Impact of COVID-19 Immigration Restrictions on the US Labor Market and Skill Demand

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Content

Introduction: Before COVID-19

- **Immigrant Significance:** Immigrants constitute a growing share of the U.S. population and workforce.
  - Positive effects on GDP, innovation, and poverty reduction

- **Trends:** Immigrant share of the working-age population rose from 11.4% in 1995 to 18.4% in 2019.

- **Push and Pull Factors**
  - **Push:** Economic hardships, political instability, limited jobs
  - **Pull:** Higher-paying jobs, labor demand, better living conditions

- **Task specialization and adaptation**
  - Less-educated immigrants tend to specialize in manual-intensive service occupations (Peri and Sparber 2009)
  - Recent immigrants include highly skilled individuals, particularly in STEM fields (science, technology, engineering, and math)

Immigration Policy Responses To The Pandemic

✓ April 2020: Immigrant visa ban on issuance of most categories

✓ June 2020: Ban on popular temporary work visas
  - H-1B, H-2B, J-1, L-1 visas, and visas for their family members

✓ February 2021: Ban on permanent immigrant visas ended

✓ March 2021: Ban on temporary visas expired

Table 1: Number of Visas Issued by the Department of State

Immigrant (Permanent) Visa Issuance			
	Before the Ban: May 2019–February 2020	During the Ban: May 2020–February 2021	Percent Change
Banned Visas	273,000	17,000	-94%
Exempt Visas	119,000	66,000	-45%
Nonimmigrant (Temporary) Visa Issuance			
	Before the Ban: July 2019–March 2020	During the Ban: July 2020–March 2021	Percent Change
Banned Visas	628,000	161,000	-74%
Exempt Visas	5,195,000	1,076,000	-79%

Notes: Nonimmigrant visa numbers include visas for tourists and business travelers.
Sources: Migration Policy Institute analysis of data from the U.S. Department of State

US Working-age Foreign-born Population
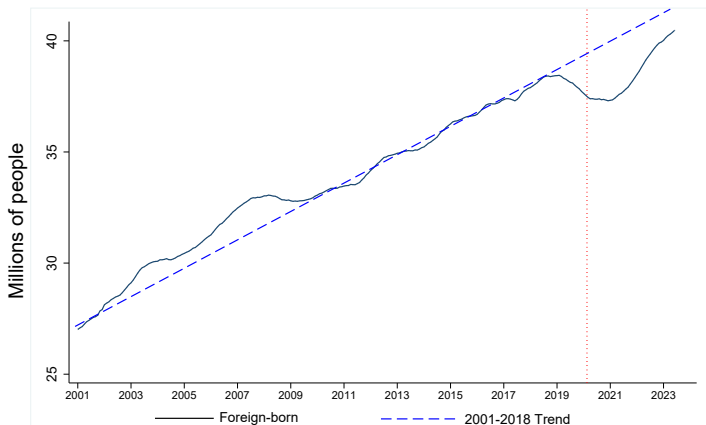
Notes: The solid line shows the centered twelve-month moving average total number of working-age (15-64) foreign-born individuals, considering 6 months before and 6 months after each observation. The dashed line provides the linear fit of the data from 2001 to 2018 and has a slope of 644,868. In 2020, the number of working-age foreign-born individuals fell by 2,321,016, compared with the level that would have reached if the 2001-2018 trend had continued to 2020.

Introduction: During and after COVID-19

- **COVID-19 Impact:** Sharp decline in immigration due to border closures, travel bans, and visa restrictions

- **Resulting Changes**
  - Estimated shortfall of 2.3 million working-age foreign-born individuals in 2020.
  - Share of foreign-born in the working-age population dropped from 18.4% (March 2019) to 17.5 % (September 2020).
  - Peri and Zaiour (2022) estimate a 1.65 million shortfall in 2021.

- **Labor Market Tightness**
  - Shortage of immigrant labor tightened the U.S. labor market
  - Impact sectors reliant on immigrant workers, such as agriculture, hospitality, construction, and personal services.

Contribution of this Paper: Novel Study on

- **Effect of COVID-19 Immigration Visa Ban on Labor Market**
  - Examine the effects of the immigration visa ban on both native- and foreign-born employment and wages
  - No prior literature has focused specifically on how COVID-19 immigration visa ban have impacted labor market outcomes

- **Effect of Immigration Restrictions on Employers' Skill Demand**
  - Utilize Job Postings (BG) and Current Population Survey (CPS)
  - Enhance our understanding of the effect of Covid immigration restrictions on skill demand and technology adoption.

- **Methodology**
  - Panel regression, difference-in-differences (DiD), event-studies
  - Capture both differential pre-trends and post-ban effects, documenting labor market dynamics over time
  - ✓ A unique approach using the immigration visa ban as an exogenous shock to analyze automation and skill demand.

$\Longrightarrow$ This study provides a distinct analysis of both labor market outcomes and employer behavior in the context of the COVID-19 immigration visa ban.

A Comprehensive Study Filling Gaps in the Literature

- **Immigration Restrictions & Immigrant-Native Substitutability**
  - **Substitutes:** Czech workers' influx into German border regions caused significant drops in native employment, especially for younger and unskilled workers (Dustmann et al. 2017)
  - **Complements:** IR fail to improve native employment & wages, leading to high labor costs (East et al. 2023; Clemens et al. 2018)
  - ✓ My paper: Native workers substitute immigrants during the visa van.

- **Immigration and Polarization**
  - Immigrants delay automation and mitigate employment polarization (Basso et al. 2020; Mandelman and Zlate 2014)
  - ✓ My paper: Firms adopt new technology and automation after IRs.

- **Skill Demand, Technology Adoption, and Labor Market**
  - Automation reduced demand for routine jobs while increasing demand for cognitive/analytical skills (Autor et al. 2003; Acemoglu et al. 2019)
  - ✓ My paper: IRs increase demand for STEM and analytical skills while decreasing demand for management and administrative roles.

Research Questions

- Question 1 How did Immigration of Foreign-Born to the US change during and after Covid-19?
  - Which group is affected: education, age, gender, regions, and sectors?

- Question 2 Did the drop in immigration increase the share of native employment and induce disproportionate wage growth, indicating a substitution effect?

- Question 3 Did the drop in immigration affect employer skill requirements and firms' adoption of new technologies?
  - Identify the skills associated with immigrants

Empirical Strategy: Employment response

Difference in Differences: TWFE (quarterly CPS, 2015-2023)

$$ln(L_{g,c,t}^{N \, or \, F}) = \alpha + \delta_c + \tau_t + \gamma_1 \left(Immigration \, Shock_c \times Ban_t \right) + \beta X_{c,t} + \varepsilon_{g,c,t}.$$

$$\left(\frac{L^{N \, or \, F}}{Pop} \right)_{g,c,t} = \alpha + \delta_c + \tau_t + \gamma_2 \left(Immigration \, Shock_c \times Ban_t \right) + \beta X_{c,t} + \varepsilon_{g,c,t}.$$

where $Immigration \, Shock_c = \Delta Foreign\text{-}born \, Share_c$

$$= Foreign\text{-}born \, Share_{c, Apr2020-Mar2021} - Foreign\text{-}born \, Share_{c,2017-2019}$$

✓ $L_{g,c,t}^N$: Number of native employment of group g in county c at time t

✓ $(\frac{L^N}{Pop})_{g,c,t}$: Share of native employment in working-age population

✓ $Immigration \, Shock_c$: Continuous variable measuring exposure to shocks at the county level, values between 0 and 1.

✓ Ban_t: Indicator variable that denotes whether time t belongs between Apr 2020 and Mar 2021, immigrant visa ban period

✓ δ_c: Geographic (MSA, county, or state) fixed effect

✓ τ_t: Temporal fixed effect

✓ $\varepsilon_{g,c,t}$: Error term, clustered at the county c level

$\implies$ γ_1, γ_2 show the response of employment to immigration shocks.

Pre-pandemic Foreign-born Share and Change in Proportion of Immigrants in Population


coef = -.058, (robust) se = .019, t = -2.91
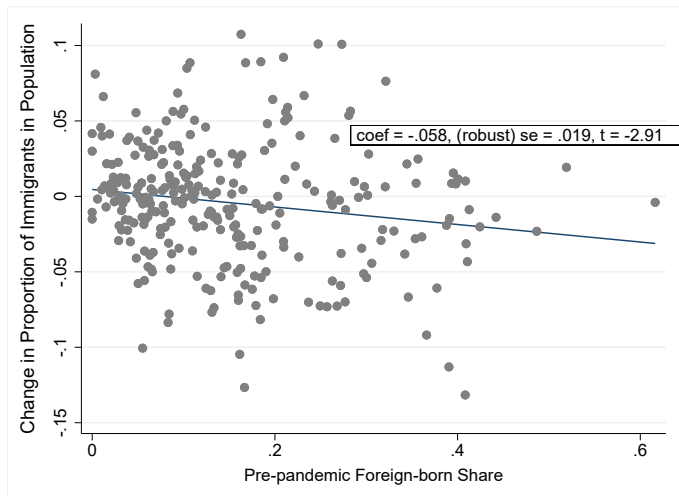
The change in the proportion of immigrants in the population is measured as a change in the mean of the immigrant visa ban period (Apr 2020 to Mar 2021) compared to the mean of 2017-2019. The pre-pandemic foreign-born population share is based on data from 2017.

Share of Foreign-born Aged 15-64 in Population

Share of Foreign-born Population Aged 15-64 by Sex
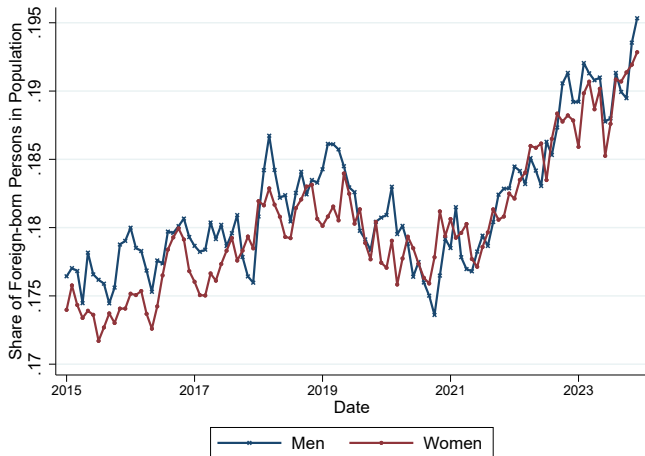
Empirical Strategy: Disproportionate wage growth

Difference in Differences: TWFE (quarterly CPS, 2015-2023)

$$ln(W_{g,c,t}^N) = \alpha + \delta_c + \tau_t + \gamma_3 \ (\textit{Foreign-born Share}_{c,2017} * Ban_t) + \beta X_{c,t} + \varepsilon_{g,c,t}.$$

$$ln(W_{g,c,t}^F) = \alpha + \delta_c + \tau_t + \gamma_4 \ (\textit{Foreign-born Share}_{c,2017} * Ban_t) + \beta X_{c,t} + \varepsilon_{g,c,t}.$$

- ✓ $W_{g,c,t}^N$: Average real wages of natives in county c, year-quarter t
- ✓ $W_{g,c,t}^F$: Average real wages of immigrants at county c in time t
- ✓ $X_{c,t}$: Time-varying controls, demographic characteristics
  - Age, age squared, gender (female), race (Black, Hispanic, Asian)
  - Marital status, presence of children (any age and under 5)
  - Educational attainment: High school dropout, high school diploma, some college, bachelor's degree, master's degree
  - Nativity of parents: Whether both parents are native-born
  - Employment characteristics: Full-time status, private-sector employment, government employment, and union coverage

$\implies \gamma_3$ and γ_4 show the response of wages to immigration shocks.

Regression Results (1)

Table 2: Immigration Shocks on Native- and Foreign-born Employment

	All	Gender		Skill	
	(1)	(2) Male	(3) Female	(4) High-	(5) Low-
Log(Native-born Employment)					
Foreign-born $\text{Share}_{c,2017}$	0.087**	0.064*	0.032	0.047	0.150***
	(0.036)	(0.038)	(0.041)	(0.040)	(0.054)
Observations	10,115	10,115	10,112	10,114	10,104
R^2	0.953	0.945	0.945	0.934	0.886
Log(Foreign-born Employment)					
Foreign-born $\text{Share}_{c,2017}$	-0.204**	-0.287**	-0.412***	-0.432***	-0.270*
	(0.103)	(0.144)	(0.145)	(0.152)	(0.165)
Observations	9,250	8,738	8,480	8,640	7,990
R^2	0.889	0.835	0.825	0.794	0.780
Geography FE	County	County	County	County	County
Time fixed effect	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes
Employment type	Yes	Yes	Yes	Yes	Yes

Notes: If the employment of immigrants is zero, they were excluded from the sample for the Log of Foreign-born Employment. Standard errors in parentheses are clustered by the geography (281 counties or 261 MSAs) for all specifications. Significance levels: * 0.10, **0.05, ***0.01.

Regression Results (2)

Table 3: Immigration on Share of Native- and Foreign-born Employment

	All	Gender		Skill	
	(1)	(2) Male	(3) Female	(4) High-	(5) Low-
Share of Native-born Employment					
Foreign-born Share$_{c,2017}$	0.084***	0.053***	0.090***	0.071***	0.075**
	(0.016)	(0.018)	(0.023)	(0.018)	(0.030)
Observations	10,115	10,115	10,113	10,114	10,109
R^2	0.850	0.812	0.766	0.750	0.732
Share of Foreign-born Employment					
Foreign-born Share$_{c,2017}$	-0.059***	-0.035*	-0.056***	-0.060***	-0.075***
	(0.010)	(0.019)	(0.017)	(0.016)	(0.026)
Observations	10,115	10,115	10,113	10,114	10,109
R^2	0.902	0.804	0.767	0.767	0.725
Geography FE	County	County	County	County	County
Time fixed effect	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes
Employment type	Yes	Yes	Yes	Yes	Yes

Notes: This table shows the share of Native- and foreign-born Employment in the population. Standard errors in parentheses are clustered by the geography (281 counties or 261 MSAs) for all specifications. Significance levels: * 0.10, **0.05, ***0.01.

Dynamic Effects & Robustness Checks: Event Studies

Validate the identification strategy by testing for pre-trends and evaluating the dynamic effects of the immigration ban

$$y_{g,c,t} = \alpha + \delta_c + \tau_t + \beta X_{c,t} + \sum_{x=-4+}^{-1} \tau_x \cdot (\textit{Foreign-born Share}_{c,2017} \geq 0)$$

$$+ \sum_{x=1}^{4+} \rho_x \cdot (\textit{Foreign-born Share}_{c,2017} * \textit{Ban}_t) + \varepsilon_{g,c,t}$$

- ✓ $y_{g,c,t}$: Outcome variables of group g at county c in time t
- ✓ δ_c: County fixed effect
- ✓ τ_t: Year-quarter fixed effect
- ✓ $X_{c,t}$: Time-varying controls, demographic characteristics
- ✓ Treatment variable: Foreign-born share across counties at time t
- ✓ Interaction terms: Leads and lags interact with foreign-born share to capture intensity
- ✓ Event time: Quarters relative to immigration visa bans (Q2 2020, x=0)

Event Study: Share of Native-born Employment, All
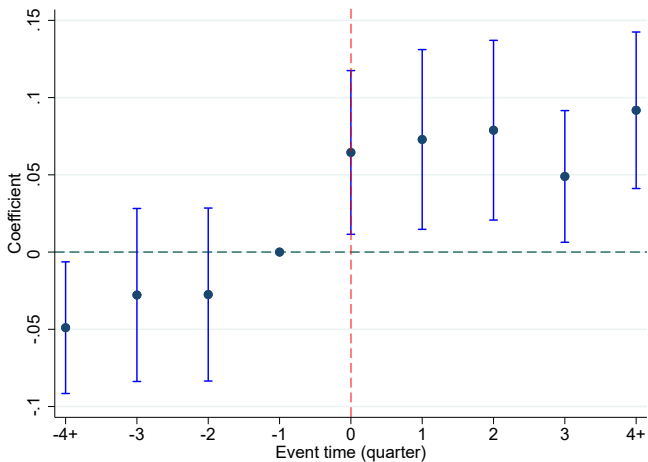
Notes: The panel variable is county. Standard errors are clustered at the county level, and the 95% confidence intervals are shown by the vertical lines. The horizontal axis denotes the event time in the months before and after the implementation of the immigration visa ban.

Event Study: Share of Foreign-born Employment, All
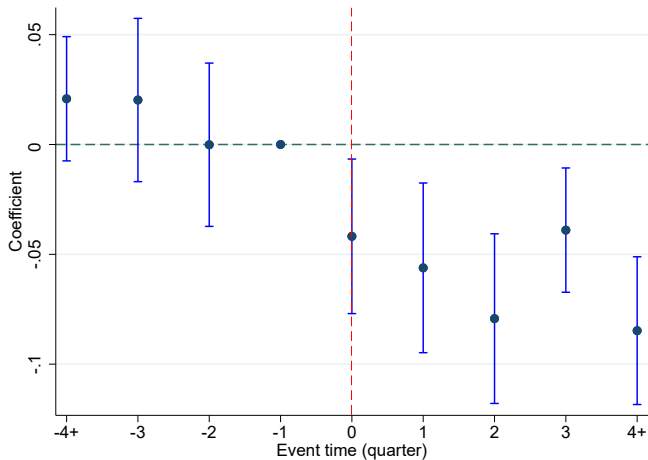
Notes: The panel variable is county. Standard errors are clustered at the county level, and the 95% confidence intervals are shown by the vertical lines. The horizontal axis denotes the event time in the months before and after the implementation of the immigration visa ban.

Regression Results (3)

Table 4: Effect of Immigration Shocks on Real Wages

	All	Gender		Skill	
	(1)	(2) Male	(3) Female	(4) High-	(5) Low-
$ln(hourly\ wages_{Native})$					
Foreign-born Share$_{c,2017}$	-0.067**	-0.087**	-0.067	-0.024	-0.075
	(0.034)	(0.041)	(0.044)	(0.047)	(0.049)
R^2	0.421	0.403	0.410	0.389	0.363
$ln(hourly\ wages_{Foreign})$					
Foreign-born Share$_{c,2017}$	0.039	-0.030	0.113**	0.037	0.058
	(0.048)	(0.050)	(0.046)	(0.051)	(0.051)
R^2	0.267	0.299	0.300	0.335	0.282
N	9,273	9,273	9,273	9,273	9,272
Geography FE	County	County	County	County	County
Time FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Notes: I use the consumer price index to transform nominal hourly wages into real hourly wages. Standard errors in parentheses are clustered by county for all specifications.

Skill Requirements and Technology Adoption

DiD: TWFE (quarterly BGT and CPS, 2015-2023)

$$\text{Skill Share}_{g,c,t}^{S} = \alpha + \delta_c + \tau_t + \gamma \left(\text{Foreign-born Share}_{c,2017} * \text{Ban}_t \right) + \beta_1 X_{c,t} + \beta_2 Z_c + \varepsilon_{g,c,t}.$$

$$\text{Skill Share}_{g,c,t}^{S} = \frac{\text{Number of Job Postings requesting Skill } s_{g,c,t}}{\text{Total Number of Job Postings}_{g,c,t}}$$

- ✓ Outcome variables: Share of job postings requiring specified education or experience requirements or other skills in group g, county c, and time t

- ✓ $\text{Skill Share}_{g,c,t}^{AI}$: Proportion of job postings in a given skill category s that require at least one AI-related skill out of the total number of job postings in group g, county c, and time t

- ✓ Foreign-born Share$_{c,2017} \times \text{Ban}_t$: Exposure to immigration shocks at the county level

- ✓ $X_{c,t}$: Time-varying controls, demographic characteristics, wages

- ✓ Z_c: Bartik-style measures of labor demand, remote work for pay

$\implies \gamma$ captures the relationship between the intensity of local-level immigration shocks and share of job postings requiring skill s.

Regression Results (4)

Table 5: Skill Requirements and Immigration Shocks

Dependent Variable:	Education Requirement (1)	Experience Requirement (2)
Ad characteristics		
Any	0.024*	-0.014**
	(0.013)	(0.007)
HS	-0.026**	
	(0.012)	
BA	0.034***	
	(0.012)	
>BA	0.003	
	(0.004)	
$0-5$		-0.030**
		(0.012)
>5		0.015**
		(0.007)
Geography FE	County	County
Time fixed effect	Yes	Yes
Remote work, Labor demand	Yes	Yes
Demographics, wages	Yes	Yes
Observations	9,864	9,864

Notes: $***$ $p<0.01$, $**$ $p<0.05$, $*$ $p<0.1$. Standard errors in parentheses

Regression Results (5)

Table 6: Effect of Immigration Shocks on Other Skill Demand

	AI/ML	Data Analysis	General Software
Foreign-born Share$_{c,2017}$	0.013***	0.009***	0.009**
	(0.003)	(0.003)	(0.003)
R^2	0.843	0.827	0.874
	Computer	Engineering	Problem Solving
Foreign-born Share$_{c,2017}$	0.020**	0.022***	0.013**
	(0.009)	(0.005)	(0.006)
R^2	0.725	0.836	0.729
	Noncognitive	Management	Administrative support
Foreign-born Share$_{c,2017}$	0.009	-0.005	-0.009
	(0.012)	(0.005)	(0.009)
R^2	0.773	0.635	0.614
Geography FE	County	County	County
Time FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	9,042	9,042	9,042

Notes: Each cell in this table presents the coefficient of immigration shocks on the share of postings that requires at least one skill in the categories indicated in each column. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standard errors in parentheses

Dynamic Effects for Skill Demand: Event Study Model

Firms are unable to upgrade their technology immediately. After IRs, they may shift towards automation as a substitute over time.

- In the short term, they hire natives to substitute for the shortage of immigrants.

$$y_{g,c,t} = \alpha + \delta_c + \tau_t + \beta_1 X_{c,t} + \beta_2 Z_c + \sum_{x=-8+}^{-1} \tau_x \cdot (\textit{Foreign-born Share}_{c,2017} \geq 0)$$

$$+ \sum_{x=1}^{8+} \rho_x \cdot (\textit{Foreign-born Share}_{c,2017} * \textit{Ban}_t) + \varepsilon_{g,c,t}$$

- ✓ $y_{g,c,t}$: Outcome variables of group g at county c in time t
- ✓ δ_c and τ_t: County fixed effect and Time fixed effect
- ✓ $X_{c,t}$: Time-varying controls, demographic characteristics
- ✓ Z_c: Bartik-style measures of labor demand, remote work for pay
- ✓ Treatment variable: Foreign-born share across counties at time t
- ✓ Interaction terms: Lags and leads interact with foreign-born share to capture intensity
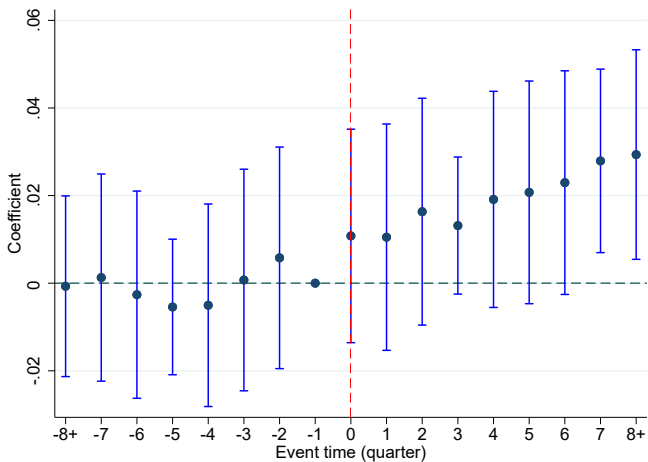- ✓ Event time: Quarters relative to immigration visa bans (Q2 2020, x=0)

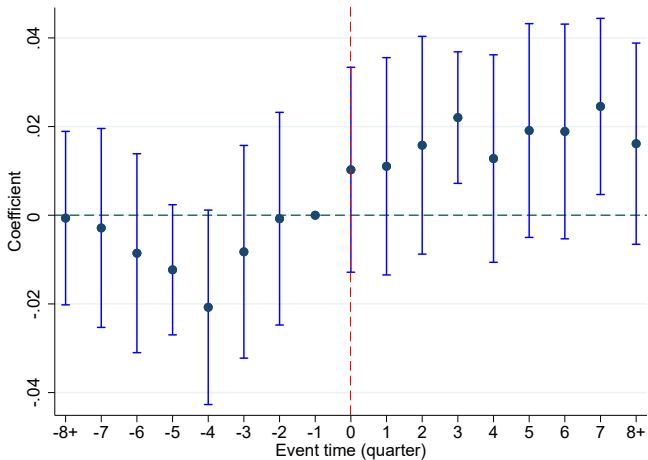# Effect of Immigration Shocks on AI/ML Demand
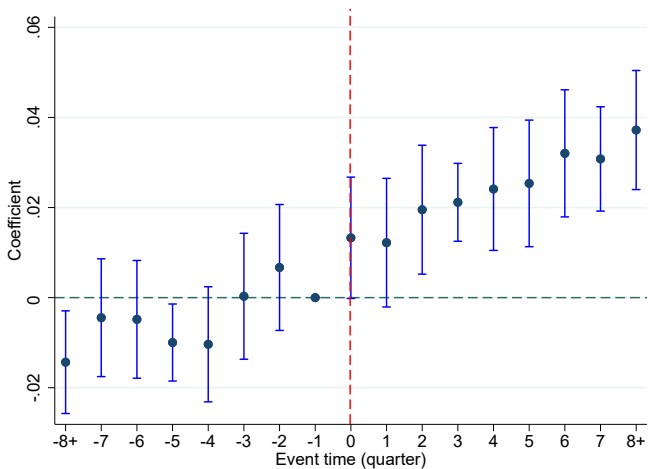
Notes: The panel variable is county. Standard errors are clustered at the county level, and the 95% confidence intervals are shown by the vertical lines. The horizontal axis denotes the event time in the months before and after the implementation of the immigration visa ban.

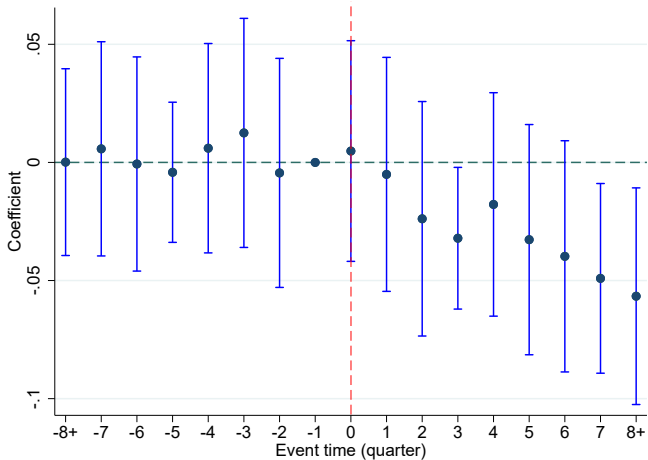# Effect of Immigration Shocks on Data Analysis Demand

Notes: The panel variable is county. Standard errors are clustered at the county level, and the 95% confidence intervals are shown by the vertical lines. The horizontal axis denotes the event time in the months before and after the implementation of the immigration visa ban.

Effect of Immigration Shocks on Engineering Demand

Notes: The panel variable is county. Standard errors are clustered at the county level, and the 95% confidence intervals are shown by the vertical lines. The horizontal axis denotes the event time in the months before and after the implementation of the immigration visa ban.

Effect of Visa Bans on Administrative Support Demand

Notes: The panel variable is county. Standard errors are clustered at the county level, and the 95% confidence intervals are shown by the vertical lines. The horizontal axis denotes the event time in the months before and after the implementation of the immigration visa ban.

Conclusion

Using the immigration visa ban as an exogenous shock to analyze automation and skill demand, this paper finds

- The COVID-19 immigration restrictions led to Immigrant-Native substitutability in the labor market during the visa ban.

- Firms have responded by adopting automation and new technologies to adjust to immigrant labor shortages after the immigration restrictions.

- Covid IRs increase demand for STEM and analytical skills while decreasing demand for management and administrative skills.