Measuring the Long-Term Impact of Environmental Externalities

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Motivation

- The environmental and health economics literature has studied the causal relationship between short-run fluctuations in pollution and contemporaneous health outcomes (Currie, Davis, Greenstone, and Walker, 2015).

- We exploit a unique dataset in which we observe the entire Danish population from 1980 to 2018.

- We study the causal relationship between cumulative exposure to pollution and lung cancer over time.

Empirical Strategy

- **Incinerators:** We choose incinerators as the source of pollution of interest.

- **HyADS:** We measure incinerator exposure using the Hybrid Single-Particle Lagrangian Integrated Trajectory Model (HYSPLIT). The resulting measure is HyADS. Moving of particles taking into account various factors (e.g. location, wind, height of the source of pollution).

- **Individual cumulative exposures over time.** Our model produces an individual-level proxy of cumulative exposure.

- **Openings:** In a diff-in-diff framework, we document the presence of decades-long delays between the start of exposure and the manifestation of lung cancer.

- **Closings:** In a survival analysis framework, we study effects on individuals after the end of exposure; individuals keep experiencing an excess risk of lung cancer for 10 years as a pure latency effect. Implications for future research.

- **Regulation:** We exploit an emissions cap introduced in 1991 as an exogenous shock, documenting the same pattern observed with reference to the closings.
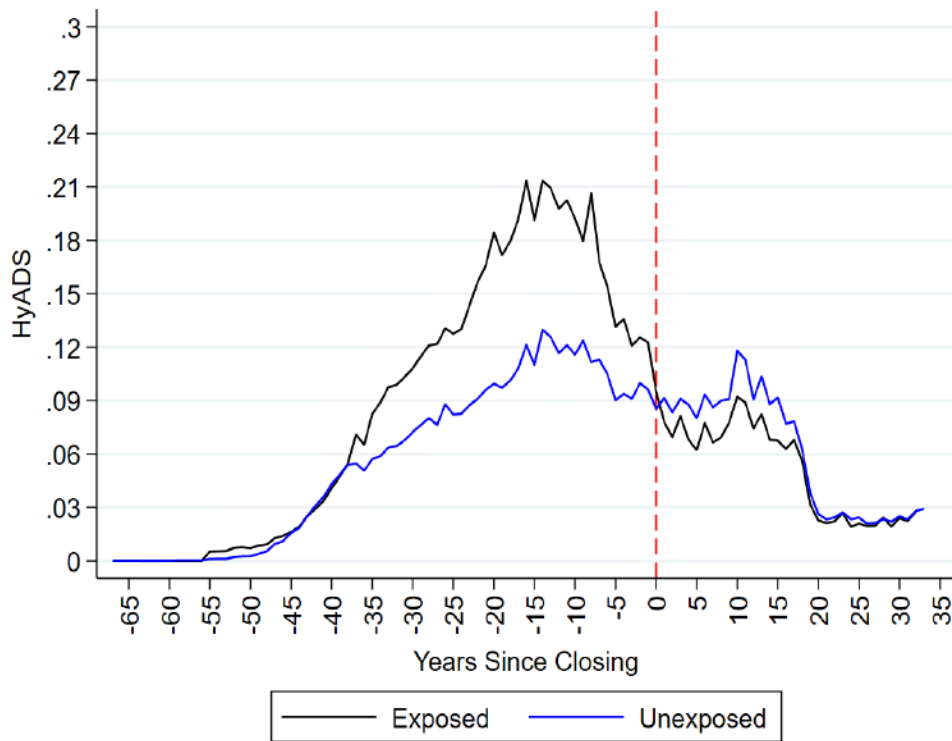
Openings
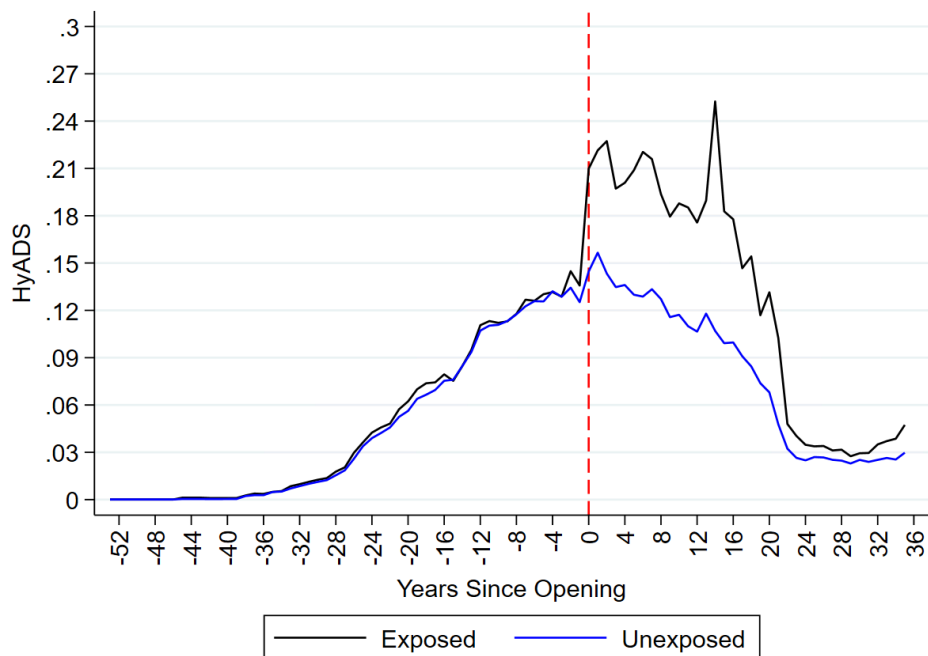
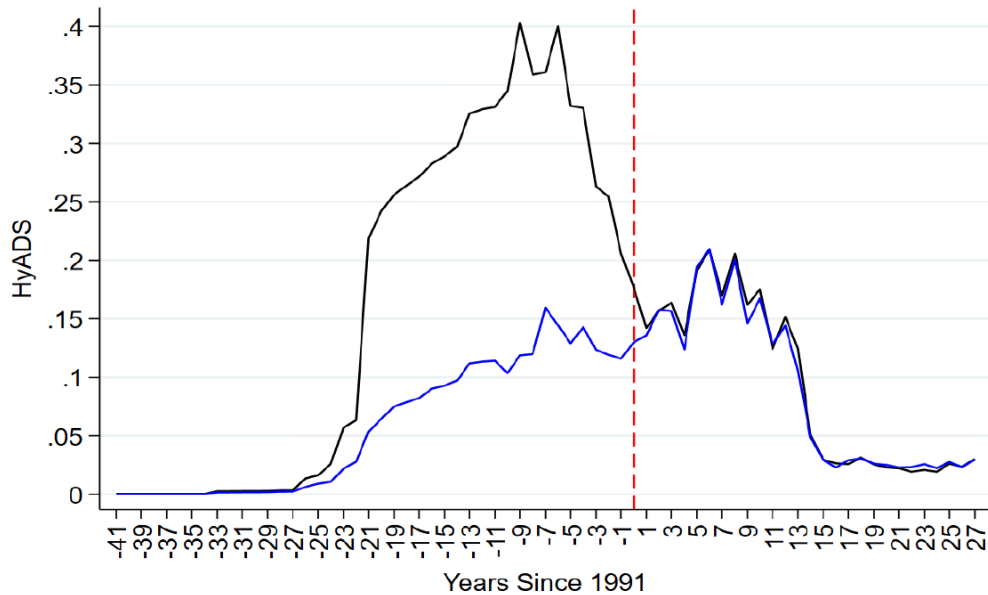| Lung Cancer	
0-4 Years Since Opening	0.357
	(0.670)
5-9 Years Since Opening	-0.612
	(0.730)
10-14 Years Since Opening	0.057
	(0.801)
15-19 Years Since Opening	1.301
	(0.904)
20-24 Years Since Opening	0.424
	(1.018)
25+ Years Since Opening	2.961***
	(1.125)
R^2	0.002
N	11,937,642

Effect: 15% increase (3 BP yearly on a 20 BP baseline)

Closings

Lung Cancer	HR Per 0.3-HyADS-Year
0-4 Years Since Closing	1.0050***
	(0.0014)
5-9 Years Since Closing	1.0025**
	(0.0013)
10-14 Years Since Closing	0.999
	(0.002)
15+ Years Since Closing	0.996
	(0.005)
N	4,314,653

Regulation

Lung Cancer	HR Per 0.3-HyADS-Year
0-4 Years Since 1991	1.026***
	(0.001)
5-9 Years Since 1991	1.006*
	(0.003)
10-14 Years Since 1991	1.007*
	(0.004)
15+ Years Since 1991	0.996
	(0.003)
N	8,215,591