

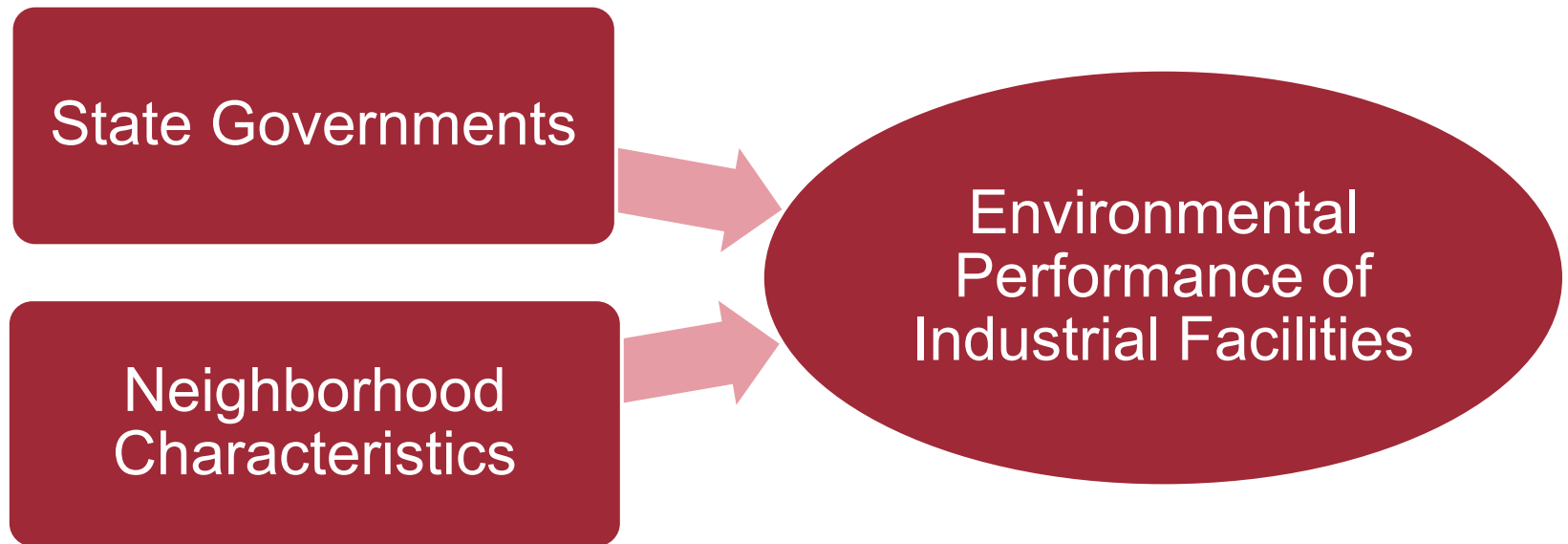
2014 TRI Conference

**BEYOND THE NEIGHBORHOOD:
UNDERSTANDING THE UNEQUAL DISTRIBUTION OF
ENVIRONMENTAL HAZARDS
ACROSS U.S. NEIGHBORHOODS**

Juyoung Lee
Brown University

OVERVIEW

- How did the operations of state governments, in conjunction with neighborhood characteristics, shape the environmental performance of polluting industrial facilities between 2002 and 2012?



PRESENTATION OUTLINE

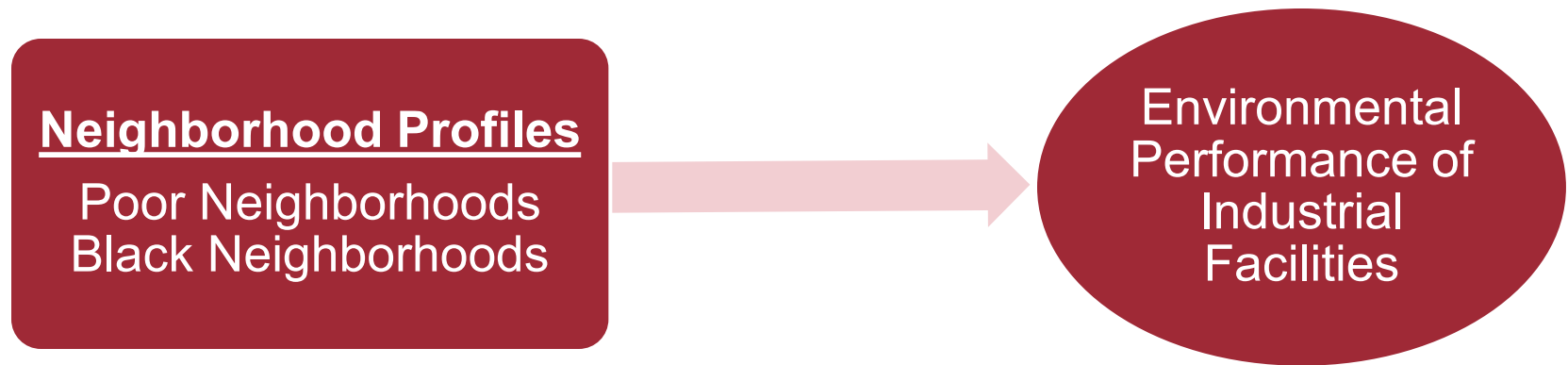
- Research Motivation
- Research Questions and Hypotheses
- Research Design
 - Sample
 - Outcome variable
 - Explanatory variables
 - Statistical models
- Statistical Results
- Conclusion

BEYOND THE NEIGHBORHOOD

- Environmental Inequality Literature
 - The racial and socioeconomic characteristics of neighborhoods
 - Mixed evidence of environmental inequality
 - Variation across metropolitan areas in the U.S. (Downey 2007)
- Social Processes on Broader Spatial Scales
 - The operations of state governments (Burns, Lynch, and Stretesky 2008)

RESEARCH QUESTIONS & HYPOTHESES

RESEARCH QUESTION I



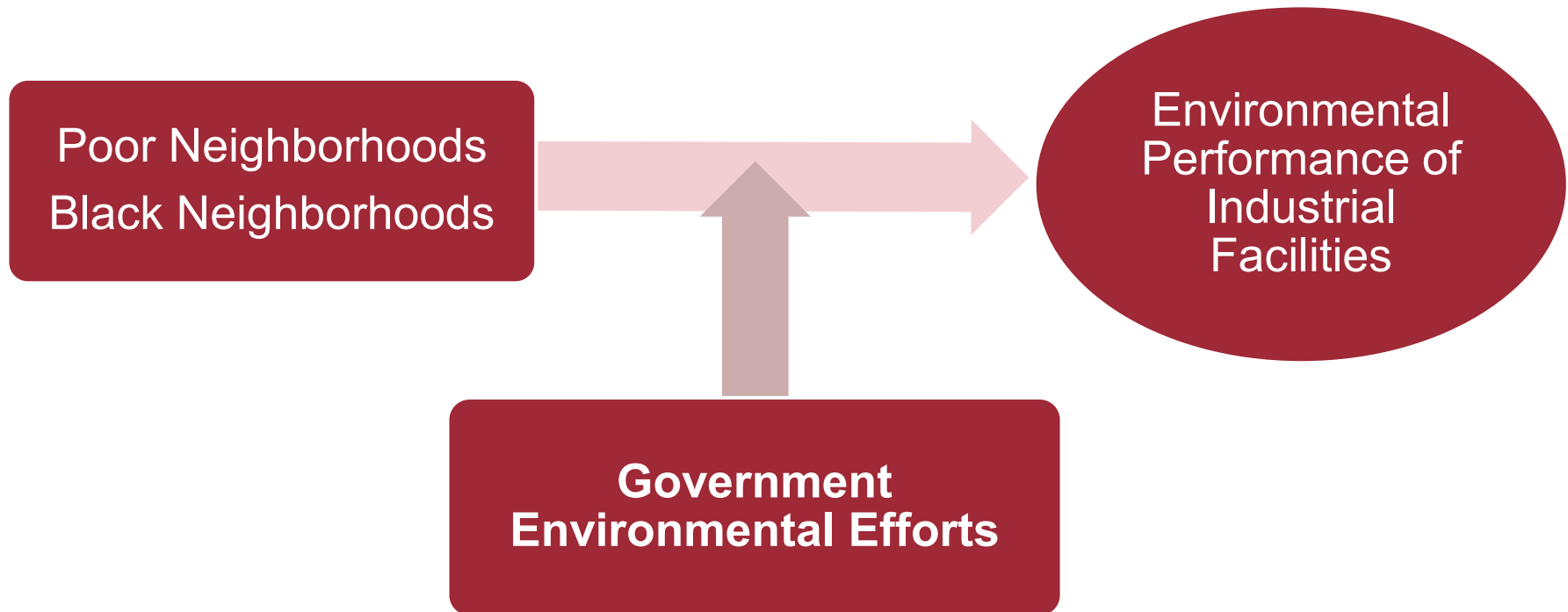
- Hypothesis 1: Industrial facilities in poor or African American neighborhoods are less likely to make improvements in their environmental performance.

RESEARCH QUESTION II



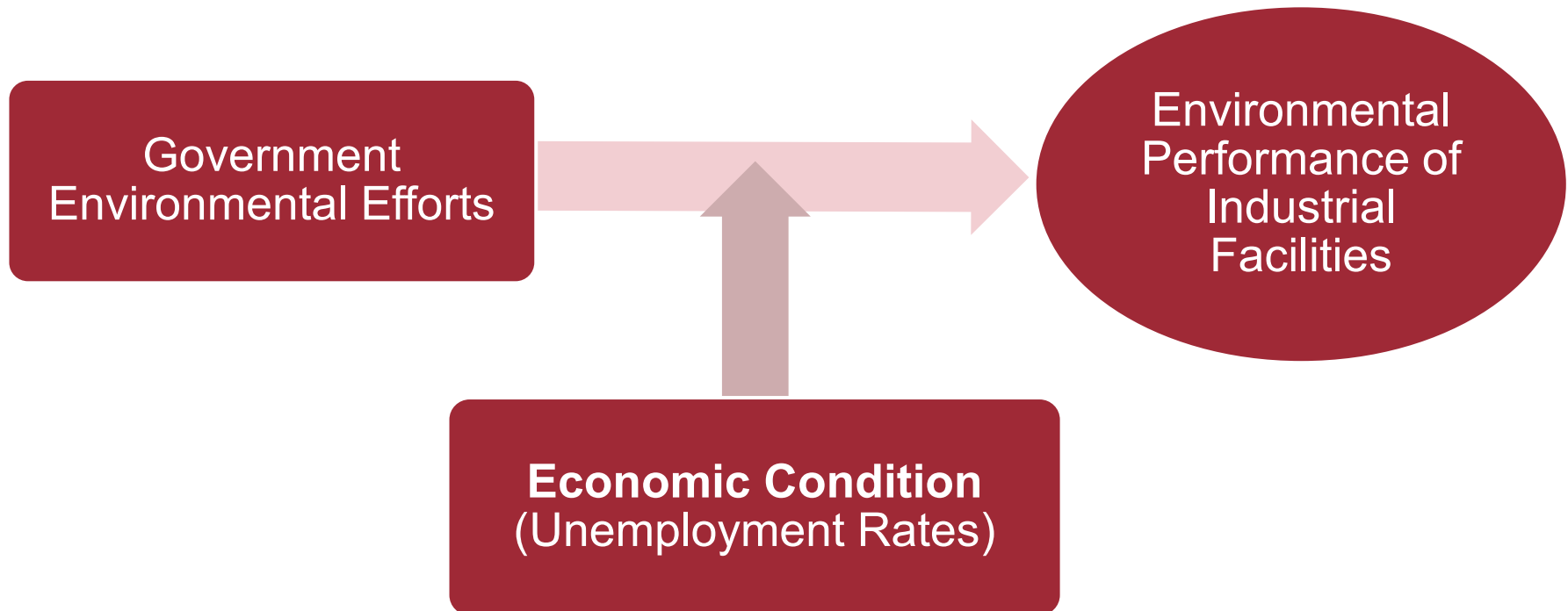
- Hypothesis 2: Government environmental efforts improve the environmental performance of industrial facilities.
 - Ecological modernization theory: Environmental protection and regulation as part of basic state responsibility (Frank et al. 2000; Mol 2010)

RESEARCH QUESTION III



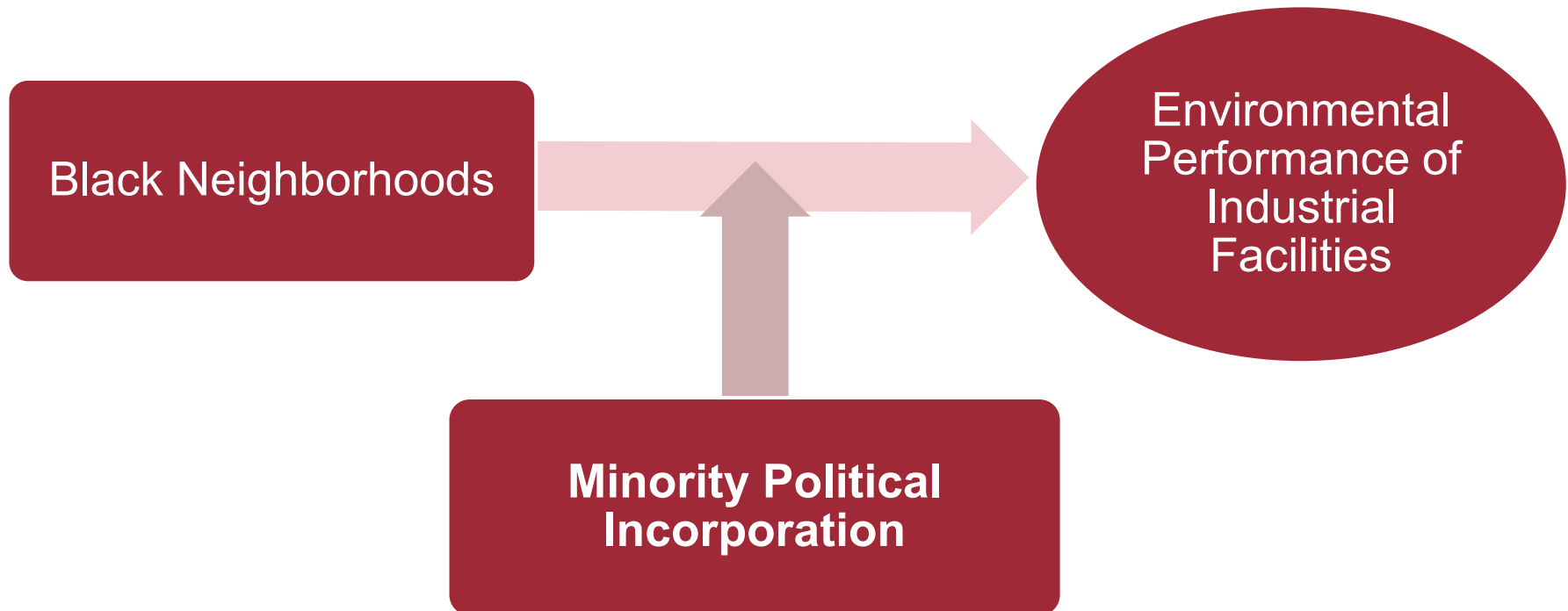
- Hypothesis 3: Government environmental efforts contribute to improving the environmental performance of industrial facilities in poor or African American neighborhoods.

RESEARCH QUESTION IV



- Hypothesis 4: The positive impacts of government environmental efforts weaken when governments suffer from economic hardships.
 - Environmental qualities vs. economic growth (Dryzek et al. 2002; Logan and Molotch [1987] 2007)

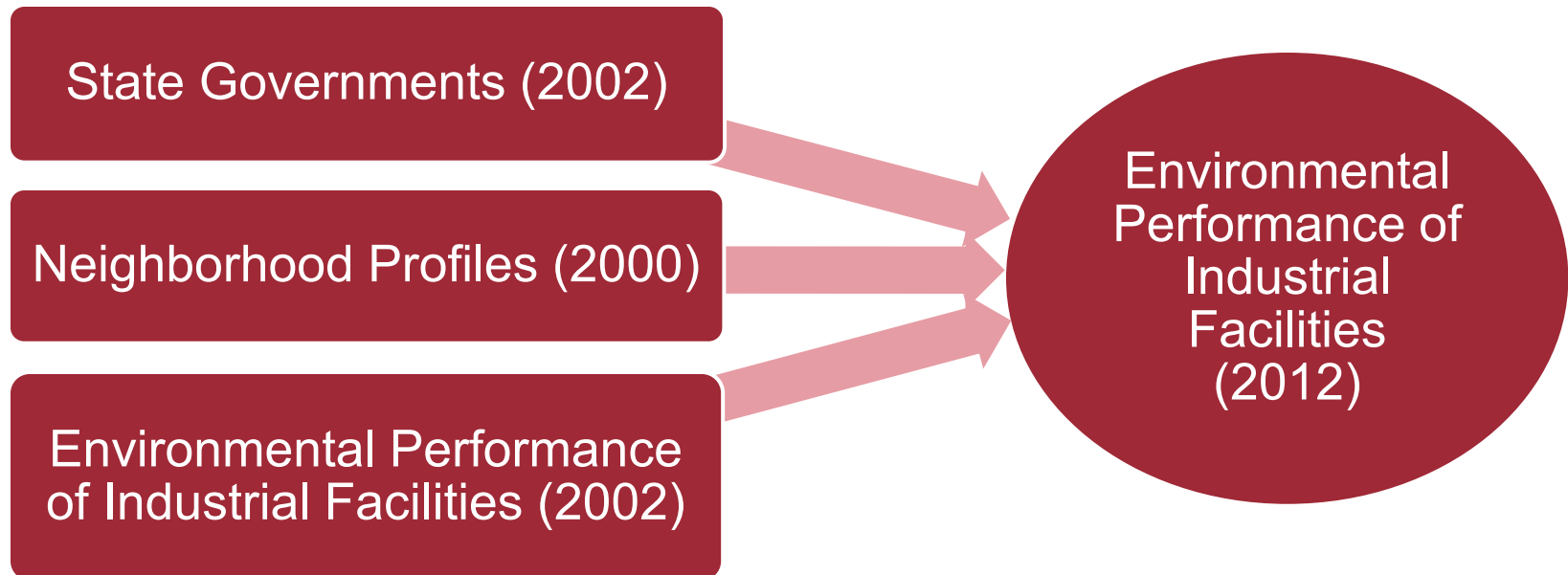
RESEARCH QUESTION V



- Hypothesis 5: The incorporation of African Americans into local political institutions contributes to improving the environmental performance of facilities in African American neighborhoods.
 - Environmental inequality literature: the political capacity of minority neighborhoods (Saha and Mohai 2005)

Overarching Research Question

- How did the operations of state governments, in conjunction with neighborhood characteristics, shape the environmental performance of polluting industrial facilities between 2002 and 2012?



RESEARCH DESIGN

THE SCOPE OF THE STUDY

- 1,748 Industrial Facilities
 - Industrial Facilities in the TRI program
 - PBT (Persistent Bioaccumulative Toxic) Chemicals
 - e.g., Dioxin and dioxin-like compounds, Lead compounds, Mercury and Mercury compounds
 - In 2002 and 2012
 - In the forty eight contiguous United States

OUTCOME VARIABLE

- PBT Chemical Hazards
 - The amount of PBT chemicals released into the air
X
 - Inhalation toxicity weights for PBT chemicals

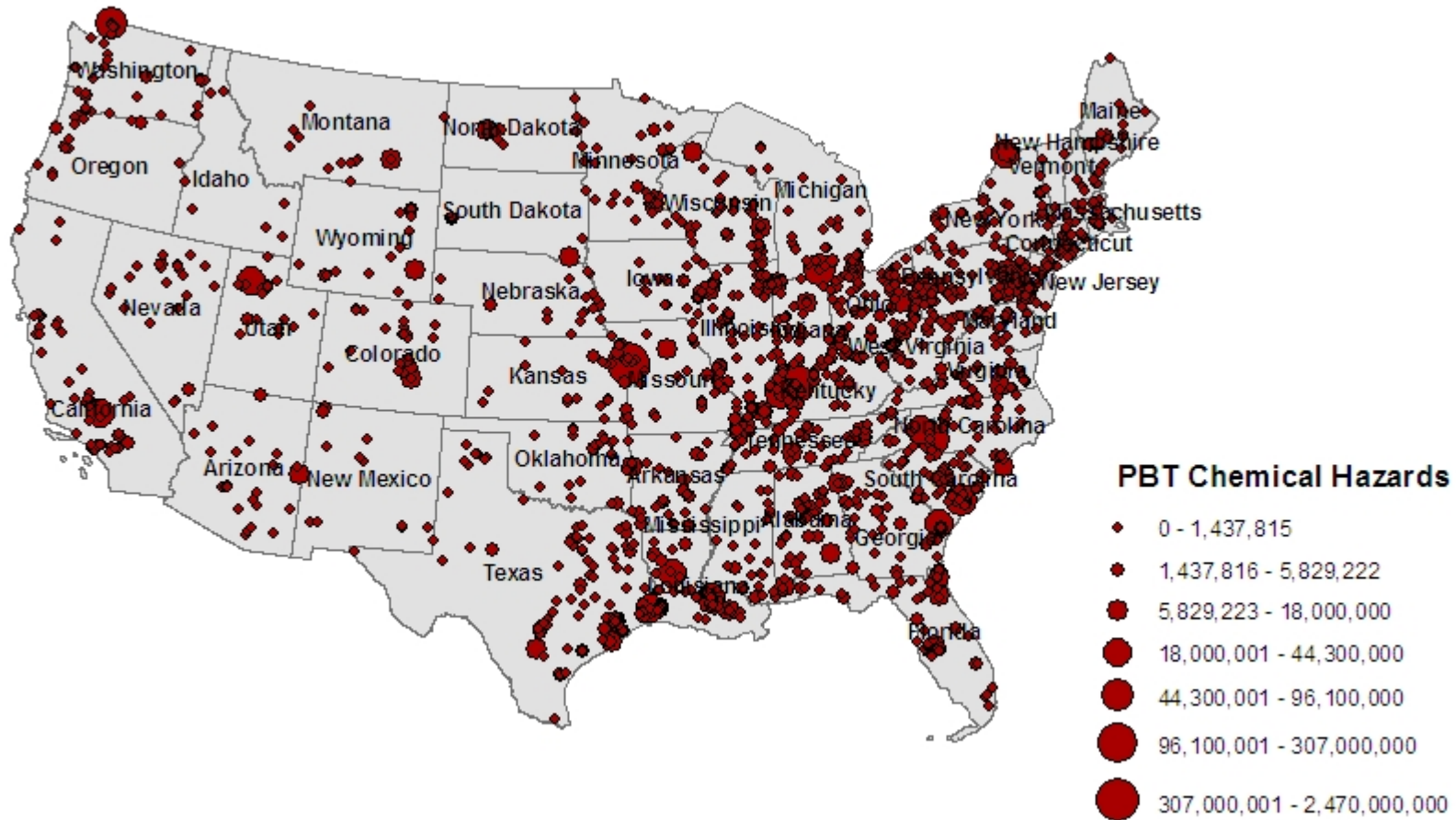
OUTCOME VARIABLE

- The List of PBT Chemicals
 - 15 PBT chemicals from 19 PBT chemicals of the TRI program

Chemical	Toxicity	Chemical	Toxicity
ALDRIN	18,000,000	METHOXYCHLOR	200
CHLORDANE	360,000	PENDIMETHALIN	10
DIOXIN AND DIOXIN-LIKE COMPOUNDS	1,400,000,000	PENTACHLOROBENZENE	1,300
HEPTACHLOR	4,600,000	POLYCHLORINATED BIPHENYLS	360,000
HEXACHLOROBENZENE	1,600,000	POLYCYCLIC AROMATIC COMPOUNDS	1,300,000
LEAD COMPOUNDS	18,000	TOXAPHENE	1,100,000
MERCURY	12,000	TRIFLURALIN	770
MERCURY COMPOUNDS	12,000		

Excluded PBT Toxic Chemicals: BENZO(G,H,I)PERYLENE, ISODRIN, OCTACHLOROSTYRENE, and TETRABROMOBISPHENOLA

PBT CHEMICAL HAZARDS (2012)



NEIGHBORHOOD-LEVEL VARIABLES (1)

- The Egocentric Neighborhoods of TRI Facilities
 - **The Location of TRI Facilities**
 - Near the boundaries of several Census geographical units (Downey 2006)
 - **Areal Appointment Method (Mohai and Saha 2006)**
 - Drawing circular buffers around each TRI facility (0.5, 1, 3, 5 miles)
 - Constructing the profiles of neighborhoods surrounding TRI facilities from the block group-level Census data

NEIGHBORHOOD-LEVEL VARIABLES (2)

- Racial Composition
 - Percentage of African American population
- Socioeconomic Characteristics
 - Poverty: Percentage of population below the poverty line
 - Unemployment: Percentage of population unemployed
 - Education: Percentage of adults without a high school degree
- Dataset:
 - The 2000 U.S. Census Summary File 3

STATE-LEVEL VARIABLES (1)

- Government Environmental Efforts
 - **Governmental Expenditures on Environmental Issues**
 - Percentage of governmental expenditures on health in total expenditure
 - Dataset: The 2002 Census of Governments (2002)
 - **Pro-environmental Policies**
 - Percentage of pro-environmental votes by states' congressional delegation
 - Dataset: The League of Conservation Voters (2001-2003)

STATE-LEVEL VARIABLES (2)

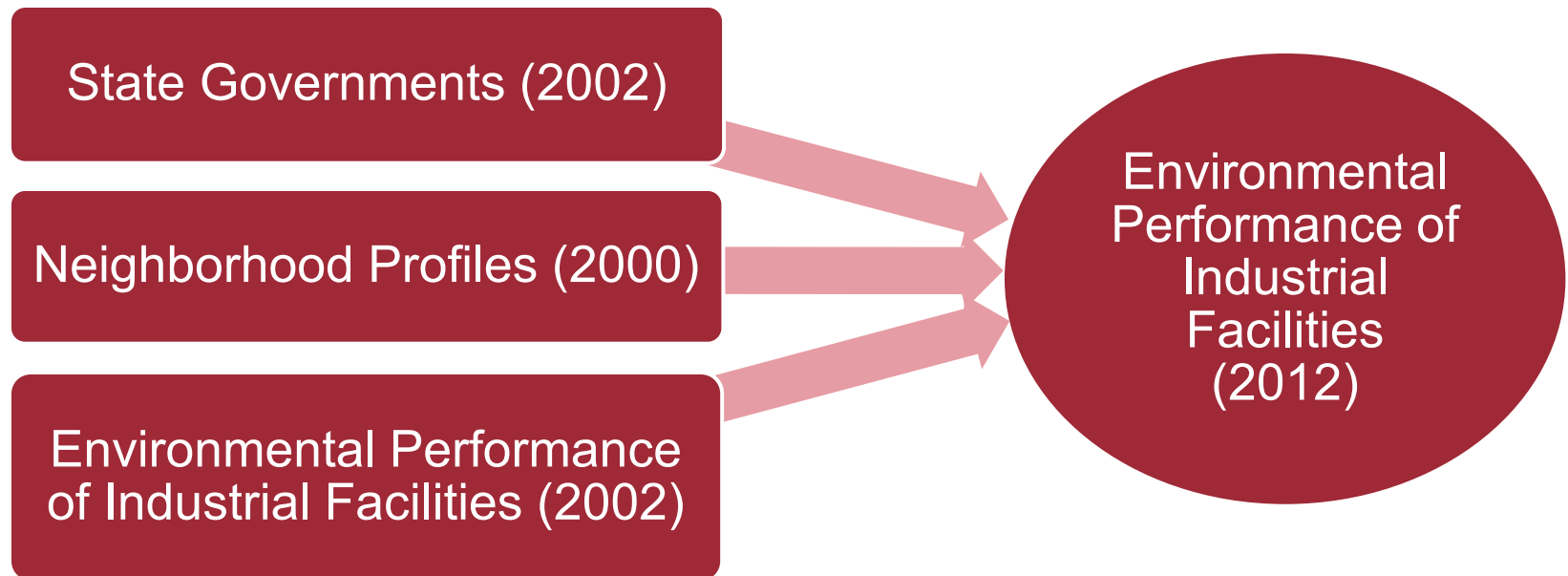
- Minority Political Incorporation
 - The number of African American elected officials per 100,000 African Americans in each state
 - Members of Congress, Governors, and State Legislators
 - Dataset: The Gender and Multi-Cultural Leadership Project (2006)

STATE-LEVEL VARIABLES (3)

- Economic Condition
 - State-level unemployment rates
 - Data: The US Census (2000)
- Control Variable
 - Government revenues per capita
 - Dataset: The 2002 Census of Governments (2002)

ANALYSIS FRAMEWORK

- Random-Effect Multilevel Analysis
 - Level 1: Egocentric Neighborhoods of TRI Facilities
 - Level 2: States



- Control variables: (1) facilities' industrial sectors; (2) facilities near the state border; (3) population density

STATISTICAL RESULTS

H1. NEIGHBORHOOD CHARACTERISTICS

Variables	Coef.	SE
Log PBT Hazards in 2002	0.7963***	0.0178
Population Density	-0.0428***	0.0087
% African American Population	0.2247	0.3714
% Population below the Poverty Line	2.6318*	1.1532
% Adults without a High School Degree	-0.8792	0.7340
% Unemployed	-2.7098	2.0530
Near the State Border	0.2165	0.1460

+ $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

R-sq: within = 0.5785 / between = 0.9105 / overall = 0.6014

Control Variables: Facilities' NAICS codes

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H2. STATE GOVERNMENTS

Variables	Coef.	SE
Log PBT Hazards in 2002	0.7901***	0.0179
Population Density	-0.0381***	0.0089
% African American Population	0.1112	0.3755
% Population below the Poverty Line	1.9744+	1.1670
Per Capita Government Revenues	0.1376	0.1235
% Government Expenditures on Health	0.6021	5.7807
% Pro-Environmental Votes	-1.0064**	0.3365
Per Capita Black Elected Officials	-0.0012	0.0240
% State-Level Unemployment Rates	15.2402+	8.2563

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R-sq: within = 0.5794 / between = 0.9173 / overall = 0.6045

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H3a. POLICIES & POOR NEIGHBORHOODS

Variables	Coef.	SE
% Population below the Poverty Line	0.1462	1.6426
Per Capita Government Revenues	0.1369	0.1234
% Government Expenditures on Health	-0.1660	5.7986
% Pro-Environmental Votes	-1.6190**	0.5131
Per Capita Black Elected Officials	0.0009	0.0241
% State-Level Unemployment Rates	15.5170+	8.2545
% Pro-Environmental Votes X % Population below the Poverty Line	4.7239	2.9882

+ p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001

R-sq: within = 0.5799 / between = 0.9159 / overall = 0.6051

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R-sq: within = 0.5799 / between = 0.9159 / overall = 0.6051

H3b. POLICIES & BLACK NEIGHBORHOODS

Variables	Coef.	SE
% African American Population	0.1685	0.6083
Per Capita Government Revenues	0.1376	0.1235
% Government Expenditures on Health	0.6664	5.8073
% Pro-Environmental Votes	-0.9896**	0.3646
Per Capita Black Elected Officials	-0.0012	0.0240
% State-Level Unemployment Rates	15.1078+	8.3323
% Pro-Environmental Votes X % African American Population	-0.1993	1.6653

+ p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001

R-sq: within = 0.5794 / between = 0.9172 / overall = 0.6045

H3a. POLICIES & POOR NEIGHBORHOODS

Variables	Coef.	SE
% Population below the Poverty Line	0.1462	1.6426
Per Capita Government Revenues	0.1369	0.1234
% Government Expenditures on Health	-0.1660	5.7986
% Pro-Environmental Votes	-1.6190**	0.5131
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+ p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001

R-sq: within = 0.5799 / between = 0.9159 / overall = 0.6051

H4. POLICIES & ECONOMIC CONDITIONS

Variables	Coef.	SE
Per Capita Government Revenues	0.1448	0.1241
% Government Expenditures on Health	1.4212	5.9481
% Pro-Environmental Votes	0.0989	1.9145
Per Capita Black Elected Officials	-0.0026	0.0242
% State-Level Unemployment Rates	21.4029+	13.3637
% Pro-Environmental Votes X % State-Level Unemployment Rates	-30.8677	52.6280

+ p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001

R-sq: within = 0.5795 / between = 0.9174 / overall = 0.6046

H5a: POLITICAL INCORPORATION

Variables	Coef.	SE
% African American Population	-0.3382	0.6993
Per Capita Government Revenues	0.1281	0.1241
% Government Expenditures on Health	0.7073	5.7831
% Pro-Environmental Votes	-0.9803**	0.3383
Per Capita Black Elected Officials	-0.0080	0.0257
% State-Level Unemployment Rates	14.2275+	8.3636
Per Capita Black Elected Officials X % African American Population	0.2072	0.2720

+ p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001

R-sq: within = 0.5792 / between = 0.9168 / overall = 0.6046

H5a: POLITICAL INCORPORATION

Variables	Coef.	SE
% African American Population	-0.3382	0.6993
Per Capita Government Revenues	0.1281	0.1241
% Government Expenditures on Health	0.7073	5.7831
% Pro-Environmental Votes	-0.9803**	0.3383
Per Capita Black Elected Officials	-0.0080	0.0257
% State-Level Unemployment Rates	14.2275+	8.3636
Per Capita Black Elected Officials X % African American Population	0.2072	0.2720

+ p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001

R-sq: within = 0.5792 / between = 0.9168 / overall = 0.6046

H5b: POLITICAL INCORPORATION IN THE SOUTH

Variables	Coef.	SE
% African American Population	1.0400	0.9423
Per Capita Government Revenues	0.3203	0.2042
% Government Expenditures on Health	11.1851	13.7241
% Pro-Environmental Votes	-0.9479	0.7947
Per Capita Black Elected Officials	0.3434**	0.1576
% State-Level Unemployment Rates	17.7918	15.2438
Per Capita Black Elected Officials X % African American Population	-0.6153	0.4078

+ p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001

R-sq: within = 0.5862 / between = 0.6879 / overall = 0.5934

Sample: 713 facilities in 16 states

CONCLUSION

- Neighborhood Characteristics
 - PBT chemical hazards increased in poor neighborhoods between 2002 and 2012.
- Government Environmental Efforts
 - PBT chemical hazards decreased in states with stronger pro-environmental policies.
- Political Incorporation of Minorities
 - Greater incorporation of African Americans into local political institutions contributed to improving the environmental performance of TRI facilities in African American neighborhoods (only in the Southern region).

Thank You

ADDITIONAL...

DESCRIPTIVE STATISTICS (Level 1 Variables)

Variables	Mean	SD	Min	Max
Log PBT Hazards (2012)	9.803	4.248	0.002	21.628
Log PBT Hazards (2002)	10.557	3.993	0.003	19.273
Population (Unit: 1,000 persons)	3.132	7.627	0.001	162.694
% African American Population	0.138	0.215	0.000	0.993
% Population below the Poverty Line	0.145	0.091	0.000	0.631
% Adults without a High School Degree	0.243	0.115	0.011	0.755
% Unemployed	0.066	0.042	0.000	0.473
Near the State Border	0.275			

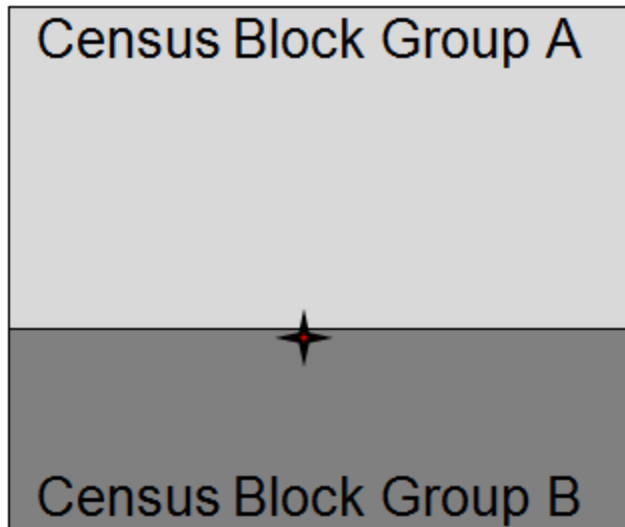
n = 1744

DESCRIPTIVE STATISTICS (Level 2 Variables)

Variables	Mean	SD	Min	Max
Per Capita Government Revenues	4.005	0.727	2.896	5.975
% Government Expenditures on Health	0.035	0.013	0.016	0.059
% Pro-Environmental Votes	0.430	0.281	0.016	0.922
Black Elected Officials per 100,000 African Americans	3.341	5.483	0.000	32.647
% State-Level Unemployment Rates	0.054	0.009	0.035	0.073

n = 48

EGOCENTRIC NEIGHBORHOODS



- Example: Facility near the Boundary of Census Block Groups A and B

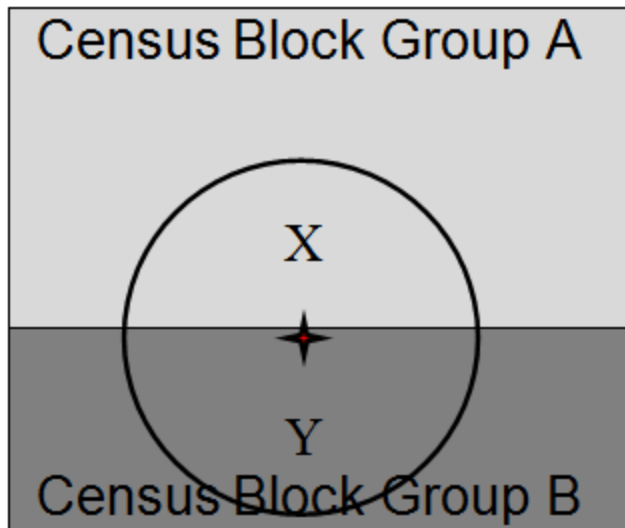
Census Block Group A

- Total Pop: 1000
- Black Pop: 100

Census Block Group B

- Total Pop: 500
- Black Pop: 100

EGOCENTRIC NEIGHBORHOODS



Census Block Group A

- Total Pop: 1000
- Black Pop: 100

Census Block Group B

- Total Pop: 500
- Black Pop: 100

- Example: Facility near the Boundary of Census Block Groups A and B
 - Constructing circular buffers around each TRI facility (0.5, 1, 3, 5 miles)
 - Identifying the overlapping areas, X and Y
 - X: 30 percent of Census Block Group A
 - Y: 50 percent of Census Block Group B
 - Calculating Black population within X and Y
 - X: $100 \times 0.30 = 30$
 - Y: $100 \times 0.50 = 50$
 - Calculating total population within X and Y
 - X: $1000 \times 0.30 = 300$
 - Y: $500 \times 0.50 = 250$
 - Calculating the percentage of Black pop within the buffer
 - $(30 + 50) / (300 + 250) = 0.14$