Air Pollution and Migration – exploiting a natural experiment from the Czech Republic

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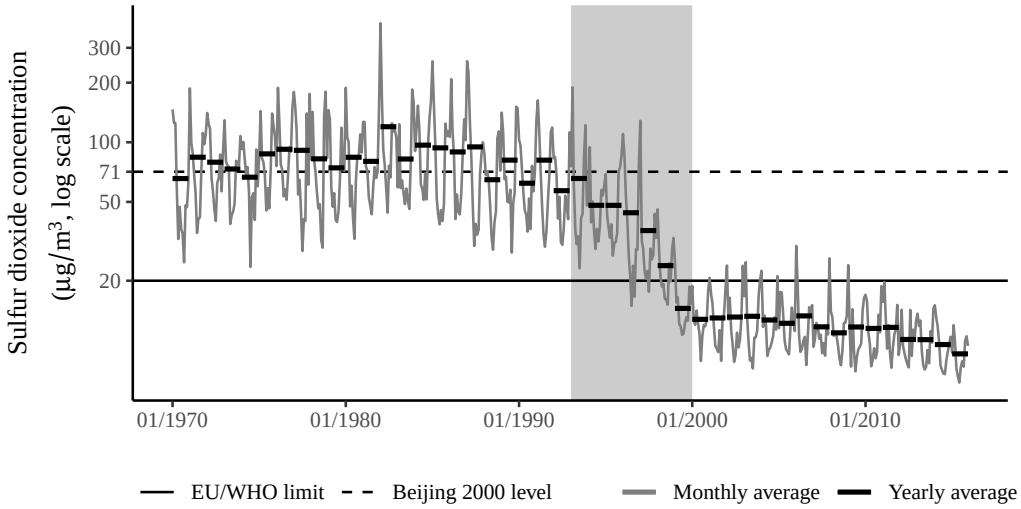
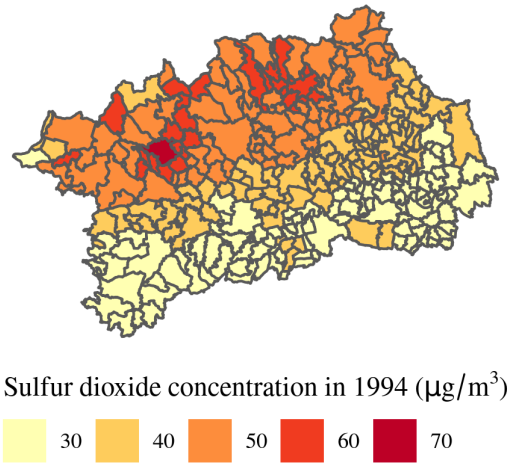
EALE 2020

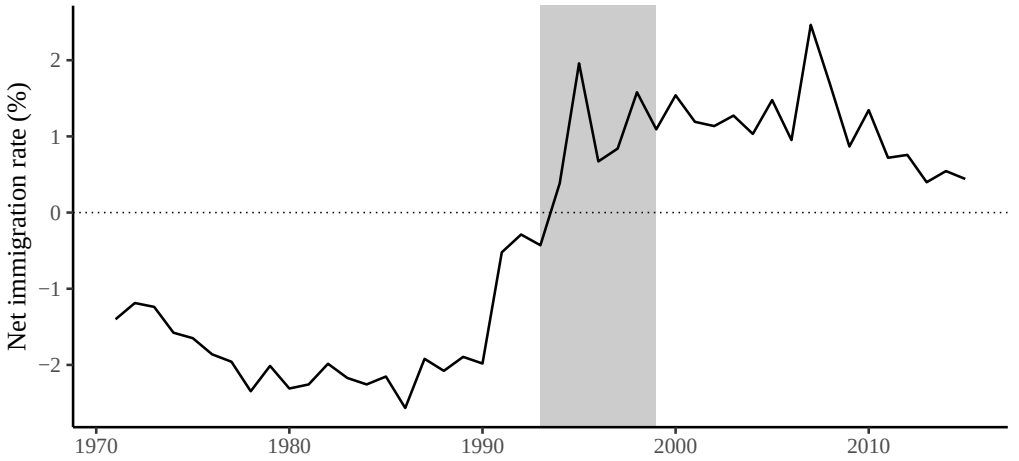
Sulfur dioxide concentration in Northern Bohemia (1970–2015)



Spatial distribution of
Sulfur dioxide concentrations (1994)



Net immigration rate in Northern Bohemia (1971–2015)



Anti-depopulation policies (1980–1992):

- Eligibility for (substantial) pro-immigration benefits determined by **individual characteristics.**
- Eligibility for (rather small) anti-emigration benefits determined by **municipality.**

Desulfurization (1993–1999)

- Sulfur dioxide concentrations decreased due to adoption of modern (filtering) technologies.
- Desulfurization did not *per se* affect economic activity in the region.
- Therefore, desulfurization created a **natural experiment** we exploit to **identify the effect of air pollution on residential migration.**

Data/Sample:

- Yearly migration rates for 301 municipalities from Northern Bohemia
- Pre-desulfurization period (1983–1989), Post-desulfurization period (2000–2015)
- Pre-desulfurization SO_2 concentrations in levels (30, 40, 50, and 60 $\mu g/m^3$) as of 1994.

We identify the impact of desulfurization (air pollution reduction) using DiD framework:

$$m_{i,t} = \sum_j \gamma_j SO_i p + \sum_k \beta_k l + \theta_i + \theta_p + \varepsilon_{i,t} \qquad (1)$$

m... migration rate, i... municipality, t... year, SO... pre-desulfurization pollution level, p... indicator variable for post-desulfurization period, l... linear trend for each of three sub-regions and period.

	Dependent variable		
	Emigration rate (%) (1)	Immigration rate (%) (2)	Net immig. rate (%) (3)
Pre-desulf. $SO_2 = 40\,\mu g/m^3$	-0.879^{**}	-0.533	0.346
× Post-desulfurization period	(0.397)	(0.378)	(0.562)
Pre-desulf. $SO_2 = 50\,\mu g/m^3$	-1.700^{***}	1.061^{**}	2.760^{***}
× Post-desulfurization period	(0.419)	(0.484)	(0.729)
Pre-desulf. $SO_2 = 60\,\mu g/m^3$	-1.588^{***}	0.171	1.760^{**}
× Post-desulfurization period	(0.469)	(0.567)	(0.856)
Adjusted R^2	0.339	0.142	0.140
Observations	6,229	6,229	6,229

Notes: Table reports coefficients γ from Equation (1). Robust standard errors clustered by municipality are reported in parentheses: *, ** and *** denote statistical significance at 10%, 5% and 1%. The reference category for sulfur dioxide concentration is 30 $\mu g/m^3$.

Results

Decrease in pollution:

- Substantially decreased emigration by 17–27%.
- Had no or positive effect on immigration.
- Triggered re-population of the region.

Effects tend to be non-linear in sulfur dioxide concentrations.

Air pollution reduction vs. abolition of anti-depopulation policies:

- Effect on emigration does not differ between municipalities formerly eligible and not eligible for benefits.
- Zero results on immigration suggest that pro-immigration policies could compensate the dis-utility from pollution in pre-desulfurization period.

We utilize the variability in social capital and man-made amenities endowments orthogonal to pollution concentrations to study their impact on migratory responses to air pollution, which tend to be larger in municipalities:

- lower in social capital, and
- less equipped with man-made amenities.

These results suggest, that **social capital and man-made amenities can compensate for dis-utility from air pollution.**