A Contest Theoretical Study of Class Action

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Abstract

This paper presents a contest theoretical analysis of class action in litigation. Following Tullock's rent-seeking contest model, we show that homogeneous plaintiffs each have incentive to join class action against the defendant. If plaintiffs are heterogeneous, only low-value plaintiffs will pool together if upon winning each plaintiff gets equally compensated. However, if each plaintiff gets compensated in proportion to their claims or valuations, each of them has incentive to join the class action.

1 Introduction

Class action has been used in litigation to determine the rights of and remedies, if any, for large numbers of people whose cases involve common questions of law and fact. In a single class action, usually millions of plaintiffs may be represented, hundreds of millions of

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dollars may be at stake, and whole industries may be at risk of liability.[1] To name a few examples, \$145 billion awarded by a Florida jury against five tobacco companies on behalf of all American smokers in 2000 (later overturned); a \$65 million settlement against IBM in an overtime claim by technical and support staff in 2006; an ongoing gender-discrimination claim against Wal-Mart on behalf of some 2 million past and present female employees in America, etc.[2] The preamble to the *Class Action Fairness Act of 2005*, passed by the United States Congress, reads:

> Class-action lawsuits are an important and valuable part of the legal system when they permit the fair and efficient resolution of legitimate claims of numerous parties by allowing the claims to be aggregated into a single action against a defendant that has allegedly caused harm.

Since Tullock's (1975, 1980) seminar contribution, rent-seeking contests have been widely studied to analyze situations in which competitors expend irreversible investments to win a limited number of prizes. From a contest theoretical approach, this paper studies economic agents' incentives of joining a class action, equilibrium efforts and social cost and benefit of class actions. If the plaintiffs are homogeneous, i.e., they have identical claims or valuations, each plaintiff has incentive to join the class action. Moreover, the more plaintiffs join, the better compensation they could get upon winning the trial. However, equilibrium formation of class action is different if the plaintiffs are heterogeneous. Depending on different compensation schemes, plaintiffs have different incentives to join the class action. If proportional scheme is applied, each plaintiff will join the class action. If egalitarian scheme is applied, only low-value plaintiffs will join the class action and high-value ones prefer to sue the defendant individually.

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[1] The asbestos industry has been exposed to numerous class actions since the 1970s, resulting in several defendants becoming insolvent. See Hensler et al. (1985).

[2] "If you can't beat them, join them", *The Economist*, Feb.17th-23rd, 2007, 66-67.

To the best of my knowledge, there is no formal analysis on equilibrium formation of class action suits except Che (1996). He studies the equilibrium formation of a class action and his findings confirm the prevalence of two "market failures": either a potentially viable class action may not arise or the equilibrium size is inefficient. He documents an interesting adverse selection problem: high-stake plaintiff may opt out in equilibrium and only low-stake plaintiffs have incentives to join a class action. Kornhauser (1983) studies class conflicts but considers homogeneous plaintiffs, so adverse selection is not an issue there. Klement and Neeman (2004) examine the attorney fee structure that maximizes the expected recovery for class members in a class action. Sui (2009) studies the possible design of an optimal auction that would implement an optimal fee schedule characterized by Klement and Neeman (2004).

Our analysis is also related to rent-defending literature. Competition for a monopoly position with known profitability is often analyzed as a rent-seeking game. On the other hand, buyers do not always passively accept monopoly pricing. On the contrary, they often engage in costly rent-defending activities, such as persuading authorities to regulate the price and quality of the monopolized good. If a large number of buyers form a coalition to act together, they may successfully defend the rent.[3]

The rest of this paper proceeds as follows. Section 2 lays out the model. Section 3 presents equilibrium analysis of the contest game between the defendant and the plaintiffs. Section 4 concludes.

2 The Model

A single defendant faces N plaintiffs. Each plaintiff chooses either to sue the defendant individually or to join a class action against the defendant. Each plaintiff's claim, or their valuations upon winning the trial, is assumed to be common knowledge. Let v_i denote plaintiff i's

[3]See Wenders (1987) and Ellingsen (1991).

claim, without loss of generality, we assume

$$v_1 \leq v_2 \leq \cdots \leq v_N \tag{1}$$

Let v_0 denote the defendant's value upon winning the trial. If losing the trial, the defendant not only pays the claims, but incurs reputation loss. Define $V = \sum_{i=1}^{N} v_i$. Depending on whether the plaintiffs get all of their claims or not, v_0 may exceed or not V.

Consider a plaintiff i. If she decides to sue the defendant individually by making effort b_i, her probability of winning the trial is determined by

$$p_i = \frac{b_i}{b_i + b_0} \tag{2}$$

where b_0 is the irreversible resources expended by the defendant to win the trial. Then plaintiff i's expected payoff will be

$$\pi_i = \frac{b_i}{b_i + b_0} v_i - b_i \tag{3}$$

Another option for plaintiff i is to join a class action. The participating plaintiffs pool their resources and share attorney's service. As a whole group, its expected payoff is

$$\pi_c = \frac{b_c}{b_c + b_0} V - b_c \tag{4}$$

If the defendant loses the trial to a class action suit, we assume there are two kinds of compensation scheme for the plaintiffs: proportional scheme or egalitarian scheme. For proportional scheme, plaintiff i gets compensation according to her relative claim:

$$\pi_p^i = \frac{v_i}{V} \pi_c \tag{5}$$

For egalitarian scheme, the plaintiffs divide π_c equally:

$$\pi_e^i = \frac{1}{N}\pi_c \tag{6}$$

Intuitively different compensation schemes have different impact on plaintiffs' incentives to join the class action.

3 Equilibrium

3.1 Homogeneous Plaintiffs

Suppose all plaintiffs have identical claims or values upon winning the trial. Let us consider plaintiff i with valuation v_i. If she decides to sue the defendant individually, we have a contest between plaintiff i (v_i) and the defendant (v_0). Standard results from contest literature[4] suggest that equilibrium efforts will be

$$\beta_i = \frac{v_i^2 v_0}{(v_i + v_0)^2} \tag{7}$$

and

$$\beta_0 = \frac{v_i v_0^2}{(v_i + v_0)^2} \tag{8}$$

Therefore, the equilibrium payoffs for both plaintiff i and the defendant are

$$\pi_i = \frac{\beta_i}{\beta_i + \beta_0} v_i - \beta_i = \frac{v_i^3}{(v_i + v_0)^2} \tag{9}$$

and

$$\pi_0 = \frac{\beta_0}{\beta_i + \beta_0} v_0 - \beta_0 = \frac{v_0^3}{(v_i + v_0)^2} \tag{10}$$

[4] See Nti (1999).

Now if plaintiff i decides to join the class action with all other plaintiffs against the defendant, we have a contest between the whole group of plaintiffs (V) and the defendant. By the same argument, we have equilibrium efforts

$$\bar{\beta}_c = \frac{V^2 v_0}{(V+v_0)^2} \tag{11}$$

and

$$\beta_0 = \frac{V v_0^2}{(V+v_0)^2} \tag{12}$$

Since all plaintiffs claim the same amount of compensation, in equilibrium, the expected payoff for each plaintiff will be

$$\bar{\pi}_i = \frac{V^3}{N(V+v_0)^2} \tag{13}$$

and the expected payoff for the defendant will be

$$\bar{\pi}_0 = \frac{v_0^3}{(V+v_0)^2} \tag{14}$$

Comparing π_i with $\bar{\pi}_i$, we have

$$\bar{\pi}_i - \pi_i = \frac{(N-1)v_0 v_i^3[2V+(N+1)v_0]}{[(V+v_0)(v_i+v_0)]^2} > 0 \tag{15}$$

The above inequality hold strictly if and only if $N > 1$. That implies that class action always benefit individual plaintiff so each plaintiff has incentive to join the class action instead of suing the defendant individually. Recall that

$$\bar{\pi}_i = \frac{V^3}{N(V+v_0)^2} = \frac{N^2 v_i^3}{(Nv_i+v_0)^2} = \frac{v_i^3}{(v_i+\frac{v_0}{N})^2} \tag{16}$$

Clearly $\bar{\pi}_i$ is increasing in N. The more plaintiffs join the class action, the more payoff they can expect in equilibrium.

Proposition 1. *In the legal contest between homogeneous plaintiffs and one defendant, each plaintiff has incentive to join a class action against the defendant. In equilibrium, every plaintiff joins the class action.*

3.2 Heterogeneous Plaintiffs

Suppose all plaintiffs have different claims or values upon winning the trial. If egalitarian compensation scheme is applied, the expected payoff for plaintiff i will be

$$\bar{\pi}_i^e = \frac{V^3}{N(V+v_0)^2} \tag{17}$$

If proportional compensation scheme is applied, the expected payoff for plaintiff i will be

$$\bar{\pi}_i^p = \frac{V^3}{(V+v_0)^2}\frac{v_i}{V} = \frac{v_i V^2}{(V+v_0)^2} \tag{18}$$

Comparing π_i with $\bar{\pi}_i^p$, we have

$$\frac{\bar{\pi}_i^p}{\pi_i} = \frac{v_i V^2}{(V+v_0)^2}\frac{(v_i+v_0)^2}{v_i^3} = [\frac{V(v_i+v_0)}{v_i(V+v_0)}]^2 > 1 \tag{19}$$

That implies when proportional scheme is applied, class action always benefit individual plaintiff so each plaintiff has incentive to join the class action instead of suing the defendant individually.

Proposition 2. *In the legal contest between heterogeneous plaintiffs and one defendant, each plaintiff join a class action against the defendant if upon winning each plaintiff gets compensated in proportion to their claims or valuations.*

Now consider the egalitarian scheme.

$$\begin{aligned}
\bar{\pi}_i^e - \pi_i &= \frac{V^3}{N(V+v_0)^2} - \frac{v_i^3}{(v_i+v_0)^2} && (20)\\
&= \frac{V^3(v_i+v_0)^2 - Nv_i^3(V+v_0)^2}{N(V+v_0)^2(v_i+v_0)^2} && (21)\\
&= \frac{v_i^2V^2(V-Nv_i) + 2v_iv_0V(V^2-Nv_i^2) + v_0^2(V^3-Nv_i^3)}{N(V+v_0)^2(v_i+v_0)^2} && (22)
\end{aligned}$$

Then, $\bar{\pi}_i^e > \pi_i$ if

$$v_i \leq \frac{V}{N} < \frac{V}{\sqrt{N}} < \frac{V}{\sqrt[3]{N}} \tag{23}$$

and $\bar{\pi}_i^e < \pi_i$ if

$$v_i \geq \frac{V}{\sqrt[3]{N}} > \frac{V}{\sqrt{N}} > \frac{V}{N} \tag{24}$$

The underlying intuition is as follows. If the egalitarian compensation scheme is applied, those plaintiffs with smaller claims have stronger incentive to join the class action since, on the one hand, they have higher chance to win the trial and on the other hand, upon winning they could get the same share of compensation as those with larger claims. On the contrary, those plaintiffs with larger claims are less inclined to join the class action since they can be compensated better if they sue the defendant individually.

Proposition 3. *In the legal contest between heterogeneous plaintiffs and one defendant, not every plaintiff has incentive to join a class action against the defendant if upon winning each plaintiff gets equally compensated regardless of their claims or valuations. In particular, there exists a v_1^* such that all plaintiffs valuing the contest higher than v_1^* prefer to sue the defendant individually. There exists a v_2^* such that all plaintiffs valuing the contest low than v_2^* will join the class action against the defendant.*

By this argument, with heterogeneous plaintiffs, there will be market failures. In large class actions, members often differ significantly in their damages as well as in the cause of their injuries and the defendant's liability. It is relatively easy for courts to recognize individual damages, but the cause of each victim's injury is often difficult and costly to establish. Thus, courts often base their awards or important decisions on the aggregate merit of the entire class cases. The consequence of this practice is so-called "damage averaging": severely injured victims are undercompensated while minor victims are overcompensated. Damage averaging appears to affect victims' incentives to participate in a voluntary class action in a particular way. Our result show that only low-stakes plaintiffs participate in a class action while high-stakes plaintiffs opt out, a phenomenon commonly referred to as "adverse selection".[5]

According to Proposition 2, if the court could easily establish each plaintiff's cause of injury and corresponding compensation and hence apply the proportional scheme, this market failure could be avoided and each plaintiff will participate the class action regardless of their different claims.

Define $\Delta\pi = \bar{\pi}_i^e - \pi_i$, then we have $\Delta\pi(\frac{V}{N}) > 0$, and $\Delta\pi(\frac{V}{\sqrt[3]{N}}) < 0$. If we can show that $\frac{\partial \Delta\pi}{\partial v_i} < 0$, then there must be a unique $\frac{V}{N} < v_i^* < \frac{V}{\sqrt[3]{N}}$ such that $\bar{\pi}_i^e > \pi_i$ if $v_i < v_i^*$ and $\bar{\pi}_i^e < \pi_i$ if $v_i > v_i^*$.

By manipulating $\frac{\partial \Delta\pi}{\partial v_i}$, we have $\frac{\partial \Delta\pi}{\partial v_i} < 0$ if $v_i > \frac{V}{\sqrt{N}}$. Then, if there exists a unique v_i^*, it must satisfy $\frac{V}{\sqrt{N}} < v_i^* < \frac{V}{\sqrt[3]{N}}$.

Now let us examine $\Delta\pi(\frac{V}{\sqrt{N}})$. Substituting $v_i = \frac{V}{\sqrt{N}}$ into (22), we have

$$\Delta\pi(\frac{V}{\sqrt{N}}) = \frac{v_i^2 V^2 (V - N v_i) + v_0^2 (V^3 - N v_i^3)}{N (V + v_0)^2 (v_i + v_0)^2} \tag{25}$$

$$= \frac{V^3(\sqrt{N} - 1)(\frac{v_0^2}{\sqrt{N}} - \frac{V^2}{N})}{N (V + v_0)^2 (v_i + v_0)^2} \tag{26}$$

Therefore, $\Delta\pi(\frac{V}{\sqrt{N}}) > 0$ if $v_0 > \frac{V}{\sqrt[4]{N}}$, and $\Delta\pi(\frac{V}{\sqrt{N}}) < 0$ if $v_0 < \frac{V}{\sqrt[4]{N}}$. This implies that when $v_0 > \frac{V}{\sqrt[4]{N}}$, $\frac{V}{\sqrt{N}} < v_i^* < \frac{V}{\sqrt[3]{N}}$; when $v_0 < \frac{V}{\sqrt[4]{N}}$, $\frac{V}{N} < v_i^* < \frac{V}{\sqrt{N}}$.

[5] See Coffee (1987).

The above results could be summarized in the following proposition.

Proposition 4. *Suppose the egalitarian compensation scheme is applied in the legal contest between heterogenous plaintiffs and one defendant. If* $v_0 > \frac{V}{\sqrt[4]{N}}$*, there exists a unique* $\frac{V}{\sqrt{N}} < v_i^* < \frac{V}{\sqrt[3]{N}}$ *such that* $\bar{\pi}_i^e > \pi_i$ *if* $v_i < v_i^*$ *and* $\bar{\pi}_i^e < \pi_i$ *if* $v_i > v_i^*$*. If* $v_0 < \frac{V}{\sqrt[4]{N}}$*, there exists a unique* $\frac{V}{N} < v_i^* < \frac{V}{\sqrt{N}}$ *such that* $\bar{\pi}_i^e > \pi_i$ *if* $v_i < v_i^*$ *and* $\bar{\pi}_i^e < \pi_i$ *if* $v_i > v_i^*$*.*

With heterogeneous plaintiffs, class action will be only formed by those whose stakes are closely aligned. Suppose K plaintiffs participate the class action, it must be that $\frac{\tilde{V}}{K} < \tilde{v}_K < \frac{\tilde{V}}{\sqrt[3]{K}}$, where $\tilde{V}$ denotes the sum of valuations of those K plaintiffs, $\tilde{v}_K$ denote the highest valuation among those K plaintiffs. However, in a large class action case, this means there will be some high-stake plaintiff opting out, which leads to inefficient litigation. Che (1996) shows existence of an inefficient equilibrium in which only a fraction of plaintiffs join the class action, due to coordination failure. This explains the prominent role that attorneys play in large class suits. On the one hand, class attorneys often initiate class suits and actively solicit their members. On the other hand, the contingent fee system reduces the fixed cost of lawsuits borne by plaintiffs and encourages their class participation.

3.3 Numerical Examples

Now let us consider some numerical examples illustrating our main results. Suppose there are four plaintiffs and a single defendant.

Example 1. $v_1 = v_2 = v_3 = v_4 = 1$, $v_0 = 10$.

In this example, if each plaintiff sues the defendant individually, each of them gets expected payoff $\frac{1}{121}$. If all plaintiff form a class action, each gets expected payoff $\frac{4}{49} > \frac{1}{121}$. In equilibrium, every plaintiff will participate.

Example 2. $v_1 = 1$, $v_2 = 2$, $v_3 = 3$, $v_4 = 4$, *and* $v_0 = 10$.

In this example, if each plaintiff sues the defendant individually, their expected payoffs are $\pi_1 = \frac{1}{121}$, $\pi_2 = \frac{1}{18}$, $\pi_3 = \frac{27}{169}$, and $\pi_4 = \frac{16}{49}$. If the court applies proportional compensating scheme, every plaintiff will join a class action and their expected payoffs will be $\bar{\pi}_1 = \frac{1}{2}$, $\bar{\pi}_2 = 1$, $\bar{\pi}_3 = \frac{3}{2}$, and $\bar{\pi}_4 = 2$. If the court applies egalitarian scheme (damage averaging), each plaintiff gets $\frac{5}{4}$ if all participate a class action. In equilibrium, every plaintiff will participate.

Example 3. *$v_1 = 1$, $v_2 = 2$, $v_3 = 3$, $v_4 = 8$, and $v_0 = 10$.*

In this example, if each plaintiff sues the defendant individually, their expected payoffs are $\pi_1 = \frac{1}{121}$, $\pi_2 = \frac{1}{18}$, $\pi_3 = \frac{27}{169}$, and $\pi_4 = \frac{128}{81}$. If the court applies proportional compensating scheme, every plaintiff will join a class action and their expected payoffs will be $\bar{\pi}_1 = \frac{49}{144}$, $\bar{\pi}_2 = \frac{49}{72}$, $\bar{\pi}_3 = \frac{49}{48}$, and $\bar{\pi}_4 = \frac{49}{18}$. If the court applies egalitarian scheme (damage averaging), each plaintiff gets $\frac{343}{288}$ if all participate a class action. However, plaintiff 4 has incentive to deviate and sue the plaintiff individually since she could be better compensated in equilibrium.[6] Therefore, only the first three plaintiffs will participate in equilibrium.[7]

4 Conclusion

A class action in litigation allows a lawsuit to be brought by a large number of claimants. Through a class action, claimants can pool their resources, share attorney's services and save the time costs of litigation. Despite these scale benefits, some market failures have been noted when not all cases that are eligible to join the class action actually join it. This paper presents a contest theoretical exploration about this commonly observed phenomenon.

With homogeneous claimants, it is trivial to show that each plaintiff has incentive to join a class action in equilibrium. Furthermore, the more the better. With heterogeneous claimants, the analysis becomes more interesting. If the court adopts proportional compensation scheme

[6] Clearly, $\frac{343}{288} < \frac{128}{81}$.

[7] In equilibrium, they each get expected payoff $\frac{9}{32}$.

which is quite difficult to apply actually, each plaintiff will join a class action in equilibrium. If the court adopts egalitarian compensation scheme which is often the case in reality, not all plaintiffs will participate a class action. In particular, only low-stake plaintiffs have incentives to participate and high-stake plaintiffs will opt out, which leads to an inefficient legal dispute.

For implication, if the court is able to apply proportional compensation scheme, each involved claimant has incentive to join a class action and efficiency will be restored. If proportional scheme is not an option at all, or the court can only apply egalitarian scheme (damage averaging), it is crucial to provide incentives for high-stake claimants to participate. Otherwise, they will opt out and market failure (adverse selection) results.

Throughout the whole exploration, we assume complete information, i.e., each claimant's stake is common knowledge, and the defendant's valuation is also common knowledge. Though our results provide an intuitive explanation for class action in litigation, it will be interesting to examine class action in an environment that allows incomplete information.

Another direction for future research goes to examine general contests through a cooperative approach. In certain industry, all incumbents exert irreversible efforts to achieve some monopoly power. During the contest, some firms will be inevitably merged with other firms. Finally the market ends up with either a monopoly or a duopoly or even an oligopoly. The equilibrium coalition formation in the market surviving contests will be an interesting research question.

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