

EC337 – Spring 2013 – Personal Injury Examples

Consider a hypothetical accident involving a driver and a pedestrian. If neither party takes care, the probability of an accident occurring at any given location at any given time is 10%. In the event that an accident occurs, the pedestrian/plaintiff (P) will suffer true damages in the amount of \$1000, while the driver/defendant (D) will suffer no damages.

Case 1:

Suppose that, to independently reduce the probability of an accident to zero, drivers would have to install a sensor on their cars at a cost of \$500 each. Also suppose that, to independently reduce the probability of an accident to zero, pedestrians would have to buy special running shoes at a cost of \$400 each.

a) What is the efficient level of prevention and the associated outcome? Why?

The efficient level of prevention is for neither party to take care. The expected harm from an accident is the probability that the accident will occur ($Pr = 10\%$) multiplied by the damage that would be suffered ($L = 1000$), or \$100 in this case, which is the social loss if neither party takes care. The burden to a representative driver of avoiding the accident (B_D) is \$500 in this case, which is the social loss if only drivers take care (expected harm of zero but investment in prevention of 500). The burden to a representative pedestrian of avoiding the accident (B_P) is \$400 in this case, which is the social loss if only pedestrians take care (expected harm of zero but investment in prevention of 400). And the social loss if both drivers and pedestrians take care is \$900 (expected harm of zero but investment in prevention of $400 + 500 = 900$).

The social loss is therefore minimized if there is no investment in prevention ($100 < 400 < 500 < 900$). So it is efficient for neither party to take care.

The outcome associated with no investment in prevention is for the probability of accidents to remain at 10%. So it is efficient for there to continue to be accidents involving a driver and a pedestrian.

b) Will efficiency be achieved if everyone knows that courts always apply the original Hand Rule when deciding which party is at fault? Explain.

The original Hand Rule is as follows: if $B_D < Pr \times L$, D was negligent (i.e. at fault) and must pay L to P. In this case, $500 > 100$, so D will not be found negligent and will never have to pay if there is an accident.

Since his cost of avoiding accidents (500) is greater than his expected benefit in terms of avoided damages payments ($10\% \times 0 = 0$ – with damages payments if there is an accident being zero as the defendant will not be found negligent), a representative driver has no incentive to bear the cost of avoiding accidents.

And since her cost of avoiding accidents (400) is greater than her expected benefit in terms of avoided harm ($10\% \times 1000 = 100$), a representative pedestrian has no incentive to bear the cost of avoiding accidents.

Therefore, neither party will choose to take care, and the original Hand Rule hence achieves the efficient level of prevention in this case.

Case 2:

Now suppose that a new technology becomes available to drivers. Specifically, to independently reduce the probability of an accident to zero, drivers now just need to have their brakes tuned up regularly at a cost of \$20 each. Continue to assume that, to independently reduce the probability of an accident to zero, pedestrians would have to buy special running shoes at a cost of \$400 each.

a) What is the efficient level of prevention and the associated outcome? Why?

The efficient level of prevention is for D to take care.

Social loss if neither takes care = 100

Social loss if D takes care = 20

Social loss if P takes care = 400

Therefore, the social loss is minimized when only D invests in prevention. So it is efficient for only D to take care.

The outcome associated with only D taking care is for the probability of accidents to fall to zero. So the efficient outcome is for there to be no accidents involving a driver and a pedestrian.

b) Will efficiency be achieved if everyone knows that courts always apply the original Hand Rule when deciding which party is at fault? Explain.

Courts will find D negligent if $B_D < Pr \times L$. In this case, $20 < 100$, so D will be found negligent and will have to pay 1000 if there is an accident.

Since his cost of avoiding accidents (20) is less than his expected benefit in terms of avoided damages payments ($10\% \times 1000 = 100$), a representative driver has an incentive to bear the cost of avoiding accidents.

And since her cost of avoiding accidents (400) is greater than her expected benefit in terms of avoided harm ($10\% \times 0 = 0$ – with the net loss if there is an accident being 0 because the 1000 true damages will be exactly compensated by D), a representative pedestrian has no incentive to bear the cost of avoiding accidents.

Therefore, only D will choose to take care, and the original Hand Rule hence achieves the efficient level of prevention in this case as well.

Case 3:

Forget about the braking technology and once again assume that, to independently reduce the probability of an accident to zero, drivers would have to install a sensor on their cars at a cost of \$500 each. But now assume that a new “technology” becomes available to pedestrians. Specifically, to independently reduce the probability of an accident to zero, pedestrians now just need to look both ways before crossing at a cost of \$5 each.

a) What is the efficient level of prevention and the associated outcome? Why?

The efficient level of prevention is for P to take care.

Social loss if neither takes care = 100

Social loss if D takes care = 500

Social loss if P takes care = 5

Therefore, the social loss is minimized when only P invests in prevention. So it is efficient for only P to take care.

The outcome associated with only P taking care is for the probability of accidents to fall to zero. So the efficient outcome is for there to be no accidents involving a driver and a pedestrian.

b) Will efficiency be achieved if everyone knows that courts always apply the original Hand Rule when deciding which party is at fault? Explain.

Courts will find D negligent if $B_D < Pr \times L$. In this case, $500 > 100$, so D will not be found negligent and will never have to pay 1000 if there is an accident.

Since her cost of avoiding accidents (5) is less than her expected benefit in terms of avoided harm ($10\% \times 1000 = 100$ – since she would not be compensated for damages suffered as the defendant will not be found negligent), a representative pedestrian has an incentive to bear the cost of avoiding accidents.

And since his cost of avoiding accidents (500) is greater than his expected benefit in terms of avoided damages payments ($10\% \times 0 = 0$ – with damages payments if there is an accident being zero as the defendant will not be found negligent), a representative driver has no incentive to bear the cost of avoiding accidents.

Therefore, only P will choose to take care, and the original Hand Rule hence achieves the efficient level of prevention in this case once again.

Case 4:

Now suppose that both new technologies are available simultaneously. That is: to independently reduce the probability of an accident to zero, drivers just need to have their brakes tuned up regularly at a cost of \$20 each; and, to independently reduce the probability of an accident to zero, pedestrians just need to look both ways before crossing at a cost of \$5 each.

a) What is the efficient level of prevention and the associated outcome? Why?

The efficient level of prevention is for P to take care.

Social loss if neither takes care = 100

Social loss if D takes care = 20

Social loss if P takes care = 5

Therefore, the social loss is minimized when only P invests in prevention. So it is efficient for only P to take care.

The outcome associated with only P taking care is for the probability of accidents to fall to zero. So the efficient outcome is for there to be no accidents involving a driver and a pedestrian.

b) Will efficiency be achieved if everyone knows that courts always apply the original Hand Rule when deciding which party is at fault? Explain.

Courts will find D negligent if $B_D < Pr \times L$. In this case, $20 < 100$, so D will be found negligent and will have to pay 1000 if there is an accident.

Since his cost of avoiding accidents (20) is less than his expected benefit in terms of avoided damages payments ($10\% \times 1000 = 100$), a representative driver has an incentive to bear the cost of avoiding accidents.

And since her cost of avoiding accidents (5) is greater than her expected benefit in terms of avoided harm ($10\% \times 0 = 0$ – with the net loss if there is an accident being 0 because the 1000 true damages will be exactly compensated by D), a representative pedestrian has no incentive to bear the cost of avoiding accidents.

Therefore, only D will choose to take care. The original Hand Rule hence does not achieve efficiency in this case. (The efficient qualitative outcome – no accidents – is achieved, but the cost of achieving it is higher than necessary.)

c) Will efficiency be achieved if everyone knows that courts always apply the contributory negligence standard when deciding which party is at fault? Explain.

The contributory negligence standard is as follows: if $B_D < Pr \times L$, D was negligent; but if $B_P < Pr \times L$ as well, P was also negligent; and if both parties were negligent, P is not entitled to any damages payments. In this case, $20 < 100$, so D will be found negligent; and $5 < 100$, so P will also be found negligent; so there will be no damages payment from D to P.

Since her cost of avoiding accidents (5) is less than her expected benefit in terms of avoided harm ($10\% \times 1000 = 100$ – since she would not be compensated for damages suffered due to the application of the contributory negligence standard), a representative pedestrian has an incentive to bear the cost of avoiding accidents.

And since his cost of avoiding accidents (20) is greater than his expected benefit in terms of avoided damages payments ($10\% \times 0 = 0$ – with damages payments if there is an accident being zero due to the application of the contributory negligence standard), a representative driver has no incentive to bear the cost of avoiding accidents.

Therefore, only P will choose to take care, and the contributory negligence standard hence achieves the efficient level of prevention in this case.

Case 5:

Forget about brake tune-ups, sensors, running shoes, and looking both ways. Now suppose that, to independently reduce the probability of an accident to zero, drivers would have to have special horns installed at a cost of \$72 each. And, to independently reduce the probability of an accident to zero, pedestrians would have to wear special reflective clothing at a cost of \$88 each. (Horns and reflective clothing are the only two possible ways to invest in accident prevention.)

a) What is the efficient level of prevention and the associated outcome? Why?

The efficient level of prevention is for D to take care.

Social loss if neither takes care = 100

Social loss if D takes care = 72

Social loss if P takes care = 88

Therefore, the social loss is minimized when only D invests in prevention. So it is efficient for only D to take care.

The outcome associated with only D taking care is for the probability of accidents to fall to zero. So the efficient outcome is for there to be no accidents involving a driver and a pedestrian.

b) Will efficiency be achieved if everyone knows that courts always apply the original Hand Rule when deciding which party is at fault? Explain.

Courts will find D negligent if $B_D < Pr \times L$. In this case, $72 < 100$, so D will be found negligent and will have to pay 1000 if there is an accident.

Since his cost of avoiding accidents (72) is less than his expected benefit in terms of avoided damages payments ($10\% \times 1000 = 100$), a representative driver has an incentive to bear the cost of avoiding accidents.

And since her cost of avoiding accidents (88) is greater than her expected benefit in terms of avoided harm ($10\% \times 0 = 0$ – with the net loss if there is an accident being 0 because the 1000 true damages will be exactly compensated by D), a representative pedestrian has no incentive to bear the cost of avoiding accidents.

Therefore, only D will choose to take care, and the original Hand Rule hence achieves efficiency in this case.

c) Will efficiency be achieved if everyone knows that courts always apply the contributory negligence standard when deciding which party is at fault? Explain.

In this case, $72 < 100$, so D will be found negligent; and $88 < 100$, so P will also be found negligent; so there will be no damages payment from D to P.

Since his cost of avoiding accidents (72) is greater than his expected benefit in terms of avoided damages payments ($10\% \times 0 = 0$ – with damages payments if there is an accident being zero due to the application of the contributory negligence standard), a representative driver has no incentive to bear the cost of avoiding accidents.

And since her cost of avoiding accidents (88) is less than her expected benefit in terms of avoided harm ($10\% \times 1000 = 100$ – since she would not be compensated for damages suffered due to the application of the contributory negligence standard as discussed above), a representative pedestrian has an incentive to bear the cost of avoiding accidents.

Therefore, only P will choose to take care. The contributory negligence standard hence does not achieve efficiency in this case. (The efficient qualitative outcome – no accidents – is achieved, but the cost of achieving it is higher than necessary.)

Note: when D has lower costs of avoidance, as in this case, the original Hand Rule achieves efficiency and the contributory negligence standard fails to; but when P has lower costs of avoidance, as in Case 4, the contributory negligence standard achieves efficiency and the original Hand Rule fails to. This highlights the difficulty that courts would have in trying to come up with a simple uniform standard that would achieve efficiency across many different types of cases. Note also that it seems very unlikely that private bargaining could achieve efficiency despite a court applying the “wrong” rule: for example, in the present case, if courts always apply the contributory negligence standard, one could imagine pedestrians trying to bribe drivers to install the horns so that they can avoid bearing the cost of wearing the reflective clothing, in which case only drivers would end up choosing to take care after all; but the transaction costs

associated with all pedestrians getting organized enough to bribe every driver to install a horn would seem to be insurmountably high.

d) Will efficiency be achieved if everyone knows that courts always apply the pure comparative negligence standard when deciding which party is at fault? Explain.

The pure comparative negligence standard is as follows: if $B_D < Pr \times L$, D was negligent; but if $B_P < Pr \times L$ as well, P was also negligent; and if both parties were negligent, D is only required to pay the proportion $\left(1 - \frac{B_D}{B_D + B_P}\right)$ of L to P. In this case, $72 < 100$, so D will be found negligent; and $88 < 100$, so P will also be found negligent; so there will be a payment of $(1 - 72/(72 + 88)) \times 1000 = \550 from D to P if there is an accident.

Since his cost of avoiding accidents (72) is greater than his expected benefit in terms of avoided damages payments ($10\% \times 550 = 55$), a representative driver has no incentive to bear the cost of avoiding accidents.

And since her cost of avoiding accidents (88) is greater than her expected benefit in terms of avoided harm ($10\% \times 450 = 45$ – with the net loss if there is an accident being 450 because the 1000 true damages will be partially compensated by 550 by D), a representative pedestrian has no incentive to bear the cost of avoiding accidents.

Therefore, neither D nor P will choose to take care. The pure comparative negligence standard hence does not achieve efficiency in this case. (This is a more serious efficiency loss than that suffered with the contributory negligence standard in this case: rather than the “wrong” party taking care but accidents at least being avoided – with a social loss of 88 rather than 72, so just 16 worse than its minimum – accidents will continue to occur with 10% probability – with a social loss of 100 rather than 72, so 28 worse than its minimum.)

Note: in other cases, when the numbers are a bit different, the pure comparative negligence standard can achieve efficiency.