Labor Market Competition and the Assimilation of Immigrants

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Immigrants' labor market assimilation

- **Rising shares of immigrants** in the population of many developed countries
  - USA: rise from 6% to 13% between 1980 and 2010
  - Germany: rise from 7.5% to 18% between 1990 and 2022

$\rightarrow$ Renewed interest in **immigrants' labor market assimilation**
  - Typically measured as **relative wage** compared to natives
  - Tends to increase over time in the host country

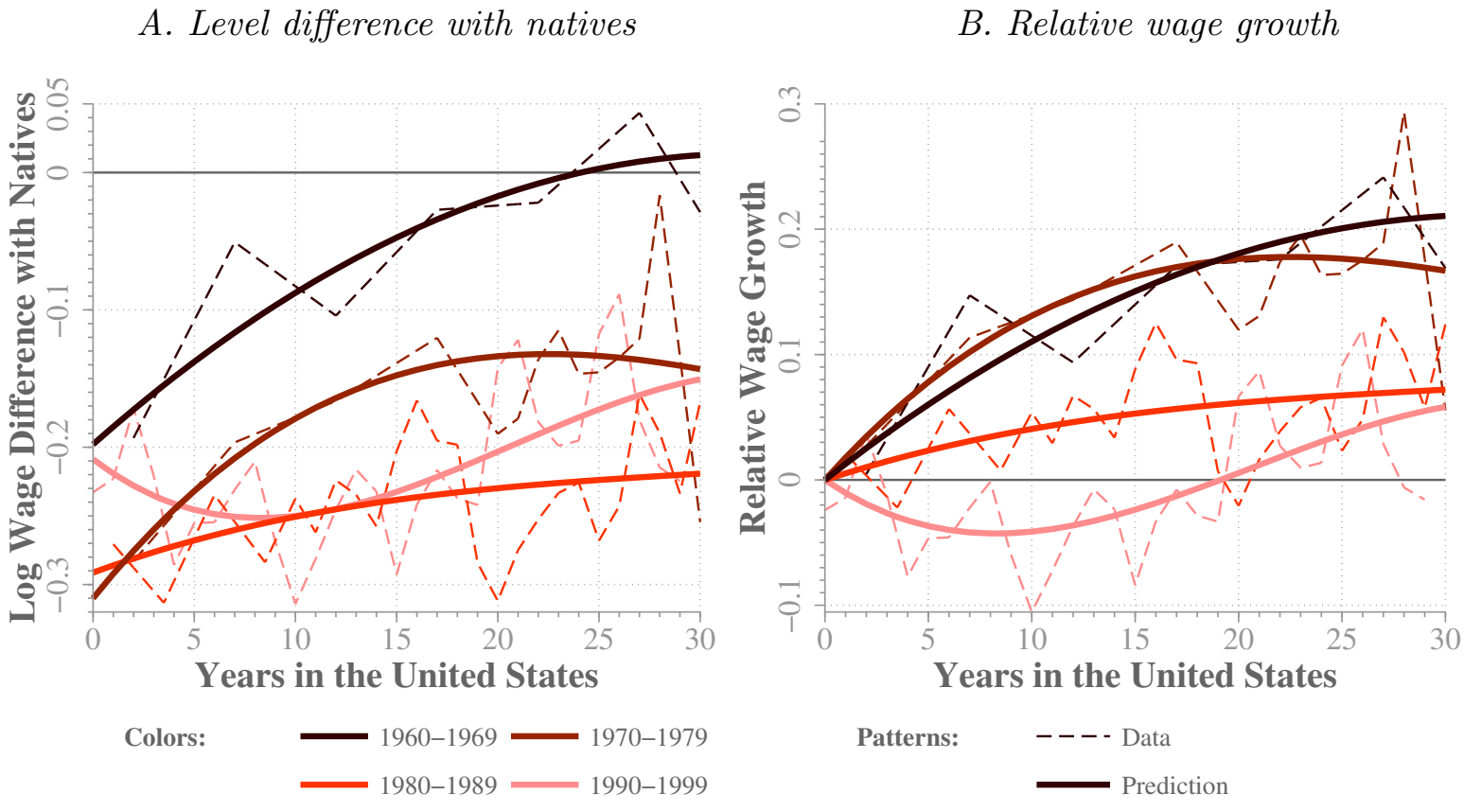
- Previous literature: disentangle **assimilation** from **composition effects** (e.g. education, origin, selection)

- **Unexplored mechanism**:
  - Immigrant and native workers tend to be imperfectly substitutable in production

  $\Rightarrow$ Relative wages depend on the **sizes of immigrant cohorts**

Assimilation Profiles in the United States

FIGURE 1. WAGE GAP BETWEEN NATIVES AND IMMIGRANTS AND YEARS IN THE U.S.



Main Intuition

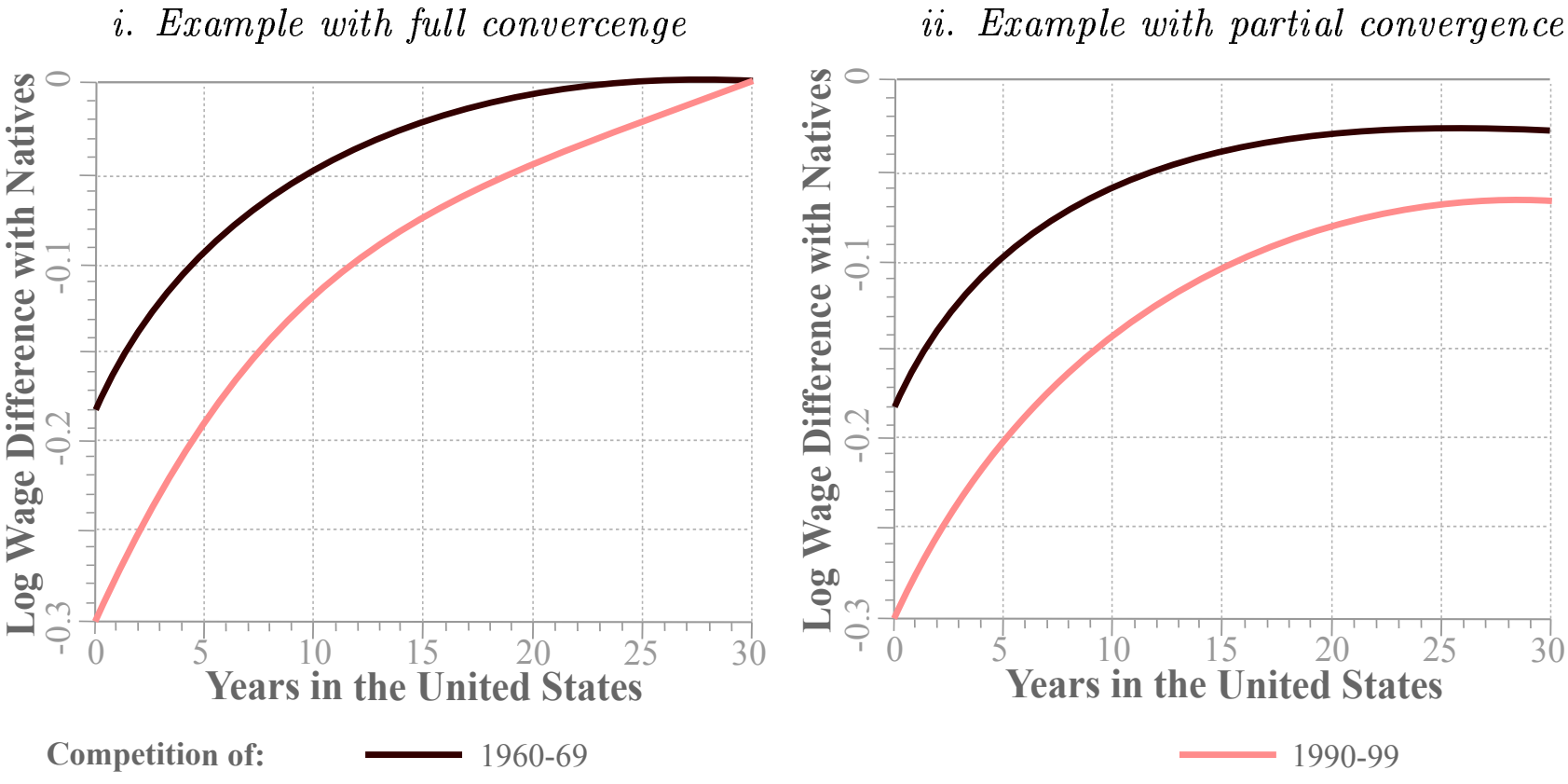
Natives and immigrants tend to have different skills sets $\Rightarrow$ **imperfect substitutes** in production.

Implication $\Rightarrow$ increasing **sizes of immigrant cohorts** change labor market competition for natives and immigrants differently.

- Larger **wage gap** at arrival
- Ambiguous effect on **speed of convergence**

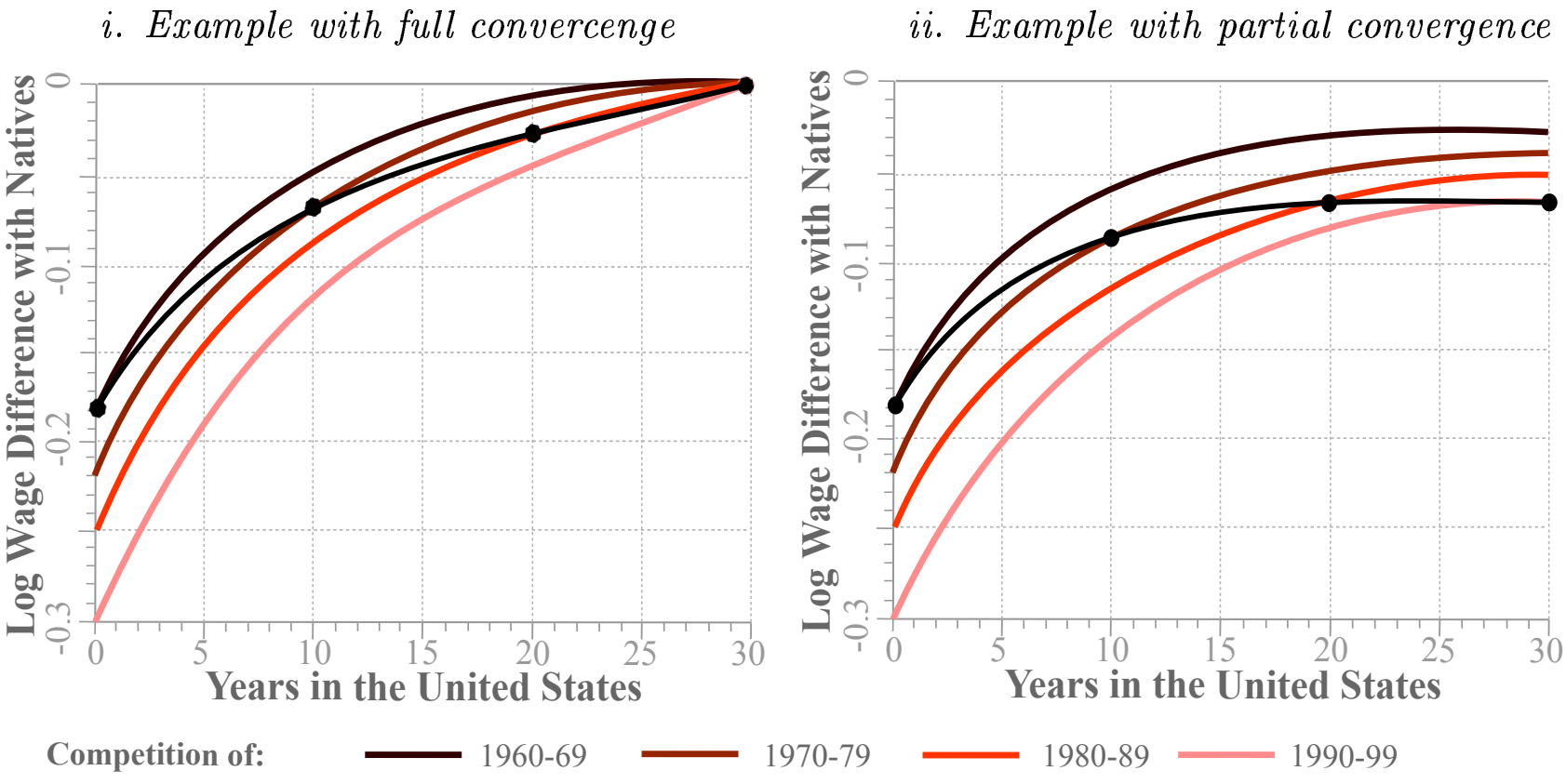
Main Intuition

Figure: Dynamic Competition Effect: An Example



Main Intuition

Figure: Dynamic Competition Effect: An Example



Contribution

- Provide a **simple framework** to study the link between immigrants' **assimilation** and **wage impact**

- Estimate the parameters of the model and then use them to **decompose** the observed wage dynamics into:

  - **Competition effects** (our new mechanism):
    Explains **44%** of initial wage gap difference between the 1960s and 1980s cohorts

  - Effects from **relative demand shifts**:
    Explains **24%** of initial wage gap difference between the 1960s and 1980s cohorts

  - **Composition effects**: education, country of origin, and unobservables ("cohort quality")

(Some of the) Literature

Assimilation (U.S.): Chiswick (1978); Borjas (1987,1992,1995,2015); LaLonde and Topel (1992); Jasso, Rosenzweig, and Smith (2000); Hu (2000); Duleep and Dowhan (2002); Card (2005); Antecol, Kuhn, and Trejo (2006); Lubotsky (2007, 2011); Beaman (2012); Abramitzky, Boustan, and Erikson (2014); Rho and Sanders (2021); Galeone and Görlach (2021).

Assimilation (other countries): Dustmann (1993); Baker and Benjamin (1994); Bell (1997); Friedberg (2000); Eckstein and Weiss (2000); LaLonde and Åslund (2000); Aydemir and Skuterud (2005); Antecol, Kuhn, and Trejo (2006); Gathmann and Monscheuer (2019).

Wage effects of immigration: Borjas (2003); Ottaviano and Peri (2012); Manacorda, Manning, and Wadsworth (2012); Glitz (2012); Chassamboulli and Palivos (2014); Dustmann, Frattini, Preston (2013); Dustmann, Schönberg and Stuhler (2016, 2017); Llull (2018a,b); Edo (2019); Monras (2020); Albert (2021).

Theoretical Framework - Overview

Two types of **imperfectly substitutable skills**: "general" and "U.S.-specific".

Observationally equivalent natives and immigrants supply the same **general skills**.

Immigrants arrive with only a fraction of the **specific skills** of comparable natives and then accumulate more ($\rightarrow$ assimilation).

Skills are **accumulated mechanically** (no investment decision).

Workers are **paid their marginal product**.

Production Technology

Let G_t denote the aggregate supply of **general skill units** in year t, and let S_t denote the aggregate supply of **specific skill units**.

Output, Y_t, is produced according to:

$$Y_t = A_t \left(G_t^{\frac{\sigma-1}{\sigma}} + \delta_t S_t^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

where:

- σ is the **elasticity of substitution** between general and specific skills
- A_t is **total factor productivity**
- δ_t is a relative **demand shifter**

Equilibrium skill prices equal the respective **marginal products**:

$$r_{Gt} = A_t \left(\frac{Y_t}{A_t G_t} \right)^{\frac{1}{\sigma}} \qquad \text{and} \qquad r_{St} = A_t \delta_t \left(\frac{Y_t}{A_t S_t} \right)^{\frac{1}{\sigma}}$$

Skill Supplies and Wages

Individuals in the economy supply one **general skill unit** and s **specific skill units** (shifted by productivity factor $h_{gt}(E,x)$ below):

$$s_g(n,y,o,c,E,x) \equiv \begin{cases} 1 & \text{if } n=1 \\ \theta_{1go} + \sum_{\ell=1}^{3} \theta_{2\ell go} y^{\ell} + \theta_{3ge} + \sum_{\ell=1}^{3} \theta_{4\ell ge} y^{\ell} & \\ \quad + \sum_{\ell=1}^{3} \theta_{5\ell g} (x-y)^{\ell} + \theta_{6gc} + \sum_{\ell=1}^{3} \theta_{7\ell gc} y^{\ell} & \text{if } n=0 \end{cases}$$

- y denotes **years in the host country**
- $n=1$ denotes **natives** and $n=0$ denotes **immigrants**
- o denotes country of **origin**
- c denotes **cohort** of entry
- E denotes years of **education** (and e education group)
- x denotes **potential experience** (age minus education)
- g denotes **gender**

Skill Supplies and Wages

General and specific skills are shifted by the following **productivity factor**:

$$h_{gt}(E,x) \equiv \exp\left(\eta_{0get} + \eta_{1gt}E + \sum_{\ell=1}^{3}\eta_{2\ell gt}x^{\ell}\right)$$

Therefore, **wages** are:

$$w_{gt}(n,y,o,c,E,x) = \left[r_{Gt} + r_{St}s_g(n,y,o,c,E,x)\right]h_{gt}(E,x).$$

Relative wages of immigrants compared to equivalent natives are:

$$\begin{aligned}\frac{w_{gt}(0,y,o,c,E,x)}{w_{gt}(1,\cdot,\cdot,\cdot,E,x)} &= \frac{r_{Gt} + r_{St}s_g(0,y,o,c,E,x)}{r_{Gt} + r_{St}} \\ &= \frac{1 + s_g(0,y,o,c,E,x)\delta_t(G_t/S_t)^{\frac{1}{\sigma}}}{1 + \delta_t(G_t/S_t)^{\frac{1}{\sigma}}}\end{aligned}$$

Discussion

The model features:

- **Competition** effects as discussed above if $\sigma < \infty$.
- **Imperfect substitutability** between immigrants and natives if $\sigma < \infty$.
- **Downgrading** of immigrants upon arrival (Dustmann et al., 2013) if $s < 1$ at entry.
- Embeds the **traditional** assimilation model when $\sigma = \infty$.

Data

The sample consists of **salaried workers aged 25-64** from the U.S. Census 1970-2000, ACS 2009-2011 and ACS 2018-2019.

Immigrants are defined as **foreign-born without U.S. parents**.

Hourly wages are computed by dividing the annual wage and salary income by annual hours worked, and deflated to 1999 US$.

Descriptive Statistics

Estimation Results

- Returns to **education and potential experience** in line with the literature. Table
- **Heterogeneous skill accumulation** patterns by origin, education, and cohort. Table Figure
- The model **fits the data** well. Figure
- **Similar level of imperfect substitutability** between natives and immigrants as in the literature (with very different production function!). Table Figure

Counterfactual Exercises - Examples

We construct a (synthetic) individual with the unobservable skills of the 1960s cohort who experienced that cohort's demand shifts, has average potential experience at arrival (11.2 years), and is a:

- Mexican high school dropout Figure
- Latin American high school graduate Figure
- Western college graduate Figure

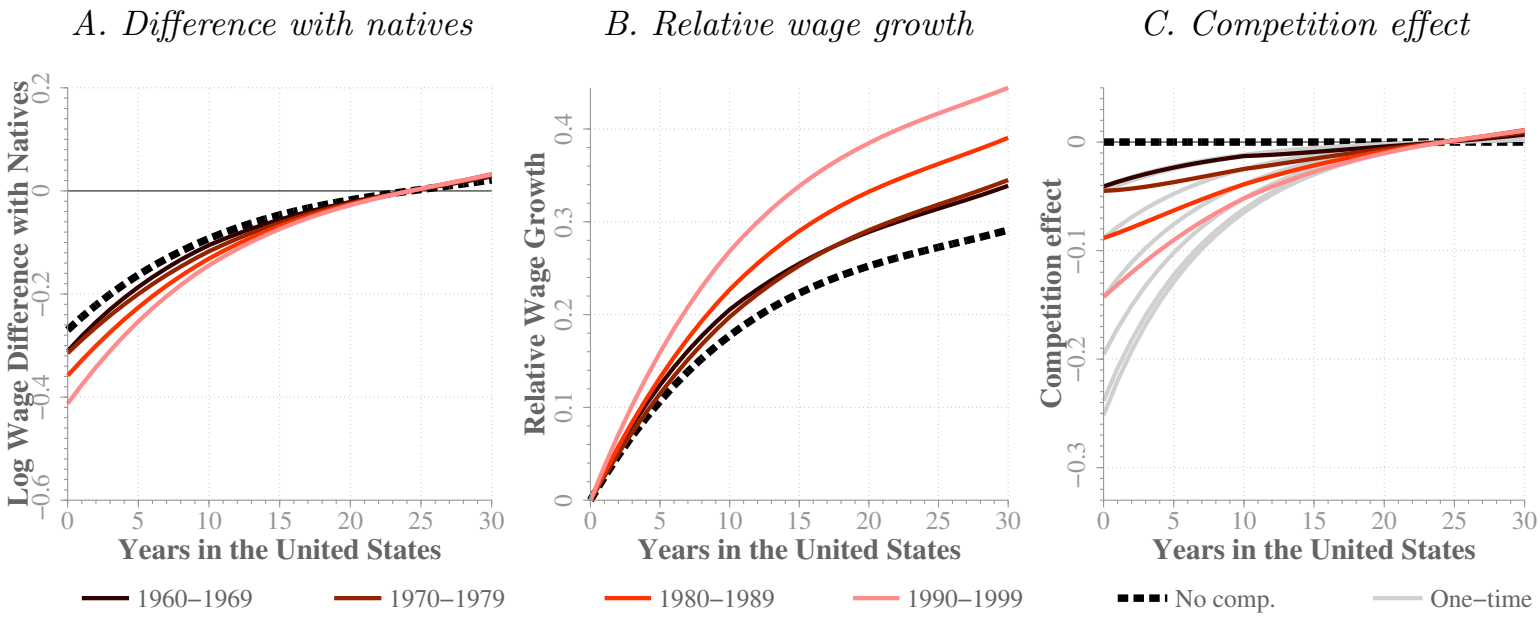
For each (synthetic) individual, we **quantify the competition effect** through the following simulations:

- Simulate assimilation profile without competition ($\sigma = \infty$)
- Simulate assimilation profiles assuming the sequence of competition levels faced by each arrival cohort

Mexican High School Dropout

FIGURE 8. THE LABOR MARKET COMPETITION EFFECT: SOME EXAMPLES

I. Mexican high school dropout



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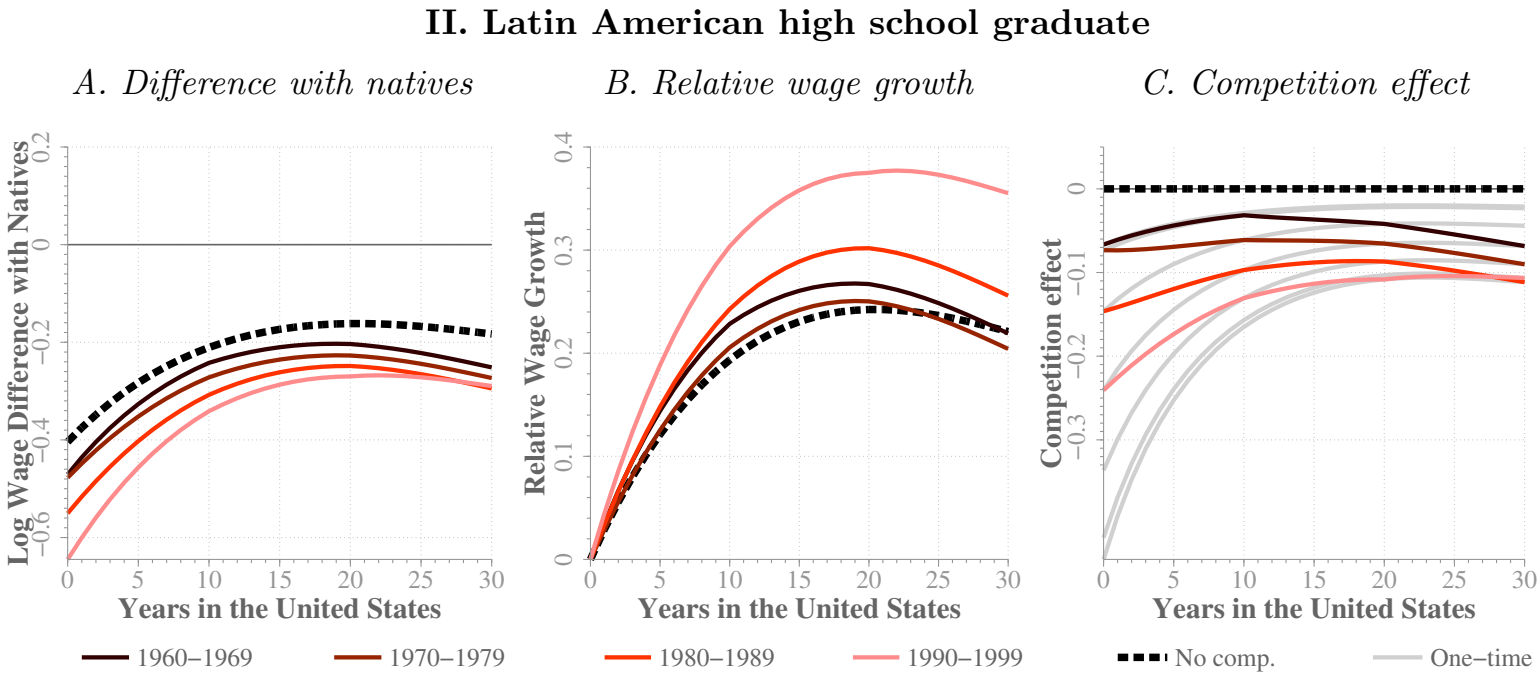
Latin American High School Graduate



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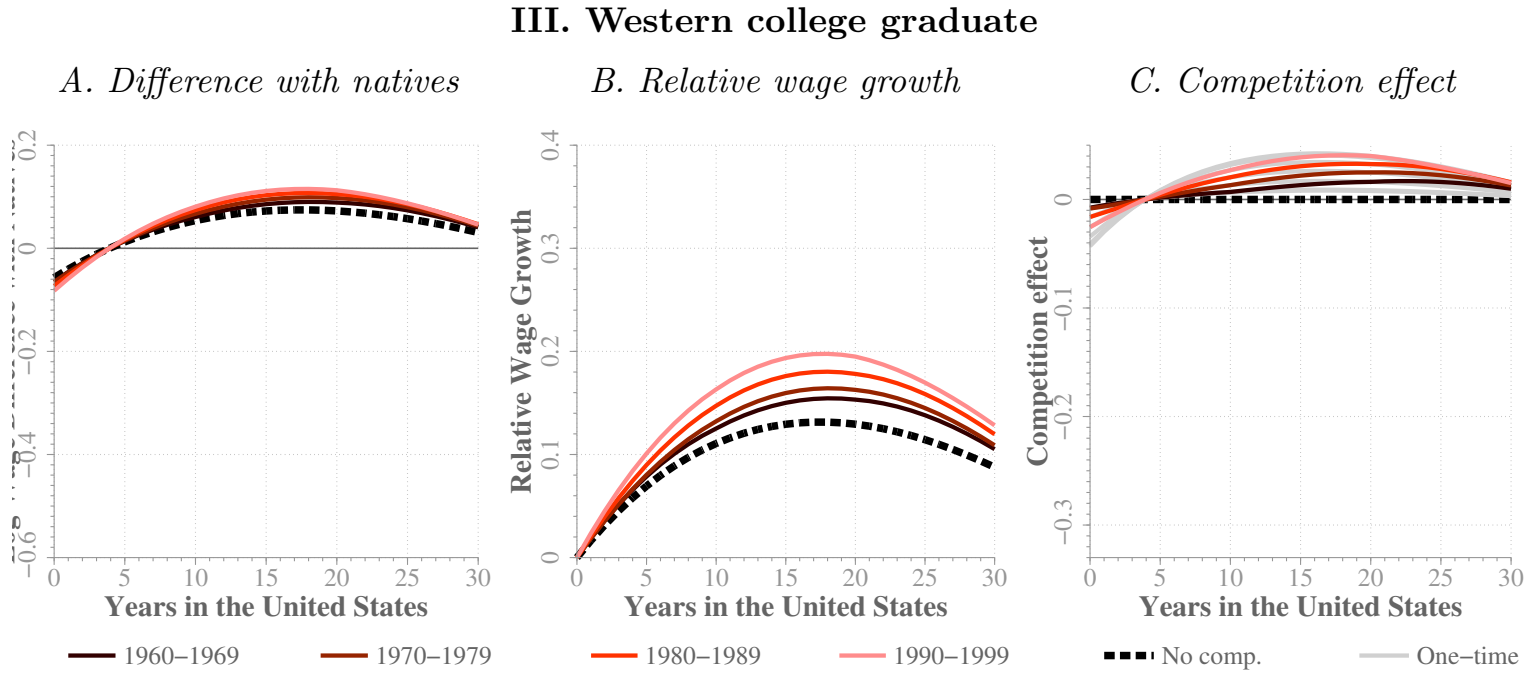
Western College Graduate



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Counterfactual Exercises - Decomposition

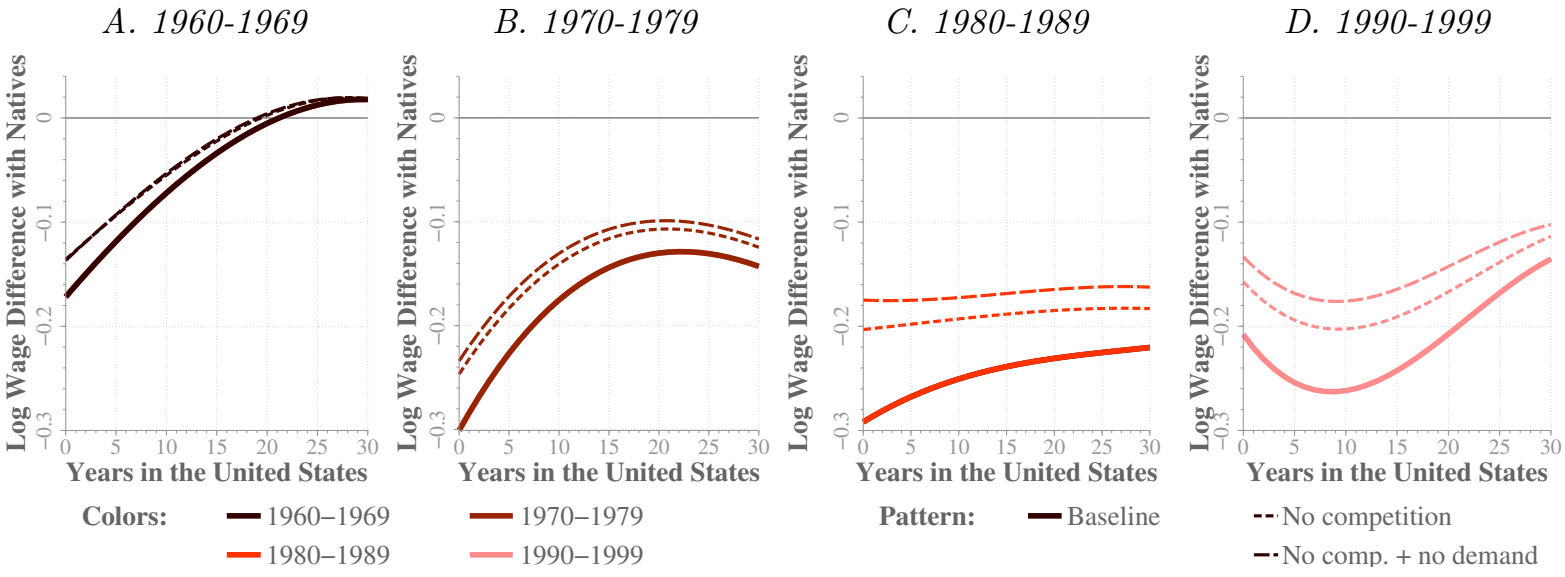
Decomposition of changes in aggregate assimilation profiles into

- Competition effects
- Additional effects due to shifts in relative demand
- Composition effects (education, country of origin, and unobservables)

Decomposition

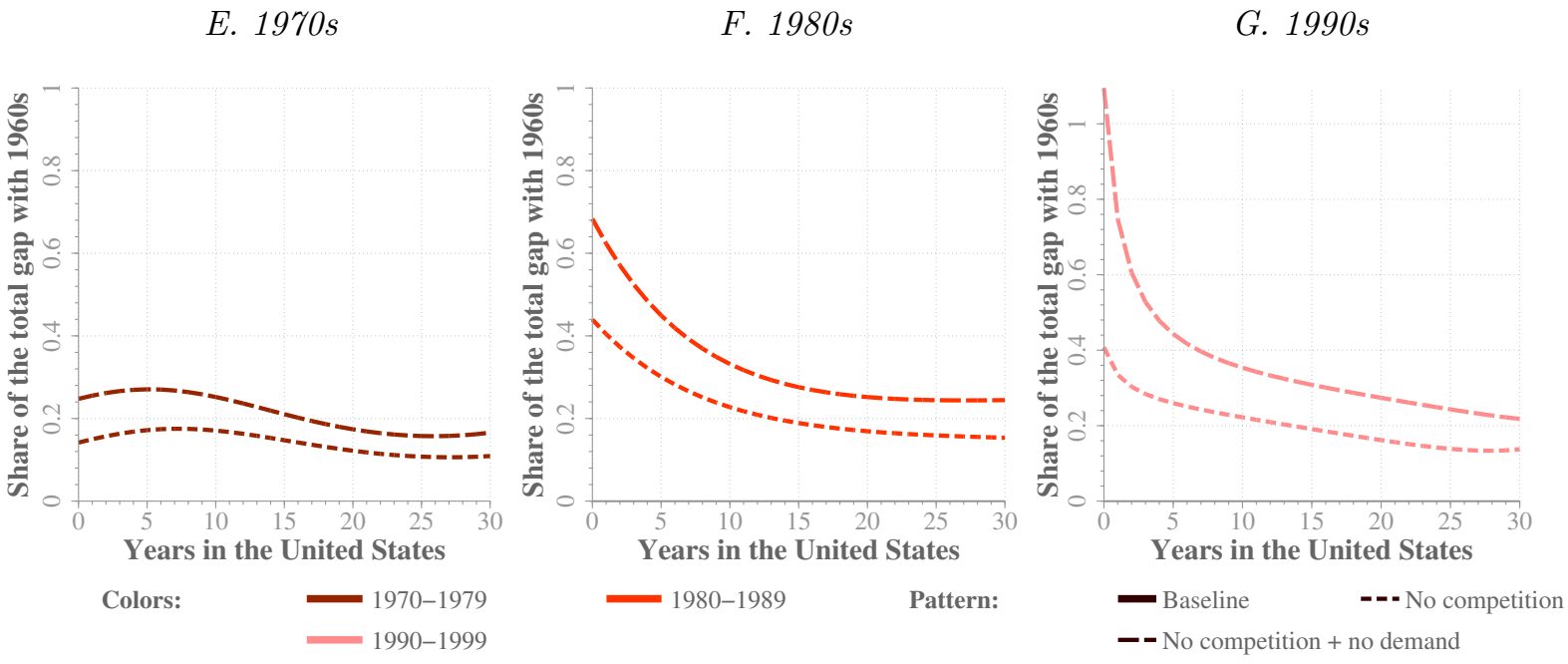
FIGURE 9. WAGE GAP DECOMPOSITION: COMPETITION AND DEMAND EFFECTS

I. Assimilation profiles under different scenarios



Decomposition

II. Share of the increase in the wage gaps relative to 1960s closed by each channel



Robustness Checks

- **Network effects**: allowing stock or share of immigrants from the same country of origin to affect the skill function s.
- **Selective outmigration**: both positive and negative endogenous selection based on existing estimates in the literature.
- **Undocumented migrants**: accounting for undercounting (underestimating competition) and a potentially different assimilation profile.
- **Alternative labor market definitions**: state-education, gender, census division.
- **Endogenous immigration across states**: optimal instruments type GMM estimation based on Card (2001).

Conclusions

We explore the role of **labor market competition** in explaining the observed wage assimilation patterns in the United States.

Main findings:

- The **competition effect** alone explains **14.2%**, **43.9%** and **40.8%** of the increase in the **initial wage gap** between the baseline 1960s cohort and the 1970s, 1980s and 1990s cohorts.
- Large contribution of competition effect to the **widening** of the initial wage gap, small effect on **speed of convergence**.
- Remaining "**decreasing cohort quality**" is entirely driven by education and origin, as selection in terms of unobservables improved across cohorts.

Thank you!

Step-wise Estimation Procedure

Step 1: From **native wages**, OLS estimate:

$$\ln w_i = \gamma_{j(i)t(i)} + \eta_{0g(i)e(i)t(i)} + \eta_{1g(i)t(i)} E_i + \sum_{\ell=1}^{3} \eta_{2\ell g(i)t(i)} x_i^{\ell} + \epsilon_i,$$

where $\gamma_{j(i)t(i)} = \ln\left(r_{Gj(i)t(i)} + r_{Sj(i)t(i)}\right)$ is a set of **state-year dummies**.

Step 2: From **immigrant wages**, NLS estimate:

$$\ln w_i - \ln(\widehat{r_{Gj(i)t(i)} + r_{Sj(i)t(i)}}) - \ln \widehat{h_{g(i)t(i)}(E_i, x_i)} = -\ln\left[1 + \exp(\tilde{\delta} t_i)\left(\frac{\widehat{G}_{j(i)t(i)}}{\widehat{S}_{j(i)t(i)}(\boldsymbol{\theta})}\right)^{\frac{1}{\sigma}}\right] +$$

$$\ln\left[1 + s_{g(i)}(n_i, y_i, o_i, c_i, E_i, x_i; \boldsymbol{\theta}) \exp(\tilde{\delta} t_i)\left(\frac{\widehat{G}_{j(i)t(i)}}{\widehat{S}_{j(i)t(i)}(\boldsymbol{\theta})}\right)^{\frac{1}{\sigma}}\right] + \epsilon_i$$

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Descriptive Statistics

TABLE 1—DESCRIPTIVE STATISTICS OF IMMIGRANT COHORTS

	Cohort of entry:					
	1960-69	1970-79	1980-89	1990-99	2000-09	2010-19
Share of population (%)	3.0	4.2	5.6	7.7	9.0	7.3
Cohort size (millions)	0.8	1.4	2.3	3.8	4.6	4.2
Men (%)	65.0	61.8	62.4	61.7	60.1	59.5
Age	38.3	36.7	36.5	36.8	37.8	38.0
Hourly wage	16.7	16.0	14.5	16.0	14.2	18.1
HS dropouts (%)	46.7	40.9	31.3	28.1	26.1	15.1
HS graduates (%)	22.1	21.3	24.8	28.8	28.3	25.5
Some college (%)	11.0	11.8	17.2	12.0	11.8	11.7
College graduates (%)	20.2	25.9	26.7	31.1	33.8	47.8
Mexico (%)	8.4	19.8	18.4	25.7	27.2	13.2
Other Latin America (%)	30.6	21.5	26.9	22.0	26.6	28.0
Western countries (%)	36.9	17.3	11.1	9.7	6.6	8.3
Asia (%)	14.5	34.0	35.7	29.3	28.6	38.0
Other (%)	9.6	7.5	7.8	13.2	10.9	12.4

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Descriptive Statistics

TABLE B1—ADDITIONAL DESCRIPTIVES

	Census year:					
	1970	1980	1990	2000	2010	2020
Immigrant share (%)	3.8	5.0	6.9	10.8	14.5	16.3
Number (millions):						
Natives	46.9	62.2	76.0	86.9	89.3	97.2
Immigrants	1.8	3.1	5.3	9.4	12.9	15.9
Men (%):						
Natives	67.8	60.8	56.1	54.1	52.6	52.7
Immigrants	64.6	59.6	58.8	59.4	57.5	56.7
Age:						
Natives	43.2	41.3	40.7	42.4	44.1	43.6
Immigrants	44.0	42.2	42.4	42.4	44.2	45.6
Hourly wage:						
Natives	18.8	18.8	18.1	19.5	19.0	19.8
Immigrants	18.5	18.1	17.2	17.8	16.3	19.1
HS dropouts (%):						
Natives	38.2	21.7	10.3	6.4	4.5	3.6
Immigrants	48.1	39.5	30.8	28.6	25.9	21.1
HS graduates (%):						
Natives	36.4	39.9	35.3	40.4	35.1	32.7
Immigrants	24.2	24.3	24.8	28.6	28.1	28.2
Some college (%):						
Natives	11.6	17.6	29.0	23.8	25.8	24.9
Immigrants	11.4	12.9	18.2	13.8	13.9	13.5
College graduates (%):						
Natives	13.8	20.8	25.3	29.4	34.5	38.8
Immigrants	16.3	23.2	26.2	29.0	32.1	37.2

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Results - Index of Skills

TABLE 2—PRODUCTIVITY FACTOR, $h_{0t}(E, x)$

	Census year:					
	1970	1980	1990	2000	2010	2020
Years of education	0.046	0.042	0.047	0.052	0.063	0.052
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Potential experience	0.057	0.070	0.052	0.061	0.073	0.066
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Potential experience squared ($\times 10^2$)	-0.171	-0.191	-0.107	-0.173	-0.199	-0.165
	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
Potential experience cube ($\times 10^3$)	0.016	0.016	0.006	0.016	0.017	0.014
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
High school graduate	0.015	0.054	0.048	0.052	0.036	0.013
	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)	(0.006)
Some college	0.081	0.095	0.142	0.146	0.136	0.125
	(0.004)	(0.003)	(0.003)	(0.003)	(0.005)	(0.007)
College graduate	0.275	0.274	0.366	0.386	0.403	0.471
	(0.005)	(0.004)	(0.004)	(0.005)	(0.008)	(0.010)

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Parameter Estimates I

TABLE 3—SPECIFIC SKILL ACCUMULATION, $s_0(0, y, o, c, E, x)$

		Interactions with years since migration:		
	Intercepts	Linear	Quadratic ($\times 10^2$)	Cubic ($\times 10^3$)
Region of origin:				
Latin America	0.028	0.005	-0.006	-0.002
	(0.009)	(0.002)	(0.014)	(0.003)
Western countries	0.619	-0.008	0.027	-0.008
	(0.018)	(0.003)	(0.022)	(0.004)
Asia	0.183	-0.004	0.037	-0.008
	(0.011)	(0.002)	(0.016)	(0.003)
Other	0.034	0.012	-0.014	-0.003
	(0.012)	(0.003)	(0.021)	(0.004)
Education level:				
High school graduate	-0.230	-0.005	0.009	-0.001
	(0.009)	(0.002)	(0.013)	(0.002)
Some college	-0.250	-0.008	0.020	-0.003
	(0.012)	(0.003)	(0.016)	(0.003)
College graduate	-0.233	-0.002	-0.019	0.002
	(0.011)	(0.003)	(0.017)	(0.003)

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Parameter Estimates II

TABLE 3—SPECIFIC SKILL ACCUMULATION, $s_0(0, y, o, c, E, x)$

		Interactions with years since migration:		
	Intercepts	Linear	Quadratic ($\times 10^2$)	Cubic ($\times 10^3$)
Pre-1960s	0.335	-0.023	0.150	-0.021
	(0.120)	(0.016)	(0.065)	(0.008)
1960s	-0.106	0.046	-0.148	0.018
	(0.016)	(0.003)	(0.019)	(0.003)
1970s		0.030	-0.080	0.008
		(0.002)	(0.014)	(0.002)
1980s	0.061	0.022	-0.067	0.009
	(0.009)	(0.002)	(0.014)	(0.003)
1990s	0.242	-0.004	0.066	-0.011
	(0.010)	(0.002)	(0.020)	(0.005)
2000s[a]	0.199	0.003	0.070	-0.022
	(0.013)	(0.005)	(0.056)	(0.020)
2010s[a]	0.309	0.008	0.070	-0.022
	(0.012)	(0.004)	(0.056)	(0.020)
Experience at entry:				
Linear term	-0.025			
	(0.001)			
Quadratic ($\times 10^2$)	0.076			
	(0.005)			
Cubic ($\times 10^3$)	-0.009			
	(0.001)			

Constant (relative specific skills at arrival of a male Mexican high school dropout who arrived in the 1970s cohort with zero years of experience)**:**

0.804
(0.011)

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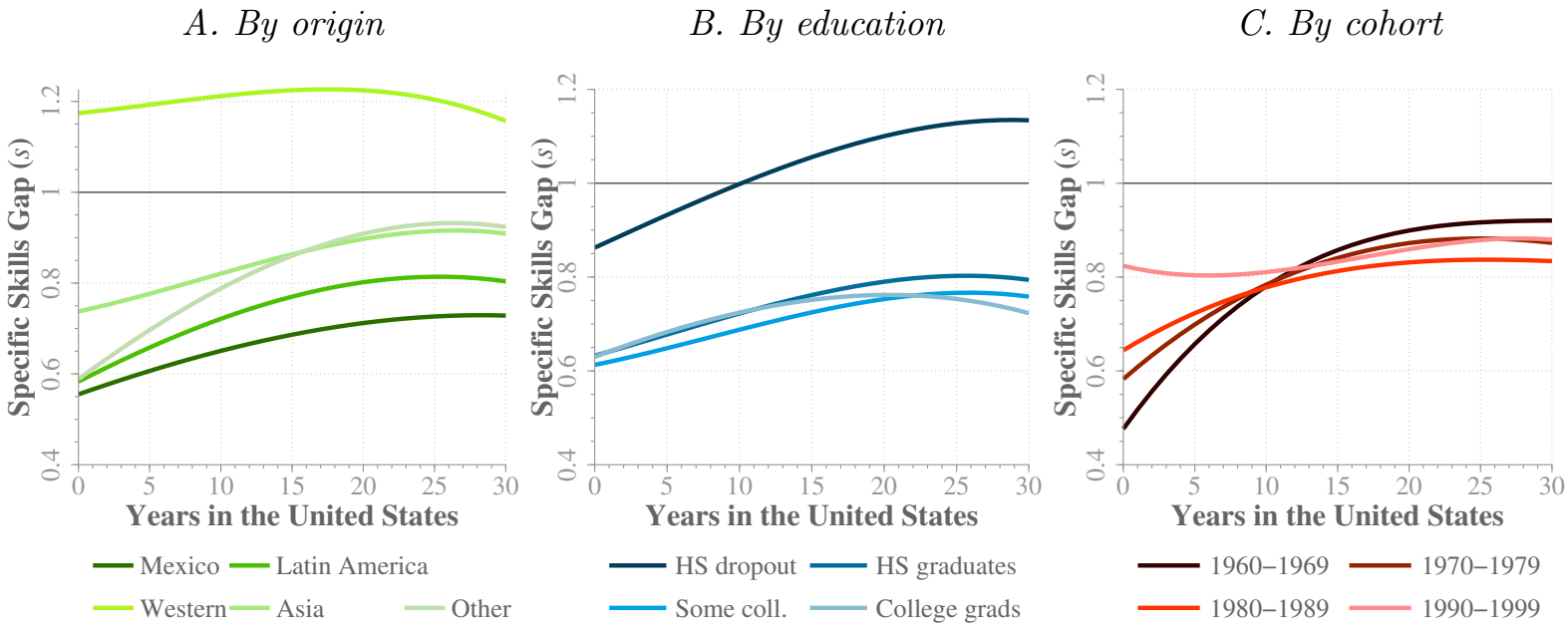
Results - Heterogeneous Assimilation Patterns

FIGURE 4. SKILL ACCUMULATION PROFILES, $s_0(0, y, o, c, E, x)$



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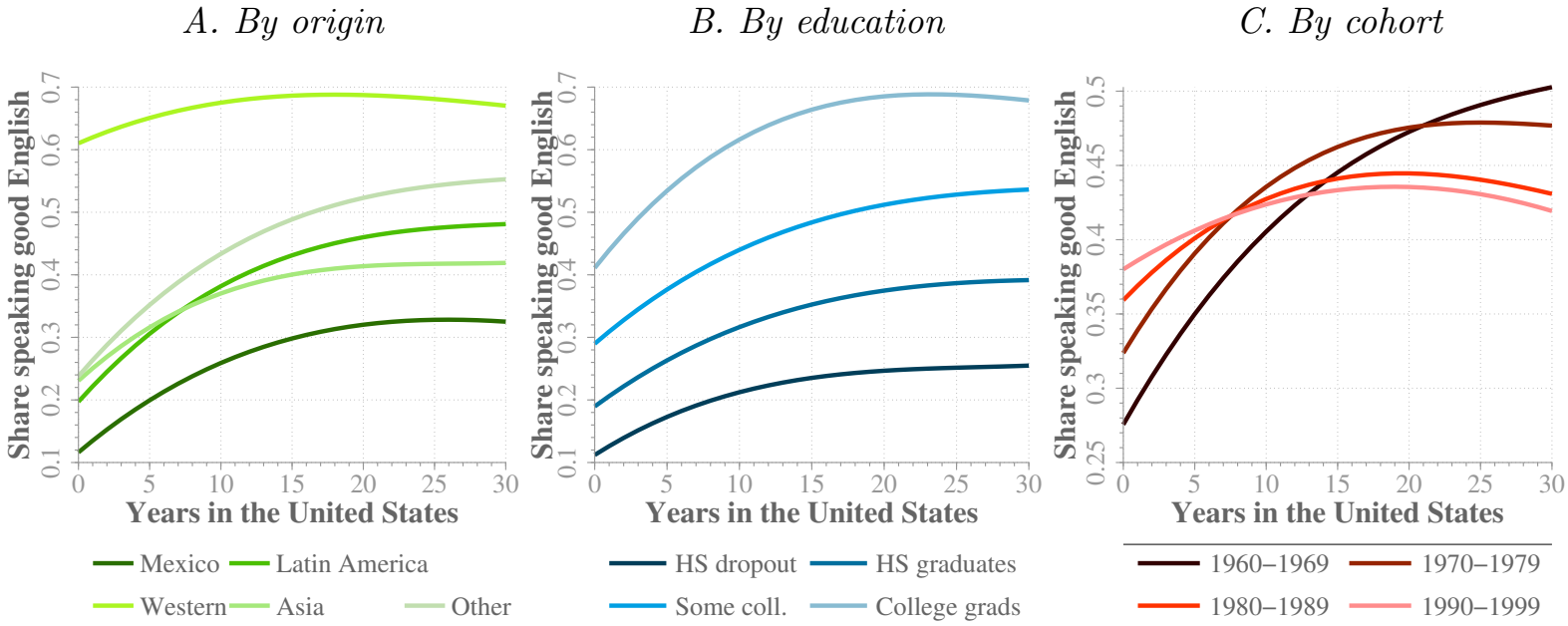
Results - English Language Proficiency

FIGURE 5. ENGLISH PROFICIENCY



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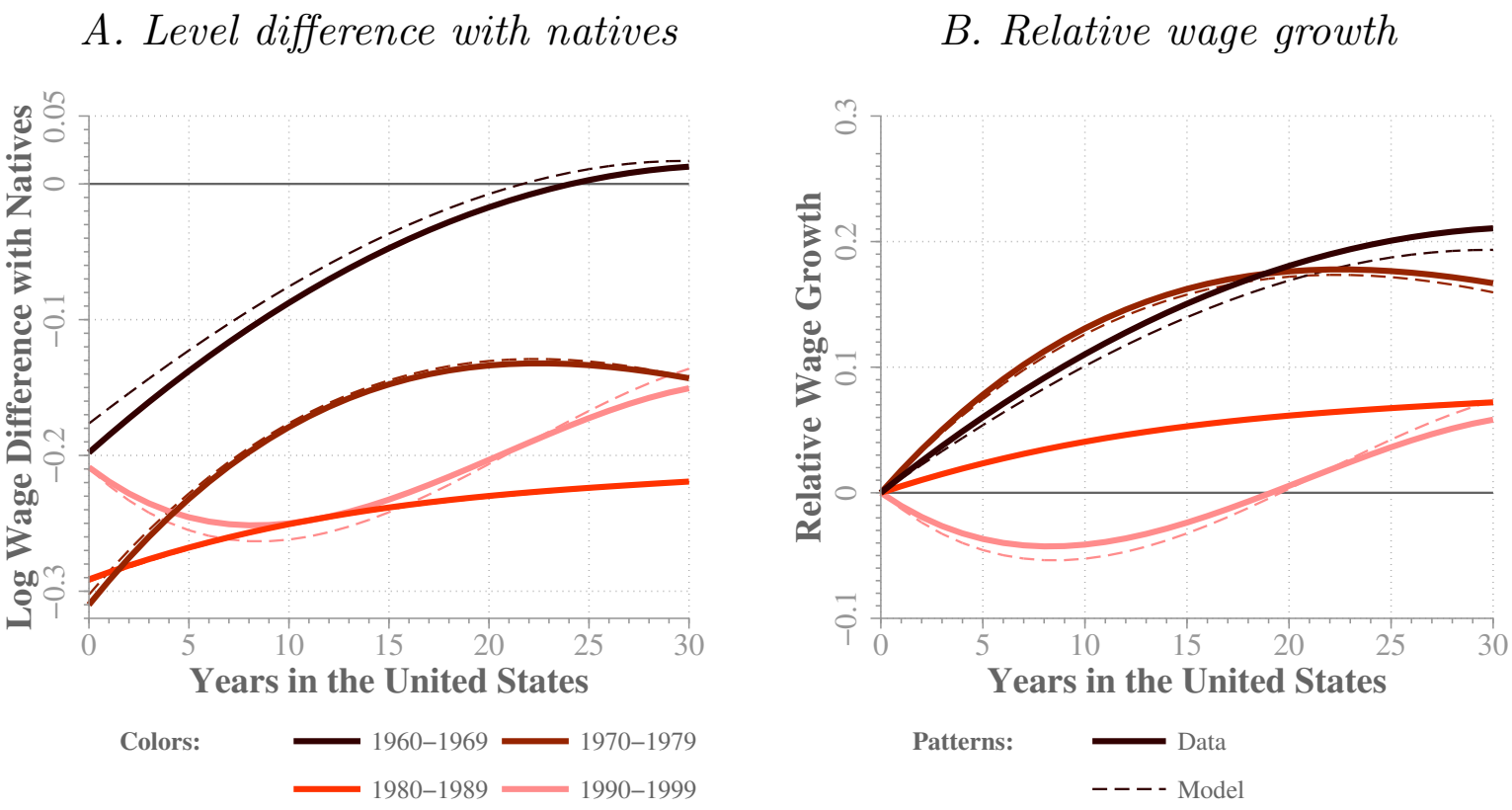
Model Fit

FIGURE B1. GOODNESS OF FIT (MEN)



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Results - Elasticity of Substitution

TABLE 4—ELASTICITY OF SUBSTITUTION PARAMETER, σ, AND DEMAND SHIFTERS, $\tilde{\delta}$

	Point estimate	Standard error	Confidence interval
Elasticity of substitution (σ)	0.020	(0.002)	[0.017,0.024]
Trend in relative demand ($\tilde{\delta}$)	0.013	(0.001)	

$$\varepsilon_{NI} = \frac{\sigma\left[1+\tilde{s}_I\delta\left(\frac{G}{S}\right)^{\frac{1}{\sigma}}\right]\left[1+\delta\left(\frac{G}{S}\right)^{\frac{1}{\sigma}}\right]}{(1-\tilde{s}_I)\delta\left(\frac{G}{S}\right)^{\frac{1}{\sigma}}\left(\frac{N\bar{h}_N}{S}-\frac{N\bar{h}_N}{G}\right)}$$

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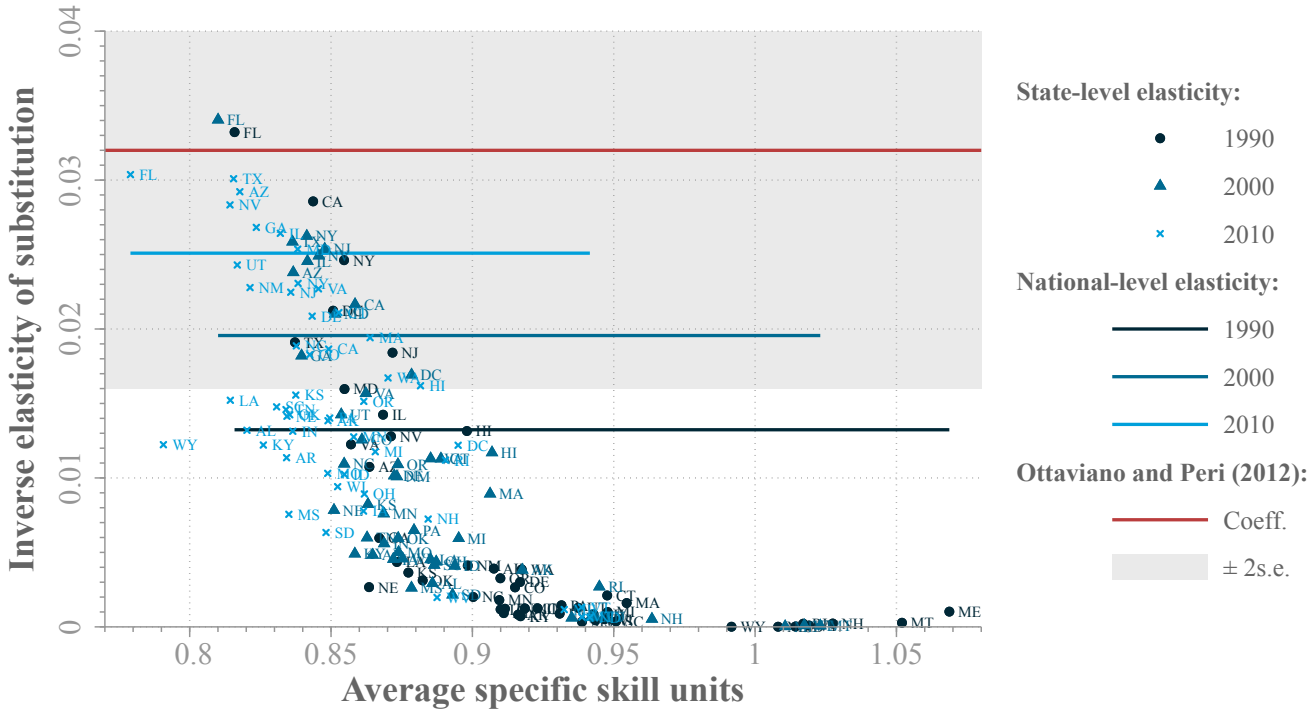
Elasticity of Substitution



The figure shows the implied inverse elasticity of substitution $1/\varepsilon_{NI}$ across different markets. The (short) blue lines represent our predicted values for 1990, 2000, and 2010 computing skill supplies and weighted average specific skills at the national level. The points in the scatter diagram are computed at the state-year level. The red (long) line and the shaded area represent the benchmark estimate and confidence band from Ottaviano and Peri (2012).

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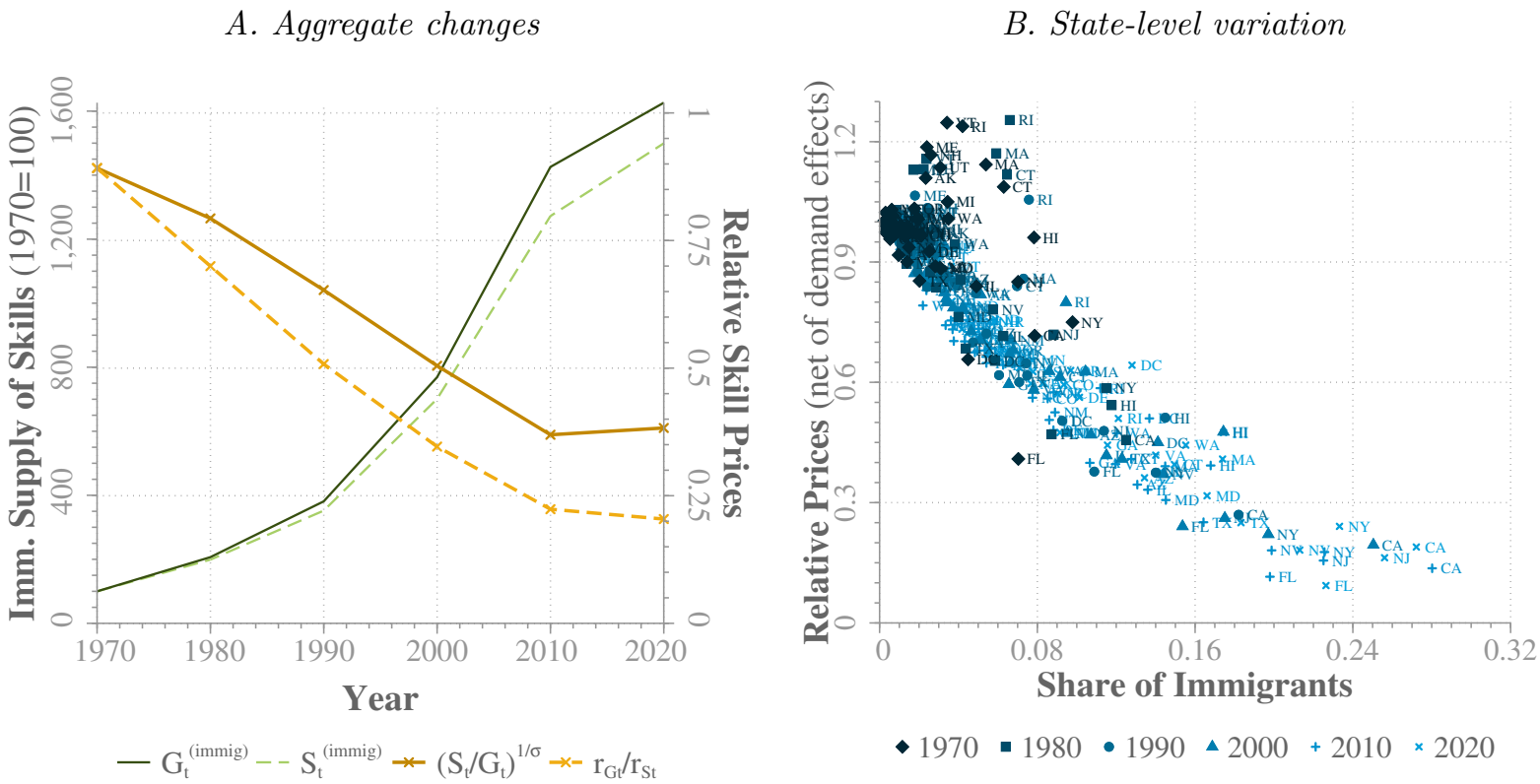
Variation in Relative Supplies and Skill Prices

FIGURE 7. CHANGES IN RELATIVE SUPPLIES AND RELATIVE SKILL PRICES



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Robustness Checks I

TABLE 5—SELECTED PARAMETER ESTIMATES FROM ROBUSTNESS CHECKS

A. Additional elements of assimilation profiles included in some of the checks

		Interaction with years since migration:		
	Direct effect	Linear	Quadratic ($\times 10^2$)	Cubic ($\times 10^3$)
Share of state's population	-0.522	0.004	-0.108	0.015
	(0.139)	(0.034)	(0.226)	(0.042)
Stock in the state ($\times 10^6$)	-0.096	-0.005	0.024	-0.004
	(0.021)	(0.005)	(0.032)	(0.006)
Potentially undocumented	—	-0.008	0.021	-0.004
		(0.001)	(0.015)	(0.004)

B. Alternative specifications of the demand shifters for relative skill prices

	$\tilde{\delta}_1 \vert \tilde{\delta}_{1980}$	$\tilde{\delta}_2 (\times 10^2) \vert \tilde{\delta}_{1990}$	$\tilde{\delta}_{2000}$	$\tilde{\delta}_{2010}$
Quadratic specification	-0.032	0.112	—	—
	(0.004)	(0.013)		
Time dummies	-0.718	-0.022	0.129	0.390
	(0.052)	(0.053)	(0.055)	(0.079)

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Robustness Checks II

TABLE 5—SELECTED PARAMETER ESTIMATES FROM ROBUSTNESS CHECKS

C. Elasticity of substitution between general and specific skills (σ)

	Estimate	Standard error
Baseline estimate:	0.021	(0.002)
Networks:		
Share of state's population	0.024	(0.003)
Stock in the state	0.023	(0.003)
Undocumented migrants:		
Reweighted only	0.020	(0.002)
Reweighted and differential convergence	0.020	(0.001)
Selective outmigration:		
Borjas and Bratsberg (1996)	0.020	(0.002)
Rho and Sanders (2021)	0.017	(0.002)
Constant distribution synthetic cohorts	0.024	(0.002)
Alternative specifications for demand factors:		
Quadratic specification	0.023	(0.002)
Time dummies	0.025	(0.002)
Alternative labor market definitions:		
Education-state	0.033	(0.002)
Census divisions	0.014	(0.001)
Optimal instruments (GMM) with aggregates based on Card (2001):		
Baseline instrument	0.061	(0.015)
Quadratic for the instrument of σ	0.046	(0.009)
Quadratic for all instruments	0.020	(0.003)

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