Injurers with Differing Costs

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Suppose that there are multiple unilateral injurers. If injurer j spends i_j on care, it costs him or her $c_j i_j$, and j then causes expected damages $D(i_j)$, where D is strictly decreasing in i_j (thus, $c_j = 1$ in the basic model). Total damage is the sum of damages.

Efficiency is obtained as the solution to

$$\min_{i_j} \left(\sum_j c_j i_j + D(i_j) \right)$$

which implies that $c_j i_j + D(i_j)$ is minimized for each j. It is easily seen that high costs injurers should take no more care than low cost injurers:

$$
\begin{aligned}
c_1 i_1^* + D(i_1^*) &\leq c_1 i_2^* + D(i_2^*) \\
c_2 i_1^* + D(i_1^*) &\geq c_2 i_2^* + D(i_2^*) . \text{ Subtracting yields} \\
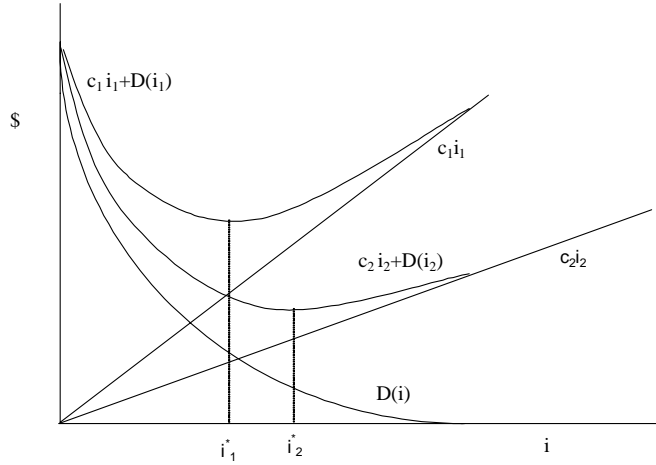(c_1 - c_2) i_1^* &\leq (c_1 - c_2) i_2^*
\end{aligned}
$$

so that $c_1 > c_2 \Rightarrow i_1^* \leq i_2^*$.

Assume differentiability and suppose that all solutions are interior solutions. Optimality requires

$$c_j + D'(i_j^*) = 0$$

so that $c_1 \neq c_2 \Rightarrow i_1^* \neq i_2^*$. Therefore, in this case high cost injurers take strictly less care than low cost injurers. From now on, we restrict our attention to this case, which is illustrated below:

Differing costs: $c_2 < c_1$

Consider a pure negligence rule. In practice a "reasonable person" standard X_r which is optimal for some c_r is used. This partitions the injurers into four classes:

1) $c_j < c_r$. Note that for these agents $i_j^* > X_r$. These agents will underinvest by choosing X_r, since, for them

$$c_j X_r < c_j i_j^* \leq c_j i_j^* + D\left(i_j^*\right) \leq c_j i_j + D\left(i_j\right) \text{ for all } i < i^*.$$

2) $c_j = c_r$. These agents will choose the efficient amount of care.

3) c_j is "slightly" above c_r. Note that for these agents $i_j^* < X_r$. These agents will overinvest by choosing X_r, since, for them

$$c_j X_r < c_j X_r + D\left(X_r\right) \approx c_j i_j^* + D\left(i_j^*\right) \text{ }^1$$

4) $c_j \gg c_r$. These agents will choose efficiently since $c_j i_j^* + D\left(i_j^*\right) \leq c_j i + D\left(i\right)$ for all i, and for large enough c_j

$$c_j i_j^* + D\left(i_j^*\right) < c_j X_r$$

(since $D\left(i\right)$ is finite and I could always choose $i = 0$). Since $i_j^* < X_r$ agents in this group will be found to be negligent if they cause damage. Ironically, these agents are "punished" although they are acting efficiently, while agents in groups 1) and 3) who are acting inefficiently are not punished.

Note that a strict liability rule would induce optimal care by everyone. (Caveat: we are assuming a unilateral care model.)

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$c_i i + D(i)$

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$c_r i_r$

$D(i)$

i^*

$1 - i_r^*$

$3 - i_r^*$

i

$4 - i_r^*$
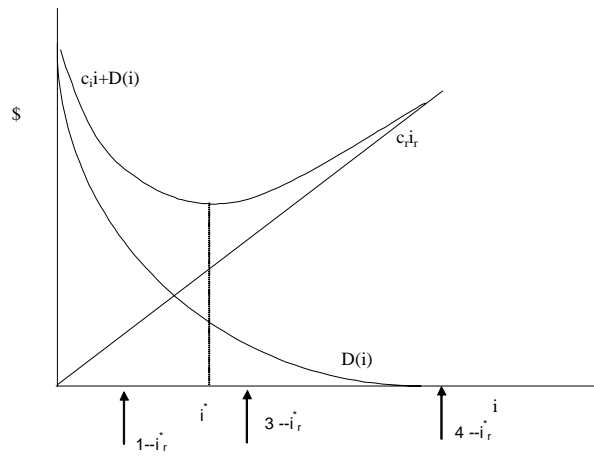
A graphical illustration of the differing behavior