The Impact of Nuclear Accidents on Ratification behavior of the CNS

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Background

- Chernobyl, April 20, 1986
- Brought to light the deficient international nuclear safety standards
- Led to drafting of the Convention on Nuclear Safety.

The Convention Summarized

- Imposed certain standards for the safety in design and siting of land-based civil nuclear power plants

- Internationally Binding

- Enforced by the International Atomic Energy Association (IAEA)

Hypothesis

- Null: There is no impact of nuclear accidents on countries ratification behavior.

- Alternative: Countries who experienced one or more nuclear accidents to be more prone to earlier ratification.

Contribution

- One of the first studies to look at the impact of Disasters on decision making in the context of international environmental agreements.

Main Variables of Interest

- Dependent
  - Ratification Delay
- Covariates
  - Nuclear Accident Occurrence
  - Countries Experiencing Effects from Chernobyl
 - Nuclear Net Capacity

Control Variables

- GDP
- Population
- Polity 2 Score
- Area
- Trade Openness

Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
The Convention on Nuclear Safety ratification delay (in days)	5167.067	2595.429	754	6949
Experienced nuclear accident prior to 1994 (Yes=1, No=0)	0.1340206	0.3415559	0	1
Affected by the Chernobyl Accidents (Yes=1, No=0)	0.1597938	0.3673628	0	1
International environmental agreements signed	9.979058	11.04486	0	51
Population (in millions)	29.0888	114.2058	0.01	1193.537
Policty 2 score	6.090718	3.296102	0	10
Gross Domestic Product (in 2005 US Dollars)	173.3076	765.2482	0.0177347	8800
Area (in millions of sq. miles)	0.7014472	1.901981	0.000006	16.38133
Trade openess	73.57658	44.51289	2.03251	286.6074
Nuclear net capacity (in megawatt-hours)	1709.428	9209.9	0	103015
Nuclear plants under construction	0.1907216	0.8013696	0	5

Note: All data for the variables collected for 1994, unless otherwise noted.
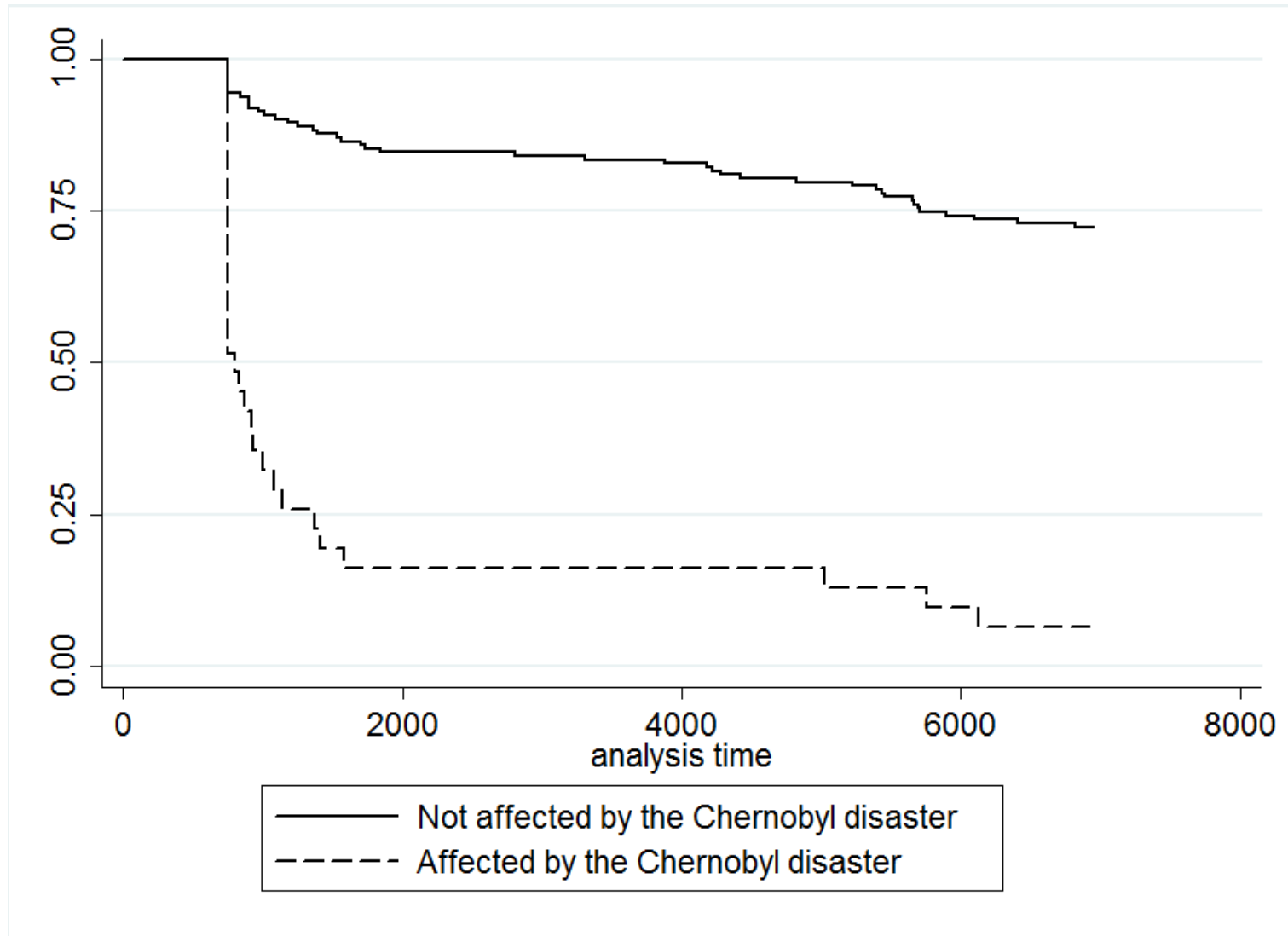
Hazard Ratio
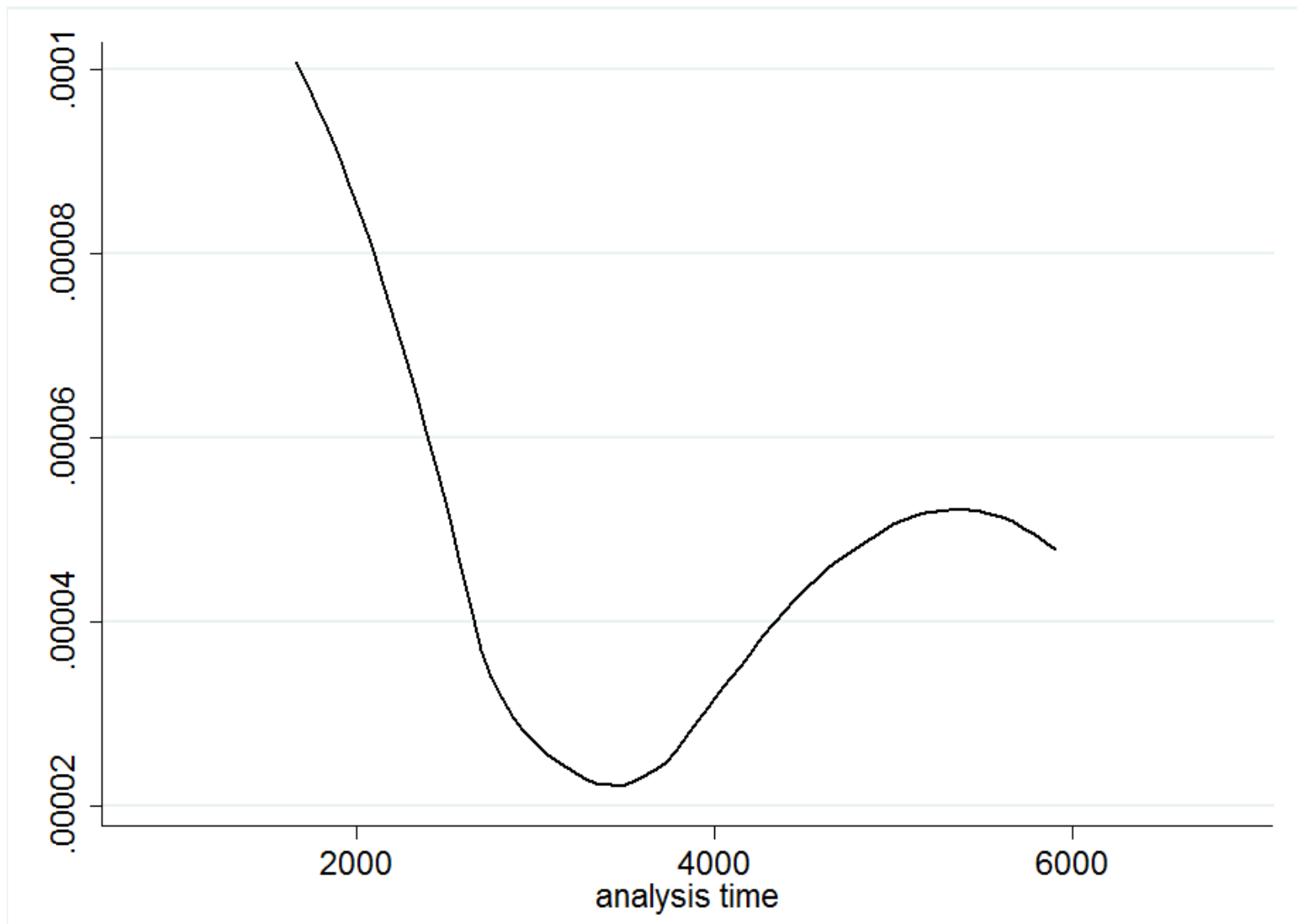
Survival Function By Accident
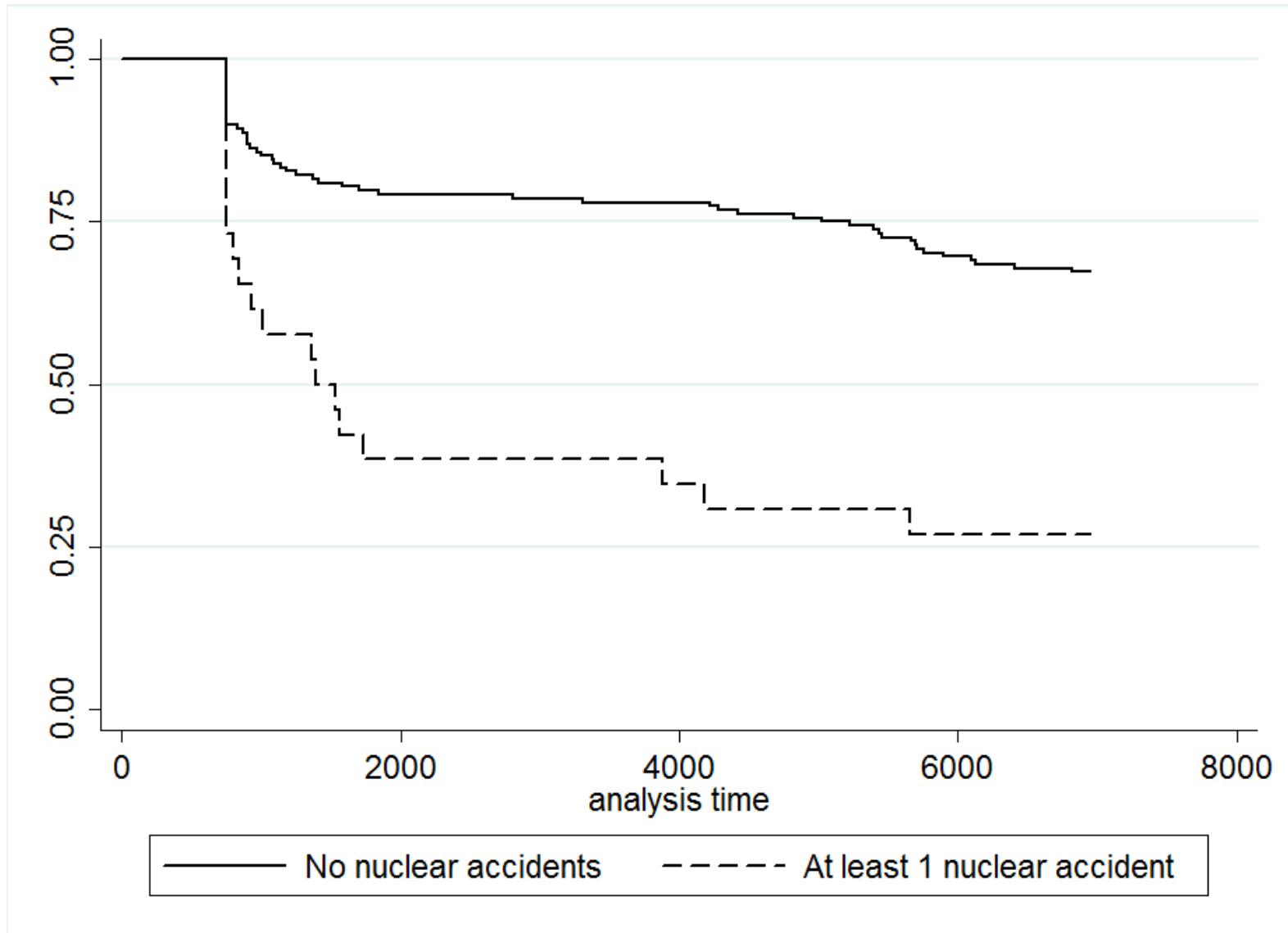
Survival Function (Chernobyl Effects)

Econometric Specification

- Cox Proportional Hazards Model.

$$h(t, X) = h_0(t) \exp(b'X)$$

  - h(t,X) = Hazard rate
  - Non-Parametric (allows for more flexibility)
  - May be less efficient than parametric specifications

Econometric Specification (cont.)

- Weibull: $h(t, X) = \lambda p(\lambda p)^{p-1}$

- Where: $\lambda = \exp(b'X)$
  - p is the shape parameter
  - λ is the location parameter
  - More efficient than Cox model
  - Potential for mis-specification.
  - Parametric

Results

Variables	(1) Cox	(2) Weibull
Experienced nuclear accident prior to 1994 (Yes=1, 0=No)	0.96927***	1.04360***
	(0.33919)	(0.37925)
Affected by the Chernobyl Accidents (Yes=1, 0=No)	1.93678***	2.14295***
	(0.38244)	(0.46456)
International environmental agreements signed (prior to 1994)	0.03543***	0.04967***
	(0.01307)	(0.01316)
Population (in millions)	0.00063	0.00029
	(0.00124)	(0.00203)
Policty 2 score	0.02337	0.03381
	(0.04166)	(0.04522)
Gross Domestic Product (in 2005 US Dollars)	0.00025	0.00041
	(0.00025)	(0.00030)
Area (in millions of sq. miles)	0.16379***	0.19221***
	(0.04865)	(0.06264)
Trade openess (in)	0.00148	0.00169
	(0.00370)	(0.00392)
Nuclear net capacity (in 1994)	-0.00003*	-0.00004*
	(0.00002)	(0.00002)
Nuclear plants under construction (in 1994)	0.14442	0.17091
	(0.19671)	(0.32256)
Constant		-14.51850***
		(1.18822)
Observations	169	169

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

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Conclusion and Policy Implications

- Significant effect of accidents on ratification
- Timing of policy prescriptions
- Further research required in this field