Toxic Metal Injustice? Socioeconomic Status at Birth and Proximity to Airborne Contamination

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Research question

- We study sorting in space due to airborne pollution
- We focus on three toxic metals: Arsenic, mercury, and lead
- We investigate whether SES groups are affected in different ways
- Intense political discussion regarding *environmental injustice*

Why should we care?

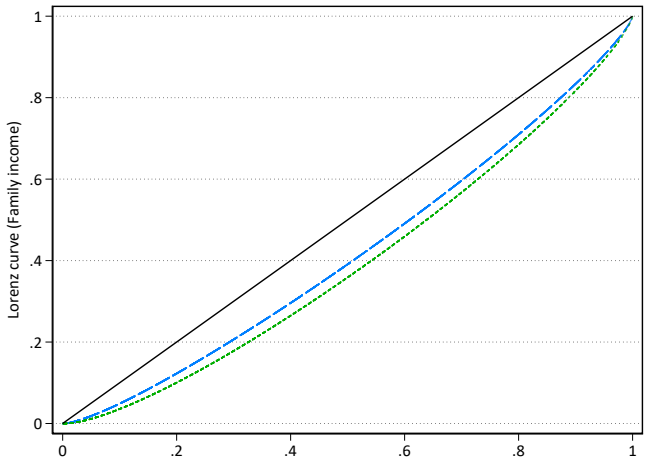
- Findings indicate that individuals of low SES live in closer proximity to contamination (Banzhaf et al., 2019b,a)
- On the other hand: Currie et al. (2020) show that the association between air pollution and SES (in the US) is not as robust anymore
- Earlier studies from Sweden have shown that lead negatively affects human capital development (Grönqvist et al., 2020)
- In this paper we take a broader descriptive perspective

Background and theoretical framework

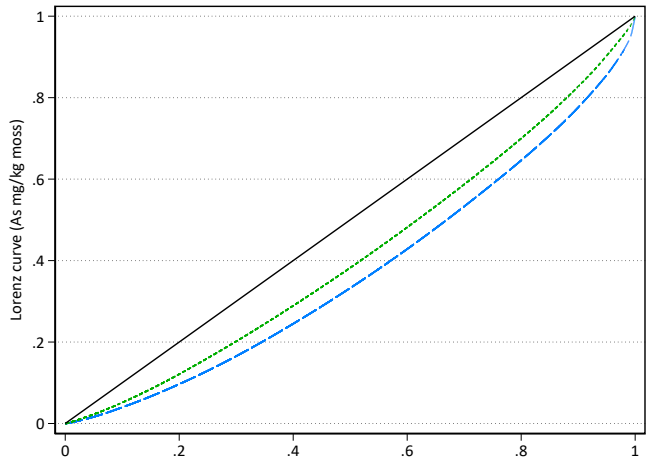
- Environmental pollution is one of the big threats to public health (WHO 2022)
- Fetuses and infants are especially at risk (WHO 2005)
- Exposure has consequences for various outcomes later in life (e.g. Heckman 2007; Almond and Currie 2011)
- One chose where to live based on preferences and budget constraints
- This should result in non-random sorting in space
- Sorting reflect attributes of an area, such as labor market opportunities and local services (Tiebout 1956; Rosen 1979; Roback 1982)
- Sorting *may* apply in the case of apparent pollution, for example smog (Neidell 2009; Moretti and Neidell 2011; Zivin et al. 2011)
- It does not necessarily apply in the case of toxic metals, which are less visible

Data material

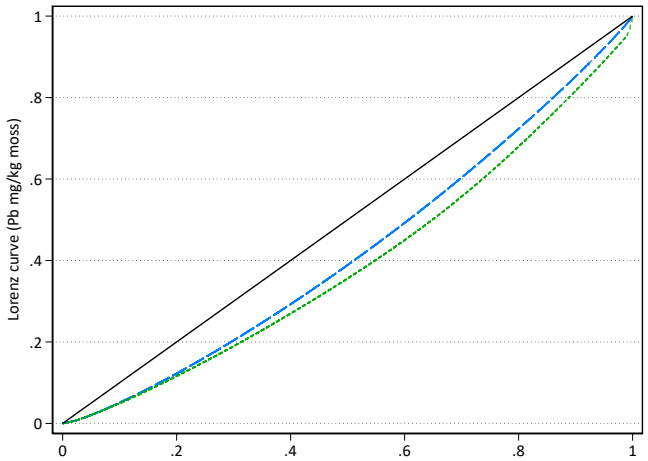
- Swedish registry data regarding place of residence on the grid level
- Income and demographic data from SCB
- Combined with data on arsenic, mercury, and lead pollution in the air from moss samples (data from IVL)
- To avoid airborne levels – one must move in space
- There are recommendations regarding for example consumption of fish during pregnancy
- We map moss samples to grid of residence at the time of birth



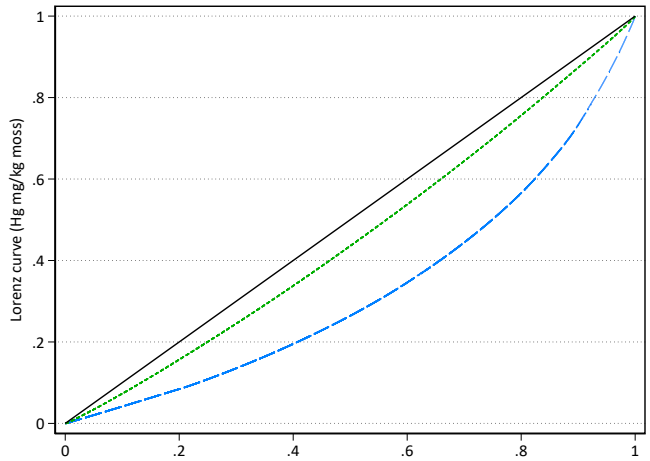
(a) Family income



(b) Arsenic

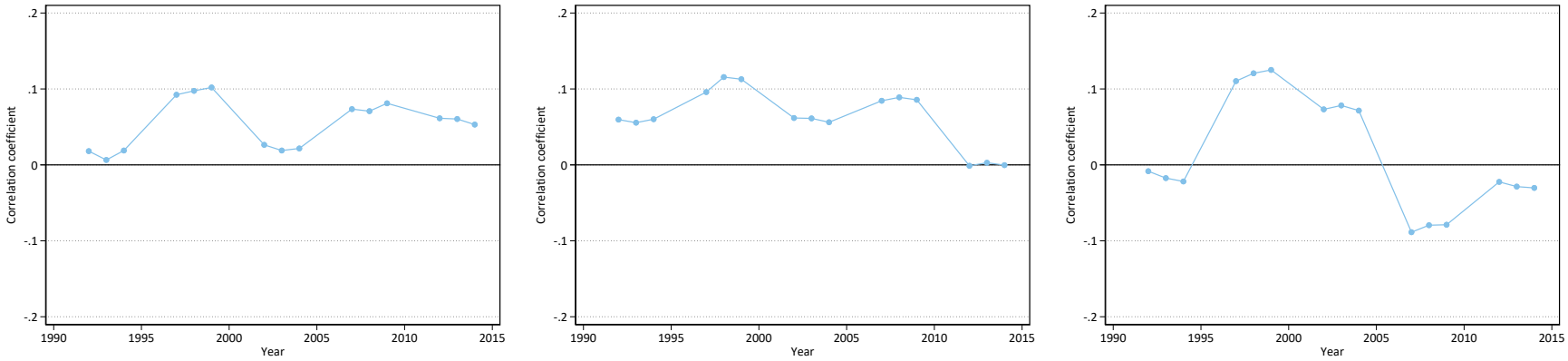


(c) Lead



(d) Mercury

Figure 1: Spatial Lorenz curves for family income and toxic metals.



(a) Ranked family income and arsenic

(b) Ranked family income and lead

(c) Ranked family income and mercury

Figure 2: Correlations between ranked levels of toxic metals (arsenic, lead, and mercury) and ranked levels of family income at birth.

The unit of analysis is the grid level, where the correlation is calculated for each year shown on the x-axis. The correlations are between each of the three toxic metals on the one hand, and ranked family income on the other. The y-axis displays correlation coefficients (r).

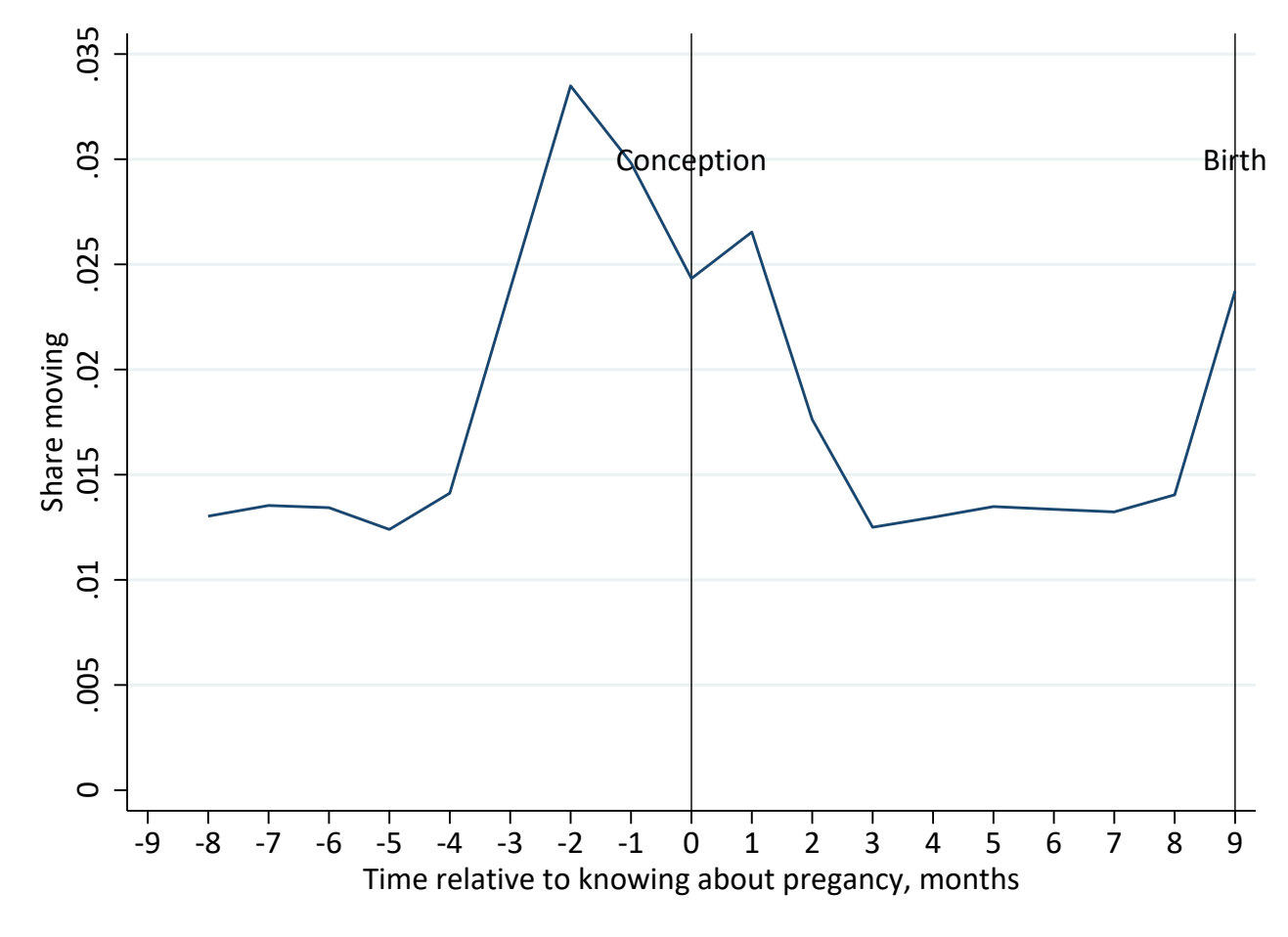
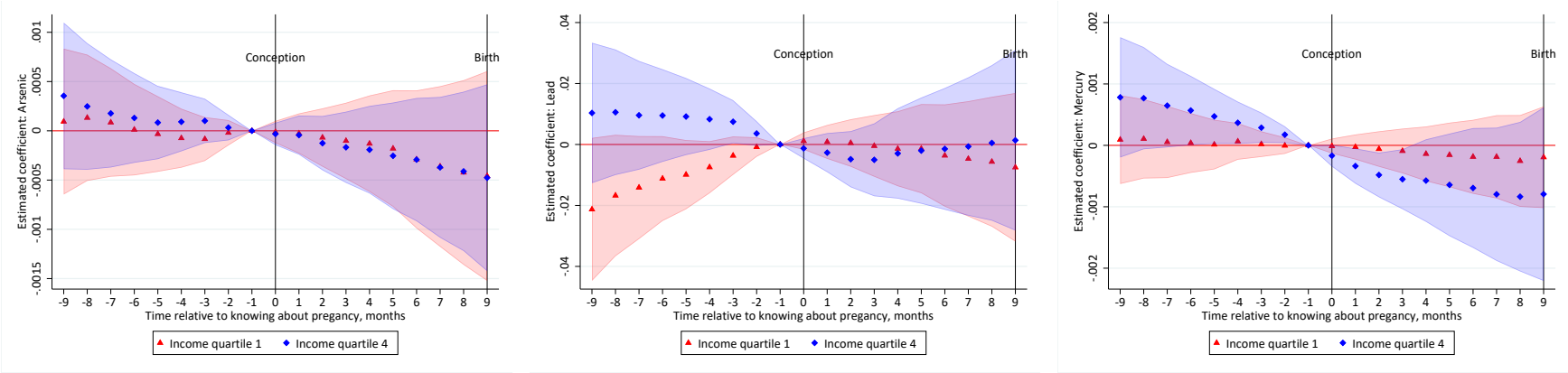


Figure 3: Number of moves

The figure displays the share of moves between parishes 9 months prior of conception and 9 months after conception (birth).



(a) Arsenic (b) Lead (c) Mercury

Figure 4: Event study: Sorting and salience.

Panels (a), (b), and (c) display coefficients from an event estimations including parish of birth fixed effects and year-month fixed effects. Standard errors are clustered at the parish of birth. We include a dummy for each event-month 9 months prior of conception and 9 months after conception (birth) where the month before conception is set as benchmark. The shaded areas are the 95% confidence intervals.

Conclusion

- The spatial distributions of airborne arsenic, lead, and mercury are not associated with the spatial distribution of SES at birth
- No evidence of sorting around pregnancy
- To sort geographically, in line with the model in Tiebout (1956), families need to have information on toxic metals
- Our results may serve as a stepping stone for future studies that estimate the causal effects of exposure towards toxic metals over the life-cycle

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