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Jean-Pierre Benoît
Let us now expand our basic model of tort law by supposing that the Let us now expand our b
injurer and victim each have Let us now expand our basic model of tort law by supposing that the
injurer and victim each have *two* parameters to choose, only one of which
is observable by the courts. Specifically, in addition to care levels *i* and Let us now expand our basic model of tort law by supposing that the
injurer and victim each have *two* parameters to choose, only one of which
is observable by the courts. Specifically, in addition to care levels *i* and probability a driver causes injury depends not only on how carefully he or is observable by the courts. Specifically, in addition to care levels i we now posit unobservable "activity" levels z and x . Thus, for examprobability a driver causes injury depends not only on how carefull she driv now posit unobservable "activity" levels z and x. The bability a driver causes injury depends not only on drives (the care level), but also on how often (the a We now write the expected damage as $D(i, v, z, x)$ reasing in th

where *D* is strictly
sing in the last two.
enefit to the victim
argument. Suppose
ique *z* and that for
ize $[w(i, z) - \alpha D(i, z)]$, while $z_1(i, v, x)$
 z, x). Similarly, for
 v, x) $-\alpha D(i, v, z, x$
 x^*)
)] Denote the benefit to the injurer by $w(i, z)$ and the benefit to the victim by $b(v, x)$, where each function is decreasing in the first argument. Suppose that for each i, the benefit $w(i, z)$ is maximized by a unique z and that for each v, the benefit $b(v, x)$ is maximized by a unique x.

Denote the benefit to the injurer by $w(i, z)$ and the benefit to the victim
by $b(v, x)$, where each function is decreasing in the first argument. Suppose that for each i , the benefit $w(i, z)$ is maximized by a unique x , Denote are benefit to the injurer by $w_i(t, z)$ and the benefit to the victime
that for each i, the benefit $w_i(t, z)$ is maximized by a unique z and that for
each i, the benefit $b(x, x)$ is maximized by a unique z.
Por any iv by (v, x), where each function is decreasing in the most eigenment. Suppose
that for each *i*, the benefit $w(i, z)$ is maximized by a unique z, and that for
each *v*, the benefit $b(v, x)$ is maximized by a unique z.
 $\text{For any$ that for each i , one tends $w(t_i, z)$ is maximized by a unique z and that for each v , the benefit $b(v, x)$ is maximized by a unique x .
For any i , v , $m \geq 1$, $b \in \mathbb{Z}$, (i, v, x) maximizes $\lfloor w(i, z) - \alpha D(i, w, z) \rfloor$ each v, the benefit $v(v, v)$ is maximized by a unique x.

For any *i*, *v*, and *x*, and $0 \le \alpha \le 1$, let $z_{\alpha}(i, v, x)$ max

Given any (i, v, x) , $z_0(i, v, x)$ maximizes Γ s benefit, *w* (

maximizes Γ s benefit net of da For any *i*,*v*, and *x*, and $0 \le \alpha \le 1$, let $z_{\alpha}(i, v, x)$ maximize $[w(i, z) - \alpha D(i, v, z, x)].$ For any $i(v, x, x, y)$ and $x \in \mathbb{R}$, (v, x) maximizes [v, v, z] (v, v, z , v, z) maximizes [v, v, z , v, z], v, w, z , v, z], v, w, w, z , v, w, w, w , and z , and z , and z , $w(i, z) - D(i, v, z, x)$]. Similarly, for v, i , and Given any (i, v, x) , $z_0(i, v, x)$ maximizes I's benefit, $w(i, z)$, while $z_1(i, v, x)$ Given any (v, v, z), z_0), $\zeta(v, v, z)$, and $\zeta(v, z)$, which $w(v, z)$, which z is benefit and of damages $\zeta(w, z)$, $D(i, v, z, x)$). Similarly, for any v, i , and z , and $0 \le \alpha \le 1$, let $x_{\alpha}(v, i, z)$ maximizes $[b(v, x) - \$ maximizes I's benefit net of damages, $[w(i, z) - D(i, v, z, x)]$. Similarly, for any v, i, and z, and $0 \le \alpha \le 1$, let $x_\alpha(v, i, z)$ maximize $[b(v, x) - \alpha D(i, v, z, x)]$.

Let i^*, v^*, z^*, x^* be the social optimum. That is,

$$
w(i^*, z^*) + b(v^*, x^*) - D(i^*, v^*, z^*, x^*)
$$

=
$$
\max_{i,v,z,x} [w(i,z) + b(v,x) - D(i, v, z, x)]
$$

$$
v(i^*, v^*, x^*)
$$
 and
$$
x^* = x_1(v^*, i^*, z^*).
$$
 Assume
table and that all maxima are interior.¹
revealed preference argument yields:

maximizes 15 benefit net of damages , [w (i,z) – D (i, v,z, p]. Damages , $p(w, z) = \log(x, y, z)$, and z , and $\beta \le \alpha \le 1$, let x^* , (x^*, z^*, x^*) be the social optimum. That is,
 $w(i^*, z^*) + b(v^*, x^*) = D(i^*, v^*, z^*, x^*)$
 $= \max_{n \neq x}$ any v, i, and z, and $\alpha \leq a \leq x$, i, $\alpha \leq x_0$ (v, x_0) = and mum. That is,

Let i^x, v^x, z^x, x^* be the social optimum. That is,
 $w(i^*, z^*) + b(v^*, x^*) - D(i^*, v^*, z^*, x^*)$
 $= \max_{x, x, x} [w(i, z) + b(v, x) - D(i, v, z, x)]$

Note that $z^* = z$ $\begin{aligned} \text{Let } t \text{ is an integer} \ \mathcal{L} \ \text{Let } \text{ } \text{[i]} \ \mathcal{L} \ \text{Let } \text{ } \text{[j]} \end{aligned}$ $D(t, t, z, x)$]
^{*}, *i*^{*}, *z*^{*}). Assu
are interior.¹
ent yields: Note that $z^* = z_1(i^*, v^*, x^*)$ and $x^* = x_1(v^*, i^*, z^*)$. Assume that all functions are differentiable and that all maxima are interior.¹

Let $\beta > \alpha$. A revealed preference argument yields:

¹Question: Assumptions on primitives?

$$
w(i, z_{\alpha}) - \alpha D(i, v, z_{\alpha}, x) \geq w(i, z_{\beta}) - \alpha D(i, v, z_{\beta}, x)
$$

\n
$$
w(i, z_{\alpha}) - \beta D(i, v, z_{\alpha}, x) \leq w(i, z_{\beta}) - \beta D(i, v, z_{\beta}, x) \Rightarrow
$$

\n
$$
(\beta - \alpha) D(i, v, z_{\alpha}, x) \geq (\beta - \alpha) D(i, v, z_{\beta}, x)
$$

\n
$$
z_{\alpha} \geq z_{\beta}
$$

\nas, z_{α} is decreasing in α .
\nFor any given *i*, *v*, and *x*, the first order condition for z_{α} is

$$
\lim_{z \to a} \alpha.
$$

and *x*, the first order condition for z_{α} is

$$
\frac{\partial w(i, z_{\alpha})}{\partial z} - \alpha \frac{\partial D(i, v, z_{\alpha}, x)}{\partial z} = 0
$$
 (1)

 $\frac{\partial w(i, z_{\alpha})}{\partial z} - \alpha \frac{\partial D(i, v, z_{\alpha}, x)}{\partial z} = 0$ (1)
For fixed z, the left hand side of (1) is strictly decreasing in α . Thus z_{α} is $\frac{\partial z}{\partial z} - \alpha \frac{\partial z}{\partial z} = 0$ (1)
e left hand side of (1) is strictly decreasing in α . Thus z_{α} is
s α changes, and the fact that z_{α} is decreasing in α implies fixed z, the left hand side of (1) is strictly decreasing in α . Thus constant as α changes, and the fact that z_{α} is decreasing in α in t z_{α} is actually strictly decreasing in α . In particular, for an and the fact that z_{α} is decreasing in α implies
decreasing in α . In particular, for any $\alpha < 1$
 $z_{\alpha} (i, v, x) > z_1 (i, v, x)$ (2)

$$
z_{\alpha}(i, v, x) > z_1(i, v, x) \tag{2}
$$

Thus, given any $(i, v, x) > z_1 (i, v, x)$ (2)
Thus, given any (i, v, x) , if I does not pay for all the damages, he chooses too high an activity level (from a social point of view).² Similarly, given any too high an activity
vrite $D(i, v, z, x) \equiv$
blem is
 $i \geq i^*$
 $i < i^*$
aximum at (i^*, z^*) , I
 i^* , the argument of (i, v, z) , if V does not pay for all the damages, she chooses too high an activity level.

 $\frac{1}{D}\sup_{i,\text{N}}\frac{1}{N}$ **1 Unilateral Case**
Suppose the only decision agent is I, so that we can write $D(i, v, z, x) \equiv$ $D(i, z)$ and $z_{\alpha}(i, v, x) \equiv z_{\alpha}(i)$.
Now consider a negligence rule with $X_r = i^*$. I's problem is

\n- (i,
$$
v, z
$$
), if v does not pay for an the damages, she chooses too high an activity level.
\n- **1** Unilateral Case
\n- Suppose the only decision agent is I, so that we can write $D(i, v, z, x) \equiv D(i, z)$ and $z_{\alpha}(i, v, x) \equiv z_{\alpha}(i)$. Now consider a negligible of the right, $X_r = i^*$. Is problem is $\max_{i,z} f(i,z)$, where $f(i,z) = \begin{cases} w(i,z) & \text{if } i \geq i^* \\ w(i,z) - D(i,z) & \text{if } i < i^* \end{cases}$. Since $[w(i,z) - D(i,z)]$ reaches an unconstrained maximum at (i^*, z^*) , I chooses the level of care i^* . However, given the choice of i^* , the argument of z^* . What if we do not assume differentiability? interior solution?
\n- **2**
\n

if $i < i$
maximu of i^* , tl
n? Since $[w(i, z) - D(i, z)]$ reaches an unconstrained maximum at (i^*, z^*) , I Since $[w(t, z) - D(t, z)]$ reaches an unconstrained maximum at $(t$ oses the level of care i^* . However, given the choice of i^* , the argum What if we do not assume differentiability? interior solution?
2 $, z, \, j, \, 1$
ment of chooses the level of care i^* . However, given the choice of i^* , the argument of ∗, the argument of

chooses the level of care i
²What if we do not assume $\frac{1}{\text{e}}$. However, given the choice of *i*
 $\frac{1}{\text{e}}$ differentiability? interior solution? ²What if we do not assume differentiability? interior solution?

the previous selection establishes that I then selects an activity level $z_0(i) \ge$
* That is I chooses too high an activity level the previous selection establishes that I then sele
 z^* . That is, I chooses too high an activity level.

Clearly, no negligence rule with $X < \infty$ in z^* . That is, I chooses too high an activity level.
Clearly, no negligence rule with $X_r < \infty$ induces efficient behavior. On

the other hand, a strict liability rule $(X_r = \infty)$ does induce I to take the efficient amount of care, since his maximization problem is then the same as in is then the same as

in the two-agent case

the efficient outcome

Then I's payoff is

()
 \hat{x} , \hat{x})

Suppose that
 \hat{f} . – $R(\hat{i}, \hat{v}; X_I, X_V)]$ < society's. However, as we will see in the next section, in the two-agent case
efficiency cannot be obtained.
 2 Billateral Case

We now show that no loss assignment rule if yields the efficient outcome

when then the sa society's. However, as we will see in the next section, in the two-agent case efficiency cannot be obtained.

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2 Bilateral Case
We now show that no loss as
when there are two agents.
Given the rule R, let (i, i) ,
 $w(i, \hat{z})$ –
while V's payoff is
 $b(i, \hat{z}) - (1 -$
Either $R(i, \hat{v}; X_I, X_V) < 1$ or
 E
Note that $\hat{z} = z_{R(i, \hat{v}; X_I, X_V)} (i$ We now show that no loss assignment rule R yields the efficient outcome when there are two agents.

Given the rule R, let $(\hat{i}, \hat{v}, \hat{z}, \hat{x})$ be an equilibrium. Then I's payoff is

$$
w(\hat{\imath},\hat{z}) - R(\hat{\imath},\hat{v};X_I,X_V)D(\hat{\imath},\hat{v},\hat{z},\hat{x})
$$

while V's payoff is

$$
w(t, z) = R(t, t, z, X_I, X_V) D(t, t, z, x)
$$

is

$$
b(\hat{i}, \hat{z}) - (1 - R(\hat{i}, \hat{v}; X_I, X_V)) D(\hat{i}, \hat{v}, \hat{z}, \hat{x})
$$

$$
X_V) < 1 \text{ or } [1 - R(\hat{i}, \hat{v}; X_I, X_V)] < 1. \text{ Suq}
$$

 $\begin{aligned} &\text{(1 } \quad R(\iota, \iota, X_I, X_V)) D(\iota, \iota, z, x) \ &\text{(1 or } [1 - R(\hat{\iota}, \hat{v}; X_I, X_V)] < 1. \text{ Sup } \\ &R(\hat{\iota}, \hat{v}; X_I, X_V) < 1 \ &\text{(2)}, \end{aligned}$ Either $R(v, v, X_I, X_V) \leq 1$ or [1]

$$
R(\hat{\imath}, \hat{\nu}; X_I, X_V) < 1
$$

Note that $\hat{z} = z_{R(i,\hat{v};X_I,X_V)} (\hat{i}, \hat{v}, \hat{x})$. But from (2),

$$
\langle 1 \text{ of } [1 - R(t, t, X_I, X_V)] \rangle 1. \text{ Suppose that}
$$
\n
$$
R(\hat{i}, \hat{v}; X_I, X_V) < 1
$$
\n
$$
R(\hat{i}, \hat{v}, \hat{x}). \text{ But from (2)},
$$
\n
$$
z_{R(\hat{i}, \hat{v}; X_I, X_V)}(\hat{i}, \hat{v}, \hat{x}) > z_1(\hat{i}, \hat{v}, \hat{x}),
$$

efficiency cannot be obtained.

2 Bilatchal Case

We now show that no loss assignment rule R yields the efficient outcome

when there are two agents, i , i , j be an equilibrium. Then Ts payoff is
 $w(i, z) = R(i, \hat{w}, X_i, X$ We note that it is expansionally the efficient. Then Eq. is particle to the efficient the rule R, let $(\hat{t}, \hat{v}, \hat{z}, \hat{x})$ be an equilibrium. Then Ex payoff is $w(\hat{i}, \hat{z}) = R(\hat{i}, \hat{v}; \hat{z}, \hat{x})$ be an equilibrium. Then Ex Given the rule R, let (i, i)

w (i, \hat{z})

while V's payoff is
 $b(i, \hat{z}) - ($

Either $R(i, \hat{v}; X_I, X_V) < 1$

Note that $\hat{z} = z_{R(i, \hat{v}; X_I, X_V)}$ $(z_{R(i, \hat{v}; \hat{v})})$

so that the equilibrium can

1, then
 $x_{R(i, \hat{v})}$

and aga Given the rule R, let (t, t, z, x) be an equilibrium. Then I's payon is
 $w(\hat{i}, \hat{z}) = R(\hat{i}, \hat{v}; X_t, X_V)D(\hat{i}, \hat{v}, \hat{z}, \hat{x})$

le V's payoff is
 $b(\hat{i}, \hat{z}) = (1 - R(\hat{i}, \hat{v}; X_t, X_V))D(\hat{i}, \hat{v}, \hat{z}, \hat{x})$

ther $R(i, \hat{v}; X_t, X_V) < 1$ or so that the equilibrium cannot be efficient. Similarly, if $[1 - R(\hat{i}, \hat{v}; X_I, X_V)]$ $\left[\frac{R(t, v, \Delta I, \Delta V)}{V} \right]$ 1, then

$$
x_{R(i,\hat{v};X_I,X_V)}(\hat{i},\hat{v},\hat{z}) > x_1(\hat{i},\hat{v},\hat{z}),
$$

and again the equilibrium is not efficient. and again the equilibrium is not efficient.

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and a simple of the efficient of the effici