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

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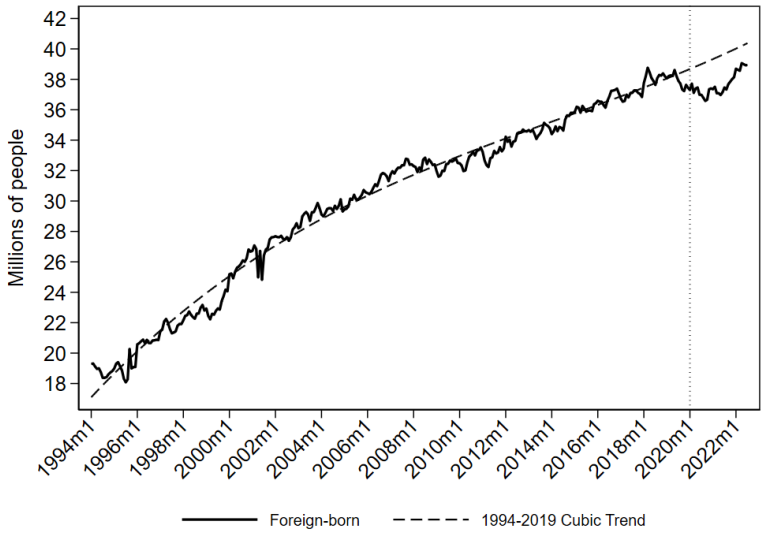
A Appendix Figures and Tables

Figure A1: US Working-age, Foreign-born Population, January 1994-July 2022



Notes: The solid line shows the total number of working-age (18-65) foreign-born individuals. The dashed line provides the cubic fit of the data from January 1994 to May 2019. By June 2022, the number of working-age foreign-born individuals was smaller by 1,390,236 relative to the level it would have achieved if the 1994-2019 trend had continued to June 2022. Data Source: Monthly CPS, January 1994 - July 2022.

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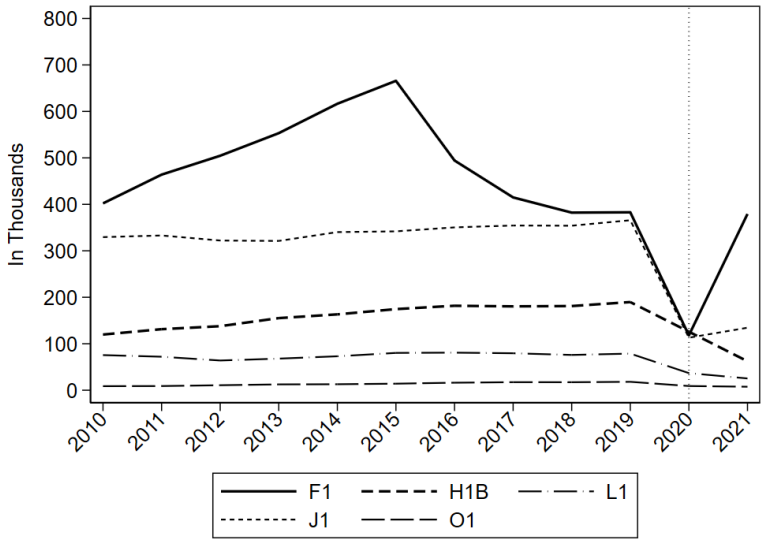
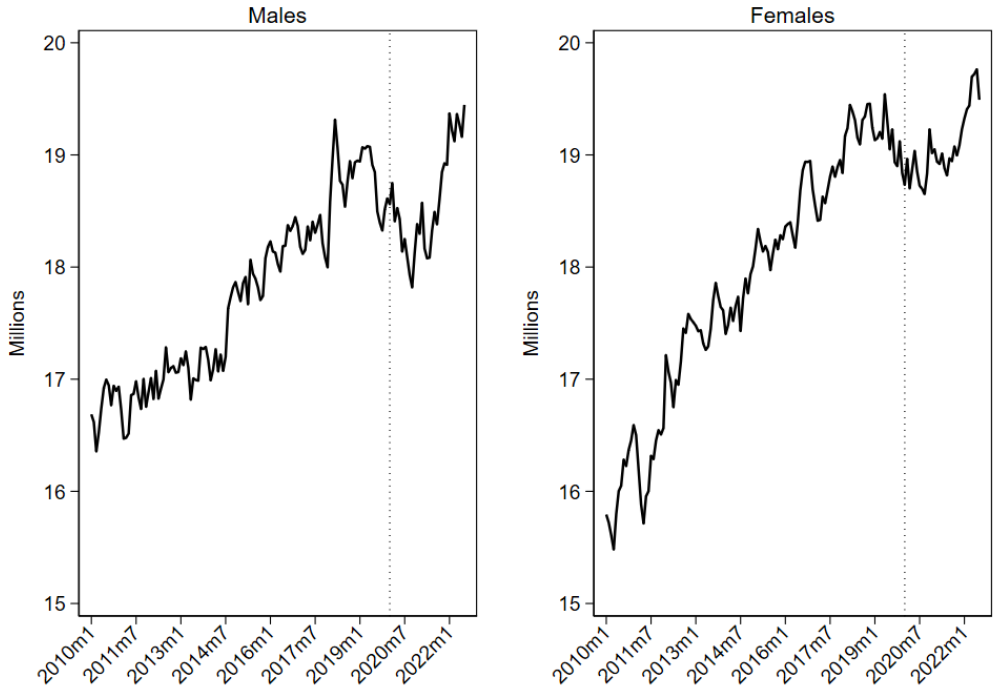
Figure A2: Visa Issuance by Class and Year



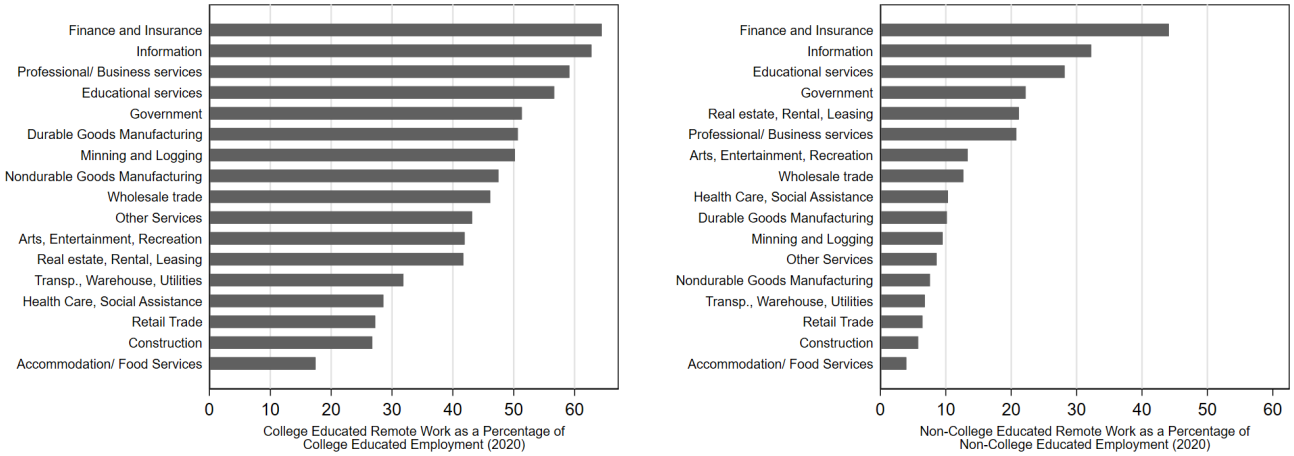
Notes: This figure shows the total number of visas issues by class and year. Data Source: Nonimmigrant Visa Statistics. U.S. Department of State, 2010 - 2021.

Figure A3: 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.

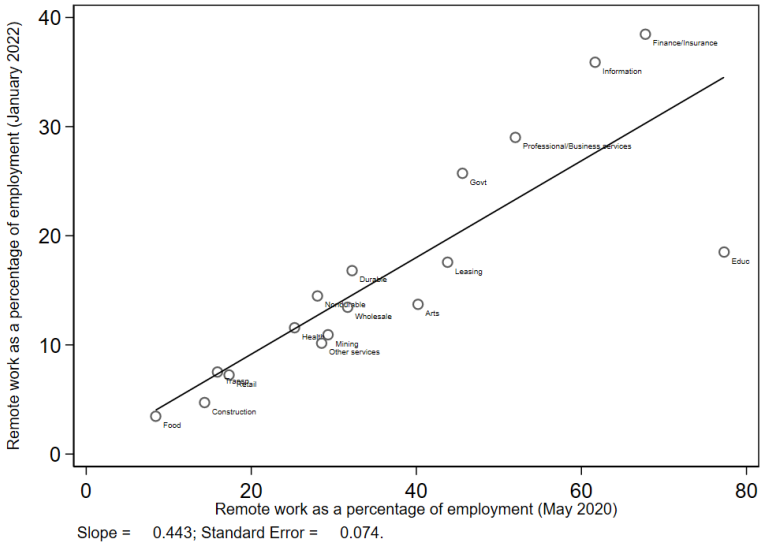
Figure A4: Remote Employment by Sectors and by College Education in 2020



(a) College Educated (b) Non-College Educated

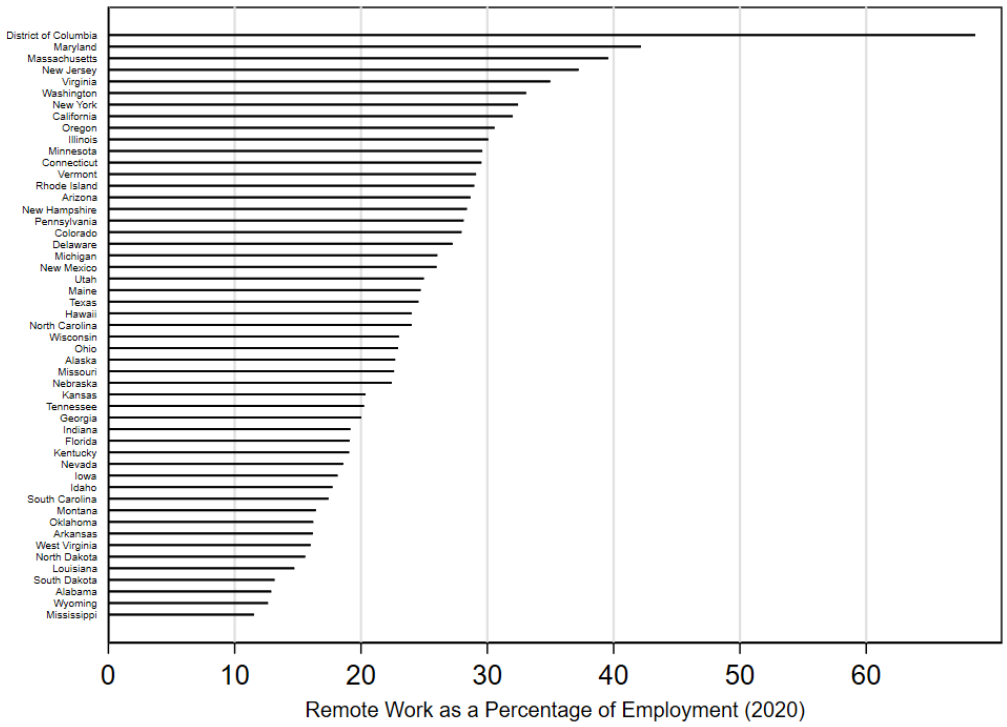
Notes: This figure shows the average percentage of working-age college (non-college) educated remote employment relative to total working-age college (non-college) educated employment across months for each sector in 2020. We exclude individuals who do not report an industry. Data Source: Monthly CPS,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

Figure A5: Persistence of Remote Employment across Sectors



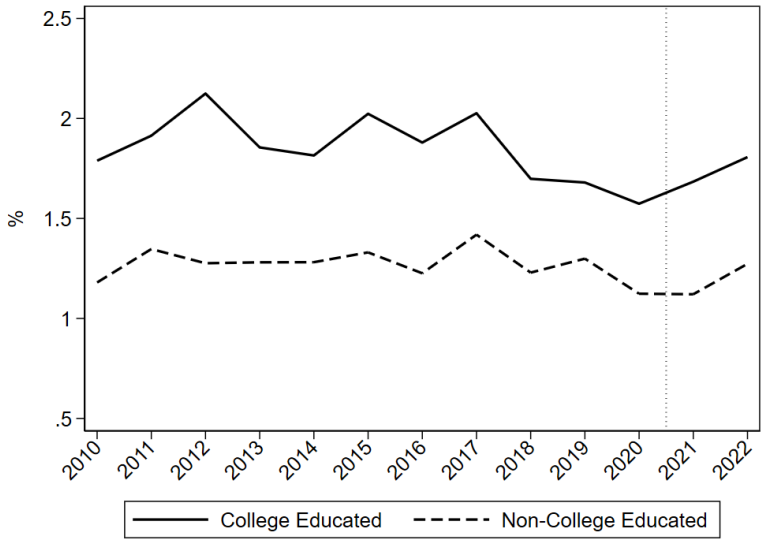
Notes: This figure shows the correlation in percentage of remote employment across sectors between May 2020 and January 2022. We exclude individuals who do not report an industry. The line represents the fitted values. Data Source: Monthly CPS, May 2020 - December 2020.

Figure A6: Remote Employment by State (2020)



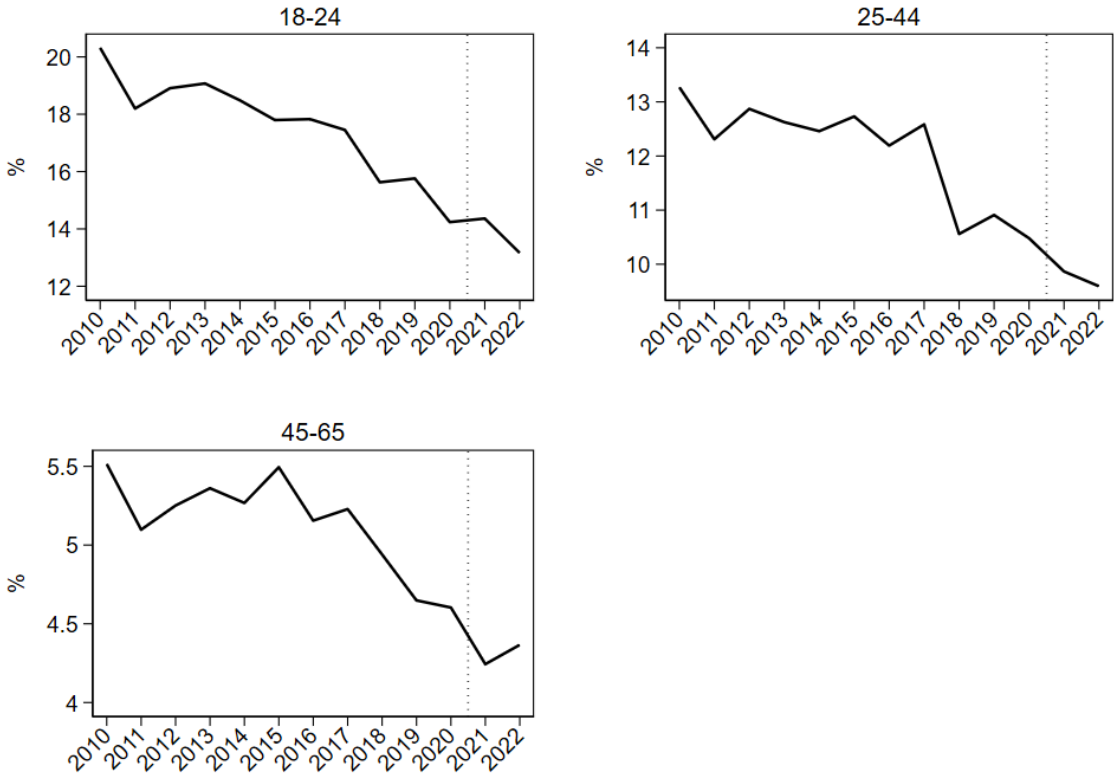
Notes: This figure shows the average percent of working-age remote employment relative to total working-age employment in 2020 for each state. Data Source: Monthly CPS, May 2020 - December 2020.

Figure A7: Working-age Native-born Mobility Rates by College Education



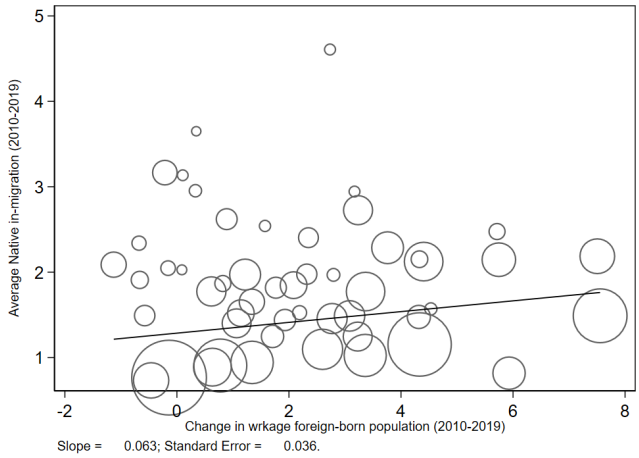
Notes: The lines show total working-age native college (non-college) educated population that migrated between states relative to the total working-age college (non-college) educated population by year. Data Source: CPS ASEC, 2010 - 2022.

Figure A8: Working-age Native-born Mobility Rates by Age Categories

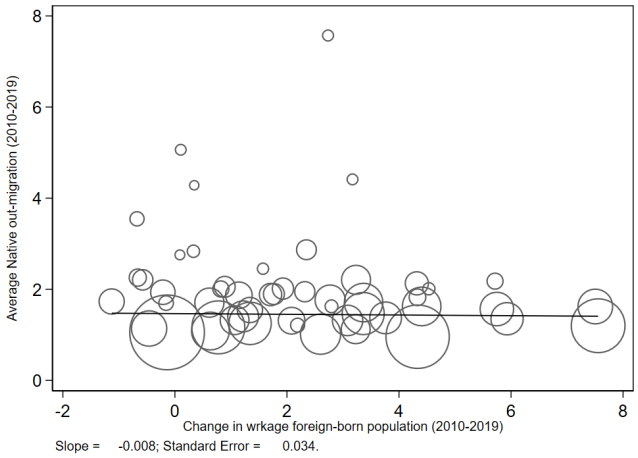


Notes: The lines show total native population by age category that migrated between and within states relative to the total population of each category by year. Data Source: CPS ASEC, 2010 - 2022.

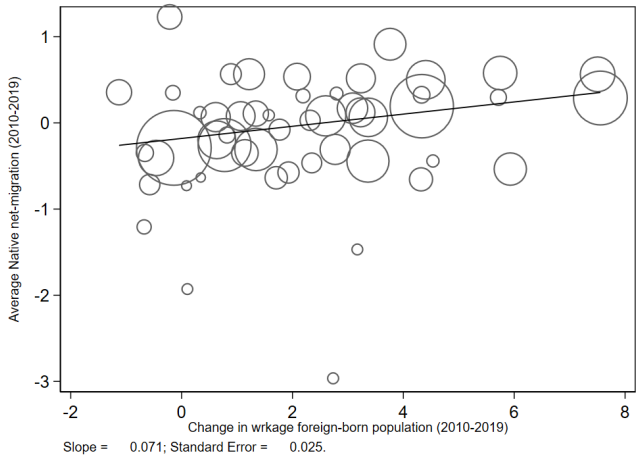
Figure A9: Working-age Native-born Migration Patterns vs Change in Foreign-born Population by State (Pre-Covid Pattern)



(a) In-migration



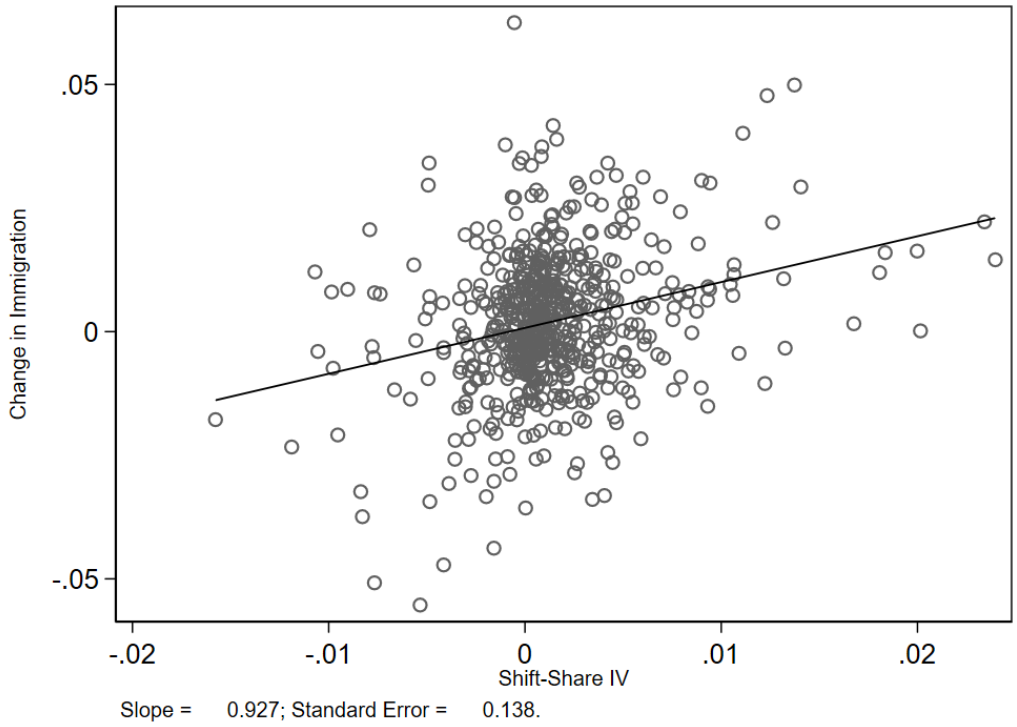
(b) Out-migration



(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 A10: 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: Native Inter-state Mobility and Local Shocks

	OLS			2SLS		
	In	Out	Net	In	Out	Net
	(1)	(2)	(3)	(4)	(5)	(6)
Vacancies Bartik Shock	0.075*	-0.084	0.159*	0.095	-0.084	0.179
	(0.043)	(0.098)	(0.092)	(0.068)	(0.116)	(0.118)
Change Immig	0.025	-0.007	0.033	0.108	-0.272	0.379
	(0.018)	(0.033)	(0.041)	(0.104)	(0.230)	(0.274)
Post x Change Immig	0.031	0.008	0.023	0.107	0.186	-0.079
	(0.061)	(0.046)	(0.068)	(0.275)	(0.433)	(0.533)
Post x Remote	0.014	0.044***	-0.030	0.021	0.037	-0.016
	(0.018)	(0.016)	(0.025)	(0.021)	(0.022)	(0.036)
Observations	600	600	600	600	600	600
Mean Y	0.0190	0.0193	-0.0003	0.0190	0.0193	-0.0003
Within R-sq	0.0106	0.0108	0.0118			

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. The Bartik shock is constructed using the change in vacancies as the shift component. Year 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 2012-2022 CPS ASEC.

Table A2: College Educated Native Inter-state Mobility and Local Shocks

	OLS			2SLS		
	In	Out	Net	In	Out	Net
	(1)	(2)	(3)	(4)	(5)	(6)
Vacancies Bartik Shock	0.014	-0.024	0.038	0.042	-0.040	0.082
	(0.028)	(0.045)	(0.060)	(0.037)	(0.051)	(0.070)
Change Immig	0.009	0.017	-0.008	0.024	-0.093	0.117
	(0.011)	(0.022)	(0.023)	(0.061)	(0.102)	(0.119)
Post x Change Immig	0.023	-0.064	0.086*	0.192	-0.096	0.288
	(0.032)	(0.046)	(0.047)	(0.176)	(0.242)	(0.383)
Post x Remote	0.007	0.006	0.000	0.015	-0.001	0.016
	(0.008)	(0.010)	(0.015)	(0.014)	(0.019)	(0.030)
Observations	600	600	600	600	600	600
Mean Y	0.0073	0.0076	-0.0003	0.0073	0.0076	-0.0003
Within R-sq	0.0062	0.0049	0.0067			

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. The Bartik shock is constructed using the change in vacancies as the shift component. Year 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 2012-2022 CPS ASEC.

Table A3: Non-College Educated Native Inter-state Mobility and Local Shocks

	OLS			2SLS		
	In	Out	Net	In	Out	Net
	(1)	(2)	(3)	(4)	(5)	(6)
Vacancies Bartik Shock	0.061*	-0.060	0.121*	0.053	-0.044	0.097
	(0.032)	(0.070)	(0.065)	(0.043)	(0.092)	(0.085)
Change Immig	0.016	-0.025	0.041	0.084	-0.179	0.263
	(0.015)	(0.026)	(0.029)	(0.073)	(0.176)	(0.200)
Post x Change Immig	0.008	0.072	-0.063	-0.085	0.282	-0.367
	(0.041)	(0.045)	(0.058)	(0.205)	(0.310)	(0.342)
Post x Remote	0.007	0.038***	-0.031*	0.007	0.038**	-0.032
	(0.012)	(0.012)	(0.017)	(0.012)	(0.017)	(0.024)
Observations	600	600	600	600	600	600
Mean Y	0.0117	0.0117	-0.0000	0.0117	0.0117	-0.0000
Within R-sq	0.0086	0.0175	0.0175			

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. The Bartik shock is constructed using the change in vacancies as the shift component. Year 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 2012-2022 CPS ASEC.

Table A4: Native Sector-Mobility and Local Shocks

	OLS			2SLS		
	Mobility Rate	In-Mobility	Out-Mobility	Mobility Rate	In-Mobility	Out-Mobility
	(1)	(2)	(3)	(4)	(5)	(6)
Vacancies Bartik Shock	-0.047	-0.019	-0.041	-0.241	-0.042	-0.077
	(0.107)	(0.038)	(0.033)	(0.190)	(0.050)	(0.049)
Change Immig	0.033	0.003	0.026	0.421	0.025	0.153
	(0.048)	(0.014)	(0.020)	(0.334)	(0.086)	(0.129)
Post x Change Immig	0.066	0.028	-0.027	-1.431*	-0.137	-0.348
	(0.140)	(0.044)	(0.036)	(0.790)	(0.189)	(0.211)
Post x Remote	-0.056	-0.025*	-0.023*	-0.100	-0.030**	-0.030*
	(0.046)	(0.013)	(0.013)	(0.067)	(0.014)	(0.015)
Observations	600	600	600	600	600	600
Mean Y	0.0924	0.0193	0.0210	0.0924	0.0193	0.0210
Within R-sq	0.0078	0.0126	0.0133			

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. The Bartik shock is constructed using the change in vacancies as the shift component. 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. District of Columbia is excluded from the analysis. Data is taken from the 2012-2022 CPS ASEC.

Table A5: Job Openings, Local Wages and Local Shocks

	Job Openings / Pops2010	Job Openings / Pops2010	Δ Log Hourly Wage	Δ Log Hourly Wage
	(1)	(2)	(3)	(4)
Vacancies Bartik Shock	0.011	0.009	-0.344	-0.292
	(0.014)	(0.027)	(0.923)	(1.134)
Change Immig	-0.012*	-0.021	-0.330	0.324
	(0.006)	(0.037)	(0.759)	(2.507)
Post x Change Immig	0.022	0.015	0.986	0.910
	(0.023)	(0.136)	(1.065)	(4.022)
Post x Remote	-0.007	-0.008	-0.051	-0.018
	(0.011)	(0.015)	(0.154)	(0.244)
Observations	600	600	550	550
Mean Y	0.0343	0.0343	0.0110	0.0110
Within R-sq	0.0078		0.0015	

Standard errors in parentheses.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Notes: This table shows the OLS (columns 1 and 3) and 2SLS results (columns 2 and 4) where the outcome is the annual average number of vacancies in a state relative to the 2010 state total working-age population (columns 1 and 2) or the change in Log Hourly Wage (columns 3 and 4). The Bartik shock is constructed using the change in vacancies as the shift component. Year 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 BLS, JOLTS 2011-2022.

Table A6: Total Working-age Native Population-Employment and Local Shocks

	OLS		2SLS	
	Δ Native Population	Δ Native Employment	Δ Native Population	Δ Native Employment
	(1)	(2)	(3)	(4)
Bartik Shock	-0.075	0.556	0.068	0.374
	(0.681)	(0.421)	(0.684)	(0.512)
Change Immig	-0.689***	-0.508***	-0.843	-0.483
	(0.072)	(0.090)	(0.504)	(0.501)
Post x Change Immig	0.000	-0.113	-0.426	0.667
	(0.191)	(0.178)	(0.835)	(1.100)
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
Within R-sq	0.1659	0.0997		

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 Kleinbergen-Paap Wald statistics of the first-stage regression is 4.4. District of Columbia is excluded from the analysis. Data is taken from the 2011-2022 CPS ASEC.

Table A7: Native Inter-state Mobility and Local Shocks: two-year periods

	Total			College Educated			Non-College Educated		
	In	Out	Net	In	Out	Net	In	Out	Net
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
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

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.

B Validity Tests and Goldsmith-Pinkham et al. (2020) Diagnostics for the Shift-Share IV

Table A8 below shows the coefficients of the constructed shift-share IV, calculated for the change in immigration across US states in 2020-2022, that were on different pre-2020 trends. Column (1) shows the partial correlation with the change in native inflows over the period 2010-2019. Column (2) shows the partial correlation with the change in native population during the same period. Column (3) shows the partial correlation with the changes in native employment from 2010 to 2019. The reported coefficients are obtained from an OLS regressions including the Bartik 2020-2022 variable and the Remote-Work variable as controls. None of the coefficients is significant at the 5% significance level, which is consistent with the validity of the IV. The power of the test, however, is limited due to the large standard errors.

Table A8: Effect of 2020-2022 Changes in IV on pre-period (2010-2019) Changes in Outcomes

	Δ Native In-mig (2010-2019)	Δ Native Pop (2010-2019)	Δ Native Emp (2010-2019)
	(1)	(2)	(3)
Change Immig (2020-2022)	-0.343*	1.358	0.297
	(0.193)	(1.216)	(0.981)
Observations	50	50	50
Mean Y	0.0014	0.0060	0.0421
Within R-sq	0.0466	0.0460	0.1239

Standard errors in parentheses.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Notes: This table shows the OLS estimate of the effect of the change in the IV (2020-2022) on pre-period changes (2010-2019) in outcomes. All outcomes are relative to the 2010 state total working-age population. We include changes in the Bartik shock (2020-2022) and the share of remote work (2020) as controls. Standard errors are clustered at the state-level. District of Columbia is excluded from the analysis. Data is taken from the 2012-2022 CPS ASEC. Specifically, we run the following regression:

$$\Delta Y_{s,2010-2019} = \beta_0 \frac{\sum_{c=1}^{51} S_{sc}^{2010} \cdot F_{2022}^{c} - \sum_{n=1}^{51} S_{sc}^{2010} \cdot F_{2020}^{c}}{Pop_{s,2010}} + \beta_1 \frac{\Delta BartikEmpl_{s,2020-2022}}{Pop_{s,2010}} + \gamma_1 \frac{Remote_{s,2020}}{Pop_{s,2020}} + \varepsilon_s \tag{2}$$

Table A9 below shows the shift-share IV diagnostics, following Goldsmith-Pinkham et al. (2020). We consider the shift-share for the change in immigrants over the period 2020-2022, with initial shares constructed in 2010. In Panel A, we see that one third of the shares have a negative weight, which casts some doubt on the validity of using all shares in the IV. However, reassuringly, panel C shows that the most relevant shares in terms of identifying variation (large values of Rothemberg weights) produce non-significant estimates of the coefficient on native mobility ($\hat{\beta}_c$), consistently with the full shift-share IV estimates. Panel D also confirms that the estimates obtained using a selected sub-set of shares as IV are not significantly different from 0 and from each other. Overall the tests in this section do not show evidence against the validity of the IV, but confirm the relatively low power and weakness of the shift-share and of similar IVs based on individual shares.

Table A9: IV diagnostics

Panel A: Negative and positive weights

	Sum	Mean	Share
$\hat{\alpha}_c \leq 0$	-1.092	-0.05	0.343
$\hat{\alpha}_c > 0$	2.092	0.072	0.657

Panel B: Correlations

	$\hat{\alpha}_c$	G_c	$\hat{\beta}_c$	$\hat{F}_c$	$Var(S_c)$
$\hat{\alpha}_c$	1.0000				
G_c	0.5734	1.0000			
$\hat{\beta}_c$	-0.0077	-0.0514	1.0000		
$\hat{F}_c$	0.2717	0.1240	-0.0826	1.0000	
$Var(S_c)$	0.36	0.3133	-0.1265	0.2558	1.0000

Panel C: Top 5 country groups

	$\hat{\alpha}_c$	G_c	$\hat{\beta}_c$	$\hat{F}_c$
CUB	0.364	141951.1	-0.2074	3.23
COL	0.314	126971.3	0.017	1.315
VEN	0.201	162197.4	0.03	2.203
NGA	0.171	-120762.6	-0.355	0.6137
MEX	0.145	356626.7	1.467	0.184

Panel D: OLS and IV estimates

	(1)	(2)	(3)	(4)	(5)	(6)
		Share	Share	Shares	Shares	Shift-share
	OLS	CUB	COL	CUB & COL	Top 5	IV
$\hat{\beta}$	0.085	-0.207	0.018	0.081	-0.065	0.349
	(0.084)	(0.223)	(0.183)	(0.189)	(0.104)	(0.331)
$\hat{F}$		3.234	1.315	2.048	1.080	2.944
Over ID				0.271	0.447	

Notes: The table reports the shift-share IV diagnostics as suggested by Goldsmith-Pinkham et al. (2020). Panel A reports the sum, the mean and the share of negative and positive Rotemberg weights $\hat{\alpha_c}$. Panel B reports correlations between the weights ($\hat{\alpha_c}$), the 2020-2022 change in immigrants by country-group (Gc), the just-identified coefficients ($\hat{\beta_c}$), the first stage F-statistics for the just-identified instruments ($\hat{F_c}$) and the variance in the foreign-born shares across country groups (Var(S_c)). Panel C reports the top five country groups according to the Rotemberg weights. CUB stands for Cuba, COL for Colombia, VEN for Venezuela, NGA for Nigeria, and MEX for Mexico. The coefficients $\hat{\beta_c}$ are based on a regression, where the outcome is the change 2020-2022 in the native working-age in-migration as a share of the 2010 state population, and control variables include the share of remote work and the Bartik shock, both as a share of the total state population in 2010. We computed the Rotemberg decomposition using Goldsmith-Pinkham, Sorkin, and Swift (2020)'s Stata package. Panel D shows our main coefficient of interest estimated using different IVs: 2SLS estimates using the share to Cuba ("Share CUB") and to Colombia ("Share COL") as instruments, both separately and jointly ("Shares CUB & COL"), as well as LIML estimates using the top-5 shares of Panel C jointly ("Top 5"). We report the first stage F-statistic and the p-value of the Sargan over-identification statistic when appropriate. The "OLS" and "Shift-share IV" columns show the coefficients of OLS and 2SLS regressions, for comparison.

References

Goldsmith-Pinkham, Paul, Isaac Sorkin, and Henry Swift, "Bartik instruments: What, when, why, and how," *American Economic Review*, 2020, *110* (8), 2586–2624.