting the idea that DACA encouraged the contacts of DACA-eligible immigrants to naturalize. In particular, DACA may have increased the incentives to naturalize due to the ability to sponsor DACA-eligible recipients for legal status, while also reducing uncertainty or fear around naturalizing while residing in a mixed-status household. We find naturalization increases among immigrants residing in households with a noncitizen childhood arrival compared to those residing with citizen childhood arrivals (who cannot benefit from DACA). These findings are important given the ongoing immigration climate in the U.S., coupled with DACA's uncertain future.

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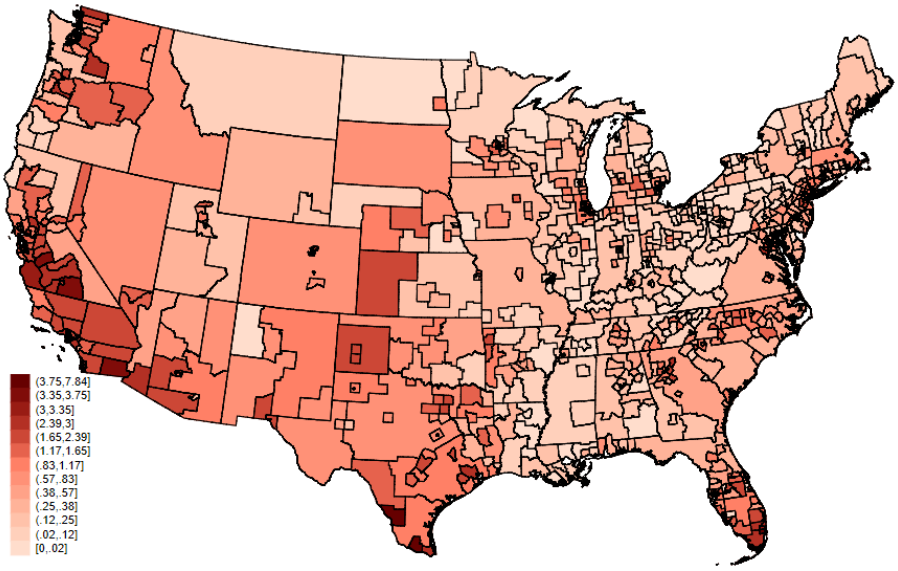
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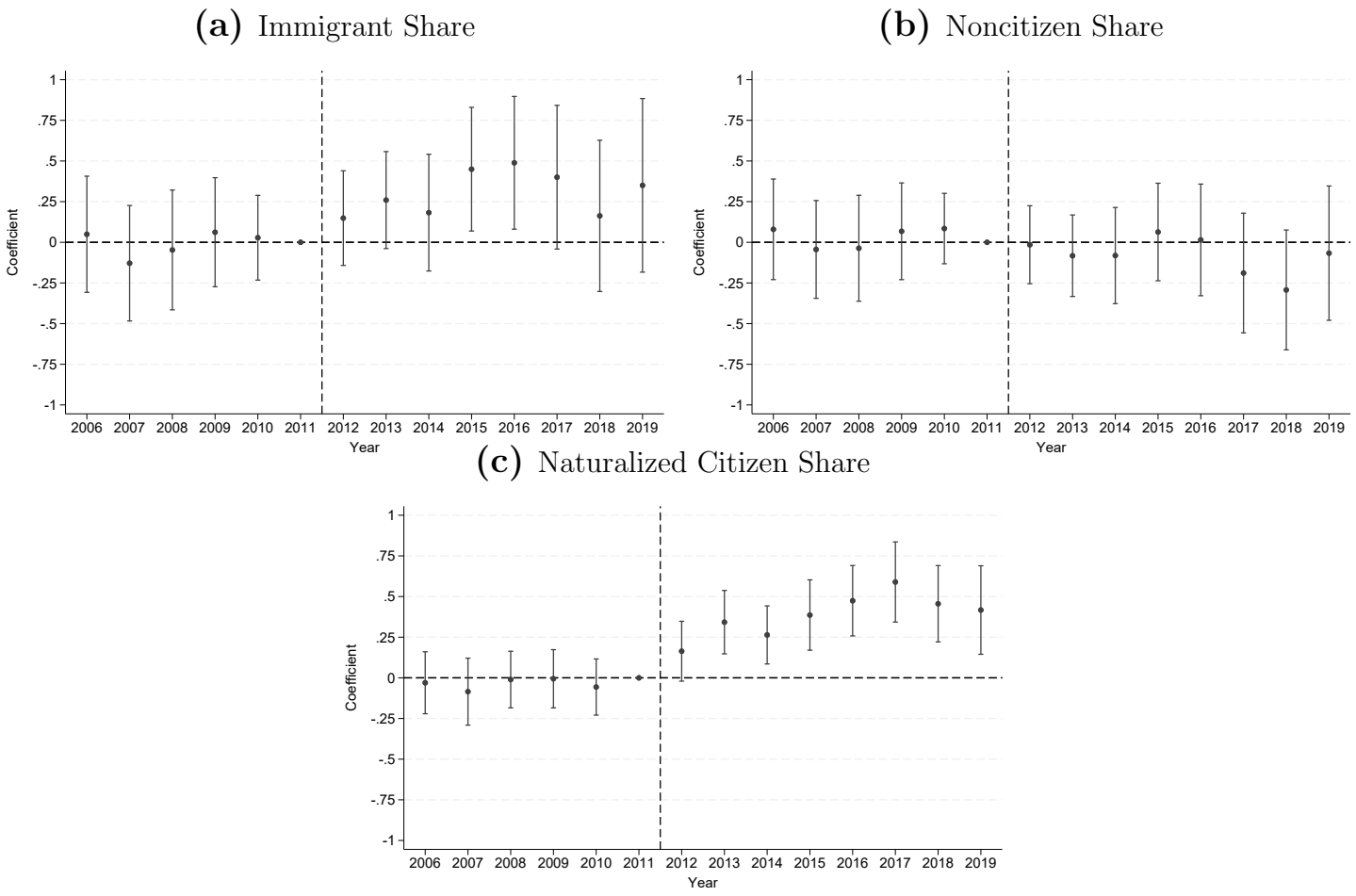
Figures

Figure (1) DACA-eligible Share



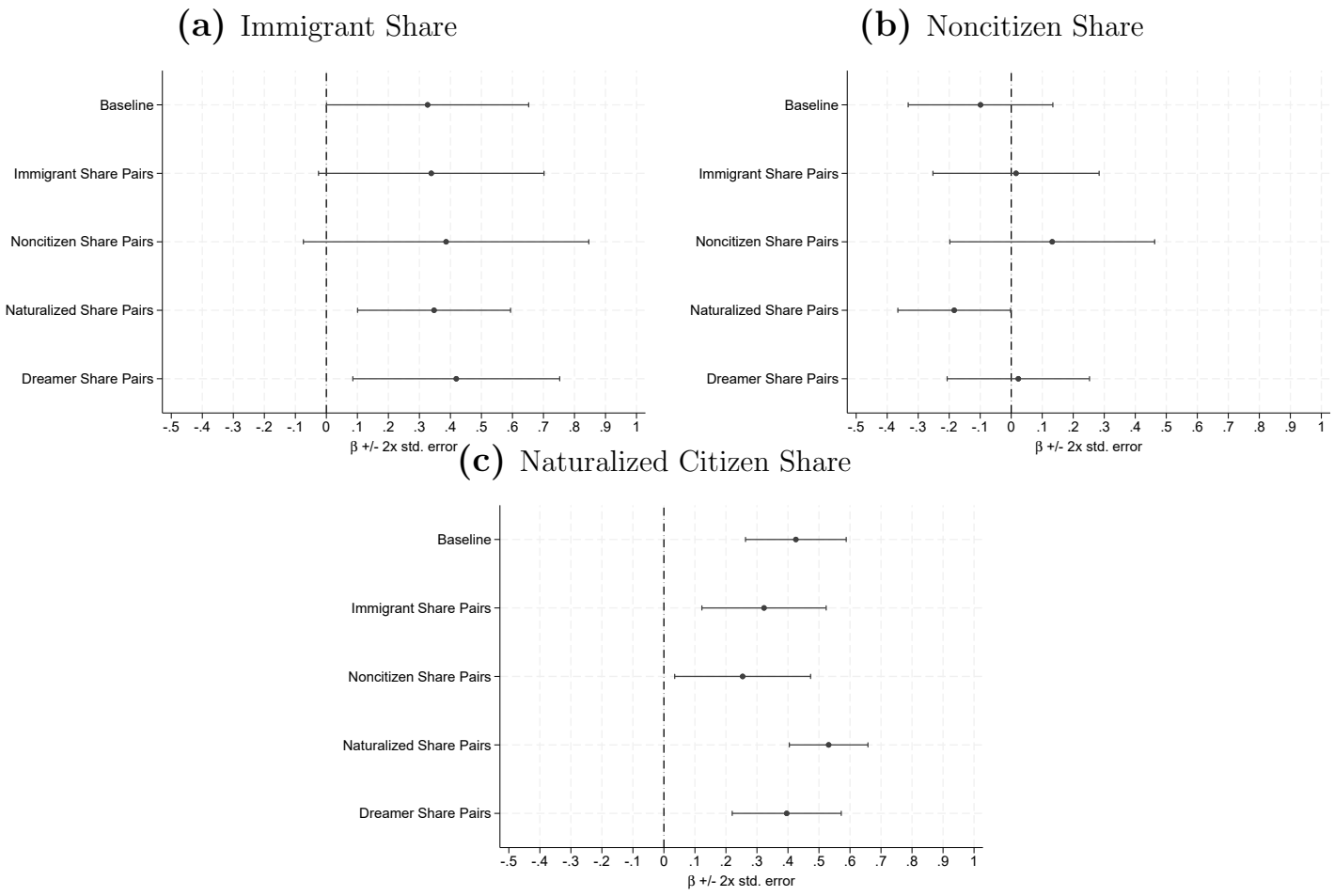
Notes: This map shows the DACA-eligible population share in 2005. The geographic units are Consistent Public Use Microdata Areas (CPUMAs).

Figure (2) Effects of DACA on Immigration



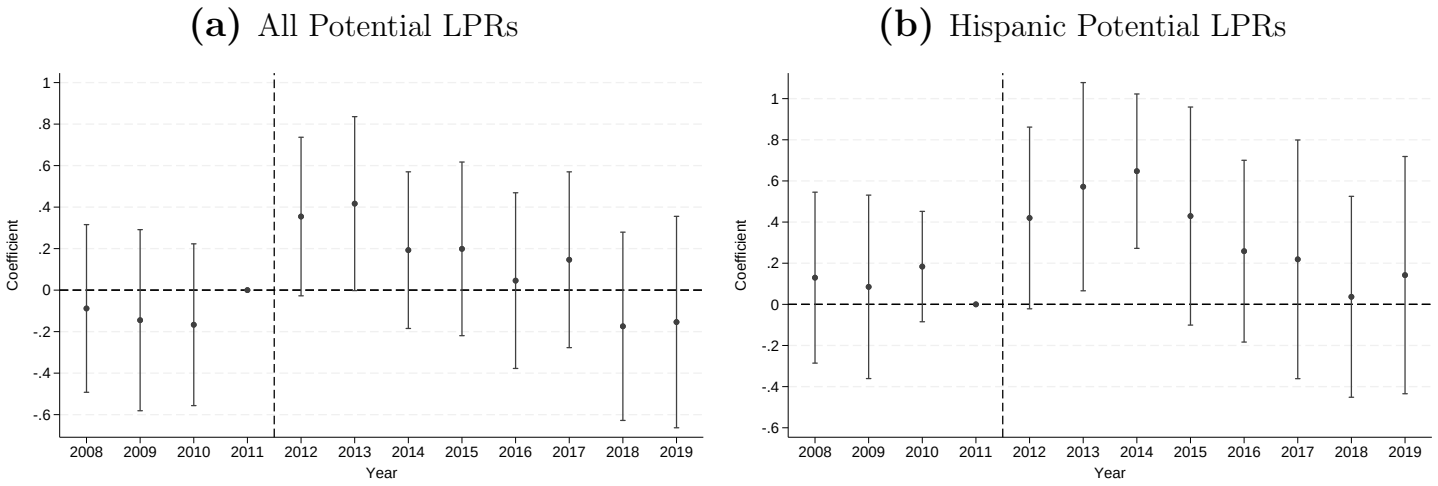
Notes: These figures show point estimates of coefficients and 95 percent confidence intervals from event study regressions similar to equation 1, which separately estimate interactions between the year and the DACA-eligible share, with 2011 as the omitted year. The sample is composed of the panel of CPUMAs for the years 2006-2019. The dependent variables are the immigrant share, the noncitizen share, and the naturalized citizen share in panels (a), (b), and (c) respectively. Regressions include CPUMA fixed effects and the following baseline (pre-DACA) controls, each interacted with year fixed effects: the immigrant population share tercile; the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Standard errors are clustered at the CPUMA level. The dashed line demarcates the implementation of DACA.

Figure (3) Matching Exercises



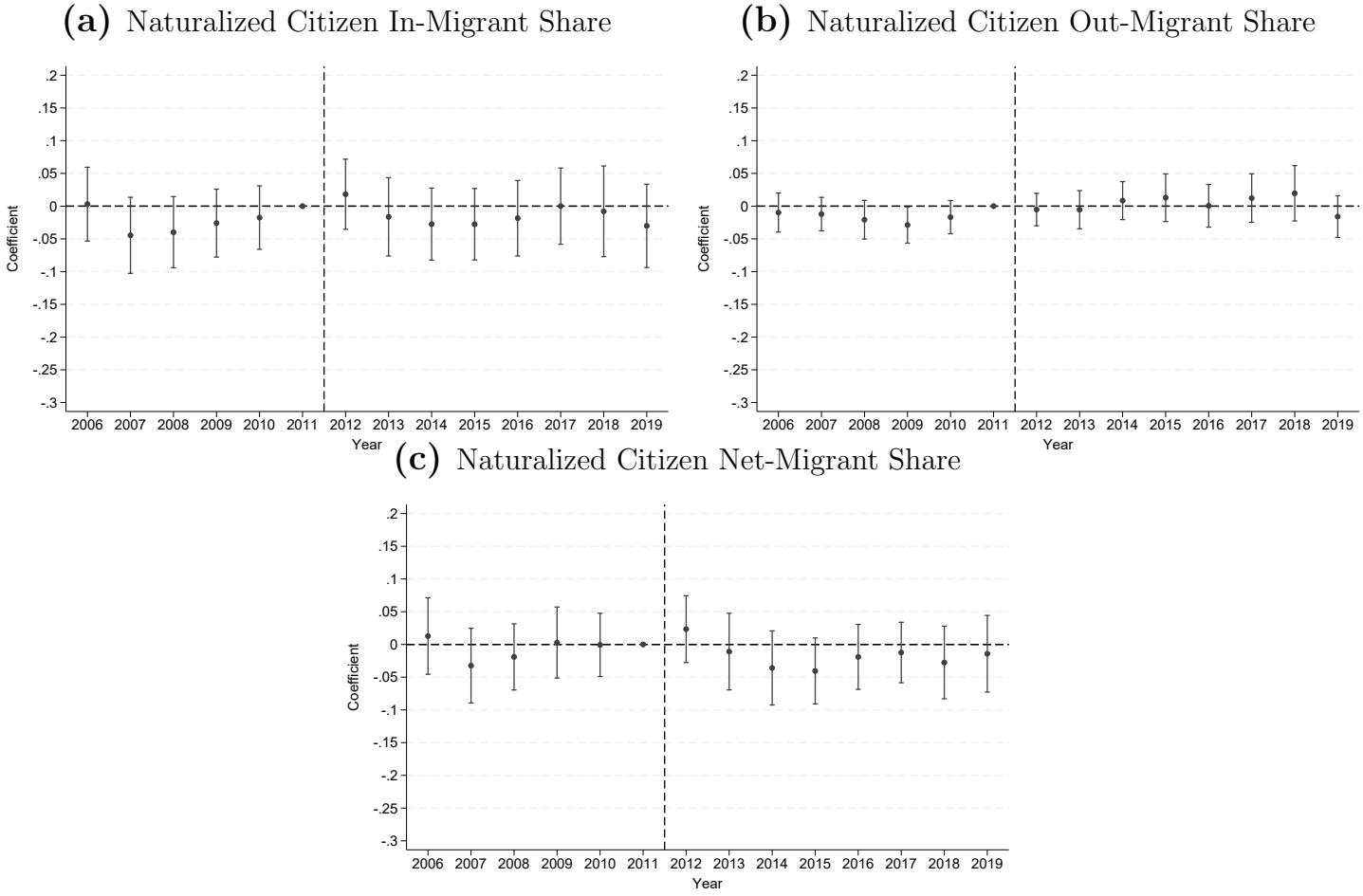
Notes: These figures show point estimates of coefficients and 95 percent confidence intervals of the coefficient of interest from regressions similar to equation 1, which include CPUMA and pair $\times$ $Post_t$ fixed effects. The sample is composed of the panel of CPUMAs for the years 2006-2019. The dependent variables are the immigrant share (panel (a)), the noncitizen share (panel (b)), and the naturalized citizen share (panel (c)). Matched pairs of CPUMAs are constructed using nearest neighbors based on their baseline (pre-DACA) immigrant share, noncitizen share, naturalized citizen share, and childhood arrival share (foreign-born individuals who arrived before age 16, "Dreamers"). The "Baseline" results come from columns 2, 4, and 6 of Table 2. Standard errors are clustered at the CPUMA level.

Figure (4) Effect of DACA Exposure on Naturalization Hazard



Notes: These figures show point estimates of coefficients and 95 percent confidence intervals from an event study regression similar to equation 3, which separately estimates interactions between the year and the DACA-eligible share, with 2011 as the omitted year. The dependent variable is an indicator ($\times$ 100) for whether the individual naturalized in the current or previous year. The sample includes noncitizens and naturalized citizens who naturalized in the current or previous year ages 18 or older that had been in the U.S. for at least five years (potential legal permanent residents (LPRs)). In panel (b), this sample is further restricted to Hispanics. Regressions include CPUMA fixed effects and the following baseline (pre-DACA) controls, each interacted with year fixed effects: the immigrant population share tercile; the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Regressions also include fixed effects for birth country category, years since immigration (in five-year intervals), education, and gender and linear controls for age and household size. Observations are weighted by the IPUMS person weights (perwt). Standard errors are clustered at the CPUMA level. The dashed line demarcates the implementation of DACA.

Figure (5) Domestic (Within U.S.) Migration of Naturalized Citizens

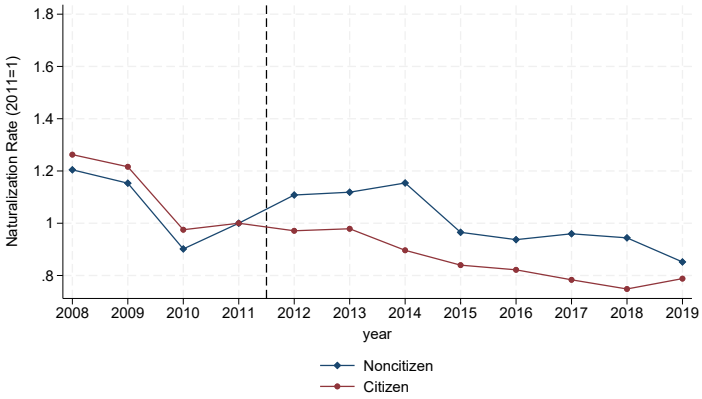


Notes: These figures show point estimates of coefficients and 95 percent confidence intervals from event study regressions similar to equation 1, which separately estimate interactions between the year and the DACA-eligible share, with 2011 as the omitted year. The dependent variables are the naturalized citizen domestic in-migrant (number of naturalized citizens moving to CPUMA c from $t-1$ to t) share, the naturalized citizen domestic out-migrant (number of naturalized citizens in CPUMA c in $t-1$ that moved to a different CPUMA in t) share, and the naturalized citizen domestic net-migrant (in-migrant share - out-migrant) share in panels (a), (b), and (c) respectively. Regressions include CPUMA fixed effects and the following baseline (pre-DACA) controls, each interacted with year fixed effects: the immigrant population share tercile; the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Standard errors are clustered at the CPUMA level. The dashed line demarcates the implementation of DACA.

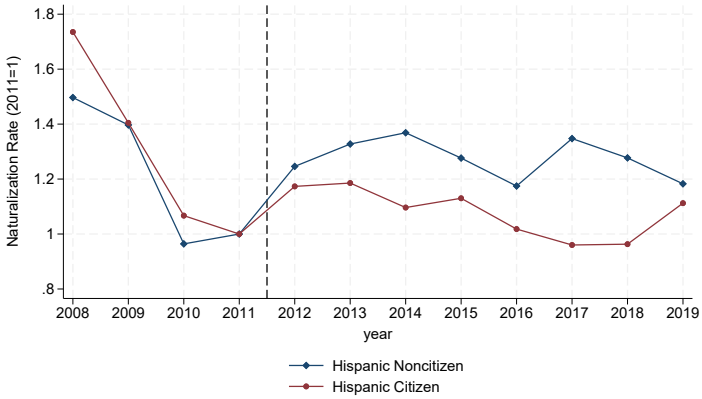
Figure (6) Naturalization Rates by Household Type

Age-Eligible Childhood Arrival Households

(a) Noncitizen vs. Citizen

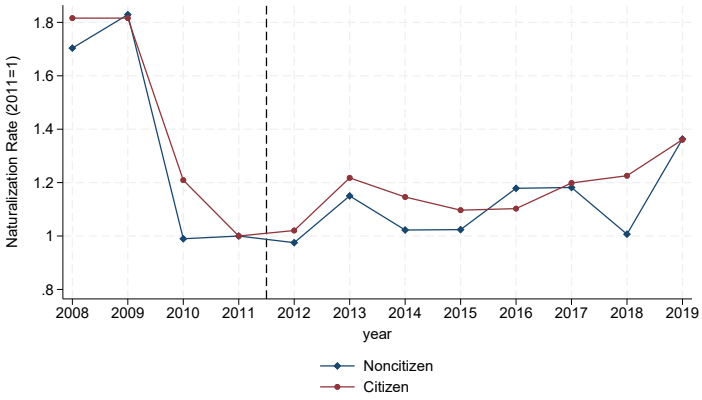


(b) Hispanic Noncitizen vs. Hispanic Citizen

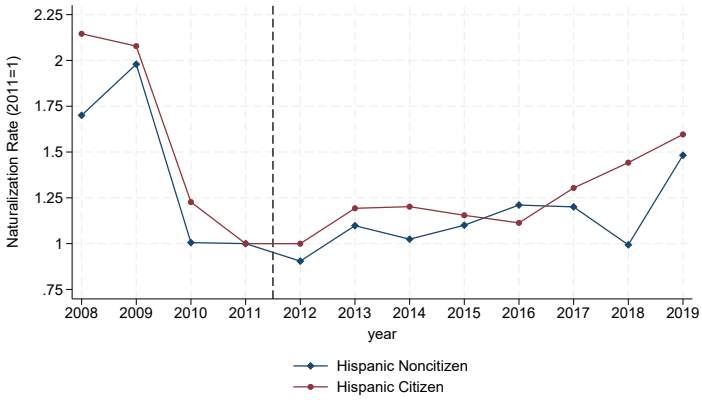


Age-Ineligible Childhood Arrival Households

(c) Noncitizen vs. Citizen

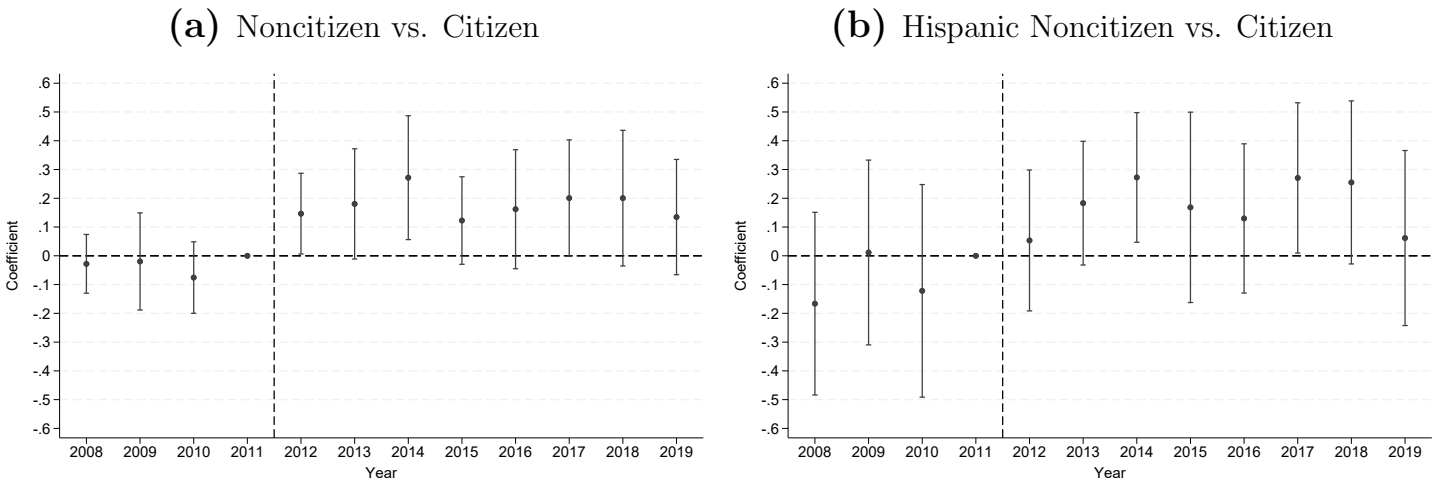


(d) Hispanic Noncitizen vs. Hispanic Citizen



Notes: These figures show average naturalization rates for immigrants living in households with immigrants who arrived before age 16. The sample in each figure includes individuals living in these households ages 18 or older who do not meet DACA's observable eligibility criteria, are either noncitizens or naturalized in the current or previous year, and have been in the U.S. for at least five years. Naturalization rates are normalized by the group's 2011 average (the year before DACA). Panels (a) and (b) include individuals living with age-eligible childhood arrivals, while panels (c) and (d) include individuals living with age-ineligible childhood arrivals. Panels (b) and (d) further restrict the samples to those living with Hispanic noncitizens or citizens.

Figure (7) Effect of Exposure to DACA Eligibile Household Members on Naturalization



Notes: These figures show point estimates and 95 percent confidence intervals from event study regressions similar to equation 6, which separately estimate interactions between the year and the DACA household$_g$ indicator, with 2011 as the omitted year. The dependent variable is an indicator for whether the individual naturalized in the current or previous year, normalized by the group's 2011 average (the year before DACA). The sample in panel (a) includes individuals living in households with age-eligible childhood arrivals who are 18 or older, do not meet DACA's observable eligibility criteria, are either noncitizens or naturalized in the current or previous year, and have been in the U.S. for at least five years. Panel (b) restricts this sample to those living with Hispanic age-eligible childhood arrivals. Regressions also include fixed effects for birth country category, years since immigration (in five-year intervals), education, and gender and linear controls for age and household size. Observations are weighted by the IPUMS person weights (perwt). Standard errors are clustered at the state level. The dashed line marks the implementation of DACA.

Tables

Table (1) Summary Statistics of Baseline Sample

	(1) Entire Sample	(2) Below-Median DACA Share	(3) Above-Median DACA Share
DACA Eligible Share	0.968	0.219	1.717
Baseline Characteristics (2005)			
Log Population	12.162	12.116	12.208
Average Age	36.843	37.614	36.072
Immigrant Population (%)	12.254	4.432	20.076
Hispanic Population (%)	12.774	4.294	21.254
Black Population (%)	11.892	9.802	13.982
Population in Poverty (%)	12.244	11.477	13.011
College-Educated Adults (%)	25.508	23.036	27.981
Male Population (%)	48.880	48.861	48.899
Outcomes			
Immigrant Share	14.096	5.724	22.467
Noncitizen Share	7.360	2.879	11.841
Naturalized Citizen Share	6.736	2.846	10.626
Observations	15,092	7,546	7,546

Notes: This table reports sample means for the listed variables for the full sample of CPUMAs from 2006–2019 (column 1), as well as separately for CPUMAs below (column 2) and above (column 3) the median DACA-eligible share. The immigrant, noncitizen, and naturalized shares are measured as the number of respective individuals divided by the 2005 population and multiplied by 100.

Table (2) Effects of DACA on Immigration

	Immigrant Share		Noncitizen Share		Naturalized Share	
	(1)	(2)	(3)	(4)	(5)	(6)
DACA Eligible Share × Post	0.311*	0.326**	-0.107	-0.099	0.418***	0.425***
	(0.167)	(0.166)	(0.119)	(0.119)	(0.083)	(0.083)
CPUMA FEs	Yes	Yes	Yes	Yes	Yes	Yes
Immig. Share Tercile x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline CPUMA Controls x Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bartik Controls		Yes		Yes		Yes
Dep. Var. Mean	14.096	14.096	7.360	7.360	6.736	6.736
Observations	15,092	15,092	15,092	15,092	15,092	15,092

Notes: This table shows results from estimating equation 1. The dependent variables are the immigrant share (columns 1-2), the noncitizen share (columns 3-4), and the naturalized citizen share (columns 5-6). In each column, the sample is composed of the panel of CPUMAs for the years 2006-2019. The baseline (pre-DACA) controls include the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Standard errors are clustered at the CPUMA level. Significance levels are denoted by $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

Table (3) Robustness Checks

Robustness Check:	Baseline	Immigration Policy			Regional/Economic		Population and Geography		
		Enforcement Index	Sanctuary City	Drop Border States	Census Division	Great Recession	Population-Weighted	Drop Large/Small Pop. CPUMAs	Commuting Zone
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(a) Dependent Variable=Immigrant Share								
DACA Eligible Share × Post	0.326**	0.322**	0.358**	0.480***	0.302*	0.326*	0.502***	0.290	0.221
	(0.166)	(0.158)	(0.165)	(0.179)	(0.163)	(0.166)	(0.193)	(0.180)	(0.189)
Dep. Var. Mean	14.096	14.051	14.096	12.155	14.078	14.096	14.295	13.914	5.970
Observations	15,092	11,759	15,092	12,628	14,924	15,092	15,092	13,594	10,374
	(b) Dependent Variable=Noncitizen Share								
DACA Eligible Share × Post	-0.099	-0.098	-0.080	0.057	-0.097	-0.099	-0.129	-0.111	-0.244**
	(0.119)	(0.115)	(0.117)	(0.129)	(0.117)	(0.119)	(0.112)	(0.124)	(0.109)
Dep. Var. Mean	7.360	7.348	7.360	6.277	7.366	7.360	7.651	7.271	3.634
Observations	15,092	11,759	15,092	12,628	14,924	15,092	15,092	13,594	10,374
	(c) Dependent Variable=Naturalized Share								
DACA Eligible Share × Post	0.425***	0.421***	0.438***	0.423***	0.398***	0.425***	0.631***	0.400***	0.465***
	(0.083)	(0.078)	(0.083)	(0.093)	(0.082)	(0.081)	(0.141)	(0.088)	(0.129)
Dep. Var. Mean	6.736	6.702	6.736	5.878	6.712	6.736	6.644	6.643	2.336
Observations	15,092	11,759	15,092	12,628	14,924	15,092	15,092	13,594	10,374
CPUMA/CZ FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Immig. Share Tercile x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Controls x Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bartik Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows results from estimating equation 1. The dependent variables are the immigrant share (panel (a)), the noncitizen share (panel (b)), and the naturalized citizen share (panel (c)). In all columns except for columns 2, 4, 8, and 9, the sample is composed of the panel of CPUMAs for the years 2006-2019. Column 2 includes the years 2007-2018, the year for which the interior enforcement index from Amuedo-Dorantes et al. (2021) is available. Column 4 drops border states from this sample (California, Arizona, New Mexico, and Texas) and column 8 drops the CPUMAs in the top and bottom ventile of baseline population size. In column 9, the sample is composed of panel of commuting zones (CZs) using the crosswalks provided by Autor and Dorn (2013) for the years 2006-2019. All regressions include CPUMA/CZ fixed effects, the immigrant share tercile × year fixed effects, baseline (pre-DACA) CPUMA/CZ controls × year fixed effects (see the notes to Table 2), and controls for Bartik labor demand shocks for all workers, immigrants, noncitizens, and naturalized citizens. Column 2 additionally controls for the interior immigration enforcement index from Amuedo-Dorantes et al. (2021). Column 3 additionally controls for an indicator equal to one if any county within the CPUMA had a sanctuary city policy active at the time (Alsan and Yang 2024). Column 5 additionally controls for census division × year fixed effects. Column 5 additionally controls for the change in the unemployment rate from 2006-2010 × year fixed effects. Column 7 weights each observation by the baseline population. Standard errors are clustered at the CPUMA/CZ level. Significance levels are denoted by $*p < 0.1$, $**p < 0.05$, and $***p < 0.01$.

Table (4) Summary Statistics of Individual-Level Sample

	(1) All Potential LPRs	(2) Hispanic Potential LPRs	(3) Naturalized = 0	(4) Naturalized = 1
DACA Eligible Share	1.850	2.000	1.852	1.819
Individual Characteristics				
Age	42.367	41.057	42.389	42.085
Male	0.513	0.534	0.517	0.458
Years Since Immigrating	17.861	18.478	17.942	16.830
Education Levels				
No high school diploma	0.402	0.544	0.417	0.198
High school diploma or GED	0.246	0.262	0.247	0.226
Some college, no degree	0.124	0.105	0.119	0.181
Associate's degree	0.041	0.026	0.039	0.071
Bachelor's degree	0.108	0.046	0.101	0.195
Graduate/professional degree	0.080	0.017	0.076	0.129
Origins				
Mexican	0.428	0.680	0.448	0.174
Central American	0.105	0.165	0.108	0.064
Caribbean	0.077	0.068	0.073	0.129
South American	0.065	0.081	0.063	0.091
East Asian	0.065	0.000	0.064	0.080
Southeast Asian	0.052	0.001	0.048	0.110
South Asian	0.054	0.000	0.050	0.097
Outcome				
Naturalized x 100	7.239	4.404		
Observations	1,608,111	935,790	1,480,780	127,331

Notes: This table reports sample means for the listed variables for the full sample of noncitizens or naturalized citizens who naturalized in the current or previous year from 2008-2019 ages 18 or older that had been in the U.S. for at least five years at the time of the survey (column 1), as well as for the Hispanic sample meeting the same characteristics (column 2), the individuals who did not naturalize in the current or previous year (column 3), and the individuals who did naturalize in the current or previous year (column 4). See the full list of education and birthplace categories in Appendix Section A. Observations are weighted by the IPUMS person weights (perwt).

Table (5) Effects of DACA Exposure on Naturalization Hazard

	All Potential LPRs		Hispanic Potential LPRs	
	(1)	(2)	(3)	(4)
DACA Eligible Share × (2012-2019)	0.236*		0.251	
	(0.133)		(0.161)	
DACA Eligible Share × (2012-2016)		0.343**		0.370**
		(0.152)		(0.149)
DACA Eligible Share × (2017-2019)		0.042		0.035
		(0.149)		(0.211)
CPUMA FEs	Yes	Yes	Yes	Yes
Immig. Share Tercile x Year FE	Yes	Yes	Yes	Yes
Baseline CPUMA Controls x Year FEs	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes
Dep. Var. Mean	7.239	7.239	4.404	4.404
Observations	1,608,111	1,608,111	935,790	935,790

Notes: This table shows results from estimating equation 3. The dependent variable is an indicator equal to one if the respondent naturalized in the current or previous year. In each column, the sample is composed of foreign-born non-citizens or naturalized citizens who naturalized in the current or previous year that were 18 or older and had been in the U.S. for at least five years. The baseline (pre-DACA) controls include the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Individual controls include fixed effects for birth country category, years since immigration (in five-year intervals), education, and gender and linear controls for age and household size. Standard errors are clustered at the CPUMA level. Significance levels are denoted by $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

Table (6) Effect of DACA on Labor Market Returns to Citizenship

	Δln(earnings)		Δln(hourly wage)		%Δemployment rate		%Δhours worked	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DACA Eligible Share × Post	0.001	-0.006	-0.000	-0.006	0.002	-0.002	-0.008	-0.008
	(0.008)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.012)	(0.008)
CPUMA FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Immig. Share Tercile x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CPUMA Controls x Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bartik Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Residualized		Yes		Yes		Yes		Yes
Dep. Var. Mean	0.344	0.065	0.269	0.033	0.140	0.106	0.132	0.101
Observations	14,949	14,949	14,949	14,949	14,971	14,971	14,995	14,995

Notes: This table shows results from estimating equation 1. The dependent variables are the difference in mean log earnings (columns 1-2), the difference in mean log hourly wage (columns 3-4), the percentage difference in employment rates (columns 5-6), and the percentage difference in mean hours worked (columns 7-8) between citizens and non-citizens. In the even-numbered columns, each labor market outcome is residualized on a square in age, years since migration, and birth country and gender × education fixed effects before aggregating to the CPUMA-year level. In each column, the sample is composed of the panel of CPUMAs for the years 2006-2019 for the which there is a non-missing value in the dependent variable. The baseline (pre-DACA) controls include the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Standard errors are clustered at the CPUMA level. Significance levels are denoted by $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

Table (7) Effect of Living With DACA-eligible Household Member on Naturalization

In households with:	(a) Age-Eligible Childhood Arrivals					
	Noncitizen vs. Citizen			Hispanic Noncitizen vs. Citizen		
	(1)	(2)	(3)	(4)	(5)	(6)
Noncitizen × Post	0.201***	0.209***	0.217***	0.284***	0.243**	0.235
	(0.049)	(0.066)	(0.075)	(0.086)	(0.093)	(0.142)
Dep. Var. Mean	1.016	1.016	1.016	1.234	1.234	1.234
Observations	307,572	307,572	307,572	202,837	202,837	202,837
In households with:	(b) Age-Ineligible Childhood Arrivals					
Noncitizen × Post	0.042	0.026	0.031	0.052	0.018	0.054
	(0.051)	(0.050)	(0.049)	(0.059)	(0.059)	(0.062)
Dep. Var. Mean	1.247	1.247	1.247	0.989	0.989	0.989
Observations	156,251	156,251	156,251	111,143	111,143	111,143
Individual Controls		Yes	Yes		Yes	Yes
CPUMA × Post FEs			Yes			Yes

Notes: This table shows results from estimating equation 6. The dependent variable is an indicator for whether the individual naturalized in the current or previous year, normalized by the group's 2011 average (the year before DACA). The sample in panel (a) includes individuals living in households with age-eligible childhood arrivals who are 18 or older, do not meet DACA's observable eligibility criteria, are either noncitizens or naturalized in the current or previous year, and have been in the U.S. for at least five years. The sample in panel (b) includes individuals living in households with age-ineligible childhood arrivals who are 18 or older, do not meet DACA's observable eligibility criteria, are either noncitizens or naturalized in the current or previous year, and have been in the U.S. for at least five years. Columns 4-6 further restrict these samples to individuals living with Hispanic childhood arrivals. Individual controls include fixed effects for birth country category, years since immigration (in five-year intervals), education, and gender and linear controls for age and household size. Standard errors are clustered at the state level. Significance levels are denoted by $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

A Birthplace and Education Categories

Birthplace categories:

- Canada
- Mexico
- Caribbean and Bermuda: Cuba, Dominican Republic, Haiti, Jamaica, Antigua-Barbuda, Bahamas, Barbados, Dominica, Grenada, St. Kitts-Nevis, St. Lucia, St. Vincent, Trinidad and Tobago
- Central America: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama
- South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana/British Guiana, Paraguay, Peru, Uruguay, Venezuela
- Northern Europe: Denmark, Finland, Iceland, Norway, Sweden, England, Scotland, United Kingdom, ns, Ireland, Northern Ireland
- Western Europe: Belgium, France, Netherlands, Switzerland
- Southern Europe: Albania, Greece, Macedonia, Italy, Portugal, Azores, Spain
- Eastern Europe: Austria, Bulgaria, Czechoslovakia, Slovakia, Czech Republic, Germany, Hungary, Poland, Romania, Yugoslavia, Croatia, Montenegro, Serbia, Bosnia, Kosovo
- Former Soviet Union: Estonia, Latvia, Lithuania, Other USSR/Russia, Byelorussia, Moldavia, Ukraine, Armenia, Azerbaijan, Republic of Georgia, Kazakhstan, Kirghizia, Uzbekistan
- East Asia: China, Hong Kong, Mongolia, Taiwan, Japan, Korea
- Southeast Asia: Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam
- South Asia: Afghanistan, India, Bangladesh, Bhutan, Burma (Myanmar), Pakistan, Sri Lanka, Nepal
- Middle East: Cyprus, Iraq, Israel/Palestine, Jordan, Kuwait, Lebanon, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen Arab Republic (North), Iran
- Africa: Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, Gambia, Ghana, Guinea, Ivory Coast, Liberia, Nigeria, Senegal, Sierra Leone, Togo, Ethiopia, Kenya, Rwanda, Somalia, Tanzania, Uganda, Zambia, Zimbabwe, Eritrea, South Sudan, Cameroon, Congo, Zaire, South Africa

- Oceania/Pacific: Australia, New Zealand, Fiji, Tonga, Marshall Islands, Micronesia, Northern Mariana Islands

Education categories:

- No high school diploma
- High school diploma or GED
- Some college, no degree
- Associate's degree
- Bachelor's degree
- Graduate/professional degree

B Normalization and interpretation of the DID estimates in household-level analysis

This section formalizes the interpretation of the normalized difference-in-differences (DID) estimator used in the paper and contrasts it with the standard DID on the raw naturalization indicator.

Let the probability that individual i in group g naturalizes in year t be denoted by P_{igt}. We model this probability as:

$$P_{igt} = P_{g0}\big(1 + \lambda_t + \theta\,\text{DACA household}_g \times Post_t\big)$$

where P_{g0} denotes the group-specific baseline naturalization rate, λ_t captures common time effects, DACA household_g is an indicator equal to one if the individual lives with a DACA-eligible immigrant, and $Post_t$ equals one in the post-DACA period. The coefficient θ represents the proportional effect of the treatment and can be interpreted as the proportional increase in naturalization associated with living with a DACA-eligible household member, relative to the group's baseline rate.

To facilitate interpretation, we normalize the outcome by the group-specific pre-period average:

$$\tilde{P}_{igt} = \frac{P_{igt}}{\bar{P}_{g0}},$$

where $\bar{P}_{g0}$ denotes the mean of P_{igt} for group g in the baseline period. In expectation, $E[\bar{P}_{g0}] = P_{g0}$. Substituting into the model gives:

$$\tilde{P}_{igt} = 1 + \lambda_t + \theta\text{DACA household}_g \times Post_t.$$

The simple DID estimator is calculated as the change in the average outcome for the treatment group (DACA-eligible household) before ($t = 0$) and after ($t = 1$) the treatment, minus the corresponding change for the control group. When using the normalized outcome $\tilde{P}_{igt}$, the expected value of this estimator is θ, as shown below:

$$\begin{aligned} E[\text{DID}_{norm}] &= (\bar{\tilde{P}}_{DACA,1} - \bar{\tilde{P}}_{DACA,0}) - (\bar{\tilde{P}}_{CONTROL,1} - \bar{\tilde{P}}_{CONTROL,0}) \\ &= (1 + \lambda_1 + \theta) - (1 + \lambda_1) \\ &= \theta \end{aligned}$$

Thus, under the multiplicative model, the DID specification in equation 6 using the adjusted naturalization indicator $\tilde{P}_{igt}$ provides a consistent estimate of θ.

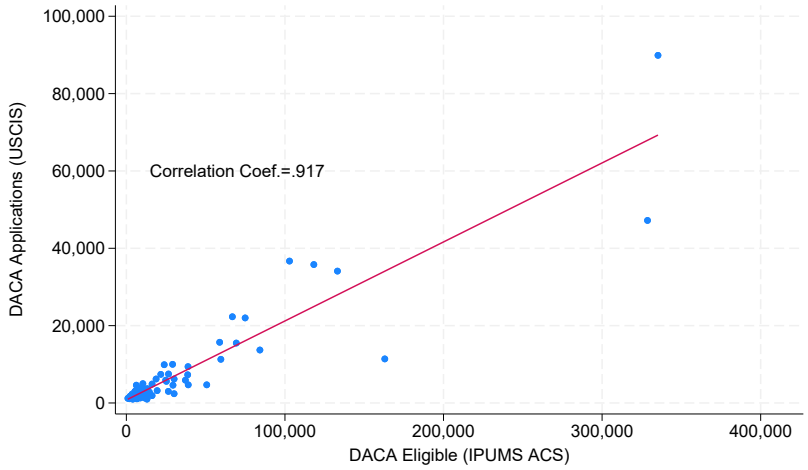
In contrast, the expected value of the DID estimator using the raw (unadjusted) naturalization indicator depends on the baseline naturalization rates of the treatment and control groups:

$$\begin{aligned} E[\text{DID}_{raw}] &= (\bar{P}_{DACA,1} - \bar{P}_{DACA,0}) - (\bar{P}_{CONTROL,1} - \bar{P}_{CONTROL,0}) \\ &= [P_{DACA,0}(1 + \lambda_1 + \theta) - P_{DACA,0}] - [P_{CONTROL,0}(1 + \lambda_1 + \theta) - P_{CONTROL,0}] \\ &= (P_{DACA,0} - P_{CONTROL,0})\lambda_1 + P_{DACA,0}\theta \end{aligned}$$

Unlike the normalized DID, the raw DID combines baseline differences with the treatment effect and does not directly recover θ. When baseline naturalization rates differ across groups, the expected value of the raw DID estimator depends on both these baseline differences and the treatment effect, complicating its interpretation. This is why we opt for the normalized outcome in our analysis. Empirically, the pre-DACA trends in the normalized naturalization rates closely follow the multiplicative model, supporting both the validity of the normalization and the interpretation of θ as a proportional effect.

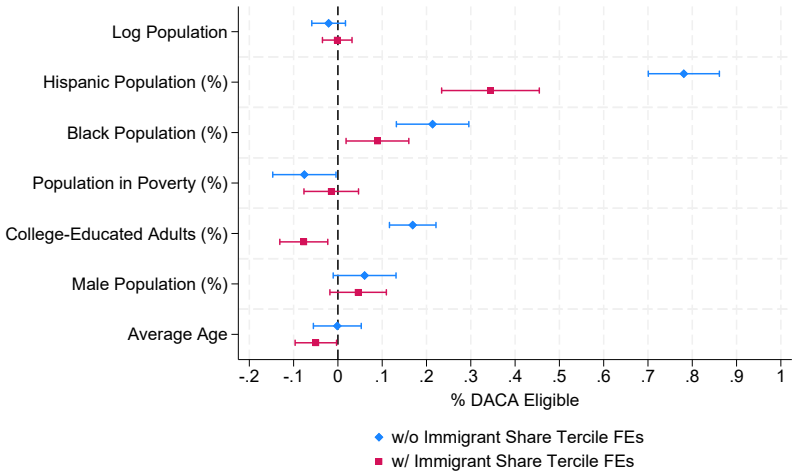
C Appendix Figures

Figure (C.1) Verifying IPUMS DACA-eligible Counts



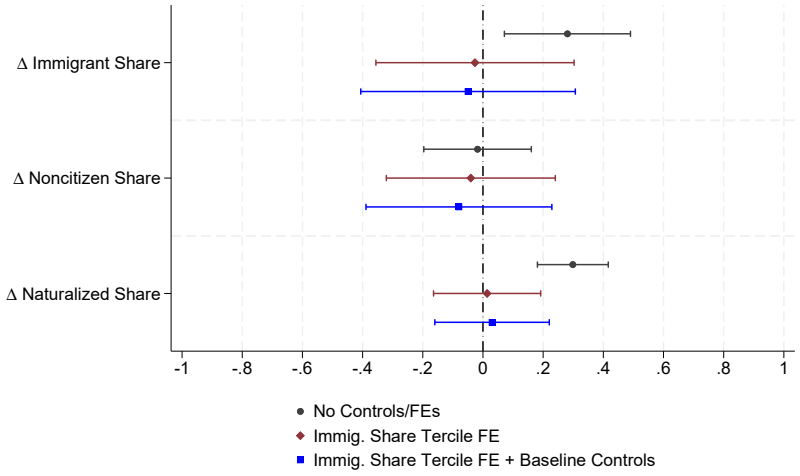
Notes: This figure plots the number of DACA applications as reported by the United States Citizenship and Immigration Services (USCIS) as of 2017 with the number of DACA-eligible immigrants identified in the IPUMS ACS in 2005 across metro areas.

Figure (C.2) Correlates of DACA-eligible Share



Notes: This figure shows point estimates and 95 percent confidence intervals from regressions of the DACA-eligible share on the baseline controls with and without the baseline immigrant share tercile fixed effects. The sample includes all CPUMAs. Robust (heteroskedasticity-consistent) standard errors are reported.

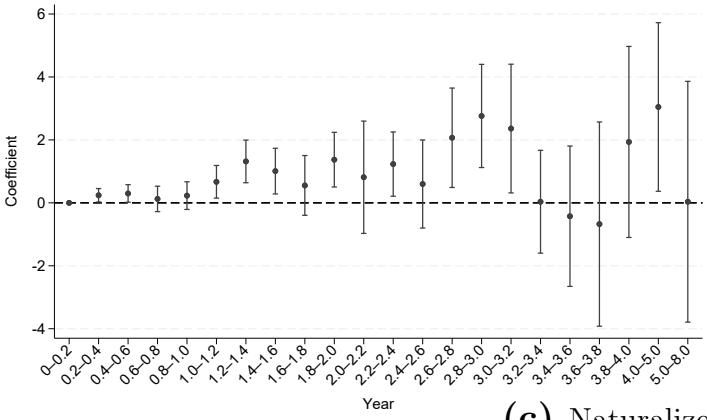
Figure (C.3) Pre-Trends in Immigrant, Noncitizen, and Naturalized Citizen shares



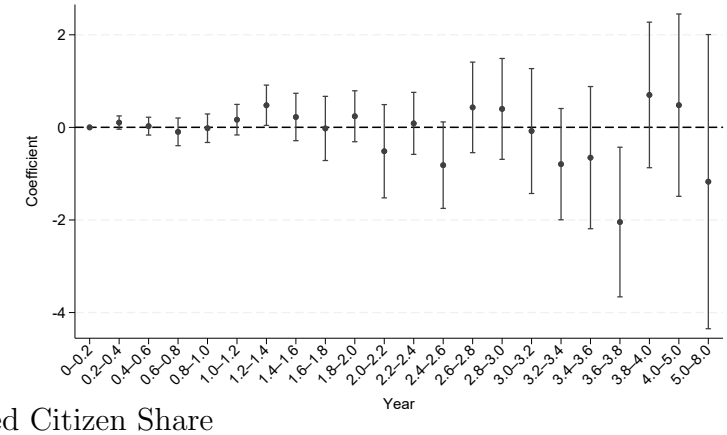
Notes: This figure shows point estimates and 95 percent confidence intervals from regressions of changes in the immigrant, noncitizen, and naturalized citizen share on the DACA-eligible share from 2006-2011 with varying controls. Baseline controls include the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. The sample includes all CPUMAs. Robust (heteroskedasticity-consistent) standard errors are reported.

Figure (C.4) Effects of DACA on Immigration by Exposure Level

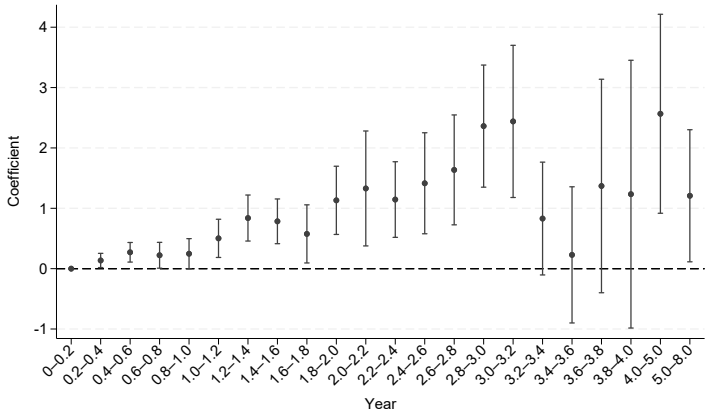
(a) Immigrant Share



(b) Noncitizen Share



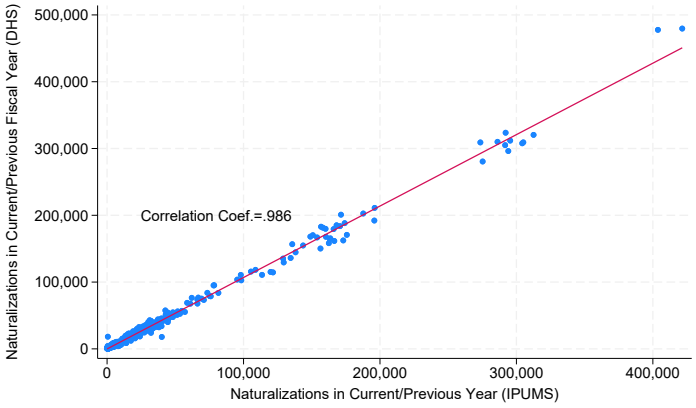
(c) Naturalized Citizen Share



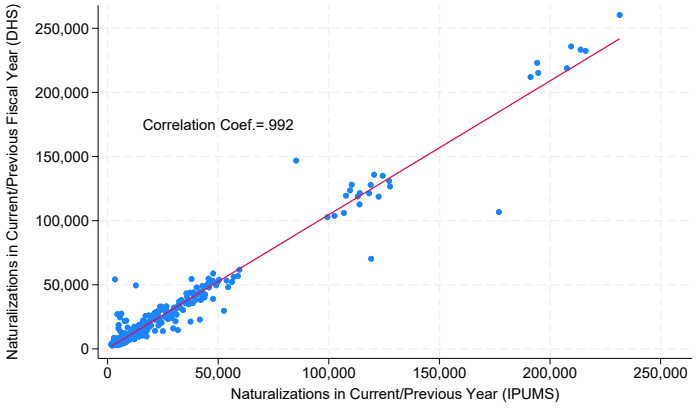
Notes: These figures show point estimates of coefficients and 95 percent confidence intervals from regressions similar to equation 1, which estimate interactions between the corresponding DACA-eligible share bin (indicated on the x-axis) and the post-DACA indicator. The sample is composed of the panel of CPUMAs for the years 2006-2019. The dependent variables are the immigrant share, the noncitizen share, and the naturalized citizen share in panels (a), (b), and (c) respectively. Regressions include CPUMA fixed effects and the following baseline (pre-DACA) controls, each interacted with year fixed effects: the immigrant population share tercile; the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Standard errors are clustered at the CPUMA level.

Figure (C.5) Verifying IPUMS Naturalizations

(a) State-Year Naturalization Counts



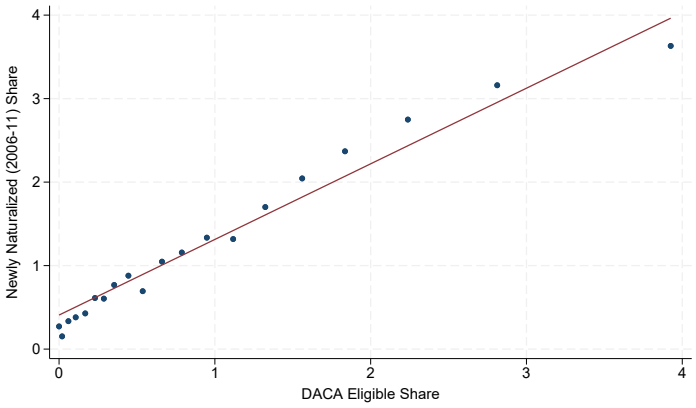
(b) CBSA-Year Naturalization Counts



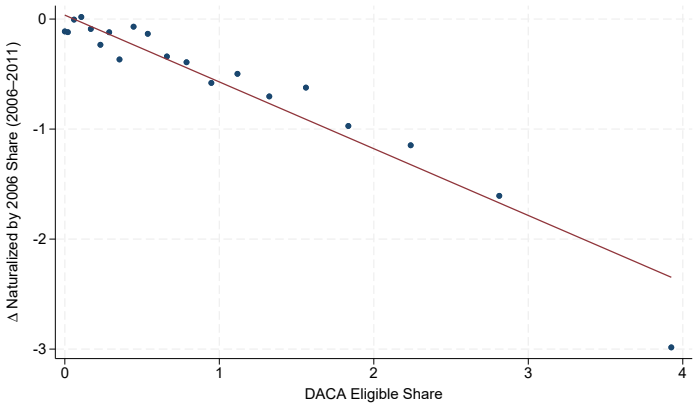
Notes: This figure plots the number of nationalizations in the current or previous year as reported by the Department of Homeland Security in a given state (panel (a)) or CBSA (panel (b)) against the number of nationalizations in the same time period using the IPUMS ACS from 2008-2019.

Figure (C.6) DACA Share and Pre-DACA Components of Changes in the Number of Naturalized Citizens

(a) Newly Naturalized Share (2005-2011)



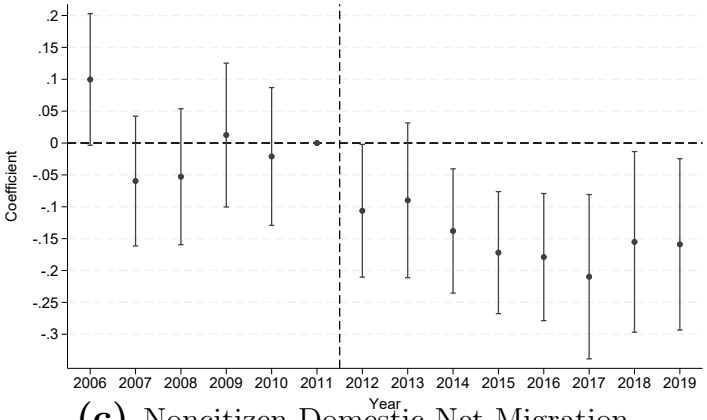
(b) Δ Previously Naturalized Share (2005-2011)



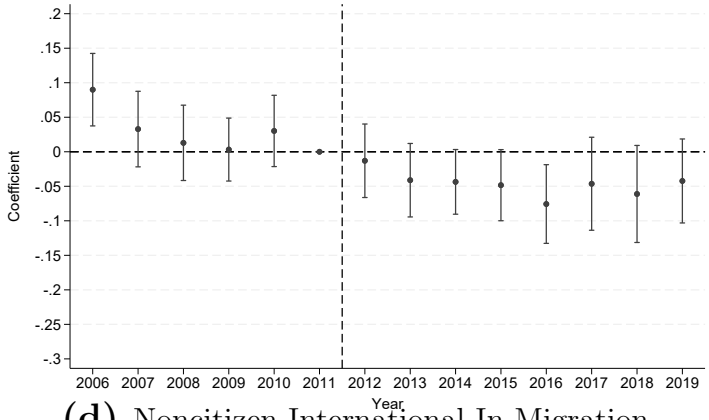
Notes: These figures show binscatters of the newly naturalized share (panel (a)) and changes in the previously naturalized share (panel (b)) during the pre-DACA period (2005–2011) against the DACA-eligible share using all CPUMAs.

Figure (C.7) Noncitizen Migration (Panels a–e)

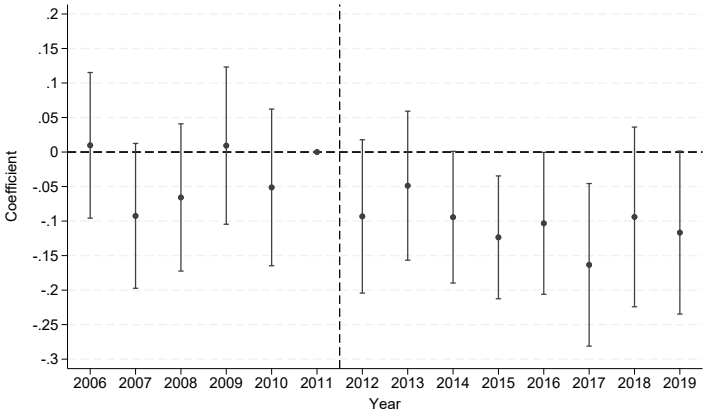
(a) Noncitizen Domestic In-Migration



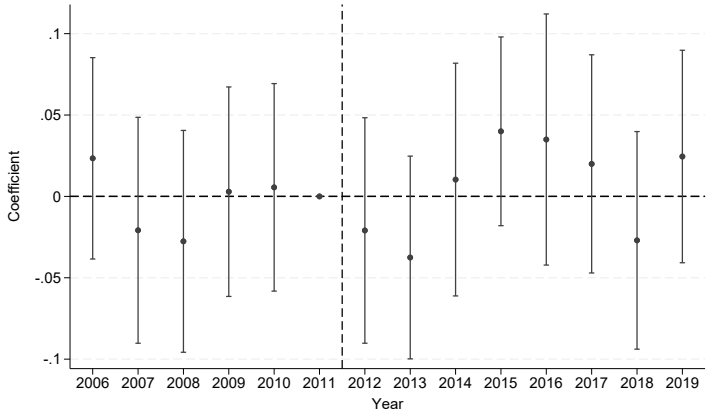
(b) Noncitizen Domestic Out-Migration



(c) Noncitizen Domestic Net Migration



(d) Noncitizen International In-Migration



(e) Noncitizen Net Migration

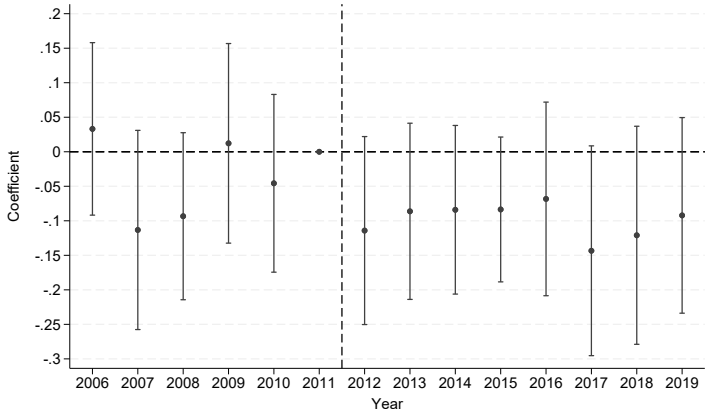
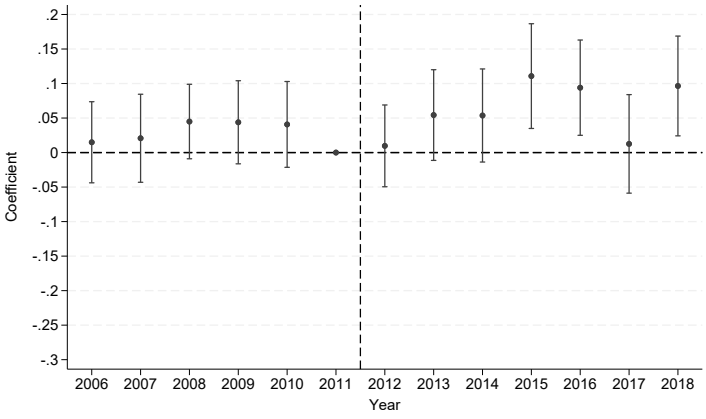
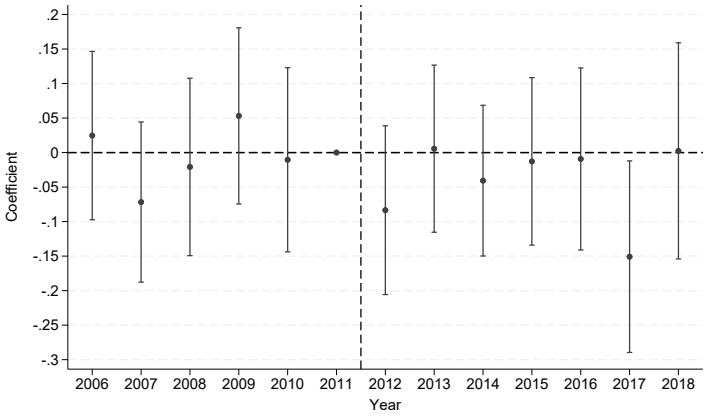


Figure (C.7) Noncitizen Migration (Panels f–g)

(f) Noncitizen Adj. International In-Migration

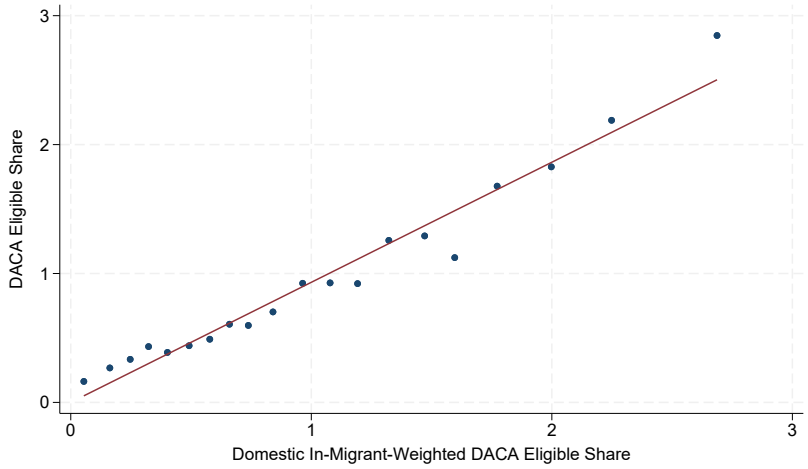


(g) Noncitizen Adj. Net Migration



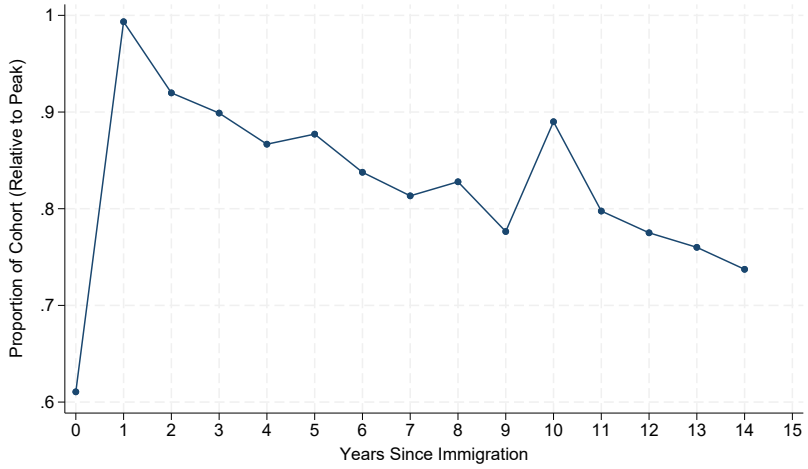
Notes: This figure shows point estimates of coefficients and 95 percent confidence intervals from event study regressions similar to equation 1, which separately estimate interactions between the year and the DACA-eligible share, with 2011 as the omitted year. In panels (a)-(e), the dependent variables are the noncitizen domestic in-migration, domestic out-migration, net domestic migration, international in-migration, and net total migration shares using the IPUMS variables. In panels (f) and (g), the dependent variables are the adjusted noncitizen international in-migration share and the noncitizen net migration share using the lagged observation approach. Regressions include CPUMA fixed effects and the following baseline (pre-DACA) controls interacted with year fixed effects: immigrant population share tercile; Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. In panels (a)-(e), the sample includes the baseline sample of CPUMAs from 2006-2019, while in panels (f) and (g), the sample is limited to this sample through 2018. Standard errors are clustered at the CPUMA level.

Figure (C.8) CPUMA DACA Share vs. Noncitizen In-Migrant-Weighted DACA Share



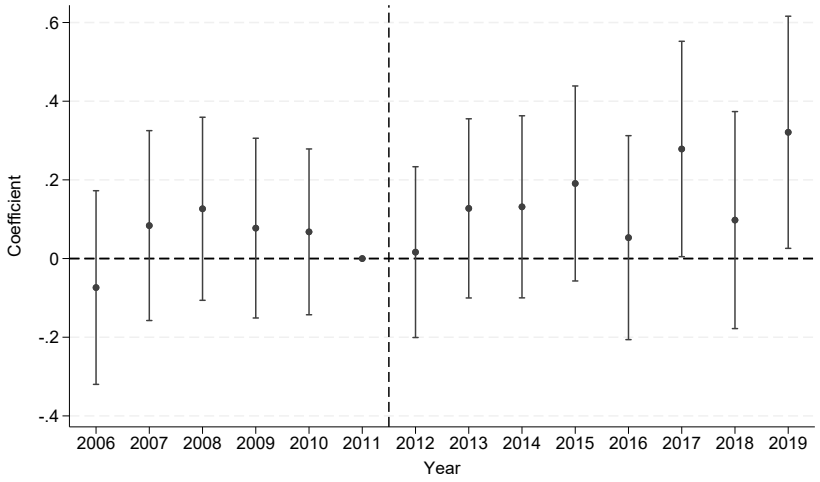
Notes: This figure is a binscatter of each CPUMA's DACA-eligible share against its noncitizen domestic in-migrant-weighted DACA-eligible share, constructed using the pre-DACA years 2005–2011.

Figure (C.9) Relative Cohort Size by Years Since Immigration



Notes: This figure shows the proportion of a cohort of immigrants (by year of arrival) surveyed in each year relative to the cohort's peak size. The sample includes all immigrants from 2005-2019 that arrived on or after 2005.

Figure (C.10) Effect of DACA on Noncitizens' Length of Time in the U.S.



Notes: This figure shows point estimates of coefficients and 95 percent confidence intervals from an event study regression similar to equation 1, which separately estimates interactions between the year and the DACA-eligible share, with 2011 as the omitted year. The dependent variable is the average number of years noncitizens in the CPUMA have been in the U.S. according to their reported year of immigration. The regression includes CPUMA fixed effects and the following baseline (pre-DACA) controls interacted with year fixed effects: immigrant population share tercile; the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Standard errors are clustered at the CPUMA level.

D Appendix Tables

Table (D.1) Effects of DACA on Immigration: Adjusting Exposure Variable

	Baseline	Exclude Outliers	Discretize Treatment
	(1)	(2)	(3)
Panel A: Immigrant Share			
Treatment × Post	0.326**	0.595**	0.622**
	(0.166)	(0.240)	(0.262)
Dep. Var Mean	14.096	11.505	14.096
Observations	15,092	9,058	15,092
Panel B: Noncitizen Share			
Treatment × Post	-0.099	0.056	-0.117
	(0.119)	(0.169)	(0.179)
Dep. Var Mean	7.360	5.967	7.360
Observations	15,092	9,058	15,092
Panel C: Naturalized Share			
Treatment × Post	0.425***	0.539***	0.739***
	(0.083)	(0.121)	(0.150)
Dep. Var Mean	6.736	5.539	6.736
Observations	15,092	9,058	15,092
CPUMA FEs	Yes	Yes	Yes
Immig. Share Tercile x Year FE	Yes	Yes	Yes
Baseline CPUMA Controls x Year FEs	Yes	Yes	Yes
Bartik Controls	Yes	Yes	Yes

Notes: This table shows results from estimating equation 1. The dependent variables are the immigrant share (Panel A), the noncitizen share (Panel B), and the naturalized citizen share (Panel C). Column 1 reproduces the baseline model with all controls (corresponding to even-numbered columns from Table 2). Column 2 excludes the top and bottom quintile of DACA-exposure. Column 3 discretizes treatment such that CPUMAs in the top quartile of exposure are considered treated. "Treatment" in Columns 1 and 2 is the continuous measure of DACA exposure. In each column, the sample is composed of the panel of CPUMAs for the years 2006-2019. The baseline (pre-DACA) controls include the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Standard errors are clustered at the CPUMA level. Significance levels are denoted by $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

Table (D.2) Components of the Change in the Naturalized Citizen Share

	Δ Naturalized Share		Post-DACA Naturalized Share		Δ Pre-DACA Naturalized Share	
	(1)	(2)	(3)	(4)	(5)	(6)
DACA Eligible Share	0.417***	0.358**	0.751***	0.359***	-0.334***	-0.000
	(0.139)	(0.145)	(0.098)	(0.072)	(0.125)	(0.112)
Immig. Share Tercile FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Prior Changes in Naturalized Pop.		Yes		Yes		Yes
Dep. Var. Mean	1.548	1.548	2.087	2.087	-0.539	-0.539
Observations	1,078	1,078	1,078	1,078	1,078	1,078

Notes: This table shows results from estimating equation 4. In columns 1-2, the dependent variable is the change in the nataralized citizen share from 2011 to 2019. In columns 3-4, the dependent variable is the post-DACA naturalized citizen share, equal to 100 multiplied by the number of naturalized citizens in 2019 who naturalized after 2011 divided by the baseline population. In columns 5-6, the dependent variable is the change in the pre-DACA naturalized citizen share, equal to 100 multiplied by the number of naturalized citizens in 2019 who naturalized before 2012 minus the number in 2011 divided by the baseline population. The sample in each column includes all CPUMAs. The baseline (pre-DACA) controls include the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Robust (heteroskedasticity-consistent) standard errors are reported. Significance levels are denoted by $^*p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

Table (D.3) Noncitizen Migration

	Domestic (Within-U.S.) Migration						
	(1) Dom. In-Mig.	(2) Dom. Out-Mig.	(3) Net Dom. Mig.	(4) Int. In-Mig.	(5) Net Mig.	(6) Adj. Int. In-Mig	(7) Adj. Net Mig.
DACA Eligible Share × Post	-0.147***	-0.075***	-0.072**	0.009	-0.064	0.035*	-0.036
	(0.037)	(0.020)	(0.031)	(0.016)	(0.039)	(0.019)	(0.038)
Immig. Share Tercile x Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Controls x Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bartik Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dep. Var. Mean	0.821	0.801	0.020	0.407	0.427	0.454	0.475
Observations	15,092	15,092	15,092	15,092	15,092	14,014	14,014

Notes: This table shows results from estimating equation 1. In columns 1-5, the dependent variables are the noncitizen domestic in-migration, domestic out-migration, net domestic migration, international in-migration, and net total migration shares using the IPUMS variables. In columns 6 and 7, the dependent variables are the adjusted noncitizen international in-migration share and noncitizen net migration share using the lagged observation approach. In columns 1-5, the sample includes the baseline sample of CPUMAs from 2006-2019, while in columns 6 and 7, the sample is limited to this sample through 2018. The baseline (pre-DACA) controls include the Black, Hispanic, poverty, college-educated, and male shares; the average age; and the natural log of the population. Standard errors are clustered at the CPUMA level. Significance levels are denoted by $^*p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

Table (D.4) Baseline (2011) Naturalization Rates by Household Group

Group	**2011 Naturalization Rate (%)**
(1) Age-Eligible Childhood Arrivals, Noncitizen	3.33
(2) Age-Eligible Childhood Arrivals, Citizen	26.24
(3) Age-Eligible Hispanic Childhood Arrivals, Noncitizen	1.85
(4) Age-Eligible Hispanic Childhood Arrivals, Citizen	15.10
(5) Age-Ineligible Childhood Arrivals, Noncitizen	2.65
(6) Age-Ineligible Childhood Arrivals, Citizen	9.44
(7) Age-Ineligible Hispanic Childhood Arrivals, Noncitizen	2.08
(8) Age-Ineligible Hispanic Childhood Arrivals, Citizen	6.85

Notes: This table shows the naturalization rate for each group for the household-exposure analysis in Section 6.

Table (D.5) Summary Statistics of Household Exposure Samples

In households with:	Age-Eligible Childhood Arrivals				Age-Ineligible Childhood Arrivals			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Hispanic				Hispanic	
	Noncit.	Cit.	Noncit.	Cit.	Noncit.	Cit.	Noncit.	Cit.
Individual Characteristics								
Age	42.693	45.171	41.992	44.840	46.353	49.228	45.666	48.704
Male	0.500	0.469	0.512	0.487	0.497	0.473	0.500	0.499
Years Since Immigrating	15.308	15.839	16.010	17.684	23.463	22.507	23.129	23.568
Education Levels								
No high school diploma	0.517	0.344	0.611	0.468	0.612	0.427	0.664	0.549
High school diploma or GED	0.243	0.264	0.244	0.283	0.230	0.252	0.218	0.250
Some college, no degree	0.085	0.131	0.073	0.111	0.080	0.120	0.068	0.102
Associate's degree	0.030	0.057	0.020	0.039	0.022	0.044	0.016	0.029
Bachelor's degree	0.081	0.134	0.040	0.071	0.040	0.106	0.027	0.053
Graduate/professional degree	0.043	0.070	0.011	0.027	0.016	0.051	0.007	0.017
Origins								
Mexican	0.575	0.256	0.736	0.539	0.691	0.410	0.796	0.663
Central American	0.121	0.071	0.153	0.145	0.124	0.095	0.142	0.150
Caribbean	0.055	0.118	0.042	0.154	0.045	0.097	0.029	0.086
South American	0.061	0.081	0.065	0.139	0.030	0.062	0.029	0.077
East Asian	0.041	0.102	0.001	0.003	0.017	0.075	0.000	0.003
Southeast Asian	0.036	0.111	0.001	0.004	0.035	0.099	0.001	0.004
South Asian	0.038	0.084	0.000	0.002	0.009	0.035	0.000	0.001
Outcome								
Naturalized x 100	3.343	22.964	2.219	16.122	2.869	11.052	2.276	8.598
Naturalized, norm. by 2011 rate	1.004	0.875	1.202	1.063	1.088	1.177	1.093	1.250
Observations	182,345	63,270	135,212	27,704	61,373	63,222	51,769	36,868

Notes: This table reports sample means for the listed variables. Columns 1–2 include individuals living in households with age-eligible childhood arrivals who are at least 18 years old, do not meet DACA's observable eligibility criteria, are either noncitizens or naturalized in the current or previous year, and have resided in the U.S. for at least five years. Columns 3–4 restrict this sample to individuals living with Hispanic age-eligible childhood arrivals. Columns 5–6 include individuals living in households with age-ineligible childhood arrivals who satisfy the same restrictions, and columns 7–8 further restrict this sample to those living with Hispanic age-ineligible childhood arrivals. Odd-numbered columns use individuals living with citizens, and even-numbered columns use individuals living with noncitizens. Observations are weighted using IPUMS person weights (perwt).