Tort Reform and Physician Moral Hazard

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55th Actuarial Research Conference (ARC 2020)
Research Question

- States have been enacting tort reforms that reduce the liability of physicians who conduct malpractice

- Whether physicians exhibit moral hazard after tort reform?
  - Moral hazard: Physicians become more careless due to reduced financial liability
  - Use a regression-based actuarial model to predict incurred losses
Motivations

- Individual-level data are hard to obtain
- Insurance data are an aggregate of the individual-level data and may serve as a representative
- Medical malpractice insurers are the primary payer of medical malpractice claims
  - They have the *data* and *ability* to predict the behavioral changes of physicians and patients
  - Explore research question through the lens of medical malpractice insurers
Background of Tort Reform

- States have been *enacting* and *repealing* tort reforms
  - Most occurred before 2005, but there were still some after 2005
  - Study 5 types of tort reforms
    - Caps on noneconomic damages
    - Caps on punitive damages
    - Reforms to punitive damage evidence rules
    - Reforms to the collateral source rules
    - Reforms to the joint and several liability rules
Hypothesis

- Physicians exhibit moral hazard after tort reform
  - Physicians bear fewer costs of malpractice risk
    - Take fewer precautions and/or become more careless due to reduced liability
    - This can cause more malpractice claims and adversely affect patients’ benefits
  - Patients must bear more costs of medical malpractice risk
    - Have to take more precautions, e.g., spend more time searching for a reliable physician or communicate more carefully with their doctor to decide an appropriate treatment
    - Once file a claim, the expected payment is reduced
Three-Factor Model

\[ X_t = F_{Dt} \ast F_{Pt} \ast S_t \]

Expected loss of malpractice insurance

\[ X_t = F_{Dt} \ast F_{Pt} \ast S_t \]

Positive Net LR Revisions

- Decompose the effects of three factors (undone)
Positive Net LR Revision

Expect to observe *positive net LR revisions* if Physician Moral Hazard dominates the other two factors.
Data

- Firm-level data
  - NAIC Property-Casualty Annual Statements, 1993-2015
- State-level data
  - Tort reform data
    - Database of State Tort Law Reforms (2012, DSTLR 5th)
    - 2017 American Tort Reform Association (ATRA) Tort Reform Record
  - State control variables: various sources
- Screening
  - Drop DPW <= 0, trim outliers at the 1% and 99% levels
Incurred Losses Prediction Method

- What are the loss reserves in absence of tort reform?
  - Predict future reserves using past information and actuarial model

- Idea of FIRR method (Grace and Leverty, 2017)
  - Full Information Reserve Revision (FIRR) = Reported Reserves (t) – Predicted Reserves (t)
  - Predicted Reserves (t) are made using data of year t-1 and a forward-looking, regression-based model
  - Around treatment year: FIRR is reserve revision after tort reform

FIRR Method

- Regression (on year t-1 data)

\[
\log(\text{IncurredLosses})_{mn} = \alpha + \sum_{m=2}^{10} \lambda_m \text{Row}_m + \sum_{n=2}^{10} \delta_n \text{Col}_n + \varepsilon_{mn}
\]

- Prediction (using year t data)

\[
\text{IncurredLosses}_t = e^{\alpha + \lambda_m + \delta_{12-n}}
\]

- Full Information Reserve Revision (FIRR)

\[
\text{FIRR}_t = \text{ReportedIncurredLosses}_t - \text{IncurredLosses}_t
= \sum_{m=2}^{10} (\text{ReportedIncurredLosses}_{mt} - \text{IncurredLosses}_{mt})
\]
Example of FIRR

\[
\log(\text{IncurredLosses})_{mn} = \alpha + \sum_{m=2}^{10} \lambda_m \text{Row}_m + \sum_{n=2}^{10} \delta_n \text{Col}_n + \varepsilon_{mn}
\]

Panel A: Reporting Year 1994

<table>
<thead>
<tr>
<th>Accident Year</th>
<th>col1</th>
<th>col2</th>
<th>col3</th>
<th>col4</th>
<th>col5</th>
<th>col6</th>
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<td>197291</td>
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<td>124453</td>
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| row2 1986     | 212791| 213042| 168307| 156990| 134873| 115985| 105829| 95486 | 91773 | α + λ₂ + δ₁₀
| row3 1987     | 271404| 172330| 177027| 146324| 120119| 111173| 94104 | 89484 | α + λ₃ + δ₉
| row4 1988     | 183638| 168941| 154539| 130901| 122902| 109151| 101216| α + λ₄ + δ₈
| row5 1989     | 196963| 180051| 153666| 141629| 121042| 112140| α + λ₅ + δ₇
| row6 1990     | 196639| 169779| 153772| 135711| 120996| α + λ₆ + δ₆
| row7 1991     | 173433| 167964| 160731| 142990| α + λ₇ + δ₅
| row8 1992     | 190764| 186226| 147255| α + λ₈ + δ₄
| row9 1993     | 194654| 153910| α + λ₉ + δ₃
| row10 1994    | 163462| α + λ₁₀ + δ₂

Panel B: Reporting Year 1995

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</table>

Panel C: Summary

\[
\text{incurred losses reported} = 1027648 \quad \text{(1995 data)}
\]
\[
\text{incurred losses predicted} = 787260 \quad \text{(1994 data)}
\]
\[
\text{FIRR} = 240388 \quad \text{1995 FIRR}
\]
Allocate FIRR to State Level

• Pure sample
  ▶ Medical malpractice insurers operating in only one state
  ▶ 283 firms and 1,224 firm-year-state observations
  ▶ 18% incurred losses and 17% direct premiums of full sample
  ▶ *Biased toward small mutual insurers and RRGs*

• Full sample
  ▶ All insurers, 497 firms and 50,580 firm-year-state observations
  ▶ Allocate *FIRR to state level* using the proportion of premiums for each state
    ✦ *FIRR*$_{st}$ = *FIRR* * %DPW$_{s}$
Diff-in-Diff Model

- Two-way fixed effects DiD regression

\[
FIRR(st)_{ist} = \sum_{j=1}^{5} \beta_j Reform_{j,st} + \alpha_i + \delta_s + \gamma_i + \lambda X_{it} + \eta Z_{st} + \epsilon_{ist}
\]

- \(FIRR(st)\) is \(FIRR\) for the single-state sample or \(FIRRst\) for the full sample, both scaled by the average total admitted assets

- \(Reform\) is a dummy for each of five types of tort forms

- Physician moral hazard prevails if \(\beta_j > 0\)

  - Firm-level control variables \(X\): managerial incentives for reserve management, firm size, group dummy, org form

  - State-level control variables \(Z\): GSP per capita, personal healthcare expenditures, \# of EEs of insurance carriers/hospitals, \# of lawyers, average ratio of Republican in lower & upper house
## Result of DiD Model

<table>
<thead>
<tr>
<th>Dependent Var =</th>
<th>Single-State Sample</th>
<th>Full Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FIRR_occ</td>
<td>FIRR_clm</td>
</tr>
<tr>
<td><strong>Tort Reform Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caps on Noneconomic Damages</td>
<td>-0.007</td>
<td>0.002</td>
</tr>
<tr>
<td>(0.013)</td>
<td>(0.014)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Caps on Punitive Damages</td>
<td>0.005</td>
<td>-0.011</td>
</tr>
<tr>
<td>(0.011)</td>
<td>(0.029)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Punitive Damage Evidence</td>
<td>-0.020</td>
<td>0.074**</td>
</tr>
<tr>
<td>(0.028)</td>
<td>(0.032)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Collateral Source Rules</td>
<td>-0.067</td>
<td>0.043</td>
</tr>
<tr>
<td>(0.054)</td>
<td>(0.033)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>Joint and Several Liability</td>
<td>0.005</td>
<td>0.019</td>
</tr>
<tr>
<td>(0.009)</td>
<td>(0.015)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Observations</td>
<td>809</td>
<td>1,068</td>
</tr>
<tr>
<td>Overall R-squared</td>
<td>0.649</td>
<td>0.574</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>Firm, State, Year</td>
<td>Firm, State, Year</td>
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</table>

*Note: The table reports robust standard errors clustered by states in parentheses.*

- **Magnitude:** $4.6\% = $32.8$ million, $0.1\% = $2.8 million

- **Why these reforms?**
  - Punitive damages may unpredictably lead to a catastrophic jury verdict against the physicians.
  - Joint and several liability rules may also cause a significant liability.
Decomposition of LR Revision (future work)

- Partial derivatives

\[ \Delta X = \Delta F_D \cdot F_{P0} \cdot S_0 + \Delta F_P \cdot F_{D0} \cdot S_0 + \Delta S \cdot F_{D0} \cdot F_{P0} \]

\[ = (F_{D1} - F_{D0}) \cdot F_{P0} \cdot S_0 + (F_{P1} - F_{P0}) \cdot F_{D0} \cdot S_0 + (S_1 - S_0) \cdot F_{D0} \cdot F_{P0} \]

- NPDB data

  - Medical malpractice payment records, 1993 to 2014
    - Patient (yearly average count) \( \rightarrow F_{P1}, F_{P0} \)
    - Severity (yearly average payment) \( \rightarrow S_1, S_0 \)
  
  - Adverse action records, 1997 to 2018
    - Physician (yearly average count) \( \rightarrow F_{D1}, F_{D0} \)
Conclusion & Contribution

- This paper investigates the prevalence of physician moral hazard after tort reform using medical malpractice insurers’ reserve data.

- I find that physician moral hazard significantly exists after reforms to punitive damages and to joint and several liability rules.

- Contribution:
  - Provide the first empirical evidence of physician moral hazard due to tort reform
  - Add new evidence regarding the downside of tort reform
All comments are appreciated!

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THANK YOU VERY MUCH!