Changes in International Immigration and Internal Native Mobility after Covid-19 in the US *

Giovanni Peri
University of California -Davis

Reem Zaiour
University of California -Davis

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Abstract

In the months since the beginning of the Covid-19 pandemic till late 2021, international immigration flows to the US decreased significantly. We document the timing and the characteristics of these significant changes in flows, their most recent evolution and their geographic and sector distribution. We also consider, in a similar way, changes in internal native mobility in the US, before and after Covid-19. We then connect cross-state native mobility to foreign immigration, the emergence of remote-work options, and changes in labor demand, before and after Covid. In spite of the large changes in labor markets and international migration, we do not measure any significant changes in native internal mobility. Then, using a panel regression and a shift-share IV, we find that the post-Covid drop in immigration and differential increase in remote-work options across sectors and states were not associated with changes in natives' cross-state mobility. We discuss possible implications of the decline in immigration and low native mobility on unfilled jobs in local labor markets.

*Peri: gperi@ucdavis.edu, Zaiour: rzaiour@ucdavis.edu. This paper was written as part of the Boston Fed 66th Economic Conference: "Labor Markets During and After the Pandemic".

1 Introduction

Since the onset of the Covid-19 pandemic in March 2020, a large number of rapid changes have occurred in the US economy and its labor markets. The employment rate fell dramatically in the few months after March 2020 with an especially sharp impact on female participation (Albanesi and Kim 2021). Older workers retired in large numbers (Faria-e Castro et al. 2021), and a substantial proportion of in-person work was replaced by remote work (see Barrero et al. 2020). Several of these changes and their consequences lasted well after the pandemic's recession, into 2022 (see Parker et al. 2022). In addition, the recession produced a significant sudden decline of employment relative to working-age population, and a strong reallocation of work, due to large variation in the incidence of these shocks across sectors. Only in July 2022 was the total employment level back to the level of January 2020 (around 158.5 million jobs). During the previous 10 years, employment had been growing on average by 2 million jobs per year. While the US economy has climbed out of its Covid-recession phase, the number of jobs is still 4-5 million smaller than it would have been had it continued its growth on the pre-2020 trend. Similarly persistent were, as of July 2022, the share of remote work (see Aksoy et al. 2022) and the large number of unfilled jobs (vacancies), implying changing work habits and slow reallocation of labor across sectors and possibly across space.

A less known fact that may have contributed to the stagnation of aggregate employment growth was that the inflow of foreign-born workers essentially stopped. Immigration had already slowed down since 2017, but it experienced a significant decline in late 2019 and during 2020 up to mid-2021. The executive orders limiting visa issuance and slowing the processing of green cards introduced during the Trump administration[1], combined with the usual sluggishness of the US immigration system, reduced the inflows, especially of non-college educated immigrants, already in the years leading to the pandemic. Then, the Covid-19 pandemic almost entirely halted international travel and stopped the processing of visas during most of 2020, producing a drastic reduction in the net growth of the foreign-born population during that year.

This fact is demonstrated in Figure 1. The chart plots the monthly time series (using Monthly

[1]See Bolter et al. 2022 for a detailed description of all the executive orders relative to immigration and enforcement introduced between 2017 and 2020.

Current Population Survey data) of the foreign-born adult population in working age (18-65 years old) in the US, beginning in January 2010 up to July 2022 (solid line). The figure additionally shows the linear trend for this population (dashed line) from January 2010 to May 2019, which represents the peak of the pre-Covid foreign-born population. We project such a trend up to July 2022. During the nine years before May 2019, the working-age foreign-born population grew by an average of about 660,000 individuals per year. Between May 2019 and June 2022, in two and a half years, it only added a total of 300,000 units. This implies a gap of 1.65 million working-age foreign-born individuals, relative to what it would have been at the pre-2019 growth rate.

In this paper, we will focus on such a slowdown and characterize the skill, location and sector distribution of this strong decline in foreign-born workers inflow. As foreign-born workers tend to concentrate in some sectors/jobs and in some states, the large decline in their inflow affected local US labor markets in very different ways. To understand how local economies were affected by the drop of immigrants and whether that had an impact on aggregate employment with eventual effects on vacancies (unfilled jobs) and wages, an important margin of response to analyze is native workers' internal mobility response and in general how native mobility behaved, during the years 2020-2022. In particular, we ask whether native internal mobility changed relative to pre-2020 trends, and whether native mobility to and from areas and sectors that lost a large number of immigrants, partially offset these changes, stabilizing employment and population.

One well-known, yet not fully explained, fact about the US-born labor force has been the decline in its mobility across labor markets during the last few decades (Molloy et al. 2011, Kaplan and Schulhofer-Wohl 2017, Basso and Peri 2020). Studies have documented the smaller responsiveness of native mobility to economic shocks and to local employment opportunities (Cadena and Kovak 2016), especially that of lower educated natives. The existing literature has shown that natives' mobility was not very responsive to the inflow of immigrants in the pre-Covid era (see Peri and Sparber 2011 and Card 2001), and that local employment shocks were mainly absorbed by mobility of immigrants themselves rather than natives (Cadena and Kovak 2016).

This paper will analyze whether the drop in immigration in the post-Covid era encouraged internal mobility of natives and inverted the trend of the previous years. In addition to mobility

across areas in response to asymmetric inflows of foreign-born during and after Covid-19, we measure the impact of emergence of remote work.

Using CPS data, and the additional module introduced in May 2020 on remote work, we analyze differences in remote employment across skills, states and sectors. The opportunity of working remotely may have created additional possibility for native mobility by decoupling work and residence location. Additionally, we document the increase in unfilled jobs (vacancies) and its variation across states and sectors, especially in the second half of 2021 and in early 2022, revealing significant labor market bottlenecks.

Those quantitatively significant and geographically uneven Covid-related changes could have stimulated stronger inter-state mobility of natives. To test for evidence supporting such a claim, we go beyond correlations. Using a panel regression and shift-share style instruments to proxy for the change in immigrants' inflow, we analyze whether native inter-state mobility responded to these flows, and we allow for a different response before and after 2020. We include a measure of remote work opportunities after Covid and control for changes in labor demand (Bartik variable) as additional potential determinants of inter-state mobility. Our analysis shows that neither overall native mobility (and in its demographic components) nor its responsiveness to the drop in international immigration changed significantly during and after Covid-19 (post 2020).

Additionally, the drop in immigration had heterogeneous effects on sector employment, due to the uneven distribution of foreign workers across sectors. Remote work opportunities varied across sectors too. These two factors sometimes implied that the same sector experienced a drop in immigrant workers and a lack of remote-work opportunities for natives. A prominent example is the "Food and Hospitality" sector, that experienced the largest drop in foreign employment, but was one of the sectors with lowest remote work possibility. It also had the largest number of unfilled jobs openings in 2022. We therefore complement the cross-state analysis with an analysis of the mobility of natives across sectors to examine whether the latter was responsive to these combined post-2020 shocks. To do this, we organize the data in 17 large sectors, and we run a panel specification in which the dependent variables are mobility across macro-sectors, or in- and out-mobility of workers between two broad sector groups, one with high presence of immigrants

and low-remote work opportunities and the other including the rest of the economy. We find only weak evidence of increased mobility across sectors being associated with the drop in immigration and the rise of remote work.

Finally, we analyze whether the drop in immigration coupled with no changes in mobility of natives generated labor market shortages and unbalances captured by unfilled jobs. While we find some evidence of that, the significance and the magnitude of the association is small. With only 2 years of post-Covid, the cross-state and yearly analysis is rather under-powered to find clear effects, and future analysis of local labor market data over a longer period of time is granted.

We conclude by discussing the main implications of our findings, emphasizing how the significant changes in foreign-born immigration and remote-work opportunities after 2020 do not seem to have produced short-run large effects on native internal mobility. Similarly, native workers' mobility across sectors and states did not respond quickly and significantly to the changed patterns of immigration and remote work. While preliminary, these results may speak to rigidity in labor markets and costs of moving (such as housing cost and workers' preferences) that need to be included more explicitly in the analysis to understand the continued lack of native mobility.

The rest of the paper is organized as follows: We briefly describe the data we use in section 2, then in section 3, we describe the evolution of foreign-born immigration, remote work and vacancies in the US. In section 4, we discuss the evolution of internal mobility of natives. Section 5 shows results from panel estimates of native mobility in relation to pre- and post-Covid changes; section 6 utilizes the same panel regression to analyze the correlation of these shocks with unfilled job vacancies. Section 7 provides concluding remarks.

2 Data

Our choice of data balances the need to extend our analysis to as recently as possible, to track post-Covid trends, and to have a sufficient sample size to perform a representative analysis, at least at the state and sector level. To track the aggregate foreign-born population in the US, we rely on data from the Current Population Survey (CPS), obtained through IPUMS (Flood et al. 2022). We construct the monthly time series using the monthly surveys of the CPS, from January 2010

to July 2022. In our analysis using the CPS monthly data, we restrict the samples to working-age (18-65) non-institutionalized individuals. We define foreign-born individuals as those who were born outside the US and its outlying areas. College educated individuals are those with a college degree or more. Individuals who are non-college educated are those with some college education but no degree, a high school degree, or less than a high school degree. We are also able to observe whether individuals were attending college (full time or part time) during the previous week.

We define as employed an individual who was at work (or had a job) during the preceding week. We follow the industry (sector) classification of the Bureau of Labor Statistics (BLS). That classification is based on the North American Industry Classification System (NAICS). The industries are aggregated to form super sectors and select sub-sectors. We map each individual's industry reported in the CPS to the aggregate sector groups using crosswalks publicly provided by the BLS.[2] We then only focus on the 17 mutually exclusive broad sectors for our analysis.[3]

Starting in May 2020, the CPS added a module with specific questions related to the mode of work during the Covid-19 pandemic. We specifically consider the question of whether an individual did any telework or worked from home during the four preceding weeks, due to the pandemic. For each individual, we construct a dummy variable that takes the value 1 when the respondent answered that they have worked remotely for pay due to the pandemic. We calculate the percent of employees working remotely as the share of workers for which the dummy is equal to one.

In order to look at native internal mobility patterns, we rely, instead, on the Annual Social and Economic Supplements (ASEC) of the CPS (March supplement) for the time period 2010-2022, that we obtained through IPUMS (Flood et al. 2022). We restrict the samples to working-age individuals. The data provides information on whether individuals changed their address since the reference date (March 1 of the preceding year). Individuals who did not change residence and still live in the same house are considered non-movers. Movers on the other hand are those that are not living in the same house they were living in on March 1 of the previous year. This move is further classified as within county, within state, across states or from abroad. In addition, we are

[2] https://www.bls.gov/cps/cpsoccind.htm

[3] These are: Mining and logging; Construction; Information; Professional and business services; Other services; Durable goods manufacturing; Non-durable goods manufacturing; Wholesale trade; Retail trade; Transportation, warehousing, and utilities; Finance and insurance; Real estate and rental and leasing; Educational services; Health care and social assistance; Arts, entertainment and recreation; Accommodation and food services.

able to observe the state or foreign country where the movers resided a year ago. These variable allows us to calculate the in- and out-mobility across states for each year between 2010 and 2022. Finally, the dataset reports the reasons for moving. We group the reasons into two broad groups: "employment-related"[4] and "other", or "non-employment related" [5].

In addition to geographic mobility, we analyze industrial sector mobility of native employed individuals using the CPS ASEC (2010-2022). The March supplement of CPS asks individuals about the industry of employment one year ago, conditional on them having worked in that year. Thus, if the individual is currently employed, we are able to observe their current industry of employment and the industry of employment one year earlier. We construct a dummy that indicated mobility from one macro-sector to the other, by grouping industries into the 17 macro-sectors that we defined above. This dummy takes the value 1 if the industry where the individual currently works (in year t) is different from the previous year ($t-1$). This dummy indicates employment mobility across sectors[6]. Using this variable, we are able to construct a sector mobility rate in each state, by dividing the total number of people who moved during the previous year by the working-age population of the state in year t.

We then zoom in on the mobility of natives in and out of a particular group of macro-sectors. These are five sectors that, as we will document, employed a large share of immigrant workers and provided limited possibility of remote work during Covid. These are: construction, accommodation and food services, other services, non-durable goods manufacturing, and transportation, warehousing and utilities. In-mobility into these sectors is defined as an individual moving into one of these five high-immigrant low-remote-work sectors from one of the other 12 sectors. Out-mobility from these sectors is defined as an individual moving from one of these five high-immigrant low-remote-work sectors to one of the other 12 sectors. Using these dummy variables, we are able to construct mobility rates into and out-of those five sectors, by dividing the total number of people who moved

[4]Employment reasons include: new job or job transfer; looking for work; a lost job; moving closer to work/easier commute; retirement; other job-related.

[5]Other reasons include: family reasons (change in marital status; establish one's own household; other family reasons; relationship with unmarried partner); housing reasons (wanting to own a home rather than rent; wanting newer/better/larger housing; wanting cheaper housing; foreclosure/eviction; and more); other (attend/leave college; change of climate; health reasons; other reasons; natural disaster).

[6]To construct all of these variables, we restrict the sample to employed working-age individuals who report an industry in both the current and previous year. This therefore represent only cross-sector mobility of people who are and were employed one year ago.

between these two broad groups during the previous year, by the state working-age population in year t.

Finally, we obtain data on vacancies from the Job Openings and Labor Turnover Survey (JOLTS) of the U.S. Bureau of Labor Statistics.[7] The data covers all non-agriculture industries in public and private sectors for 50 states and the District of Columbia. Agriculture, forestry, fishing and hunting are out of the scope of the JOLTS program. Industries are grouped to form super and sub-sectors. The industry classification used in JOLTS can be easily cross-walked to the Census classification used in the CPS. A job opening is defined as a position that is open and not filled on the last business day of the month. The position could either be full-time or part-time. At the sector level, the data provides seasonally-adjusted monthly counts of job openings in the US for establishments of all sizes from January 2010 to August 2022. At the state level, the data provides seasonally-adjusted monthly counts of total non-farm job openings for all establishment sizes from January 2010 to July 2022.

3 The world after 2020: Drop in Immigrants, Increase in Remote Work, Rising Vacancies

The first goal of this paper is to characterize the changes in immigration to the US after January 2020, with the onset of Covid-19, the economic recession and later during the economic recovery. First, we consider how the aggregate working-age immigrant population changed, and which subgroups, locations and sectors were most affected.

Then, we consider and describe two additional important factors, which changed significantly since 2020 and may relate to native mobility. The first is the opportunity of doing work remotely, which was introduced with Covid. Since then, many employers have allowed it to continue, even as the emergency passed, as workers appreciate the flexibility it allows. The second is the rise and persistence of unfilled vacancies in several sectors and jobs. The significant increase in unfilled vacancies is an outcome indicating sluggishness and frictions in the adjustment of labor markets.

[7] https://www.bls.gov/jlt/

3.1 Drop in immigrants: timing, skills, geography

Figure 1 shows the significant slowdown in the growth of working-age foreign-born population since mid-2019. Figure 2, panels (a) and (b), show the same trends, separately for (a) college and (b) non-college educated working-age population. We notice two differences. First, the pre-2019 trend growth was steeper for the college educated foreign population, that was growing by almost 480,000 individuals each year. In contrast, non-college educated foreign-born were only adding around 180,000 individuals to the US working-age population each year. The second is that while the college educated immigrants had a slowdown in growth starting in early 2020, almost perfectly coinciding with the onset of the Covid-19 pandemic, the non-college educated had an earlier stagnation and decline beginning in mid-2019. The number of college educated foreign-born barely increased between January 2020 and June 2022. Interruption of international travel and the slowdown in processing of student, scholar and professional visas (F1, J1 and H1B) in 2020 were among the main causes of the decline in the college educated inflow of immigrants.[8] The working-age foreign-born population without college degree (panel (b)) was already growing at a rather slow rate in the last decade. Since 2017, it barely grew at all. This group experienced a drop in absolute numbers between May 2019 and July 2022, deriving from a very large decline between 2019 and 2020 and a partial recovery in 2021. As of June 2022, this group was smaller by 1.1 million individuals than if it had kept its pre-May 2019 trend. The slowdown in non-college educated immigrants, who typically do manual jobs in hospitality, construction, personal services was a phenomenon already noticed by several economists (see Hanson and McIntosh 2016). It was made more significant after the Trump administration and the Covid-19 pandemic.

While the slowdown in college educated immigrants was less pronounced than that of non-college educated, one additional event that will continue to contribute to lower inflows of college educated in the US labor force is the decline in foreign college students. Figure 3 shows the decline in foreign college students population (aged between 18 and 24) from 2010 to 2022, smoothed by

[8] Figure A1 in the appendix shows the very large drop in F1 and J1 visas in 2020, as well as a pre-existing decline in student visas starting in 2017.

a 12-month moving average. The number started declining in 2017 and dropped significantly in 2020. Given that between one fifth and one fourth of those students will work in the US (see Beine et al. 2022) at least for a few years, such a decline will contribute to the reduction in young highly educated workers joining the US labor force for some years to come.

Foreign population of either sex was affected in similar ways by the Covid-19 pandemic slowdown, as one can see in Figure A2 in the Appendix, showing a very similar pattern for men and women. Immigration by age groups shows clearly that the most affected group was that of prime-age workers (between 25 and 44 years of age), whose population growth experienced a halt (Figure 4). Their number declined and as of mid-2022, it was still lower than in mid-2019. On the other hand, the number of younger working age immigrants (18-24) and the number of older working-age immigrants (45-65) appear to have continued on the pre-2020 trend. This is an additional indication that the post 2020 change in immigration may have had a significant impact on the US labor force, having reduced a group of immigrants most likely to work and whose employment rate was and is high.

Significant variation exists in the post 2020 change in immigration across US states. Figure 5 shows that, among the six states with largest immigrant populations in working age, California and Florida experienced the largest slowdown (or decline) of foreign-born, relative to the pre-2020 trend. New York, New Jersey and Illinois, whose foreign-born population was already rather steady, did not experience a large change, and Texas, the state whose immigrant population was growing the most during the last decade, continued on that trend without much of a change. We will characterize the net immigration in each state and its relation to native population change, in section 4.3 below. Here, we point out that the general slowdown in immigration post 2020 varied significantly across US locations. Additionally, as the share of foreign-born in the total labor force varies very significantly across states, we will use such differences to capture the differential impact of immigration decline on local population and labor force through a shift-share instrumental variable estimation.

The changes in immigration were also quite different across countries of origin. Figure 6 shows the time series of working-age foreign-born population for the largest three countries of immigration

(Mexico, China and India) and for the remaining immigrants (denoted as “others"). The panels of Figure 6 show a clear decline in the Mexican population after 2019, relative to pre-2019 stability, as well as a clear slowdown in the growth of Indian-born population (which was on an upward trajectory before Covid-19) and a slowdown of the population of "other" origins. The population of immigrants from China remained on a relatively constant growth trajectory. Broadly, the behavior of the Mexican population mirrored that of non-college immigrants (seen in Figure 2b). Non-college educated immigrants constitute a large part of Mexican immigrants. On the other hand, Indian and "Other" immigrants show a trend more similar to that of the college educated foreign-born, as most of the inflow of these immigrants in the last decade was represented by college educated individuals. A drop in the population of foreign-born from Mexico and without a college degree and a slowdown/arrest in the growth of the population of foreign-born with college degree from the rest of the world, is one way to characterize the impact of post-Covid pandemic on immigrants flows.

A final way to observe how the large slowdown in foreign-born population growth can have heterogeneous effects through the US economy is to characterize the foreign-born employment growth across sectors. As described in the Data section, we use the BLS system that divides the US economy in 17 mutually exclusive broad sectors. Figure 7 shows the evolution of working-age foreign-born employment overall (the dark line), and in four of the broad sectors where immigrants represented a large share (more than 20%) of employment before Covid-19, namely “Accommodation and Food Services", “Retail Trade", “Non-durable Good Manufacturing" and “Health Care and Social Assistance". We standardize the value in January 2020 to 100, and we show the time series from January 2010 to July 2022. Three facts are noticeable. First, relative to the pre-2020 trend growth, foreign-born employment overall and in each sector experienced a deep drop in 2020 and only a partial recovery in 2021. In the four sectors shown in the graph, employment dropped by at least 10% during 2020. By July 2022, its value was barely back to its level in January 2020. Second, foreign employment in “Accommodation and food services" experienced a stunning drop in 2020 by more than 30%, with a sharp recovery in 2021. However, still in mid-2022, the number of foreign-born workers employed in this sector was 10% lower than in January 2020. This is one of

the sectors (as we will see below) with the largest number of unfilled vacancies in the US economy and a very large share of foreign-born workers. Finally, also significantly hit was the "health care and social assistance" sector, the most exposed during the Covid-19 pandemic and where immigrants played a crucial role. According to the data, the number of immigrants employed in this sector was smaller in July 2022 than it was at the beginning of the pandemic.

3.2 The Emergence of Remote Work

In the early months of 2020 when Covid-19 became a pandemic, the possibility of working remotely became widespread in the US and many other countries. While already available in some jobs, the possibility of telecommuting for part or all of the working week was expanded substantially (OECD 2021). In many cases, it was the only option for continued working during national and regional lock-downs. The monthly Current Population Survey started collecting information, in May 2020, on who was performing at least some days of remote work, due to Covid-19. We will use some of those data to provide a picture of the uneven diffusion of remote work.

One key feature in the access to remote work that emerged immediately and is affecting labor markets to these days (see Barrero et al. 2020) is a substantial disparity across sectors/occupations. This is illustrated in Figure 8. The bar chart shows the percent of workers who did at least some remote work in the last 4 weeks, averaged in May-December 2020 and divided into the 17 broad sectors that we defined above. The figure ranks the sectors from lowest to highest. In sectors such as Finance and Insurance, Information and Education Services, 50% or more of the employees performed some remote work in 2020. To the opposite end of the spectrum, in Construction and Accommodation and Food services less than 10% performed any remote work. Sectors with a prevalence of in-person, manual and physical intensive jobs performed mainly by individuals without a college degree were able to use remote work to a much smaller extent than sectors with cognitive-intensive, information-intensive jobs performed by the college educated.

It is important to emphasize that the variation in availability of remote jobs across sectors is not only due to different share of college educated who can more easily access remote work. Figure A3 in the appendix shows in Panel (a) and (b) the percentage of workers doing remote

work at least sometimes, across sectors, but separately for those with college degree (Panel a) and those without college degree (panel b). One sees very clearly that the range of variation is just as large across sectors within each education group. For instance, while 30% or more of non-college educated performed some remote work in the Information or in the Finance Sector, less than 6% did in Construction and Accommodation/Food. Similarly while more than 60% of college educated had access to remote work in Finance and Information sectors, only 15% of them had access to it in the Accommodation/Food sector.

Additionally, the prevalence of remote work across sectors tended to be quite persistent after Covid. We know from the literature (e.g. Barrero et al. 2020) that several employees kept a part of their work from home, as they valued the flexibility and convenience of it. Figure A4 in the appendix shows that the percentage of remote work in May 2020 across sectors is highly correlated with that in January 2022. Except for the education sector, where many schools resumed in person activities and remote work dropped significantly as of 2022, the other sectors still had significant percentages of remote work in 2022 and the ranking among them was almost identical to that in May 2020.

The differences in availability/access to remote work was also very heterogeneous across US states. Certainly because sector composition and education vary significantly across those, but also due to different employer attitudes, the percent of workers performing part of their job remotely varied substantially. Appendix Figure A5 shows the bar chart distribution of percentage of remote workers across states in May 2020, from lowest to highest. Even ignoring DC, a very special city-economy, the percent of workers performing remote work varies from 11.3% in Mississippi, Wyoming and Alabama to around 40% in New Jersey, Massachusetts and Maryland.

As the option of working from home, even after Covid, has been increasingly valued by workers especially those with families, as it provides flexibility, lower exposure to risks and sometimes productivity advantages (see Barrero et al. 2021), the lower availability of this type of work in a sector or a location can generate lower willingness for US workers to supply labor (see Lufkin 2022).

Figure 9 shows that several of the sectors providing fewer remote-work employment opportu-

nities were also the sectors most reliant on foreign-born workers, as measured by the percentage of foreign-born in employment in 2019. The figure shows a clear and significant negative correlation. Sectors like Services, Food, Non-durable Production and Construction did not allow much remote work and had a very large dependence on immigrants before 2019. Therefore those sectors possibly experienced decline in labor supply both from fewer immigrants and lower willingness of natives to work in person during the Covid and post-Covid period. At the opposite range of the spectrum, sectors like Education and Information had a much larger share of remote work and smaller dependence on foreign-born employees. The simultaneous occurrence of an increase in remote work and drop in immigration was likely to cause a much larger drop in supply of workers in the former group of sectors than the latter. Mobility of US workers across sectors could have offset, in part, the loss of immigrant workers but opposite incentives provided by the preference for remote work may have reduced this type of mobility. We will analyze the impact of these two shocks on geographic and sector mobility of natives in the rest of the paper.

3.3 Vacancies

Before focusing on native internal mobility (within and across US states) let us show a few facts, relative to an indicator of the "mismatch" between demand and supply in the labor market, the number of unfilled jobs or "Vacancies". Mobility of native workers across states and sectors is a crucial mechanism to fill these unfilled jobs. Figure 10 shows the number of unfilled vacancies in the US economy, as percent of the employment from January 2010 to August 2022. The value almost doubled in 2021, from 3.5% to 7% and remained very high in 2022, starting to decline in the last 3 months. While the tightness of the labor market was increasing during the extended economic expansion started after the great recession, and it dropped significantly in the early months of 2020, at the onset of Covid-19, the sudden increase in 2021 is totally unprecedented showing a degree of excess labor demand and demand-supply mismatch not experienced before in the US. The growth of demand during the post-2020 recovery, combined with no inflow of immigrants and workers resigning and retiring from sectors, especially where labor conditions were becoming hard and work from home was not allowed, can explain some of this increase.

Figure 11 shows the correlation between average unfilled jobs in 2022 (measured at the end of each month, as a percent of 2019 employment) and dependence on foreign-born workers, measured as percent of employment in 2019, across broad private sectors (we omit the Government sector). We see a weak positive correlation indicating higher vacancies in sectors where the immigrant drop was more consequential on total labor supply. Similarly, Figure 12 shows a weak negative correlation between prevalence of remote work measured after May 2020 and unfilled vacancies in 2022 across broad sectors. Those two correlations and the correlation shown in Figure 9 imply that sectors experiencing loss in foreign workers and small availability of remote work are likely those also experiencing highest levels of unfilled jobs. However such a correlation does not seem too strong. Did a lack of native workers' mobility contribute to unbalances and uneven excess demand across sectors? We will inquire into this in the rest of the paper.

4 Native mobility

Several recent papers have shown that the internal mobility of US individuals in almost any dimension of geography (between commuting zones, states and census regions) has been declining for the last three decades (see Jia et al. Forthcoming for an overview and Basso and Peri 2020 and Molloy et al. 2011 for additional details). The Covid-19 shock and the subsequent deep changes in labor markets documented above may have, however, changed the incentives. Native workers may have increased their willingness to move either to take advantage of job opportunities signalled by the large number of unfilled jobs, or to take advantage of work at home opportunities moving to more desirable locations.

In this section, we update the data on native mobility within and across US states, including the most recent years up to 2022 and using the March CPS. We then verify the existence of a downward trend, and focus on whether there is any evidence that mobility of natives changed significantly post-Covid. We use one-year mobility measures, considering people who moved within the last year in the March CPS (hence March-to-March) as a percent of the working-age population. As the data are collected yearly, we only have 2 observations (2021 and 2022) post-Covid[9]. Still, we

[9]As Covid-19 was declared a pandemic in March 2020, the period covered by the data for 2020 includes only

will assess in a preliminary way whether there is any evidence of a change in trend for all or some groups of natives. We will first characterize overall migration, then split it by education, age and reason for moving. Finally, we will analyze the correlation between immigrant inflows and native mobility, and between remote work availability and native internal mobility across US states.

4.1 Evolution of native internal Mobility over time

Figure 13 updates a broadly used measure of internal mobility rates using March CPS data up to 2022. The values we report are the number of working-age natives who have moved between states (solid line) or within state (dashed line) in the previous year as a percent of the total working-age population in the US. Three things emerge from a look at the chart. The first is that within-state mobility has steadily declined in the last 10 years. The second is that inter-state mobility, which is significantly lower, has been steady in the early period showed and slightly decreasing since 2017. The third is that the observations for 2021 and 2022 do not signal any any sharp break in trend relative to the previous years. The intra-state mobility continues the decline observed pre-2020, while the inter-state mobility shows a small up-tick. While it is clearly too early to see the long-run effects of some of the deep changes introduced by the Covid-19 years on internal mobility of US citizens, the chart does not show evidence, as of 2022, of a sudden break in the native mobility trend. Vis-a-vis the sudden stop in foreign population growth or the increase in remote work opportunities, intra-state mobility of natives does not exhibit a similar change.

Figure A6 in the Appendix zooms into the inter-state mobility rate, which is relevant as mechanism to balance labor markets across states, and shows mobility by schooling level, separating college and non-college educated. One can see more clearly the decline in mobility rates for both college and non-college educated since 2012 and more significantly since 2017. The observations for 2021 and 2022 show a small up-tick in inter-state mobility, especially for college graduates, but do not reveal a drastic increase after 2020. Figure A7 in the Appendix, breaks total mobility by age group and shows a continued downward trend in mobility for 2021 and 2022 for people in prime working age (25-44). Older workers (45-56) and younger workers did not show consistent decline

pre-Covid 19 mobility, from March 2019 to March 2020

in mobility in the last 2 years, but their level of mobility was lower in 2022 than before Covid. These figures do not suggest that people in prime working-age experienced substantial increases in their mobility level in aggregate. In fact, the long-run decline seems to have continued during the Covid-19 years.

An interesting piece of information available in the March CPS data we use to construct internal migration rates is the "main reason for the move". We aggregate the moves by "reason" into two groups, one "employment-related" and another combining all the other reasons together. This gives an idea of what moves were directly related to job opportunities. Additionally, with the remote work option rising, individuals may move more for other non-job related reasons, keeping their job while moving to a more desirable living location. Figure 14 shows the time series 2010-2022 of total native internal mobility rate as percent of the population separating these two groups. The downward trend is clear for the variable capturing mobility for "other reasons", in dashed line. Beginning in 2014, we notice a downward trend in the mobility for employment reasons too. No significant trend break is observable in the post-2020 observations for either line. Even focusing only on mobility because of employment, one does not discern a significant jump after 2020, rather a continued and slightly declining trend. All in all, the unusual conditions generated in US labor markets after 2020, namely decline in labor supply due to fewer immigrants, imbalances across sectors due to different conditions did not change, in aggregate, the slow decline in mobility of US workers, at least as of 2022, using the measures in March CPS.

4.2 Native inter-state mobility correlation to immigrant change and remote work

The data in the previous section document the evolution of gross native mobility in the decade before 2020 and in the 2 years since the beginning of the Covid-19 pandemic. Economists, however, are more focused on understanding net and "directed" mobility, namely the fact that individuals may respond to asymmetric shocks across labor markets by moving towards better wage and employment opportunities and away from places where labor market and earnings opportunities deteriorate. In this spirit, we consider the changes in immigrant working-age population and the

rise in remote work opportunities as potential "shocks" with heterogeneous impacts across the US.

We begin by showing the correlation between the change in foreign-born working-age population, post Covid-19 (2020-2022) and the in-, out- and net-mobility rates of native working-age individuals across US states during the same period. A negative (positive) correlation between in-mobility (out-mobility) of natives and change in foreign-born population would suggest that natives moved to fill jobs that the drop/stagnation in immigrant workers left vacant.

Panels a,b and c of Figure 15 show exactly these correlations. On the vertical axis, we show in-migration as percent of the working-age population (Panel a), out-migration (Panel b) or net migration (Panel c) in the 2020-2022 period. On the horizontal axis, we show the change in the foreign-born as percent of working-age population. Each bubble is a state, the size of which is proportional to the size of the state population in 2019. Let's notice that, on average, the net change in foreign-born population was about 0 in this period (after a decade of positive values), and some states experienced significant decline as large as 2-3 percent of their working age population. Two facts emerge from these correlations. First, all of the correlations are very small and not statistically significant, implying no association between the decline in foreign-born and inflows (or outflows) of natives. The OLS regression line in Figure 15, Panel (c) has a positive slope of 0.06 with a standard error of 0.045. Hence, the association implies that natives are actually more likely, in net, to leave (or not to go to) a state where immigrant population drops. The point estimate, however, is very small and not statistically significant at the 5% level. Second, from Panel (c) we see no evidence that even states experiencing the most significant drop in foreign-born population (shown in the left side of the panel) with drops as large as -5 percent of the population experienced a net inflow of natives. Rather, on average they have experienced net outflows of natives.

The finding that native mobility does not seem to respond too much to the net inflow of immigrants represents the consensus in the previous literature (e.g. Peri and Sparber 2011; Card 2001). We confirm in Figure A8 of the Appendix that such small correlation between immigrant net inflow and native mobility held in the 2010-2019 pre-Covid period. Panels (a), (b) and (c) of the figure mirror those of Figure 15, except that the period considered, both for foreign-born inflow and native inter-state migration rate, is 2010-2019. We see in that case small coefficients of the

regression line, not significant on in-mobility and out-mobility, but significant in the net mobility. The sign of the correlation between native net-mobility and immigrants' inflow is positive, in contrast with the idea that the inflow of immigrants, which during this period was positive for almost every single state and sometimes quite large, would push out (crowd out) natives. Just as natives cross-state mobility was not significantly associated to immigrant inflows before Covid-19, as they did not flee states with large immigration, they did not move to replace them when their number stagnated or declined during the post-Covid pandemic.

We then show the correlation between native in-, out- and net mobility and the prevalence of remote work among employees of different states. Panels (a), (b) and (c) of Figure 16 show such correlations, measuring individuals who did remote working (in 2020) as a percent of employment, on the horizontal axis and the same measures of inter-state mobility in-, out- and net (as in Figure 15), on the vertical axis. It appears that higher opportunity of remote work, is associated with reduced inflow of natives to a state (and no change in outflows), producing a significant negative correlation between net migration and remote work opportunities. The coefficient is large enough to imply that states with one standard deviation higher remote work share are associated with one third of standard deviations lower net in-mobility. While these are only correlations, they may suggest that states providing more remote job opportunities, due to their sector composition or the willingness of their employers to give more location-flexibility to their workers, reduced the number of natives actually moving to these states, while possibly still working for local companies. This association is large enough that we would want to consider this shock's potential impact on native mobility in a more careful way in the next section.

5 Pre- and Post-Covid19 response of native mobility to immigration

In this section, we try to connect in a more systematic and possibly causal way the post-Covid19 changes in immigration across states (and sectors) with the internal gross and net mobility response of natives, controlling for remote work opportunities, and changes in labor demand.

To do this, we estimate a panel regression across states and over time. Smaller geographical units, like Commuting Zones, would be preferable to analyze the impact of immigrants, demand shifts and remote work shocks on labor markets. However, as we use the March CPS data and include 2 years of post-Covid observations, the sample size of that dataset limits us to a state-level analysis. Additionally, as we are trying to evaluate short-run effects taking place within one or two years, we consider yearly observations in the panel. We first estimate the panel using Least Squares, to have a sense of the partial correlation between immigration and native mobility, allowing for a different response after the onset of Covid. We also make some progress in identifying the causal short-run impact of the changes in immigration on native mobility as we construct a Shift-share Instrument for a 2SLS estimation. These variables (subject to several caveats as pointed out in recent papers by Goldsmith-Pinkham et al. 2020 and Jaeger et al. 2018 proxy for immigration flows based on the shares of immigrants by nationality in 2010, well before the Covid shock, augmented by the national changes in flows across countries of origin, during the post-2010 years. By isolating the variation of immigrants driven by the aggregate changes in migration to the US, and the presence of different networks of immigrants by nationality in 2010, the IV should not be affected by local labor demand factors pre and post Covid, but only supply shifts. We explicitly separate a response of native mobility to these exogenous changes, pre- and post-Covid, by interacting the coefficient on this variable with a post-2020 dummy.

5.1 Panel Estimates: OLS and Shift-share IV controlling for Bartik shocks and Remote work

The regression we estimate in order to gain some insight on the possible impact of immigrants on native mobility in the short run and after the Covid-19 pandemics is as follows:

$$\frac{Mig_{st}}{Pop_{s,2010}} = \phi_t + \phi_s + \beta_0 \frac{\Delta Immi_{st}}{Pop_{s,2010}} + \beta_1 \frac{\Delta BartikEmpl_{st}}{Pop_{s,2010}} + \gamma_0(PostCov_t)\frac{\Delta Immi_{st}}{Pop_{s2010}} + \gamma_1(PostCov_t)\frac{Remote_{s,2020}}{Pop_{s,2020}} + \varepsilon_{st} \quad (1)$$

The variable $\frac{Mig_{st}}{Pop_{s2010}}$ measures, alternatively native in-movers, out-movers and net movers (the difference of the two) for state s during the period between year $t-1$ and year t as a share of the working-age population at the beginning of the decade, namely year 2010, in the state $Pop_{s,2010}$. This is a measure of mobility of individuals across states. Alternative dependent variables we use in further specifications are the net change in the native population in working-age, in employment and measures of mobility across sectors and from sectors with high immigrant presence, during the same period as fraction of 2010 population.

Among the explanatory variables, ϕ_t represents year fixed effects, and ϕ_s captures states fixed effects. Together, these effects imply that we control for state-specific trends in the population evolution of immigrants and for common US changes over time. $\frac{\Delta Immi_{st}}{Pop_{s,2010}}$ represents the change in immigrants (working-age foreign-born individuals) during the year, between $t-1$ and t, as a share of the working-age population in 2010. The variable $\frac{\Delta BartikEmpl_{st}}{Pop_{s2010}}$ is a measure of sector-driven labor demand growth, as a share of working-age population, in the state and year, broadly used in the regional and trade literature, that we will define below.

These two variables capture changes in international migrations (affecting labor supply), and changes in sector-driven labor demand, across US states. Variation in these variables could produce a migratory response of natives, if those respond promptly to labor market demand and to the increased or decreased competition from foreign workers. Previous literature has not found much responsiveness of natives' mobility to local labor demand and immigrant supply.

The last two terms of equation 1 are the interactions of a post-Covid19 dummy ($PostCov_t$) which is equal to one for years 2021 and 2022 (capturing the period during or after the Covid-19 pandemic), with the change in immigrants, and with the increase in remote work opportunities as a fraction of the population in working age in 2020 (average May-December) using the monthly CPS $\frac{Remote_{s,2020}}{Pop_{s,2020}}$, assuming essentially small availability of work from home before the Covid-19 crisis. The first variable captures whether the sudden slow-down in the inflow of foreign-born individuals, affected native mobility response differently, during and after the Covid-19 crisis, relative to earlier. A significant coefficient would imply that the negative change in immigrants post-2020 produced a different response of native internal migration relative to the response to (mainly) increases pre-

2020. This could be either because a drop in workers available may have encouraged natives to move in affected states and sectors to fill the gap, or because natives were more ready and eager to take those opportunities during and after the Covid crisis in very tight labor markets. The second term looks at whether the sudden increase of remote work opportunities across states, introduced during the Covid-19 lockdown, affected mobility of natives in the period 2020-2022.

5.1.1 Description of Shift-share IV and of the Bartik control

In order to capture sector-driven shifts in labor demand that could affect states differently, we included a Bartik control in the panel regression. This variable uses the 2010 share of employment of each of the 17 broad BLS sectors in state s to construct the employment growth in the state that one would expect if each sector grew at its national rate, keeping its share in state s constant. Namely, the Bartik variable is constructed as follows:

$$\frac{\Delta BartikEmpl_{s,t}}{Pop_{s,2010}} = \frac{\sum_{n=1}^{17} S_{ns}^{2010} \cdot Empl_t^n - \sum_{n=1}^{17} S_{ns}^{2010} \cdot Empl_{t-1}^n}{Pop_{s,2010}} \tag{2}$$

In equation 2, the term S_{ns}^{2010} is the 2010 share of employment of sector n in state s, relative to the total 2010 employment of that sector nationally in the US. Those shares sum to one if we fix a sector n and we sum across states s. The term $Empl_t^n$ is the total national US employment of sector n in year t. Hence, $\Delta BartikEmpl$ captures the change in employment of a state, keeping constant the sector distribution across states (to its 2010 value) and using national employment growth to capture the growth in sector-specific labor demand. The value is standardized by the population in working-age in 2010, so that its value (times 100) is a percent of the 2010 population in working age. Such a term captures the increase/decrease in labor demand in a state due to the fast growth/decline of sectors.

The shift-share instrument for the immigration variable is similarly constructed. We use the distribution of immigrants from 51 different countries (or country-groups) of origin in 2010 (for the country definition, we refine the classification of Card 2009 by including additional smaller countries and grouping the remaining ones into one group, yielding 51 origin groups), and we apply to each country share the growth of total foreign-born population from that country in the

US. The shift-share is defined as follows:

$$\frac{\widehat{\Delta F_{s,t}^{Foreign}}}{Pop_{s,2010}} = \frac{\sum_{c=1}^{51} S_{sc}^{2010} \cdot F_t^c - \sum_{n=1}^{51} S_{sc}^{2010} \cdot F_{t-1}^c}{Pop_{s,2010}} \tag{3}$$

In equation 3, the term S_{sc}^{2010} is the share of foreign-born (age 18-65) from country of origin c in state s in the total foreign-born population aged 18-65 from country c in the whole US in 2010. For each country of origin c, the sum of those shares across all US states (s) is equal to one. The term F_t^c is the total foreign-born working-age population from country c residing in the US in year t. This instrument captures the changes in state immigrant population driven by aggregate shifts in the migration patterns across countries, distributed proportionally to the presence of country-specific networks (the shares in 2010) which differ across states.

The shift-share IV and its interaction with the post-2020 dummy will allow us to obtain an estimate closer to the causal impact that the immigrant inflows in a state had on native mobility.

5.2 Main Results: Cross State mobility

Table 1 shows the results of estimating equation (1) using OLS (columns 1-3) or 2SLS with the Shift-Share IV (Columns 4-6). The outcome is migration of natives into the state in columns (1 and 4), out of the state (Column 2 and 5) and net native mobility from the state (columns 3 and 6). Confirming the lack of responsiveness of native mobility in the short-run to labor market shocks, most of the coefficients are not significant. Focusing on the response of native mobility to inflow of foreign potential workers, the coefficients are very small and not significant using OLS and small, not significant and not very precisely estimated using 2SLS. Even with the larger standard errors of the IV estimates, one can rule out significant net in-mobility of natives to replace the decline in immigrants. For each one immigrant lost, we can rule out that more than 0.12 natives moved into the state[10]. In fact, the coefficient on immigrant change is positive, and even after Covid, the net effect of a loss of immigrants in a state is net outflow of natives. Using the estimates in the row 2 and 3 of Table 1, we estimate that, after Covid, the states that lost more immigrants did

[10]The coefficient of column 6 is 0.38 and the lower bound of a 1% confidence interval is -0.12, which multiplied by a -1 change in immigrants generates 0.12

not experience an inflow of natives, in fact they experienced a slight outflow of them. The 2SLS coefficient for net migration post Covid is (0.38-0.17=0.21), implying that for one fewer immigrant, a state also lost 0.21 natives (not significant). At the state level, the Bartik demand shock and the increased remote work opportunities did not translate into short-run mobility responses of natives either. We estimate a positive correlation of larger remote share and out-migration from states post Covid, weakly hinting to a tendency of workers to take advantage of remote work by moving, but the significance depends on the specification, and in net the effect is not significant.

5.3 High skill and Low skilled mobility

While immigration changes and other labor market shocks did not seem to produce significant changes in aggregate native mobility in the short run, including after Covid, it is useful to separate mobility of college and non-college educated. The first group has been more sensitive to responding to economic conditions in the long-run and has moved towards fast growing high employment locations (e.g. Moretti 2013). The second group, instead, has showed low and declining mobility. More specifically, it has shown a much smaller tendency to move towards strong labor markets, in the long run, generating a strong correlation between economic growth and presence of college educated workers across US cities (e.g. Jia et al. Forthcoming). Additionally the drop of immigrants after 2020, which as we saw was more significant for less educated than more educated may have generated different competition/complementarity effects on those two groups.

Table 2 and Table 3 show the native mobility response, separating the response of college educated (Table 2) and non college educated (Table 3). The coefficients show weak evidence of mobility of college educated in response to the immigration drop, after Covid (significant using OLS but not using 2SLS), implying that locations losing one additional immigrant were slightly more likely to lose also college educated natives (0.08 of one person in OLS or 0.27 in 2SLS). This make sense as this group should have been more sensitive to the loss of complementarity from non-college educated immigrants providing a large share of services in high demand by college educated (food, restaurant, hospitality). Additionally this result emphasizes how th college educated group co-moves with immigrants, as shown in previous research (e.g. Basso and Peri 2020). Such effect is

not present for less educated natives (see Table 3). They instead show a mild tendency to respond to remote work opportunities, leaving states where those opportunities are larger, possibly to more to more affordable states while keeping jobs. Such effect of positive impact of post-Covid remote work prevalence on net migration of non-college educated is, however, a rather weak result.

We do not find significant one-year mobility effects of the Bartik shock, in aggregate or for each education group, as those sector-driven demand forces are likely affecting mobility in the longer-run. Overall the mobility regressions confirm the sluggishness of native cross-state mobility response, both to the change in pattern of immigration, as well as to the remote work opportunities that appeared after Covid. Lacking these margins of adjustment, the supply shock and the resignation shock likely generated unbalances and unfilled vacancies.

Aware that our panel regressions only capture the one-year response, which is extremely short-run, we have tried additionally to estimate the regression using 2-years intervals. This reduces the number of observations to only 300, and only includes one post-Covid observation per state. Table A2 in the Appendix shows the OLS estimates[11] of the mobility panel regression for in-migration, out-migration and net-migration using 2-year intervals. The slightly longer period generates slightly larger and more significant estimates of the positive inflow response of natives to immigrants, before Covid. Still, we do not estimate any significant change in mobility response of natives to immigration post-Covid. Additionally, the positive coefficient of remote work on out-migration, especially for non-college-educated, is slightly larger and more significant. The moving out of state when remote work is an option, possibly to avoid higher prices is consistent with this 2-years pattern. The results confirm mostly those of Tables 1-3, that suggested limited native mobility in response to immigrants[12].

[11] Shift share IV were too weak to generate reasonable 2SLS results.

[12] We also run a specification (available upon request) as in Table 1-3 using OLS, including lagged immigration changes. The estimates confirm a positive and marginally significant coefficient of native in-mobility on contemporaneous and lagged inflow of immigrants pre-Covid. The post-Covid coefficients are unchanged and not significant

5.4 Sector Mobility overall and from high-immigrant/low-remote work Sectors

The results on native mobility across states, suggest that at least in the short run, such a margin of adjustment is unlikely to respond to changes in immigration, differential labor demand shocks and differential remote work opportunities so as to balance labor markets. Even post-Covid, their response do not seem very vigorous, so that those unbalances are likely to persist in terms of unfilled jobs and non-employed people. The 2SLS estimates from Table A1 in the appendix show that the response of native aggregate population and employment to Bartik, Immigration and Remote-work shocks, estimated in the same panel regression with Shift-share instruments as for Table 1, are rather weak. Employment of natives responds positively to Bartik (but not significantly) while negatively to immigration, but the estimates are very imprecise and not significantly different after Covid.

In Table 4, we explore the response to the shocks of three variables, capturing the extent of native employment reallocation in the local economy, across sectors. Those measures give an idea of the reallocation of natives to adjust the a-symmetries generated by the differential effect of immigrant decline across sectors.

The first variable, reported in Columns (1) and (4), is the mobility rate across macro-sector of native workers, namely the number of workers who changed jobs across the 17 macro-sectors, relative to the population in working age. This rate is a measure of how much US-born workers move across sectors. As cross-sector unbalances due to differential drop in immigrants and remote job options have increased after Covid-19, this type of mobility could contribute to adjust the large unbalances in terms of unfilled jobs, during the post-Covid era. The second variable is a measure of job-mobility into (in-mobility) and out of (out-mobility) five large sectors in the economy which are standing out for the high share of immigrants they employed (since the beginning of the period analyzed) and the low share of remote-work employment they allowed after Covid. These are construction, accommodation and food services, other services, non-durable goods manufacturing, and transportation, warehousing and utilities. The regression measures whether in states with stronger immigrant drops, native mobility into (Column 2 and 5) or out of (columns 3 and 6)

those sectors, controlling for remote work availability, responded as adjustment mechanism, to the decline in labor supply that, especially these sectors, have experienced because of the immigrant drop.

Focusing on the 2SLS estimates, few results stand out. First, increased local demand captured with the Bartik index, increased the mobility across sectors as well as into and out of the five sector with high immigration and low remote options. This is consistent with labor demand growth producing a reallocation across sectors of workers, as some sectors expand and other decline. Interestingly, the post-Covid drop in immigration, induced some significant increase in cross-sector mobility of natives (negative coefficient in column 4). However, it did not generate increased inflow of natives into the five high-immigration, low-remote work sectors. In fact, it increased the outflows of natives in response to a drop in immigrants. Replacement of immigrants with natives in those sectors did not happen at a significant rate after Covid, and higher opportunity of remote work in some states somewhat discouraged mobility across sectors, likely because people stayed into the sectors allowing remote work, and did not move in net into sectors with low remote probability, which were experiencing immigrants' decline.

These regression analyses need to be taken with caution. They only consider very short-term mobility responses of natives and are conducted using US states, which are clearly more aggregated than local labor markets. They use March CPS data that include a smaller sample than American Community Survey. Still a few results seem suggestive. First, the decline in immigrants, that after Covid affected significantly some states and some sectors, was not offset within the short run, by geographical mobility of natives. We do not find evidence that natives moved into states that were losing immigrants, and this effect is imprecise and never significant. Mobility of employed natives across sectors seems to have responded more to the drop in immigrants after Covid, with natives readjusting their sector composition, in part to fill sectors where immigration drop was more significant and where lack of remote work opportunities prevented demand to be satisfied by remote workers. Sector mobility of natives, rather than geographical mobility, could be a mechanism that responded more to change in labor demand and immigration. Still, natives do not seem to respond to immgarnt drop by moving into the intense immigration sectors with little

remote work options. The availability of remote work in a state, reduced the mobility of workers across sectors, suggesting that remote work could have been a substitute for sector mobility in labor market adjustment.

6 Potential effects of shocks on labor unbalances

As cross-states mobility of natives did not adjust much to the post-Covid drop in immigrants and cross-sector mobility responded only mildly, one can expect that such a drop contributed to the creation of unbalances in the labor market, such as unfilled jobs.

An inspection of Figure 11 and Figure 12 suggests that "Food and Accommodation", and to a lower extent "Other services" and "Transport", which are among the sectors with highest foreign shares and lowest remote work options are also relatively high in their vacancy rate. The correlation however is not strong, implying that other factors are contributing to the unfilled job phenomenon.

To make this analysis more systematic, we perform a similar panel regression analysis, to identify the correlates of the vacancy rate across states and over time, focusing on the Bartik shock, the immigrant inflows, before and after Covid, and the remote work possibility after Covid. Specifically, we estimate the following equation:

$$\begin{aligned}\frac{Vacancies_{st}}{Pop_{s,2010}} = \phi_s + \phi_t + \beta_0 \frac{\Delta Immi_{st}}{Pop_{s,2010}} + \beta_1 \frac{\Delta BartikEmpl_{st}}{Pop_{s,2010}} + \\ \gamma_0(PostCov_t)\frac{\Delta Immi_{st}}{Pop_{s2010}} + \gamma_1(PostCov_t)\frac{Remote_{s,2020}}{Pop_{s,2020}} + \varepsilon_{st}\end{aligned} \tag{4}$$

In equation (4), the dependent variable $\frac{Vacancies_{st}}{Pop_{s,2010}}$ represents the number of unfilled vacancies as share of working-age population in state s at the beginning of the period. The explanatory variables are defined as in equation 1. Notice that the regression uses variation of shocks across states (not across sectors), in order to be consistent with the previous analysis and to construct a believable IV.

Table 5 shows the estimates of the coefficients in OLS (column 1) and 2SLS (Column 2). While not much is significant, and the standard errors for the IV make inference very imprecise, the

2SLS point estimates suggest that a drop in immigrants and a lack of remote options both would contribute positively (but not significantly) to vacancies in a US state.

Using the point-estimates of the 2SLS specification, a drop of immigrants by 5 percent of the working age population, as happened during Covid in the most negatively affected US states, would be associated with an increase by two tenths of a point in vacancy rates (as percent of employment) (5*0.045=0.22). Similarly, a decrease in remote work options by 10 percent of employment, (equal to one standard deviation in the remote work opportunities across states) will only generate 1 tenth of a percentage point higher vacancy rate (10*0.011=0.1). Taking these coefficients at face value would imply that even the strong drop in immigration rates, would explain a small part of the very steep increase in vacancies (equal to about 3.5 percent of employment) in the 2 years after Covid.

7 Discussion and Conclusions

The first goal of this paper was to document the changes in foreign-born immigration to the US after the onset of Covid-19. Additionally, we want to document potential changes in internal cross-state mobility of natives in the US after Covid. Finally, we wanted to capture using short-run regressions whether the changes in immigrant flows controlling for the operating of demand shocks and the unequal access to remote work opportunities were significantly associated with native mobility responses measured by in and out migration from US states or to local labor market unbalances captured by vacancy rates.

The main messages emerging from this analysis that uses early available data (from Monthly CPS, CPS ASEC, JOLTS) and will need to be validated when datasets using larger samples (such as the American Community Survey) are available, are three.

First, immigration of foreign-born experienced a significant slow-down and stagnation starting in late 2019 up to 2021. It has recovered somewhat from late 2021. This decline has affected mainly prime age immigrants (25-45), and corresponded to a drop in non-college educated immigrants (and of immigrants form Mexico) and a halt of the growth of college educated immigrants (and immigrants from India and "other" origins specifically). The decline was heterogeneous across states.

In some large immigration states such as California, Florida the number of immigrants dropped or its growth stopped; other states, such as Texas did not experience a decline in immigrants' growth. The drop of foreign-born immigrants during Covid, was very unequal, in terms of employment across sectors. "Food and Accommodation Services" received the largest negative shock in foreign-born employment during Covid, with a sudden decline by 30 pp. of employment in the first half of 2020, but a strong rebound in 2021. Other sectors lost and partially recovered but to a less dramatic extent. Most numbers relative to employment and population of foreign-born in the late months of 2021 and early months of 2022, seem to be back towards a trend more similar to pre-2020. All the data on foreign-born recent evolution were derived from monthly CPS, the less precise sample, but confirmed with CPS ASEC.

The second lesson we can draw from our data analysis is that the cross-state mobility of natives, which has been on the decline for a while before Covid (see Basso and Peri 2020) seems to have continued on that trajectory. The presumption that labor market imbalances during Covid, or the option of remote work could have inverted the trend or represented a large uneven shock that natives would absorb by increasing mobility has not materialized yet. Granted that we only have 2 yearly observation after Covid, we still observe a decline/stagnation in mobility of both college and non-college educated, especially for people in prime working age, and especially of mobility for employment reasons. We also do not observe a correlation between the drop in immigrant flows and mobility of native targeted to locations or sectors that lost a large number of immigrant workers. The rigidity of the labor markets that have generated the unbalances may also imply that natives continue not to respond to local shocks in their net flows. There is some mild evidence that more remote work availability may have reduced the moving into states for working reasons, suggesting that it may have started a decoupling of location for work and for residence. more analysis would be needed on this connection.

Finally, in an effort to connect more systematically internal cross-state mobility of natives to the drop in flows of foreign-born and to the raise in the remote work options, we use cross-state variation of those, controlling for a Bartik demand shock and for state and year fixed effects, and we run panel regressions including pre-and post Covid years, to test if there is evidence of native

mobility response to shocks during the Covid period. We admittedly can only look at short-run (one-year) responses, and while we try to use an IV estimation to capture immigrant changes not specifically driven by state-specific labor conditions, we are dealing with significant imprecision and lingering possibility of endogeneity. The regressions reveal no significant partial correlation between internal migratory and the drop in immigrants, and hardly a change in such a correlation after Covid. We find only very weak evidence that, as a consequence, the drop in immigrants is correlated with more vacancies, a measure of labor market unbalances and it hardly explain a part of the large increase in vacancies.

We conclude with three considerations. First, while decline of immigrants may have played a role in generating vacancies in some specific sectors (Food and accommodation seems to be the prime candidate) as we hinted in an early note (Peri and Zaiour 2021), systematic analysis of correlations across states and sectors of those shocks does not support the idea that such a drop significantly helps to explain vacancies across US sectors and US states, especially using the updated data to July 2022 as we do in this study. Large changes in job preferences, resignations, and a large shift of native workers' choices triggered by Covid must play a more prominent role.

Second, we did not analyze wages in our study. Wages tend to be slower in responding to changes in labor market conditions. The unbalances and shortages in the labor market, however, are likely driving wage increases and may be passed on to inflation. A margin of adjustment to fewer foreign immigrants can be wage increase. However, if firm growth is slowed because they cannot fill jobs and investments are reduced and firms close as a consequence, the long-run effect on wages can be attenuated by a loss in labor demand and fewer immigrants can trigger a negative cycle of lower growth (e.g. Lee et al. 2022).

Finally, the long-run consequences of the drop in immigrants, that worsened a trend towards low immigration rates in the US, started before Covid and may continue to play a role for years to come. One may need to look at a decade of immigration decline, in an era of labor force shrinking as will likely be the US in the next decade, to really understand the long-run consequences of a trend exacerbated during the last 2 years.

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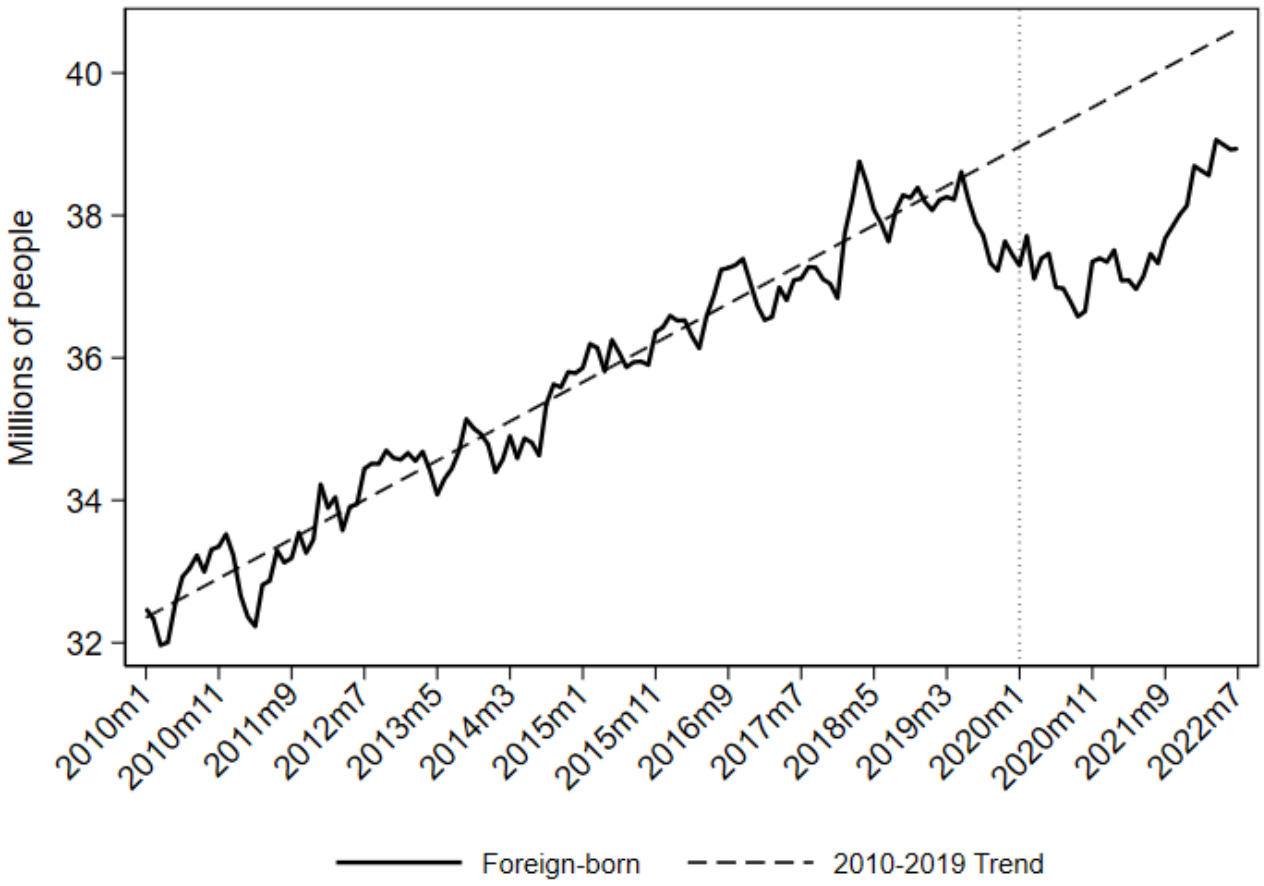
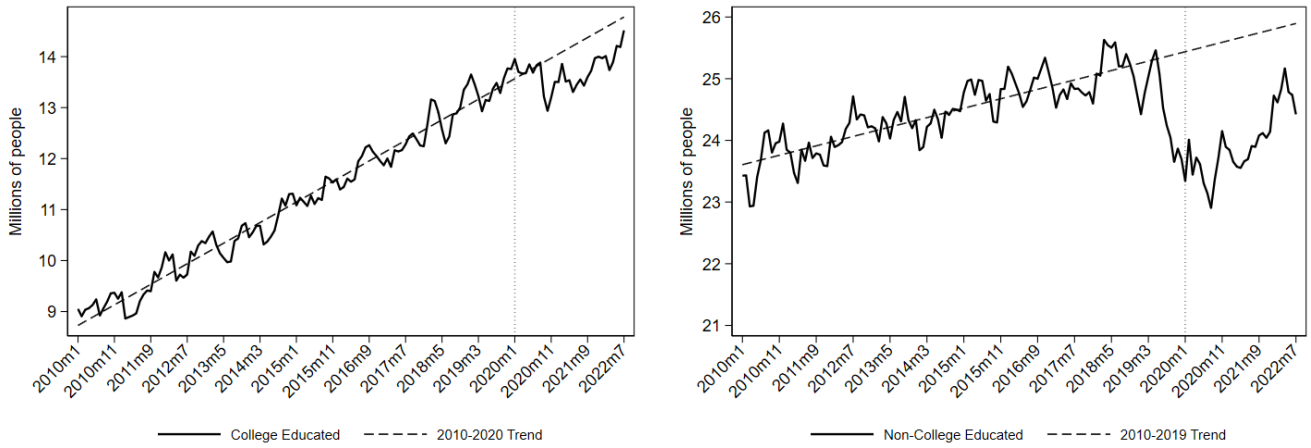
8 Figures and Tables

Figure 1: US Working-age Foreign-born Population, January 2010-July 2022



Notes: The solid line shows the total number of working-age (18-65) foreign-born individuals. The dashed line provides the linear fit of the data from January 2010 to May 2019. The slope of the dashed line is 55,106. By July 2022, the number of working-age foreign-born individuals was smaller by 1,638,680 relative to the level it would have achieved if the 2010-2019 trend had continued to July 2022. Data Source: Monthly CPS, January 2010 - July 2022.

Figure 2: US Working-age Foreign-born Population by College Education

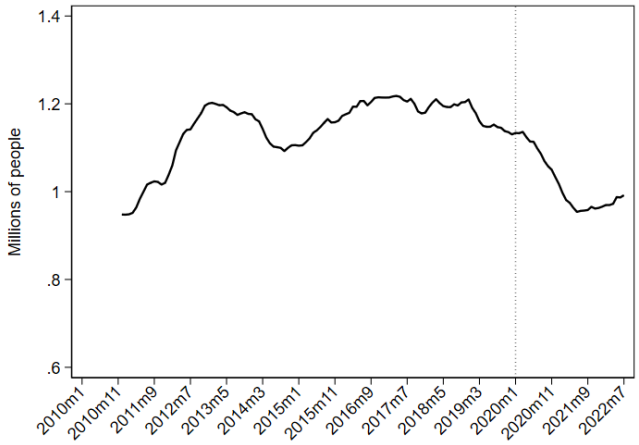


(a) College Educated

(b) Non-College Educated

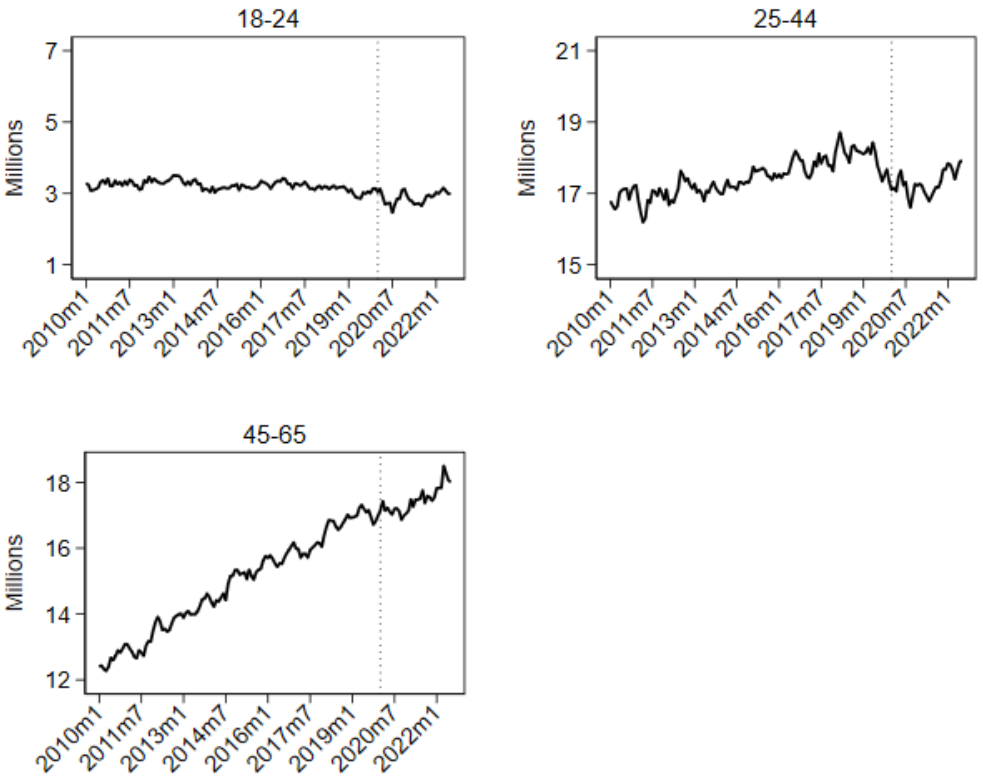
Notes: In panel (a), the solid line shows the total number of working-age college educated foreign-born individuals, while the dashed line provides the linear fitting of the data from January 2010 to January 2020. The slope of the dashed line is 40,327. By June 2022, the number of working-age college-educated foreign-born individuals was smaller by 547,957 relative to the level it would have achieved if trend had continued. In panel (b), the solid line shows the total number of working-age non-college educated foreign-born individuals, while the dashed line provides the linear fitting of the data from January 2010 to May 2019. The slope of the dashed line is 15,261. By June 2022, the number of working-age non-college educated foreign-born individuals was smaller by 1,143,683 relative to the level it would have achieved if trend had continued. Data Source: Monthly CPS, January 2010 - July 2022.

Figure 3: US Foreign-born Population, 18-24, Attending College



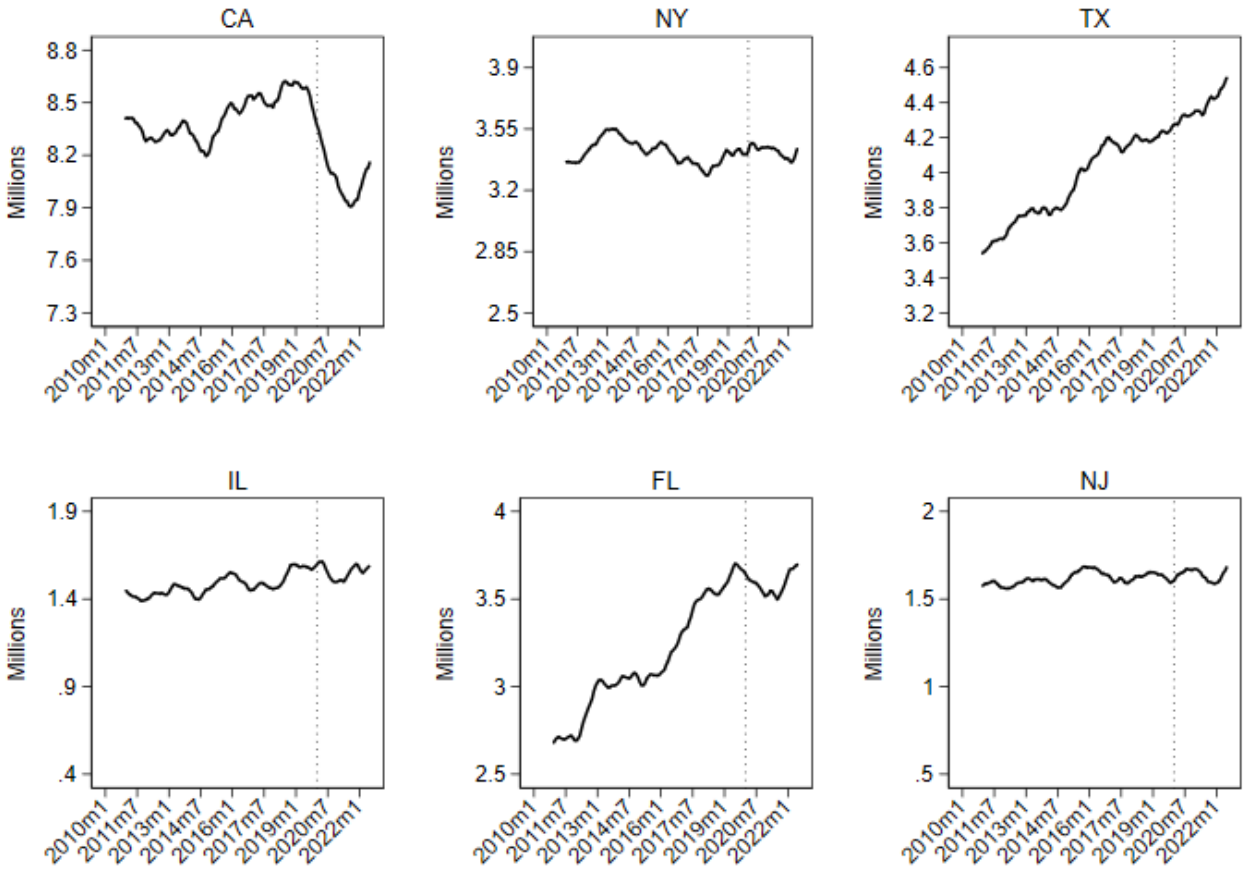
Notes: This figure shows the twelve-month moving average of the number of foreign-born individuals who are between 18 and 24 years old and who are attending college. Data Source: Monthly CPS, January 2010 - July 2022.

Figure 4: US Foreign-born Population by Age Group



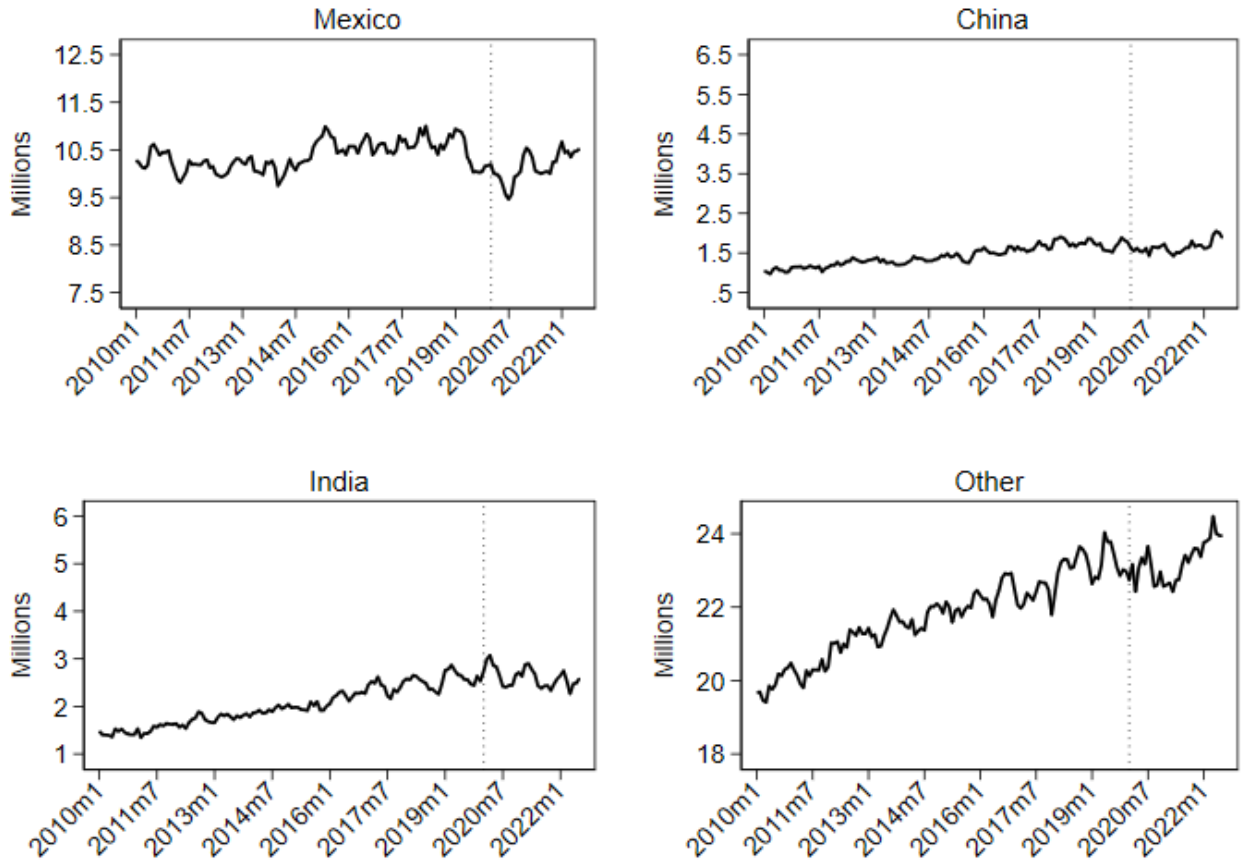
Notes: This figure shows the number of working-age foreign-born individuals separated into three age categories: 18-24, 25-44, 45-65. Data Source: Monthly CPS, January 2010 - July 2022.

Figure 5: Working-age Foreign-born Population in Top Immigration States



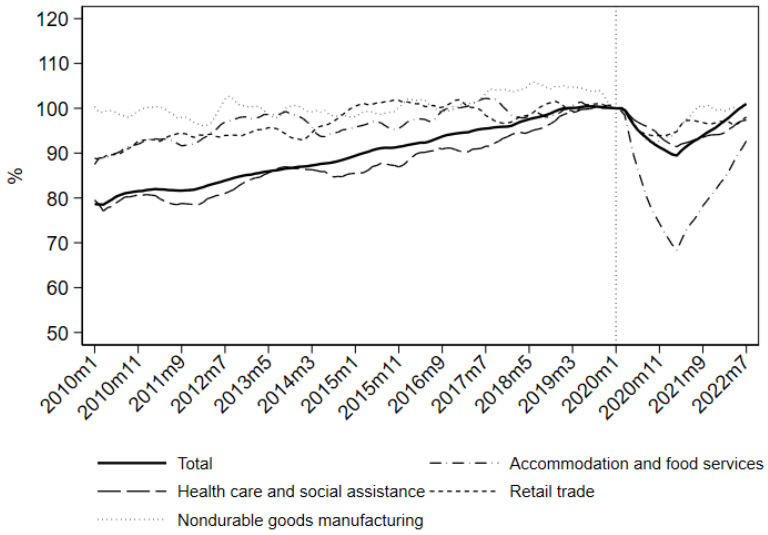
Notes: This figure shows the twelve-month moving average of the number of working-age foreign-born individuals in six main states. Data Source: Monthly CPS, January 2010 - July 2022.

Figure 6: Working-age Foreign-born Population by Origin



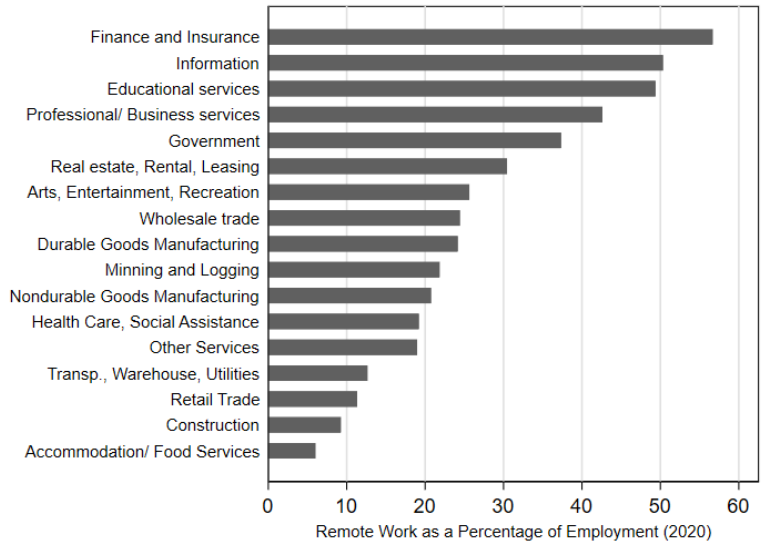
Notes: This figure shows the number of working-age foreign-born individuals from the main countries of origin. Data Source: Monthly CPS, January 2010 - July 2022.

Figure 7: Working-age Foreign-born Employed Population by Industry and Month



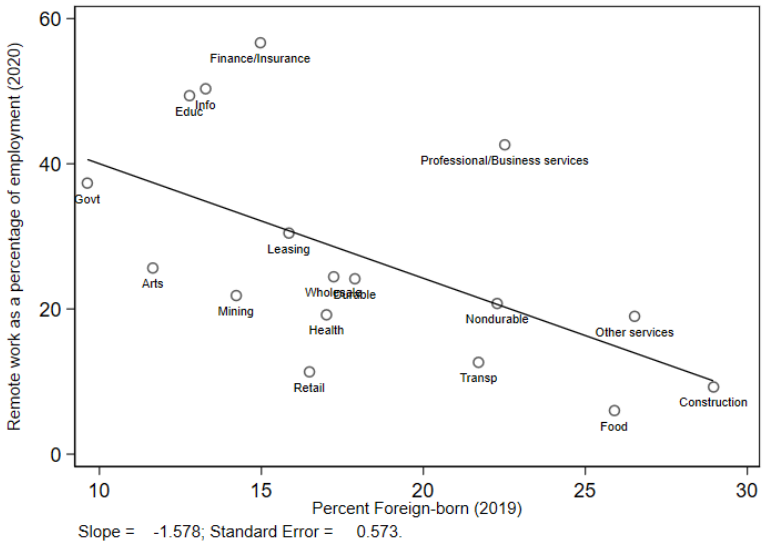
Notes: This figure shows the 12-month moving average of the total working-age foreign-born employed population standardized to 100 on January, 2020 by industry group. The four sectors included are those with largest share of foreign workers in employment as of year 2019. Data Source: Monthly CPS, January 2010 - July 2022.

Figure 8: Percent of Remote Employment by Sectors (2020)



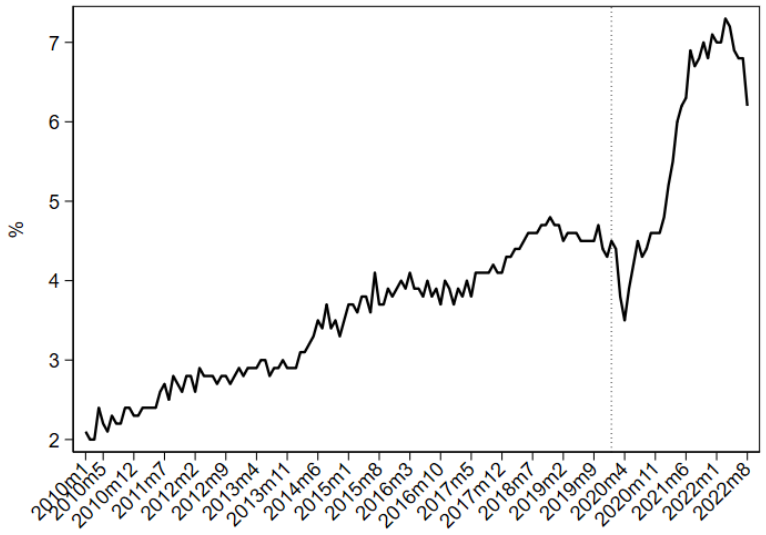
Notes: This figure shows the average percent of working-age remote employment relative to total working-age employment in 2020 for each sector. We exclude individuals who do not report an industry. Data Source: Monthly CPS, May 2020 - December 2020.

Figure 9: Percent Remote Employment vs Percent Foreign-born across Sectors



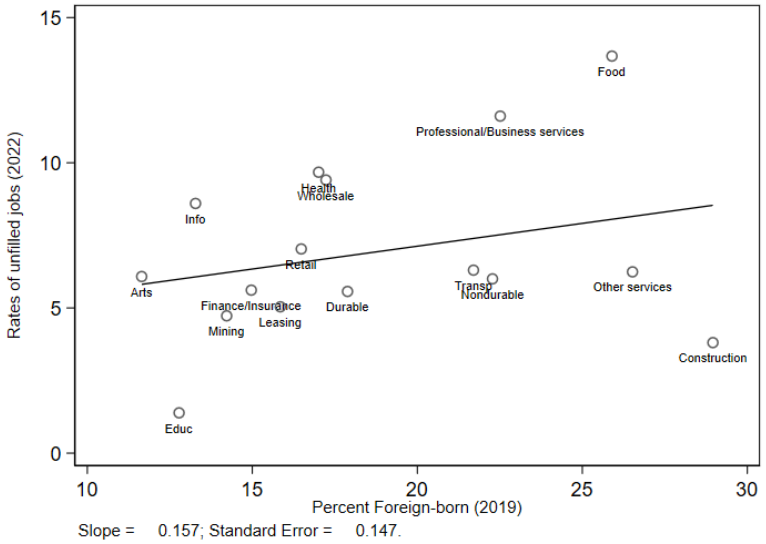
Notes: This figure shows the correlation between the percentage of remote employment and the percentage of foreign-born across sectors. The x-axis pertains to the percent of working-age foreign-born employment relative to total working-age employment in 2019, calculated using CPS ASEC (2019). The y-axis pertains to the average percentage of remote working-age employment in 2020, calculated using the Monthly CPS (May 2020 - December 2020). We exclude individuals who do not report an industry. The line represent the fitted values.

Figure 10: Total Nonfarm Job Vacancy Rate by Month and Year



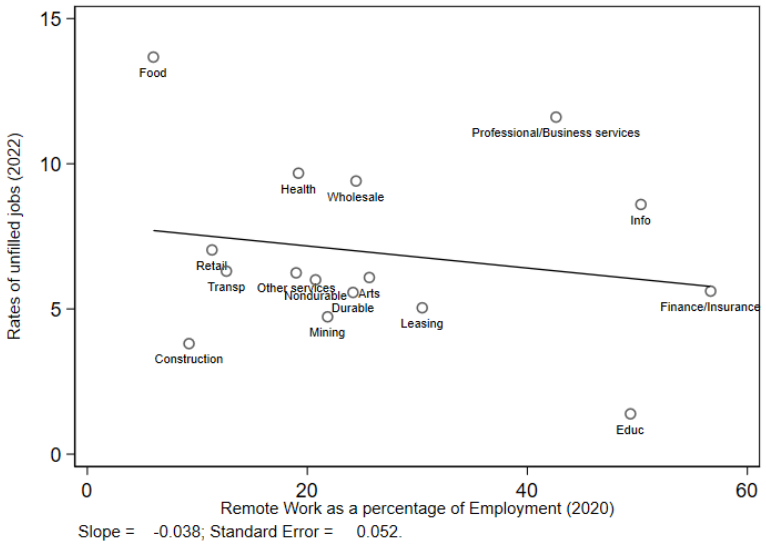
Notes: The data shows total non-farm seasonally adjusted job vacancy rates for establishments of all size classes in the US. The vacancy rate is the total number of vacancies divided by the sum of total employment and vacancies. Data Source: BLS JOLTS, January 2010 - August 2022.

Figure 11: Rates of Unfilled Jobs vs Percentage Foreign-born across Sectors



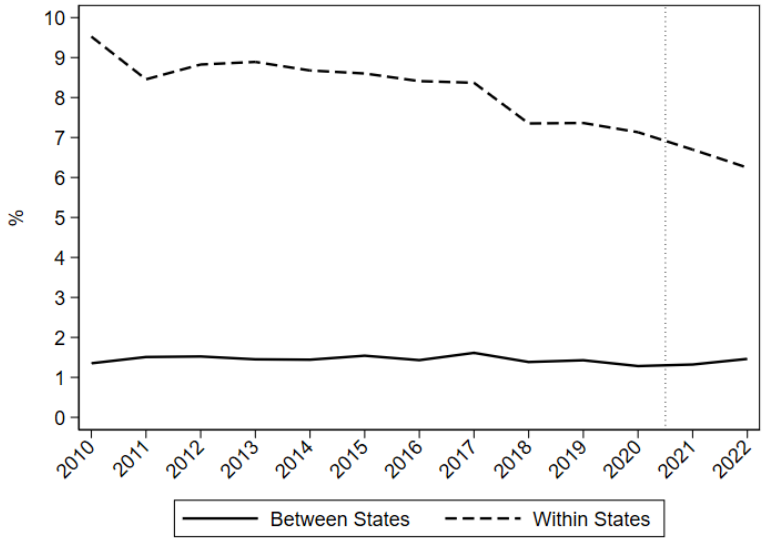
Notes: This figure shows the correlation between the rate of unfilled jobs and the percent foreign-born across sectors. The x-axis pertains to the percentage of working-age foreign-born employment relative to total working-age employment in 2019, calculated using CPS ASEC (2019). The y-axis pertains to the rate of unfilled jobs by sector in 2022. That is, the average number of vacancies in 2022 (BLS JOLTS, January 2022 - August 2022) relative to total working-age employment in 2019 by sector. We exclude the Government sector. The line represent the fitted values.

Figure 12: Rates of Unfilled Jobs vs Percent of Remote Employment across Sectors



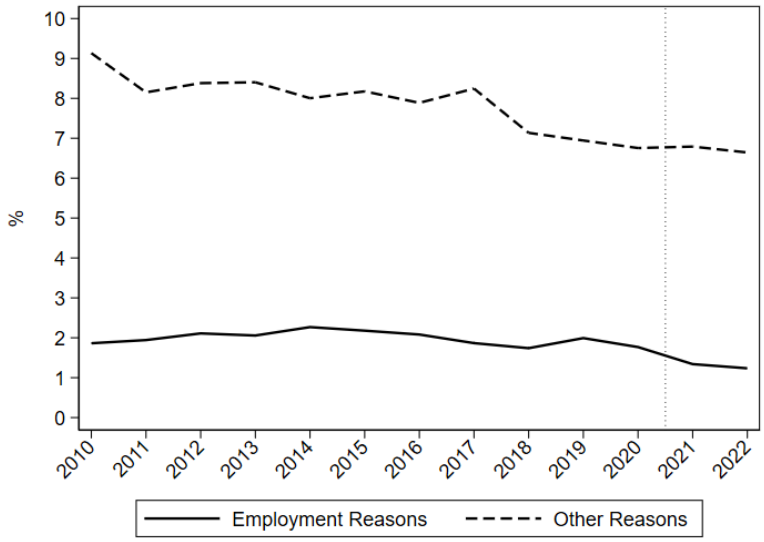
Notes: This figure shows the correlation between the rate of unfilled jobs and the percentage of remote employment across sectors. The x-axis pertains to the average percent of remote working-age employment relative to total working-age employment by sector in 2020. The y-axis pertains to the rate of unfilled jobs by sector in 2022. That is, the average number of vacancies in 2022 (BLS JOLTS, January 2022 - August 2022) relative to total working-age employment in 2019 by sector. We exclude the Government sector. The line represent the fitted values.

Figure 13: Working-age Native-born Mobility Rates by Distance of Migration



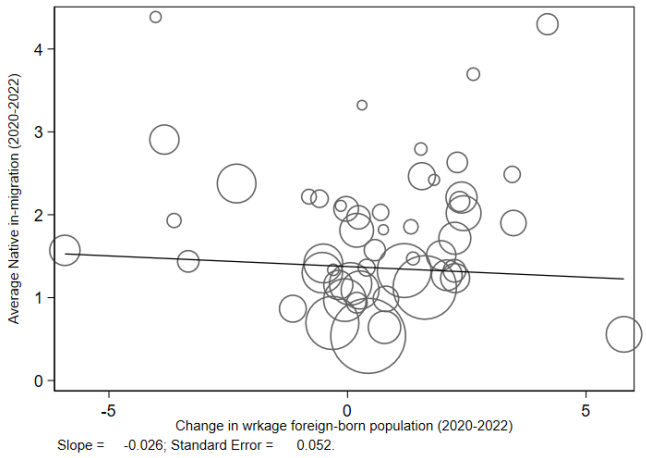
Notes: This figure shows total working-age native-born migration (between and within states) relative to the total working-age population in each year. Data Source: CPS ASEC, 2010 - 2022.

Figure 14: Working-age Native-born Mobility Rates by Reason for Migration

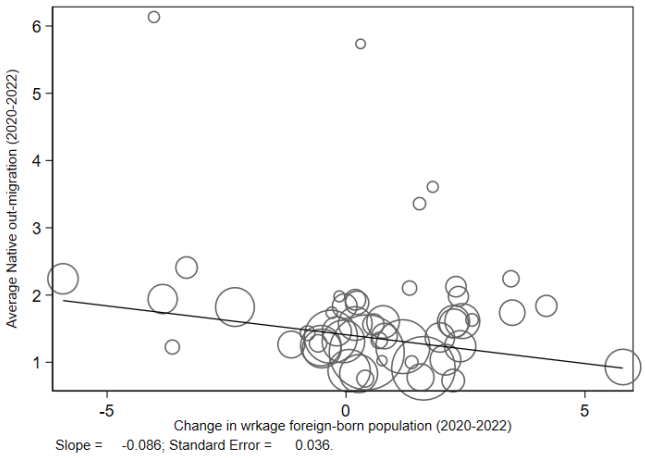


Notes: This figure shows total working-age native-born migration (between and within states) by reason for move relative to the total working-age population in each year. Data Source: CPS ASEC, 2010 - 2022.

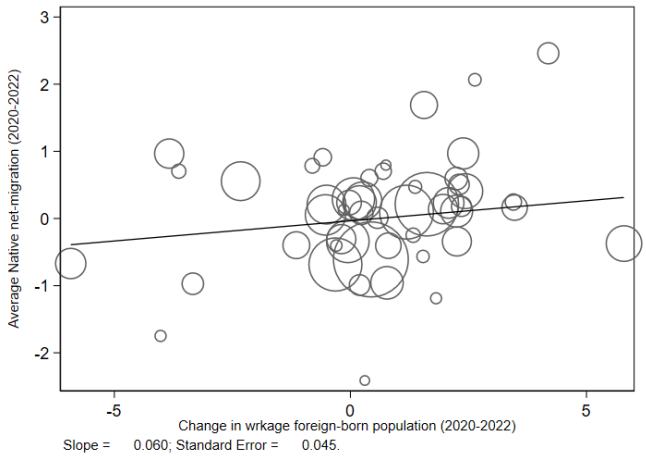
Figure 15: Working-age Native-born Migration Patterns vs Change in Foreign-born Population by State



(a) In-migration



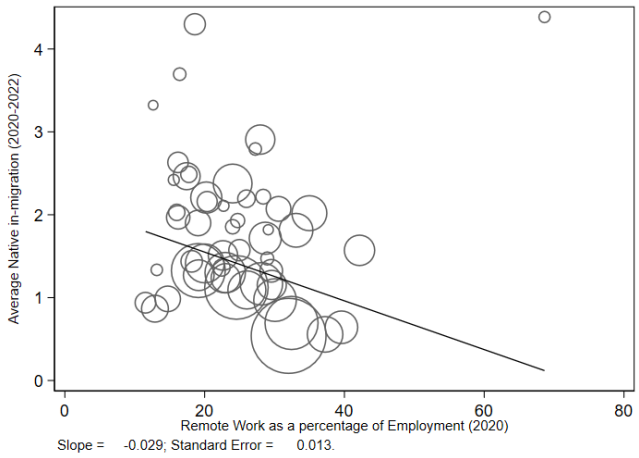
(b) Out-migration



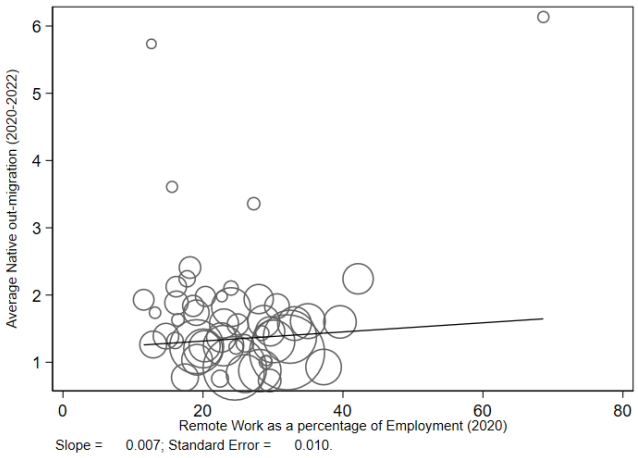
(c) Net-migration

Notes: In this figure, we look at the correlation between native migration patterns and the change in foreign-born population by state. The y-axis pertains to the average working-age native in-migration (panel a), out-migration (panel b) and net-migration (panel c) into states between 2020 and 2022. The x-axis pertains to the change in working-age foreign-born population between 2020 and 2022. All the variables are standardized to the state total working-age population in 2019 (in percent). The line represents the fitted values weighted by the state total working-age population in 2019. Data Source: CPS ASEC, 2019 - 2022.

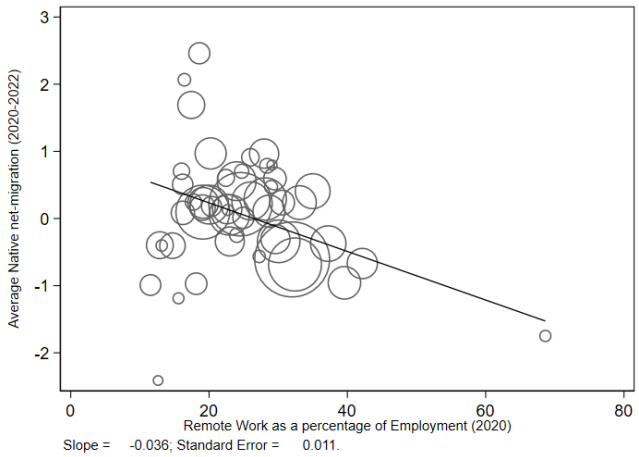
Figure 16: Working-age Native-born Migration Patterns vs Intensity of Remote Employment by State



(a) In-migration



(b) Out-migration



(c) Net-migration

Notes: In this figure, we look at the correlation between native migration patterns and percent of remote employment by state. The y-axis pertains to the average working-age native in-migration (panel a), out-migration (panel b) and net-migration (panel c) into states between 2020 and 2022. All the variables are standardized to the state total working-age population in 2019 (in percent). The x-axis pertains to the average percent of remote employment by state in 2020. The line represents the fitted values weighted by the state total working-age population in 2019. Data Source: Monthly CPS, May 2020 - December 2020 & CPS ASEC, 2019 - 2022.

Table 1: Native Inter-state Mobility and Local Shocks

	OLS			2SLS		
	(1) In	(2) Out	(3) Net	(4) In	(5) Out	(6) Net
Bartik Shock	-0.062	0.233	-0.296	-0.090	0.273	-0.363
	(0.129)	(0.181)	(0.218)	(0.166)	(0.204)	(0.259)
Change Immig	0.027	-0.009	0.035	0.114	-0.270	0.384
	(0.018)	(0.034)	(0.042)	(0.107)	(0.225)	(0.273)
Post x Change Immig	0.022	0.014	0.008	0.025	0.197	-0.172
	(0.060)	(0.045)	(0.069)	(0.231)	(0.361)	(0.419)
Post x Remote	0.014	0.040**	-0.026	0.019	0.034	-0.014
	(0.017)	(0.015)	(0.025)	(0.020)	(0.021)	(0.034)
Observations	600	600	600	600	600	600
Mean Y	0.0190	0.0193	-0.0003	0.0190	0.0193	-0.0003
R-sq	0.5782	0.4694	0.2511	-0.0314	-0.1054	-0.1479
Year FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y

Standard errors in parentheses.

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

Notes: This table shows the OLS and 2SLS results where the outcomes are native working-age in, out and net-migration to states as a share of the 2010 state total working-age population. Year and state fixed effects are added. Standard errors are clustered at the state-level. The F-statistic of the first-stage regression is 10.25. District of Columbia is excluded from the analysis. Data is taken from the 2011-2022 CPS ASEC.

Table 2: College Educated Native Inter-state Mobility and Local Shocks

	OLS			2SLS		
	(1) In	(2) Out	(3) Net	(4) In	(5) Out	(6) Net
Bartik Shock	-0.012	0.161	-0.173	-0.048	0.204	-0.252
	(0.070)	(0.204)	(0.206)	(0.090)	(0.190)	(0.192)
Change Immig	0.009	0.017	-0.007	0.027	-0.089	0.115
	(0.011)	(0.021)	(0.023)	(0.061)	(0.106)	(0.122)
Post x Change Immig	0.021	-0.064	0.085*	0.159	-0.114	0.272
	(0.031)	(0.045)	(0.045)	(0.147)	(0.219)	(0.335)
Post x Remote	0.007	0.004	0.003	0.014	-0.005	0.019
	(0.008)	(0.009)	(0.015)	(0.013)	(0.018)	(0.028)
Observations	600	600	600	600	600	600
Mean Y	0.0073	0.0076	-0.0003	0.0073	0.0076	-0.0003
R-sq	0.4199	0.2531	0.1941	-0.0889	-0.0730	-0.1435
Year FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y

Standard errors in parentheses.

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

Notes: This table shows the OLS and 2SLS results where the outcomes are college educated native working-age in, out and net-migration to states as a share of the 2010 state total working-age population. Year and state fixed effects are added. Standard errors are clustered at the state-level. The F-statistic of the first-stage regression is 10.25. District of Columbia is excluded from the analysis. Data is taken from the 2011-2022 CPS ASEC.

Table 3: Non-College Educated Native Inter-state Mobility and Local Shocks

	OLS			2SLS		
	(1) In	(2) Out	(3) Net	(4) In	(5) Out	(6) Net
Bartik Shock	-0.050	0.073	-0.123	-0.042	0.069	-0.111
	(0.076)	(0.164)	(0.194)	(0.096)	(0.172)	(0.201)
Change Immig	0.017	-0.026	0.043	0.088	-0.181	0.269
	(0.015)	(0.027)	(0.029)	(0.076)	(0.174)	(0.200)
Post x Change Immig	0.001	0.078*	-0.078	-0.133	0.311	-0.444
	(0.042)	(0.043)	(0.059)	(0.203)	(0.254)	(0.299)
Post x Remote	0.007	0.037***	-0.030*	0.005	0.038**	-0.033
	(0.011)	(0.012)	(0.017)	(0.013)	(0.016)	(0.024)
Observations	600	600	600	600	600	600
Mean Y	0.0117	0.0117	-0.0000	0.0117	0.0117	-0.0000
R-sq	0.5849	0.4714	0.2304	-0.0373	-0.0665	-0.1156
Year FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y

Standard errors in parentheses.

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

Notes: This table shows the OLS and 2SLS results where the outcomes are non-college educated native working-age in, out and net-migration to states as a share of the 2010 state total working-age population. Year and state fixed effects are added. Standard errors are clustered at the state-level. The F-statistic of the first-stage regression is 10.25. District of Columbia is excluded from the analysis. Data is taken from the 2011-2022 CPS ASEC.

Table 4: Native Sector-Mobility and Local Shocks

	OLS			2SLS		
	(1) Mobility Rate	(2) In-Mobility	(3) Out-Mobility	(4) Mobility Rate	(5) In-Mobility	(6) Out-Mobility
Bartik Shock	0.387	0.159**	0.126	0.579*	0.190**	0.150*
	(0.275)	(0.065)	(0.077)	(0.300)	(0.078)	(0.088)
Change Immig	0.031	0.003	0.025	0.418	0.028	0.151
	(0.048)	(0.014)	(0.020)	(0.328)	(0.090)	(0.126)
Post x Change Immig	0.063	0.026	-0.025	-1.335*	-0.148	-0.306
	(0.141)	(0.045)	(0.037)	(0.675)	(0.180)	(0.185)
Post x Remote	-0.063	-0.027**	-0.025**	-0.104*	-0.034**	-0.031**
	(0.047)	(0.013)	(0.013)	(0.062)	(0.014)	(0.014)
Observations	600	600	600	600	600	600
Mean Y	0.0924	0.0193	0.0210	0.0924	0.0193	0.0210
R-sq	0.7751	0.6477	0.6596	-0.2238	-0.0223	-0.1089
Year FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y

Standard errors in parentheses.

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

Notes: This table shows the OLS and 2SLS results where the outcomes are the total sector mobility rate of the native working-age employed population (1 and 4), the total in-mobility to high-immigrant low-remote work sectors from other sectors (2 and 5), and the out-mobility from high-immigrant low-remote work sectors to other sectors (3 and 6). High-immigrant low-remote work sectors include: construction, accommodation and food services, other services, non-durable goods manufacturing, and transportation, warehousing and utilities. All outcomes are measured as a share of the 2010 state total working-age population. Year and state fixed effects are added. Standard errors are clustered at the state-level. The F-statistic of the first-stage regression is 10.25. District of Columbia is excluded from the analysis. Data is taken from the 2011-2022 CPS ASEC.

Table 5: Job Openings and Local Shocks

	(1) OLS	(2) 2SLS
Bartik Shock	0.097	0.109
	(0.076)	(0.085)
Change Immig	-0.012*	-0.015
	(0.006)	(0.039)
Post x Change Immig	0.018	-0.030
	(0.023)	(0.129)
Post x Remote	-0.009	-0.011
	(0.011)	(0.015)
Observations	600	600
Mean Y	0.0343	0.0343
R-sq	0.9662	-0.0027
Year FE	Y	Y
State FE	Y	Y

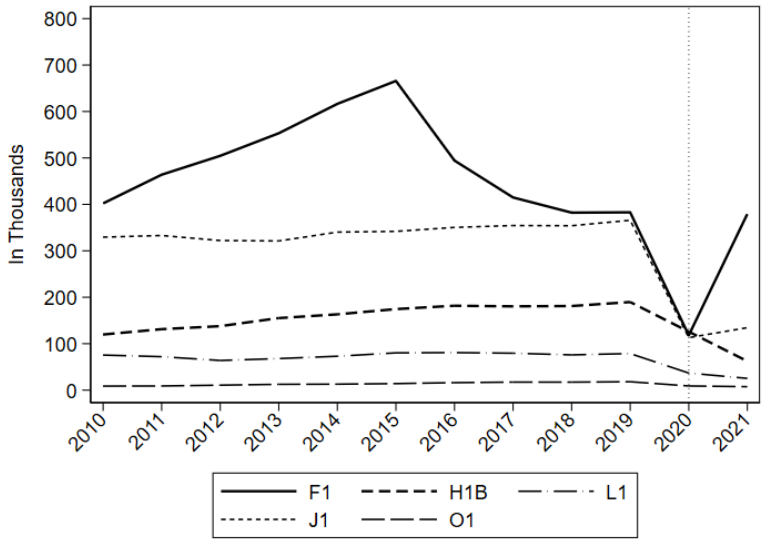
Standard errors in parentheses.

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

Notes: This table shows the OLS and 2SLS results where the outcome is the annual average number of vacancies in a state relative to the 2010 state total working-age population. Year and state fixed effects are added. Standard errors are clustered at the state-level. The F-statistic of the first-stage regression is 10.25. District of Columbia is excluded from the analysis. Data is taken from the 2011-2022 CPS ASEC & BLS, JOLTS 2011-2022.

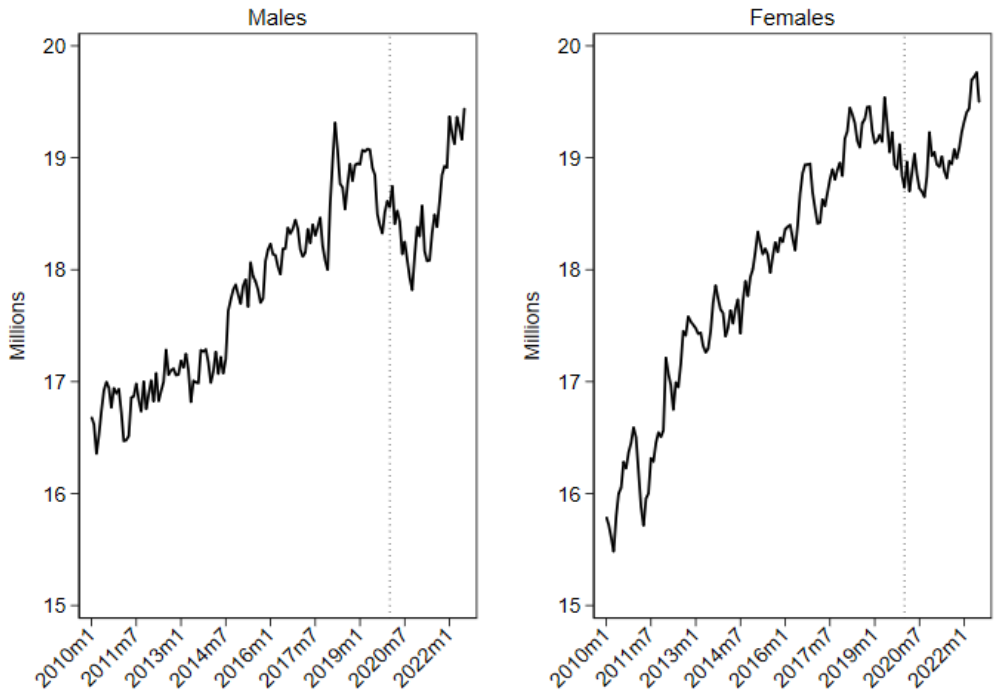
A Appendix

Figure A1: Visa Issuance by Class and Year



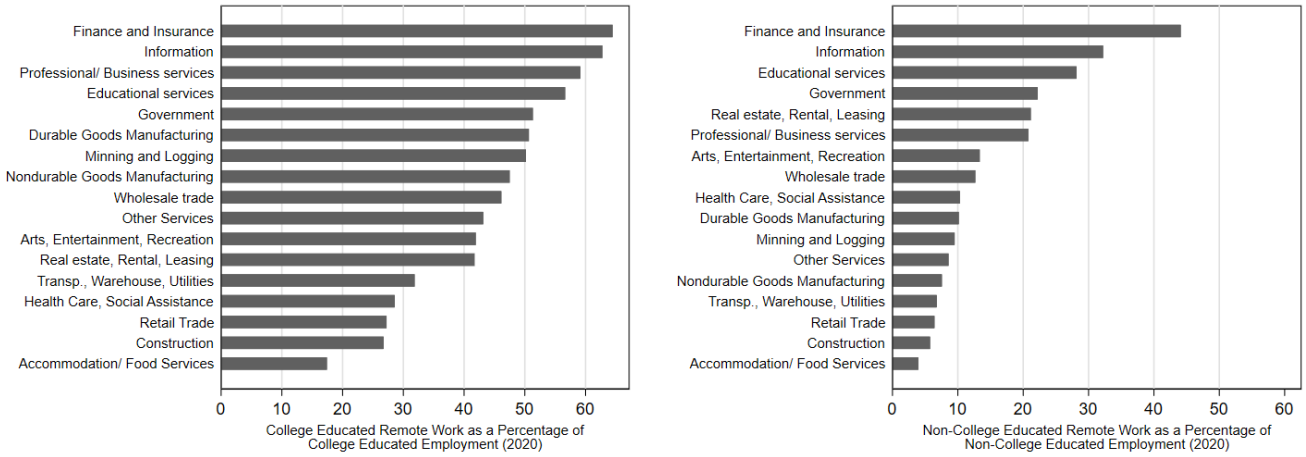
Notes: This figure shows the total number of visas issues by class and year. Data Source: Nonimmigrant Visa Statistics. U.S. Department of State, 2010 - 2021.

Figure A2: Working-age Foreign-born Population by Sex



Notes: This figure shows the number of working-age foreign-born individuals by sex. Data Source: Monthly CPS, January 2010 - July 2022.

Figure A3: Remote Employment by Sectors and by College Education in 2020

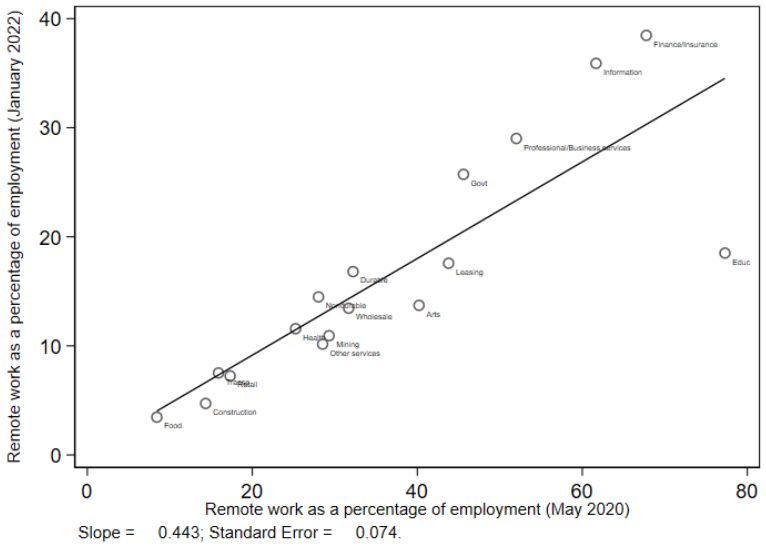


(a) College Educated

(b) Non-College Educated

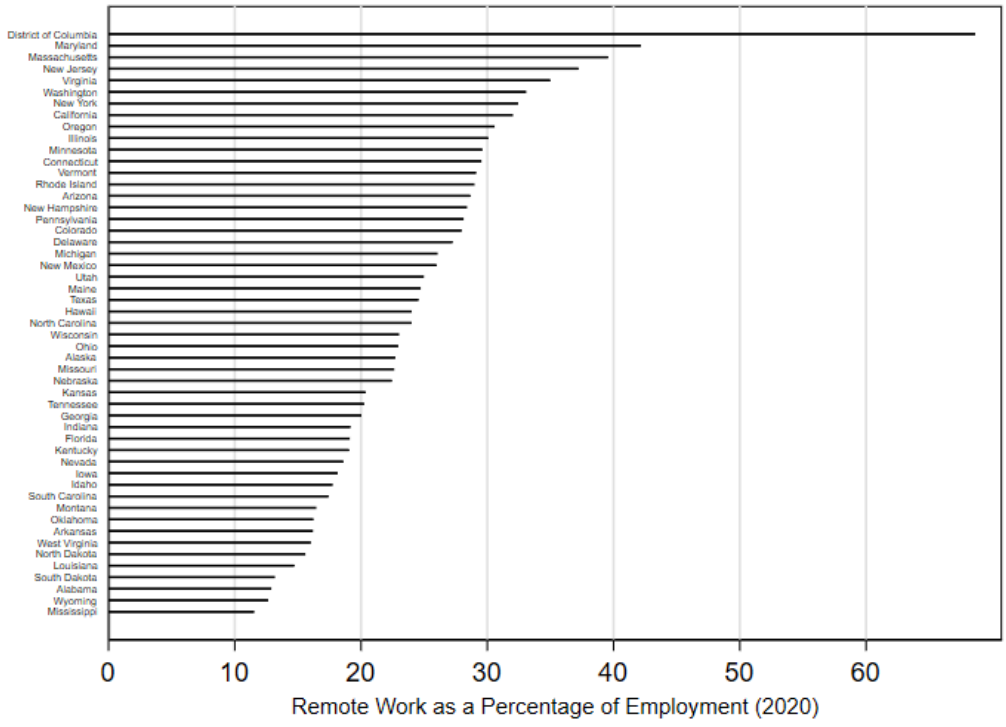
Notes: This figure shows the average percentage of working-age college (non-college) educated remote employment relative to total working-age college (non-college) educated employment across months for each sector in 2020. We exclude individuals who do not report an industry. Data Source: Monthly CPS, May 2020 - December 2020.

Figure A4: Persistence of Remote Employment across Sectors



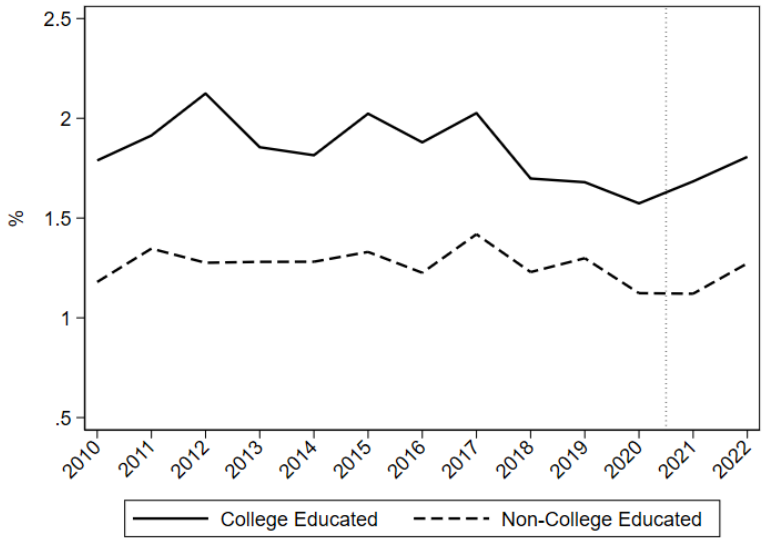
Notes: This figure shows the correlation in percentage of remote employment across sectors between May 2020 and January 2022. We exclude individuals who do not report an industry. The line represents the fitted values. Data Source: Monthly CPS, May 2020 - December 2020.

Figure A5: Remote Employment by State (2020)



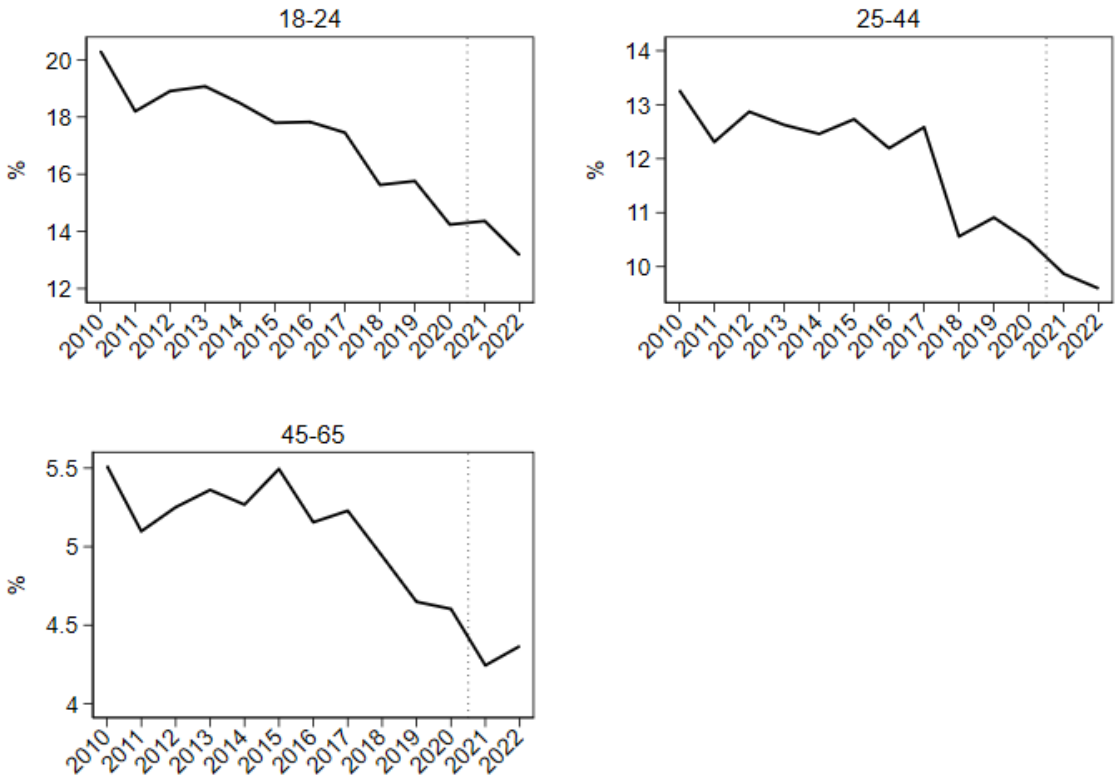
Notes: This figure shows the average percent of working-age remote employment relative to total working-age employment in 2020 for each state. Data Source: Monthly CPS, May 2020 - December 2020.

Figure A6: Working-age Native-born Mobility Rates by College Education



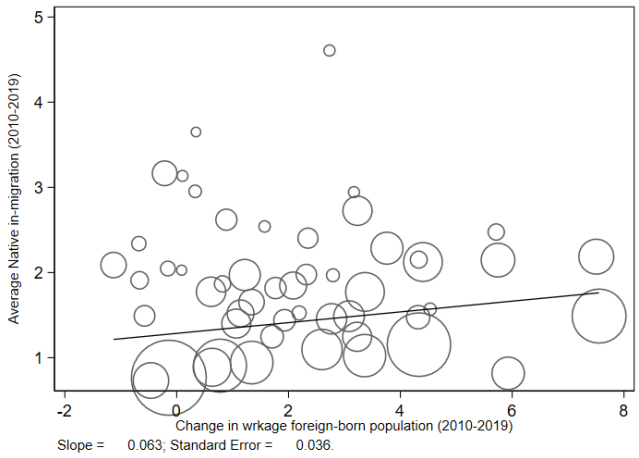
Notes: The lines show total working-age native college (non-college) educated population that migrated between states relative to the total working-age college (non-college) educated population by year. Data Source: CPS ASEC, 2010 - 2022.

Figure A7: Working-age Native-born Mobility Rates by Age Categories

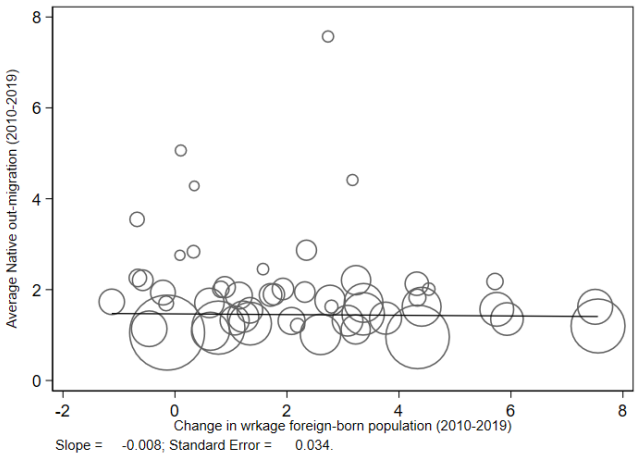


Notes: The lines show total native population by age category that migrated between and within states relative to the total population of each category by year. Data Source: CPS ASEC, 2010 - 2022.

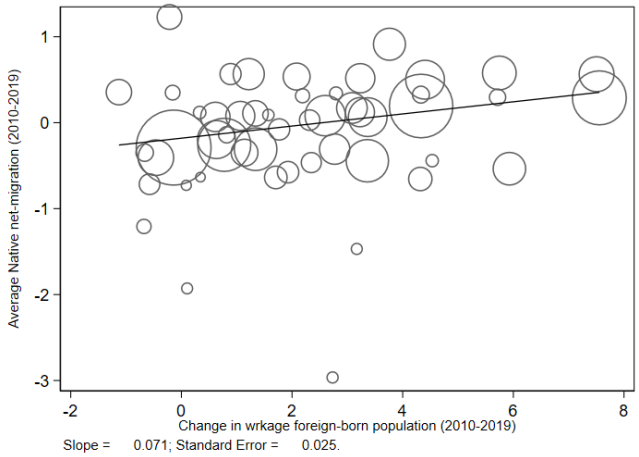
Figure A8: Working-age Native-born Migration Patterns vs Change in Foreign-born Population by State (Pre-Covid Pattern)



(a) In-migration



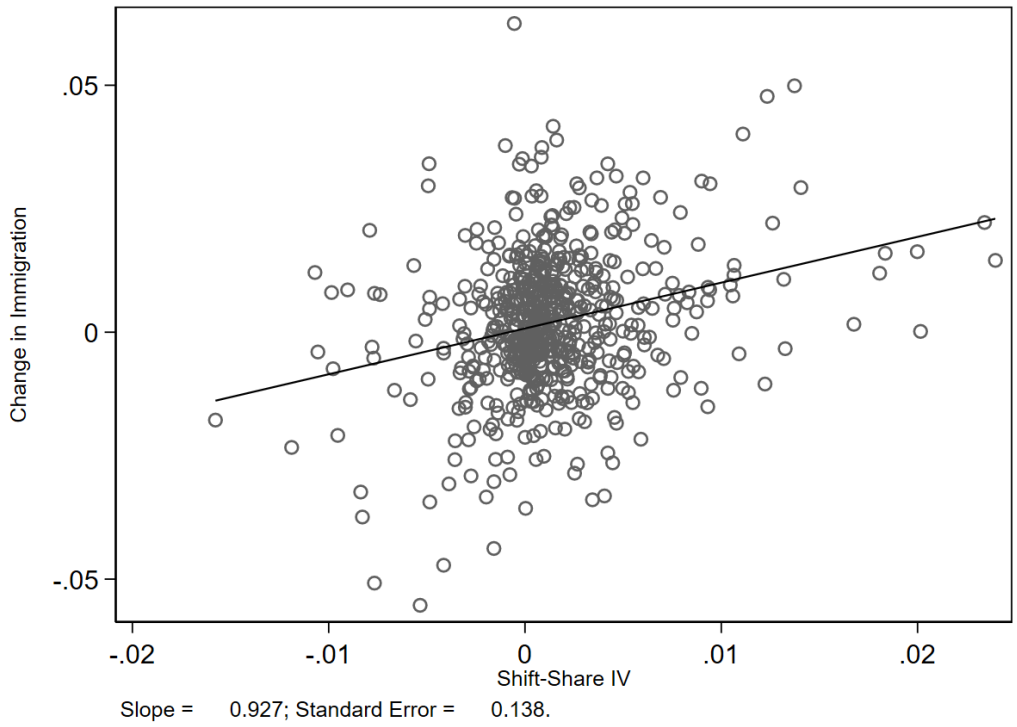
(b) Out-migration



(c) Net-migration

Notes: In this figure, we look at the correlation between native migration patterns and the change in foreign-born population by state. The y-axis pertains to the average working-age native in-migration (panel a), out-migration (panel b) and net-migration (panel c) into states between 2010 and 2019. The x-axis pertains to the change in working-age foreign-born population between 2010 and 2019. All the variables are standardized to the state total working-age population in 2019 (in percent). The line represents the fitted values weighted by the state total working-age population in 2019. Data Source: CPS ASEC, 2010 - 2019.

Figure A9: Change in Immigration versus the Shift-share Instrument



Notes: This figure shows the correlation between the shift-share IV and the change in immigration. Both variables are measured as a share to the 2010 state total working-age population. The line represents the fitted values. Data Source: CPS ASEC, 2010 - 2022.

Table A1: Total Working-age Native Population-Employment and Local Shocks

	OLS		2SLS	
	(1)	(2)	(3)	(4)
	Δ Native Population	Δ Native Employment	Δ Native Population	Δ Native Employment
Bartik Shock	-0.075	0.556	0.068	0.374
	(0.681)	(0.421)	(0.684)	(0.513)
Change Immig	-0.689***	-0.508***	-0.843	-0.483
	(0.072)	(0.090)	(0.505)	(0.501)
Post x Change Immig	0.000	-0.113	-0.426	0.667
	(0.191)	(0.178)	(0.836)	(1.101)
Post x Remote	0.001	-0.036	-0.027	0.002
	(0.052)	(0.044)	(0.073)	(0.068)
Observations	600	600	600	600
Mean Y	0.0016	0.0041	0.0016	0.0041
R-sq	0.2153	0.2214	0.1352	0.0537
Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y

Standard errors in parentheses.

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

Notes: This table shows the OLS and 2SLS results where the outcomes are change in native working-age population and change in native working-age employment both relative to the 2010 state total working-age population. Year and state fixed effects are added. Standard errors are clustered at the state-level. The F-statistic of the first-stage regression is 10.25. District of Columbia is excluded from the analysis. Data is taken from the 2011-2022 CPS ASEC.

Table A2: Native Inter-state Mobility and Local Shocks: two-year periods

	Total			College Educated			Non-College Educated		
	(1) In	(2) Out	(3) Net	(4) In	(5) Out	(6) Net	(7) In	(8) Out	(9) Net
Bartik Shock	-0.205	-0.073	-0.131	-0.005	0.380	-0.385	-0.200*	-0.453	0.254
	(0.184)	(0.277)	(0.304)	(0.100)	(0.345)	(0.293)	(0.116)	(0.338)	(0.348)
Change Immig	0.063**	0.013	0.050	0.012	0.011	0.002	0.050**	0.002	0.048
	(0.026)	(0.053)	(0.070)	(0.014)	(0.035)	(0.038)	(0.019)	(0.037)	(0.047)
Post x Change Immig	0.033	0.026	0.007	0.040	-0.060	0.100	-0.007	0.087	-0.094
	(0.119)	(0.091)	(0.140)	(0.048)	(0.055)	(0.075)	(0.082)	(0.077)	(0.098)
Post x Remote	0.019	0.047***	-0.028	0.008	-0.000	0.008	0.011	0.047***	-0.036**
	(0.017)	(0.016)	(0.024)	(0.008)	(0.010)	(0.015)	(0.011)	(0.015)	(0.017)
Observations	300	300	300	300	300	300	300	300	300
Mean Y	0.0190	0.0193	-0.0003	0.0073	0.0076	-0.0003	0.0117	0.0117	-0.0000
R-sq	0.7200	0.6671	0.4033	0.5886	0.4437	0.3539	0.7432	0.6689	0.3763
Period FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

Standard errors in parentheses.

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

Notes: This table shows the OLS results where the outcomes are 2-year averages of native working-age in, out and net-migration to states relative to the 2010 state total working-age population. Here, the data is constructed at the period-state level, where a period pertains to two consecutive years. Period and state fixed effects are added. Standard errors are clustered at the state-level. District of Columbia is excluded from the analysis. Data is taken from the 2011-2022 CPS ASEC.