The Immigration Impact on Population, Labor Productivity, Investments and TFP in OECD Countries*

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*The views expressed in this paper are those of the authors and do not necessarily reflect those of Banca d'Italia or the Eurosystem.

Population growth in developed economies changed during the last 3 decades

- **Sharp decline in native adult population growth since 1990**, strongly in Europe
- Native demographic change turned **negative** in many countries in the 2010s and 2020s
- Total population did not fall as much, because **net immigration increased substantially**, mostly from **non-OECD origins: Eastern Europe, Asia, Africa and Latin America**, strongly in Europe

Core Question

- What was the **productivity effect of this change**?
- Did immigration only sustain population size, or did it also raise **labor productivity growth**, hence average wages and GDP per person, in the medium/long run? Worries about overcrowding, costs and disruptions.

This study provides a common macro perspective on this phenomenon

1. **What were the main features of such population change?** Key **facts** about immigration, its origin and education over 1990–2024 (for EU regions, 2005–2024)

2. **What drove variation in immigration across countries?** The role of origin-country push factors, migrant networks, migration crises, immigration policies, and less predictable shocks.

3. **What were the macroeconomic effects and, more specifically, the productivity effects?** How immigration predicted growth of population, GDP per capita, GDP per worker, investment, human capital, TFP (and inflation).

Key Contributions

- Comprehensive, **high-quality (Census-based) cross-country (and EU-regions) data on *net* immigration**, non-OECD immigration and high- and low-skilled immigration.

- Combine them with macro growth outcomes to **estimate how immigration predicts aggregate productivity** (Peri, 2012; Engler et al., 2023), over medium-to-long-run horizons, for all OECD countries (Furlanetto et al., 2019).

- Analyze high- and low-skilled immigrants; nonlinearities. **Connect these results to micro-based evidence.**

Data: country-level panel and regional extension

- **Country sample:** 38 OECD destination countries, 1990–2024, **plus** EU-14 + UK, Canada, US, Australia, NZ – institutionally and culturally similar, spanning most of the immigration range.
- **Main frequency:** five-year windows, consistent with the most reliable stock-based migrant measures from National Censuses, and appropriate for **medium-to-long-run analysis**.
- **Migration and population sources:** UNDESA, OECD DIOC, and EU-LFS microdata
- **Macroeconomic outcomes:** Penn World Table 11.0 and Eurostat Regional Economic Accounts for GDP, employment, capital, human capital, TFP and prices

Key Demographic Variables

Main immigration measure

$$\frac{\Delta Immi^{nonOECD}_{i,t,t-5}}{Pop^{15+}_{i,1990}} = \frac{NonOECDBornStock_{i,t} - NonOECDBornStock_{i,t-5}}{Pop^{15+}_{i,1990}}$$

Native demographic change

$$\frac{\Delta NativeWorkAge_{i,t,t-5}}{Pop^{15+}_{i,1990}} = \frac{NativeWorkAge_{i,t} - NativeWorkAge_{i,t-5}}{Pop^{15+}_{i,1990}}$$

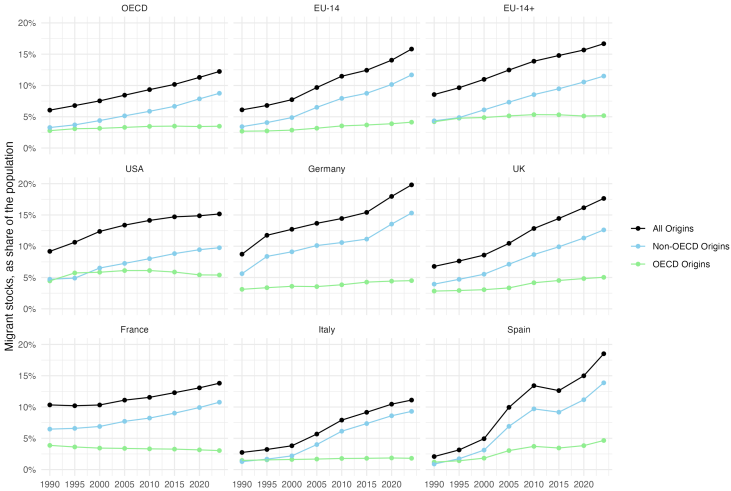
- Comparable, both as a percent of adult population.
- Skill split: high-skilled=tertiary education; low-skilled=secondary education or less.

Aggregate trends: quinquennial OECD averages, 1990–2024

Outcome	1990–1995	1995–2000	2000–2005	2005–2010	2010–2015	2015–2020	2020–2024
Total immigration in working age, as % of initial adult population	0.015	0.019	0.027	0.028	0.032	0.041	0.038
Change of native population in working age, as % of initial total adult population	0.014	0.008	0.009	0.007	-0.019	-0.026	-0.036
Total change of population, as % of initial total population (PWT)	0.034	0.029	0.041	0.046	0.039	0.047	0.022
% change in GDP per capita (PWT)	0.068	0.164	0.085	0.013	0.034	0.014	0.091

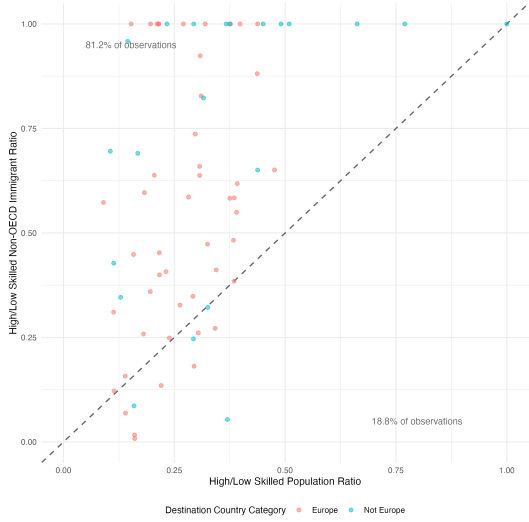
- Total working-age immigration rose from 1.5 to 3.8 percent of initial adult population
- Native working-age population growth went from positive in the 1990's to negative values in the 2010s

Immigrants as a share of adult population, from OECD and non-OECD



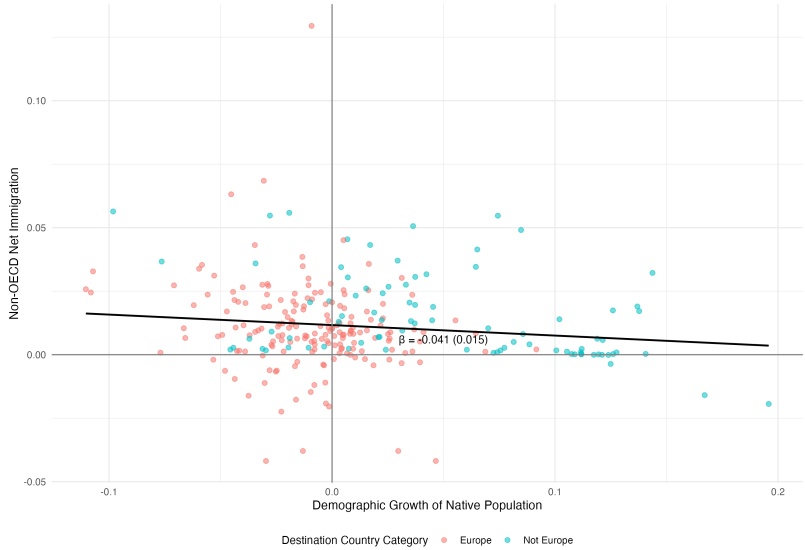
- Foreign-born shares increased substantially in OECD and largest EU countries
- Mainly driven by immigrants from non-OECD countries, with balanced growth from E. Europe, Asia, MENA, Africa, and Lat. Am. Chart

Relative Human Capital intensity of non-OECD immigration vs. residents



- In most country-period observations, net immigration is more skill-intensive than the resident population (above the 45-degree line)

Immigration not “replacing" native demographic decline, across countries



- OLS coefficient is -0.04; full replacement=-1

Explaining differential immigration: push factors, networks, policies and idiosyncratic shocks

- Push-driven shift-share: changing emigration in non-OECD countries interacted with existing networks. Explains the variation in immigration rates as origin composition changes over time.
- Crisis-driven shift-share limited to crisis countries (Syria 2015, Afghanistan 2000, Venezuela 2015, Ukraine 2022, Albania 1990, Romania 2005).
- Immigration policies: (i) **External Regulation** of access for Family, Work and Refugee entries; (ii) **Border control** and enforcement (IMPIC indexes; Helbling et al., 2017)
- **Surges = sudden increase (event) in immigration rates for at least 2 periods** Chart.
- **Shocks = low-probability high immigration rates, not predicted by other factors**, Chart

$\Rightarrow$ Country-level predictors explain little of the variation in changes in net immigration

Empirical power: EU14 plus countries

	(1)	(2)	(3)	(4)	(5)	(6)
Shift Share (T-5)	-0.354	-0.354	-0.0864			
	(0.414)	(0.308)	(0.345)			
Crisis Shift Share (T-5)				-0.609	-0.345	0.139
				(0.538)	(0.490)	(0.333)
1 - IMPIC External Controls	0.0150	0.0119	0.0508**	0.00505	0.00583	0.0539*
	(0.0140)	(0.0145)	(0.0205)	(0.0196)	(0.0228)	(0.0287)
1 - IMPIC External Regulations	0.0970	0.0687*	0.119**	0.0868	0.0620	0.120**
	(0.0643)	(0.0377)	(0.0426)	(0.0635)	(0.0431)	(0.0470)
Shock (p75)		0.0166***			0.0161***	
		(0.00355)			(0.00280)	
Surge (p50, 2 periods)			0.0212***			0.0221***
			(0.00485)			(0.00568)
Native Demo Change	-0.0263	-0.0493	0.0863	-0.0261	-0.0402	0.0993
	(0.0595)	(0.0675)	(0.0743)	(0.0778)	(0.0768)	(0.0985)
Year FE	X	X	X	X	X	X
Country FE	X	X	X	X	X	X
Observations	74	74	74	74	74	74

- Push-driven shift-share does not explain country-level immigration changes (Ortega and Peri 2013, Jaeger et al, 2018)
- External Regulation matters, Border control less so (IMPIC indexes; Helbling et al., 2017)
- Idiosyncratic surges and shocks have the most predictive power.

$\Rightarrow$ Country-level predictors explain only a limited share of the variation in changes in net immigration

Empirical framework: local projections (Jordà, 2005)

Baseline specification

$$y_{i,t+h} - y_{i,t-5} = \alpha_i + \lambda_t + \beta_I \frac{\Delta Immi^{nonOECD}_{i,t,t-5}}{Pop^{15+}_{i,1990}} + \beta_D \frac{\Delta NativeWorkAge_{i,t,t-5}}{Pop^{15+}_{i,1990}} + \rho y_{i,t-5} + \varepsilon_{i,t}$$

- Horizons: cumulative changes over 0–5 and 5–10 years
- Country and period FE; one lag of the dependent variable
- Population weights; standard errors clustered at the destination-country level
- Identification strategy: compare baseline estimates with responses to policy changes, shocks/surges, and regional shift-share IV estimates.
- Split high- and low-skilled estimates

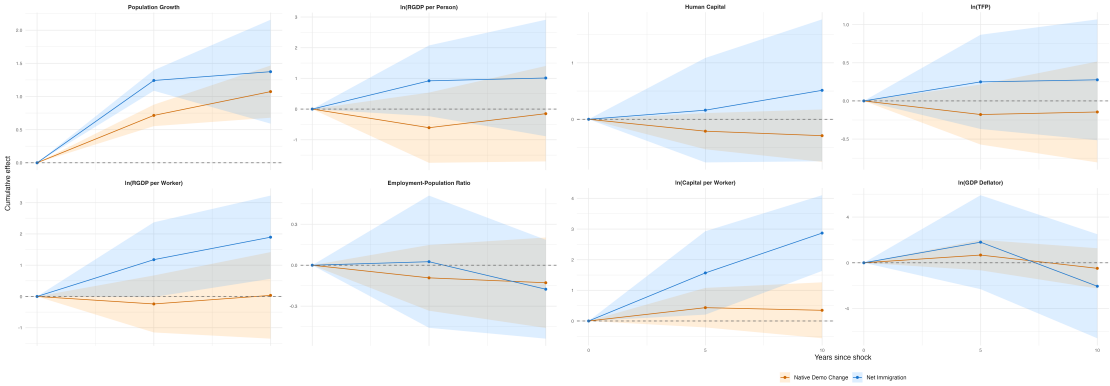
Outcomes

- **Full Outcomes**:
  - Changes in population,
  - GDP per person,
  - **GDP per worker**,
  - Employment-population ratio,
  - **human capital** (years of schooling weighted by returns to schooling) h,
  - **TFP**, A
  - **capital per worker**, k
  - GDP deflator (P)

- We focus on labor productivity and its standard accounting decomposition of GDP per worker growth:
  $g_{ypw} = g_A + (1 - \alpha)g_k + \alpha g_h$

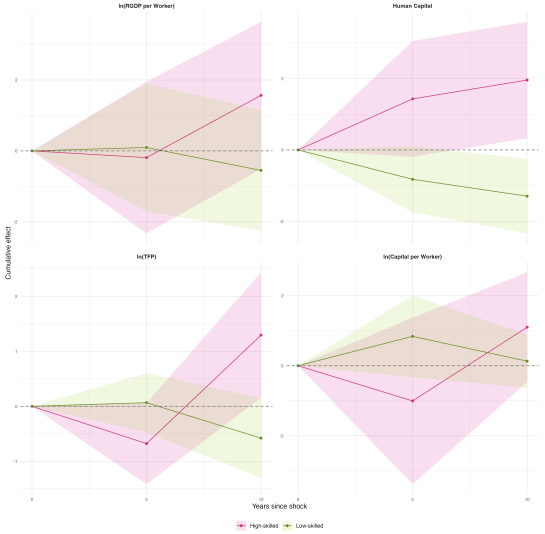
Baseline results: impulse responses to non-OECD immigration

Table



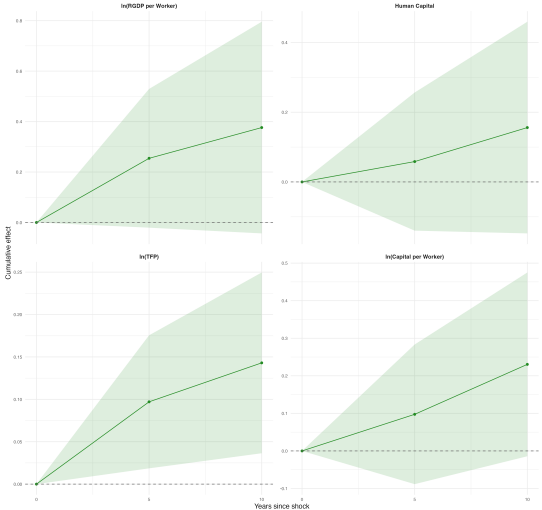
- A 1 pp higher non-OECD immigration rate predicts about 1.2 pp GDP per worker growth in 5 years, 1.9 pp in 10y
- The strongest, most precise effect is capital per worker: $\sim$1.6 pp in 5 years, 2.9 pp in 10y. TFP and human capital are positive but not significant.
- Native demographic change has no predictive power, except for population

High-skilled vs low-skilled immigration



	Horizon 0–5 yrs	Horizon 5–10 yrs
ln(RGDP per Worker)		
High-skilled	-0.190	1.567
	(1.091)	(1.059)
Low-skilled	0.0943	-0.551
	(0.918)	(0.869)
Human Capital		
High-skilled	1.430*	1.958**
	(0.827)	(0.833)
Low-skilled	-0.822*	-1.295**
	(0.470)	(0.532)
ln(TFP)		
High-skilled	-0.678*	1.294**
	(0.376)	(0.580)
Low-skilled	0.0659	-0.579
	(0.273)	(0.370)
ln(Capital per Worker)		
High-skilled	-1.006	1.101
	(1.213)	(0.798)
Low-skilled	0.840	0.130
	(0.594)	(0.388)
Observations	82	82
Lags	X	X
Native Demo Change	X	X
Year FE	X	X
Country FE	X	X

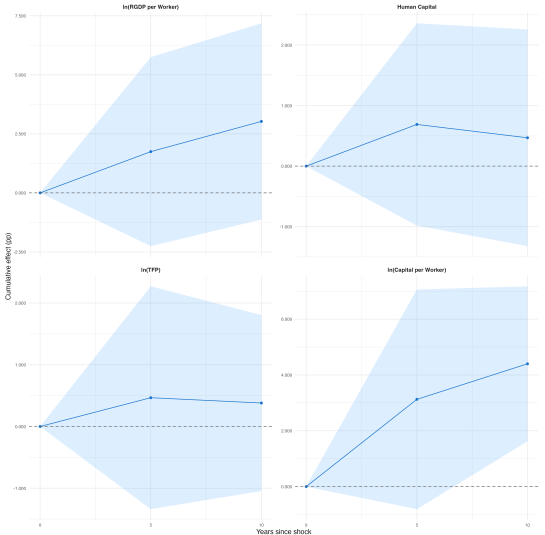
Regressing Outcomes on Immigration Policy: Loosening External Regulations



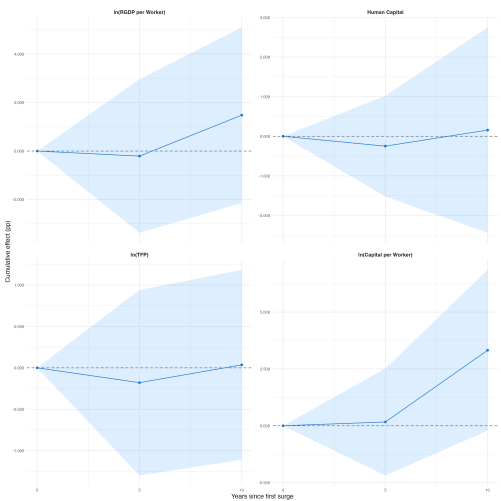
	Horizon 0-5 years	Horizon 5-10 years
ln(RGDP per Worker)		
1 - IMPIC External Regulations	0.254*	0.376*
	(0.140)	(0.214)
Native Demo Change	-0.605	0.481
	(0.396)	(0.700)
Human Capital		
1 - IMPIC External Regulations	0.0584	0.156
	(0.101)	(0.155)
Native Demo Change	-0.179	-0.283
	(0.165)	(0.258)
ln(TFP)		
1 - IMPIC External Regulations	0.0970**	0.143**
	(0.0400)	(0.0544)
Native Demo Change	-0.343*	-0.243
	(0.189)	(0.306)
ln(Capital per Worker)		
1 - IMPIC External Regulations	0.0975	0.230*
	(0.0948)	(0.125)
Native Demo Change	0.218	0.213
	(0.492)	(0.585)
Observations	132	132
Lags	X	X
Year FE	X	X
Country FE	X	X

Immigration Shocks and Surges, All OECD countries

Shocks

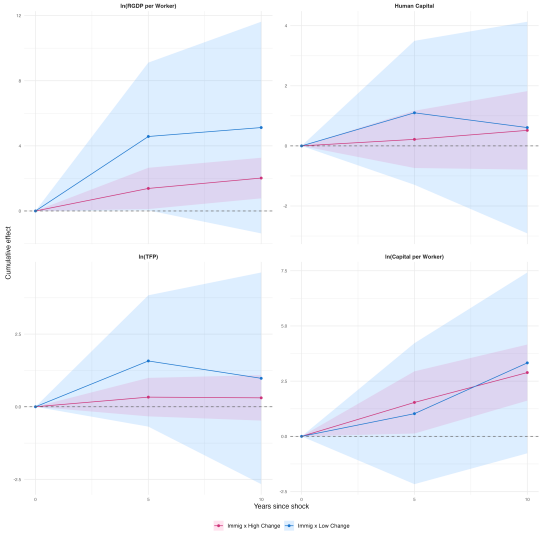


Surges

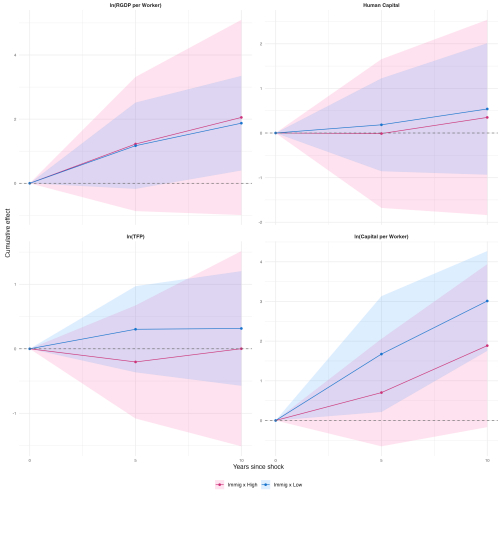


High and Low rates and immigrant shares, All OECD countries

High vs Low Imm. Rates



High vs Low Imm. Shares



Regional analysis: LP-IV results

	(1) Horizon 0-5 years	(2) Horizon 5-10 years
ln(RGDP per Person)		
Net Immigration	-2.398	8.964
	(1.501)	(7.605)
Native Demo Change	-1.641**	1.061
	(0.700)	(2.323)
ln(RGDP per Worker)		
Net Immigration	-4.704***	13.944**
	(1.226)	(6.255)
Native Demo Change	-1.427*	1.904
	(0.733)	(1.319)
ln(Capital per Worker)		
Net Immigration	-4.375	14.098**
	(2.935)	(7.129)
Native Demo Change	-2.569	3.587*
	(1.975)	(2.051)
Observations	439	282
Lags	X	X
Year FE	X	X
Region FE	X	X

- European NUTS-2 regions, 2005–2024
- Shift-share IV, weak, but still doable (F-stat around 11)
- Regional estimates support the country-level evidence (labor productivity and capital per worker)
- But caveat: point estimates are large and imprecise (qualitative support for the national results)

Summary of Main Findings

- **Net immigration** $\rightarrow$ **higher GDP per worker growth** over ten years.
- **Strongest channel is capital deepening**;
- **High-skilled immigration** drives the strongest **human capital, TFP and labor productivity effects**. Low-skilled immigration has neutral effects on productivity
- More open external immigration regulations, large immigration shocks, sustained immigration surges and regional analysis **all point in the same pro-growth direction**
- **Native demographic change did not show any positive association with productivity**

Connecting to the mostly applied literature

- **Existing macro evidence:** Aligned with positive investment and productivity responses in aggregate OECD countries and US states.
  - Engler et al., 2023; Peri, 2012.
- **High-skilled immigration and TFP:** Evidence on STEM workers, patents, innovation, productivity spillovers
  - Bernstein et al., 2022; Mayda et al., 2022; Peri et al., 2015; Jaumotte et al., 2016).
- **Strongest effects over 10 years:** Evidence of strong economic integration of immigrants within 10 years, and an efficient transition for natives.
  - Lee et al. 2022; Peri and Sparber, 2009
- **Firm creation, entrepreneurship and investments:** Immigrants are overrepresented among entrepreneurs, high-growth startups and attract investments
  - (Chodavadia et al., 2024; Azoulay et al., 2022; Tareque et al., 2024; Beine et al., 2023; Beerli et al (2020)
- **Labor market effects:** Small wage-displacement effects once capital adjustment, task specialization and complementarities are considered
  - (Ottaviano and Peri, 2012; Peri and Yasenov, 2019; Peri and Sparber, 2009; Caiumi and Peri, 2024; Manacorda et al., 2012)

Magnitudes and Takeaway

- While these results should be taken with caveats, the magnitude is significant. Net immigration may have helped cumulative 1990–2024 **labor productivity growth** by:
  - 28% in Spain
  - 19% in the UK
  - 14.5% in Italy
- These represent **1/3 or more of the growth in labor productivity** during the period.

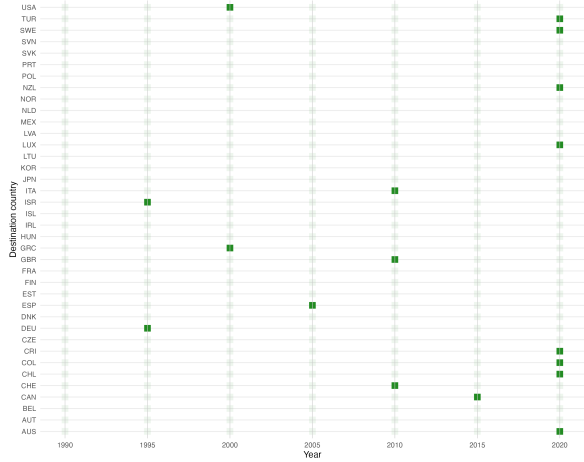
Policy takeaway

In aging advanced economies, evidence is consistent with immigration not only helping offset demographic decline but also supporting investments and long-run productivity growth, more than native population growth would have done

Appendix

Idiosyncratic variation: immigration shocks

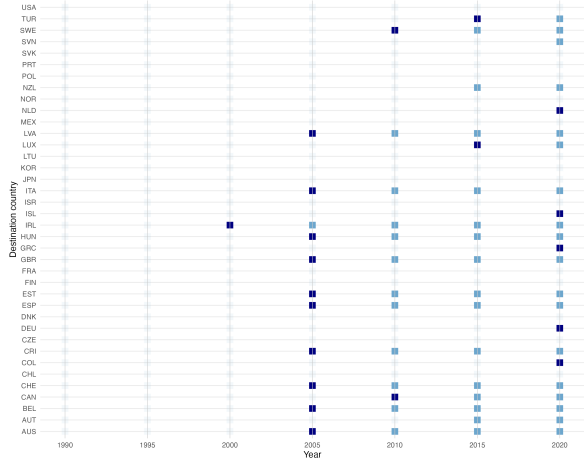
Back



- Migration shocks are often considered detrimental to growth
  - Country-period above both the destination-specific and cross-country 75th percentile

Idiosyncratic variation: immigration surge

Back



- Migration shocks are often considered detrimental to growth
  - Country-period with increase in immigration rate by >p50, sustained for at least 2 periods.

Baseline local projection coefficients

Back

	Horizon 0-5 years	Horizon 5-10 years
Population Growth		
Net Immigration	1.242***	1.374***
	(0.0789)	(0.400)
Native Demo Change	0.715***	1.074***
	(0.0825)	(0.201)
ln(RGDP per Person)		
Net Immigration	0.921	1.013
	(0.588)	(0.968)
Native Demo Change	-0.607	-0.150
	(0.584)	(0.793)
ln(RGDP per Worker)		
Net Immigration	1.177*	1.896***
	(0.609)	(0.678)
Native Demo Change	-0.240	0.0345
	(0.465)	(0.706)
ln(Capital per Worker)		
Net Immigration	1.568**	2.869***
	(0.694)	(0.630)
Native Demo Change	0.435	0.349
	(0.329)	(0.466)
Observations	266	228
Lags	X	X
Year FE	X	X
Country FE	X	X

	Horizon 0-5 years	Horizon 5-10 years
Employment-Population Ratio		
Net Immigration	0.0256	-0.176
	(0.247)	(0.185)
Native Demo Change	-0.0926	-0.128
	(0.123)	(0.169)
Human Capital		
Net Immigration	0.161	0.513
	(0.472)	(0.641)
Native Demo Change	-0.211	-0.290
	(0.163)	(0.237)
ln(TFP)		
Net Immigration	0.250	0.277
	(0.315)	(0.404)
Native Demo Change	-0.178	-0.145
	(0.201)	(0.337)
ln(GDP Deflator)		
Net Immigration	1.803	-2.052
	(2.096)	(2.322)
Native Demo Change	0.678	-0.484
	(0.680)	(0.897)
Observations	266	228
Lags	X	X
Year FE	X	X
Country FE	X	X

Alternative margins: shocks and saturation

Back

(a) Immigration shocks

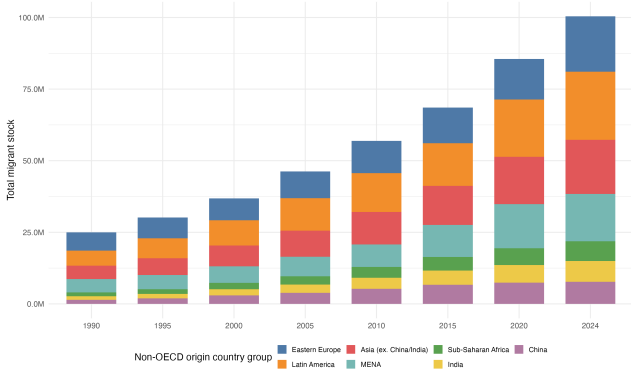
	Horizon 0-5 years	Horizon 5-10 years
ln(RGDP per Worker)		
Shock Dummy (p75)	1.746	3.027
	(2.041)	(2.120)
Human Capital		
Shock Dummy (p75)	0.689	0.468
	(0.852)	(0.913)
ln(TFP)		
Shock Dummy (p75)	0.466	0.380
	(0.921)	(0.727)
ln(Capital per Worker)		
Shock Dummy (p75)	3.126	4.400***
	(2.006)	(1.416)
Observations	266	228
Lags	X	X
Native Demo Change	X	X
Year FE	X	X
Country FE	X	X

(b) Large immigration waves

	Horizon 0–5 yrs	Horizon 5–10 yrs
ln(RGDP per Worker)		
Net Immigration × Low Change	4.575*	5.123
	(2.315)	(3.316)
Net Immigration × High Change	1.384**	2.022***
	(0.646)	(0.635)
Native Demo Change	-0.192	0.0749
	(0.455)	(0.659)
Human Capital		
Net Immigration × Low Change	1.101	0.610
	(1.222)	(1.797)
Net Immigration × High Change	0.217	0.517
	(0.486)	(0.666)
Native Demo Change	-0.194	-0.289
	(0.148)	(0.233)
ln(TFP)		
Net Immigration × Low Change	1.576	0.979
	(1.152)	(1.858)
Net Immigration × High Change	0.332	0.307
	(0.337)	(0.399)
Native Demo Change	-0.150	-0.135
	(0.200)	(0.337)
ln(Capital per Worker)		
Net Immigration × Low Change	1.027	3.327
	(1.628)	(2.089)
Net Immigration × High Change	1.536**	2.888***
	(0.718)	(0.647)
Native Demo Change	0.429	0.352
	(0.327)	(0.469)
Observations	266	228
Lags	X	X
Year FE	X	X
Country FE	X	X

Non-OECD immigrants by regions of origin

Back



Number of immigrants from non-OECD origins, stocks in OECD countries.