Air Pollution Quotas and the Dynamics of Internal Skilled Migration in Chinese Cities

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Introduction

We examine the role of a sulphur dioxide (SO2) emissions quota introduced as part of China's 11^{th} Five-Year Plan on internal movements of high-skilled labour across Chinese prefectures. Using data on migration flows calculated through changes in Hukou status, this study suggests that a 10,000 tons increase in the SO2 emissions reduction quota leads on average to approximately a 0.15 percentage points increase in high-skilled net outmigration. Compared to the largest prefectures, this regulation effect is twice as large in the smaller regulated prefectures.

Internal Migration

- **High-skilled labour:** move urban non-agricultural Hukou
- **Low-skilled labour:** move rural Hukou

Formula: residual method (Feng et al., 2010)

$$y_{c,t} = \frac{NonAgr_{c,t-1} - NonAgr_{c,t}}{NonAgr_{c,t-1}} - Pop.\ Growth\%_{c,t}.$$

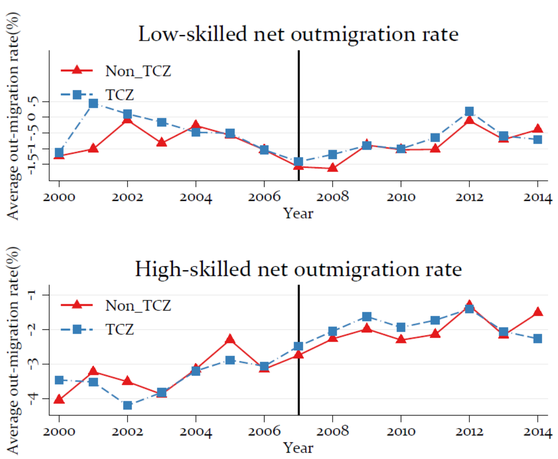


Figure: Outmigration trends for high- and low skills

Air Pollution Regulation in China

Speaking of **Solution**

- Binary: Two-Control Zone (TCZ, "两控区")
- Continuous: Target-based 11^{th} Five-Year Plan: Chen et al. (2018, JEEM)

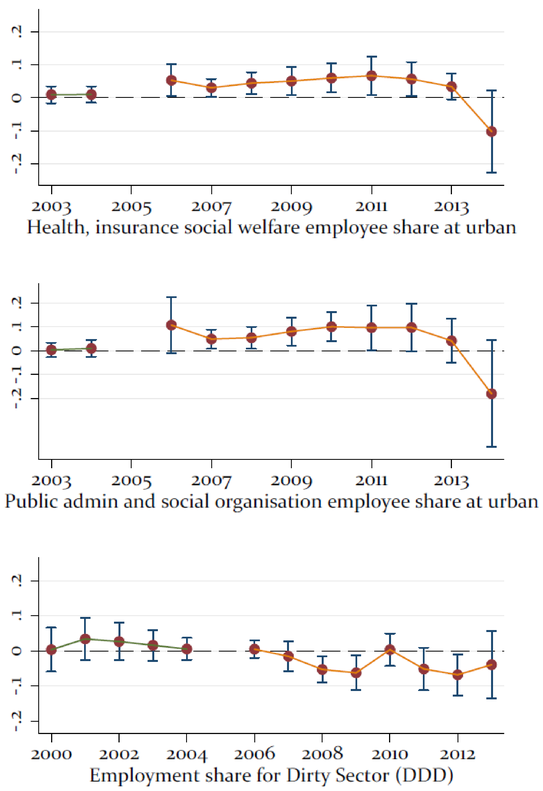
Speaking of **Policy Cost**

- Decrease employment due to Clean Air Act: Walker (2011; AER)
- GDP growth reduction in 11th Five-Year Plan: Chen et al. (2018, JDE)

Speaking of **Identification**

- TCZ status & continuous SO_2 quota
- Time variation: 11^{th} FYP (2006 - 2010)
- thus, Diff-in-Diff

Short-term Mechanism: Dirty-to-Clean Transition



Two-Control Zone vs Continuous SO_2 Quota

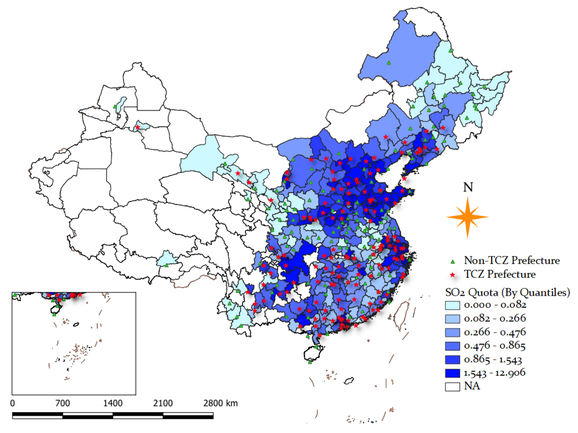
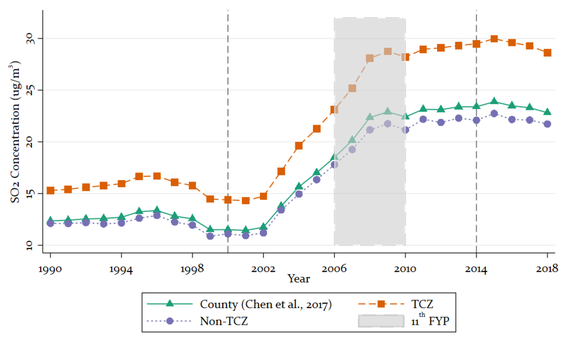


Figure: TCZ strongly correlates with SO_2 quota measurement

Long-term Mechanism: Non-deteriorating Air Quality



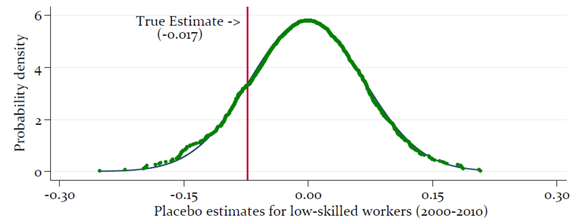
Note: The overall county-level SO2 trends are obtained by using monthly NASA MERRA-2 data. We also replicate the trend seen in Chen et al. (2017)'s study using county level data. TCZ and NTCZ represent average SO2 concentration levels for the TCZ and Non-TCZ prefectures, respectively. The net outmigration trend fades in the long term due to stabilisation in air quality.

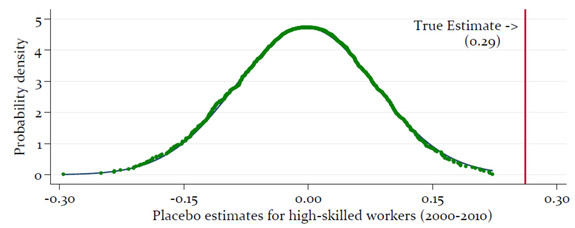
Identification

$$y_{c,t} = \beta_1 \times Quota_c \times Post_t + \mathbf{X_{ct}} + \mathbf{Z_c} \times \mathbf{f(t)} + \delta_c + \lambda_t + \epsilon_{c,t}$$

- Z_c is a vector of TCZ selection variable averaged from 1990 - 1995
- f(t) is a third-order polynomial time trends
- $\mathbf{X_{ct}}$: Push-pull factors that explains outmigration
- δ_c, λ_t: prefecture and year fixed effects

Results for Low- and High-skills





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[3] Chen, Zhao, Matthew E Kahn, Yu Liu, and Zhi Wang (2018), "*The consequences of spatially differentiated water pollution regulation in China.*" Journal of Environmental Economics and Management, 88, 468–485.

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