

# Rational Legal Decision-Making, Value Judgment and

## Efficient Precaution in Tort law

By

MINGLI ZHENG\*

&

SAJID ANWAR

By reinterpreting Savage axioms as axioms of the social rationality over resource allocations, we derive a social welfare function encompassing individual social values and a social attitude towards distributional inequality. Wealth maximization becomes the purpose of law only if individuals have equal social values and the society does not care about distributional inequality. In tort law, when the injurer is less socially valued than the victim, the society imposes a stricter due precaution level, and punitive damages will be awarded. Tort law also implicitly transfers wealth from the less socially valued party to the more socially valued party. (**JEL:** D70, K41, K49)

### 1 Introduction

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The normative foundations of law have been widely debated among researchers.<sup>1</sup> Utilitarianism implies maximization of social welfare which is a (weighted) sum of individual utilities. POSNER [1979] highlights the weaknesses of utilitarianism in the economic analysis of law: apart for its shortcomings as a system of ethics and morality, an individual utilities based social welfare function also has serious shortcomings in guiding social and legal decisions, because of its difficulties associated with interpersonal comparison and aggregation of individual utilities. Posner proposes that the purpose of law is social wealth maximization, as “it provides a firmer basis for a normative theory of law than utilitarianism” (POSNER [1979, 103]).

Although legal decision-making in real life is not based on individual utilities<sup>2</sup>, social wealth maximization is also an over-simplified view for legal decision-making. DWORKIN [1980] argues that wealth is neither a value nor an instrument of social value. Some critical legal studies, for example, FITPATRICK and HUNT [1987], assert that law systematically protects the interests of the more socially valued parties, thus does not maximize social wealth. CALABRESI [1985, 69] argues that:

“Who is the cheapest avoider of a cost, depends on the valuations put on acts, activities, and beliefs by the whole of our law and not on some objective or scientific notion” . “ What is efficient, or passes a cost-benefit test, is not a ‘scientific’ notion separated from beliefs and attitudes, and always must respond to the question of who we wish to make richer or poorer.”

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<sup>1</sup> See, for example, POSNER [1979], and DWORKIN [1980]. See also SHAVELL [2003].

<sup>2</sup> For example, in eminent domain cases where private property is taken for public use by a state or municipality, the payment of just compensation to the owner of that property is not based on the owner’s loss of utility, but is based only on the fair market value of the property.

In this paper we use the resource allocations, instead of individual utilities, as the consequence space for social welfare. We justify the use of such social welfare functions by the social rationality over resource allocations, as rationality and consistency are basic requirements of legal decision-making. By reinterpreting the famous Savage theorem of individual decisions involving risk to social decisions of resource allocations (i.e., the state of the world in Savage's theorem is replaced by the individuals of the society and the act space is replaced by all possible resource allocations), we show that the social rationality implies maximization of a cardinal social welfare function in the form of  $W(x) = \sum_{i=1}^n I_i u(x_i)$  for the resource allocation  $x = (x_1, \dots, x_n)$ . Most importantly, this social welfare function encompasses two important aspects in the social decision-making: a social value for each individual and a social attitude towards distributional inequality.

In normative economics, researchers usually use welfarist social welfare functions.<sup>3</sup> For example, the famous HARSANYI's [1955] social aggregation theorem uses the Pareto indifference principle to obtain a social welfare function that is a weighted sum of individual utilities, and claims that it provides support for utilitarianism. Harsanyi's social aggregation theorem has been established for many different formulations (see BLACKORBY, DONALDSON, AND WEYMARK [1999] and references in the paper). However, the resource based social welfare function has some very useful features.

First, the resource based social welfare function reveals important social value judgments. The weights in the social welfare function are uniquely determined, intrinsic

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<sup>3</sup> Welfarist is defined as the approach claiming that individual utilities are both necessary and sufficient for a social welfare function. A number of studies have argued for or against welfarist social welfare function. See BLACKORBY, BOSSERT AND DONALDSON [2002], KAPLOW AND SHAVELL [2001], MONGIN [2000] for related issues.

to the relevant social preference, and they represent the social values of individuals<sup>4</sup> (the same as the weights in the subjective expected utility derived from Savage's axioms which reveal an individual's belief about the probability of each state). The Arrow-Pratt coefficient of function  $u$  in the social welfare function can represent social attitude towards distributional inequality.<sup>5</sup>

Second, the social welfare function derived in this paper is the one actually used in guiding social and legal decisions, representing "what is" instead of "what should be" in the decision-making. The social value of each individual and the social attitude towards distributional inequality are perceptions of a society and do not have any meaning except in relation to the society. Therefore, the social values and the social attitude towards distributional inequality can be different in different societies.

Although much can be said about the ethical and moral issues using the type of social welfare function, we restrict our discussion to its simple application in the economic analysis of law. We consider two hot debates: whether wealth is a social value and whether punitive damages should be awarded in tort law if there is no possibility of avoiding compensations. It is pretty easy to see that welfare maximization is equivalent to wealth maximization and thus wealth become a social value, only if all individuals have equal social values and the society does not care about distributional inequality.

In standard economic analysis of tort law, due precaution level is determined by maximizing total social wealth, and the award of damage compensation is equal to the actual damage. POLINSKY AND SHAVELL [1998] argue that punitive damages are

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<sup>4</sup> "The social value of each individual" may also be named as social influence, or social power of each individual. We didn't see an accepted terminology for this weight. However, it should not be confused with the individual value as in ARROW's [1951] "Social choice and individual values".

<sup>5</sup> The welfare function utilized in this paper can be generalized to situations without independent axioms and can incorporate explicitly the envy or altruism in the social welfare function (GILBOA AND SCHMEIDLER [1994]).

awarded only because the injurers can avoid paying compensations with some probability. However, COOTER AND ULEN [1988] argue that punitive damages are necessary because some benefits that are not sanctioned by law could be categorized as illicit and therefore can not be incorporated into a social welfare function.<sup>6</sup> Some studies have argued that punitive damages are necessary because they serve as a deterrence and/or retribution.<sup>7</sup>

Simple analysis using resource based social welfare function shows that if the injurer is valued less than the victim by the society, the society imposes a due precaution level that is stricter than the one that maximizes social wealth. Punitive damages must be awarded to induce the due precaution, and tort law implicitly transfers wealth from the less socially valued party to the more socially valued party. Therefore, punitive damage awards are needed because of the social value judgments. We also provide an explanation of the arbitrariness of the exact amount of punitive damage award (DANIELS and MARTIN [1990]) by its sensitivity to the error in social value estimations.

The rest of this paper is organized as follows. Section 2 contains a discussion of rational social choice and the value judgments in the social welfare function. Section 3 contains an application of the proposed social welfare function to two debates in the economic analysis of law. Section 4 contains concluding remarks.

## *2 Rationality, Subjective Social Welfare Function and Value Judgment*

Legal decisions affect the resource allocations among social members. But unlike irrationality and inconsistency observed in politics, rationality and consistency are basic

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<sup>6</sup> As pointed out by KLEVORICK [1985], it is not clear why there is a category called illicit, and what activities can be categorized as illicit.

<sup>7</sup> See BIGGAR [1995] and references therein for some studies about the punitive damage award.

requirements for the legal decision-making. The famous Savage axioms (SAVAGE [1948]) can be reinterpreted to model the rationality of social decision-making over resource allocations.

Savage theorem (SAVAGE [1948]) considers the rationality of individual choices facing risk. There is a state space  $\Omega$  representing all possible states of the world, a set  $C$  of consequences and an act space  $F = \{f : \Omega \rightarrow C\}$ . An act  $f \in F$  specifies the outcome in each possible state and an individual chooses the optimal act from all possible ones. Savage axioms consider the individual preferences over the acts. If all the Savage axioms are satisfied, the preferences can be represented by a subjective utility function

$$U = \sum_{i=1}^n m_i u(x_i).$$

<sup>8</sup> The weights  $\{m_i\}_{i=1, \dots, n}$  represent the decision-maker's subjective belief

about the probability of the states and the function  $u$  represents her attitude towards risk. Therefore, an individual's choices reveal her belief about the probability of each state and her attitude towards risk.

Savage axioms can be reinterpreted in a social decision setting. Each element of  $\Omega$  represents a member of the society. An element  $c$  of the space  $C$  describes the amount of resource that a social member can get. The space  $F$  represents all possible resource allocations among social members: an element  $f \in F$  (a mapping from  $\Omega$  to  $C$ ) specifying the resource allocated to each individual. A rational society has preferences over different resource allocations and it chooses the optimal resource allocation in a decision-making.

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<sup>8</sup> Here we assume that the state space is finite.

We follow Shaffer's version of Savage's axioms (SHAFER [1986]), since it is more concise and intuitive. The Axioms are stated first and the discussion is provided later on.

The ordering of social preferences over resource allocations in  $F$  is described by a binary relation  $\succ$ . The relation  $f \succ g$  means that society prefers  $f$  to  $g$ . If neither  $f \succ g$  nor  $g \succ f$ , then  $f \approx g$ , indicates that the society is indifferent between  $f$  and  $g$ .

**Postulate 1.** (There exists a complete ranking): All resource allocations can be ranked by the society. The relation  $\succ$  is irreflexive and transitive, and the relation  $\approx$  is transitive.

For each allocation  $f$  in  $F$  and each subset  $A$  of  $\Omega$ , denote  $f_A$  as the restriction of the mapping  $f$  to the subset  $A$ , representing an allocation among social members in  $A$ . A subset  $A$  of  $\Omega$  is null if  $f \approx g$  whenever  $f_{A^c} = g_{A^c}$ , where  $A^c$  denotes the complements of  $A$ . The resource allocations among null group of social members have no influence on social preferences.

Given a subset  $A$  of  $\Omega$  and two mapping  $p$  and  $q$  from  $A$  to  $C$ , we write  $p \succ q$  if  $f \succ g$  for every pair  $f$  and  $g$  of mapping in  $F$  such that  $f_A = p$ ,  $g_A = q$  and  $f_{A^c} = g_{A^c}$ . Given an element  $c$  in  $C$ , let  $[c]$  denote the equal allocation that maps all  $s$  in  $\Omega$  to  $c$ , i.e., every member receives equal resource  $c$ .

**Postulate 2.** (The independence postulate): If  $f \succ g$  and  $f_{A^c} = g_{A^c}$ , then  $f_A \succ g_A$ .

**Postulate 3.** If  $A$  is not null, then  $[c]_A \succ [d]_A$  if and only if  $[c] \succ [d]$ .

**Postulate 4** Suppose  $[c] \succ [d]$ ,  $f$  is equal to  $c$  on  $A$  and  $d$  on  $A^c$ ,  $g$  is equal to  $c$  on  $B$  and  $d$  on  $B^c$ . Similarly, suppose that  $[c'] \succ [d']$ ,  $f'$  is equal to  $c'$  on  $A$  and  $d'$  on  $A^c$ ,  $g'$  is equal to  $c'$  on  $B$  and  $d'$  on  $B^c$ . In such a case  $f \succ g$  if and only if  $f' \succ g'$ .

Together with three other 3 postulates concerning about the boundedness and continuity of the welfare function (see SHAFER [1986, 468]), Savage theorem can be restated as:

**Savage theorem for social resource allocations:** *Social preferences over resource allocations satisfying all of the above seven postulates can be represented by a subjective social welfare function  $W(f) = E^m u[f(s)]$ , i.e.,  $f \succ g$  if and only if  $W(f) > W(g)$ , where  $m$  is a unique probability measure on the space  $\Omega$ , the function  $u$  is bounded, continuous, and unique to an affine transformation, and  $E^m$  represents the expectation with respect to  $m$ .*

If the society has a finite number of members, then any allocation can be written as  $x = (x_1, \dots, x_n)$  and the subjective social welfare function can be written as

$$W(x) = \sum_{i=1}^n I_i u(x_i) \text{ where } I_i \geq 0 \text{ and } \sum_{i=1}^n I_i = 1.^9$$

We now discuss the postulates for the social rationality over resource allocations. The last three postulates are more technical and are not restated here; they do not impose significant constraints on the social rationality. Postulate 1 assumes that the society can rank all possible resource allocations. Postulate 2 is the most controversial in Savage's theorem. Before turning back to it, we first discuss Postulates 3 and 4.

Consider two equal resource allocations: in allocation 1 each individual has resource  $c$  while in allocation 2 each individual has resource  $d$ . Postulate 3 states that if a society prefers allocation 1 to allocation 2, then, when constrained to the resource allocations among any sub-group of social members  $A$ , the society should still prefer

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<sup>9</sup> In fact, Savage's theorem normally assumes that the space  $\Omega$  is infinite. As indicated by GUL [1992], some of Savage's postulates require technical modification when  $\Omega$  is finite.



allocation 1 to allocation 2. For the special case where  $A$  has a single member,  $A = \{s\}$ , i.e., when a social decision only affects a single individual, the preference ordering over the resource allocations is the same for any member, and the identity of the member is irrelevant to the ordering.

In Postulate 4, suppose that the allocation  $f$  in which each member in subgroup  $A$  has the same resource  $c$  is preferred to the allocation  $g$  in which each member in subgroup  $B$  has the same resource  $c$  (while all other members have the same resource  $d$  and  $[c] \succ [d]$ ), if Postulate 3 is true, the only available explanation for the preference  $f \succ g$  is that the society believes that members in  $A$  have higher social values than those in  $B$ . In order for this to work, the preference  $f \succ g$  must be unchanged when  $c$  and  $d$  are replaced by any other pair of the amount of resource  $c'$  and  $d'$  with  $[c'] \succ [d']$ , as required in postulate 4.

Now we turn to the most controversial Postulate 2. It states that if two resource allocations agree on  $A^c$ , then the choice between these two allocations should depend only on how they differ on  $A$  and should not depend on how they agree on  $A^c$ . This postulate excludes externalities among individuals in social resource allocations. (This postulate is similar to the independence postulate in FLEMING [1952], which is criticized by HARSANYI [1955]). Fortunately, without the independence postulate, we can derive a social welfare function (see GILBOA [1987], GILBOA and SCHMEIDLER [1994]) as a weighted sum of social welfare over all possible social coalitions, and it can be informally thought of as “utilitarian” with respect to coalitions and “egalitarian” with respect to individuals within coalitions. ZHENG [2004] discusses optimal income

distribution under this type of social welfare function and obtains very interesting results.

A complete discussion of these issues is beyond the scope of this paper.

To explore the economic intuition of the parameter in the social welfare function, we consider a problem of the income redistribution among  $n$  parties:  $Max \sum_{i=1}^n I_i u(x_i)$  with the constraint  $\sum_{i=1}^n x_i = w$ . Without loss of generality, we assume that  $I_1 > \dots > I_n$ . If  $u$  is strictly convex, the optimal allocation leads to a corner solution where the first member receives all resource while the rest receive nothing. If  $u$  is strictly concave, from the first order condition  $u'(x_i)/u'(x_j) = I_j/I_i$ , the assumption  $I_i > I_j$  implies  $x_i > x_j$ , i.e., the society allocates more resource to person  $i$  than to person  $j$ . Therefore we can consider  $I_i$  as the (relative) social value (or social influence, social power) of individual  $i$ . Since members have different social values, dollars can worth different amount depending on who has each dollar.

In expected utility theory, the Arrow-Pratt coefficient  $-u''/u'$  represents local risk aversion (PRATT [1964]).<sup>10</sup> Similarly in social decisions, for any income distribution, there is an equivalent equal income distribution that leads to the same social welfare. Society 1 has greater Arrow-Pratt coefficient  $-u''/u'$  than society 2 at all points if and only if society 1 is more inequality averse in the sense that, for any income distribution, the equivalent equal income for society 1 is smaller than for society 2. Therefore the Arrow-Pratt coefficient of the function  $u$  can represent the social attitude towards distributional inequality. The larger the Arrow-Pratt coefficient, the higher the degree of

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<sup>10</sup> In expected utility theory, one decision maker has greater local risk aversion than another at all income level if and only if she is globally more risk averse in the sense that, for every risky income, her certainty equivalent (the amount for which he would exchange the risky income) is smaller than for the other decision maker. (PRATT [1964]).

inequality aversion. From Postulate 3, the social inequality aversion also corresponds to the decreasing marginal social welfare of the resource hold by each individual.

**Proposition 1:** *In the following social welfare function representing rationality of social preferences over resource allocations,*

$$(1) \quad W(x) = \sum_{i=1}^n \mathbf{I}_i u(x_i),$$

*the weight  $\mathbf{I}_i$  represents the social value of individual  $i$  and the Arrow-Pratt coefficient of the function  $u$  represents the social attitude towards distributional inequality.*

The obtained social welfare function is subjective to a society. DE FINETTI [1964] has formed the basis of the subjective probability. A probability does not have to be the objective frequency of an event; it represents the individual belief of the event. In our subjective social welfare function, social values of the individuals express the perceptions of the society about who is more important (or more valuable). Social value judgments, such as the individual social values and the social attitude towards distributional inequality, are not objective and universal, and do not have to be imposed on all societies. As the perception of a society, these value judgments are determined by the current political and social environments, past social experiences and institutional constraints, and they describe “what is” instead of “what should be” in guiding social decisions. Different societies have different value judgments. Therefore, the value judgments included in the social welfare function have no meaning except when related to a specified society.

The resource based social welfare function has its advantages in guiding the social decision-making. Resource allocations are observable and often verifiable, and there is no need to estimate and aggregate the individual utility, as in welfarist welfare functions.

Another advantage is that there is a clear separation of individual social values and the social attitude towards distributional inequality. Such separation in the social welfare function will be very useful in future analysis of social decision-making, even though in the following we only need to consider a distributional inequality neutral society.

This non-welfarist social welfare function has a similar welfarist version. In Harsanyi's social aggregation theorem (see BLACKORBY et al. [1999] and reference in that paper), the strong Pareto plus an additional preference diversity condition<sup>11</sup> also imply a social welfare function represented by a weighted sum of individual utilities with unique positive weights. However, unlike our social welfare function that has a clear economic interpretation, there is much controversy in the interpretation and the significance of Harsanyi's theorem. Since individual utilities used in the aggregation are ordinary, any increasing function of the individual utilities also represents the same individual preferences. In order that Harsanyi's theorem makes any economic sense, the individual utilities must be able to be compared interpersonally, a topic with a large amount of literature but also lots of disagreements.

MONGIN [2000] observes that economists have started to reorient social choice theory into a non-welfarist direction and he suggests a "fourth stage of normative economics".<sup>12</sup> Although the social welfare function used here is not welfarist, it does not provide any argument to imply that welfarist should be rejected. Intuitively, a society has no good reason to reject policies that improve the well-being of each social member, and the Pareto indifference principle should still hold. Welfarist approach and the approach

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<sup>11</sup> The condition is equivalent to requiring the individual utility functions to be affinely independent.

<sup>12</sup> MONGIN [2000] provides some recent interesting arguments against the sufficiency and the necessity of individual utility for social welfare. The argument against sufficiency can be made in terms of socially undesirable aspirations, and the case against the necessity is expedited by taking note of those highly desirable objective achievements, good health, real freedom, etc.

based solely on resource allocations are two different ways to look at the social decision-making. However, these two approaches are not completely compatible. In a recent paper, BLACKORBY et al. [2002] shows that when the domain of a social evaluation functional consists of multiple profiles of both welfare and non-welfare information, any evaluation principle with unlimited domain, Pareto indifference and binary independence of irrelevant alternatives<sup>13</sup> must ignore non-welfare information. In other words, any principle for social evaluation with unlimited domain and binary independence of irrelevant alternatives that uses non-welfare information must fail to satisfy Pareto indifference. The resource based social welfare function in this paper has the domain that contains only non-welfare information, so it does not have to violate Pareto indifference. We believe further study can provide a better understanding of the relationship between welfarist and non-welfarist social welfare functions.

One might criticize the resource allocation based welfare function because it does not consider how social preferences are formed. Actually, social preferences are the outcomes of fighting among individuals and the interactions of many other factors. But we can still imagine that a social preference as well as individual preferences over resource allocations satisfies Savage axioms, and we then try to aggregate individual preferences into the social preference, as in HARSANYI [1955]. Such an aggregation problem is equivalent to the problem of: (a) aggregating different individual views on social influence into a single social influence and (b) aggregating different individual attitudes towards distributional inequality into a single social attitude towards

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<sup>13</sup>Binary independence of irrelevant alternatives requires the social ranking of any two alternatives to depend on the utility information and non-welfare information associated with those two alternatives only.

distributional inequality. However, MONGIN [1995] shows that such an aggregation is impossible.<sup>14</sup>

In the proposed subjective social welfare function, social values and social attitude towards distributional inequality reflect the social and political powers, social norms, morals and institutional constraints. It would be very interesting to know how to estimate these social values and the attitude towards distributional inequality in a given social decision-making. There is some literature on such estimations, see for instance, HAMPTON, MOORE, AND THOMAS [1973].

### 3 Application to economic analysis of law

The social welfare function established in the previous section can be used straightforwardly to shed lights on standard debates in law and economics. We consider two most debated topics : the purpose of law and the award of punitive damages.

#### 3.1 Is wealth maximization the purpose of law?

Individuals are selfish, and they maximize their own utilities. For activities with significant externalities (either positive or negative) and high transaction costs, some kinds of social decisions have to be made. Legal decisions choose actions (or action rules) that are considered to be optimal for the society, but may not be optimal for each individual.

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<sup>14</sup> MONGIN [1995] considered the aggregation of preferences satisfying Savage's axioms. When considering the aggregation of relative social influence without considering the social attitude toward distributional inequality, affine rule is the only solution. When we consider the aggregation of relative social influence together with aggregating attitude toward distributional inequality, dictatorial rule is the only solution with weak Pareto condition. With strong Pareto condition, there does not exist any solution.

Suppose that the society chooses an activity  $e$  from a set  $E$  of possible actions. For activity  $e$ , let  $x_i(e)$  be the amount of resources allocated to individual  $i$ , and  $w(e) = \sum_{i=1}^n x_i(e)$  be the total social wealth. From the preceding section, a rational social decision maximizes the social welfare function:

$$(2) \quad W = \sum_{i=1}^n I_i u [x_i(e)].$$

Therefore, any legal decision must involve social value for each individual and a social attitude towards distributional inequality.

Critical legal studies such as FITPATRICK AND HUNT [1987] emphasize that there is no universal concept of justice or fairness. The framework utilized in the present study is consistent with their arguments. The social welfare function is subjective to a society. Because societies are unlikely to have identical preferences, the value judgment in legal decision-making is likely to vary across societies. Changes in social environment, such as technological progresses and interest group activities, affect social preferences and change social value judgments. Lobbying activities are used to influence social preferences; the activities of judges and juries are attempting to recover the social preferences.

It can easily be shown that, if lump sum transfers are possible and wealth transfer is costless, a welfare maximizing society will choose activities that maximize social wealth. However, lump sum transfers are not always possible. A society cannot always freely transfer wealth among individuals because of legal and other constraints. Therefore wealth maximization is usually not the objective of the legal decision-making. However, there are still some cases in which wealth maximization is equivalent to

welfare maximization. If the society does not care about distributional inequality,<sup>15</sup> the function  $u$  in the social welfare function is a linear function and the resulting social welfare function is  $W = \sum_{i=1}^n I_i x_i(e)$ .

If  $I_i$  is constant for all  $i$ , i.e., if all parties have equal social values, the corresponding social welfare is equivalent to the total social wealth and welfare maximization is identical to wealth maximization. For legal decision-making, this implies that the purpose of the law is wealth maximization.

If  $I_i$ 's are not identical, then welfare maximization is not equivalent to wealth maximization. When parties are assigned with different social values, the society chooses actions in favor of the parties with higher social values. The more diverse social values are, the less likely social wealth is maximized. An activity that creates considerable wealth may still be socially undesirable if it hurts a party with a high social value while an activity that reduces social wealth may be socially desirable if it benefits a party with a high social value.

The above discussion can be summarized as:

**Proposition 2:** *All legal decision-making involves a social value for each individual and a social attitude towards distributional inequality. Legal decision-making can be described by welfare maximization, which is equivalent to wealth maximization only if all parties are valued equally and the society does not care about distributional inequality in the decision-making.*

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<sup>15</sup>This is true in many cases of legal decision-making as redistribution of wealth can be better implemented through the income tax system and it is usually not one of the objectives of most legal decisions.



POSNER [1979] claims that the efficiency in economic analysis of law is equivalent to wealth maximization and suggests that wealth maximization seems to be a more defensible principle than utilitarianism. DWORKIN [1980] argues that wealth is neither a value nor an instrument of social value. The above proposition indicates that, in certain cases, social wealth is a defensible social value.

### 3.2. Efficient precaution level and damage compensation in tort law

As another application to the economic analysis of law, we consider the determination of due precaution levels and the award of compensation in tort law. Because of the conflicts between the social preference and individual preferences, societies use their coercive powers to change individual choices. In tort law, a society specifies a due precaution level and uses compensations to induce individuals to behave in a manner that is consistent with welfare maximization. In the following, we show that the difference in individual social values can lead to precaution level and damage compensations that are very different from the ones that maximize social wealth in the standard economic analysis of law.

For simplicity, we consider a case with only two parties: an injurer and a victim. The injurer chooses precaution level  $a$  that leads to a resource allocation between the injurer and the victim:  $x = [x_1(a), x_2(a)]$  where  $x_1(a) > 0, x_2(a) < 0$ .

In tort law we can reasonably assume that the society does not care about distributional inequality, i.e.,  $u$  is linear. The social welfare function associated with the precaution level  $a$  is:<sup>16</sup>

$$(3) \quad W(a) = I_1 x_1(a) + (1 - I_1) x_2(a),$$

where  $I_1$  and  $I_2$  are the social values of the injurer and the victim, respectively. In the extreme case when the social value of one member approaches 0, her wealth will be ignored in calculating social welfare. COOTER AND ULEN [1988] examine such a case where wealth acquired by some parties through illegal means is not included in total social wealth.

In most cases of contract and tort law, social members have equal chance to play different roles in possible legal disputes and all parties of a legal dispute tend to have the same social value. Therefore, wealth maximization can be considered as the basis for legal decision-makings. This can explain why most contract and tort law cases are decided without an explicit reference to value judgment issues. However, historically or due to interest group activities, the group of injurers and the group of victims may have different social values in some tort cases, in which wealth maximization is no longer consistent with welfare maximization.

For a precaution level  $a$ , the revenue and the cost function of the injurer are  $R(a)$  and  $C(a)$ , respectively, where  $R'(a) - C'(a) < 0$ . A higher level of precaution reduces profit of the injurer. At the same time, the action causes a fixed damage  $D$  to a potential injurer with probability  $p(a)$ . A higher level of precaution reduces the probability of an accident but at a decreasing rate:  $p'(a) < 0, p''(a) > 0$ . The action with precaution level

<sup>16</sup>For simplicity we assume that social values do not depend on the injurer's precaution level. In real life, the social

$a$  results in an expected allocation  $(x_1, x_2)$ , with  $x_1 = R(a) - C(a)$ ,  $x_2 = -p(a)D$ . The social welfare associated with the precaution level  $a$  is:

$$(4) \quad W(a) = I_1 [R(a) - C(a)] + (1 - I_1) [-p(a)D].$$

The optimal level of precaution  $a^*$  is determined by the first order condition:  $W'(a) = I_1 [R'(a) - C'(a)] + (1 - I_1) [-p'(a)D] = 0$ . Therefore, the socially efficient precaution level  $a^*$  is determined by:

$$(5) \quad p'(a^*) = \frac{I_1}{1 - I_1} \left[ \frac{R'(a^*) - C'(a^*)}{D} \right].$$

On the other hand, the wealth maximizing precaution level  $a_0$  (which corresponds to the case of  $I_1 = I_2 = 1/2$ ), is determined by:

$$(6) \quad p'(a_0) = \frac{R'(a_0) - C'(a_0)}{D}.$$

Without the imposition of compensations, the injurer does not consider the externality imposed on the victim. The preferred precaution level for the injurer is 0. To increase the precaution level, the society must provide incentives to the injurer by imposing an award of damage  $K$  to force her internalize the externality.<sup>17</sup> Given the damage compensation, the injurer's profit after compensation is  $R(a) - C(a) - p(a)K$ . If the injurer's utility function is an increasing function of the profit, the injurer chooses the action satisfying:

$$(7) \quad R'(a) - C'(a) - p'(a)K = 0$$

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value of an individual depends on her actions.

<sup>17</sup> Under a negligence rule, the injurer pays compensation  $K$  only if her precaution level is less than the due care level. Under a strict liability rule, the injurer pays compensation  $K$  once damage occurs. From the standard economic analysis of law, both a negligence rule and a strict liability rule induce the socially optimal precaution.

A comparison of (5) and (7) shows that, in order to induce the injurer to choose the socially optimal level of precaution, the compensation should be set to :

$$(8) \quad K = \frac{1 - I_1}{I_1} D$$

There are three different cases for the due precaution level and for the compensation:

1. if  $I_1 > 1/2$  (i.e., the injurer has a higher social value), by comparing (5) and (6)<sup>18</sup>, the due precaution level under a negligence rule is less strict than the precaution level that maximizes the total social wealth, i.e.,  $a^* < a_0$ . From (8), the compensation to be paid is also lower than the full compensation, i.e.,  $K < D$ .
2. If  $I_1 < 1/2$  (i.e., the victim has a higher social value), the due precaution level under a negligence rule is more strict than the precaution level maximizing total social wealth, i.e.,  $a^* > a_0$ . The compensation to be paid is greater than the actual damage, i.e.,  $K > D$ . The injurer has to pay punitive damages.
3. If  $I_1 = I_2$  (both parties have equal social values), the due precaution level under a negligence rule is equal to the precaution level that maximizes total social wealth, i.e.,  $a^* = a_0$ . The compensation is equal to the actual damage, i.e.,  $K = D$ .

The above discussion can be summarized as:

**Proposition 3:** *In tort law, the due precaution level and the award of compensation depend on the relative social values of the injurer and the victim. If the relative social value of the injurer is smaller than that of the victim, the due precaution level is more strict than the wealth maximizing precaution level and punitive damages will be awarded.*

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<sup>18</sup> and using the fact that  $p'(a) < 0, p''(a) > 0$ .

In the standard law and economic analysis, punitive damages can be awarded only if there is a possibility that the injurer can avoid compensations. The amount of compensation is equal to the value of loss multiplied by the reciprocal of the probability that the defendant can escape from compensations (see POLINSKY AND SHAVELL [1998]). However, a large number of cases involve a situation where the probability of compensation is very high and punitive damages are still awarded (for instance in cases of assaults, pollutions, etc). Our simple analysis shows that the punitive damage award is possible even without the possibility of avoiding compensations. The punitive damage award is the consequence of different social values of the injurer and the victim. Therefore, the punitive damage award is normally associated with social value judgments.<sup>19</sup>

Most literature on tort compensations focuses on the award of full or punitive damages. Our analysis shows that less than full compensation is also possible<sup>20</sup>. In the case of less than the full compensation, the action of the injurer is often regarded as accidental or inevitable.

Next, we consider the expected post-compensation resource allocations. It is easy to see that under a strict liability rule, the payoff of the injurer is proportional to the social

welfare, i.e.,  $p(a) = R(a) - C(a) + \frac{1 - I_1}{I_1} [-p(a)D] = \frac{1}{I_1} W(a)$ , whereas the payoff of the

victim is proportional to the actual damage:  $p(a)(K - D) = p(a) \frac{1 - 2I_1}{I_1} D$ . Therefore, if

the victim has a lower social value than the injurer (i.e.,  $I_1 > 1/2$ ), she always ends up

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<sup>19</sup> According to the usual formulation in practice, punitive damages can be awarded when the defendant's behavior is malicious, oppressive, gross, willful and wanton, or fraudulent. It should be noted that the social value of an individual might not be simply determined by her social status, but might also be determined by the action that she has taken.

with a negative payoff. If the victim has a higher social value than the injurer (i.e.,  $I_1 < 1/2$ ), then she always ends up with a positive payoff; alternatively, part of the injurer's wealth is transferred to the victim in this case. A strict liability rule actually transfers the wealth from the less socially valued party to the more socially valued one.

Similarly, under a negligence rule, the payoff of the injurer is:

$$p(a) = \begin{cases} R(a) - C(a) & \text{if } a \geq a^* \\ R(a) - C(a) + \frac{1 - I_1}{I_1} [-p(a)D] = \frac{1}{I_1} W(a) & \text{if } a < a^* \end{cases}$$

The payoff of the victim is  $-p(a)D$  for  $a > a^*$ , and  $p(a)(K - D) = p(a)\frac{1 - 2I_1}{I_1}D$  for

$a < a^*$ . Therefore, if the victim has a lower social value than the injurer (i.e.,  $I_1 > 1/2$ ), she ends up with a negative payoff. If the victim has a higher social value than the injurer

(i.e.,  $I_1 < 1/2$ ), then the payoff of the victim is positive when the injurer is negligent.

Even a negligence rule can transfer wealth from the less socially valued party to the more socially valued one to some extent. We can summarize the above discussion as:

**Proposition 4.** *Tort law implicitly transfers wealth from the less socially valued party to the more socially valued party.*

The result is consistent with that of CALABRESI [1985], who argues that the choice of the due care level also reflects the choice of who we wish to make richer or poorer. It is interesting that this result is obtained under the assumption that redistribution is not an objective of the society, i.e., under the assumption that the function  $u$  is a linear function.

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<sup>20</sup> DOBBS [1989] has considered the case of under-compensation.

One of the characteristics of punitive damage award is its arbitrariness. Whatever the purpose of the punitive damage award, it is criticized as being unpredictable, even out of control.<sup>21</sup> SUNSTEIN, KAHNEMANN AND SHKADE [1998] examine the source of such arbitrariness. They selected 899 jury-eligible people and examined their deliberations of some tort cases. They found that people's moral judgments are remarkably widely shared, (and punitive damages are largely determined by value judgments), but most people have a great deal of difficulty in mapping their moral judgments to an unbounded scale of dollars.

Such arbitrariness can be explained by the excessive sensibility of the dollar value of punitive damage award to the error in the social value estimation. When deliberating a case, a jury attempts to assess the social preference (i.e., the “sense of community”), i.e., to estimate the exact value of  $I_1$ . Errors in such estimation are inevitable. Expression (8) shows that for a relatively large  $I_1$ , a small error in the estimation will not significantly affect the value of  $K$ . However, when  $I_1$  is very small (and a punitive damage award becomes necessary), the value of  $K$  becomes extremely sensitive to even a very small error in the estimation of  $I_1$ .

Consider an example where the damage caused by the injurer's activity is  $D$ . A jury tries to estimate the relative social value  $I_1$ . Suppose there is an estimation error  $dI_1$ . The estimated value of  $I_1$  can fall into the range  $(\underline{I}_1, \bar{I}_1)$ , where  $\underline{I}_1 = I_1 - dI_1$  and

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<sup>21</sup> In one study of 47 counties in US over a several-year period, the median verdicts ranged from less than \$10,000 in some area to as much as \$204,000 in San Diego. See DANIELS AND MARTIN [1990].

$\bar{I}_1 = I_1 + dI_1$ . Therefore, the estimation of the damage award lies in the range  $(\underline{K}, \bar{K})$

where  $\underline{K} = \frac{1 - \bar{I}_1}{\bar{I}_1} D$  and  $\bar{K} = \frac{1 - I_1}{\underline{I}_1} D$ .

For a numerical example, suppose there is an estimation error  $dI_1 = 0.05$  and consider three different values of  $I_1$ : 0.9, 0.5, and 0.1. When  $I_1 = 0.9$ , the victim is under-compensated. The range of the damages award is from 0.053D to 0.176D. When  $I_1 = 0.5$ , the range the damage award is from 0.818D to 1.220D. When  $I_1 = 0.1$ , punitive damages are awarded and the range of the damage award is from 5.667D to 19.00D. These possible values of damage awards demonstrate a significant degree of arbitrariness when punitive damages are awarded.

Excessive sensitivity of the dollar value of the punitive damage award to the error in social value estimation suggests that procedures utilized for the determination of the punitive damage award must be carefully scrutinized. As indicated by ELLIS [1989], such arbitrariness can be reduced if stricter procedures and very detailed judicial rules are developed.

#### 4 Concluding Remarks

This paper proposes a non-welfarist social welfare function for legal decision-making. The social welfare function is based on the social rationality over resources allocations and it encompasses a relative social value of each individual and a social attitude towards distributional inequality. It is derived by reinterpreting the Savage-like axioms.

As the social welfare function describes how legal decisions ‘are’ made instead of how legal decisions ‘should’ be made and as it encompasses social value judgments, the



approach used in the paper can shed light on controversies in the economic analysis of law. A straightforward application of the welfare function shows that social wealth is a defensible social value only if each individual has equal social value and the society does not care about distributional inequality. The determination of the due precaution level and the damage award depends on relative social values of the injurer and the victim. If the victim has a higher social value, the due precaution level is stricter than the one that maximizes the total social wealth and punitive damages will be awarded. We find that tort law implicitly transfers wealth from the less socially valued parties to the more socially valued parties.

Since the framework we use can incorporate social value judgments, it can be very useful for the analysis of other field of law, especially for criminal law, where value judgments play a more important role.

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Mimeo, University of Macau.

Mingli Zheng

Faculty of Social Sciences and Humanities

University of Macau

Macau, SAR of China

Email: mlzheng@umac.mo

And

Sajid Anwar

International Graduate School of Management

University of South Australia, SA 5000

Australia