Tort Liability and Unawareness

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Plan of Presentation

1. Introduction.
2. Accident Model.
3. Unawareness and Reverse Bayesianism.
4. New Links.
5. New Consequences.
6. Conclusion.

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- BP Deepwater Horizon, involved drilling at new depths with a complex advanced technology.

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  - The court's decision revealed the potential harm of this new act.

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  - For unilateral accidents both strict liability and negligence lead to efficient actions.
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  - Why do courts use the more costly rule?
- We argue that when there is unawareness, negligence is superior, since it reveals information to potential injurers, which can enable them to take efficient levels of care.

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  - new acts new technology, new financial instruments.
  - new act-consequence links e.g. diesel engines cause pollution.

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- The fact a case has been brought will alert the court to this possibility.
- Moreover the court deals with a number of similar cases while each injurer or victim is only involved in one case.

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- We assume **act independence**. Outcomes are independent across activities.

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- In this example,

$$\tilde{x}_1 = \frac{\pi_1 z_2}{2} \quad \text{and} \quad \tilde{x}_2 = \frac{\pi_2 z_2}{2}.$$

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  - AI pins down how the probability mass shifts to new states.

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- Under negligence, the court stipulates $\bar{x}_1 = 0$ and $\bar{x}_2 = \tilde{x}_2$.

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$$\widehat{\widetilde{x}}_1 = \frac{(\widehat{p}_3 + \widehat{p}_4)\, z_2}{2} = \frac{\delta z_2}{2} \quad \text{and} \quad \widehat{\widetilde{x}}_2 = \frac{(\widehat{p}_2 + \widehat{p}_4) z_2}{2} = \frac{p_2 z_2}{2}.$$

New Links: Negligence vs. Strict Liability

Theorem

$\widehat{p}_1 = (1-\delta)p_1, \quad \widehat{p}_2 = (1-\delta)p_2, \quad \widehat{p}_3 = \delta p_1, \quad \textit{and} \quad \widehat{p}_4 = \delta p_2.$

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New Links: Negligence reveals more information

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  - May be useful because they reveal information about desirable care levels for both the injurer and the victim.

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- Suppose a new consequence is discovered. Working in the mine can lead to an industrial disease, say a specific type of cancer, z_3.

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- The feasible state space expands from four to nine states:

$\hat{p}$	$\hat{p}_1$	$\hat{p}_2$	$\hat{p}_3$	$\hat{p}_4$	$\hat{p}_5$	$\hat{p}_6$	$\hat{p}_7$	$\hat{p}_8$	$\hat{p}_9$
$F \setminus \hat{S}$	$\hat{s}_1$	$\hat{s}_2$	$\hat{s}_3$	$\hat{s}_4$	$\hat{s}_5$	$\hat{s}_6$	$\hat{s}_7$	$\hat{s}_8$	$\hat{s}_9$
f_1	$0\hat{s}_2$	0	z_2	z_2	z_3	z_3	0	z_2	z_3
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- By virtue of the suit, the parties learn that f_1 yields z_3 with probability $\alpha = \widehat{p}_5 + \widehat{p}_6 + \widehat{p}_9$ and f_2 yields z_3 with probability $\beta = \widehat{p}_7 + \widehat{p}_8 + \widehat{p}_9$.

New Consequences: Theorem

Theorem

$\hat{p}_1 = (1-\delta)\, p_1$	$\hat{p}_2 = (1-\delta)\, p_2$	$\hat{p}_3 = (1-\delta)\, p_3$
$\hat{p}_4 = (1-\delta)\, p_4$	$\hat{p}_5 = \frac{\alpha(1-\delta)}{1-\alpha}\,(p_1+p_3)$	$\hat{p}_6 = \frac{\alpha(1-\delta)}{1-\alpha}\,(p_2+p_4)$
$\hat{p}_7 = \frac{\beta(1-\delta)}{1-\beta}\,(p_1+p_2)\,,$	$\hat{p}_8 = \frac{\beta(1-\delta)}{1-\beta}\,(p_3+p_4)\,,$	$\hat{p}_9 = \alpha+\beta-\delta.$

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$\hat{p}_7 = \frac{\beta(1-\delta)}{1-\beta}(p_1 + p_2)\,,$	$\hat{p}_8 = \frac{\beta(1-\delta)}{1-\beta}(p_3 + p_4)\,,$	$\hat{p}_9 = \alpha + \beta - \delta.$

- Note that the degree of unawareness is

$$\delta = \widehat{p}_5 + \widehat{p}_6 + \widehat{p}_7 + \widehat{p}_8 + \widehat{p}_9 = \alpha + \beta - \alpha\beta.$$

Efficient care with a new consequence

- Given $\widehat{S}$ and $\widehat{p}$, the efficient levels of care are

$$\begin{aligned}
\widehat{\tilde{x}}_1 &= \frac{(\widehat{p}_3+\widehat{p}_4+\widehat{p}_8)z_2+(\widehat{p}_5+\widehat{p}_6+\widehat{p}_9)z_3}{2} \\
&= \frac{(1-\alpha)(p_3+p_4)z_2+\alpha z_3}{2}, \\
\widehat{\tilde{x}}_2 &= \frac{(\widehat{p}_2+\widehat{p}_4+\widehat{p}_4)z_2+(\widehat{p}_7+\widehat{p}_8+\widehat{p}_9)z_3}{2} \\
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- Note that $\widehat{\tilde{x}}_1 > \tilde{x}_1$ and $\widehat{\tilde{x}}_2 > \tilde{x}_2$.

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- Moreover, the agents can deduce α and β from $\widehat{\tilde{x}}_1$ and $\widehat{\tilde{x}}_2$ (and, therefore, δ).

$$\alpha = \frac{p_3 z_2 - 2\widehat{\tilde{x}}_1 + p_4 z_2}{p_3 z_2 - z_3 + p_4 z_2} \quad \text{and} \quad \beta = \frac{p_2 z_2 - 2\widehat{\tilde{x}}_2 + p_4 z_2}{p_2 z_2 - z_3 + p_4 z_2}.$$

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- This makes injurers and victims aware of z_3.
- But it provides them with no information about probability that f_1 or f_2 causes z_3.