

Impact of Education Level Changes on Inequality

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Fall 2024



Overview

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Research Question

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Methodological Approach

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Key Findings

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We define the random variable Y as the change in a specific outcome for U.S. natives, X as the Immigrant Inflow, and Z as the instrument for X . The sample $\{Y_c, X_c, Z_c\}_{c=1}^{722}$ consists of 722 CZs across the United States.

Due to the potential endogeneity of X , the structural model is proposed as follows:

$$Y_c = \alpha + \beta X_c + \mathbf{W}_c' \gamma + u_c \quad (1)$$

$$X_c = \phi + \xi Z_c + \mathbf{W}_c' \theta + \nu_c \quad (2)$$

(3)

$$\mathbb{E}[u_c | X_c] \neq 0 \quad (4)$$

$$\text{Cov}(X_c, Z_c) \neq 0 \quad (5)$$

$$\mathbb{E}[u_c | Z_c] = \mathbb{E}[\nu_c | Z_c] = 0 \quad (6)$$

Where W is a vector of controls.

This model is estimated using 2SLS, correcting inference for heteroskedasticity and autocorrelation with clustered robust standard errors, grouped by state.

We are interested in evaluating the relationship between the instrument Z and the endogenous variable X , specifically $\text{Cov}(X_c, Z_c) \neq 0$, given the control variables W . To do so, we use the auxiliary regression:

$$r_{X,c} = \psi r_{Z,c} + \omega_c \quad (7)$$

where $r_{X,c}$ and $r_{Z,c}$ are the orthogonal components of X and Z , respectively, defined as:

$$X_c = a_0 + \mathbf{W}'_c \mathbf{a}_1 + r_{X,c} \quad (8)$$

$$Z_c = b_0 + \mathbf{W}'_c \mathbf{b}_1 + r_{Z,c} \quad (9)$$

The null hypothesis that the instrument is irrelevant ($\psi = 0$) is rejected if the $F_{partial}$ statistic exceeds 10¹. Alternatively, this can be tested using a χ^2 distribution with one degree of freedom², as we have a single endogenous variable and a single instrument.

The $F_{partial}$ statistic is defined as:

$$F_{partial} = \frac{R^2}{\frac{1-R^2}{n-1}} \quad (10)$$

where R^2 is the coefficient of determination from the auxiliary regression 7, and n is the number of observations, which in this case is 722.

¹Staiger & Stock (1997)

²Montiel Olea & Pflueger (2013)

Table 1: First-Stage 2SLS Results

Endogenous Variable: Change in the share of the population with less than 12 years of education			
		(1)	(2)
Partial F Statistic		22.376	44.856
P-value		0.0000	0.0000
Constant		-0.0362*** (0.0027)	-0.2737*** (0.0311)
Share of the college-educated population in 1990			0.0130 (0.0229)
Share of employment among the foreign-born population 1990			0.0607*** (0.0119)
Share of employment among women in 1990			0.0353 (0.0775)
Share of population with high school education in 1990			0.2617*** (0.0170)
Logarithm of total population in 1990			0.0000 (0.0013)
Share of employment in manufacturing in 1990			-0.0431*** (0.0139)
Instrument		0.2015*** (0.0426)	0.2276*** (0.0340)
R^2		0.1834	0.7092
Partial R^2		0.1834	0.2424

Notes: $N = 741$. Robust standard errors (in parentheses) are clustered at the state level. A Partial F-statistic below 10 is typically considered weak evidence of instrument relevance. The p-value is calculated using a $\chi^2(1)$ distribution. Weighted regression based on the population size in each "CONSPUMA."

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Main Results

Instrumental Relevance

The results in Table 1 present the partial F -statistic corresponding to the first stage of the 2SLS regression. According to the commonly accepted rule by Staiger and Stock (1997), and considering that the value of the partial F -statistic exceeds 10 in both exercises, it is concluded that the instrument is relevant for the measurement of the change in the proportion of individuals with less than 12 years of schooling.

Main Results

Causal Effect on Native Population Outcomes

Table 2: Results of the 2SLS on the Difference Between High and Low Education Levels for Various Outcomes of the Native Population

Native Population Outcome	Growth Rate of Wages		Growth Rate of Unemployment		Growth Rate of NILF	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant Term	-0.010*** (0.002)	0.120* (0.068)	0.163*** (0.017)	-0.047 (0.198)	0.0122*** (0.0020)	0.0749 (0.0516)
Share of the college-educated population in 1990		-0.012 (0.043)		0.254** (0.129)		-0.2459*** (0.0522)
Share of employment among the foreign-born population in 1990		-0.076* (0.039)		0.200** (0.079)		-0.0692** (0.0275)
Share of employment among women in 1990		-0.353*** (0.080)		-0.225 (0.354)		0.1914* (0.1096)
Share of population with high school education in 1990		0.011 (0.063)		0.230* (0.125)		-0.0434 (0.0511)
Logarithm of total population in 1990		0.002 (0.001)		-0.002 (0.005)		-0.0033** (0.0017)
Share of employment in manufacturing in 1990		0.044* (0.025)		0.328*** (0.093)		0.0225 (0.0273)
Change in the share of the population with less than 12 years of education	-0.074 (0.083)	0.154 (0.207)	1.902*** (0.503)	1.221** (0.518)	0.4093*** (0.1279)	0.9830*** (0.1379)

Notes: $N = 741$. Robust standard errors (in parentheses) are clustered at the state level. Weighted regression based on the population size in each CONSPUMA.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Main Results

Causal Effect on Native Population Outcomes

Los resultados 2 muestran que, dado un incremento en el Change in the share of the population with less than 12 years of education (x):

- No hay un efecto significativo sobre la diferencia relativa entre los grow rates de los salarios de los trabajadores nativos con educación alta y baja (Columna 1 y 2)
- El crecimiento en la tasa de desempleo de los trabajadores nativos con alta educación es significativamente mayor que el de los trabajadores con baja educación (Columna 4).
- El crecimiento en la tasa de inactividad laboral de los trabajadores nativos con alta educación es significativamente mayor que el de los trabajadores nativos con baja educación (Columna 6).

Main Results

Causal Effect on Native Population Outcomes

Defining a region as highly exposed if it ranks in the 75th percentile ³ of the change in population share with less than 12 years of education, while a low-exposure region corresponds to the 25th percentile:

- The unemployment growth rate for highly educated native workers relative to less-educated native workers in highly exposed regions is projected to be 4.58 percentage points higher than in low-exposure regions.
- The NILF growth rate for highly educated native workers relative to less-educated native workers in highly exposed regions is projected to be 3.68 percentage points higher than in low-exposure regions.

³Percentiles weighted by population size.

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