Regulation and U.S. State-Level Corruption

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Motivation: a stylized fact

"It is the regulatory state with its elaborate system of permits and licenses that spawns corruption, and different countries with different degrees of insertion of the regulatory state in the economy give rise to varying amounts of corruption."

— Bardhan (1997, p. 1330)

- Regulation and corruption
  - Extensively discussed
  - Widespread opinion: $\uparrow$ regulation $\Rightarrow$ $\uparrow$ corruption
    - $\uparrow$ regulation $\Rightarrow$ $\uparrow$ opportunities of interaction
    - $\uparrow$ regulation $\Rightarrow$ $\uparrow$ incentives to avoid regulatory cost

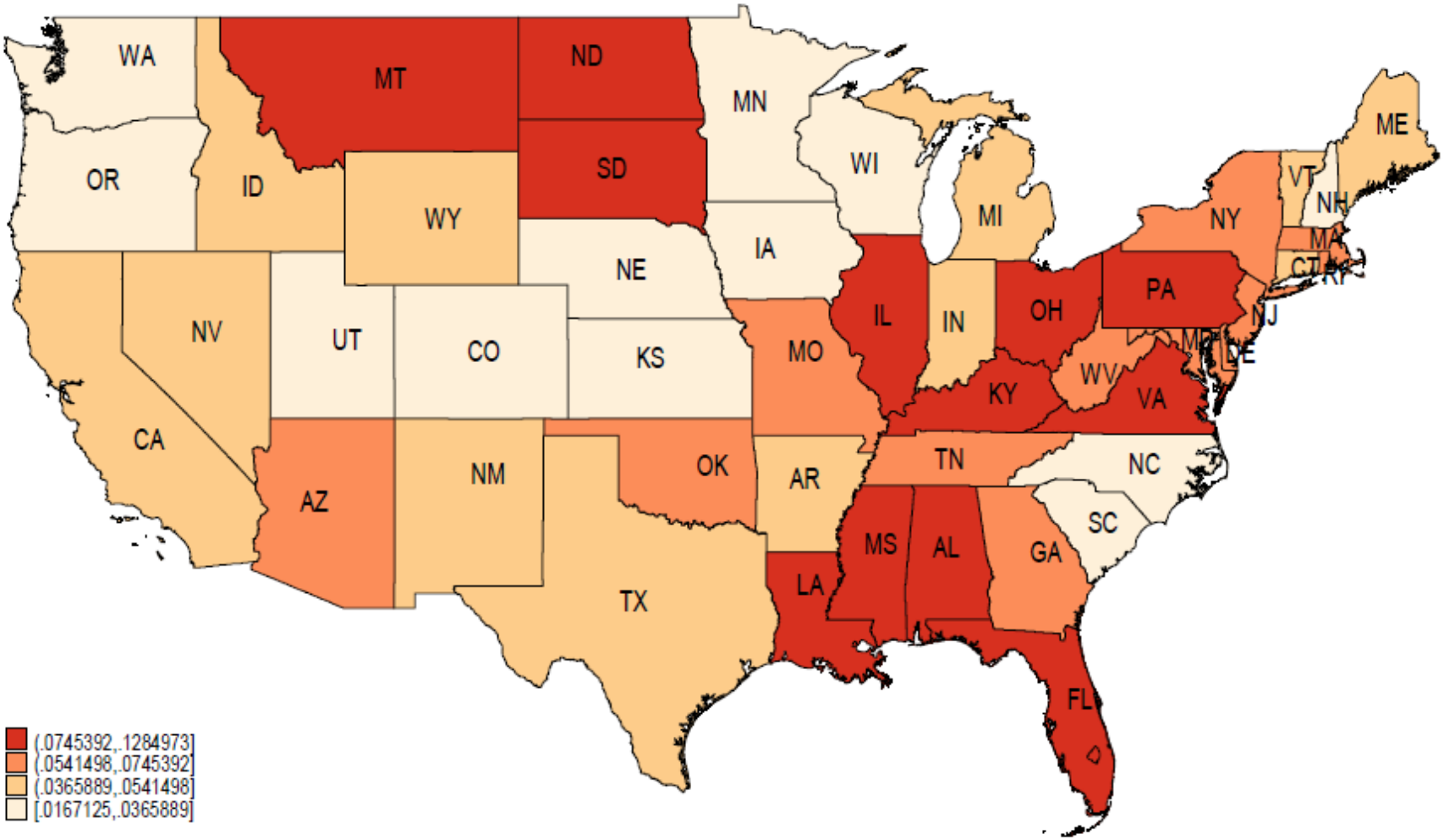
Motivation: extant studies on the relationship

- Literature $\Rightarrow$ inconclusive
  - Theories $\longrightarrow$ bidirectional causal relationship
    - Public Choice: benefit special interest groups Go to Details
    - Public Interest: benevolent purpose Go to Details
  - Empirical evidence $\longrightarrow$ contradictory
    - Majority $\longrightarrow$ positive correlation
    - Few $\longrightarrow$ negative association
    - *Causal* link $\longrightarrow$ nearly unexplored; few exceptions: cross-national studies

Motivation: in the U.S. context

- Evidence on the association
  - Empirical study $\longrightarrow$ positive correlation
  - Anecdotes $\longrightarrow$ Public Integrity Section (PIN) annual reports
    - Public officials convicted of bribery in exchange for business favors
      ▸ Examples
- Corruption per se
  - Matters
    - Corruption Perception Index (Transparency International) $\longrightarrow$ score 74 $\longrightarrow$ 0 (most corrupt) - 100 (cleanest)
    - Low among OECD countries ▸ World Map
  - Varies across states (PIN data: 1990 - 2013) ▸ U.S. Map

Variation of bureaucratic corruption across states



Measure: convictions of public officials per 1000 government employees, 1990-2013

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The research question

Given, association $\longrightarrow$ inconclusive and *causal* relationship $\longrightarrow$ not substantiated, the question addressed:

Does government regulation of industries have a causal effect on bureaucratic corruption?

Pertinent econometric challenges

1. Corruption measure: one-sided measurement error
   - Non-classical
     - Non-positive or non-negative
     - Varies across states
2. Regulation measure: potential endogeneity
   - Traditional solution not viable
     - Regulation and corruption $\longrightarrow$ complicated phenomena

Solution: apply state-of-the-art econometric techniques

Main findings

1. Comprehensive model $\longrightarrow$ **both the issues addressed**
   - Evidence of endogeneity of regulation
   - **Absence of a causal link**
2. Naive estimation strategies $\longrightarrow$ **either issue is ignored**
   - **Evidence of a spurious relationship**
     - Statistically significant impacts
     - Conflicting signs

Outline

Outline

Corruption data

- Panel data $\longrightarrow$ 50 states, 1990 - 2013
- State level convictions of public officials
  - Federal, state and local
  - PIN (Department of Justice)
- Circumvent timing issue
  - $Conviction_{t+1} = Corruption_t$
- Bureaucratic corruption: total number of convictions of public officials in a state per 1000 government employees

Regulation data

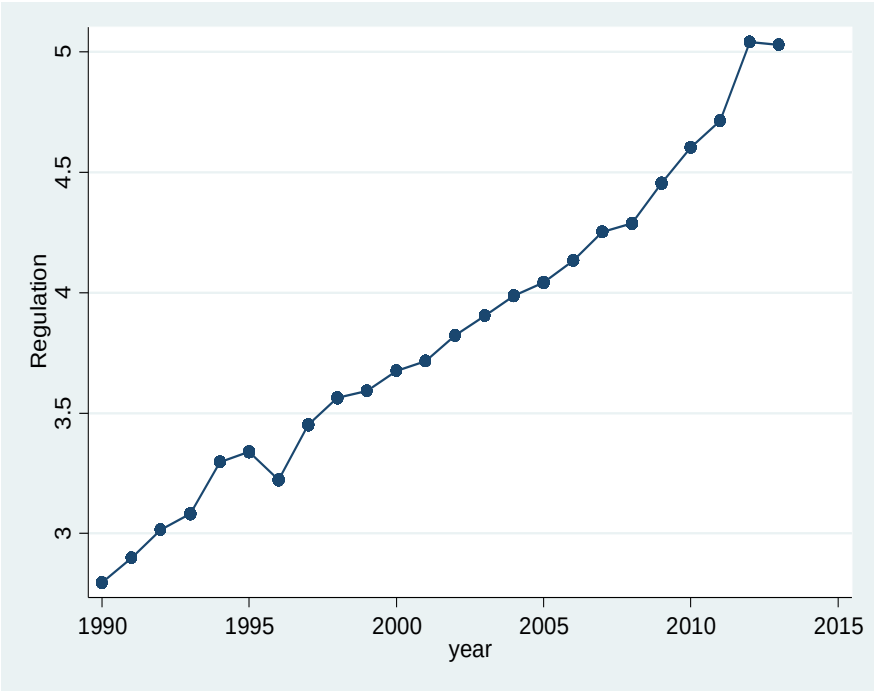
- First panel data on federal regulation of industries
  - RegData $\longrightarrow$ Al-Ubaydli and McLaughlin (2015)
  - Four-digit level $\longrightarrow$ 2007 North American Industrial Classification System (NAICS)
- Generate state level measure
  - Weighting by time invariant state-level employment composition across industries

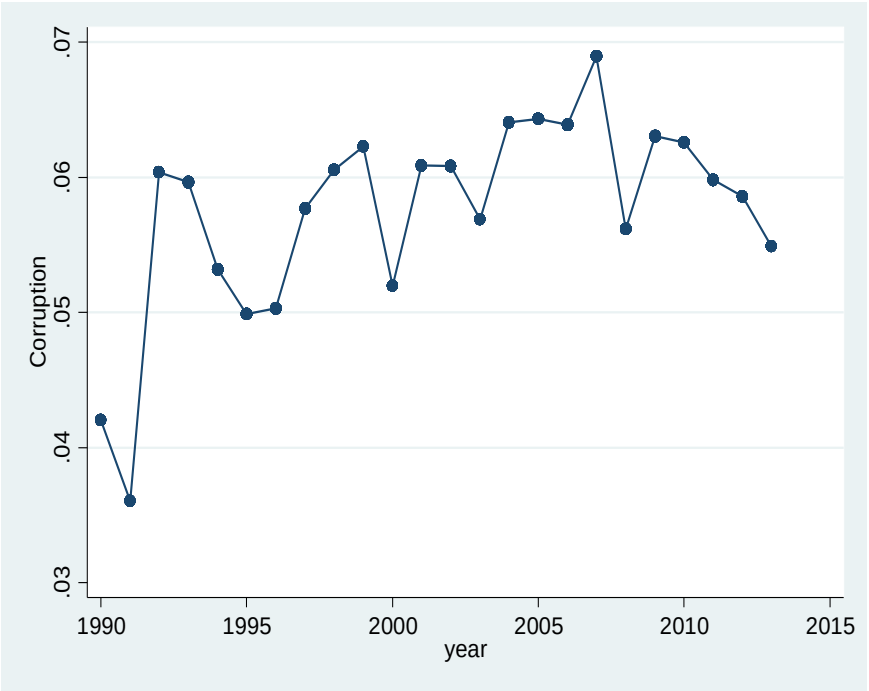
$$R_{st} = \sum_{i=1} \frac{Emp_{is,1990}}{Emp_{s,1990}} * R_{it}$$

▸ Additional Details

▸ Sum Stats

Trends over the sample period 1990-2013

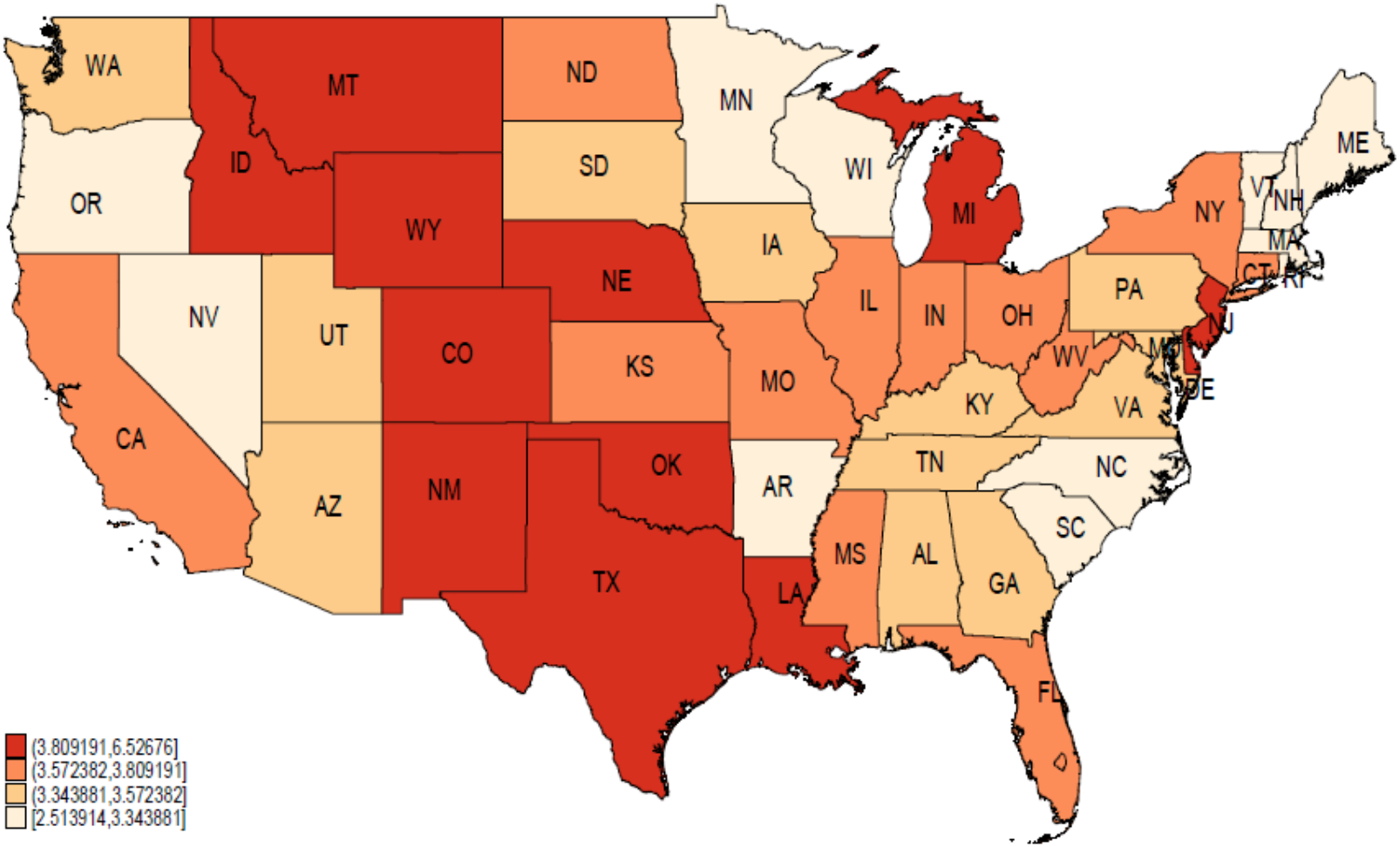




Left Panel: Regulation grows over time

Right Panel: Bureaucratic corruption fluctuates over time

Regulatory constraints across states



Degree of regulation varies across states over time (1990-2013)

Outline

Issue one: one-sided measurement error in bureaucratic corruption

- 'True' corruption level $\longrightarrow$ unobserved
  - Not an issue per se
- Serious problem if
  - Observed measure $\longrightarrow$ strictly under-reported or over-reported
  - Varies across states contingent on state-specific characteristics
- If ignored $\longrightarrow$ biased and inconsistent estimates

- Convictions $\longrightarrow$ involve a few steps
  - Crime is reported
  - Criminal investigation
  - Sent to Attorney's office
  - Successful prosecution $\longrightarrow$ availability of resources $\longrightarrow$ vary across states

Bureaucratic corruption $\longrightarrow$ under-reported $\longrightarrow$ varies $\longrightarrow$ state-specific characteristics

- Formally,

$$C_{st} = (C^*_{st} - u_{st}) \; and \; u_{st} \geq 0,$$

where u_{st} $\longrightarrow$ one-sided or strictly non-negative and heteroskedastic

▸ Solution

Issue two: potential endogeneity of regulation

1. Reverse causality
   - Industries $\longrightarrow$ special interest group
2. Omitted variables
   - Business environment, quality of politicians, de-facto decentralization of government, etc.
3. Measurement error: *de-jure* versus *de-facto* regulation
   - Official regulatory laws $\longrightarrow$ observed
   - Actual implementation $\longrightarrow$ unobserved

- Traditional solution
  - Exogenous factor $\longrightarrow$ impact corruption through regulation only $\longrightarrow$ traditional instrumental variable
- Not viable in current context
  - Difficult to comprehend one
  - Complex phenomena

Absence of a traditional solution, i.e., traditional instrumental variables

Outline

For issue one: stochastic frontier approach

- Explicitly model the one-sided measurement error
  - Formally,

$$C_{st} = \beta_0 + X_{st}\beta_1 + \gamma R_{st} + \alpha_s + \delta t + \varepsilon_{st} - u_{st}$$

  - ε_{st} : standard two-sided error $\longrightarrow$ normal distribution
  - u_{st} : one-sided error $\longrightarrow$ half-normal distribution
- Resembles normal-half normal stochastic frontier model
  - Productivity analysis
  - Firm's (unobserved) inefficiency

▸ Go Back
▸ Formally

Intuition in the current context

- u_{st} : allocation of prosecutorial resources
  - Non-negative
  - Mean $\longrightarrow$ positive number
  - Modal value $\longrightarrow$ zero
    - White-collar crime rarely prosecuted $\longrightarrow$ resource constraints
  - Heteroskedasticity $\longrightarrow$ mainly political indicators
    - Divided government, citizen's ideology, government centralization and urbanization
    - Over-specified function better

Go to Details

For issue two: Lewbel (2012) approach

- Generate valid instruments within the model
  - Two conditions to be satisfied

1. Some covariates $\longrightarrow$ correlated with first-stage error variance
   - Corresponds $\longrightarrow$ standard relevance assumption
2. These covariates $\longrightarrow$ uncorrelated with the product of first- and second-stage errors
   - Corresponds $\longrightarrow$ standard exogeneity assumption

▸ Formally

Intuition in the current context

- A common (unobserved) factor: discretionary power of bureaucrats (e.g.)
  - Affects both regulation and corruption
  - Mean zero
    - Used positively or abused
  - Independent of state-specific characteristics
    - Not legally binding $\longrightarrow$ permissive but not mandatory
  - Its final impact on regulation $\longrightarrow \uparrow$ or $\downarrow$ by state-specific characteristics
    - Income inequality, education status, government centralization, divided government

▸ Formally

Outline

Main results

Impact of Regulation on Bureaucratic Corruption: 1990-2013

Variable	Traditional FE	FE-SFM	FE-IV	FE-SFM-IV
Regulation	0.008	0.018‡	- 0.069⋆	- 0.011
	(0.012)	(0.010)	(0.026)	(0.034)
N	1194	1194	1194	1194
State Covariates	Y	Y	Y	Y
State-Fixed Effects	Y	Y	Y	Y
Linear Time Trend	Y	Y	Y	Y
Year-Fixed Effects	N	N	N	N
Underidentification			0.042	
Overidentification			0.335	
Rk F-Statistic			11.665	
Endogeneity Test			0.082	
Significance of Endog Var	0.497	0.054	0.006	0.742

Notes: ‡ p<0.10, † p <0.05, ⋆ p<0.01.

▸ Alternative Specification

Outline

Conclusion

- Question addressed:
  - Does government regulation have a *causal effect* on bureaucratic corruption? ▸ Policy Relevance
- Analysis:
  - Panel data for the U.S. $\longrightarrow$ 1990-2013
  - Controlled for associated econometric issues $\longrightarrow$ state of the art econometric techniques
- Found:
  - Evidence of an *absence* of a causal link in the U.S.
    - Key $\longrightarrow$ careful consideration of the associated issues
    - Implication $\longrightarrow$ warning against ignoring such concerns

Theoretical prediction: public choice theory

- Public Choice Theory $\longrightarrow$ a special interest group $\longrightarrow$ own benefits
  - Capture Theory $\longrightarrow$ industries $\longrightarrow$ *corruption causes regulation*
    - reduce competition
    - retain monopoly power
  - Tollbooth Theory $\longrightarrow$ government $\longrightarrow$ *regulation causes corruption*
    - complicate procedures
    - greater opportunities to extract rents

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Theoretical prediction: public interest theory

- Public Interest Theory $\longrightarrow$ government a benevolent agent
  - address market failures
  - protect from monopoly power
  - $\uparrow$ competition $\Rightarrow \downarrow$ socially inferior outcomes (corruption)
- Effect of competition on corruption $\longrightarrow$ ambiguous
  - rents available to each firm $\downarrow$
  - monitoring bureaucrats $\longrightarrow$ difficult

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Examples of anecdotal evidence

- Bribery offers ranging between \$1500 and \$24 million
  - Preferential treatment for awarding contracts and manipulation of bid
    - Federal Acquisition Regulation (Title 48, Chapter 1 of the Code of Federal Regulations)
    - Disclosure of bids, proposal information or any related information, and/or preferential treatment $\Rightarrow$ violation of law
  - Non-compliance with currency transaction reports (CTRs)
    - Liquor stores, grocery stores, car dealerships
    - Track cash transactions and monitor tax violation or illegal activity

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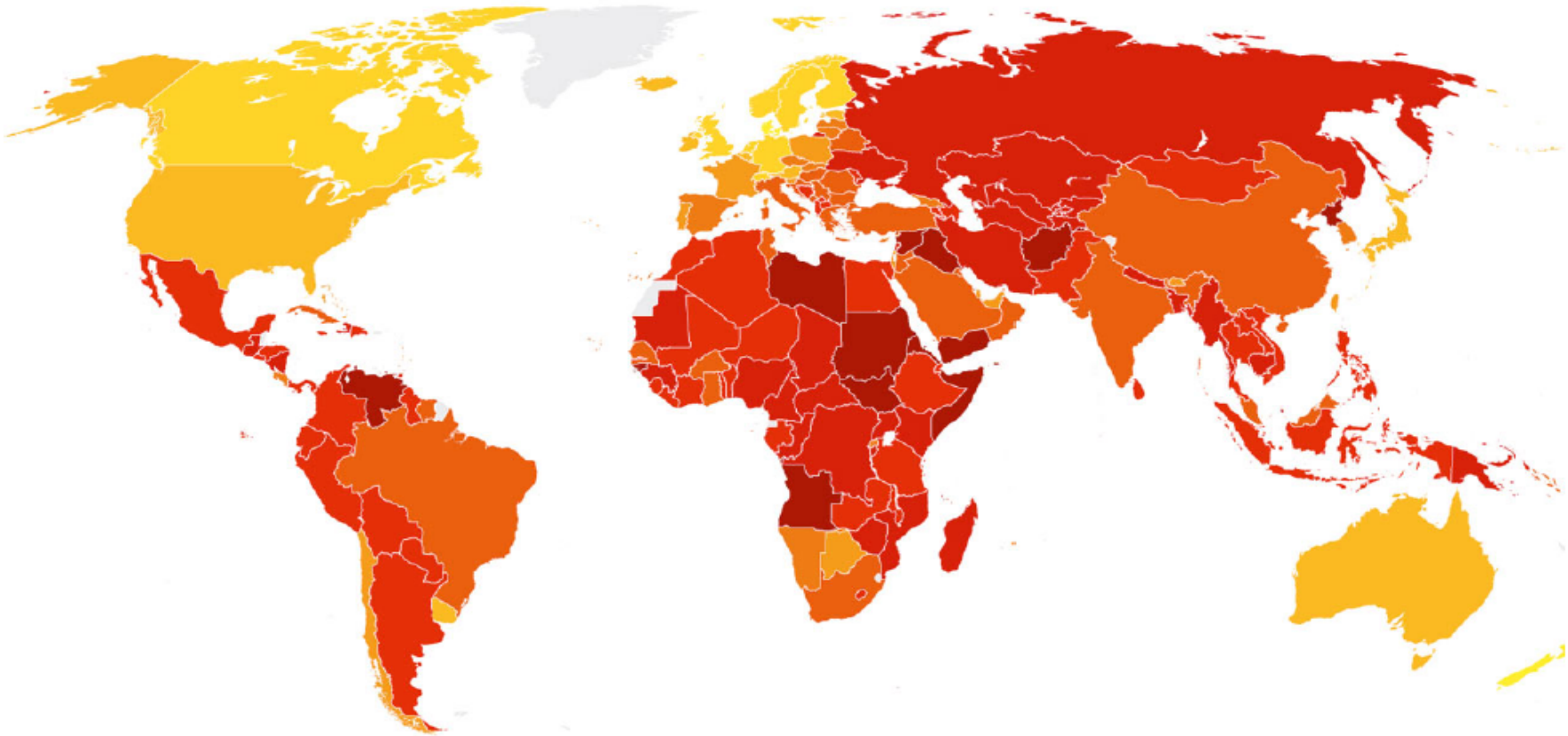
Corruption perception index



- U.S. scores lower than several other OECD countries (example: Sweden, Finland, United Kingdom, Belgium)
- Also very close to some non-OECD countries (example: Uruguay)

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Additional details on data

- Government employment data $\longrightarrow$ U.S. Census Bureau
- Industry-level employment data $\longrightarrow$ Quaterly Census of Employment and Wages (QCEW)
  - 2002 NAICS code
  - Transformed to 2007 NAICS using 2002 to 2007 concordances from Census Bureau
- Covariates $\longrightarrow$ pooled from multiple sources
  - Income
  - Ideology
  - Income Inequality
  - Education
  - Unemployment
  - Centralization
  - Government Size
  - Divided Government
  - Urbanization

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Summary statistics

Variables	N	Mean	SD	Min	Max
Bureaucratic Corruption	1194	0.06	0.05	0.00	0.41
Regulation	1200	3.83	1.15	1.75	9.04
Income (in dollars)	1200	16707.12	2922.75	10170.06	27356.95
Ideology	1200	50.14	15.11	8.45	95.97
Income Inequality	1200	0.58	0.04	0.52	0.71
Education	1200	82.72	5.70	64.30	93.50
Unemployment (in hundreds)	1200	175630.40	232681.90	8074.00	2244326.00
Centralization	1200	0.66	0.08	0.44	1.00
Government Size (in dollars)	1200	3919.79	1201.33	1912.55	12700.09
Divided Government	1200	0.54	0.50	0	1
Urbanization (in thousands)	1200	0.71	0.15	0.32	0.99

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Stochastic frontier approach: formal representation

- Formally,

$$C_{st} = \beta_0 + X_{st}\beta_1 + \gamma R_{st} + \alpha_s + \delta t + \varepsilon_{st} - u_{st}$$

where

$$\begin{aligned} \varepsilon_{st} &\sim N(0, \sigma_\varepsilon^2) \\ u_{st} &\sim N^+(0, \sigma_u^2(h_{st})) \\ h_{st} &\subseteq X_{st} \end{aligned}$$

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Assumption details: allocation of prosecutorial resources

- Theories in criminology:
  - System Capacity Theory: $\uparrow$ in $u_{st} \Rightarrow \uparrow$ in C_{st}
  - Deterrence Theory: $\uparrow$ in $u_{st} \Rightarrow \downarrow$ in C^*_{st}
    - $u_{st} \Rightarrow$ deviation of observed C_{st} from the 'true' unobserved C^*_{st}
- What determines u_{st}?
  - Decisions $\longrightarrow$ Attorney's Office
  - Attorneys $\longrightarrow$ appointees of President
  - Appointment decisions $\longrightarrow$ influenced by partisan factors
  - Partisanship $\longrightarrow$ more in urban areas

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Lewbel (2012) approach: formal representation

- First-stage:

$$R_{st} = \pi_0 + X_{st}\pi_1 + \pi_s + \delta_1 t + \eta_{st}$$

- If there exists $z_{st} \subseteq X_{st}$ such that

$$\begin{aligned} Cov(z, \eta^2) &\neq 0 \\ Cov(z, \ \varepsilon\eta) &= 0 \end{aligned}$$

  then $\widetilde{z} \equiv (z - \overline{z})\eta$ are valid instruments

- First condition $\longrightarrow$ Breusch-Pagan test for heteroskedasticity
- Second condition $\longrightarrow$ $\widetilde{z}$ are valid instruments $\longrightarrow$ standard IV specification tests

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Intuition: formal representation

- Define ε and η as:

$$\begin{aligned} \varepsilon_{st} &\equiv \sigma_{\varepsilon}\lambda_{st} \\ \eta_{st} &\equiv \sigma_{\eta}(z)\lambda_{st} \end{aligned}$$

where

$$\begin{aligned} \varepsilon_{st} &\sim N(0, \sigma_{\varepsilon}^2) \\ \eta_{st} &\sim N(0, \sigma_{\eta}^2(z)) \\ \lambda_{st} &\sim N(0, 1) \end{aligned}$$

- λ_{st} : unobserved discretionary power of bureaucrats
  - Effect on regulation $\longrightarrow \uparrow$ or $\downarrow$ by state-specific characteristics $\longrightarrow$ captured by $\sigma_{\eta}(z)$

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Results for alternative specification

Impact of Regulation on Bureaucratic Corruption: 1990-2013

Variable	Traditional FE	FE-SFM	FE-IV	FE-SFM-IV
Regulation	0.024	0.033*	- 0.028	0.018
	(0.015)	(0.012)	(0.022)	(0.037)
N	1194	1194	1194	1194
State Covariates	Y	Y	Y	Y
State-Fixed Effects	Y	Y	Y	Y
Linear Time Trend	N	N	N	N
Year-Fixed Effects	Y	Y	Y	Y
Underidentification			0.225	
Overidentification			0.143	
Rk F-Statistic			9.127	
Endogeneity Test			0.109	
Significance of Endog Var	0.113	0.006	0.002	0.939

Notes: ‡ p<0.10, † p <0.05, ⋆ p<0.01.

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Policy Relevance

- Crucial empirical question $\longrightarrow$ corruption may be
  - Unintended consequence
    - Deregulation $\longrightarrow$ not a solution then
    - Regulation $\longrightarrow$ welfare enhancing purpose (Public Interest Theory)
    - Alternative tool $\longrightarrow$ combat corruption
  - Reduced
    - Above tool $\longrightarrow$ may be counter-productive
  - No causal link at all
    - All the discussions $\longrightarrow$ irrelevant
    - Shift focus $\longrightarrow$ other plausible causes

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