Non-existence of equilibria under liability rules when due care is set at a level greater than the optimal level

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Abstract

This paper explores some aspects related to excessive due care level greater than the optimal level under some liability rules. If the due care level is set at a level greater than optimal level, pure strategy Nash Equilibrium, which represents the equilibrium behaviour of rational parties involved in an interaction, may not exist in some cases under some liability rules. In this paper, negligence rule, negligence rule with defence of contributory negligence and strict liability with defence of contributory negligence have been discussed.

A tort is a harm done to some party by the activity of another party. The party which gets harmed may file civil suit against the party who caused injury. The injured party is called plaintiff and the purported injurer is known as tortfeasor or defendant. Plaintiff moves the court for compensation for the loss that she/he has suffered. Since torts are civil suits, it only requires

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monetary compensation from defendant to plaintiff in case the defendant is found guilty by the court for causing harm to the plaintiff. Court decides how the burden is to be shared by the injurer and victim according to a liability rule. Both the injurer and the victim have a duty to behave in a certain way or to take a definite level of care. If anyone among them does not behave in the required manner or in other words fails to take the due care level, she/he may be adjudged to be negligent in her/his behaviour. Most of the liability rules determine the burden of damages to be borne by the parties on the basis of the care levels taken by them. Both the victim and injurer are assumed to be rational. So, they would choose actions so as to minimise their expected costs. There is a cost of taking care. More care implies more cost. Hence, cost of care itself can be used to reflect the level of care taken. It has been further assumed, in the existing literature, that quantum of loss and probability of loss, each is non-increasing with the cost of care. Hence, expected loss is a function, which is non-increasing with cost of care taken by each party. Apart from the cost of care level taken by a party, it also has to bear the part of the damages as decided by the court given some liability rule. Liability rule may take into account the care level taken by the parties to determine negligence of the parties involved in an interaction. Equilibrium outcome stemming from the rational behaviour of the two parties will be given by the pure strategy Nash equilibrium.

The outcome that is socially optimal or efficient may not be the same as the pure strategy Nash equilibrium. In the existing literature, wealth maximisation principle has been used as a criterion for determining efficiency. A liability rule takes into account cost of care taken by one or both the parties

to determine negligent behaviour and determines compensation accordingly, thus a liability rule creates incentives for the parties to behave in certain ways. If a liability rule invariably induces all the parties involved in an interaction to behave in such a manner that the individual rational equilibrium behaviour is also socially optimal then the liability rule is an efficient one. In other words, a liability rule is efficient if and only if, for all possible situations or interactions, the pure strategy Nash equilibrium coincides with socially efficient or total social cost minimising outcome.

Under no liability rule, injurer is never held liable for the damages to the victim. There is no incentive for a rational injurer to take any level of care. Hence, under no liability rule, Nash equilibria outcomes may not always coincide with outcomes which are socially optimal. So, it is not an efficient rule. Similarly, under strict liability rule, injurer has to pay compensation against all the damages to the victim irrespective of the level of care level taken by the injurer. So, victim may take no care at all. In general, both the magnitude of harm and probability of occurrence will depend upon the care level taken by either both or one of the parties. Hence, this is also not an efficient rule. Most of the liability rules in use take into account the level of care taken by the parties involved in an interaction and also the due care levels prescribed under the law. Court may fix a due care level specific to each party. It is assumed that the court fixes the due care levels at a level which is socially optimal. When an accident occurs and the aggrieved party approaches court; court figures out the level of care taken by each party. If a party has taken care level which is less than the due care level, then that party is adjudged negligent. Then, depending upon the liability rule in force,

the burden share of the damages for party is determined. Some of the liability rules are -

1- Simple Negligence rule- Under this rule, injurer is held liable for the loss to the victim if and only if he is found negligent.

2- Negligence rule with defence of contributory negligence- Injurer is held liable for the loss to victim if and only if injurer is found negligent and the victim is found to be non-negligent otherwise victim bears the entire loss.

3- Strict liability with defence of contributory negligence- Under this rule, if the victim is negligent he bears the entire loss otherwise injurer is held liable for the loss to the victim.

If court sets due care requirements for the parties involved in an interaction at the socially optimal level, all of these would be efficient. Given any interaction, there will be some expected cost associated with the different combinations of care level taken by parties involved. Efficient Liability rule implies all the Nash equilibria would be coincident with some socially optimal care levels and there would exist at least one Nash equilibrium.

However, all the assumptions may not hold in practice. Victim and injurer are closer to the accident, so they have more accurate information. Court and regulators are far away from the accident so they have relatively less information. It is assumed that victim and injurer are aware of the socially optimal level of cares as well as the due care levels set by courts. If there is error in setting the due care by the court or the regulator then different rules

will perform differently. Ideally due care level for a party should be set equal to the optimal level of care that minimizes the total social cost. If there is error then due care will be either greater than or less than the optimal level of care. So, efficiency of liability rules suffers. The degree of sufferance could be ascertained only if there are Nash equilibria in this setting. If there are Nash equilibria then we can say which liability rule is relatively less affected and which is more affected on efficiency criterion.

Let c be cost associated with any feasible care level taken by the victim and d be cost associated with any feasible care level taken by the injurer. Assuming that the cost function for any party is strictly increasing with the level of care taken by that party and no care costs zero, cost of care itself can be used as a proxy for the level of care. Henceforth, both care level as well as cost of care for victim will be represented by c and for injurer by d. Let c_m and d_m denote costs associated with the total social cost minimizing level or the optimal level of care for victim and injurer respectively.

Let c^* and d^* denote costs associated with the due care levels set by the court for the victim and injurer respectively.

And let $L(c,d)$ be the expected loss function. It is assumed to be non-increasing in both c and d.

Ideally $c^* = c_m$ and $d^* = d_m$. Suppose in an interaction, the various costs of care configurations and expected loss function are such that there exists a total social cost minimising care configuration. And, if due care levels are set

at the optimal level, then under each liability rule above from 1 to 3, there would exist a Nash equilibrium which would coincide with the optimal level of cares, i.e., (c_m, d_m) would be pure strategy Nash Equilibrium. Individually rational behaviour will lead to an outcome that is socially efficient(Jain and Singh, 2002). However when the court or regulator makes error in setting the due care levels then $c^* > c_m$ or $c^* < c_m$ and/or $d^* > d_m$ or $d^* < d_m$. If due care levels are set at a level different from the optimal level, then their efficiency of the liability rules will get affected. Analysis of divergence can be done to figure out which rule is more resilient towards such errors. Equilibrium behaviour of the rational individuals is assumed to be given by pure strategy Nash Equilibrium concept. However, pure strategy Nash Equilibrium may not always exist under such errors. So, in order to study the efficiency of various liability rules under such sub-optimal due care levels, it is pertinent to figure out necessary and sufficient condition under which pure strategy Nash Equilibria exist.

Negligence Rule

Under simple negligence rule, only injurer's care level matters. Under this rule, a rational injurer has no reason to take care level greater than d^* because by taking care level d^*, she/he would be non-negligent in the eyes of the court. If the injurer takes care level greater than d^* , only her/his cost will increase.

If $d^* > d_m$, then under negligence rule, the injurer will either take d^* or take some care level $d' < d^*$. If the injurer takes the due care d^*, then victim

will minimise her cost plus expected loss given injurer's care level. If the injurer takes less than d^*, victim being rational will take no care because all the damages are to be compensated by the injurer if she/he is negligent given negligence rule is in force. So, injurer may take d^* or less than d^* depending on the condition whether $d' + L(0, d')$ is less than d^*. However, pure strategy Nash Equilibrium may not always exist. The reasoning is as follows:

Let $d' = \arg\min_{d} d + L(0, d)$ and $c' = \arg\min_{c} c + L(c, d^*)$ and $d'' = \arg\min_{d} d + L(c', d)$

If $d' + L(0, d') > d^*$ then injurer would intend to take d^* to minimise her expected cost. Then, given injurer's strategy, victim would try to take c' to minimise her expected cost. Then, given victim's cost c', injurer would try to optimise and choose d''. However, if $d'' < d^*$ and $d'' + L(c', d'') < d^*$ then injurer would deflect towards being negligent. However, if the injurer is negligent, then victim would take zero care level under negligence rule. But, given $d' + L(0, d') > d^*$, if victim takes zero care level then injure would tend to take due care level. Hence, there would be no pure strategy Nash equilibrium.

Negligence Rule with Defence of Contributory Negligence

Under Negligence Rule with Defence of Contributory Negligence, both victim's as well as injurer's care levels matter. Injurer has to compensate for damages if and only if the injurer is negligent and victim is not negligent. Let $c^* > c_m$ and $d^* > d_m$.

Let $c' = \arg\min_{c} c + L(c, d^*)$ and $c'' = \arg\min_{c} c + L(c, 0)$ and $d' = \arg\min_{d}$

$d + L(c^*, d)$.

If the victim takes care level $c < c^*$, injurer would take care level $d = 0$. Given $d = 0$, victim would compare c^* and $c'' + L(c'', 0)$. If $c'' + L(c'', 0) > c^*$, then victim would take c^*. At c^*, injurer would compare $d' + L(c^*, d')$ and d^*. If $d' + L(c^*, d') > d^*$, then it would be wise of injurer to take d^* level of care. Now, if $c' + L(c', d^*) < c^*$, then there would be no Nash equilibrium.

Strict Liability with Defence of Contributory Negligence Rule

Under Strict Liability with Defence of Contributory Negligence, only victim's care level matters. Let victim's due care level be set at a level $c^* > c_m$. If the victim takes at least c^* care level then injurer compensates for all damages, otherwise victim bears everything. A rational victim would take either c^* level of care or less than it, but never greater than c^*

Let $c' = \arg\min\limits_{c} c + L(c, 0)$ and $d' = \arg\min\limits_{d} d + L(c^*, d)$ and $c'' = \arg\min\limits_{c} c + L(c, d')$

If the victim takes c^* level of care, then injurer would tend to take d' level of care. Suppose $c'' + L(c'', d') < c^*$ then victim would tend to take $c'' < c^*$. However then injurer would take no care because if the victim is negligent then injurer would not have to bear any liability. If the injurer takes care level zero then victim would tend to take c'. Now, if $c' + L(c', 0) > c^*$ then there would be no pure strategy Nash equilibrium.

When due care levels are set at the optimal levels by the court then the three rules discussed above are efficient. However if due care levels are not equal to the optimal level then they fail to remain efficient. Some liability rules may become more inefficient while others may be little less inefficient in a relative sense. How much an efficient liability rule deviates from the total social cost minimising level may depend upon the type of error like greater or less than optimal level. For making any comparison of efficiency one must have Nash equilibrium under each rule. If we do not have Nash equilibrium we cannot compare them. This paper shows the possibility of no pure strategy Nash Equilibrium. Hence, necessary and sufficient conditions for existence of pure strategy Nash Equilibrium can be explored to analyse relative efficiency of the liability rules under such circumstances.

Reference

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