Causal Inference Strategies in Corporate Governance Research (Mostly in Emerging Markets)

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Goal

How to address endogeneity and other econometric issues; assess whether corporate governance *causes* something:
- Firm market value
- Accounting performance
- Firm behavior

• Research design for credible “causal inference”
  - sometimes called “identification” – fuzzy term, I will avoid it

• Main themes:
  - Strong research design is often based on legal rules
  - Corporate governance is a fruitful area to find useful rules

• I'm a lawyer by training, but sometimes pretend to know some econometrics
Focus on firm-level governance

• Put country level studies aside:
  • LLSV and all that
  • Little or no basis for causal inference . . .
  • Ditto for many-country studies . . .
  • Credible inference is usually local

• Beyond scope of talk:
  – Given credible inference, what have you learned?:
    ATE, ATET, LATE, and all that.
  – Covariate balance in DiD and RD designs
    • Matching, multiple imputation, propensity score weighting,
      subclassification, etc.
Getting to Causal Inference

• Start with **association**: some aspect of corporate governance (gov) predicts firm value or performance, say Tobin’s $q$, with control variables $X$:

$$q = a + b \cdot \text{gov} + c \cdot X + e$$

• (bold ➔ many X's)

• Assume $b > 0$ and (statistically) significant

• How likely is it that $\Delta(\text{gov})$ **causes** $\Delta(q)$?
Causation, or only correlation?

• Many obstacles to inferring causation, including:
  – endogeneity
    • reverse causation ($\Delta q \Rightarrow \Delta \text{gov}$)
    • optimal differences
  – omitted variables
    • Economic variables (many things predict $q$)
    • Other aspects of “overall” governance (GOV)
  – signaling
  – Measurement error: We’re not sure
    • what counts as good “gov”
    • What else belongs in GOV
    • How to quantify these concepts
First reaction of many economists: Instrumental variables (IV)

• Find **instrument** $z$ for **gov**; then use 2SLS.
• Valid instrument must be:
  – *Exogenous*  
    • can't be caused by $q$; other variables which predict $q$
  – *Correlates* with instrumented variable (**gov**)  
    • preferably strongly
  – “*exclusion restriction*” (**hard**): Predicts dependent variable ($q$) **only through** instrumented variable (**gov**)  
    – not directly -- not (partially) correlated with $q$
    – not indirectly through (or mediated by) an omitted variable:
Warning: Good Instruments are Rare

- Econometrics texts: two conditions for valid instrument:
  - Correlated with instrumented variable:
    \[ \text{Cov} (z, \text{gov}) \neq 0 \]
  - Uncorrelated with unobserved “true error” \( \varepsilon \):
    \[ \text{Cov} (z, \varepsilon) = 0 \]

- Please ignore this! Use my three conditions
  - Need exogeneity and “only through” to be confident that \( \text{Cov} (z, \varepsilon) = 0 \)
  - Depends on logic, not algebra
  - Rarely testable (testability = beyond scope)
• **Only** credible instruments for gov:
  - Legal rules and preferably **rule changes**
  - Exceptions = theoretically possible, but I know of none

• But then you don’t need IV or 2SLS!

• Top finance, econ, accounting journals: many many non-credible instruments

• Beyond scope: Heckman selection correction
  – Rarely valid, problems similar to IV
Ways to exploit legal rules

• Four requirements for causal inference:
  – Exogenous
    • Doesn’t mirror what firms would doing anyway
  – Changes gov
    • preferably strongly
  – exclusion restriction: Predicts $q$ only through gov

So far, looks a lot like IV

• Control group exists:
  • some firms “treated” (rule applies)
  • Others are not (control firms)
  • Treatment and control groups are similar (preferably highly)
Method 1: If have all four: DiD

- $w = 1$ if treated (0 if control)
  - $\Delta q = a + b*w + c*X + e$
  - $\Delta \text{gov} = a + d*w + c*X + e$

- Wald estimate:

  \[
  \text{effect of gov on } q = \frac{E[\Delta q_i | w_i=1] - E[\Delta q_i | w_i=0]}{E[\text{gov}_i | w_i=1] - E[\text{gov}_i | w_i=0]} = \frac{b}{d}
  \]
A harder example: 3 of 4

• Example from my own work on Korea
  – (Black and Kim, JFE 2011; Black, Kim, Jang and Park, working paper 2011)

• 1999 legal shock to large firms
  – large firms (> 2 trillion won) must have 50% outside directors, audit committee, outside director nominating committee
  – other public firms: 25% outside directors
Is Rule Exogenous?

Board structure index at year-end 1998
Firms with assets > 0.25 trillion won (exclude banks, SOEs)
Does rule change gov?

- Board structure index in 2001
- Exogeneity: no evidence of move from top-R to lower-L
How good is the control group?

• Mid-sized firms (0.5-2T won) as control group for large firms (> 2T won)
  – Not perfect; could differ from large firms
    • Partial responses:
      – Lots of control variables
      – Firm fixed effects

• Key code words: “covariate balance”
  – Good balance = often crucial, how to improve = beyond scope
“Only thru”? 

- Could $\ln(\text{assets}) \rightarrow q$ (directly)?
  - Sure, and empirically yes
- Could $\ln(\text{assets}) \rightarrow q$ indirectly through omitted variable
  - Sure
- What to do?
Method 2: (Regression) Discontinuity

Here combined with DiD, but needn’t be

• gov jumps at 2T won threshold
• Does q jump also?

• Control for smooth effect of size on q:
  \[ q = a + b*w + c_1*\ln(\text{assets}) + c*X + e \]

  Better: control for polynomial in \ln(\text{assets})

• Broader/narrower treatment and control groups
  – Is “jump” in q stable?
• Sign of jump same as smooth effect?
• Use when (BJK, 2006):
  – Have a sharp threshold
  – Didn’t (then) have a before and after

• Core assumption:
  – Firms close to threshold are similar
    • Covariate balance is essential
  – Effect of legal difference (very similar to DiD):

\[
\text{effect of gov on } q = \frac{E[q_i|w_i=1] - E[q_i|w_i=0]}{E[\text{gov}_i|w_i=1] - E[\text{gov}_i|w_i=0]}
\]
• Regression lines are without controls.
• With KCGI, other controls, slope for large firms is negative & significant
• The jump at 2 trillion won is the discontinuity
Strategy 3: Two share classes; differential effects

- **Example 1:** Brazil until 1997: takeout bid required for common shares, not preferred shares
  - 1997: government relaxes mandatory bid rules
  - 1999: partly restored by CVM
  - 2001: mostly restored by law

- **Two papers exploit this shock**
  - $\Delta$ (value of common vs. preferred shares in same firm)
    - Nenova (2005); Carvalhal-da-Silva & Subramanyam (2007)

- **Example 2:** Muravyev (2010): 2001 law changes rights of Russian preferred shares
  - Some companies provided similar rights in charters
Strategy 4: Continuous treatment

- Atanasov, Black, Ciccotello & Gyoshev (JFE 2010), *How Does Law Affect Finance? An Examination of Equity Tunneling in Bulgaria*
  - 1998: mass privatization
  - 1999-2001: dilution and freezeout wave
  - 2002: new rules limit dilution, freezeout
Tunneling risk and financial metrics

• Lower tunneling risk should predict larger change in Tobin’s q for firms at high tunneling risk
• Which firms are those?
• Estimate propensities for dilutive offering, freezeout
  – Propensity scores predict value jump when new law adopted
• DiD-like: Some firms are more treated than others

• DiD Alternative: high propensity firms as treatment group, low propensity as control group
DiD results

![Graph showing the relative percentage change of Tobin's q over quarters.](image-url)

- The graph compares the tunneling risk defined using tunneling propensities (solid line) with the tunneling risk defined using ownership (dashed line).
- The graph is labeled and provides a legend indicating the different risk definitions.

**Legend:**
- Green solid line: Tunneling Risk Defined Using Tunneling Propensities
- Orange dashed line: Tunneling Risk Defined Using Ownership
Interlude: Power of good graphs

• If you have strong results, you can often convince readers with graphs . . .
Strategy 5: Event Study

- Any regulatory change potentially permits an event study. But (some big buts):
  - need a crisp event date
  - need a control group
  - common event date for all firms \( \Rightarrow \) cross-sectional correlation

- Sometimes first two conditions can be met
  - Very similar to DiD
  - common event date affects “power”
    - can deal with econometrically
Event study 1: India adoption of Clause 49

- Black & Khanna (JELS 2007), *Can Corporate Governance Reforms Increase Firms' Market Values? Event Study Evidence from India*
  - 1999 adoption of Clause 49 (package of governance rules)
    - pushed by big firms, applied to them first
    - small firms as control group – rules would apply later or not at all.
India event study results

<table>
<thead>
<tr>
<th>Window</th>
<th>(0, +1)</th>
<th>(0, +4)</th>
<th>(0, +9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>large firm dummy</td>
<td>0.040***</td>
<td>0.072***</td>
<td>0.099***</td>
</tr>
<tr>
<td></td>
<td>[4.50]</td>
<td>[5.34]</td>
<td>[5.55]</td>
</tr>
<tr>
<td>medium firm dummy</td>
<td>0.022***</td>
<td>0.031***</td>
<td>0.037**</td>
</tr>
<tr>
<td></td>
<td>[2.88]</td>
<td>[2.87]</td>
<td>[2.63]</td>
</tr>
<tr>
<td>constant (small firms)</td>
<td>0.009</td>
<td>0.002</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>[1.26]</td>
<td>[0.18]</td>
<td>[0.98]</td>
</tr>
<tr>
<td>observations</td>
<td>837</td>
<td>747</td>
<td>814</td>
</tr>
</tbody>
</table>

- Specification: industry-group clusters, winsorize outlier returns; robust standard errors
Event study 2: SOX adoption

Litvak (JCF 2007), The Impact of the Sarbanes-Oxley Act on Non-US Companies Cross-Listed in the US

• SOX applies to all US firms, so no control group
• SOX applies to some cross-listed firms (level 2 or 3):
  – first control group: matching non-cross-listed firms
  – second control group: cross-listed on level 1 or 4

• DiD: Event study of pair difference in returns
• Also DiDiD: level-23 pairs versus level-14 pairs
  – Third difference addresses weakness in DiD design
**SOX Event Study: Matched Pair Results**

Overall, level-23 pairs drop around 10% during SOX events. “Excess” level-23 drop (versus level-14 pairs) ~6%

<table>
<thead>
<tr>
<th>Event coeff</th>
<th>Full House</th>
<th>Senate Comm.</th>
<th>Sarbanes Amend’t</th>
<th>Dorgan Amend’t</th>
<th>SEC Rule 302</th>
<th>Pitt Speech</th>
<th>SEC Rule 404</th>
<th>Sum of Events</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.007</td>
<td>-0.004</td>
<td>-0.014</td>
<td>-0.009</td>
<td>-0.007</td>
<td>0.018</td>
<td>-0.010</td>
<td>-0.058</td>
</tr>
<tr>
<td></td>
<td>(1.96)**</td>
<td>(1.74)*</td>
<td>(2.37)**</td>
<td>(2.91)***</td>
<td>(2.71)***</td>
<td>(3.49)***</td>
<td>(3.06)***</td>
<td>(5.48)***</td>
</tr>
</tbody>
</table>
Strategy 6: Results too good to explain any other way

Example 1: Russia in 1999

- Black (EMR, 2001), The Corporate Governance Behavior and Market Value of Russian Firms
  - Russian CG in 1999 was really bad
    - shares were out-of-money options, value only if controller didn't steal everything
  - value ratio = Russian market cap/(theoretical Western market cap) (from Troika Dialog)
  - governance score: from Brunswick Warburg)
- worst-best change in governance ➔ 700x (70,000%) increase in predicted value ratio
Regress: $\ln(\text{Value Ratio})$ on Governance Score

- $n = 21$ firms
- $r = -0.90$
- $R^2 = 0.81$
- $t = -8.97$

(high ranking implies worse governance)
Can't explain another way 2: Bulgaria dilution

\( k = \) measure of dilution
\( k=0 \ (1-k) = 1 \) ➞ complete dilution
\( k=1 \ (1-k) = 0 \) ➞ prorata purchase

<table>
<thead>
<tr>
<th>( k = ) fractional purchase of shares by minority</th>
<th>model 1</th>
<th>model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate for ((1 - k)) pre-2002</td>
<td>1.104*** (t=2.62)</td>
<td>1.132*** (2.75)</td>
</tr>
<tr>
<td>Change in ((1 - k)) post-2002</td>
<td>-1.051 (3.04)</td>
<td>-0.92*** (2.70)</td>
</tr>
<tr>
<td>Resulting estimate for ((1 - k)) post-2002</td>
<td>0.053 (0.01)</td>
<td>0.211 (0.18)</td>
</tr>
<tr>
<td>Pre-law offerings</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>post-law offerings</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Adjusted R(^2)</td>
<td>0.08</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Source: Atanasov, Black, Ciccotello and Gyoshev (2010)
Strategy 7: Legislative reversal

• Can be especially convincing for event study or DiD – if legislature reverses course, get two events
• If opposite sign, competing stories get weaker
  – Results may be believable even with weak control group
Some reversal examples

- Litvak (2007) (SOX event study of pair returns, above)
- after SOX is adopted:
  - SEC applies SOX 302 to cross-listed firms
  - SEC chairman Harvey Pitt says we'll be flexible (but is fired soon thereafter)
  - SEC applies SOX 404 to cross-listed firms
  - pair return is (strongly) negative, positive, negative.
- Brazil mandatory bid studies (above)
- Muravyev study (above): Duma adopts law, Federation council (unexpectedly) rejects

Sometimes one study can use several approaches
- and should, if they are available)
• IV (nearly equivalent to DiD):
  – 1 for treated firms after shock
  – 0 for treated firms before shock; 0 for controls
• IV (nearly equivalent to RD):
  – 1 for treated firms
  – 0 for controls