NBER WORKING PAPER SERIES

OPENING THE DOOR: IMMIGRANT LEGALIZATION AND FAMILY REUNIFICATION IN THE UNITED STATES

Elizabeth U. Cascio
Ethan G. Lewis

Working Paper 27874
http://www.nber.org/papers/w27874

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
October 2020, Revised August 2021

An earlier draft of this paper circulated under the title, "Opening the Door: Migration and Self-Selection in a Restrictive Legal Immigration Regime." For helpful comments and suggestions, we thank Cynthia Bansak and seminar participants at Cornell University, Harvard Kennedy School, Stanford University, Tufts University, the University of Nebraska, the University of Virginia, Vanderbilt University, the 2020 AEA Meetings, the Virtual Economic History seminar, and the National Bureau of Economics Research conference on Immigrants and the United States Economy. We are also extremely grateful for the research assistance of Meriem Fouad, Ben Matejka, and Michelle Wu, and funding support from Dartmouth College. All errors are our own. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Opening the Door: Immigrant Legalization and Family Reunification in the United States
Elizabeth U. Cascio and Ethan G. Lewis
NBER Working Paper No. 27874
October 2020, Revised August 2021
JEL No. F22,J08,J61,J68

ABSTRACT

We examine how the legalization programs of the Immigration Reform and Control Act of 1986 (IRCA) have affected immigration to the United States since the late 1980s. Our empirical approach exploits variation in IRCA's timing and the magnitude of the legalization shock across metropolitan areas for the one country – Mexico – that dominated the legalized population. We find that "opening the door" to family-sponsored admissions has indeed increased authorized immigration by family members. However, our estimates imply that each IRCA-legalized immigrant has sponsored only one family member for admission over the past three decades. Most induced admissions have also been immediate family, inconsistent with explosive chain migration. Estimates are highly robust and similar in magnitude when we use variation across countries of origin in the magnitude of the legalization shock, irrespective of place of residence within the U.S., or consider survey-based estimates of total immigrant arrivals, rather than admissions alone.

Elizabeth U. Cascio
Department of Economics
Dartmouth College
6106 Rockefeller Hall
Hanover, NH 03755
and NBER
elizabeth.u.cascio@dartmouth.edu

Ethan G. Lewis
Department of Economics
Dartmouth College
6106 Rockefeller Hall
Hanover, NH 03755
and NBER
ethan.g.lewis@dartmouth.edu

I. Introduction

An estimated 10.5 million unauthorized immigrants reside in the United States today (Passel and Cohn, 2018). Despite heightened immigration enforcement and efforts to curb even legal immigration in recent years, expansive legalization efforts are not without precedent. In 1986, President Ronald Reagan signed into law a comprehensive immigration reform – the Immigration Reform and Control Act (IRCA) – one pillar of which was a set of legalization programs that allowed nearly 3 million unauthorized immigrants at the time to become lawful permanent residents (LPRs).[1] Since then, several immigration reform bills with legalization provisions similar to IRCA have been proposed, but none have made it through Congress.

A key obstacle to mass legalization in the U.S. over the past 30 years has been a concern over how it might affect *future* immigration flows, given peculiar features of the U.S. immigration system. A hallmark of that system, put in place by the Immigration and Nationality Act of 1965, has been prioritization of family reunification over other considerations. In fiscal 2018, two-thirds of the 1.1 million immigrants to the U.S. gaining "admission" – the same as becoming an LPR or obtaining a so-called "Green Card" – did so through a family tie (U.S. Department of Homeland Security, 2019). Thus, large-scale legalization policies can *in effect* legalize many more immigrants than those who are directly affected themselves: The initial wave of legalized immigrants can bring their spouses, children, parents, and siblings; siblings can bring their spouses and children; and so on. Such "chain migration" is controversial not only due to its perceived scale but also because family-sponsored migrants are perceived to impose a fiscal burden, in being less likely to be working age and not selected on skill.

[1] IRCA's legalization programs improved labor market outcomes (Phillips and Massey, 1999; Kossoudji and Cobb-Clark, 2002; Amuedo-Dorantes, Bansak, and Raphael, 2007; Pan, 2012; Steigleder and Sparber, 2017), reduced crime (Baker, 2015; Freedman, Owens, and Bohn, 2018), and increased filing of personal income tax returns (Cascio and Lewis, 2019).

Empirically, however, we know little about even the scale of chain migration. Most existing studies (Yu, 2008; Carr and Tienda, 2013; Tienda, 2018) consist of accounting exercises that make heroic assumptions about who can start a "chain" and the amount of time that can transpire between this initiating admit and subsequent family sponsorship. These assumptions can greatly affect estimates of what this literature calls the "immigration multiplier" (Jasso and Rosenzweig, 1986; Jasso and Rosenzweig, 1989) – the number of family sponsored admissions per initiating admit.[2] Moreover, no existing studies exploit exogenous variation in that first admission, despite the possibility that the same "push" and "pull" factors may affect them and the family members whose admissions they may later sponsor.

We address these limitations by combining administrative data with variation in the size of the legalization shock brought about by IRCA's legalization programs. Figure 1 shows that these programs generated 2.7 million admissions over the narrow time frame from 1989 and 1991. Countries across the world contributed to this admissions spike, but nearly three-quarters of it came from Mexico. We focus on Mexico in our analysis, positing larger increases in family-sponsored admissions of Mexicans after the IRCA cohort was admitted for U.S. metropolitan areas where the scope for family sponsorship among Mexicans increased more due to IRCA. Our analysis does not cap the length of time it may take family members to follow and accounts for the fact that citizenship affords the broadest family sponsorship rights.

Our estimates come from data on immigrant admissions. We find that through 2019 – fully 30 years after the initial legalization event – the average Mexican awarded a Green Card through IRCA was responsible for just over one additional admission. Eighty percent of this

[2] For example, Tienda (2018) estimates that every Mexican admission in the late 1990s subsequently sponsored the admission of 6.38 family members. However, this figure assumes that all family admissions from Mexico in the early 2000s were sponsored by a small number of employer-sponsored Mexican admissions in the late 1990s, not the much larger IRCA cohort admitted a decade before.

effect is accounted for by immediate relatives, specifically spouses and unmarried children of a sponsor; only 3% is accounted for by siblings and married children, who are critical to starting migratory chains. These estimates account for push factors through year fixed effects and are not sensitive to controls for local pull factors, like demand shocks for Mexican labor or traditional enclave measures used to predict future Mexican settlement. More affected areas also did not see larger changes over time in admissions under other initiating sponsor categories (e.g., employers), suggesting other sources of sponsorship do not explain our findings.

The conclusions are similar when we use variation across origin countries in the size of the legalization shock, regardless of residence within the U.S., or consider survey estimates of total immigrant arrivals, rather than admissions alone. First, cross-country variation does yield a larger estimate (1.5 family-sponsored admissions per IRCA Green Card holder), with a smaller portion (two-thirds) coming from spouses and children. However, the number of other relatives sponsored per IRCA admit is still economically and statistically significantly below one. Further, the estimates are comparable to baseline for the subset of countries that, like Mexico, have low naturalization rates and thus less scope for citizen sponsorship. Second, estimates based on total immigrant arrivals from the Census and American Community Survey – including unauthorized arrivals and temporary visas, not just admissions – are statistically indistinguishable from estimates based on the administrative data for admissions only. We thus cannot reject that, over the long term, the marginal induced arrival due to IRCA's legalization programs was a family-sponsored admission – and that IRCA was not a magnet for further unauthorized immigration. However, these latter estimates are too noisy to draw strong conclusions.[3]

[3] For this reason, we have abandoned the further analysis using the Census and ACS pursued in earlier drafts of this paper. We leave further investigation of the substitutability between family-sponsored admissions and other means of entering the U.S., as well as of selection among family-sponsored admissions, to future research.

What do these estimates imply about the immigration multiplier? By allowing chain migration to play out over 30 years, we may be estimating not just the first-generation effects captured in this multiplier, m, but also second-generation effects, and so on (e.g., $m + m^2 + m^3 + \cdots$). Our estimates for other relatives being well below one could therefore be consistent with $m < 1$, or with migratory chains dying out. However, if first generation impacts have not yet been realized, our estimates would understate m. Annual quotas on citizen-sponsored admissions of siblings and married children generate long wait lists for entry, especially for Mexico, and estimated effects on this group of other relatives indeed remain statistically above zero (though small) even as late as 2019. While we thus cannot rule out "explosive" chain migration, such a process would be very slow-moving. Evidence in Section VI also suggests that our estimates would imply $m < 1$ if first-generation impacts could be observed in full.

This is the first paper to rigorously examine how legalization opportunities reverberate through the American immigration system. Our estimates suggest that in practice, the current system results in migration by nuclear families, with few initiating admits bringing distant relatives. This appears due to a combination of legal limits on the supply of slots and low actual demand for family sponsorship, insofar as that demand is reflected in naturalization rates. The generalizability of our estimates to present-day policy thus depends on the comparability of the naturalization rates of any newly authorized population with those of the IRCA cohort and the supply of slots relative to cohort size. Even if naturalization rates had risen, there is a much larger unauthorized population today than in the mid-1980s, and quotas have not changed since 1990. This suggests even more supply-side constraints than in the past, an issue exacerbated by existing wait lists. In the absence of an increase in the quotas, our estimates might therefore be an upper bound on the response per marginal admission from a similar program now.

II. Background and Data

This paper focuses on *immigrant admissions* – foreign nationals admitted to the U.S. as LPRs, or with Green Cards. Immigrant admissions are one of two major forms of authorized immigration to the U.S., and not all immigrants are authorized.[4] We return to other forms of immigration later, focusing here on the rules governing immigrant admissions since 1965 and on our sources of data on this immigrant group. (See Appendix A for more details.)

A. Admissions Programs

The primary way for an immigrant to be admitted to the U.S. (as an LPR/with a Green Card) is to be sponsored. Since 1965, three major groups have been eligible to sponsor admissions – American citizens, current Green Card holders/LPRs, and employers. The first two groups can sponsor family members only; however, there are differences in which family members they can sponsor. Both citizens and current LPRs can sponsor their spouses and minor (under age 21) or unmarried children for admission – what we will call "spouses and kids" in tables and figures for the rest of the paper. But only citizens can sponsor their parents, married children, and siblings – the relatives typically thought of as "chain migrants."

Though citizens can sponsor their spouses, minor children, and parents in unlimited numbers, other family sponsorship is quota restricted. In particular, LPRs can sponsor children and spouses, but only up to an annual (worldwide) quota of 226,000,[5] and since the Immigration Act of 1990, citizen-sponsored admissions of adult or married children and of siblings have been capped at 46,800 and 65,000, respectively. For the most part, naturalized citizens of all countries

[4] *Non-immigrant admissions* are foreign citizens permitted to enter the U.S. on a temporary basis, such as with student or employment visas. Unauthorized immigrants consist of those who overstayed a temporary visa or entered the country without authorization.

[5] In theory, a larger annual admission is possible under the law if few close relatives of citizens are admitted in a year, but this does not happen. The Immigration Act of 1990 also temporarily expanded this quota by 55,000 in each of the fiscal years 1992, 1993, and 1994 expressly for the spouses and children of those legalized under IRCA.

compete equally for these slots, but large sending countries face an additional 7% cap on how much of any category-specific quota they may use annually (e.g., naturalized citizens for any given country can sponsor no more than 4,550 siblings per year). The 7% cap also applies to the quota on LPR sponsorship of their spouses and children.

There are other pathways to admission that do not rely on sponsorship. For example, refugees can become LPRs, as can winners of the diversity visa lottery, which was also established in 1990. Special, limited-time programs have also been periodically established by law. The historically most significant of these and the programs of study in the present paper – the General Legalization Program (GLP) and the Seasonal Agricultural Workers (SAW) program – were authorized by IRCA in 1986.[6] IRCA's GLP targeted the long-term unauthorized, defined as those who at the time of application could demonstrate continuous residency in the U.S. since prior to 1982. The SAW program, by contrast, targeted immigrants who could demonstrate 90 days of employment in seasonal agriculture (for certain USDA-defined crops) in the year running up to May 1, 1986 and required no more in the way of residency.[7] Admission under these programs – which was concentrated between 1989 and 1991 (Figures 1 and 2) – was the culmination of a multi-step process that began with application for temporary status and continued with temporary admission before Green Card application (Cascio and Lewis, 2019).

Regardless of how Green Cards are awarded, Green Card holders are eligible to naturalize five years after admission, e.g., starting in 1994 for the earliest awardees under IRCA's legalization programs, as shown Figure 2. Naturalization rates vary across countries, and

[6] The Nicaraguan Adjustment and Central American Relief Act (NACARA), passed in 1997, did something on a much smaller scale for registered asylum seekers from Nicaragua, Cuba, El Salvador, Guatemala, and the former Soviet Union.

[7] IRCA also authorized adjustment to permanent residence under two much smaller programs with less restrictive timing: Cubans and Haitians already living in the U.S., and those who had been in the U.S. since at least 1972. These groups are also included in our analysis and in Figure 1.

in the context of IRCA, they also varied across programs even within country. SAW participants naturalized at lower rates: As of 2001, 23% of those admitted under SAW had naturalized (about 18% for Mexico), compared to 40% of those admitted through the GLP (about 34% for Mexico).[8] A lower naturalization rate means less scope for sponsoring family members.

B. Data on Admissions

Our outcome variables are drawn from administrative admissions data published as anonymized Immigration and Naturalization Service (INS) microdata (fiscal years 1983 though 2004) and in tables published by the Department of Homeland Security (DHS) (more recent years).[9] The tables allow us to produce annual counts of Mexican admissions for all key admission categories (e.g., Green Card-sponsored, citizen-sponsored) from 2007 to 2019 for the top 200 receiving counties in each year. We create comparable figures for earlier years from the INS microdata, which include admission category, country of birth, age, as well as zip code of intended residence, which we map to counties. We then aggregate county counts to 1999 Primary Metropolitan Statistical Areas (PMSA) boundaries – the metro area level. While our estimation sample is limited by the published tabulations, it ultimately consists of 66 metro areas over the period 1983-2019, representing 61% of Mexican LPRs admitted through IRCA.[10]

We obtain IRCA admissions information from the Legalization Applications Processing System (LAPS), which provides anonymized data on all IRCA legalization applicants through the GLP and SAW program. The LAPS tracks application status through the end of the 1992

[8] These percentages were calculated by the authors using numbers reported in tables and figures of Rytina (2002). This is the most recent information on naturalization rates by program for all admitted through IRCA.
[9] Microdata are available before 1983 but lack enough geographic information to identify metropolitan areas. No data by metro area are available for 2005 and 2006. We linearly interpolate data in those years. References vary by year and are detailed in Appendix A and Table A1. The INS microdata also include information on the two much smaller one-time legalization programs authorized by IRCA and described in footnote 7.
[10] To ensure accurate measurement of the legalization ratio, described in the next section, we also required that the area have at least 20 registered Mexican Green Card holders in 1980. This eliminated one metro area: Trenton, NJ.

fiscal year, at which point 98.2% of GLP and essentially all SAW program applicants who would become LPRs (through 2001) had received Green Cards (Rytina, 2002). The LAPS includes information on country of origin and county of U.S. residence at the time of application, which we aggregate to metro areas. Using these data, we can thus estimate the number of Mexican IRCA admissions by metro area.

As discussed below, the intensity with which IRCA's legalization programs affected the scope for family sponsorship among Mexicans in a given metro area depends on how much scope for family sponsorship that group had *prior* to IRCA. That, in turn, depends on the pre-IRCA stock of Mexican immigrants in that metro area with sponsorship rights – existing LPRs and citizens. We obtain information on the number of existing Mexican LPRs by metro area using an anonymized 1980 registry of Green Card holders ("Alien Address Reports"), compiled and distributed by the INS (United States Department of Justice, 1992). Like the anonymized INS microdata, this registry gives information on country of origin and zip code of U.S. residence, which we code to metro areas. A similar registry is not available for foreign-born citizens, so we estimate the number of Mexican citizens by metro area using the 5% public use microdata sample of the 1980 Census of Population (Ruggles, et al, 2020).

III. Identification Strategy

A. Intuition and Specification

The sharp timing of IRCA and the fact that citizens enjoy broader family sponsorship rights comprise the first elements of our identification strategy. That is, we expect IRCA-induced increases in family-sponsored admissions to manifest in changes in category-specific admissions that align with IRCA applicants' transitions to sponsorship status. For example, because "family 4th preference" visas (for siblings) require citizen sponsorship, and IRCA Green Card holders did

not naturalize until 1994 at the earliest (Figure 2), we expect to observe changes in admissions under this category only after 1994. Similarly, parents can only be sponsored by citizens, so their numbers should only rise after 1994. However, spouses and minor or unmarried children, who can be sponsored by LPRs, can see their numbers rise soon after 1989.

To demonstrate, Figure 3 Panel A shows admissions through IRCA's legalization programs for Mexico, which accounted for roughly 75% of IRCA LPRs, and other Mexican admissions over time.[11] Consistent with expectations, Green Card-sponsored admissions rose after 1991, whereas citizen-sponsored admissions began to rise in the mid-1990s (Panel B). Also consistent with admissions rules, it is only after the mid-1990s that admissions of parents and non-immediate relatives from Mexico start to rise, though admissions of spouses and children begin to rise after 1991 (Panel C). Taking post-pre differences of each normalized series (Panel B) around 1988 and multiplying each of these differences by 28 (years) to accumulate the predicted change in annual admissions through 2016 (when the country level data end), we would conclude that, for each Mexican admission through IRCA, there were 0.93 (s.e.=0.12) family-sponsored admissions, with 0.43 (0.06) of an admission through Green Card sponsorship and 0.50 (0.09) of an admission through citizen sponsorship. Thus, for each IRCA admission, there has been less than one family-sponsored admission *in total* between 1988 and 2016.

A drawback of relying only on the timing of specific sponsorship patterns for identification is that other factors affecting admissions could be changing over time. For example, the Mexican peso crisis unfolded in the mid-1990s, just as Mexicans obtaining Green Cards through IRCA would have been able to naturalize and sponsor the admission of a broader set of family members. Our research design therefore also uses variation across U.S. metro areas

[11] The country-by-year admissions counts for this analysis come from the INS microdata described in Section IIA (through 2004) and country (of origin)-level tables published by DHS (from 2005 through 2016). See Appendix A.

in the intensity of IRCA as a legalization shock. Intuitively, metro areas for which Mexican IRCA admissions were large relative to pre-existing stocks of Mexican legal residents (LPRs and citizens) should have experienced proportionally larger Green Card- (and citizen-) sponsored admissions following the 1989 to 1991 spike in IRCA Green Card awards. Such areas experienced larger proportional increases in potential future sponsorship, due to IRCA.

We measure the intensity of IRCA as a legalization shock with the "legalization ratio," $lpr_{c,IRCA}/legal_{c,1980}$, where $lpr_{c,IRCA}$ is the number of Mexicans in metro area *c* receiving Green Cards through IRCA, and $legal_{c,1980}$ is the number of authorized Mexican residents – LPRs and citizens combined – in *c* in 1980. The model of interest is then this event-study one:

$$\frac{a_{ct}}{legal_{c,1980}} = \delta_c + \gamma_t + \sum_{\tau \neq 1988} \theta_\tau D_t^\tau \left(\frac{lpr_{c,IRCA}}{legal_{c,1980}}\right) + \varepsilon_{ct} \quad (1)$$

where a_{ct} represents Mexican admissions in a specific category (e.g., Green Card-sponsored) settling in metro area *c* in (fiscal) year *t*, and the D_t^τ are a set of indicator variables equal to one if $t = \tau$, for $\tau \neq 1988$. The model includes a vector of metro area fixed effects, δ_c, to account for the possibility that some areas have systematically larger flows of Mexican admissions than others. It also includes a vector of year fixed effects, γ_t, to account for aggregate shocks, like economic shocks that push (or pull) Mexicans to reunite with family members in the U.S.

The coefficients of interest in (1) are the θ_τ, on the interactions between the legalization ratio and the D_t^τ. For any given τ, θ_τ gives the predicted difference in admissions between τ and the omitted year, 1988, for every unit increase in the legalization ratio. As formalized in Appendix B, θ_τ also estimates the *number* of additional admissions in τ *per IRCA Green Card holder* under fairly weak assumptions. Intuitively, (1) is derived from a model in levels, where admissions counts, a_{ct}, are regressed on interactions between year indicators and both $lpr_{c,IRCA}$ and $legal_{c,1980}$. θ_τ is the coefficient on the IRCA LPR interactions with D_t^τ in this alternative

model, capturing how many additional admissions are predicted in τ for each IRCA admission.[12],[13] Accumulating across years after 1988, we then arrive at a prediction of the stock of IRCA-sponsored family admissions as of 2019 relative to the number of original IRCA LPRs, assuming no return migration or mortality, $\theta = \sum_{\tau>1988} \theta_\tau$. Accumulating marginal admissions from 1989 forward is conservative, since 1989 is the first year for IRCA admissions, and allows coefficients for mutually exclusive subcategories of admissions to sum to the coefficient for the total. This simplifies our analysis going forward.

For least squares estimates of the θ_τ in (1) – and thus of θ – to capture the full family-sponsorship effects of IRCA, it must be the case that sponsored family members locate in the same metro area that their sponsors settled. This seems a reasonable assumption for spouses and children, but only insofar as sponsors have low mobility within the U.S. from their initial destinations. And even with low mobility of sponsors, siblings and even parents may settle elsewhere. Below, we therefore estimate a version of (1) that replaces metro areas, *c,* with origin countries, thus expanding the scope of the analysis beyond Mexico. This approach does not limit admissions for Mexico (or any other country) to any particular U.S. destination. We also compare our cross-metro area estimates for Mexico to those based on the time series (Figure 3).

For our estimates to have a causal interpretation, we must assume that areas with higher legalization ratios would not have experienced larger increases in (scaled) admissions in the absence of IRCA's legalization programs. This assumption would be violated if metro areas

[12] γ_t is the coefficient vector on the interaction terms between year dummies and $legal_{c,1980}$ in the levels model (Appendix B). By including year fixed effects, (1) thus allows us to avoid confounding admissions due to IRCA with admissions due to an increasing propensity for family sponsorship among pre-IRCA LPRs and citizens.
[13] We do not estimate the levels model, however, due to outliers from strong regional concentrations of the foreign-born population (Lewis and Peri, 2015). We do not scale by population because the estimates would not have the preferred interpretation without additional controls (Appendix B). Appendix B shows conditions under which a feasible scaling by legal immigrants as of 1980 – instead of legal immigrants just before the IRCA legalizations in 1988 – will lead to unbiased estimates. A sufficient condition is that the legalization ratio is uncorrelated with admissions 1981-1987 per existing legal immigrant in 1980. We provide evidence of this in Table 1 Panel B.

with higher legalization ratios were systematically different in ways that correlated with immigrant settlement, especially after IRCA. For example, if the legalization ratio were correlated with the location of traditional Mexican enclaves, the spread of new Mexican arrivals beyond traditional enclaves in the 1990s (Card and Lewis, 2007) would bias our estimates. The remainder of this section examines this assumption empirically.

B. Probing the Identifying Assumption

Table 1 Panel A lists the metro areas with the top legalization ratios in our estimation sample of 66 metro areas, in descending order by the ratio's value (see Table A2 for the full sample and Table A3 for descriptive statistics on all variables). While Los Angeles was residence of the largest *number* of Green Cards recipients awarded under IRCA – and is a traditional destination for Mexican immigrants – it did not have anywhere near the highest legalization ratio. Indeed, metro areas in Florida, rather than California, dominate the top-ten list. Florida metro areas had relatively high SAW shares in their legalized population, and indeed, variation in the legalization ratio is driven by those legalized under the SAW program, who also make up the majority of Mexicans admitted in the average metro area in our sample (Table A4). As mentioned, the lower naturalization rates among SAWs (Figure 2) would have affected their ability to sponsor relatives. We explore how this may influence the estimates below.

Table 1 Panel B returns to a systematic exploration of the relationship between the legalization ratio and several correlates of Mexican settlement. The 1980 Mexican share in the local population, which is a strong predictor of the spread of Mexicans across the U.S. in the 1990s (Card and Lewis, 2007), is significantly lower in metro areas with higher legalization ratios (column 2).[14] However, the coefficient on the legalization ratio is smaller in magnitude and

[14] This is not a mechanical negative correlation: The density measure in row a of panel B includes all Mexicans, not just citizens and LPRs, and was measured using tabulations from the 20% count data (Manson et al., 2020).

not significant conditioning on state fixed effects (column 3). Our preferred specification therefore allows for state-by-year fixed effects, not just year fixed effects as in (1), to remove bias from state-specific admissions shocks.[15]

Conditioning on state fixed effects, the legalization ratio is also not correlated with two measures of local labor demand shocks – local job growth leading up to IRCA (calculated from County Business Patterns data) and a Bartik-style predictor of Mexican job growth through 2019 based on 1980 occupation mix (see Appendix A). These results are reassuring, since Mexican settlement patterns are particularly responsive to local economic conditions (Cadena and Kovak, 2016). All of these predictors of Mexican settlement are also jointly insignificantly related to the legalization ratio within state (column 4).[16]

IV. IRCA Legalizations and Subsequent Admissions

A. Baseline Estimates

Figure 4 Panel A presents estimates of the θ_τ from model (1) (augmented to include state-by-year fixed effects), along with 90% confidence intervals (with standard errors clustered on metro area), for the two main family sponsorship categories – Green Card and citizen – and for their sum, capturing total family sponsorship.[17] Consistent with expectations, Green Card-sponsored admissions rise after the spike in IRCA Green Card awards (which culminated in 1991), with the first statistically significant coefficient arising in 1993.[18] Increases in citizen-

[15] State-by-year fixed effects also remove bias from state-by-year heterogeneity in the relationship between existing legal immigrants and family-sponsored admissions. See Appendix B.

[16] The legalization ratio also does not predict pre-IRCA Mexicans admitted in proportion to $legal_{c,1980}$, related to the condition for (1) to yield unbiased estimates in dividing by $legal_{c,1980}$, instead of $legal_{c,1988}$ (Appendix B). Table A4 shows that conditional on state fixed effects, the legalization ratio does not significantly predict the rate at which applications for legal status were accepted, reducing concerns about endogenous differences in admission rates (e.g., a preference for or against those with families) potentially driving our results.

[17] Figure A1 shows the year-by-year scatterplots underlying the estimates of the θ_τ's for overall family sponsorship. These show that the estimates are not driven by outliers.

[18] The lag in effects is not entirely surprising given that the cross-metro variation is driven by the SAW program, and LPRs under the SAW program received their Green Cards later than those under the GLP (Figure 2).

sponsored admissions do not emerge until later, consistent with the lag in naturalization, and are not significant until 1999. After that, both series fluctuate for about 10 years before trending downward, though citizen-sponsored flows remain statistically significant through the end of the period. The pattern is similar to the simple time series for Mexico (Figure 3).

Table 2 summarizes these event-study estimates with estimates of θ, which sum the post-1988 coefficients separately for each visa category (i.e., $\hat{\theta} = \sum_{\tau>1988} \widehat{\theta_\tau}$) and so estimate cumulative admissions per IRCA LPR. Our baseline estimates (column 1) imply 0.48 additional Green Card-sponsored admissions (s.e.=0.09) and 0.55 additional citizen-sponsored admissions (s.e.=0.18) through 2019 for every immigrant admitted through IRCA, amounting to 1.03 additional family-sponsored Mexican admissions in total (s.e.=0.25). Weighting by 1980 population lowers these estimates and reduces precision (Solon, Haider, and Wooldridge, 2015), but the basic pattern remains unchanged (column 2).

Table 2 also presents $\hat{\theta}$'s by relative type. Spouses and children account for most of the additional admissions (column 1 coef. (s.e.)=0.87 (0.20)); parents account for most of the remainder (coef. (s.e.)=0.12 (0.05)). Figure A2 Panel A shows the timing: admissions of parents did not significantly rise until the late-1990s, consistent with when IRCA naturalizations began (as only citizens can sponsor family members beyond spouses and unmarried children). Still, spouses and kids continue to dominate the remaining admissions, stabilizing at around 80% of the total by 2019. Other relatives (not spouses, kids, or parents) account for only 3% of IRCA-sponsored family admissions from Mexico (column 1 coef. (s.e.) = 0.03 (0.02)).

Notably, the estimates are very similar to what we obtained from the simple time series analysis for Mexico, including in narrow categories of sponsorship.[19] This result suggests that

[19] Harmonizing the sample to the same time frame in Figure 3, the estimate is 0.87 for all family-sponsored admissions, 0.45 for Green-Card sponsored, and 0.42 for citizen-sponsored (vs. 0.93, 0.43, and 0.5, respectively).

exploiting cross-metro area variation does not lead to a great deal of attenuation due to internal migration, a consideration that we explore further using cross-country variation in Section V. It also suggests that it was indeed IRCA – and not the Mexican peso crisis or any other factor – that drove the rise in Mexican family-sponsored admissions in the mid-1990s.

B. Robustness

Our estimates can be interpreted causally if trends in family-sponsored admissions would have been the same in the absence of IRCA across metro areas in the same state, but with different legalization ratios. While this is fundamentally unknowable, the fact that areas with relatively high legalization ratios for their state were not already experiencing an upward trend in family-sponsored admissions prior to IRCA (Figure 4 Panel A) suggests that the legalization ratio is not correlated with unobserved drivers of family-sponsored admissions. The timing of effects across admissions categories after IRCA also aligns with expectations. Here, we consider additional robustness checks.

Placebo outcomes. Our first check is to estimate effects on other admissions categories that should not have been affected by IRCA but could subsequently sponsor family members for admission. Figure 4 Panel B shows no significant change in diversity visa or employer-sponsored admissions for more heavily treated metro areas after IRCA versus before. Put differently, because there is no systematic change in other potential sponsors after IRCA, the family-sponsored Mexicans arriving after IRCA were very likely sponsored by the original Mexican IRCA admissions, or family members whom they subsequently sponsored.

Controls. Our second approach is to add the vector of predictors of Mexican arrivals (Table 1 Panel B) interacted with year fixed effects to the baseline model. Consistent with these predictors being unrelated to the legalization ratio within state, Table 2 column 3 shows that

adding these controls has virtually no effect on the point estimates but makes them more precise. Not shown is that replacing state-by-year fixed effects with year fixed effects also has almost no impact on the estimates (the overall estimate is 1.07 (0.22), with 82% accounted for by spouses and kids).

Heterogeneity by program type. As noted, metro areas with higher legalization ratios have higher SAW shares in their legalized population than metro areas with lower legalization ratios within the same state in our estimation sample (Table A4). At the same time, SAW admissions had lower naturalization rates (Figure 2), and thus had less ability to sponsor family members for admission. Our estimates may therefore be lower than what would be representative of Mexican IRCA admissions as a whole.

Table A5 splits the legalization ratio into two separate legalization ratios (both divided by $legal_{c,1980}$) – one based on SAW admissions only and other based on GLP and other IRCA admissions. Consistent with their low naturalization rates – and a causal interpretation – SAWs induce a smaller increase in citizen-sponsored admissions (Panel B, 0.49 vs. 0.84). However, this is entirely made up for by significantly greater Green Card-sponsored admissions (0.57 vs. 0.01). We thus fail to reject that SAWs sponsor the same number of relatives as others legalized by IRCA; in fact, the overall SAW point estimate is larger (1.06 vs. 0.85). The long-term residency requirements of the GLP may have meant that many families were already intact in the U.S. at the time of IRCA, for example, and would have been jointly eligible for legalization.

V. Additional Results

Estimates presented thus far: (1) are specific to Mexico; (2) do not capture family-sponsored admissions that do not settle in the same metropolitan area as their sponsor originally settled; and (3) do not consider immigration responses to IRCA's legalization programs through

other channels. This section discusses results that address these concerns using an alternative source of variation and alternative data.

A. Cross-country Analysis for Admissions

Figure 5 Panel A presents estimates of the θ_τ (90% confidence intervals) from an alternative version of equation (1) where *c* indexes country of origin. We include world region-by-year fixed effects in this model and cluster standard errors on origin country.[20] We restrict this analysis to the 29 countries where IRCA accounted for at least a third of all admissions across the IRCA, refugee, and diversity visa categories combined over our study time frame, 1983 to 2016 (Figure A3), and which have a legalization ratio of at least 0.1 (that is, IRCA increased the number of legal residents from a country by at least 10%).[21] Despite these restrictions, the 29 countries in our final sample cover over 90% of those admitted under IRCA. The variation across countries is nevertheless much lower than the cross-metro area variation for Mexico (Table A3, Panel 1), so precision is correspondingly lower in this approach.

Still, Figure 5 shows that, similar to Figure 4 for Mexico, family-sponsored admissions do not rise until after the spike in IRCA Green Card awards (which culminated in 1991), and citizen-sponsored admissions do not emerge until later (and are not statistically significant until 1997). The maximum increase in Green Card-sponsored flows relative to 1988 emerges in 1993, with coefficients trending downward thereafter, but, just as in the baseline cross-metro area analysis for Mexico, citizen-sponsored flows remain significant through the end of the period.

[20] Because there are so few counties in our sample outside of the Americas, we consider three groups – North America, South America, and the rest of the world. We allow the year fixed effects to vary by world region because the legalization ratios are particularly high for many Central American and Caribbean countries (Table A6 Panel A).
[21] The former restriction is important because both diversity visas and refugee flows can generate large spikes in new Green Card holders (Figure A3) – potential sponsors – that could confound our ability to attribute the post-IRCA increase in family-sponsored admissions to IRCA. In practice, most of the countries below the one-third threshold also do not meet the latter 0.1 legalization ratio threshold. For comparison, only one metro area had a legalization ratio below 0.1 (Detroit), which we dropped for consistency. Like in the metro analysis, we also required that the country have at least 20 Green Card holders in 1980. This eliminated only one country (Dominica).

Table 3 summarizes with estimates of $\theta = \sum_{\tau>1988} \theta_\tau$ for each sponsorship category. Including all countries and no additional controls beyond fixed effects (column 1), the $\hat{\theta}$'s are larger than those presented in Table 2 based on cross-metro area variation for Mexico only. They imply 0.68 additional Green Card-sponsored admissions (s.e.=0.13) and 0.76 additional citizen-sponsored admissions (s.e.=0.37) for every immigrant admitted through IRCA, amounting to 1.44 additional family-sponsored admissions in total (s.e.=0.39). There are also larger estimates for all relative types, including parents and other relatives besides spouses and kids (see also Figure A2 Panel B).

These estimates are not statistically larger than those in Table 2, but why are they larger in magnitude? Downward bias from internal migration is one potential explanation. However, our baseline estimates were for Mexico, and there could be heterogeneous effects across counties based on differences in their demand for family sponsorship and the supply of slots available, or the quotas, relative to cohort size. Naturalization rates may reveal demand, since U.S. citizenship expands sponsorship rights. Limiting the sample to the 14 countries with naturalization rates below the median in this sample (60%) produces estimates much closer to those for Mexico alone, with the largest decline coming from citizen-sponsored categories (column 2), as expected.[22] This suggests that demand-side factors could be influential.

We have less scope to explore supply-side factors empirically, since there is so little cross-country variation in the quotas. However, Mexico is subject to more restrictive quotas due

[22] Naturalization rates for IRCA immigrants are not available by country. We therefore estimate them using the 5% public-use microdata sample from the 2000 Census, restricting attention to foreign-born arrivals between 1971 and 1986 – cohorts likely legal by 2000 and thus eligible to naturalize. The Census-estimated naturalization rate for Mexico (36%) is similar to the (non-IRCA) naturalization rate for Mexicans calculated with administrative data (35%, from Rytina, 2001). Across countries, Census-estimated naturalization rates are correlated with administratively measured naturalization rates reported occasionally in INS publications. For example, naturalization rates for the 1977 admission cohort (by 1992), listed in U.S. INS (1993), page 803, have a similar cross-country ranking, with Guyana near the top and Mexico at the bottom.

to its size (i.e., due to the 7% cap; see Section II), unlike other countries with below-median naturalization rates. Dropping Mexico from this subsample slightly increases the estimates (column 3), consistent with an impact of these restrictions. However, it is also consistent with Mexico having one of the lowest naturalization rates among the countries under consideration (Table A7), making this exercise a relatively weak test of the importance of quotas for the estimates. Still, the quantitative similarity of this independent estimate, focused on other countries with demand-side conditions similar to Mexico, bolsters the generality of this result.

We have subjected these estimates to a similar battery of robustness checks as the cross-metro area analysis. For example, controlling for two time-varying predictors of immigrant arrivals suggested by previous research (Yang, 2006; Llull 2018) – push factors including the real exchange rate and growth in the origin country population – has little impact on the estimates (Table 3 columns 4 and 5).[23] In addition, other admissions categories that should not have been affected by IRCA generally show no significant change, though the estimates are noisy (Figure 5 Panel B).

B. Analyses for Total Immigrant Arrivals

Table 4 column 1 gives estimated responses to IRCA legalizations for all immigrant arrivals for the Mexican cross-metro area analysis (Panel A) and for the country analysis (Panel B), based on microdata from the Census and American Community Survey (ACS). To smooth year-to-year fluctuations in these sample data, we aggregated arrival years into bins (mostly in 5-year increments).[24] We adjusted equation (1) accordingly, omitting interactions between the legalization ratio and the indicator for 1987-89 arrival to identify the coefficients of interest.

[23] This finding is consistent with the balance test in Table A6 Panel B: Within world region, the legalization ratio is not correlated with trends in the real exchange rate or population growth rates.
[24] A further description of this analysis is given in Appendix A.

Estimates for overall admissions in the binned data are quite similar to the response of family-sponsored admissions in Table 2. They also provide the benchmark to which to compare the Census/ACS based estimates of θ.

Using neither source of variation do we reject equality between the estimates of θ for all immigrant arrivals and overall admissions. As shown in column 3, the $\hat{\theta}$ for all arrivals is slightly larger than that for overall admissions using the cross-metro variation (coef=0.20 (s.e.=0.82)), and smaller using the cross-country variation (coef=-0.57 (s.e.=1.14)). In both cases, however, the difference is estimated imprecisely. So while these findings suggest that IRCA's legalization programs were not a magnet for further unauthorized immigration, we cannot draw strong conclusions.

VI. Discussion

The quantity estimated in this paper is related to, but distinct from, the immigration multiplier, m. The immigration multiplier is *generational* in nature, capturing the number of family sponsored admissions per initiating admit over the initiating admit's lifetime. If $m < 1$, then the geometric sequence $\sum_{n=1}^{\infty} m^n$ converges to the value of $\frac{m}{1-m}$, i.e., it is "non-explosive," or migratory chains die out. By contrast, the $\hat{\theta}$ in this paper estimate $\sum_{n=1}^{N} m^N$, where both m and N are unknown. That is, our concept of a multiplier is *time*-based, rather than generation-based. The longer-time horizon over which we calculate $\hat{\theta}$, the higher N might be.

Still, rejecting that $\theta \geq 1$ for other relatives, as we do (strongly) in both Table 2 and Table 3, does not necessarily prove that $m < 1$ because, even after 30 years, the first-generation "link" in the chain – where the sequence begins – might not be complete. For example, the siblings and married children of Mexican citizens most recently granted Green Cards submitted their applications in 1999 and 2000, respectively, or only shortly after the IRCA cohort began to

naturalize.[25] The long wait owes to low category-specific worldwide quotas in combination with the 7% cap on what Mexico can represent in all worldwide admissions in any category, discussed in Section II. An even longer horizon for the analysis than 30 years would allow time to work through this large backlog of admissions, raising $\hat{\theta}$. This is suggested by the event-study estimates for citizen-sponsored admissions continuing to be statistically significant in the most recent years of data (Figures 4, 5, and A2).

On the basis of our estimates, we thus cannot definitively rule out that $m \geq 1$ – that chain migration is explosive, or that the geometric sequence above never converges. However, the fact that it will take more than three decades for the first-generation impacts to materialize shows that any such "explosion" is very slow-moving. Moreover, the evidence suggests that, if N were one, $\hat{\theta}$ (and therefore m) for siblings and married/adult kids would be less than one. First, the wait list for siblings and married children for low-naturalization counties aside from Mexico is not as long, and, at 0.11 (0.08), the $\hat{\theta}$ for these relatives is still significantly less than one, both statistically and economically (Table 3, column 3). Second, for Mexico – and indeed for all countries – citizen-sponsored admissions of parents are not quota constrained. For Mexico, the $\hat{\theta}$ for parents, at 0.12 (0.05) (Table 2, column 1), is only marginally significantly greater than the estimate for other relatives; in the cross-country analysis, it is statistically indistinguishable, at 0.22 (0.07) (Table 3, column 1). Potential sponsors may have fewer living parents than siblings, but this finding could also suggest they may not have strong demand for bringing extended family members to the U.S.

[25] https://travel.state.gov/content/travel/en/legal/visa-law0/visa-bulletin/2021/visa-bulletin-for-july-2021.html, accessed 7/9/2021.

Third, as suggested above, we may be able to use naturalization rates as a signal of demand. Naturalized citizens do, in fact, appear to robustly exercise their family sponsorship rights. We can see this by scaling our estimates by IRCA *naturalized citizen*, rather than by IRCA LPR. Baker (2010) reports a naturalization rate of 41% across all IRCA LPRs for 2009, up from 33% in 2001 (Rytina, 2002). Assuming a continuation of this trend (1 percentage point per year) yields a predicted overall naturalization rate for IRCA LPRs of 51% in 2019. Thus, our estimates are consistent with 43% of IRCA LPRs who naturalized – so nearly half – sponsoring the admission of one parent.[26]

The fact that naturalization rates are not 100% – or anywhere near that – then suggests that a significant share of the legalized population is not willing to bear the costs of naturalizing in order to sponsor family members. Or at least that appears the case in the present policy environment, where some relatives may not have the patience to wait 20 years to be admitted. Even though becoming a citizen affords certain sponsorship rights, the current system of strict quotas and long wait lists in some admissions categories, like that for siblings, makes those rights more difficult to exercise.

VII. Conclusion

This paper provides the first causal estimates how the U.S. immigration system's preference for family reunification works in practice when the U.S. temporarily opens the door to countries that otherwise have little access to authorized immigration. We exploit variation from IRCA's legalization programs, which allowed a cohort of 2.7 million unauthorized immigrants –

[26] We make this calculation by dividing the $\hat{\theta}$ for parents in Table 3 column 1 (0.22) by the predicted naturalization rate, 0.51. The assumption that annual changes in the naturalization rate did not diminish between 2009 and 2019 is probably a generous one, making this calculation a likely lower bound. While we cannot do a similar calculation for Mexico alone, the lower naturalization rate for Mexican IRCA LPRs observed in 2001 (27%) is consistent with the lower $\hat{\theta}$ for parents in Table 2 column 1 (0.12), and thus a similar rate of parent sponsorship among Mexican IRCA naturalized citizens.

2.02 million from Mexico alone – to obtain Green Cards over a narrow time frame starting in the late 1980s. We estimate both family sponsorship rates of the IRCA cohort over a 30-year period and the mechanisms that underlie them.

Our preferred approach, exploiting cross-metro area variation for Mexico, estimates about one additional admission in total per Mexican IRCA LPR across three decades. Taking this estimate at face value, we conclude that IRCA induced about 2.08 million (2.02 x 1.03) subsequent admissions from Mexico through 2019 by way of family sponsorship. While this number is substantial – and indeed, our estimates imply that IRCA can account for 53% of family-sponsored Green Cards from Mexico since 1989 – most sponsored family members (1.76 million) have been spouses and minor or unmarried children – not the relatives typically thought of as chain migrants.

Cross-country variation delivers similar conclusions and highlights the potential importance of demand-side factors. Naturalization rates among IRCA arrivals are low, particularly among SAW admissions (Rytina, 2002; Baker, 2010) even though DHS explicitly promotes naturalization as a way to facilitate family sponsorship (e.g., DHS, 2016, p. 3). When IRCA admits have naturalized, however, they appear to bring relatives in citizen-sponsored categories, sponsoring parents at fairly high rates, for example. In addition, IRCA admits from countries that share Mexico's low naturalization rate but not its long wait lists do not sponsor any more relatives than Mexicans do, reinforcing the conclusion that demand for sponsorship may be limited in the low naturalization group.

However, supply-forces are also likely important. The fact that the family sponsorship response to IRCA legalization remains above zero in 2019 – and wait lists for sponsorship of relatives remain long – suggests that the quotas are binding constraints on sponsoring siblings

and adult children. This is particularly true for Mexico, whose wait lists still include those who applied around the year 2000. The size of quotas relative to the size of a newly admitted population thus seems a central predictor of the rate at which a group will sponsor relatives.

From this understanding, we believe our findings speak to the consequences of recently proposed openings. These include the U.S. Citizenship Act of 2021 proposed by the Biden administration, which contains provisions similar to IRCA's SAW and GLP provisions, or the U.S. House-passed Farm Workforce Modernization Act, which has a SAW-like provision. The unauthorized population in the U.S. is now more than triple the number admitted under IRCA, while the quotas for family-sponsored admissions have not changed. This suggests rates of family sponsorship would not be any higher now than for those admitted under IRCA.[27] Biden's proposal does include provisions to help clear wait lists, and it expands quotas, but the changes will far less than triple the number of family-sponsored admissions allowed annually. And while the mix of countries estimated to make up the unauthorized population has been shifting away from Mexico (Lopez et al., 2021; Baker, 2014), it remains dominated by countries with low naturalization rates, and naturalization rates show little trend (Teke, 2019). The design of future legalization proposals might benefit from direct consideration of the demand for family sponsorship that they will induce.[28]

This paper is part of a broader push to evaluate the impacts of immigration *policy* – not just of the much better studied immigration *flows* – for the host country (e.g., Chen, 2015; Foged and Peri 2016; Dustmann, Schönberg, and Stuhler, 2017; Clemens, Lewis, and Postel, 2018;

[27] Also, Latin American fertility rates have declined, so family sizes in today's unauthorized population are likely smaller than when IRCA passed (see https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=ZJ, accessed 7/9/2021).

[28] For example, through a temporary expansion of quotas for immediate family members, which, in the case of IRCA, was only accomplished with separate legislation years after IRCA. The Biden proposal goes further and removes quotas for immediate family members of LPRs.

Allen, Dobbin, and Morten, 2019; Abramitsky et al. 2019; Tabellini, forthcoming). This literature includes studies of IRCA itself (Baker, 2015; Freedman, Owens, and Bohn 2018; Cascio and Lewis, 2019), to which we add. A hope is that this will lead to better informed debates over immigration policy.

References

Allen, Treb, Caue Dobbin, and Melanie Morten. 2019. "Border Walls." Mimeo, Dartmouth College, November 2019.

Abramitsky, Ran, Philipp Ager, Leah Platt Boustan, Elior Cohen and Casper Worm Hansen. 2019. "The Effects of Immigration on the Economy: Lessons from the 1920s Border Closure." National Bureau of Economic Research Working Paper #26536, December 2019.

Amuedo-Dorantes, Catalina, Cynthia Bansak, and Steven Raphael. 2007. "Gender Differences in the Labor Market: Impact of IRCA's Amnesty Provisions." *American Economic Review, Papers & Proceedings* 97(2): 412-416.

Baker, Bryan C. 2010. "Naturalization Rates among IRCA Immigrants: A 2009 Update." Fact Sheet, October. Washington, DC: United States Department of Homeland Security, Office of Immigration Statistics.

Baker, Bryan C. 2014. "Estimates of the Unauthorized Immigrant Population Residing in the United States: January 2014." *Population Estimates*. Washington, DC: United States Department of Homeland Security, Office of Immigration Statistics.

Baker, Scott R. 2015. "Effects of Immigrant Legalization on Crime." *American Economic Review, Papers & Proceedings* 105(5): 210-213.

Cadena, Brian C. and Brian K. Kovak. 2016. "Immigrants Equilibrate Local Labor Markets: Evidence from the Great Recession." *American Economic Journal: Applied Economics* 8(1): January, pp. 257-90.

Card, David and Ethan Lewis. 2007. "The Diffusion of Mexican Immigrants During the 1990s: Explanations and Impacts." In George J. Borjas, Ed., *Mexican Immigration to the United States*. Chicago: University of Chicago Press, p. 193-227.

Carr, Stacie and Marta Tienda. 2013. "Family Sponsorship and Late-Age Immigration in Aging America: Revised and Expanded Estimates of Chained Migration." *Population Research Policy Review* 32: 825-849.

Cascio, Elizabeth U. and Ethan G. Lewis. 2019. "Distributing the Green (Cards): Permanent Residency and Personal Income Taxes After the Immigration Reform and Control Act of 1986." *Journal of Public Economics* 172: 135-150.

Clemens, Michael A., Ethan G. Lewis, and Hannah M. Postel. 2018. "Immigration Restrictions as Active Labor Market Policy: Evidence from the Mexican Bracero Exclusion." *American Economic Review* 108(6): June, pp. 1468-87.

Dustmann, Christian, Uta Schönberg and Jan Stuhler. 2017. "Labor Supply Shocks, Native Wages, and the Adjustment of Local Employment." *Quarterly Journal of Economics* 132(1): pp. 435-483.

Foged, Mette, and Giovanni Peri. 2016. "Immigrants' Effect on Native Workers: New Analysis on Longitudinal Data." *American Economic Journal: Applied Economics* 8(2): pp. 1-34.

Freedman, Matthew, Emily Owens, and Sarah Bohn. 2018. "Immigration, Employment Opportunities, and Criminal Behavior." *American Economic Journal: Economic Policy* 10(2): 117-151.

Kossoudji, Sherrie A., and Cobb-Clark, Deborah A. 2002. "Coming Out of the Shadows: Learning about Legal Status and Wages from the Legalized Population." *Journal of Labor Economics*, 20(3): 598-628.

Lewis, Ethan G. and Giovanni Peri. 2015. "Immigration and the Economy of Cities and Regions." In *Handbook of Urban and Regional Economics*, Volume 5 (eds. Gilles Duranton, Vernon Henderson, and William Strange). Elsevier.

Llull, Joan. 2018. "The Effect of Immigration on Wages: Exploiting Exogenous Variation at the National Level." *Journal of Human Resources* 53(3): 608-662.

Lopez, Mark Hugo, Jeffrey S. Passel and D'Vera Cohn. 2021. "Key facts about the changing U.S. unauthorized immigrant population," accessed at https://www.pewresearch.org/fact-tank/2021/04/13/key-facts-about-the-changing-u-s-unauthorized-immigrant-population/, 5/6/2021.

Manson, Steven, Jonathan Schroeder, David Van Riper, Tracy Kugler, and Steven Ruggles. 2020. IPUMS National Historical Geographic Information System: Version 15.0 [dataset]. Minneapolis, MN: IPUMS. http://doi.org/10.18128/D050.V15.0

National Academies of Sciences, Engineering, and Medicine; Division of Behavioral and Social Sciences and Education; Committee on National Statistics; Panel on the Economic and Fiscal Consequences of Immigration. 2016. *The Economic and Fiscal Consequences of Immigration*. Francine D. Blau and Christopher Mackie, Editors.

Pan, Ying. 2012. “The Impact of Legal Status on Immigrants’ Earnings and Human Capital: Evidence from the IRCA 1986.” *Journal of Labor Research* 33: 119-142.

Phillips, Julie A., and Douglas S. Massey. 1999. “The New Labor Market: Immigrants and Wages after IRCA.” *Demography* 36(2): 233-246.

Passel, Jeffrey S. and D’Vera Cohn. 2018. “U.S. Unauthorized Immigrant Total Dips to Lowest Level in a Decade” Pew Research Center post dated November 27, 2018. https://www.pewresearch.org/hispanic/2018/11/27/u-s-unauthorized-immigrant-total-dips-to-lowest-level-in-a-decade/, accessed 20 December 2019.

Ruggles, Steven, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas and Matthew Sobek. 2020. *IPUMS USA: Version 10.0* [dataset]. Minneapolis, MN: IPUMS. https://doi.org/10.18128/D010.V10.0

Rytina, Nancy. 2002. “IRCA Legalization Effects: Lawful Permanent Residence and Naturalization through 2001.” Mimeo, Office of Policy and Planning Statistics Division, U.S. Immigration and Naturalization Service.

Solon, Gary, Steven J. Haider and Jeffrey M. Wooldridge, 2015. "What Are We Weighting For?" *Journal of Human Resources* 50(2): pages 301-316.

Steigleder, Quinn and Chad Sparber. 2017. “The effect of legal status on immigrant wages and occupational skills.” *Applied Economics Letters* 24(2): 80-84.

Tienda, Marta. 2018. “Multiplying Diversity: Family Unification and the Regional Origins of Late-Age US Immigrants.” *International Migration Review* 51(3) 727-756.

Tabellini, Marco. Forthcoming. "Gifts of the Immigrants, Woes of the Natives: Lessons from the Age of Mass Migration." *Review of Economic Studies*.

Teke, John. 2019. “US Naturalizations: 2018.” *Annual Flow Report,* US Department of Homeland Security, Office of Immigration Statistics, August.

United States Department of Homeland Security. 2016. *A Guide to Naturalization*. Washington, D.C.: U.S. Department of Homeland Security, November.

United States Department of Homeland Security. 2019. *Yearbook of Immigration Statistics: 2018*. Washington, D.C.: U.S. Department of Homeland Security, Office of Immigration Statistics.

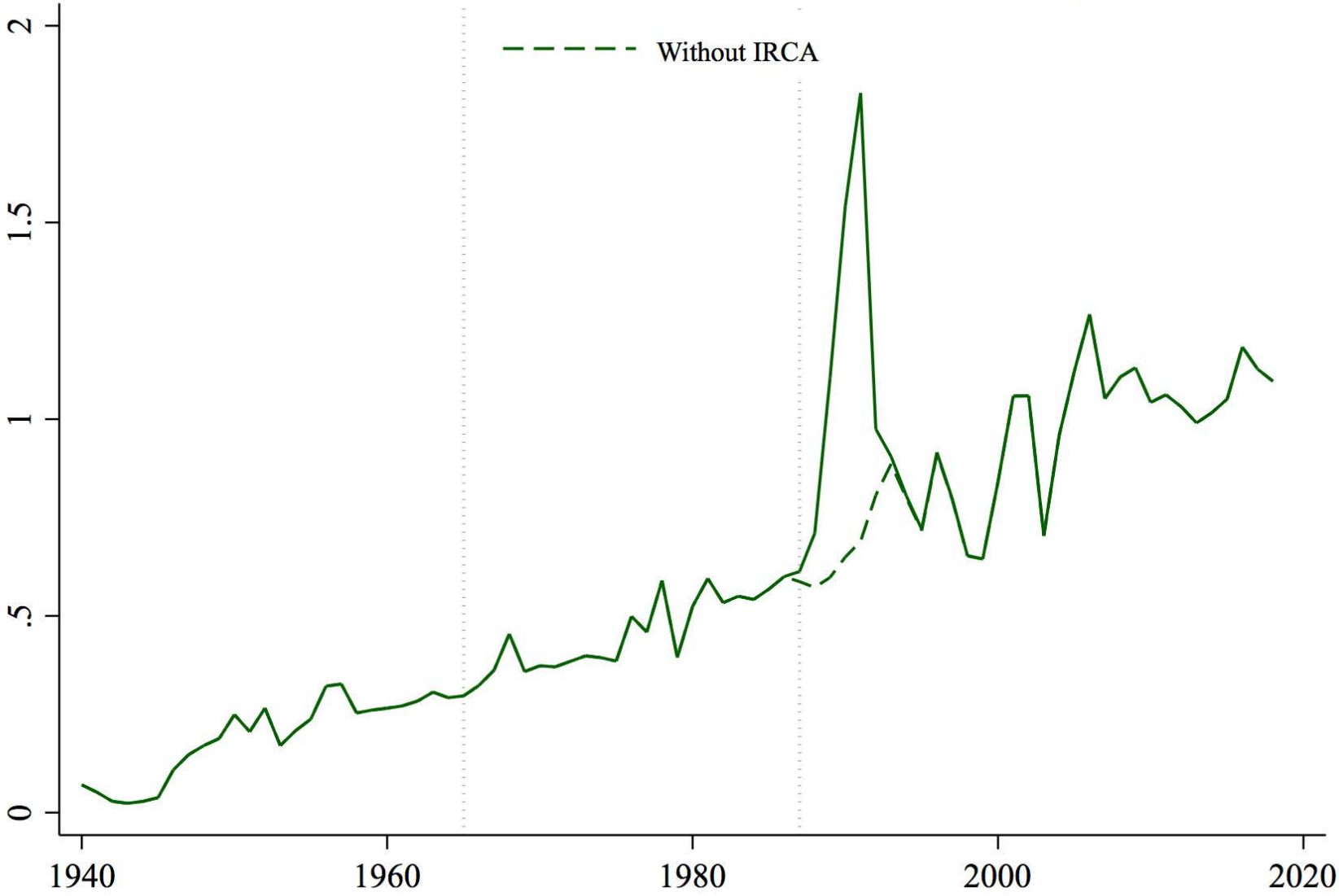
United States Department of Justice, Immigration and Naturalization Service. 1992. “Alien Address Reports: 1980 Public Use File.” [distributor] https://doi.org/10.3886/ICPSR07998.v1

United States Department of Justice, Immigration and Naturalization Service. 1993. *Statistical Yearbook of the Immigration and Naturalization Service, 1992*. Washington, DC: U.S. Government Printing Office: Washington, D.C.

Yang, Dean. 2006. "Why Do Migrants Return to Poor Countries? Evidence from Philippine Migrants' Response to Exchange Rate Shocks." *Review of Economics and Statistics* 88(4): 715-735.

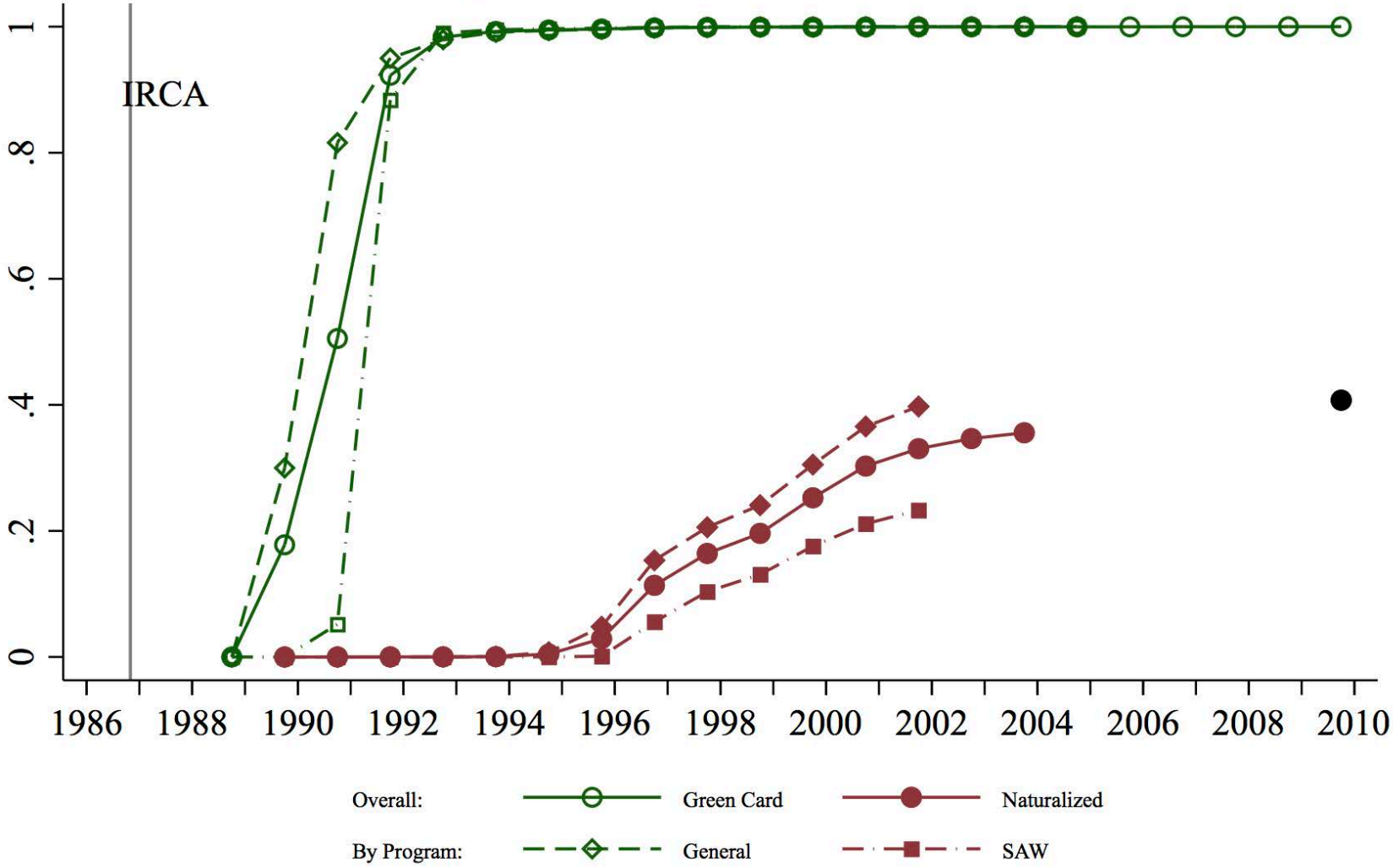
Yu, Bin. 2008. *Chain Migration Explained: The Power of the Immigration Multiplier*. New York: LFP Scholarly Publishing.

Figure 1. U.S. Admissions: Green Cards Issued (Millions) by Year



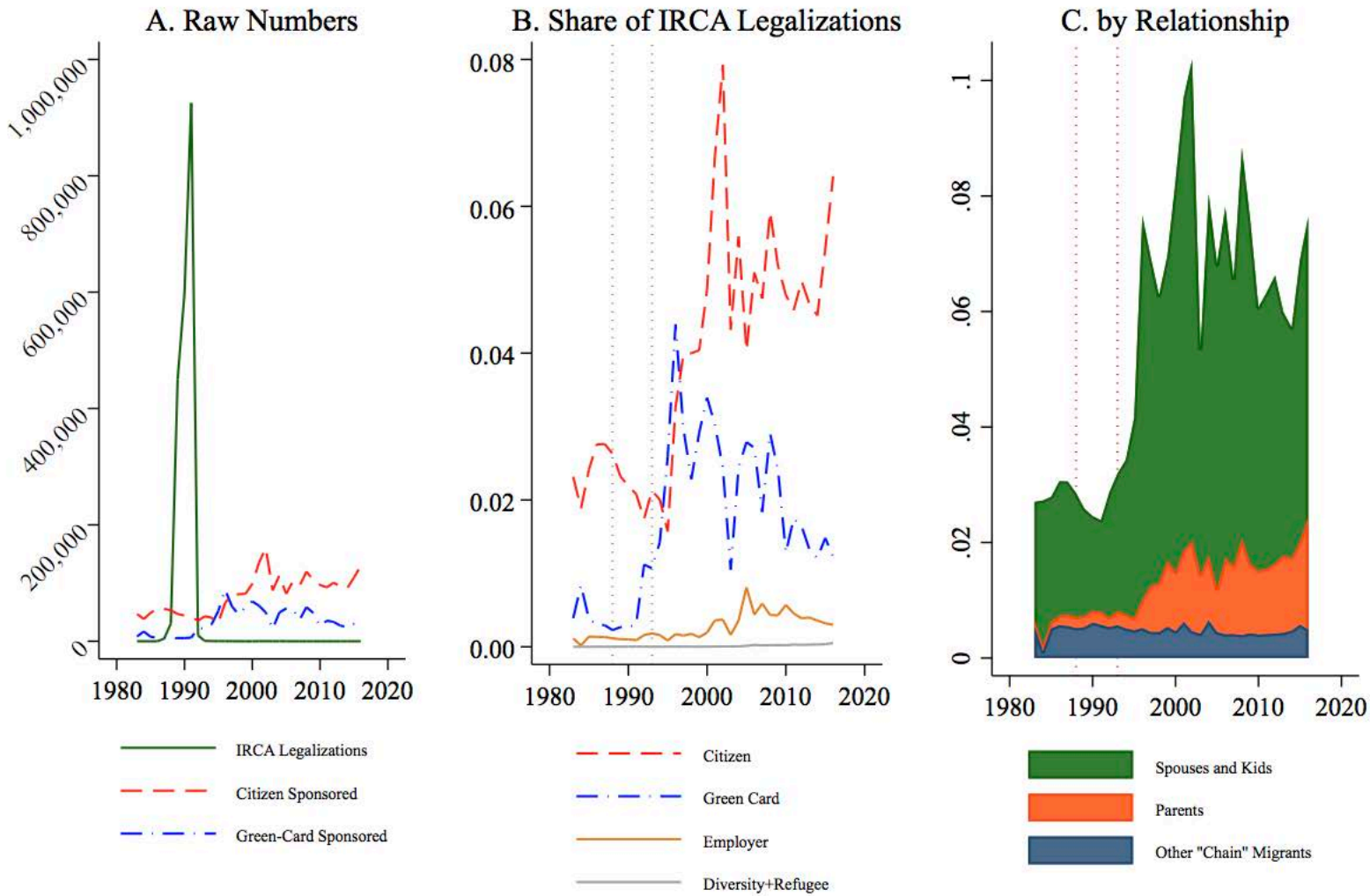
Notes: Authors' calculations using data on overall admissions from Table 1 of the *2018 Yearbook of Immigration Statistics* (https://www.dhs.gov/immigration-statistics/yearbook/2018/table1) and data on IRCA admissions from Rytina (2002) (for the SAW program and the GLP) and *Immigrants Admitted to the United States* (FY 1987-2004) (for two smaller IRCA programs).

Figure 2. Fraction of IRCA General Legalization and SAW Admits Receiving Green Card and Naturalized Over Time



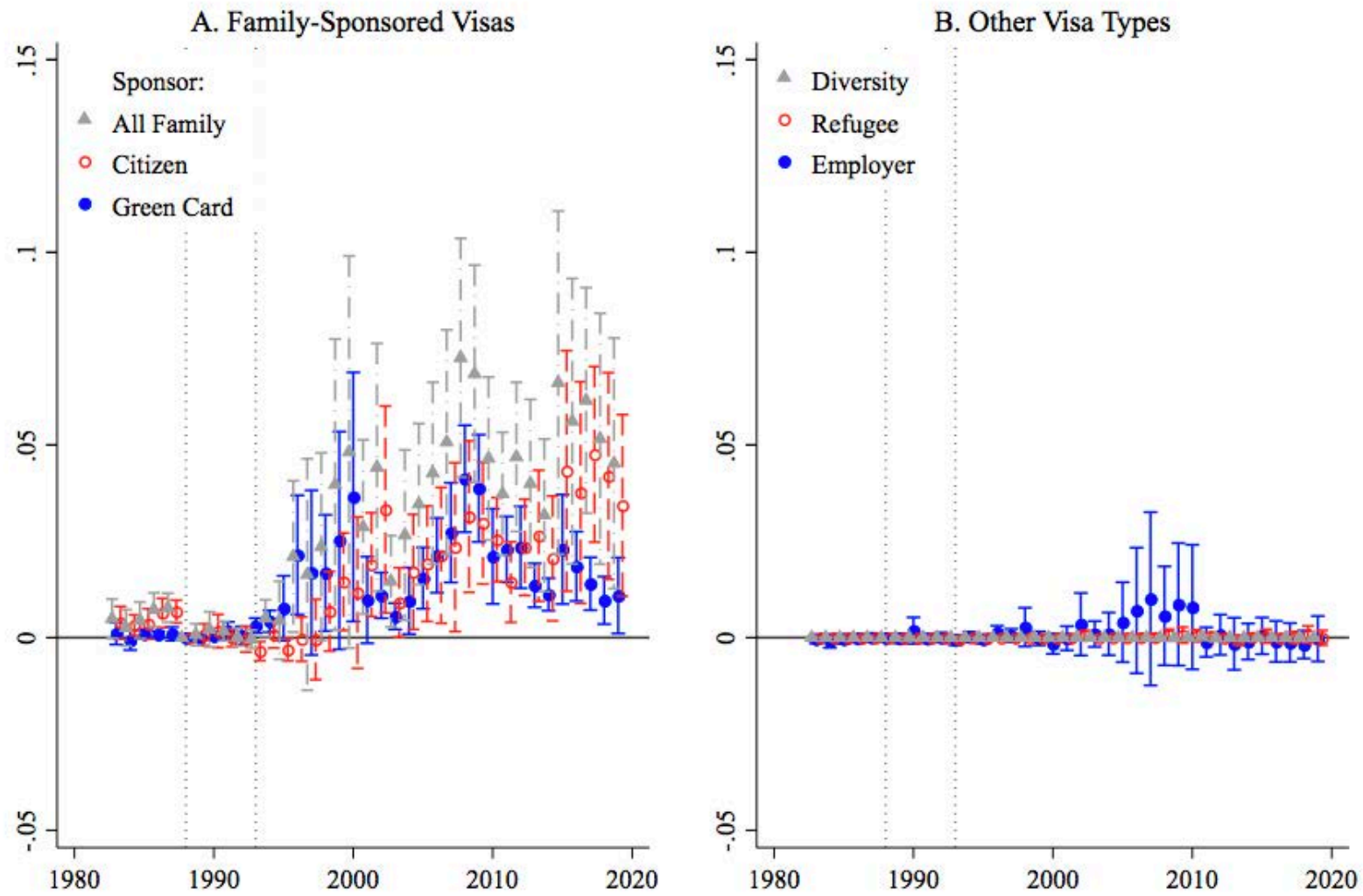
Notes: Points plotted at the end of the relevant fiscal year (FY). For IRCA admissions (Green Cards), data are from the *Yearbook of Immigration Statistics* (YIS); data by program (GLP, SAW) were last reported in FY 2004. For IRCA naturalizations, data are from Rytina (2002) through FY 2001, YIS for FY 2002 and 2003, and Baker (2010) for FY 2009.

Figure 3. Selected Mexican Admission Classes Over Time



Notes: Authors' tabulations using data on Mexican IRCA admissions from the Legalization Applications Processing System (for the SAW program and the GLP) and ~~*I*~~*mmigrants Admitted to the United States* (FY 1987-2004) (for two smaller IRCA programs) and data on other admissions from *Immigrants Admitted to the United States* (FY 1983-2004) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPR-by-major-class-and-country (for FY 2005-2016). See Appendix A.

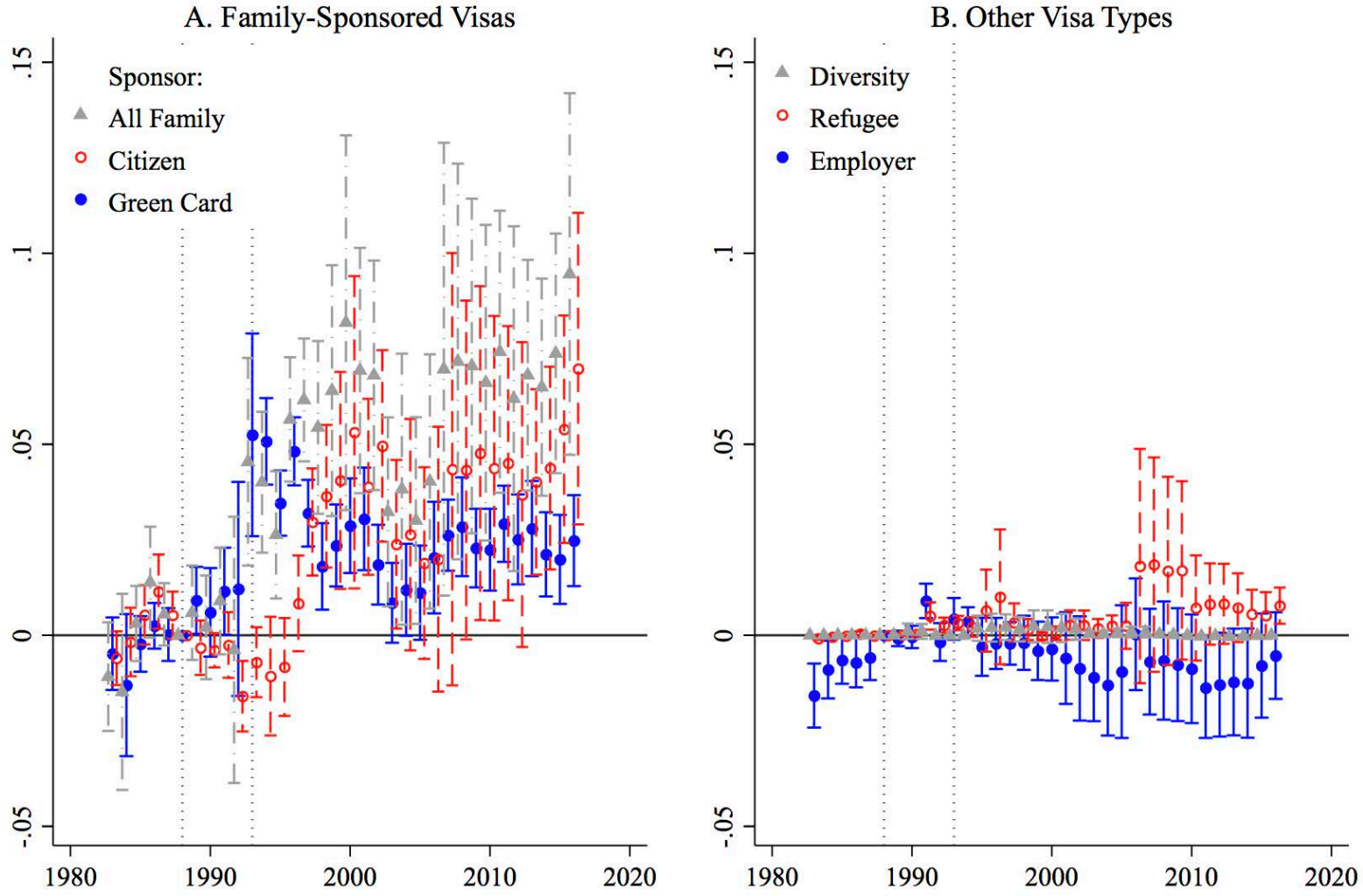
Figure 4. Response to Mexican IRCA Legalizations, by Visa Type and Year



Sources: See Table 1 Panel A source notes for legalization ratio. Data for admissions by type from *Immigrants Admitted to the United States* (FY 1983-2004) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPRcounty (FY 2007-2019). Admissions for FY 2005 and 2006 are linearly interpolated. See Appendix A.

Notes: Figures plot coefficients (with 90% confidence intervals) on the Mexican legalization ratio ($lpr_{c,IRCA}/legal_{c,1980}$) interacted with year dummies from a regression that also includes metro area and year-by-state fixed effects; the interaction between the legalization ratio and the dummy for 1988 is omitted to identify the model (equation 1). Regressions give each metro area equal weight, and standard errors are clustered on metro area. Estimation sample includes the 66 metro areas listed in Table A2.

Figure 5. Response to IRCA Legalizations Across Countries, by Visa Type and Year



Sources: See Table 1 Panel A source notes for legalization ratio. Data for admissions by type from *Immigrants Admitted to the United States* (FY 1983-2004) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPR-by-major-class-and-country (for FY 2005-2016). See Appendix A.

Notes: Figures plot coefficients (with 90% confidence intervals) on the legalization ratio ($lpr_{c,IRCA}/legal_{c,1980}$) interacted with year dummies from a regression that also includes country and year-by-world region fixed effects; the interaction between the legalization ratio and the dummy for 1988 is omitted to identify the model (equation 1). Regressions give each country area equal weight, and standard errors are clustered on country. Estimation sample includes the 29 countries listed in Table A7.

Table 1. Cross-Metro Area Variation in IRCA Legalizations among Mexicans

Panel A. Top MSAs on Mexican Legalization Ratio

	Metro Area	Legalization Ratio: (2)/(3)	Legalized by IRCA	Legal Immigrants, 1980	% of Legalizations
		(1)	(2)	(3)	(4)
1	Lakeland-Winter Haven, FL	8.4	4,162	495	0.21
2	Fort Myers-Cape Coral, FL	6.9	1,958	282	0.10
3	Fort Pierce-Port St. Lucie, FL	5.7	898	157	0.04
4	Reno, NV	5.0	3,377	676	0.17
5	Naples, FL	4.4	5,428	1,241	0.27
6	West Palm Beach-Boca Raton, FL	3.8	4,103	1,077	0.20
7	Sarasota-Bradenton, FL	3.6	1,286	362	0.06
8	Fort Lauderdale, FL	3.4	1,462	432	0.07
9	Santa Rosa, CA	3.1	8,362	2,675	0.41
10	Monmouth-Ocean, NJ	2.7	300	110	0.01
16	Los Angeles-Long Beach, CA	1.7	560,289	329,865	27.8

Panel B. Balance Test: Correlates of the Legalization Ratio

	Characteristic	Mean	Regressions on Leg. Ratio		Reverse
		(1)	(2)	(3)	(4)
(a)	Mexicans/Population, 1980	0.0290	-0.00465	0.00106	1.719
			(0.00211)	(0.00157)	(2.297)
(b)	Mexicans Admitted, 1983-87	3.844	0.0149	0.649	0.0124
	/Legal Mexicans, 1980		(0.488)	(0.488)	(0.0196)
(c)	Employment Growth, 1980-87	0.258	0.0412	-0.0109	-1.013
			(0.0188)	(0.0230)	(2.164)
(d)	Mex Emp Growth, 1980-2019	5.452	-0.195	0.441	0.0151
	predicted from 1980 Occ Mix		(0.492)	(0.755)	(0.0330)
State Effects?			No	Yes	Yes
F-stat					0.578

Sources: Panel A columns 2 and 4: Legalization Applications Processing System (LAPS) (for the SAW program and the GLP) and *Immigrants Admitted to the United States* (FY 1987-2004) (for two smaller IRCA programs). Panel A column 3: *Alien Address Reports, [United States], 1980 Public Use File* (for LPRs) and 1980 Census PUMS (Ruggles et al., 2020) (for citizens). Panel B row a: 1980 Census tabulations (Manson et al., 2020). Panel B row b: *Immigrants Admitted to the United States*, FY 1983-87 (numerator) and Panel A column 3 sources (denominator). Panel B row c: County Business Patterns. Panel B row d: 1980 Census PUMS and 2018-19 American Community Surveys (Ruggles et all, 2020). See Appendix A.

Notes: The unit of observation is a metro area. The legalization ratio in Panel A is the number of Mexican immigrants granted permanent residence by IRCA who listed that metro area as their intended residence, divided by the number of Mexican citizens and LPRs in that metro area in 1980. Columns 2 and 3 of Panel B show the coefficient from a regression of the variable listed on the legalization ratio; the regression in column 3 also includes dummies for the state in which the majority of the metro area's population resided in 1986. Column 4 of Panel B shows the slope coefficients from a multivariate regression of the legalization ratio on the variables listed plus state dummies; the F-stat is on the joint significance of the variables listed.

Table 2. Long-Run Response to IRCA Legalizations of Mexicans: Metro Area Evidence

	Baseline	Weighted	Adding controls
	(1)	(2)	(3)
Overall Family Sponsored	1.03	0.88	1.01
	(0.25)	(0.37)	(0.20)
By Family Sponsorship Type			
Green-Card Sponsored	0.48	0.39	0.49
	(0.09)	(0.13)	(0.08)
Citizen-Sponsored	0.55	0.50	0.52
	(0.18)	(0.26)	(0.15)
By Relative Type			
Spouses and Kids[a]	0.87	0.76	0.84
	(0.20)	(0.30)	(0.16)
Parents[c]	0.12	0.12	0.13
	(0.05)	(0.06)	(0.04)
Other relatives[c]	0.03	0.01	0.03
	(0.02)	(0.02)	(0.01)
Other Major Categories			
Employer Sponsored	0.05	0.20	0.02
	(0.09)	(0.19)	(0.05)
Refugees	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)
Diversity	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
Weights:	None	1980 Pop	None
Controls			
State x Year	Yes	Yes	Yes
Other Controls[b]	No	No	Yes

Sources: See Table 1 Panel A source notes for legalization ratio and other controls. Data on admissions by type from *Immigrants Admitted to the United States* (FY 1983-2004) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPRcounty (FY 2007-2019). Admissions for FY 2005 and 2006 are linearly interpolated. See Appendix A.

Notes: The cross-section unit of analysis is a metro area. Baseline regression (column 1, based on equation 1) includes metro area fixed effects, state-by-year fixed effects, and interactions between the legalization ratio ($lpr_{c,IRCA}/legal_{c,1980}$) and year indicators. Table entries report the sum of the post-1988 interaction coefficients for the variable listed (divided by $legal_{c,1980}$), based on data for 66 metropolitan areas across 37 years (1983-2019). Unless otherwise noted (column 2), regressions give each metro area equal weight. Standard errors in the underlying regressions are clustered on metro area, and standard errors in parentheses are calculated using the delta method.

[a] Sum of citizen-sponsored spouses and minor children and Green Card-sponsored spouses and unmarried children.

[b] Interactions between year dummies and the variables listed in Table 1 Panel B.

[c] Relatives who would typically be considered "chain migrants."

Table 3. Long-Run Response to IRCA Legalizations: Country Evidence

	Baseline	<60% Citizens by 2000	Dropping Mexico	Nonmissing Controls	With Controls
	(1)	(2)	(3)	(4)	(5)
Overall Family Sponsored	1.44	0.91	0.93	1.52	1.39
	(0.39)	(0.19)	(0.20)	(0.40)	(0.34)
By Family Sponsorship Type					
Green-Card Sponsored	0.68	0.46	0.44	0.71	0.69
	(0.13)	(0.09)	(0.07)	(0.14)	(0.05)
Citizen-Sponsored	0.76	0.46	0.50	0.81	0.70
	(0.37)	(0.21)	(0.21)	(0.37)	(0.33)
By Relative Type					
Spouses and Kids[a]	1.03	0.67	0.67	1.08	1.01
	(0.28)	(0.18)	(0.19)	(0.30)	(0.24)
Parents[d]	0.22	0.15	0.15	0.23	0.20
	(0.07)	(0.05)	(0.05)	(0.07)	(0.06)
Other relatives[d]	0.18	0.10	0.11	0.21	0.18
	(0.09)	(0.09)	(0.08)	(0.08)	(0.07)
Other Major Categories					
Employer Sponsored	-0.15	-0.30	-0.31	-0.14	-0.19
	(0.16)	(0.11)	(0.10)	(0.13)	(0.10)
Refugees	0.17	0.05	0.06	0.17	0.16
	(0.13)	(0.04)	(0.04)	(0.13)	(0.13)
Diversity	0.02	0.00	0.00	0.02	0.02
	(0.02)	(0.00)	(0.00)	(0.02)	(0.02)
Countries:	29	14	13	27	27
Fixed Effects					
Country	Yes	Yes	Yes	Yes	Yes
Region x Year	Yes	Yes	Yes	Yes	Yes
Baseline Controls x Year[b]	No	No	No	No	Yes
Time-Varying Controls[c]	No	No	No	No	Yes

Sources: See Table 1 Panel A source notes for legalization ratio. Data on admissions by type from *Immigrants Admitted to the United States* (FY 1983-2004) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPR-by-major-class-and-country (for FY 2005-2016). See Appendix A for more details and sources for controls.

Notes: The cross-section unit of analysis is a country. Baseline regression (column 1, based on equation 1) includes country fixed effects, world region-by-year fixed effects, and interactions between the legalization ratio ($lpr_{c,IRCA}/legal_{c,1980}$) and year indicators. Table entries report the sum of the post-1988 interaction coefficients for the variable listed (divided by $legal_{c,1980}$) based on data for 29 countries across 34 years (1983-2016). Regressions give each country equal weight. Standard errors in the underlying regressions are clustered on country, and standard errors in parentheses are calculated using the delta method.

[a] Sum of citizen-sponsored spouses and minor children and Green Card-sponsored spouses and unmarried children.

[b] Interactions between year dummies and each of 1983-87 LPR admissions per 1980 legal immigrant and a dummy for upper income country.

[c] Annually varying real exchange rate and population (divided by $legal_{c,1980}$), lagged one year.

[d] Relatives who would typically be considered "chain migrants."

Table 4. Long-Run Response to IRCA Legalizations by Arrival Mode

	All Arrivals[b]	Overall Admissions	Other Arrivals, (1) – (2)
	(1)	(2)	(3)
A. Across Metropolitan Areas (Mexico only)			
Cumulative Response	1.23	1.04	0.20
	(0.98)	(0.32)	(0.82)
MSAs	63	63	63
Controls			
State x Year?	Yes	Yes	Yes
Other Controls?[a]	Yes	Yes	Yes
A. Across Countries			
Cumulative Response	1.24	1.80	-0.57
	(1.00)	(0.67)	(1.14)
Countries	29	29	29
Controls			
Region x Year?	Yes	Yes	Yes

Sources: See Table 1 Panel A source notes for legalization ratio and for the other controls in the metro area analysis (Panel A). Sources for other controls in the country analysis (Panel B) are in Appendix A. Data on all arrivals (column 1) are from the 1990 and 2000 Census and 2016-19 ACS (Ruggles et al., 2020) and are linearly adjusted for years in the U.S. as described in Appendix A. Data on overall admissions (column 2) are from *Immigrants Admitted to the United States* (FY 1983-2004) for both metro areas (Panel A) and countries (Panel B) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPRcounty for metro areas (FY 2007-2019) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPR-by-major-class-and-country for countries (for FY 2005-2016). Admissions for FY 2005 and 2006 are linearly interpolated in the metro area analysis.

Notes: The cross-section unit of observation is metro area (Mexicans only) in Panel A and country in Panel B. Underlying regressions in Panel A include metro area fixed effects, state-by-arrival year bin fixed effects, and interactions between the legalization ratio ($lpr_{c,IRCA}/legal_{c,1980}$) and arrival year bin indicators. Underlying regressions in Panel B include country fixed effects, world region-by-arrival year bin fixed effects, and interactions between the legalization ratio and arrival year bin indicators. Arrival bins are 1982-84, 1985-86, 1987-89, and five-year intervals thereafter (except for the last bin, 2015-2018), to accommodate reporting of arrival year in the 1990 Census; interactions with 1987-89 are omitted to identify the model. Table entries report the sum of the post-1987-89 interaction coefficients for the variable listed (divided by $legal_{c,1980}$) Regressions in Panel A are based on data for 66 metro areas across 36 years (1983-2018); regressions in Panel B are based on for 29 countries across 32 years (1983-2016). Standard errors in the underlying regressions are clustered on metro area (Panel A) or country (Panel B), and standard errors in parentheses are calculated using the delta method.
[a] Interactions between arrival year bin dummies and the variables listed in Table 1 Panel B.

Online Appendices (Not for Publication)

Opening the Door: Immigrant Legalization and Family Reunification in the United States

Elizabeth Cascio and Ethan Lewis
Dartmouth College and NBER

Appendix A. Data

I. Treatment Variable: the Legalization Ratio

A. Legalization Applications Processing System (LAPS) data

The SAW and GLP admissions that enter the numerator of the legalization ratio were taken from the Legalization Applications Processing System (LAPS), available from the National Archives. These public-use microdata consist of selected fields from anonymized records from all forms I-687 (application for temporary legal status under IRCA's general legalization program, spilt across two files) and forms I-700 (application for temporary legal status under IRCA's SAW program) received by the Immigration and Naturalization Service (INS), consisting of 3,040,948 records in total.

These fields describe some outcomes of the application process, including whether and when a Green Card was awarded, through the end of the 1992 fiscal year.[1] This is critical to establishing the timing for our event-study model, as outlined in Figure 2. These fields also include the applicant's country of birth and state and county of intended residence within the U.S. (current U.S. address) at the time of application. In these and all other administrative data, we code counties to metropolitan areas using 1999 Primary Metropolitan Statistical Areas (PMSA) boundaries.[2] For the metro area-level analysis for Mexican admissions, we focus on 66 metropolitan areas that are observable in admissions statistics published by Department of Homeland Security (DHS) for years 2007 and later.[3] For the country-level analysis, we focus on 29 countries where IRCA admissions represented at least a third of total admissions also including refugees and the diversity visa, over 1983 to 2016. Section II.A of this Appendix describes these other admissions data in more detail.

Note that in forming these samples, we also restrict attention to metro areas with at least 20 registered Mexican LPRs in 1980 or countries with at least 20 registered LPRs (see Section I.C) and a legalization ratio of at least 0.1.

B. Immigrants Admitted to the United States

For the two much smaller legalization programs authorized by IRCA – the Cuban-Haitian Adjustment and Pre-1972 Arrivals programs – we obtain total admissions by country (29 sample countries) and metro area (for Mexicans only) across the 1987 to 2004 fiscal years from several sources: (1) for 1987 to 1997 from *Immigrants Admitted to the United States* microdata, available on ICPSR (all United States Department of Justice, Immigration and Naturalization Service, various years); and for 1998 and 2001-04 from the *Lawful Immigrants Files* version provided by the National Archives (Department of Homeland Security. Management Directorate.

[1] Statistics on IRCA admissions through fiscal year 2001, reported in Rytina (2002), show that nearly all IRCA admissions had occurred by the end of the 1992 fiscal year.
[2] For New England, we use New England County Metropolitan Areas (NECMAs). See June 30, 1999 definition at https://www.census.gov/geographies/reference-files/time-series/demo/metro-micro/historical-delineation-files.html.
[3] Because these metro areas are relatively large, the estimates are unaffected by the fact that county information is suppressed in the LAPS for applicants in counties with under 100,000 population (as of the 1990 census) or with fewer than 25 applications.

Office of Immigration Statistics, various years).[4] In table source notes, we refer to these files collectively as *Immigrants Admitted to the United States*. Like the LAPS, these data provide selected fields from anonymized records for Green Card admissions under all programs except the GLP and the SAW program. Because these data include detailed class of admission (identifying the relevant program), country of birth, and location within the U.S. at the time of admission, we are able to adjust the numerator of the legalization ratio for these two smaller legalization programs. We describe these data further in Section II of this Appendix.

C. Alien Address Reports

We obtain part of the denominator of the legalization ratio from *Alien Address Reports, [United States], 1980 Public Use File*, available at ICPSR. These public-use microdata consist of selected fields from anonymized records of registered aliens in the U.S. in 1980. LPRs are separately identified. These data were collected as part of the INS's alien address reporting program for 1980 and were used at the time to estimate unauthorized immigration in conjunction with the 1980 Census. The fields include country of birth and state and zip code of residence within the U.S., which we use to map to counties, and then to metro areas (see Section I.A of this Appendix).

D. Citizen Count

The denominator of the legalization ratio is the sum of the LPR count from I.C plus a count of citizens estimated from the 1980 Census PUMS (Ruggles et al., 2020). County groups in these data were matched to metro areas according to their 1999 definitions.

E. Descriptive Statistics

Table A2 shows how we arrived at the legalization ratio for each sampled metro area, by state. We show both the numerator (from sources I.A and I.B; column 2) and the denominator (from sources I.C, I.D; column 3) in addition to the ratio itself (column 1). We also show the share of IRCA admissions accounted for by that area (column 4). Table A7 shows how we arrived at the legalization ratio for each sampled country, by world region. We show both the numerator (from sources I.A and I.B; column 2) and the denominator (from sources I.C and I.D; column 3) in addition to the ratio itself (column 1). We also show the share of IRCA admissions accounted for by each country (column 4).

II. Outcomes Data: Immigrant Admissions

A. Immigrants Admitted to the United States

We calculate the first half of our country and metro-area panel on admissions by sponsor, relative type, and age from two sources: (1) *Immigrants Admitted to the United States* microdata, available on ICPSR, for fiscal years 1983-1997 and 1999-2000 (United States Department of Justice, Immigration and Naturalization Service, various years); (2) the National Archives

[4] These visa categories are not separately identified in the 1999 and 2000 files, but their numbers are very small in 1998 and 2001.

version of this file for fiscal years 1998 and 2001-2004, the *Lawful Immigrant Files* (Department of Homeland Security. Management Directorate. Office of Immigration Statistics, various years). In table source notes, we refer to these files collectively as *Immigrants Admitted to the United States* (1983-2004). These data provide selected fields from anonymized records for Green Card admissions under all programs except the GLP and the SAW program. These fields include detailed class of admission (identifying the relevant program), country of birth, and age and location within the U.S. at the time of admission.[5] In addition to identifying admissions under the Cuban-Haitian Adjustment and Pre-1972 Arrivals programs (see Section I.B of this Appendix), these data identify a variety of family-sponsorship visas, employer visas, diversity visas, and refugee visas.

We are constrained in what we can do with these data by the published tables that provide our main data source for fiscal years 2007 to 2019 for the metro-level analysis and 2005 to 2016 for the country-level analysis (see section II.B). We categorize the family-sponsorship visas into two broad groups that align with what is available in later published data – e.g., a Green Card-sponsored category and a citizen-sponsored category. Likewise, among family-sponsored admissions overall, we are able to separate relatives into three categories – spouses and unmarried children of the sponsor, parents of the sponsor, and other relatives of the sponsor.

B. Office of Immigration Statistics Tables

Unfortunately for our study, publication of anonymized admissions microdata ceased after 2004. For the country-level analysis, we have collected tables for 2005 to 2016 from an online DHS database.[6] For the Mexican metro analysis, we relied on another online DHS database which is tabulated at the county level (for the largest immigrant destinations) from 2007 to 2019, which we further aggregate to the metropolitan area level.[7] So in addition to the constraints on these data noted in Section II.A, we lack data on Mexican admissions by metropolitan area for 2005-06, and at the country level beyond 2016. We interpolate Mexican admissions for 2005-06 but stop the country series in 2016.

III. Outcomes Data: Total Arrivals

We estimated counts of recent immigrant arrivals by country from the 5% public-use microdata samples of the 1990 and 2000 Decennial Censuses (Ruggles, et al., 2020) and the public-use microdata samples of the 2006-2019 American Community Surveys. We focus on persons born

[5] Location is recorded in different ways over time, e.g., initially and in 2001-04 as zip code and state and in 1999 and 2000 as metropolitan area. We convert all location information to metro areas (see Section I.A of this Appendix).

[6] https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPR-by-major-class-and-country. Unfortunately, this is the only database which details admissions by country and the legal status of the sponsor (Green Card/citizen) for the U.S. as a whole, and it has not been updated since the publication of the FY 2016 statistics. Less detailed statistics by country are available more recently (giving, for example, total admissions by country).

[7] https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPRcounty. Unlike the U.S. wide statistics (previous note) the county-level statistics are updated every fiscal year. Unfortunately, it is not possible to "recreate" the U.S. wide statistics from the county-level ones, because the statistics only cover the largest immigrant destinations.

in one of the 29 sample countries.[8] In calculating both the counts and the characteristics, we used survey-provided sampling weights.

Because the Census is not annual, we do not observe the size of all arrival cohorts at the time of arrival. We instead approximate it through extrapolation, taking advantage of the fact that we observe each cohort at multiple points in time. Specifically, to create the data for the cross-metro Mexican analysis, we begin by estimating U.S. resident population counts of immigrant arrivals by survey year y, arrival year (or cohort) t, and metro area c, N_{cyt}. We normalize these counts by $legal_{c,1980}$ – the same denominator as is used for the legalization ratio. We then regress these normalized counts on a vector of area-by-arrival cohort fixed effects and a survey-specific effect of years in the U.S., $y - t$:

$$\frac{N_{cyt}}{legal_{c,1980}} = \eta_{ct} + \beta_1(y-t) + \beta_2(y-t) \times D(CENS) + v_{cyt}.$$

$D(CENS)$ is a dummy which indicates data are from 1990 or 2000 Census (rather than the American Community surveys). β_1 (or $\beta_1 + \beta_2$) is anticipated to be less than 1 to the extent that return migration or other forms of attrition shrink cohort sizes over time. To predict (normalized) cohort size at entry, we then evaluate the fit of this model at zero years in the U.S., i.e., $\frac{\widehat{N_{cyt}}}{legal_{c,1980}} = \hat{\eta}_{ct}$ when $y - t = 0$.

Arrival cohorts are not identified in single years in the 1990 Census: the available groupings are 1982-84, 1985-86, and 1987-90. We therefore also group 1980s arrivals in the 2000 Census and ACS 2006-2019 (where cohorts are reported in single arrival years) similarly: 1982-84, 1985-86, and 1987-89.[9] For these categories, we define "t" at the midpoint (that is, 1983, 1985.5, and 1988, respectively).

For the purpose of estimating the adjustment regression above, we drop those who arrived during the survey year (since full coverage of the year's arrival cohort will not be possible in a survey that takes place partway through the year) and only include cohorts within 18 years of the survey (so $1 \leq (y-t) \leq 18$). The latter restriction, for example, means only the 1990 and 2000 Censuses and the 2006 ACS give us observations on cohorts that arrived in the 1980s. We also can consider only cohorts up to t=2018. (For the country-level analysis, we stop at t=2016, the last year available in the admissions data, but nevertheless include ACSs through y=2019.)

Self-reported arrival cohorts are measured with a lot of error (e.g., Lubotsky 2007). To reduce noise, after the adjustment we further aggregated post-1990 arrivals into five-year intervals (1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2014, 2015-2018) by summing up the relevant $\hat{\eta}_{ct}$'s. We further inflated the counts to "five-year equivalent" intervals by scaling up each $\hat{\eta}_{ct}$ by 5/number of years in the interval (for example, 5/3 for 1982-4, 5/2 for 1985-86 and 5/4 for 2015-2018).

[8] We exclude a small number of individuals born to U.S. citizens abroad.

[9] To be clear, 1990 Census defines the cohort as 1987-90, while later years we define the bin as 1987-89. We do this because the 1990 Census is taken in April, so most 1990 arrivals would not actually have been covered by the 1990 Census.

We also aggregate admissions A_{ct} – Mexican LPRs in area *c* in arrival cohort *t* – in the same way. That is, we aggregate A_{ct} into the same year intervals as the Census arrivals and adjust those to five-year equivalents as well. (Because of the missing 2005 and 2006 data, in particular, we adjust the 2005-2009 interval upwards by a factor of 5/3; we also have only 1983-1984 for the 1982-4 interval, so we adjust that upward by 5/2.)

Finally, the difference $\hat{\eta}_{ct} - \frac{A_{ct}}{legal_{c,1980}}$ captures arrivals in all other immigrant categories ("other arrivals"). We also follow the same procedure outlined to estimate adjusted data from the cross-country analysis substituting country for metro area for the "c" index.

IV. Other Data: Other Characteristics

A. Metro Area-Level Characteristics

We use tabulations of the 1980 Census 20% sample (Manson et al., 2020) to calculate the 1980 percent of a metro area's population who were Mexican. To calculate Mexicans admitted between 1983 and 1987 per legal Mexican in 1980, we use sources already described in I.B, I.C, and I.D above. Employment between 1980 and 1987 is calculated using *County Business Patterns* data (United States. Bureau of the Census). We calculate the "Bartik" instrument for Mexican employment growth between 1980 and 2019 as follows:

$$\frac{\sum_o \frac{\Delta E_{o,-c}}{E_{o,-c,1980}} \widehat{Mex}_{oc,1980}}{Mex_{c,1980}}$$

Where $\frac{\Delta E_{o,-c}}{E_{o,-c,1980}}$ is employment growth in occupation o in areas besides area c between 1980 and 2019 and $Mex_{c,1980}$ is the number of Mexicans in area c in 1980, and $\widehat{Mex}_{oc,1980} \equiv E_{oc,1980} \frac{Mex_{o,-c,1980}}{E_{o,-c,1980}}$ is the predicted number of Mexicans working in occupation o in area c in 1980 based on the Mexican share of that occupation outside the area, $\frac{Mex_{o,-c,1980}}{E_{o,-c,1980}}$, and the 1980 size of the occupation in that area, $E_{oc,1980}$. The idea of this measure is to leverage a combination of the local occupation mix and which occupations are growing fastest to predict which areas will become most attractive to Mexicans over the period of our study. All figures were computed using 1980 Census and 2019 ACS data from Ruggles et al. (2020).

B. Country-Level Characteristics

We used the 2000 Decennial Census (Ruggles et al., 2020) to approximate the naturalization rates of the IRCA cohort (entering 1971 to 1986) by country. For Mexicans in this cohort, we arrive at a naturalization rate of 35.6% – similar to Green Card holders entering the U.S. between 1979 and 1982 (35%), based on internal INS data through 2001. Like Rytina (2002), we also find a considerably higher naturalization rate for non-Mexicans – 55% in the Census versus 52% in the administrative data.

To calculate admissions between 1983 and 1987 per legal immigrant in 1980, we use sources already described in I.B, I.C, and I.D above. Upper income countries were identified using the United Nations World Development Indicators. Real exchange rates and population were computed using the Penn World Tables, version 10.0 (Feenstra et al., 2018). The population figures were normalized by the number of legal immigrants in 1980, previously described.

V. Tables

The data sources used in this project and their role in and use in this project are also summarized in Table A1.[10] Tables A2 and A7 report the raw data for the main cross-sectional variables used in the analysis (including the treatment) for the cross-metro area and -country analysis, respectively. Table A3 reports summary statistics for all of the variables used in the analysis. The remaining appendix tables are robustness checks for main analysis tables.

VI. Data References

A. Legalization Application Processing System Data.

Department of Justice. Immigration and Naturalization Service. Office of Strategic Planning. Statistics Division. 1991-1995. *1992 Legalization Summary Public Use Tape: Application Form I-687 Data File for California*. Distributed by the United States National Archives, https://catalog.archives.gov/id/1315257.

Department of Justice. Immigration and Naturalization Service. Office of Strategic Planning. Statistics Division. 1991-1995. *1992 Legalization Summary Public Use Tape: Application Form I-687 Data File for States Other Than California*. Distributed by the United States National Archives, https://catalog.archives.gov/id/1315263.

Department of Justice. Immigration and Naturalization Service. Office of Strategic Planning. Statistics Division. 1991-1995. *1992 Legalization Summary Public Use Tape: Application Form I-700 Data File*. Distributed by the United States National Archives, https://catalog.archives.gov/id/1315265.

B. Immigrants Admitted to the United States.

----. *Immigrants Admitted to the United States, 1983*. Inter-university Consortium for Political and Social Research [distributor], 2010-04-02. https://doi.org/10.3886/ICPSR08963.v2

----. *Immigrants Admitted to the United States, 1984*. Inter-university Consortium for Political and Social Research [distributor], 2010-04-02. https://doi.org/10.3886/ICPSR08964.v2

----. *Immigrants Admitted to the United States, 1985*. Inter-university Consortium for Political and Social Research [distributor], 2010-04-07. https://doi.org/10.3886/ICPSR08965.v2

----. *Immigrants Admitted to the United States, 1986*. Inter-university Consortium for Political and Social Research [distributor], 2010-04-07. https://doi.org/10.3886/ICPSR08966.v2

----. *Immigrants Admitted to the United States, 1987*. Inter-university Consortium for Political and Social Research [distributor], 2010-04-19. https://doi.org/10.3886/ICPSR09268.v2

----. *Immigrants Admitted to the United States, 1988*. Inter-university Consortium for Political and Social Research [distributor], 2010-05-12. https://doi.org/10.3886/ICPSR09269.v2

[10] We thank Cynthia Bansak for drafting this table for her discussion of our paper.

----. *Immigrants Admitted to the United States, 1989*. Inter-university Consortium for Political and Social Research [distributor], 2010-05-13. https://doi.org/10.3886/ICPSR06161.v2
----. *Immigrants Admitted to the United States, 1990*. Inter-university Consortium for Political and Social Research [distributor], 2010-05-14. https://doi.org/10.3886/ICPSR06164.v2
----. *Immigrants Admitted to the United States, 1991*. Inter-university Consortium for Political and Social Research [distributor], 2010-08-24. https://doi.org/10.3886/ICPSR06165.v2
----. *Immigrants Admitted to the United States, 1992*. Inter-university Consortium for Political and Social Research [distributor], 2010-08-26. https://doi.org/10.3886/ICPSR06449.v2
----. *Immigrants Admitted to the United States, 1993-1995*. [distributor], 2007-01-17. https://doi.org/10.3886/ICPSR02267.v1
----. *Immigrants Admitted to the United States, 1996*. Inter-university Consortium for Political and Social Research [distributor], 2010-09-17. https://doi.org/10.3886/ICPSR02534.v2
----. *Immigrants Admitted to the United States, 1997*. Inter-university Consortium for Political and Social Research [distributor], 2007-11-05. https://doi.org/10.3886/ICPSR02955.v1
Department of Homeland Security. Management Directorate. Office of Immigration Statistics. *Lawful Immigrant Files, Fiscal Year 1998*. Distributed by the United States National Archives, https://catalog.archives.gov/id/1302576.
United States Department of Justice. Immigration and Naturalization Service. *Immigrants Admitted to the United States, 1999*. [distributor], 2008-08-08. https://doi.org/10.3886/ICPSR03485.v2
----. *Immigrants Admitted to the United States, 2000*. [distributor], 2007-11-27. https://doi.org/10.3886/ICPSR03486.v2
Department of Homeland Security. Management Directorate. Office of Immigration Statistics. *Lawful Immigrant Files*, Fiscal Year 2001. Distributed by the United States National Archives, https://catalog.archives.gov/id/1302579.
----. *Lawful Immigrant Files, Fiscal Year 2002*. Distributed by the United States National Archives, https://catalog.archives.gov/id/1302580.
----. *Lawful Immigrant Files, Fiscal Year 2003*. Distributed by the United States National Archives, https://catalog.archives.gov/id/1302581.
----. *Lawful Immigrant Files, Fiscal Year 2004*. Distributed by the United States National Archives, https://catalog.archives.gov/id/1302582.

C. Alien Address Reports in 1980.

United States Department of Justice. Immigration and Naturalization Service. *Alien Address Reports, [United States]: 1980 Public Use File*. [distributor], 1992-02-16. https://doi.org/10.3886/ICPSR07998.v1

D. Census and American Community Survey

Manson, Steven, Jonathan Schroeder, David Van Riper, Tracy Kugler, and Steven Ruggles (2020). IPUMS National Historical Geographic Information System: Version 15.0 [dataset]. Minneapolis, MN: IPUMS. http://doi.org/10.18128/D050.V15.0
Ruggles, Steven, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas and Matthew Sobek (2020). IPUMS USA: Version 10.0 [dataset]. Minneapolis, MN: IPUMS. https://doi.org/10.18128/D010.V10.0

E. County Business Patterns

United States. Bureau of the Census. *County Business Patterns, 1980 [United States]: U.S. Summary, State, and County Data*. [distributor], 2006-01-12. https://doi.org/10.3886/ICPSR08142.v1

----. *County Business Patterns, 1987 [United States]: U.S. Summary, State, and County Data*. [distributor], 2006-01-12. https://doi.org/10.3886/ICPSR09381.v1

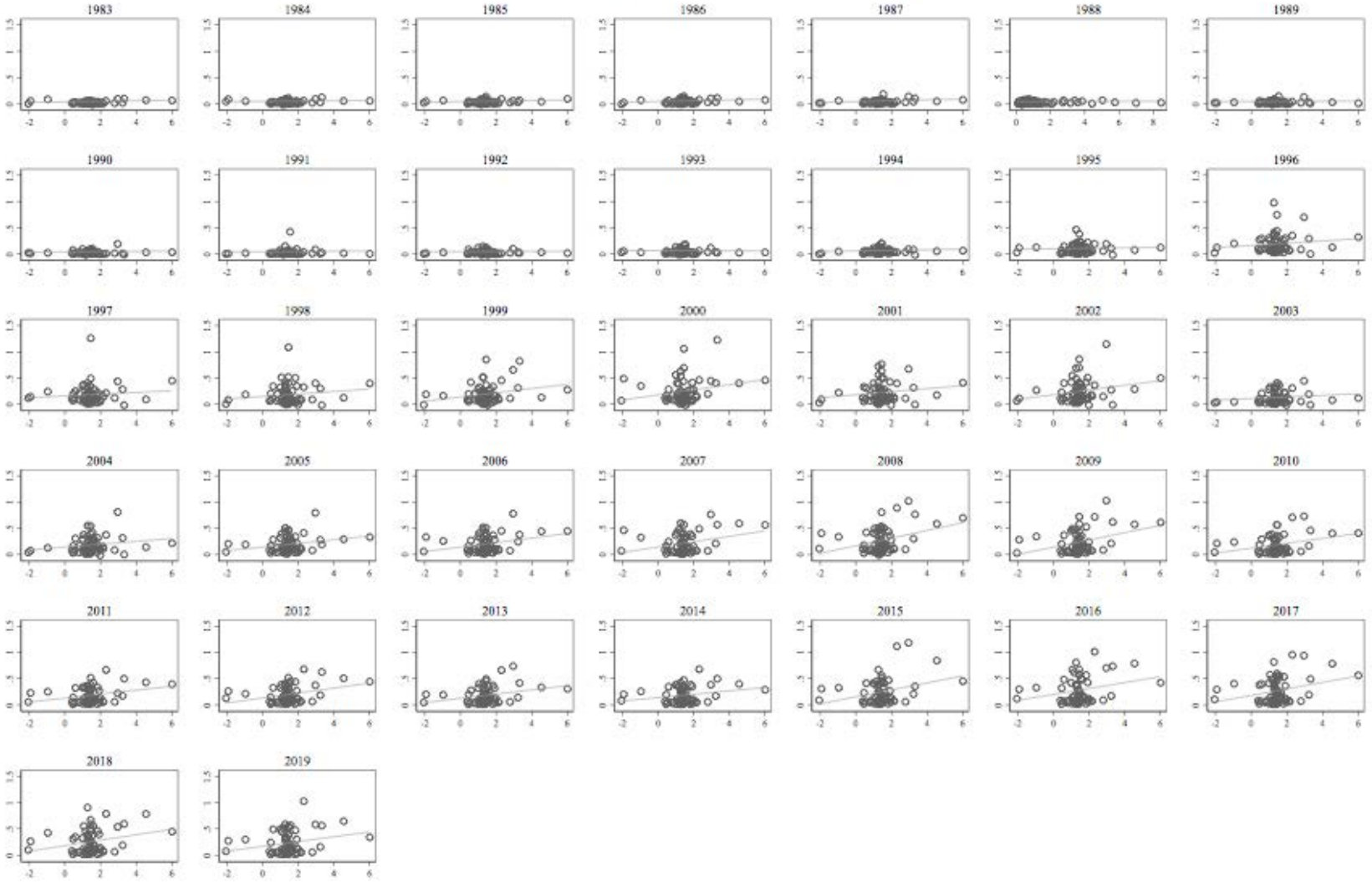
F. Penn World Tables

Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

G. Other

Lubotsky, Darren. 2007. "Chutes or Ladders? A Longitudinal Analysis of Immigrant Earnings." *Journal of Political Economy* 115(5): 820-867.

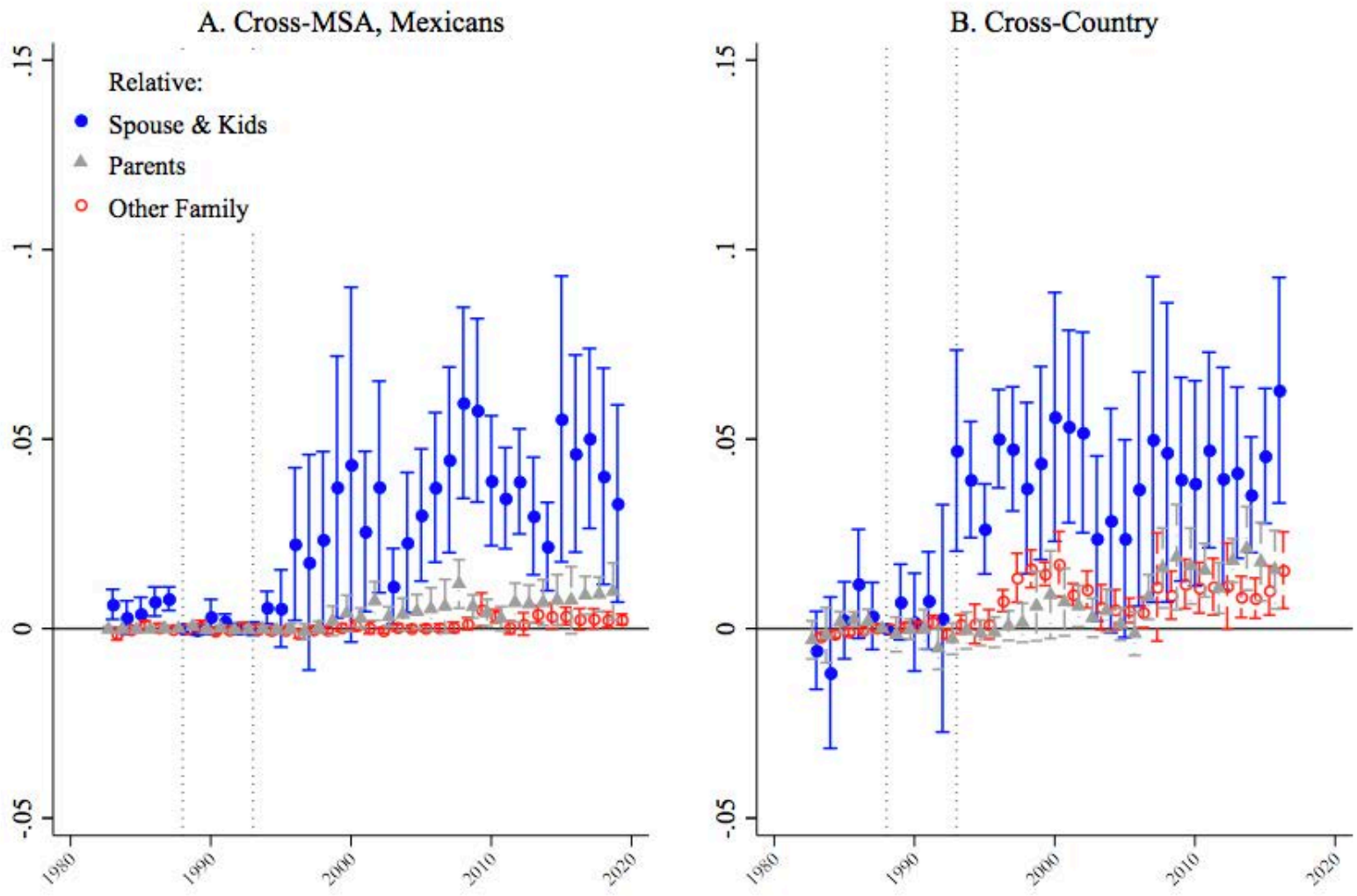
Figure A1. Cross-MSA Relationship between Mexican Family Admissions and Mexican Legalization Ratio, by Year



Sources: See Table 1 Panel A source notes for legalization ratio. Data for overall family admissions from *Immigrants Admitted to the United States* (FY 1983-2004) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPRcounty (FY 2007-2019). Admissions for FY 2005 and 2006 are linearly interpolated. See Appendix A.

Notes: Thumbnail graphs are scatterplots between overall family admissions (y-axis) and the residual legalization ratio (x-axis). Residuals are from a regression of the legalization ratio on state fixed effects, to match our baseline specification. The slopes of the lines plotted thus match the points plotted for all family admissions in Figure 4 Panel A.

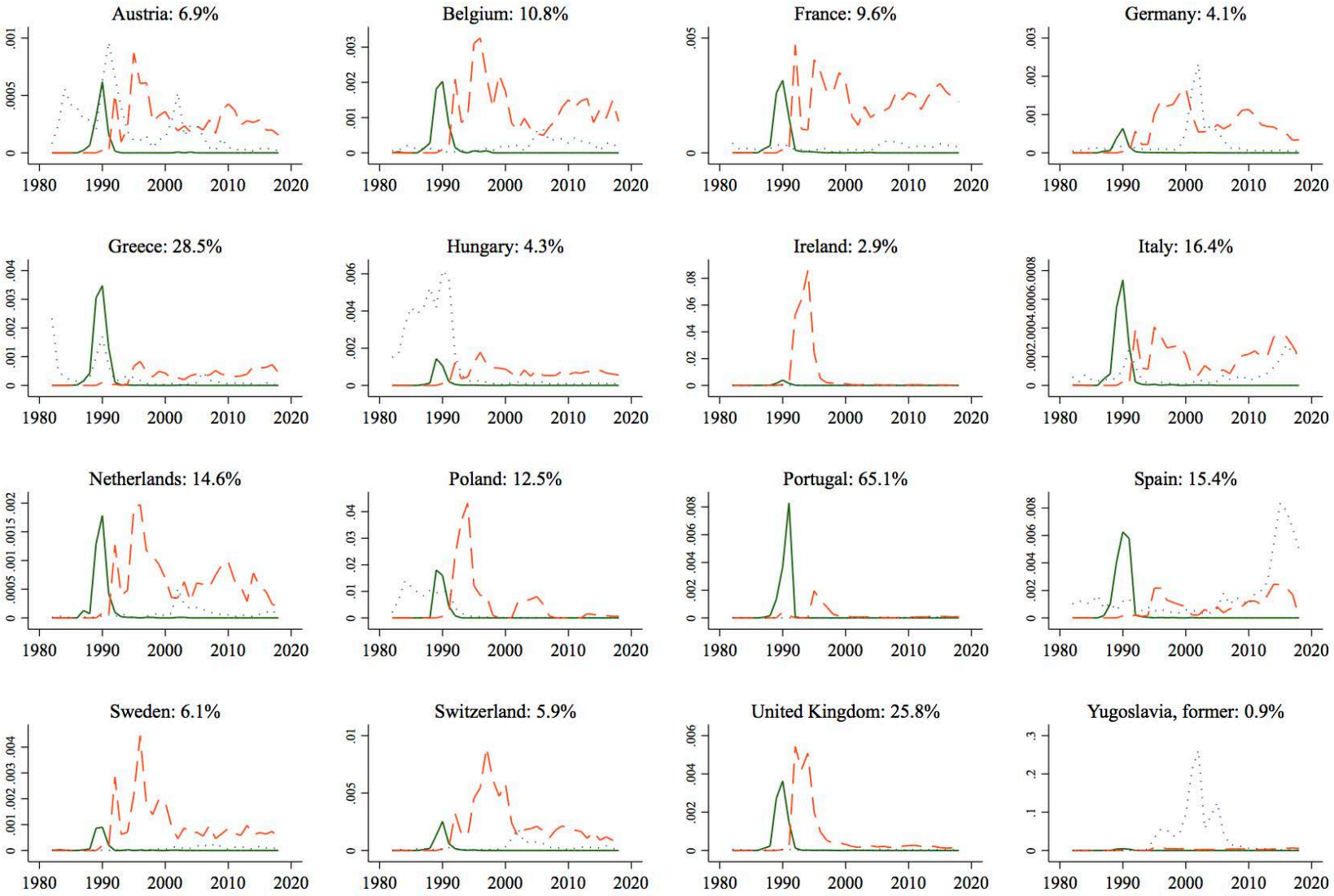
Figure A2. Response to IRCA Legalizations, by Family Relationship



Sources: See Table 1 Panel A source notes for legalization ratio. Data on admissions by relative type are from *Immigrants Admitted to the United States* (FY 1983-2004) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPRcounty for metro areas (FY 2007-2019) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPR-by-major-class-and-country for countries (for FY 2005-2016). Admissions for FY 2005 and 2006 are linearly interpolated in the metro area analysis.

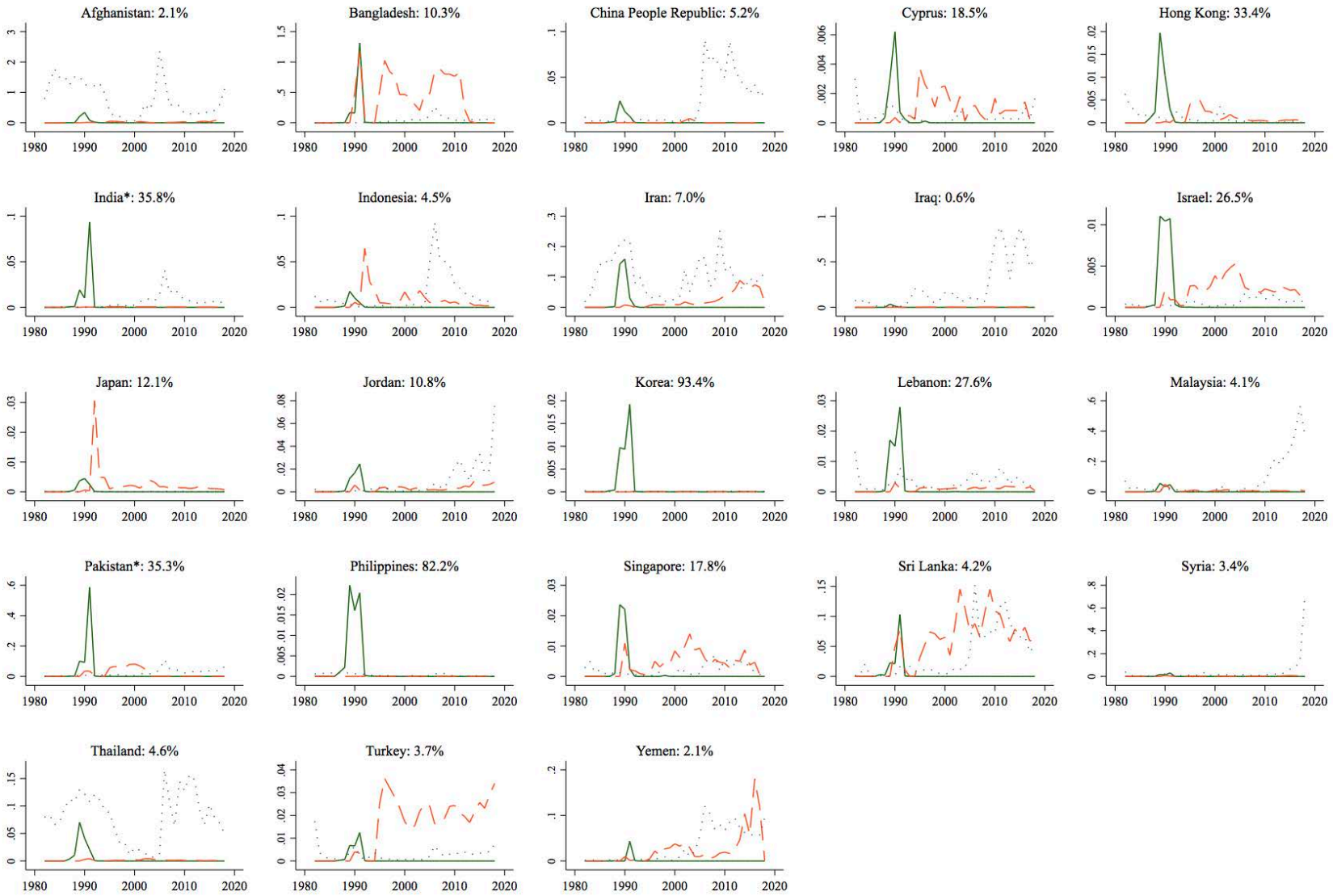
Notes: Panel A plots coefficients (with 90% confidence intervals) on the Mexican legalization ratio interacted with year dummies from a regression that also includes metro area and year-by-state fixed effects; the interaction between the legalization ratio and the dummy for 1988 is omitted. Estimation sample includes the 66 metro areas listed in Table A2. Regressions give each metro area equal weight, and standard errors are clustered on metro area. Panel B plots coefficients (with 90% confidence intervals) on the legalization ratio interacted with year dummies from a regression that also includes country and year-by-world region fixed effects; the interaction between the legalization ratio and the dummy for 1988 is omitted. Estimation sample includes the 29 countries listed in Table A7. Regressions give each country equal weight, and standard errors are clustered on country.

Figure A3a. Europe. IRCA Legalizations, Diversity, Refugees (w/IRCA's %)



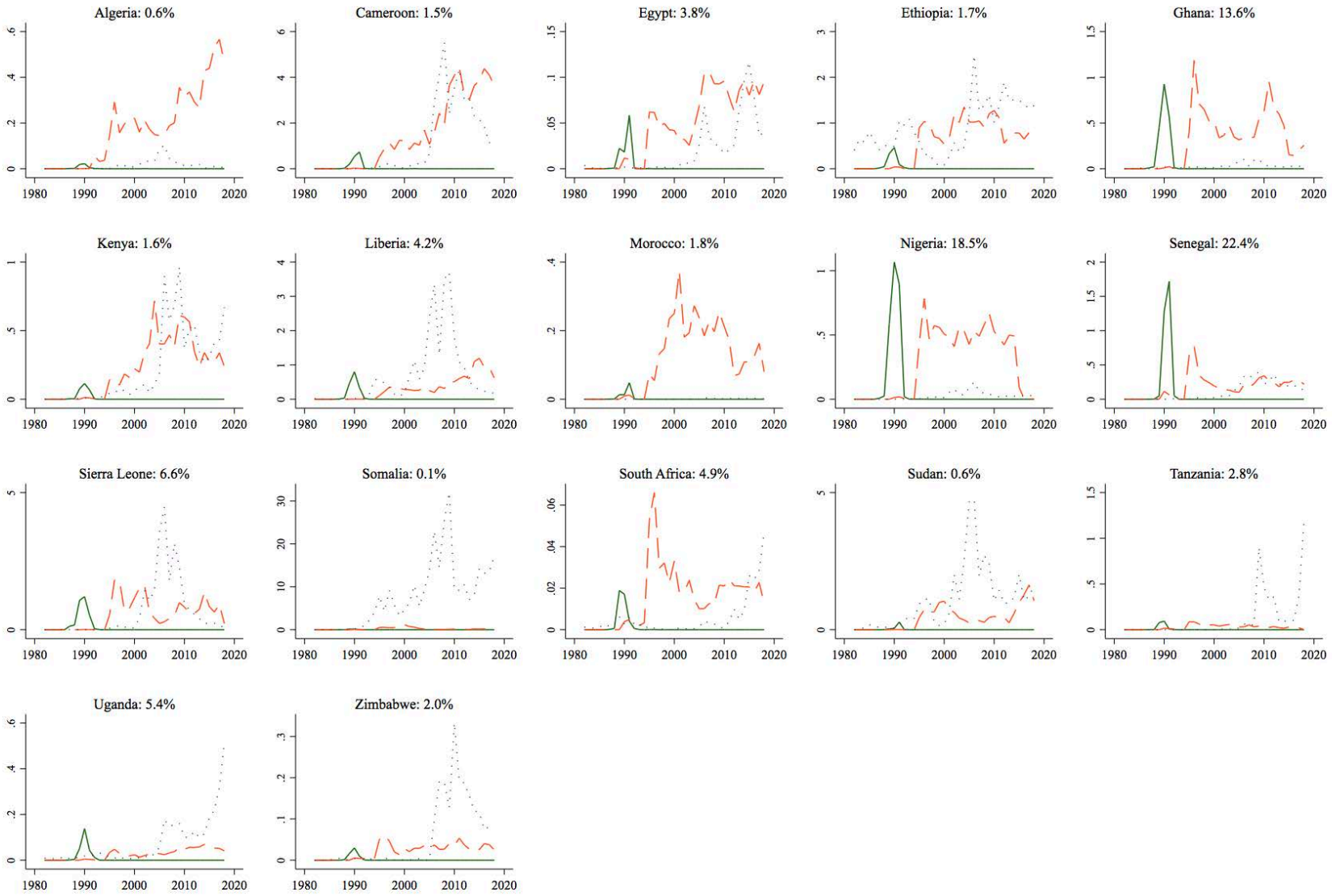
Sources: Legalization Applications Processing System (LAPS) for IRCA legalizations and *Immigrants Admitted to the United States* (FY 1983-2004) and *Yearbook of Immigration Statistics* (FY 2005-2019) for remaining variables. See Appendix A.
Notes: Solid green = IRCA legalizations, dashed orange = diversity visas, dotted blue = refugees, per 1980 legal immigrant of that origin. *Country in sample.

Figure A3b. Asia. IRCA Legalizations, Diversity, Refugees (w/IRCA's %)



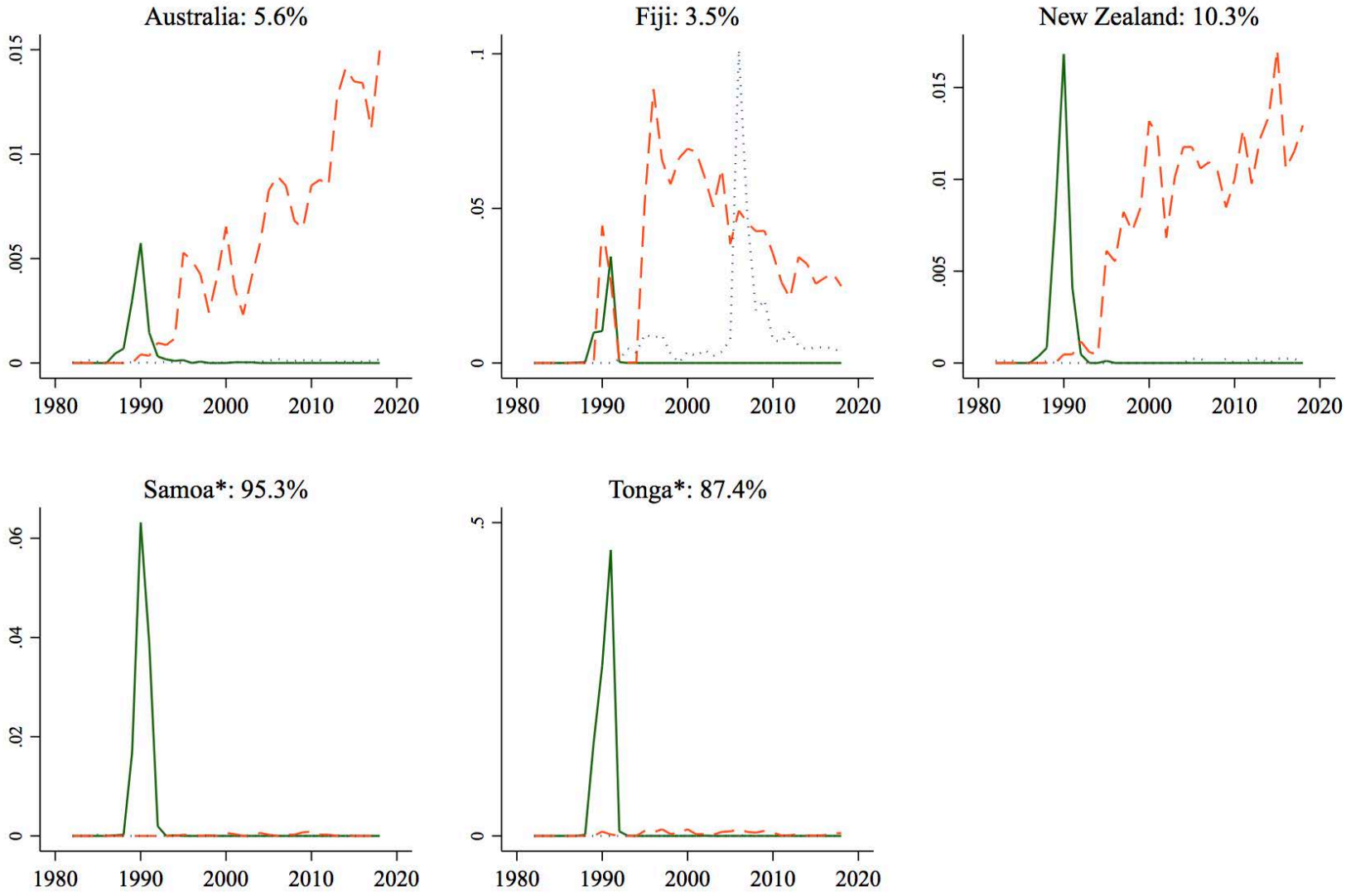
Sources: See Figure A3a.
Notes: Solid green = IRCA legalizations, dashed orange = diversity visas, dotted blue = refugees, per 1980 legal immigrant of that origin. *Country in sample.

Figure A3c. Africa. IRCA Legalizations, Diversity, Refugees (w/IRCA's %)



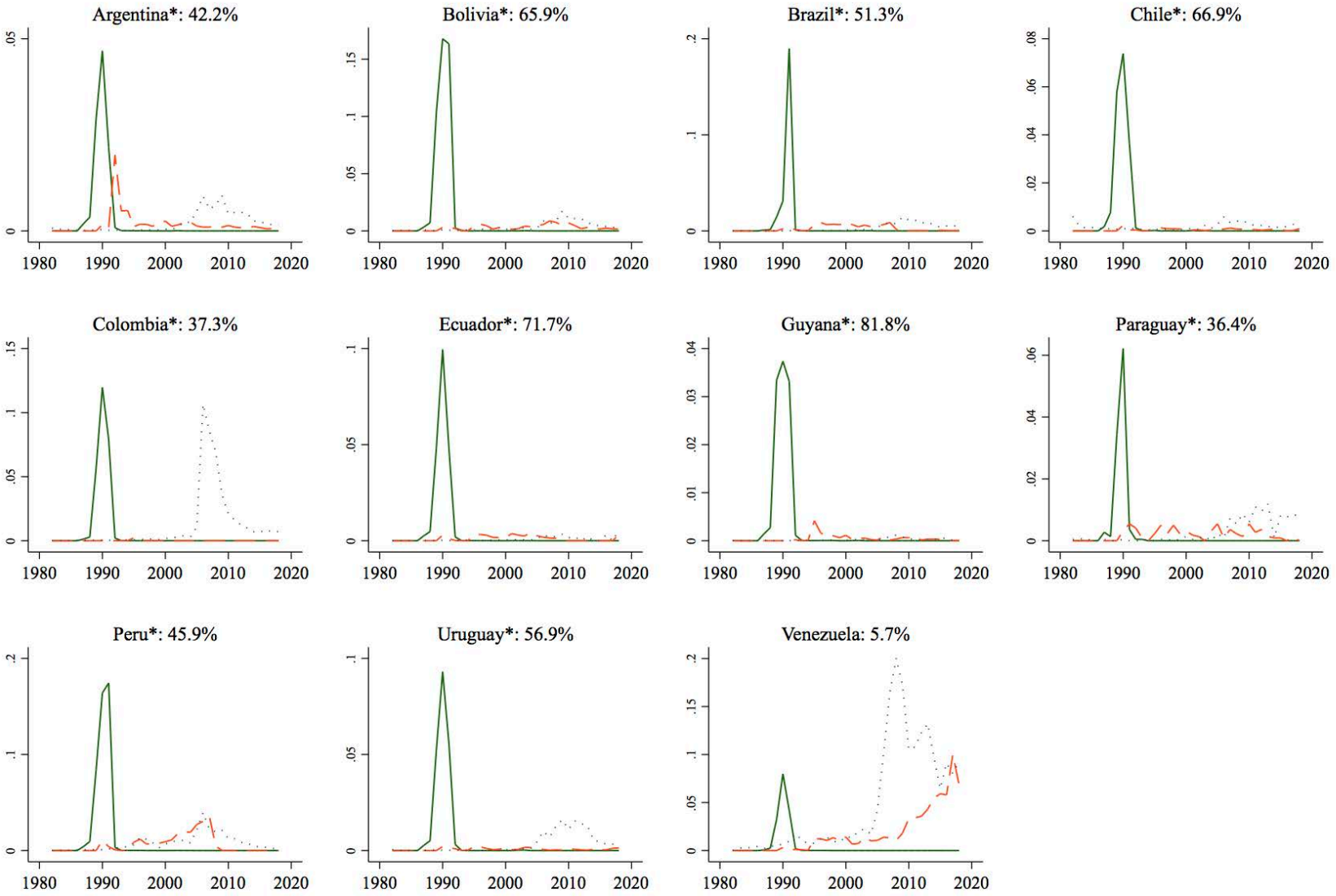
Sources: See Figure A3a.
Notes: Solid green = IRCA legalizations, dashed orange = diversity visas, dotted blue = refugees, per 1980 legal immigrant of that origin. *Country in sample.

Figure A3d. Oceania. IRCA Legalizations, Diversity, Refugees (w/IRCA's %)



Sources: See Figure A3a.
Notes: Solid green = IRCA legalizations, dashed orange = diversity visas, dotted blue = refugees, per 1980 legal immigrant of that origin. *Country in sample.

Figure A3f. South America. IRCA Legalizations, Diversity, Refugees (w/IRCA's %)



Sources: See Figure A3a.
Notes: Solid green = IRCA legalizations, dashed orange = diversity visas, dotted blue = refugees, per 1980 legal immigrant of that origin. *Country in sample.

Table A1. Summary of Data Sources

Type of Data and Source	Variable Description	Years covered	Analysis	Imputations	Unit of Analysis
Legal Admissions to the U.S.					
Immigrants Admitted to the United States	Immigrant admissions	FY1983 - 2004	Metro, Country		Anonymized microdata
DHS statistics tables	LPR by State, County, Country of Birth, and Major Class of Admission (Top 200 Counties)	FY2007 - 2019	Metro	Interpolate 2005-6	County x Country x Admission Class x Year
DHS statistics tables	LPRs by Citizenship and Major Classes of Admission	FY2005 - 2016	Country		Country x Admission Class x Year
Yearbook of Immigration Statistics	Immigrant admissions (Figure 1)	FY1940 - 2019	TS		Year
Legalized under IRCA					
Legalization Application Processing System data (LAPS)	IRCA applicant information	FY1988 - 1992	Metro, Country, TS		Anonymized microdata
Immigrants Admitted to the United States	Cuban-Haitian programs and pre-1972 arrivals	FY1988 - 1992	Metro, Country		Anonymized microdata
Rytina (2002)	Legal status of IRCA applicants	FY1989 - 2002	TS		Adminstrative tabulations
Stock of all Legal U.S. Residents in 1980					
Alien Address Reports (INS)	Legalized immigrant population data (used in legalization ratio estimation)	1980	Metro, Country		Anonymized microdata
5% Public Use 1980 Decennial Census	Naturalized immigrant population	1980	Metro, Country		Individual microdata
Legal and unauthorized arrivals					
Decennial Census	Total Immigrant arrivals (authorized and not)	1990, 2000	Metro, Country	Extrapolation to recent arrivals bins by year	Individual microdata
American Community Survey	Total immigrant arrivals (authorized and not)	2006 - 2019	Metro, Country	"	Individual microdata
Controls					
Public Use Decennial Census / American Community Survey	Bartik-style predicted Mexican employment growth	1980 - 2019 (Based on 1980)	Metro		Individual microdata
Tabulations of 20% count 1980 Decennial Census	Mexicans/Population	1980	Metro		County
County Business Patterns	Employment growth 1983-1987	1983 - 1987	Metro		County x Year
Public Use 2000 Decennial Census	Share Naturalized among 1971-1986 arrivcals	2000, for 1971-1986 arrivals	Country		Country
Penn World Tables	Real exchange rate, growth in origin country population	1987 - 2018	Country		Country x Year
UN World Development Indicators	Upper income country		Country		Country

Notes: TS = Used in time series shown in some figures. See Appendix A text for further description of these sources. We thank Cynthia Bansak for producing an initial draft of this table.

Table A2. Treatment Variation and Characteristics of Mexicans: All Metro Areas, by State

State and Metro Area	**Treatment:** Legalization Ratio: (2)/(3)	Number Legalized by IRCA	Existing Legal Immi-grants, 1980	% of IRCA Legalizations	Characteristics Mexicans/Pop, %, 1980	Characteristics Emp Growth, %, 1980-87
	(1)	(2)	(3)	(4)	(5)	(6)
Arizona						
Phoenix-Mesa, AZ	0.78	18,248	23,519	0.90	1.81	44.5
Tucson, AZ	0.53	8,618	16,109	0.43	3.00	36.7
Yuma, AZ	0.98	9,737	9,929	0.48	12.11	36.7
California						
Bakersfield, CA	1.47	24,485	16,682	1.21	5.19	17.7
Los Angeles-Long Beach, CA	1.70	560,289	329,865	27.75	9.33	11.4
Merced, CA	2.02	12,593	6,228	0.62	7.83	20.4
Modesto, CA	1.35	12,423	9,183	0.62	4.35	27.1
Oakland, CA	0.44	10,142	23,232	0.50	1.69	28.4
Orange County, CA	2.68	108,593	40,546	5.38	4.50	35.2
Riverside-San Bernardino, CA	0.95	44,102	46,329	2.18	3.39	47.3
Sacramento, CA	0.28	2,725	9,862	0.13	1.10	40.0
Salinas, CA	1.35	21,841	16,171	1.08	8.87	19.9
San Diego, CA	1.22	83,744	68,912	4.15	4.67	37.9
San Francisco, CA	0.34	6,343	18,543	0.31	1.76	9.3
San Jose, CA	1.11	30,462	27,426	1.51	2.78	20.9
Santa Barbara-Santa Maria-Lompoc, CA	1.84	19,538	10,642	0.97	4.36	21.0
Santa Rosa, CA	3.13	8,362	2,675	0.41	1.43	46.1
Stockton-Lodi, CA	1.18	15,402	13,083	0.76	3.97	29.0
Vallejo-Fairfield-Napa, CA	0.71	3,130	4,426	0.16	1.68	38.8
Ventura, CA	0.91	25,347	27,948	1.26	6.55	50.8
Visalia-Tulare-Porterville, CA	2.04	25,424	12,467	1.26	7.60	14.4
Yolo, CA	0.69	3,148	4,558	0.16	4.39	52.2
Colorado						
Colorado Springs, CO	0.60	197	326	0.01	0.14	44.9
Denver, CO	0.34	2,105	6,215	0.10	0.67	11.7

Table A2. Treatment Variation and Characteristics of Mexicans: All Metro Areas, by State (continued)

Region and Country	**Treatment:** Legalization Ratio: (2)/(3)	Number Legalized by IRCA	Existing Legal Immi-grants, 1980	% of IRCA Legalizations	Characteristics Mexican Pop %, 1980	Characteristics Emp Growth, %, 1980-87
	(1)	(2)	(3)	(4)	(5)	(6)
Connecticut						
New Haven, CT	0.69	233	338	0.01	0.03	15.8
Florida						
Fort Lauderdale, FL	3.38	1,462	432	0.07	0.05	30.6
Fort Myers-Cape Coral, FL	6.94	1,958	282	0.10	0.15	56.5
Fort Pierce-Port St. Lucie, FL	5.72	898	157	0.04	0.51	65.0
Lakeland-Winter Haven, FL	8.41	4,162	495	0.21	0.19	16.4
Melbourne, FL	0.34	70	208	0.00	0.03	47.1
Naples, FL	4.37	5,428	1,241	0.27	1.32	66.8
Orlando, FL	0.47	423	909	0.02	0.19	63.5
Sarasota-Bradenton, FL	3.55	1,286	362	0.06	0.15	46.6
Tampa-St. Petersburg, FL	1.43	1,820	1,272	0.09	0.08	44.5
West Palm Beach, FL	3.81	4,103	1,077	0.20	0.12	58.3
Hawaii						
Honolulu, HI	0.27	126	472	0.01	0.08	12.7
Illinois						
Chicago, IL	0.20	20,695	101,396	1.03	2.23	2.8
Massachusetts						
Boston, MA	0.11	95	854	0.00	0.02	22.0
Springfield, MA	0.30	8	25	0.00	0.02	9.8
Nevada						
Reno, NV	5.00	3,377	676	0.17	0.71	20.3

Table A2. Treatment Variation and Characteristics of Mexicans: All Metro Areas, by State (continued)

Region and Country	**Treatment:** Legalization Ratio: (2)/(3)	Number Legalized by IRCA	Existing Legal Immi-grants, 1980	% of IRCA Legalizations	Characteristics: Mexican Pop %, 1980	Characteristics: Emp Growth, %, 1980-87
	(1)	(2)	(3)	(4)	(5)	(6)
New Jersey						
Bergen-Passaic, NJ	1.04	654	629	0.03	0.08	17.7
Jersey City, NJ	1.03	331	320	0.02	0.06	10.6
Middlesex-Somerset, NJ	1.03	192	187	0.01	0.04	35.8
Monmouth-Ocean, NJ	2.72	300	110	0.01	0.02	45.4
Newark, NJ	0.22	89	406	0.00	0.03	13.6
New York						
Buffalo-Niagara Falls, NY	0.15	31	207	0.00	0.02	-0.8
Nassau-Suffolk, NY	0.45	343	758	0.02	0.03	31.7
New York, NY	0.32	1,729	5,400	0.09	0.10	9.0
Oregon						
Portland, OR	1.22	1,911	1,572	0.09	0.20	6.1
Pennsylvania						
Allentown, PA	0.27	37	139	0.00	0.02	3.0
Lancaster, PA	1.03	65	63	0.00	0.03	17.7
Philadelphia, PA	0.39	380	969	0.02	0.03	15.0
Texas						
Brazoria, TX	0.91	2,315	2,555	0.11	1.87	-14.4
Brownsville, TX	0.34	12,909	37,900	0.64	16.70	9.5
El Paso, TX	0.33	27,884	84,284	1.38	17.31	11.5
Houston, TX	0.42	28,352	67,082	1.40	3.29	-0.4
Laredo, TX	0.18	4,569	25,867	0.23	18.83	4.2
McAllen, TX	0.43	24,858	57,874	1.23	18.01	27.7

Table A2. Treatment Variation and Characteristics of Mexicans: All Metro Areas, by State (continued)

Region and Country	**Treatment:** Legalization Ratio: (2)/(3)	Number Legalized by IRCA	Existing Legal Immi-grants, 1980	% of IRCA Legalizations	Characteristics Mexican Pop %, 1980	Characteristics Emp Growth, %, 1980-87
	(1)	(2)	(3)	(4)	(5)	(6)
Texas (continued)						
San Antonio, TX	0.35	16,835	48,547	0.83	4.62	27.4
Utah						
Provo-Orem, UT	2.17	721	332	0.04	0.32	3.9
Salt Lake City-Ogden, UT	0.46	782	1719	0.04	0.28	14.7
Washington						
Seattle-Bellevue-Everett, WA	0.86	1,169	1367	0.06	0.10	19.3
Tacoma, WA	1.64	498	304	0.02	0.10	17.5
Wisconsin						
Madison, WI	0.73	119	164	0.01	0.09	21.9

Sources: Columns 2 and 4: Legalization Applications Processing System (LAPS) (for the SAW program and the GLP) and *Immigrants Admitted to the United States* (FY 1987-2004) (for two smaller IRCA programs). Column 3: *Alien Address Reports, [United States], 1980 Public Use File* (for LPRs) and 1980 Census PUMS (Ruggles et al., 2020) (for citizens). Column 5: 1980 Census tabulations (Manson et al., 2020). Column 6: County Business Patterns. See Appendix A text.

Table A3. Descriptive Statistics of Key Variables

	Metro Area	Country		Metro Area	Country
	(1)	(2)		(3)	(4)
1. Treatment			*Other Major Categories (Continued)*		
Legalization Ratio	1.406	0.525	Refugees	0.001	0.004
Ratio (treatment)	(1.643)	(0.681)		(0.004)	(0.013)
			Diversity	0.000	0.002
2. Mexican Legal Admissions (all per 1980 Mexican Citizens+Permanent Residents)				(0.000)	(0.007)
Overall Family Sponsored	0.156	0.146	3. Controls		
	(0.177)	(0.106)	Mexicans/Population, 1980	0.029	
By Family Sponsorship Type				(0.046)	
Green-Card Sponsored	0.039	0.031	Mexicans Admitted, 1983-87	3.845	
	(0.061)	(0.037)	/Legal Mexicans, 1980	(9.331)	
Citizen-Sponsored	0.117	0.114	Employment Growth, 1980-87	0.258	
	(0.139)	(0.091)		(0.179)	
By Relative Type			Mex Emp Growth, 1980-2019	5.452	
Spouses and Kids[a]	0.125	0.099	predicted from 1980 Occ Mix	(8.824)	
	(0.143)	(0.069)	Admissions 1983-87/1980		0.980
Parents	0.022	0.017	Legal Immigrants		(0.571)
	(0.035)	(0.018)	Upper Income Country		0.310
Other ("Chain" Migrants)	0.008	0.029			(0.463)
	(0.011)	(0.033)	Real Exchange Rate		2.367
Other Major Categories					(3.666)
Employer Sponsored	0.018	0.022	Origin Country Population		0.944
	(0.051)	(0.035)	/1K Legal Imms, 1980		(1.929)
Observations (cells)	2,310	986		2,310	986
Countries[b]	Mexico Only	29		Mexico Only	29
Metro Areas	66	(national)		66	(national)
Years	37	34		37	34

Notes: Table shows mean of referenced variable, with standard deviation in parentheses underneath. Year range: columns 1 and 3: 1983-2019; columns 2 and 4: 1983-2016.

[a] Sum of citizen-sponsored spouses and minor children and Green Card-sponsored spouses and unmarried children.

[b] In Panel 3, only 27 of the 29 total countries have the controls available.

Table A4. Cross-Metro Area Treatment Variation, Additional Correlates

Panel A. Top MSAs on Mexican Legalization Ratio

	Metro Area	Legalization Ratio	% Legalized Under SAW	% of Apps Accepted
		(1)	(2)	(3)
1	Lakeland-Winter Haven, FL	8.4	86.8	93.0
2	Fort Myers-Cape Coral, FL	6.9	88.4	94.1
3	Fort Pierce-Port St. Lucie, FL	5.7	93.0	94.3
4	Reno, NV	5.0	45.5	84.3
5	Naples, FL	4.4	91.0	95.5
6	West Palm Beach-Boca Raton, FL	3.8	81.9	93.1
7	Sarasota-Bradenton, FL	3.6	87.1	95.4
8	Fort Lauderdale, FL	3.4	67.0	89.9
9	Santa Rosa, CA	3.1	73.8	91.4
10	Monmouth-Ocean, NJ	2.7	66.4	79.3
16	Los Angeles-Long Beach, CA	1.7	21.7	87.0

Panel B. Correlations with the Legalization Ratio

Characteristic	Mean	Regressions on Leg. Ratio	
	(1)	(2)	(3)
% Legalized under SAW	58.61	5.714	2.691
		(1.202)	(1.172)
% of Applications Accepted.	85.70	1.506	0.188
		(0.335)	(0.248)
State Effects?		No	Yes

Sources: Panel A column 1 numerator: Legalization Applications Processing System (LAPS) (for the SAW program and the GLP) and *Immigrants Admitted to the United States* (FY 1987-2004) (for two smaller IRCA programs). Panel A column 1 denominator: *Alien Address Reports, [United States], 1980 Public Use File* (for LPRs) and 1980 Census PUMS (Ruggles et al., 2020) (for citizens). Panel A columns 2 and 3 and Panel B: LAPS microdata.

Notes: Unit of observation is a metro area. The legalization ratio in Panel A gives the number of Mexican immigrants granted permanent residence by IRCA who listed that metro area as their intended residence, divided by the number of Mexican citizens and LPRs in that metro area in 1980. Columns 2 and 3 of Panel B show the coefficient from a regression of the variable listed on the legalization ratio; the regression in column 3 also includes dummies for the state in which the majority of the metro area's population resided in 1986.

Table A5. Impact of Mexican IRCA Legalizations by IRCA Program

Panel A: Balance Test

	SAW	GLP + Other	P-value on joint sig.
	(1)	(2)	(3)
Mexicans/Population, 1980	0.00	-0.01	0.579
	(0.00)	(0.02)	
Mexicans Admitted, 1983-87	0.57	1.07	0.384
/Legal Mexicans, 1980	(0.58)	(1.48)	
Employment Growth, 1980-87	0.00	-0.10	0.517
	(0.03)	(0.09)	
Mex Emp Growth, 1980-2019	0.06	2.61	0.649
predicted from 1980 Occ Mix	(0.75)	(2.81)	

Panel B: Long-Run Responses

	SAW	GL+Other	P-value on difference
	(1)	(2)	(3)
Overall Family Sponsored	1.06	0.85	0.856
	(0.30)	(1.03)	
By Family Sponsorship Type			
Green-Card Sponsored	0.57	0.01	0.046
	(0.11)	(0.25)	
Citizen-Sponsored	0.49	0.84	0.712
	(0.22)	(0.83)	
By Relative Type			
Spouses and Kids[a]	0.90	0.72	0.846
	(0.24)	(0.84)	
Parents	0.11	0.19	0.700
	(0.06)	(0.17)	
Other ("Chain" Migrants)	0.05	-0.06	0.138
	(0.02)	(0.06)	
Other Major Categories			
Employer Sponsored	-0.09	0.80	0.258
	(0.14)	(0.67)	
Refugees	-0.01	0.05	0.381
	(0.02)	(0.06)	
Diversity	0.00	0.00	0.273
	(0.00)	(0.00)	

Sources: See notes to Table 1 for Panel A sources. Data on admissions by type (Panel B) from *Immigrants Admitted to the United States* (FY 1983-2004) and https://www.dhs.gov/immigration-statistics/readingroom/LPR/LPRcounty (FY 2007-2019). Admissions for FY 2005 and 2006 are linearly interpolated. See Appendix A.

Notes: Panel A shows coefficients and standard errors from a regression of the variable listed on the number of Mexican-born immigrants legalized under IRCA's SAW program (column 1) and under other IRCA legalization programs (column 2), each divided by $legal_{c,1980}$. Panel B gives the sum of post-1988 coefficients on the same two SAW and GLP variables interacted with dummies for year from a regression that also includes controls for metro area and state x year fixed effects. Standard errors in these regressions are clustered on metro area, and standard errors in parentheses are calculated using the delta method.

[a] Citizen-sponsored spouses and minor kids + Green Card-sponsored spouses and unmarried kids.

Table A6. Cross-Country Treatment Variation

Panel A. Top Countries on Legalization Ratio

	Country	Legalization Ratio: (2)/(3)	Legalized by IRCA	Legal Immigrants, 1980	% of all Legalizations
		(1)	(2)	(3)	(4)
4	**Mexico**	**1.30**	**2,019,353**	**1,548,438**	72.2
	Other 28 countries in sample		*512,056*	*1,156,230*	18.3
1	**El Salvador**	3.17	151,880	47,913	5.4
2	Haiti	1.95	88,284	45,209	3.2
3	**Guatemala**	1.64	63,663	38,742	2.3
5	**Tonga**	0.89	3,186	3,593	0.1
6	Pakistan	0.79	17,009	21,654	0.6
7	**Belize**	0.66	6,035	9,155	0.2
8	**Honduras**	0.51	16,055	31,422	0.6
9	**Bolivia**	0.45	4,337	9,666	0.2
10	Peru	0.44	18,264	41,522	0.7

Panel B. Balance Test: Correlates of the Legalization Ratio

	Characteristic	Mean	Regressed on Leg. Ratio		Reverse
		(1)	(2)	(3)	(4)
(a)	<60% of 1971-1986 Arrivals Naturalized by 2000	0.483	0.190	0.202	
			(0.108)	(0.120)	
(b)	Admissions 1983-87/ 1980 Legal Immigrants	0.980	0.126	0.0162	-0.0428
			(0.102)	(0.127)	(0.231)
(c)	Upper Income Country	0.310	-0.137	-0.143	-0.337
			(0.0783)	(0.0874)	(0.264)
(d)	Missing Country Controls (in (e) and (f))	0.0690	-0.00315	0.00412	
			(0.0428)	(0.0325)	
(e)	Δln(Real Exchange Rate), 1987-2018	2.930	-0.874	0.238	0.0085
			(0.554)	(0.357)	(0.0200)
(f)	Δ Country Pop, 1987-2018 /1K Legal Imms, 1980	0.537	-0.0828	0.0811	0.127
			(0.166)	(0.0689)	(0.117)
	Dummy Controls:				
	North and South America		No	Yes	Yes
	F-stat				0.934

Sources: Panel A columns 2 and 4: Legalization Applications Processing System (LAPS) (for the SAW program and the GLP) and *Immigrants Admitted to the United States* (FY 1987-2004) (for two smaller IRVA programs). Panel A column 3: *Alien Address Reports, [United States], 1980 Public Use File* (for LPRs) and 1980 Census PUMS (Ruggles et al., 2020) (for citizens). Panel B row a: 2000 Census PUMS (Ruggles et al, 2020). (Countries that fit this criterion appear in **bold** in panel A.) Panel B row b: *Immigrants Admitted to the United States*, FY 1983-87 (numerator) and Panel A column 3 sources (denominator). Panel B row c: UN World Development Indicators. Panel B rows d, e, and f: Penn World Tables 10.0 (Feenstra et al., 2018). See Appendix A.
Notes: Unit of observation is an origin country. The legalization ratio in Panel A gives the number of immigrants from the country granted permanent residence by IRCA, divided by the number of citizens and LPRs from that country in 1980. Columns 2 and 3 of Panel B show the coefficient from a regression of the variable listed on the legalization ratio; the regression in column 3 also includes dummies for world region. Column 4 of Panel B shows the slope coefficients from a multivariate regression of the legalization ratio on the variables listed plus world region dummies; the F-stat is on the joint significance of the variables listed.

Table A7. Treatment Variation and Characteristics: All Countries, by Region

Region and Country	**Treatment:** Legalization Ratio: (2)/(3)	Number Legalized by IRCA	Existing Legal Immi-grants, 1980	% of IRCA Legalizations	Characteristics: Estimated % naturalized	Characteristics: Upper Income Country?
	(1)	(2)	(3)	(4)	(5)	(6)
1. Europe						
(none)						
2. Asia						
India	0.13	20,906	167,896	0.75	72.59	0
Pakistan	0.79	17,009	21,654	0.61	75.57	0
3. Africa						
(none)						
4. Pacific						
Samoa	0.12	994	8,186	0.04	65.46	0
Tonga	0.89	3,186	3,593	0.11	45.79	0
5. North America and Caribbean						
Antigua and Barbuda	0.26	1,268	4,808	0.05	68.34	1
The Bahamas	0.27	2,897	10,712	0.10	48.42	0
Belize	0.66	6,035	9,155	0.22	57.39	0
Costa Rica	0.14	3,363	23,882	0.12	59.08	1
Dominican Republic	0.14	23,982	169,257	0.86	50.33	0
El Salvador	3.17	151,880	47,913	5.43	41.14	0
Grenada	0.17	921	5,300	0.03	70.43	1
Guatemala	1.64	63,663	38,742	2.28	41.89	0
Haiti	1.95	88,284	45,209	3.16	59.83	0
Honduras	0.51	16,055	31,422	0.57	48.83	0
Jamaica	0.11	17,257	158,284	0.62	66.51	0
Mexico	1.30	2,019,353	1,548,438	72.20	35.61	1

Table A7. Treatment Variation and Characteristics: All Countries, by Region (continued)

Region and Country	**Treatment:** Legalization Ratio: (2)/(3)	Number Legalized by IRCA	Existing Legal Immi-grants, 1980	% of IRCA Legalizations	Characteristics Estimated % naturalized	Characteristics Upper Income Country?
	(1)	(2)	(3)	(4)	(5)	(6)
5. North America and Caribbean (cont'd)						
St. Kitts and Nevis	0.18	629	3,554	0.02	61.81	0
St. Lucia	0.27	619	2,309	0.02	67.65	1
St. Vincent & Grenadines	0.22	716	3,219	0.03	67.61	0
6. South America						
Argentina	0.10	5,619	53,804	0.20	60.27	1
Bolivia	0.45	4,337	9,666	0.16	57.83	0
Brazil	0.24	6,956	29,027	0.25	46.87	1
Chile	0.18	4,647	25,891	0.17	57.91	1
Colombia	0.26	30,941	118,215	1.11	61.44	0
Ecuador	0.21	15,274	74,392	0.55	52.26	0
Guyana	0.11	3,990	36,391	0.14	76.84	0
Paraguay	0.11	230	2,188	0.01	54.53	0
Peru	0.44	18,264	41,522	0.65	59.73	0
Uruguay	0.21	2,134	10,039	0.08	63.44	1

Sources: Columns 2 and 4: Legalization Applications Processing System (LAPS) (for the SAW program and the GLP) and *Immigrants Admitted to the United States* (FY 1987-2004) (for two smaller IRCA programs). Column 3: *Alien Address Reports, [United States], 1980 Public Use File* (for LPRs) and 1980 Census PUMS (Ruggles et al., 2020) (for citizens). Column 5: 2000 Census PUMS (Ruggles et al., 2020). Column 6: United Nations World Development Indicators. See Appendix A text.
Notes: The naturalization rate is the percent of 1971-86 arrivals how were citizens as of the 2000 Census.

Appendix B: Derivation of the Main Estimation Equation

As discussed, our empirical approach exploits variation in the timing of IRCA and variation across metropolitan areas in the intensity of IRCA as a legalization shock. To understand the specifications we ultimately estimate, it is helpful to outline a stylized model.

I. Baseline model

Let a_{cst} represent immigrants from Mexico admitted (with a Green Card) to metro area *c* in state *s* in year *t*.[1] We begin by modeling a_{cst} as a function of a metro area fixed effect, $\tilde{\delta}_c$, with deviations subsequent to IRCA (after 1988) proportional to the number of IRCA Green Cards issued to Mexicans in *c*, $lpr_{c,IRCA}$. That is,

$$a_{cst} = \tilde{\delta}_c + \sum_{\tau>1988} \theta_\tau D_t^\tau lpr_{c,IRCA} + u_{cst}, \tag{B.0}$$

where the D_t^τ represent an exhaustive set of indicator variables for all years after 1988 and u_{cst} is an error term, capturing other area-by-time varying determinants of Mexican admissions, including various "push" and "pull" factors. The coefficients of interest are the θ_τ's. With annual data, for example, θ_{2000} would be the difference in Mexican admissions to *c* between 1988 and 2000, on average, for every Mexican IRCA Green Card recipient in c.

II. Modifications

While this model is intuitively appealing, we think it necessary to modify in several ways to produce credible estimates of the θ_τ's.

A. Modification 1: Other Sources of Sponsorship

First, IRCA Green Card holders were not the only immigrants capable of sponsoring new LPRs through family linkages in the 1990s and beyond; pre-existing LPRs and citizens were capable of sponsoring family members as well. Though it may not be the case either that these other legal immigrants accelerated their sponsorship in the 1990s, or that these stocks of other legal immigrants are even all that correlated with $lpr_{c,IRCA}$, let's allow for this possibility:

$$a_{cst} = \widetilde{\delta_c} + \sum_{\tau>1988}\left(\theta_\tau D_t^\tau lpr_{c,IRCA} + \gamma_\tau D_t^\tau legal_{c,1988}\right) + \tilde{e}_{cst}, \tag{B.1}$$

where $legal_{c,1988}$ represents the stock of LPRs and citizens (combined) from country *c* in 1988. Model (B.1) thus adjusts $lpr_{c,IRCA}$ and a_{cst} for other ways in which a_{cst} may change over time.

B. Modification 2: Scaling

Even with modification 1, the model is susceptible to influence from outliers due to regional concentrations of immigrants (e.g., areas, like Los Angeles, with large numbers of admissions). Our second modification therefore scales (B.1) by $legal_{c,1988}$:

[1] a_{cst} could also be immigrants from country *c* admitted in year *t*, where country c is within world region *s*.

(B.2) $$\frac{a_{ct}}{legal_{c,1988}} = \delta_c + \gamma_t + \sum_{\tau>1988} \theta_\tau D_t^\tau \left(\frac{lpr_{c,IRCA}}{legal_{c,1988}}\right) + e_{cst}.$$

The year effects in this model, the γ_t, thus represent the impacts of pre-existing LPRs on new arrivals, and the θ_τ continue to capture the differential impacts of IRCA LPRs on new arrivals. Intuitively, the coefficients of interest ask whether deviations of new arrivals from prior country-specific trends correlate with the "intensity" of IRCA as a legalization shock.

C. Modification 3: State-by-year effects

Our third modification to the stylized framework accounts for the possibility that the intensity of IRCA as a legalization shock, or $\frac{ircalpr_c}{legal_{c,1988}}$, may correlate with other, unobserved state-by-time varying determinants of admissions, e_{cst}. The modification is to include a full set of state-by-year effects in (B.2):

(B.3) $$\frac{a_{cst}}{legal_{c,1980}} = \delta_c + \gamma_{st} + \sum_{\tau>1988} \theta_\tau D_t^\tau \left(\frac{lpr_{c,IRCA}}{legal_{c,1988}}\right) + e_{cst}$$

Returning to the derivation of (B.2), one can see that this modification allows the existing stock of legal immigrants in *c*, $legal_{c,1988}$, to have effects on admissions that are not only time-varying, as in (B.1), but also state varying.

D. Modification 4: Using $legal_{c,1980}$ instead of $legal_{c,1988}$

Our next modification deals with a practical data challenge: we do not observe $legal_{c,1988}$ and use $legal_{c,1980}$ as a proxy. The year 1980 is last possible pre-IRCA year we can reliably measure the stock of legal residents: it is the last year that the U.S. maintained an alien registry, and it also coincides with a census year in which we can get a count of citizens. One might instead attempt to impute a stock as of 1988 by adding up arriving new Green Card admissions between 1980 and 1988 (perhaps somewhat discounted for return migration.). But notice that this can be construed as just another small group of potential sponsors that might confound our estimates.

To see this more formally, suppose this other group of potential sponsors who came between 1980 and IRCA's legalizations were denoted $legal_{c,1981-87}$, in other words, $legal_{c,1988}$ = $legal_{c,1980} + legal_{c,1981-87}$. Substituting into (B.1) *and* allowing for separate coefficient vectors on each set of resulting interaction terms yields:

$$a_{cst} = \widetilde{\delta_c} + \sum_{\tau>1988}\left(\theta_\tau D_t^\tau lpr_{c,IRCA} + \gamma_\tau D_t^\tau legal_{c,1980} + \lambda_\tau D_t^\tau legal_{c,1981-1987}\right) + \tilde{e}_{cst},$$

Now, when we divide through by $legal_{c,1980}$ (instead of $legal_{c,1988}$) and make modifications 1 to 3, we have an "extra" term in the estimation equation:

$$\frac{a_{cst}}{legal_{c,1980}} = \delta_c + \gamma_{st} + \sum_{\tau>1988} \theta_\tau D_t^\tau \left(\frac{lpr_{c,IRCA}}{legal_{c,1980}}\right) + \sum_{\tau>1988} \lambda_\tau D_t^\tau \left(\frac{legal_{c,1981-1987}}{legal_{c,1980}}\right) + e_{cst}$$

However, letting $\varepsilon_{cst} \equiv \sum_{\tau>1988} \lambda_\tau D_t^\tau \left(\frac{legal_{c,1981-1987}}{legal_{c,1980}}\right) + e_{cst}$, one can obtain:

$$\text{(B.4)} \qquad \frac{a_{cst}}{legal_{c,1980}} = \delta_c + \gamma_{st} + \sum_{\tau>1988} \theta_\tau D_t^\tau \left(\frac{lpr_{c,IRCA}}{legal_{c,1980}}\right) + \varepsilon_{cst}$$

Thus it becomes clear that dividing by the 1980 stock rather than the 1988 stock will only be an issue if the omitted terms $\sum_{\tau>1988} \lambda_\tau D_t^\tau \left(\frac{legal_{c,1981-1987}}{legal_{c,1980}}\right)$ are correlated with the legalization ratio, $\left(\frac{lpr_{c,IRCA}}{legal_{c,1980}}\right)$. Table 1 Panel B shows that there is not such a correlation for the cross-metro analysis, supporting the use of the 1980 proxy for our estimates. (Table A6 Panel B presents comparable evidence for the cross-country analysis). In addition, Figures 4, 5, and A2 show no evidence of pre-trends in any admissions class (starting in 1983 due to data constraints), which is a sufficient condition for this result.

E. Modification 5: Additional interactions to test for pre-trends

Our final modification is to allow for such a test (for pre-trends) by expanding the model to include interactions between the legalization ratio and dummies for years prior to 1988:

$$\text{(B.5)} \qquad \frac{a_{cst}}{legal_{c,1980}} = \delta_c + \gamma_{st} + \sum_{\tau\neq1988} \theta_\tau D_t^\tau \left(\frac{lpr_{c,IRCA}}{legal_{c,1980}}\right) + \varepsilon_{cst}$$

This is the estimating equation in column 1 of Tables 2 and 3 for the cross-metro and cross-country analyses, respectively.

III. Comment on Alternative Scaling

Suppose that modification 2 had scaled by, for example, 1980 population, pop_c. The ultimate estimating equation would then have to be:

$$\text{(B.6)} \quad \frac{a_{cst}}{pop_c} = \delta_c + \sum_{\tau>1988} \left(\theta_\tau D_t^\tau \frac{lpr_{c,IRCA}}{pop_c} + \gamma_\tau D_t^\tau \frac{legal_{c,1980}}{pop_c} + \lambda_\tau D_t^\tau \frac{legal_{c,1981-1987}}{pop_c}\right) + e_{cst}$$

Thus, to identify the coefficient vector of interest, θ_τ, would require multiple additional controls. Our preferred estimating equation is simpler and delivers the desired parameter estimates.