Collegio Carlo Alberto

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Carlo Alberto Notebooks

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Abstract

We show how the common occurrence of seeing exceedingly high claims in disputes and litigations about how to share a limited resource can be rationalized by a model in which claimants display reference dependent preferences, expect the judge to use a generalized social welfare function, and strategically announce their reference points. The scope of the model is wide as the resource over which the dispute arises can be positive or negative, exogenously given or endogenously determined. Moreover, the social welfare specification is consistent with a number of different liability rules.

Keywords: reference points; claims; litigations; accident law.

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1   Introduction

Disputes about how to share goods and resources usually arise because litigants hold competing claims, i.e., claims that are mutually inconsistent as their sum exceeds the total amount that is available. Competing claims are common in the context of sharing natural resources among different groups of users (see for instance Giller *et al.*, 2008). They also characterize so called bankruptcy problems (see Thompson, 2003, for a review) and play an important role in the division of assets and debts in contested divorces (Wilkinson-Ryan and Baron, 2008, show experimentally how individuals' ratings of possible proposals about how to divide marital property are usually misaligned). In addition, competing claims figure in the payment of insurance premia between insurance companies and claimants (Lougran, 2005, reports that 36% of all bodily injury claims appear to be inflated) and in the incidence of disputes about grievances. As an example of the latter, Miller and Sarat (1980) report that in a sample of 1,768 claims made by agents experiencing grievances, 62.6% were rejected or resisted and thus resulted in disputes. In other words, parties held competing claims in almost two thirds of such interactions.

The existence of subjective behavioral biases that influence agents' perception of fairness and lead claimants to overestimate how much they deserve certainly contributes to generating such a phenomenon. For instance, it is well known that self-serving bias can create costly impasses in bargaining and negotiations (see Babcock *et al.*, 1995, Babcock and Lowenstein, 1997, and Farmer *et al.*, 2004). Or that inequity aversion can lead to inefficient marital dissolution (Smith, 2007). But while behavioral biases unconsciously affect individuals' claims, the announcement of a high claim can also be the result of a conscious and strategic decision by the parties. Litigants can in fact purposively exaggerate their claims with the goal of influencing the final allocation that the judge/authority will implement.

In this paper, we explore this second option and investigate the strategic aspects related to agents' announcement of their claims. We show that, in a framework of reference dependent preferences à la Koszegi and Rabin (2006), claimants who expect the judge

to make the final decision according to a general form of social welfare function have an interest in purposively inflating their claims.

Reference dependent preferences (RDPs) capture the famous loss aversion conjecture introduced in the classic article by Kahneman and Tversky (1979). RDPs explicitly acknowledge that agents' perception of a given outcome is influenced by the comparison between the outcome itself and a certain ex-ante reference point. More precisely, people define gains and losses with respect to the reference point and losses loom larger than gains. RDPs thus seem particularly appropriate to depict the preferences of individuals involved in disputes and litigations. These are in fact typical situations in which agents build their own expectations about the allocation that the authority will implement and inevitably ex-post compare the actual outcome with the expected one.

To sum up, the analysis presented in this paper applies to all those cases in which reference dependent preferences constitute an appropriate framework, conflicting interests of the agents must be settled by an external authority, and litigants have the possibility to ex-ante declare what they expect to get. We will be very general about the size, the nature and the source of the resource to be shared. This can be positive (as in the case of a divorcing couple arguing over the division of their assets) or negative (as in the case of an injurer and a victim who cannot agree on how to share a certain loss). Moreover, the size of the resource can be deterministic and exogenously given (as in the case of two departments making claims upon the allocation of some external endowment) or it can instead be ex-ante uncertain and depend on the actions of the agents.

As an example of the latter case, consider a standard tort model of a bilateral accident (Shavell, 1987) where two agents can take costly actions that may reduce the incidence of a certain probabilistic loss. As the standard model indicates, agents choose those actions that maximize their expected utility conditional on the specific liability rule in force. These choices influence the probability that the accident occurs and/or the size of the actual loss. Once uncertainty resolves (say the accident indeed occurs), agents make claims about how to share the loss and the adjudicator intervenes to solve the dispute.

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The appendix contains a more formal model of a bilateral accident and shows how the equilibrium allocations that would stem from the implementation of different liability rules are consistent with our analysis.

2 The model

We model the situation of two claimants who cannot agree on how to divide a homogeneous and perfectly divisible good of size $S \neq 0$. The claimants thus delegate the choice and the implementation of the final allocation to an adjudicator/planner. As it has been explained in the introduction, S can be positive or negative, exogenously given or endogenously determined by some previous actions of the agents. Let $x = (x_1, x_2)$ indicate a possible allocation such that x_i is the amount of the good that the planner assigns to claimant $i \in \{1, 2\}$. If $S > 0$ then $x_i \in [0, S]$ while if $S < 0$ then $x_i \in [S, 0]$. In both cases, efficient allocations are such that $\sum_i x_i = S$.

The adjudicator, in choosing which final allocation to implement, uses a generalized utilitarian social welfare function of the form $W(u) = \sum_i g(\beta_i u_i)$ where $g(\cdot)$ is an increasing and strictly concave function with $g(0) = 0$, u_i is the utility of claimant $i \in \{1, 2\}$ and $\beta_i \in (0, 1)$ with $\beta_1 + \beta_2 = 1$ is the weight that the adjudicator attaches to claimant i. If $\beta_1 = \beta_2 = 0.5$ then both agents are on the same footing and the social welfare function is symmetric. On the contrary, if $\beta_1 \neq \beta_2$ then the function is asymmetric as the planner attributes more importance to the welfare of a specific agent. In the appendix we will show that, in the context of a standard tort model, the weights β_i can be nicely interpreted in terms of the specific liability rule in use.

The concavity of the function $g(\cdot)$ implies that the planner attaches progressively lower weight to additional units of utility. In particular, the more concave is $g(\cdot)$, the more egalitarian will be the final allocation (see Atkinson, 1970). As such $W(u)$ includes all those cases that fall between two well-known extremes. On one hand, as $g(\cdot)$ approaches a linear function, $W(u)$ tends to the purely utilitarian SWF (Bentham, 1789): $W_{ut}(u) = \beta_1 u_1 + \beta_2 u_2$. On the other hand, as $g(\cdot)$ becomes "infinitely" concave, $W(u)$ approaches

the maxmin or Rawlsian SWF (Rawls, 1971): $W_{mm}(u) = \min\{\beta_1 u_1, \beta_2 u_2\}$.

For what concerns claimants' utility function, we assume that individual preferences are such that:

$$u(x_i, r_i) = x_i + \mu(x_i - r_i) \tag{1}$$

where the function $\mu(\cdot)$ is a "universal gain-loss function". Given the individual reference point r_i, where $r_i \in [0, S]$ if $S > 0$ while $r_i \in [S, 0]$ if $S < 0$, $\mu(x_i - r_i)$ reflects the additional effects that perceived gains or losses have on $u(\cdot)$ on top of the utility the agent gets from the direct allocation of x_i. In other words, we assume that claimants display reference dependent preferences à la Koszegi and Rabin (2006).[1,2] The function $\mu(\cdot)$ satisfies the following properties:

P1: $\mu(z)$ is continuous for all z, strictly increasing and such that $\mu(0) = 0$.

P2: $\mu(z)$ is twice differentiable for $z \neq 0$.

P3: $\mu''(z) > 0$ if $z < 0$ and $\mu''(z) < 0$ if $z > 0$.

(P3': $\mu''(z) = 0$ for any z.)

P4: if $y > z > 0$ then $\mu(y) + \mu(-y) < \mu(z) + \mu(-z)$.

P5: $\lim_{z \to 0^-} \mu'(z) / \lim_{z \to 0^+} \mu'(z) \equiv \lambda > 1$.

In line with the original prospect theory formulation of Kahneman and Tversky (1979), the function $\mu(\cdot)$ is thus characterized by a kink at $x_i = r_i$. Property P3 specifies that the function $\mu(\cdot)$ is convex in the domain of losses ($x_i < r_i$) and concave in the domain of gains ($x_i > r_i$). P3 also captures the standard property of diminishing marginal sensitivity

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[1]Koszegi and Rabin (2006) actually introduce a more general family of utility functions given by $u(x_i, r_i) = m(x_i) + \mu(m(x_i) - m(r_i))$ where $m(\cdot)$ is an increasing function that captures the direct effect of x_i on total utility $u(\cdot)$. In this paper, we thus set $m(x_i) = x_i$.

[2]Another fruitful approach to the modelization of reference dependent preferences appears in Munro and Sugden (2003). The paper proposes a number of properties that individuals' *preferences* should have while the paper by Koszegi and Rabin (2006) proposes a number of properties that individuals' *utility functions* should have. While conceptually similar, we chose the latter approach as it more directly fits our analysis which is based on the use of a social welfare function.

of the agent to perceived gains and losses. The alternative assumption P3$'$ covers instead the simplified case in which the function $\mu(\cdot)$ is linear and marginal sensitivity is thus constant. P4 means that for large absolute values of z, the function $\mu(\cdot)$ is more sensitive to losses than to gains. P5 implies the same result for small values of z: $\mu(\cdot)$ is steeper approaching the reference point from the left (losses) rather than from the right (gains). P4 and P5 thus capture the loss aversion phenomenon.

In what follows, we do not explicitly investigate the issue of how agents introspectively select their reference points as the results of our model do not depend on the specific process through which claimants define r_i (but section 2.1 reviews a number of possibilities that the literature has proposed and discusses their appeal within the specific context of a dispute). We focus instead on the matter of how claimants should strategically announce their reference points to the judge with the goal of influencing, obviously in their own interest, the final allocation of the good. We thus introduce r_i^a, the key variable of the model, which indicates the reference point that agent i announces to the adjudicator. Obviously, $r_i^a \in [0, S]$ if $S > 0$ while $r_i^a \in [S, 0]$ if $S < 0$. Notice that r_i^a may differ from r_i, i.e., what an agent claims (r_i^a) may differ from his true reference point (r_i). Announced claims are mutually incompatible whenever $\sum_i r_i^a > S$. Section 2.1 briefly reviews the literature on reference point formation while the analysis of the model continues in section 2.2.

2.1   The literature on reference point formation

How an agent endowed with reference dependent preferences defines his reference point is still an open question in economics as well as in psychology. The literature on the topic has suggested a number of candidates whose appeal varies depending on the specific context under scrutiny. Moreover, these interpretations are not necessarily mutually exclusive. A first option is that agents set r_i in line with what they have or are used to. This is the traditional status quo formulation originally proposed by Kahneman and Tversky, 1979. Such an explanation seems particularly appropriate when agents are involved in some kind

of repeated interaction. For instance, an agent who repeatedly purchases a certain good is likely to set as his reference point the price he is used to paying: a lower price would then look like a gain while a higher price would sound like a loss. And if past prices are not constant then the reference point can be a weighted average of those (see Shefrin and Statman, 1985, for an application to asset pricing in behavioral finance).

Claimants can instead define r_i according to what they expect rather than to what they have (but notice that the two proposals coincide whenever agents expect to maintain the status quo, see Munro and Sugden, 2003, for a discussion about this tension). Recent empirical evidence (see for instance Abeler *et al.*, 2011) tends to support this view. As a standard example (in line with Kahneman, 1992), consider the situation of a worker who expects a wage increase of 500$ but then actually gets an increase of just 200$; this outcome is likely to sound more like a loss with respect to expectations rather than a gain with respect to the status quo. Koszegi and Rabin (2006) explicitly model the possibility that the reference point is defined by agent's expectations and introduce the notion of personal equilibrium, i.e., a situation in which claimants hold rational reference points that are then confirmed in equilibrium.

Yet another option is that agents' reference points are not fully rational. For instance, individuals may set r_i according to what they think they deserve in which case reference points are likely to be plagued by behavioral biases such as the self-serving bias (Gallice, 2011, investigates some implications of this possibility). Finally, reference points can also be set through social comparisons or by imitation. Hoch and Lowenstein (1991) show for instance how social comparison can influence consumers' reference points and thus modify their willingness to buy a certain product.

In the context of a dispute, the status-quo proposal does not seem particularly appropriate. Consider, for instance, a dispute between an injurer and a victim who never met before such that the status quo is given by the situation before the accident occurred. But if this interpretation is meaningful for the victim (in the status quo he received no harm and therefore his benchmark is to get full reimbursement), it does not seem valid for the

injurer (in the status quo he caused no accident and therefore he should set his reference point as if he expects not to have to pay anything).

On the other hand, the option that litigants set their reference points according to what they expect appears to be much more convincing. Litigants in fact inevitably build their own expectations about the allocation that the adjudicator will implement and thus compare the actual outcome with the expected one. If these expectations are correct (i.e., in line with the actual decision of the judge) or wrong (possibly due to agents' biases) depends on the degree of rationality of the players. We will come back to this issue in commenting the results of the model.

2.2 The planner's problem and the equilibrium of the game

In this section we solve the planner's problem from the claimants' point of view. Claimants announce to the planner what they expect to get (i.e., the planner knows the vector $r^a = (r_1^a, r_2^a)$). Claimants then expect the planner to set $r_i = f(r_i^a)$ with $\frac{\partial f}{\partial r_i^a} > 0$. In other words, claimants expect that the adjudicator, in assessing the agent's unknown reference point r_i, will take into (positive) consideration the announced claim r_i^a. Explicit examples for the function $f(\cdot)$ include $f(r_i^a) = r_i^a$ (the planner takes into full consideration the announced claims), $f(r_i^a) = \alpha r_i^a$ with $\alpha \in (0,1)$ (the planner discounts agents' claims) and $f(r_i^a) = \frac{E_p(r_i) + r_i^a}{2}$ (the planner takes an average between his own assessment of the true reference point of agent i and the announced claim r_i^a, where, for instance, $E_p(r_i) = \frac{S}{2}$ can be the adjudicator's prior).

Litigants thus expect the planner to face and solve the following problem:

$$\max_{x_1, x_2} W(u) = [g\left(\beta_1 x_1 + \beta_1 \mu(x_1 - f(r_1^a))\right) + g\left(\beta_2 x_2 + \beta_2 \mu(x_2 - f(r_2^a))\right)] \quad \text{s.t.} \quad x_1 + x_2 = S \tag{2}$$

The problem has a solution given that $W(u)$ is a continuous function defined on the closed and bounded space $[0, S] \times [0, S]$ if $S > 0$ or $[S, 0] \times [S, 0]$ if $S < 0$ and thus the

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Weierstrass theorem applies. In what follows we focus on those cases in which the functions $g(\beta_i u_i)$ for $i \in \{1, 2\}$ are concave. Notice that $g(\cdot)$ is strictly concave while $u_i(\cdot)$ can be linear, concave, or convex: in the first two cases $g(\beta_i u_i)$ is certainly concave while in the latter case concavity depends on the specific functional forms of $g(\cdot)$ and $\mu(\cdot)$.

When the functions $g(\beta_i u_i)$ are concave, it follows that also $W(u)$ is concave and therefore first order conditions are sufficient. The optimal allocation $\hat{x} = (\hat{x}_1, \hat{x}_2)$, where $\hat{x} = \arg\max W(u)$ and $\hat{x}_2 = S - \hat{x}_1$, will thus equalize the marginal utilities of the two claimants:

$$
\overbrace{\left[g'\left(\beta_1 \hat{x}_1 + \beta_1 \mu(\hat{x}_1 - f(r_1^a))\right)\right.}^{[p]} \overbrace{\left.\left[\beta_1 + \beta_1 \mu'(\hat{x}_1 - f(r_1^a))\right]\right.}^{[q]} =
$$
$$
= \underbrace{\left[g'\left(\beta_2(S - \hat{x}_1) + \beta_2 \mu(S - \hat{x}_1 - f(r_2^a))\right)\right.}_{[r]} \underbrace{\left.\left[\beta_2 + \beta_2 \mu'(S - \hat{x}_1 - f(r_2^a))\right]\right.}_{[t]}
$$
$$
\tag{3}
$$

Condition (3) is an equality between two products of the form $[p][q] = [r][t]$. Now assume that $[q] \leq [t]$, i.e., $[\beta_1 + \beta_1 \mu'(\hat{x}_1 - f(r_1^a))] \leq [\beta_2 + \beta_2 \mu'(S - \hat{x}_1 - r_2^a)]$. For (3) to hold it must then be the case that $[p] \geq [r]$, that is:

$$
\left[g'\left(\beta_1 \hat{x}_1 + \beta_1 \mu(\hat{x}_1 - f(r_1^a))\right)\right] \geq \left[g'\left(\beta_2(S - \hat{x}_1) + \beta_2 \mu(S - \hat{x}_1 - f(r_2^a))\right)\right] \tag{4}
$$

The function $g(\cdot)$ is strictly concave and monotonically increasing, which implies that its derivative $g'(\cdot)$ is monotonically decreasing. It follows that (4) holds if and only if:

$$
\beta_1 \hat{x}_1 + \beta_1 \mu(\hat{x}_1 - f(r_1^a)) \geq \beta_2 S - \beta_2 \hat{x}_1 + \beta_2 \mu(S - \hat{x}_1 - f(r_2^a)) \tag{5}
$$

Given that $\beta_1 + \beta_2 = 1$, the last condition can also be expressed as:

$$
\hat{x}_1 + \beta_1 \mu(\hat{x}_1 - f(r_1^a)) - \beta_2 \mu(S - \hat{x}_1 - f(r_2^a)) - \beta_2 S = k \tag{6}
$$

with $k \geq 0$. We are now in the position to study the effects that the announced reference point r_i^a has on $\hat{x}_i$. Focusing without loss of generality on claimant $i = 1$, we

can express (6) as:

$$F(\hat{x}_1, r_1^a) = \hat{x}_1 + \beta_1 \mu(\hat{x}_1 - f(r_1^a)) - \beta_2 \mu(S - \hat{x}_1 - f(r_2^a)) - (\beta_2 S + k) = 0 \qquad (7)$$

This is an implicit function that satisfies the assumptions of the implicit-function theorem. In fact, property P2 of the gain-loss function $\mu(\cdot)$ ensures that partial derivatives $\frac{\partial F(\hat{x}_1, r_1^a)}{\partial \hat{x}_1}$ and $\frac{\partial F(\hat{x}_1, r_1^a)}{\partial r_1^a}$ are continuous and different from zero for any $x_1 \neq r_1^a$. Total differentiation of $F(\hat{x}_1, r_1^a)$ leads to:

$$\beta_1 \frac{\partial \mu(\hat{x}_1 - f(r_1^a))}{\partial f} \frac{\partial f}{\partial r_i^a} + \left(1 + \beta_1 \frac{\partial \mu(\hat{x}_1 - f(r_1^a))}{\partial \hat{x}_1} - \beta_2 \frac{\partial \mu(S - \hat{x}_1 - f(r_2^a))}{\partial \hat{x}_1}\right) \frac{\partial \hat{x}_1}{\partial r_1^a} = 0 \quad (8)$$

such that $\frac{\partial \hat{x}_1}{\partial r_1^a}$ can be expressed as:

$$\frac{\partial \hat{x}_1}{\partial r_1^a} = \frac{-\beta_1 \frac{\partial \mu(\hat{x}_1 - f(r_1^a))}{\partial f} \frac{\partial f}{\partial r_i^a}}{1 + \beta_1 \frac{\partial \mu(\hat{x}_1 - f(r_1^a))}{\partial \hat{x}_1} - \beta_2 \frac{\partial \mu(S - \hat{x}_1 - f(r_2^a))}{\partial \hat{x}_1}} > 0 \qquad (9)$$

The numerator of the ratio is positive given that $\beta_1 > 0$ and $\frac{\partial f}{\partial r_i^a} > 0$ while, by property P1 of the $\mu(\cdot)$ function, $\frac{\partial \mu(\hat{x}_1 - f(r_1^a))}{\partial f} < 0$. The denominator is also positive. In particular, the second term is positive (again by P1) while the third one is negative given that $\hat{x}_2 = S - \hat{x}_1$ decreases as $\hat{x}_1$ increases. It follows that $\frac{\partial \hat{x}_1}{\partial r_1^a} > 0$.

Going back to equality (3), the result presented in (9) can be also obtained under the alternative and mutually exclusive assumption $[q] > [t]$, i.e., $[\beta_1 + \beta_1 \mu'(\hat{x}_1 - f(r_1^a))] > [\beta_2 + \beta_2 \mu'(S - \hat{x}_1 - f(r_2^a))]$. In fact, the same steps remain valid with the only difference being that $k < 0$. But the sign and the magnitude of k do not influence the result presented in (9) as k disappears in the total differentiation of $F(\hat{x}_1, r_1^a)$. Moreover, because of symmetry, condition (9) also holds for claimant $i = 2$ such that we can state the main result of this paper:

$$\frac{\partial \hat{x}_i}{\partial r_i^a} > 0 \text{ for any } i \in \{1, 2\} \qquad (10)$$

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Given that the utility of claimant i is strictly increasing in x_i,[3] this result indicates that agent i, even though he anticipates that he will possibly get $\hat{x}_i < r_i^a$, should purposely inflate his initial claim. In fact, in the final allocation, what agent i gets $(\hat{x}_i)$ is positively anchored to the reference point that he announced (r_i^a). Indeed, in the Nash equilibrium of this announcement game, both agents announce $\hat{r}_i^a = S$ if $S > 0$ and $\hat{r}_i^a = 0$ if $S < 0$. The planner then chooses the allocation $\hat{x}$ in line with the specific SWF that he uses. For instance, if the planner treats agents symmetrically $(\beta_1 = \beta_2 = 0.5)$, he implements the Solomonic solution $\hat{x} = \left\{\frac{S}{2}, \frac{S}{2}\right\}$.[4]

Notice that rational claimants correctly anticipate the outcome $\hat{x} = \{\hat{x}_1, \hat{x}_2\}$. Even if they strategically announce $\hat{r}_i^a$, they ex-ante set their "true" reference point in line with their rational expectations. In other words, and using the terminology of Koszegi and Rabin (2006), in the personal equilibrium of this strategic dispute, rational claimants announce $\hat{r}_i^a$ but set $r_i = \hat{x}_i$. As such, the allocation $\hat{x}_i$ does not generate any perceived gain or loss with respect to r_i and the agents' utility is given by $u_i = \hat{x}_i$. On the other hand, claimants that are not fully rational and set their reference point according to incorrect expectations (for instance according to their self-serving biased view of what they think they deserve) still announce $\hat{r}_i^a$ but set $r_i > \hat{x}_i$. These claimants thus experience a loss when the adjudicator implements $\hat{x}$ and they experience utility $u_i < \hat{x}_i$. This perceived loss is maximal if agents' bias is extreme $(r_i = S$ if $S > 0$ or $r_i = 0$ if $S < 0)$. This is the only case in which $r_i^a = r_i$, i.e., the announced and the actual reference points coincide. In all other (rational and irrational) cases, the relation $r_i^a > r_i$ holds, i.e., the announced reference point is larger than the "true" reference point.

The following example uses simple functional forms for $g(\cdot)$, $\mu(\cdot)$ and $f(\cdot)$ to illustrate the result established in (9) as well as the equilibrium of the game.

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[3]In particular, $\frac{\partial u(x_i, r_i)}{\partial x_i} = 1 + \mu'_{x_i}(x_i - r_i) > 0$ given that $\mu'_{x_i}(x_i - r_i) > 0$ (see property P1 of the μ function).

[4]The judge's situation indeed resembles King Solomon's problem of having to establish the "ownership" of a baby between two women who both claimed to be his natural mother. As is well known, King Solomon's suggested solution was to cut the baby in half.

Example 1 *Let $i \in \{1, 2\}$, $g(\cdot) = \sqrt{\cdot}$, $\beta_1 = \beta_2 = 0.5$, $\mu(x_i - r_i) = \begin{cases} x_i - r_i & \text{if } x_i \geq r_i \\ 2(x_i - r_i) & \text{if } x_i < r_i \end{cases}$,*

$f(r_i^a) = r_i^a$ and $S = 1$. Then $u_i = \begin{cases} 2x_i - r_i^a & \text{if } x_i \geq r_i^a \\ 3x_i - 2r_i^a & \text{if } x_i < r_i^a \end{cases}$. Claimants thus expect the

planner to maximize the function $W(u) = \sqrt{\frac{3}{2}x_1 - r_1^a} + \sqrt{\frac{3}{2}x_2 - r_2^a}$. First order condi-

tion is given by $\frac{3}{2} \left(\sqrt{\frac{3}{2}x_1 - r_1^a} \right)^{-1} = \frac{3}{2} \left(\sqrt{\frac{3}{2}(1 - x_1) - r_2^a} \right)^{-1}$ and the optimal allocation is

$\hat{x} = (\hat{x}_1, \hat{x}_2)$ with $\hat{x}_1 = \frac{1}{2} + \frac{1}{3}(r_1^a - r_2^a)$ and $\hat{x}_2 = 1 - \hat{x}_1$. Marginal effects are strictly positive

$\left(\frac{\partial \hat{x}_1}{\partial r_1^a} = \frac{\partial \hat{x}_2}{\partial r_2^a} = \frac{1}{3} \right)$ and obviously they can also be retrieved using the decomposition in (9).

In equilibrium, $\hat{r}^a = \{1, 1\}$ and $\hat{x} = \left\{ \frac{1}{2}, \frac{1}{2} \right\}$.

3 Conclusions

This paper explored the strategic aspects that may underlie litigants' decisions to ask for exceedingly high claims. More precisely, the paper showed that if claimants are characterized by reference dependent preferences (an assumption that seems particularly appropriate in the context of disputes and litigations), and if they expect the judge to reach his decision in line with the maximization of a general form of social welfare function, then there is indeed an incentive for agents to announce high reference points. Claimants, in fact, anticipate that in the final allocation what they will get is positively anchored to their initial claims. As such, agents purposively inflate these claims.

Indeed, in our model the strategy to inflate claims is strictly dominant. But notice that the same strategy remains weakly dominant even in a richer (and perhaps more realistic) framework in which the claimants are unsure about the type of adjudicator they face. Say for instance that litigants do not know if the judge will take r_i^a into account or will rather ignore it. Even if claimants attach an ϵ probability to the event that the planner is of the first type, still they maximize their expected utility by inflating their claims. The situation would instead be different if there is the possibility that the judge punishes the announcement of a reference point that he considers to be too high. Still, the effective

punishment of excessive claims is rarely observed in the solution of disputes of litigations where high claims might be stigmatized but then are at most ignored.

A further point to notice concerns claimants' true reference points as these are the ones that ultimately affect agents' actual perception of the final allocation. As the model indicates, these true reference points remain unknown to the adjudicator and, whenever agents hold irrational and biased expectations, they are not even confirmed in equilibrium. An interesting aspect to explore is thus the possible existence of an incentive compatible mechanism that the adjudicator can design in order to elicit agents' true reference points. A potential candidate is a mechanism à la Groves (1973), i.e., a mechanism that involves some specific compensation rules that could induce claimants to truthfully reveal their types/reference points. Still our framework presents some important peculiarities with respect to a standard Groves setting. For instance it involves the maximization of a welfare function that in general does not coincide with the plain sum of individual utilities, it features the presence of a behavioral component within agents' preferences, and it requires the final allocation to be budget-balanced, i.e., the allocation and the transfers implemented by the judge cannot create surpluses or deficits. The design of an incentive compatible mechanism that adjudicators can use to elicit agents' claims thus appears to be an intriguing and challenging task to which we will devote future research.

4 Appendix

4.1 Endogenous determination of S in a bilateral accident

In the following example we show how the expected size of the good upon which a dispute may eventually start can be endogenously determined by some previous actions of the claimants that take into account the allocation rule that will be implemented by the adjudicator. In particular, we analyze a standard tort model and show how our framework can easily accomodate different liability rules that are commonly used in practice.

In line with the standard economic analysis of accident law à la Shavell (1987), consider

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the situation of a bilateral accident that involves two agents: an injurer (agent 1, say a driver) and a victim (agent 2, say a byciclist). The accident, if it occurs, causes a loss $S = -100$ but both agents can ex-ante take costly actions that reduce the probability of this event. More precisely, agents can decide if to exert a low or a high level of care. Let c_i with $i \in \{1, 2\}$ be the costs associated with these actions as expressed in Table 1 below. The table (which replicates Table 2.3 in Shavell, 1987, page 11) also reports the accident probability, the expected accident loss and the total accident loss. The latter is given by the sum of the expected accident loss and the costs incurred by the two agents. The socially optimal outcome is the one that minimizes total costs.

Table 1.

Levels of care		Cost c_i		Accident probability	Expected loss S	Total costs
1	2	1	2			
low	*low*	0	0	15%	-15	15
low	*high*	0	2	12%	-12	14
high	*low*	3	0	10%	-10	13
high	*high*	3	2	6%	-6	11

As in the main text, let agents' utility function be given by $u_i(x_i, r_i) = x_i + \mu(x_i - r_i)$ for $i \in \{1, 2\}$ where $x_i \in [S, 0]$ is the part of the accident loss that the adjudicator requires agent i to cover and $\mu(x_i - r_i)$ captures agents' reference dependent preferences. The adjudicator wants to maximize the function $W(u) = \sum_i g(\beta_i u_i)$. Let the function $g(\cdot)$ approach a linear one such that $W(u)$ tends to a purely utilitarian social welfare function. Such a specification captures a number of different liability rules.

For instance, if $\beta_2 \to 1$ the planner only cares about the welfare of the victim and thus follows a rule of strict liability. In line with our model, if an accident occurs agents announce the vector $\hat{r}^a = (\hat{r}_1^a, \hat{r}_2^a) = (0, 0)$ (i.e., both agents claim no responsibility whatsoever) and the judge implements the allocation $\hat{x} = (\hat{x}_1, \hat{x}_2) = (-100, 0)$. If it is common knowledge that strict liability is the rule in use, then the injurer rationally decides to exert

a high level of care (his marginal benefit is greater than his cost) while the victim, given that he will be fully compensated, exerts a low level of care.

On the contrary, if $\beta_1 \to 1$ then there is no liability and the planner allocates the entire loss to the victim. If a dispute arises, agents again announce $\hat{r}^a = (0,0)$ but the judge now implements $\hat{x} = (0,-S)$. Under this liability rule, the injurer thus exerts low care while the victim exerts high care.

A third possible liability rule is the so called strict division of accident loss (see Shavell, 1987, section 2.2.4) in which each agent i bears a fraction $(1 - \beta_i)$ of any loss that occurs no matter their actual level of care. For instance, if $\beta_1 = \beta_2 = 0.5$ then $\hat{r}^a = (0,0)$ and $\hat{x} = \left(-\frac{S}{2}, -\frac{S}{2}\right)$ as both parties bear an equal fraction of the loss. Therefore, none of them decides to exert a high level of care and the accident occurs with 15% probability.

Our framework also accomodates more complex (but more commonly used) liability rules such as the comparative neglicence rule, the neglicence rule with the defense of contributory neglicence, and strict liability with the defense of relative neglicence (see Shavell, 1987, for a detailed description of these rules). If the planner/adjudicator properly sets and announces the level of care that one or both parties are expected to exert to be considered not liable then the socially optimal outcome (in this example both agents exert high care) can be endogenously achieved.

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