INCENTIVES TO INVEST IN LITIGATION AND THE SUPERIORITY OF THE CLASS ACTION

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ABSTRACT

We formally demonstrate the general case for class action in a rent-seeking contest model, explaining why separate action adjudication is biased in the defendant's favor and collective adjudication is bias free. Separate action bias arises from the defendant's investment advantage in capitalizing on centralized control over the aggregate (class-wide) stake in the common question defense, while the plaintiff, with only an individual recovery at stake, spends much less. Class action eliminates bias by enabling both parties to make their best case through centralized optimal classwide investments. Our social benefit–cost analysis shows that class action surpasses alternative methods for achieving bias-free adjudication.

1. INTRODUCTION

This article focuses on civil litigation that involves numerous plaintiffs with claims against a single defendant based on causes of action for damages or equitable relief that present the same or similar legal and factual questions.[1] Examples of large-scale common question litigations include claims of products liability, securities fraud, deceptive consumer practices, corporate misgovernance, environmental pollution, employment discrimination, and

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1 In some types of common question litigations, such as copyright infringement, the relationship of the parties is reversed with a single plaintiff suing multiple defendants. See, e.g., Hamdani & Klement (2005). Our analysis applies to these settings as well.

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unconstitutional state action. Employing a rent-seeking contest model, we present the first formal demonstration of a general correlation between the parties' relative investment incentives in common question litigations and the use of separate (solo) versus class (collective) actions that implies the existence of a structural, systemic bias favoring defendants in the former and the absence of bias one way or the other in the latter. Our social benefit–cost analysis shows that class action surpasses alternative methods for eliminating bias from the adjudication of common question claims. This, in essence, is the general case for class action.

In brief overview, we show that the separate action process is structured so that the defendant always can exploit its natural incentive to outspend the individual plaintiff in litigating the common questions to gain the upper hand in any solo action. The defendant's advantage is due not to its relative wealth. Rather as "owner" of the common defense to all claims, the defendant necessarily possesses and exercises centralized control over the aggregate (classwide) stake and expenditures, and invests its resources collectively to defeat all claims, not just a given plaintiff's, on the common questions presented. In contrast, the plaintiff with the expected recovery value of only his or her individual claim at stake must restrict spending typically to a very small fraction of what the defendant will invest to prevail at trial on those questions. On the realistic assumption that the amount spent on lawyers, experts, discovery, and other litigation needs and options correlates with the quality of the litigant's ensuing case, and hence prospects at trial, the defendant's greater investment incentives enables it to wield dominating litigation power that will skew adjudicative outcomes in its favor across all claims. In many cases, the defendant's classwide stake-driven investment advantage will be so overwhelming as to render claims not worth even filing.

In a class action, both sides have equivalent aggregate investment incentives, and hence there is no structural bias against either party. The collectivizing structure of class action assures plaintiffs an equal opportunity with the defendant to marshal the aggregate (classwide) stake and corresponding investment incentives in making their best case at trial on the common questions. Thus, the key de-biasing function of class action is not to increase the amount at stake and incentive to spend on the plaintiff side in litigating the common questions—it will likely do both, though overall costs may fall due to other class action efficiencies—but rather to transform the way those factors are organized, managed, and deployed. In short, class action replaces individualized (or decentralized, fractionated) stake holders and decision making with centralized control over the classwide, indivisible stake and resulting incentives to optimally invest in maximizing the expected recovery from the plaintiffs' common question case for liability. The *qualitative* benefits of collectively

litigating common question claims for the plaintiff class, as for the defendant vested naturally with centralized control over the classwide stake, are thus not merely cumulative. They are synergistic. The whole of the potential aggregate investment and resulting aggregate net recovery from prosecuting all claims by class action exceeds the sum of the parts, the potential separate action investments for and resulting separate net recoveries from prosecuting each of the claims individually as solo actions.

Society as well as plaintiffs can reap the benefits from employing bias-free class action to adjudicate common question claims. From the social perspective, class action is not simply about taking the lead out of the defendant's gloves to make a fair fight of it. Rather, class action performs an important public service. By providing plaintiffs with the same opportunity the defendant naturally possesses to make a centralized classwide investment on the common questions, class action removes a distorting pro-defendant bias that slants the record of evidence and argument—when it does not preclude plaintiffs outright from suing—that courts largely depend upon in rendering judgments. In our adversarial system, enabling both plaintiffs and the defendant, respectively, to present their best, classwide cases for and against liability on the common questions results in better informed and more reliable judicial rulings that inevitably affect the allocation of vital and scarce resources and the well-being of society.[2]

The model in our article builds upon the literature on rent-seeking contests where two or more contestants are vying for a prize and the probability that any given contestant will win the prize depends on the investments or efforts of each of the contestants.[3] See Konrad (2009) and Garfinkel & Skaperdas (2007) for

2 It is important to note the limits of our inquiry. We focus exclusively on the analytic correspondence between pro-defendant bias and the plaintiffs' investment incentives relative to the defendant's under two basically distinct general approaches for structuring control over the plaintiff-side stake—decentralization and centralization. Analysis abstracts away from the formal and operational features of actual, currently existing processes, procedures, and practices except to the extent the issues raised are relevant to the validity of our conclusions. The terms "separate actions" and "class actions" thus serve merely to conveniently denominate the respective polar approaches. "Separate actions" represent a completely decentralizing structure that disperses control among the plaintiffs and consequently motivates each to invest exclusively in maximizing the value of his or her individual recovery. "Class action", by contrast, stands for a completely centralized structure that vests control in a collective stakeholder who is thereby motivated to make the optimal aggregate investment in maximizing the classwide recovery. We also ignore the fact that neither system operates in pure form—involuntary joinder and consolidation often produce some degree of centralized separate action litigation; opt-out, subclassing and other procedural requirements forcing disaggregation of claims result in some degree of decentralized class action litigation. The reality of hybrid litigations does not change the principal thrust of our analysis and conclusions. Our finding holds firmly and generally for all variants and contexts: pro-defendant bias increases as the litigation becomes more decentralized and decreases as it becomes more centralized.

3 A premise of applying this framework to litigation is that a litigant can increase the likelihood of prevailing at trial by making additional, marginal investments. This framework has a number of

surveys of the literature. In particular, our framework is analogous to a simple "lottery contest", where a contestant's probability of winning the lottery is simply the proportion of the tickets held by that contestant.[4] Although the literature has taken a variety of approaches to modeling the underlying technology of contests,[5] the most common approach—and the one taken here—has been to assume that the probability of winning depends on the *ratio* of the expenditures of the contestants (Dixit 1987; Tullock 1980). We apply the approach to the situation involving coordination and alliances between noncompeting players (the plaintiffs in our model) in parallel contests against a common adversary (the defendant). We break new ground in this literature, in that to the best of our knowledge, there has been no prior consideration of this type of contest.

In formally modeling and demonstrating the general case for class action, we confirm the argument informally introduced in Rosenberg (1984) and developed in later work by him, including Rosenberg (2002b).[6] We also extend

realistic implications. First, holding all else equal, a litigant will tend to invest more when the stakes of litigation increase. This is consistent with empirical observation. For example, in their analysis of federal civil cases, Lee & Willging (2010) find that a 1 percent increase in stakes was associated with a 0.25 percent increase in total spending. *See also* Hersch & Viscusi (2007). Second, the parties' investment decisions interactively respond to each other's spending and its effect on their respective chances of winning at trial. In an empirical study of discovery, Shepherd (1999) found evidence of the interdependence in investments; defendants tended to increase their discovery efforts, "tit-for-tat", in response to more intensive requests by the plaintiff. Of course, the precise shape of the contest success function, the point at which the parties' respective investments yield negative expected marginal returns, and ratio of defendant versus plaintiff investments representing the Nash equilibrium will vary across cases.

4 This lottery contest is a special case of the Tullock (1980) rent-seeking contest. Papers that use contest models to study litigation include Posner (1973, appendix), Katz (1988), Farmer & Pecorino (1999), Parisi (2002), Bernardo, Talley, & Welch (2000), Prescott, Spier, & Yoon (forthcoming).The lottery success function has axiomatic foundations (Skaperdas 1996), and can also be viewed as a reduced form of a game where contestants bolster their positions by taking random draws from a common pool of evidence (Baye & Hoppe 2003). It also emerges from a stochastic all-pay auction where the effective "bids" of the contestants depend on the expenditures of the contestants as well as exponentially distributed noise (Hirshleifer & Riley, 1992, pp. 380–381).

5 Some authors have approached the problem as an "all-pay auction", where the contestant who invests the most wins the prize (Baye, Kovenock, & DeVries 1996; Hillman & Riley 1989); still others have posited that the probability of winning depends on the *difference* between the expenditures or efforts of the contestants (see Hirshleifer 1989).

6 We know of no prior work discussing the structurally engrained asymmetric investment incentives and consequent systemic pro-defendant bias in the separate action process, and the opportunity for bias-free adjudication provided by class action. Posner (1977) posits two special, unrelated scenarios in which the defendant biases adjudication in its favor by "heavily" or "excessively" outspending the plaintiff in a separate action: first, to further a "predatory" strategy of "overwhelming" one plaintiff as a warning against others tempting the same fate by filing subsequent suits; and second, to avoid adverse preclusive effects in subsequent suits under a non-mutual, offensive collateral estoppel rule.

the argument to provide new insights into the pervasiveness of pro-defendant bias in the separate action process, notably showing how it:

- distorts collateral estoppel, fee-shifting, and the other non-class procedures conventionally proffered as class action alternatives[7];
- vests defendant with superior bargaining leverage in setting the terms for global as well as individual settlements[8];
- devalues any claim, including those with high enough potential recovery to be economically viable as solo actions[9];
- enables defendant to wield superior litigation power to project and marshal such an overwhelming defense on the common questions as to render many claims with apparent economic viability, worthless as solo actions[10];
- persists despite costless information spillovers, that is, even though plaintiffs can freely share or free ride on each other's work product.[11]

Our analysis differs fundamentally from the standard academic and judicial accounts of the advantage of class actions. They offer no recognition that separate action adjudication of common question claims slant outcomes in favor of defendants and that class action is free of, and needed to overcome, this bias.[12] According to the standard account, the separate action process—pitting each plaintiff one-on-one against the defendant—is proclaimed the "day in court ideal".[13] Thus, the conventional view regards class action as useful solely for cutting litigation costs, in particular lowering fixed cost (e.g., fees for filing or minimally competent counsel) that render claims with small or negative expected net recovery value economically infeasible to bring as

Posner does not suggest that the pro-defendant bias in these scenarios results from the basic structure of the separate action process itself or that class action provides bias-free adjudication. Notably, we show that pro-defendant bias in these scenarios does not depend on a defendant's motivation to abuse the process or use of the collateral estoppel rule, but rather would arise in any event as it would in every other separation action scenario from the defendant's asymmetric investment advantage that leaves it with no economically rational alternative than to spend more, often overwhelmingly, than the plaintiff. *See* Sections 3.2, 3.3 and 3.5.

7 *See* Section 3.3.

8 *See* Section 3.4.

9 *See* Section 3.5.

10 *See* Sections 3.2 and 3.5.

11 *See* Section 2.2.2.

12 *See, e.g.* Posner (2011); *AT&T Mobility LLC v. Concepcion*, 131 S. Ct. 1740 (2011).

13 *Taylor v. Sturgell*, 128 S. Ct. 2161, 2171 (2008); *Ortiz v. Fibreboard Corporation*, 119 S. Ct. 2295, 2323 (1999). For commentary on the day-in-court norm, see Bone (2012); Solum (2004).

separate actions.[14] Beyond salvaging such "negative expected value" (NEV) claims, and consistent with the idealized conception of the separate action process, class action is seen as serving no needed function in adjudicating the balance of claims that are deemed economically viable as solo suits.[15] The conventional approach does not take into account several salient factors that imply pro-defendant biasing of separate action adjudication. In particular, no consideration is given to the fact that the defendant invests too; that the parties spend mostly on variable cost items, such as lawyers, discovery, and experts, investments they scale up and down based on their relative stake-driven incentives—aggregate for defendant; individual recovery for plaintiff—with corresponding variations in their respective odds of winning at trial; and that the parties interactively choose to optimize their respective variable-cost investments on the common questions, with each basing the decision on estimates of the amount and impact of the other's expenditure.[16]

In contrast to the conventional approach, our analysis demonstrates the indispensable role of class action in negating the defendants' structural investment advantage and providing bias-free adjudication for all common questions claims, not just those that are too small to bring as solo actions. To correct pro-defendant bias, class action will necessarily result in plaintiffs (and probably the defendant and court as well) spending much more—*more productively*—on variable cost goods than they would in the separate action process to develop the quality and maximize the trial prospects of their common question case for liability. Because the pro-defendant bias operates systemically to significantly devalue every type of common questions claim, the anti-bias function for class action is general; it applies regardless of whether the claim is or can be rendered economically feasible as a separate action. Contrary to the premise of the conventional approach that the ideal world would be one in which all claims could be brought as separate actions, we show that the opposite is true: the more that world becomes a reality the more adjudication of plaintiffs' claims will be biased against them.[17]

14 *See, e.g., Amchem Products, Inc. v. Windsor*, 521 U.S. 591, 616 (1997); *AT&T Mobility*, 131 S. Ct. at 1750 (suggesting that common question claims worth $4,000 each would not be sufficiently small to qualify for class action treatment); see also Posner (2011); Miller (1979); Miller (1998); Coffee (1987); Dam (1975); Galanter (1974); Kalven & Rosenfeld (1941).

15 *Amchem*, 521 U.S. at 615–16; *Wal-Mart Stores, Inc. v. Dukes*, 131 S. Ct. 2541, 2550 (2011).

16 *See, e.g., American Express Co. v. Italian Colors Restaurant*, 133 S. Ct. 2304, 2309, 2315 (2013) (Kagan, J dissenting) (conceding that the right of access to court overcomes only those litigation cost asymmetries favoring the defendant that categorically "foreclose . . . a plaintiff's opportunity to gain relief" not those that operate to "diminish" it)).

17 Thus, the Supreme Court in *American Express*, 133 S. Ct. at 2320, stumbled into the conventional pitfall when it recently endorsed replacing NEV-claim class actions with "non-class" procedures,

The article is organized as follows. In Section 2, we develop a general model of common question litigation and apply it to various separate action scenarios to demonstrate why and how the decentralized stakes and investment decisions in the idealized separate action process structurally biases adjudication in favor of defendants and then to the class action scenario of centralized stakes and investment decisions to show the bias-free nature of collective adjudication. In Section 3, we extend the analysis to show the pervasive effects of pro-defendant bias in paradigmatic situations involving increasing numbers of solo actions, sequential litigant expenditures, non-class procedural alternatives to class actions (including fee shifting, damage multipliers, and collateral estoppel), settlement, and bias-created NEV claims. In Section 4, we discuss the welfare implications of our findings in relation to the costs of litigation and the deterrence function of civil liability. Section 5 offers concluding remarks, including comments on the magnitude of structural bias on common question litigation in reality, and why and when it may be socially desirable for courts to mandate use of class action.[18]

2. MODEL AND BASIC ANALYSIS

We now present a model of common question litigation to explain and illustrate the pro-defendant structural bias in separate but not class actions.[19] In

such as fee-shifting, that would overcome fixed-cost barriers foreclosing plaintiffs from bringing separate actions, but would leave the plaintiff fully exposed to the pro-defendant biasing effects of asymmetric investments on variable costs. For discussion of this point, see Section 3.3.

18 This is not a brief for replacing the separate action process with class action. In making the general case for using class action, we aim to show only that centralization is the most cost-effective means for avoiding pro-defendant bias in the separate action (decentralized) process, not that the resulting benefits of bias-free adjudication tip the balance in favor of collectivization generally or in any particular type of common question litigation. Hence, we do not address such widely mooted criticisms of FRCP, Rule 23 class actions regarding the potential for imposing excessive management costs when individualized determinations are required to resolve non-common questions, see e.g., *Wal-Mart*, 131 S. Ct. at 2550; contravening plaintiffs' "autonomy" interest in having their "own day in court", *see e.g.*, *Ortiz*, 119 S. Ct. at 2323; leaving too much room in classes comprising heterogeneous claims for "sweetheart" settlement deals between class counsel and the defendant at the expense of class members, *id.*; and subjecting defendants to "in terrorem" pressure to settle weak claims, *see e.g.*, *AT&T Mobility*, 131 S. Ct. at 1751. For countering arguments that class action should be convened on a mandatory, no opt-out basis in all common questions litigations, see Rosenberg (2002b); that assertions of plaintiffs' interests in "autonomy" and having their "day in court" disregard contrary arguments from rational choice theory and overwhelming evidence of peoples' market expressed preferences for collectivization, *see id.*; that non-common questions should never preclude use of class action to determine the defendant's aggregate liability and damages, see Rosenberg (2002a, 2014); that the supposed "in terrorem" settlement pressure on defendants is a contrivance of selective analysis and in any event is readily eliminated by sampling, see Hay & Rosenberg (2000); and that the sweetheart settlement problem can be remedied by restructuring court-ordered fee awards, *see id.*

19 The solution to the general model is presented in the technical Appendix.

particular, the model posits two plaintiffs, Plaintiff 1 and Plaintiff 2, pursuing common question claims against a defendant where the probability that a plaintiff will win at trial depends on the expenditures of the three parties in litigation of the common questions presented.[20] All three litigants are assumed to be risk-neutral.[21] If a plaintiff prevails at trial, the court will award damages, x. We assume for simplicity that the damage award is fixed and commonly known by the litigants.[22] For the same reason, we ignore the possibilities of settlement, dismissal, and withdrawal of the claims, and assume that both claims are worth being and will be prosecuted to trial (settlement and NEV claims are considered in Sections 3.4 and 3.5).

The individual expenditures of the plaintiffs are given by c_1 and c_2, and the aggregate expenditures of the defendant are given by c_d. We will assume that the three litigants choose their expenditures simultaneously, without directly observing the choices made by each other (sequential investment decisions are considered in Section 3.2). The litigants fully understand the incentives created by this game, however, and therefore make rational conjectures or guesses about the likely investment decisions of the others. In the Nash equilibrium, each player chooses an investment level to maximize his or her net expected return from litigation, given his or her beliefs about the likely investments of the others.[23]

We show that the plaintiffs' incentives to invest are affected by two key factors. The first key factor is the extent to which the investments in one claim generate *spillover benefits*, improving the chance of success at trial for

20 The litigants generally are represented by attorneys. Our analysis ignores potential divergent interests between plaintiffs and their attorneys; unless otherwise specified, references to plaintiff should be taken as meaning the lawyer–client pair. For discussion of potential attorney-client "agency" problems on the plaintiff-side, *see infra* note 105 and accompanying text.

21 A risk-averse litigant would be willing to spend additional money to reduce the risk at trial. While this would complicate the analysis, it would not change the main forces and effects identified here.

22 For our running example, we specify the value of $x = \$180$. Alternatively, we could imagine that at trial a plaintiff's damage award is drawn at random from a commonly known distribution, and that x is the mean of that distribution. The results would be identical if instead of the fixed value of $180 the damages were given as $0 recovered 99 percent of the time and $18,000 the remaining one percent of the time.

23 That is, plaintiffs choose their investments to maximize their respective individual net return, the expected damage award minus the litigation cost, given their damages x and their expectations about the investment of the defendant. Similarly, the defendant chooses its expenditure to minimize its total payments (expected judgment plus legal expenditures) given its expectations about the investments of the plaintiffs. Although each party decides how much to invest without directly observing the choices made by the others (since by assumption the litigants choose their investments simultaneously), in the Nash equilibrium, the litigants' "guesses" about what the others will do are correct and thus they see no gain from a further unilateral change in their respective litigation strategies. For further explanation of the Nash Equilibrium, see Osborne (2003).

the other claim. The spillover factor reflects the degree to which information and the litigation work product becomes a matter of public record or is otherwise cheaply disseminated and available for use in litigating both claims. The second factor concerns the extent to which the plaintiffs' investment decisions are *centralized* in the sense that they are chosen to maximize the return from trial of both claims. The centralization factor reflects the extent to which the plaintiffs are legally constrained (e.g., by contract or court order) to coordinate their investments on the common questions and precluded from free riding on each other's work product. Because the defendant necessarily "owns" the defense interest in the outcome of the common question litigation, it naturally enjoys spillover benefits and centralizes its investment decision to maximize the return across the two claims.

We consider equilibrium incentives under several different litigation scenarios. To demonstrate that essential role of structural asymmetric investment incentives in systematically biasing adjudication in the defendant's favor, we initially examine the separate action scenario where there are no commonalities among the claims and hence no opportunities for either side to benefit from spillovers and centralized control on aggregate stake. Notably, we show that the symmetrical investment relationship between the parties and consequent bias-free adjudication in this scenario is identical to that which obtains in the class action scenario. We then consider the remaining scenarios involving common question claims, starting with plaintiffs pursuing separate actions independently ("*independent actions*"). To do this, we assume that there are no natural or practical means of effecting spillovers between the plaintiffs' claims and that the plaintiffs make decentralized investment choices to maximize their return from their respective claims.[24] Next, we consider a scenario where each plaintiff enjoys full costless spillovers from the work product of the other plaintiff but, as in the case of independent actions, plaintiffs make decentralized investment decisions solely to maximize individual returns on their respective claims ("*spillover actions*").[25] Finally, we consider the scenario where the plaintiffs enjoy full spillovers in their investment choices and also make their investment decisions on a centralized basis to maximize the joint, aggregate return ("*class action*").[26]

24 For example, discovery of the defendant's records by one plaintiff would not inure to the benefit of the other plaintiff who would have to spend equivalent resources for a similar discovery effort as a completely independent matter.

25 Thus, if one plaintiff hires and uses an expert witness, it would be to maximize the return on that plaintiff's claim alone; the other plaintiff would freely copy and use the expert's testimony.

26 Implicitly, we are imagining any case where the plaintiffs proceed "jointly", that is, where they overcome any free-riding challenges to centralized control, whether by contracting directly

2.1. Non-Common Question Litigation

Given that the two, one-off, independently prosecuted claims present no common questions in the benchmark scenario, neither the defendant nor the plaintiffs can exploit spillovers in the litigation. Moreover, because there are no common questions, the defendant like plaintiffs cannot benefit from centralized investment decisions. The probability that a plaintiff will prevail in a given case is simply $c_p/(c_p + c_d)$ where c_p is that plaintiff's expenditure and c_d is the expenditure of the defendant.[27] We will first explore the plaintiff's independent incentives to invest in litigation, taking as given the investment of the defendant. After doing this, we will explore the defendant's incentives to invest in litigation and the Nash equilibrium of the broader game.

Plaintiff Investment Incentives

How much money would a given plaintiff (e.g., Plaintiff 1) choose to invest in non-common question litigation? The plaintiff, would choose c_p to maximize his or her own net return from litigation,

$$\left(\frac{c_p}{c_p + c_d}\right)x - c_p. \tag{1}$$

The first term in this expression is the plaintiff's expected award at trial, the probability of winning $c_p/(c_p + c_d)$ multiplied by the expected damages x, and the second term is his or her litigation expenditure. Given the plaintiff's beliefs about the expenditures of the defendant, c_d (derived below) and the damages, x, the plaintiff will invest to the point where the marginal benefit of the investment, which is the increase in the expected damage award, is equal to the marginal cost.[28]

among themselves or indirectly through a common attorney, or by virtue of court-ordered consolidation or class action certification.

27 Note that as a plaintiff's legal expenditure c_p grows very large relative to the defendant's expenditures, the chance that that plaintiff will win approaches 100 percent. If $c_p = 990$ and $c_d = 10$, for example, then the probability the plaintiff prevails is 0.99. Similarly, in the limit as the defendant's expenditure, c_d, grows large relative to the plaintiffs' expenditure, the probability approaches zero. Here and throughout analysis of the model, we assume that the plaintiff's and defendant's investments have equal weight and effectiveness in producing the outcome of trial. Relaxing this assumption would have no general significance; it would allow for variations in the ratio of investments to probability of the trial outcome in particular common question litigations, but it would not change the basics of analysis and central conclusions we draw therefrom.

28 Taking the first derivative of the first term in expression (3) establishes that the marginal benefit of investment is $[c_d/(c_p + c_d)^2]x$. Setting this equal to 1, the marginal cost, and rearranging terms gives $c_p = \sqrt{c_d x} - c_d$. The more general derivation of this result is found in the technical Appendix.

Assuming that the damages in each claim are $x = 180$ and that the plaintiff expects that the defendant will spend against each plaintiff $c_d = 45$, this expression becomes $[c_p/(c_p + 45)]180 - c_p$. In this example, the plaintiff will choose to spend $c_p = 45$ as well, yielding a probability of prevailing of $45/(45 + 45) = 1/2$ and an expected payoff of $(1/2)(180) - 45 = 90 - 45 = 45$. To see why $c_p = 45$ is the optimal decision for a plaintiff, suppose instead that a plaintiff increased his or her spending by a dollar to $c_p = 46$. The benefit of this decision for the plaintiff is a slightly higher probability of prevailing at trial, $46/(46 + 45) \approx 0.5055$ versus 0.5000 and a correspondingly slightly higher expected award, 90.99 versus 90.00. But the marginal benefit, 0.99, is smaller than the marginal cost of that dollar of extra spending. Therefore, the plaintiff would not want to increase his or her spending above $c_p = 45$.[29] So if a plaintiff expects the defendant to spend $c_d = 45$, then the plaintiff will choose to spend $c_p = 45$ as well.

Defendant Investment Incentives

Now consider the investment incentives of the defendant. Suppose that the defendant expects that the plaintiff will invest c_p. The defendant's expected payments at trial are

$$\left(\frac{c_p}{c_p + c_d}\right)x + c_d \tag{2}$$

The first term reflects the expected damage payments at trial, and the second term is the defendant's litigation expenditure.[30]

Suppose that $x = 180$ and that the defendant expects the plaintiff to spend $c_p = 45$. From expression (4), the defendant's payments are $[45/(45 + c_d)]180 + c_d$. It is not difficult to see that $c_d = 45$ is the optimal expenditure for the defendant against each plaintiff, corresponding to total payments of $(1/2)(180) + 45 = 135$. Suppose instead that the defendant increased its expenditure by a dollar to $c_d = 46$. The benefit for the defendant is that the probability that each plaintiff would prevail would fall from 0.5000 to $45/(45 + 46) \approx 0.4945$, and the plaintiff's expected damage award would fall from 90.00 to 89.01. The marginal benefit for the defendant, the savings of 0.99, is smaller than the marginal cost of that extra dollar, so the defendant would not

29 An analogous argument establishes that the plaintiff would not lower the legal expenditure to, say, $c_p = 44$.

30 The defendant will want to minimize this expression, investing to the point where the marginal reduction in the expected damage awards, $[c_p/(c_p + c_d)^2]x$, equals the marginal cost, 1. Using simple calculus, one can show that $c_d = \sqrt{c_p x} - c_p$. Comparing this expression to the analogous expression for the plaintiff's optimal investment shows that the defendant has the same investment incentives as the plaintiff.

want to spend more than $c_d = 45$. It is straightforward to show that the defendant would not want to invest less than $c_d = 45$, either.

Nash Equilibrium

The investments $c_p = 45$ and $c_d = 45$ are, in fact, the unique Nash equilibrium of the game where $x = 180$ and the plaintiffs and the defendant all choose their investment levels independently and simultaneously. Believing that $c_d = 45$ then, as shown earlier, the plaintiff would rationally choose to invest $c_p = 45$. This investment maximizes the plaintiff's private returns from litigation. If the defendant believed that each of the plaintiffs would choose to invest $c_p = 45$, then the defendant would choose to invest $c_d = 45$ against each. These investments are mutually reinforcing, and are the predicted outcome of the game. The probability that a plaintiff will win at trial is 1/2.[31]

The upshot of this analysis is that a common defendant facing multiple non-common claims lacks centralized control over the stakes and investments across all claims, and therefore cannot wield bias-created superior litigation power against either plaintiff. This symmetry in the decentralized posture of the defendant and each plaintiff explains why separate action adjudication of non-common question claims is free of the pro-defendant bias that plagues the process when plaintiffs prosecute more than one common question claim on a decentralized basis.

2.2. Common Question Litigation in the Separate Action Context

We now turn our attention to common question litigation in the separate action context. We assume that only the defendant centralizes investment decisions to optimize its common defense across all claims, whereas plaintiffs invest on a decentralized basis to maximize returns from their respective claims. Thus, it is important to note, we are assuming throughout the discussion that the information and other beneficial work product generated by the defendant's investments in one claim are equally valuable in the other claim and, therefore, increase its likelihood of success to an equivalent degree in both claims. In other words, we assume that the defendant enjoys *positive investment spillovers* across the two claims. This is realistic in the sense that the defendant naturally knows and can use any information it obtains in litigating against either plaintiff.

In contrast, plaintiffs do not naturally benefit from spillovers in common question litigation. In many cases, it may be impractical for plaintiffs to know who among them is contemplating or has filed suit, or what information has been or is being generated in their respective cases. Positive spillovers between the

31 More generally in equilibrium, with non-common question litigation, a plaintiff will spend $c_p = x/4$ and the defendant will spend $c_d = x/4$.

plaintiffs may arise, however, in a variety of contexts, and may or may not require explicit cooperation or coordination between the plaintiffs. Even if the two claims are being pursued in separate actions, possibly even in different jurisdictions, spillovers may occur if the work product of one plaintiff becomes part of the public record and is, therefore, readily and cheaply available to the other plaintiff.

To account for the range of possibilities, we model separate action scenarios first on the assumption of no spillovers (independent action scenario) and then on full spillovers for plaintiffs (spillover action scenario). In the next section, we compare the separate action scenarios to the class action scenario in which plaintiffs and the defendant have equivalent opportunities to centralize control over their collective stakes, investment decisions, and spillovers across all claims in seeking maximum payoffs, respectively, from litigating the common questions.

2.2.1. Independent Action Scenario

We first consider common question litigation where the defendant enjoys full spillover and centralized investment benefits but plaintiffs do not; that is, there are no spillovers across the plaintiffs' claims and that the plaintiffs choose their investment strategies independently of each other.[32] If there are *no spillovers* between the plaintiffs' claims, higher investments by one plaintiff will have no effect on the other plaintiff's probability of success at trial on his or her claim. In this case, we assume that each plaintiff's probability of prevailing is simply the ratio of his or her own litigation spending to the sum of this expenditure and that of the defendant. In the case of no spillovers, the probabilities that Plaintiff 1 and Plaintiff 2 will win, p_1 and p_2, are given by:

$$p_1 = \frac{c_1}{c_1 + c_d} \quad \text{and} \quad p_2 = \frac{c_2}{c_2 + c_d}. \tag{3}$$

If the three litigants each spend the same amount on litigation, $c_1 = c_2 = c_d = 10$, for example, then the probability that each plaintiff will win is 50 percent.[33] A litigant could improve his or her odds by spending more money on the case, of course. If Plaintiff 1 raised his or her expenditure to $c_1 = 30$, say, then the likelihood of winning would rise to 75 percent (assuming that the defendant's investment remained at $c_d = 10$). Similarly, if the plaintiffs' investments remained at $c_1 = c_2 = 10$, the defendant could reduce the probability of being held liable to 25 percent by raising his or her litigation expenditure to $c_d = 30$.

32 Absent spillovers, there would be no benefit from coordination. The plaintiffs do as well making independent decisions to maximize their private returns in separate actions as they would in a consolidated proceeding.

33 This is equivalent to the common defendant behaving as if the plaintiffs were prosecuting non-common question rather than common question claims.

The fundamental structural bias favoring the defendant arises in unmitigated degree in the case without spillovers between the plaintiffs simply because it is rational for the defendant proceeding on a centralized basis against the plaintiffs to spend more than is rational for each plaintiff proceeding independently on a decentralized basis to spend in litigating the common questions. There is no mystery as to why this asymmetry in investment incentives arises. A given plaintiff invests optimally to maximize the payoff from his or her individual claim, while the defendant invests optimally to maximize its aggregate (class-wide) payoff across both claims. In the formal terms of the model, an extra dollar spent by the defendant has exactly one dollar's worth of impact in both claims 1 and 2. The plaintiffs, on the contrary, do not benefit from these spillovers; given the assumption of zero spillovers, each must fully duplicate the efforts of the other. To achieve a win rate of 50 percent, for example, the plaintiffs must spend in total, twice as much as the defendant, requiring each to invest far more than he or she would regard as individually rational.

To elaborate, we first explore the plaintiffs' independent incentives to invest in litigation, taking as given the investments of the defendant. After doing this, we will consider the defendant's incentives to invest in litigation and the Nash equilibrium of the broader game. We will see that the defendant has stronger aggregate incentives to invest than in non-common question litigation. Indeed, in our example with $x = 180$, the defendant's variable investment advantage will lead it to optimally spend $c_d = 80$, while the plaintiffs will optimally spend 40 each to achieve a 1/3 probability of succeeding at trial. Spending 80, the defendant minimizes its total expected liability at 120 (and total litigation related costs at 200), while each plaintiff maximizes his or her net expected recovery at 20. Compare the benchmark scenario in which all of the litigants proceeded on a decentralized basis without benefit of spillovers and each therefore spent $c_d = 45$ giving each plaintiff a 1/2 probability of success at trial, and the prospect of a net recovery of 45 and subjecting the defendant to total expected liability of 180 (and total litigation related costs at 270).

Plaintiff Investment Incentives

Following the logic of the previous section, Plaintiff 1 would choose c_1 to maximize his or her net return from litigation,[34]

$$\left(\frac{c_1}{c_1 + c_d}\right)x - c_1. \tag{4}$$

34 The plaintiff would invest $c_1 = \sqrt{c_d x} - c_d$.

Assuming that the damages are $x = 180$ and that the plaintiffs expect that the defendant will spend $c_d = 80$, this expression becomes $[c_1/(c_1 + 80)]180 - c_1$. Now the plaintiffs will choose to spend $c_p = 40$ each, yielding a probability of prevailing of $40/(40 + 80) = 1/3$ for each plaintiff and an expected net payoff of $(1/3)(180) - 40 = 60 - 40 = 20$. To see why $c_p = 40$ is the optimal decision for a plaintiff, suppose instead that a plaintiff increased his or her spending by a dollar to $c_p = 41$. The benefit of this decision for the plaintiff is a slightly higher probability of prevailing at trial, $41/(41 + 80) = 0.339$ versus 1/3 and a correspondingly slightly higher expected award, 60.99 versus 60. But the marginal benefit, 0.99, is smaller than the marginal cost of that dollar of extra spending. So if a plaintiff expects the defendant to spend $c_d = 80$, then the plaintiff will choose to spend $c_p = 40$.

Defendant Investment Incentives

Now consider the investment incentives of the defendant. Suppose that the defendant expects the two plaintiffs to invest the same amount each, $c_1 = c_2 = c_p$. The defendant's expected payments at trial are

$$2\left(\frac{c_p}{c_p + c_d}\right)x + c_d \tag{5}$$

The first term reflects the expected damage payments at trial to the two plaintiffs, $2[c_p/(c_p + c_d)]x$, and the second term is the defendant's litigation expenditure.[35] Comparing this expression to the analogous expression for the plaintiff's payoff function in expression (4), we see that the defendant will have stronger incentives to invest in litigation. Every dollar spent by the defendant has twice the impact on the defendant's payoff, as reflected by the multiplier 2 in front of the first term of expression (5).

Suppose that the defendant expects the plaintiffs to each spend $c_p = 40$. From expression (5), the defendant's total payments are $2[40/(40 + c_d)]180 + c_d$. $c_d = 80$ is the optimal expenditure for the defendant in this case, corresponding to total expected payments of $2(1/3)(180) + 80 = 200$. Suppose instead that the defendant increased his or her expenditure by a dollar to $c_d = 81$. The benefit for the defendant is that the probability that each plaintiff would prevail would fall from 1/3 to $40/(40 + 81) \approx 0.331$ and the corresponding sum of the plaintiffs'

35 The defendant will want to minimize this expression, investing to the point where the marginal reduction in the expected damage awards, $2[c_p/(c_p + c_d)^2]x$, equals the marginal cost, 1. Using simple calculus, one can show that $c_d = \sqrt{2c_p x} - c_p$. Comparing this expression to the analogous expression for the plaintiff's optimal investment shows that the defendant has stronger incentives to invest. This is because the defendant enjoys economies of scope across the two claims—hence the multiplier of 2 in this equation—and has the incentive to minimize his or her aggregate losses.

expected damage awards would fall from $2(1/3)(180) = 120$ to 119.01. The marginal benefit for the defendant, the savings of 0.99, is smaller than the marginal cost of that extra dollar, so the defendant would not want to spend more than $c_d = 80$.

Nash Equilibrium

The investments $c_1 = c_2 = 40$ and $c_d = 80$ are, in fact, the unique Nash equilibrium of the game where the plaintiffs and the defendant all choose their investment levels independently and simultaneously. If the plaintiff believed that $c_d = 80$ then they would rationally choose to invest $c_1 = c_2 = 40$. These investments maximize the plaintiffs' private returns from litigation. If the defendant believed that the plaintiffs would choose to invest $c_1 = c_2 = 40$, then the defendant would choose to invest $c_d = 80$. These investments are mutually reinforcing, and are the predicted outcome of the game. The probability that each plaintiff will win at trial is 1/3.[36]

It is important to emphasize once again that the defendant is at an advantage relative to the plaintiffs in this scenario. Although the litigation spending for the two sides is equal in this example, $c_d = 80$ for the defendant and $c_1 + c_2 = 40 + 40 = 80$ for the plaintiffs, the plaintiffs only prevail 1/3 of the time. The reason for this asymmetry is that the defendant exploits centralized stakes with the benefit-full spillovers to invest on an aggregate basis, more productively in litigating the common questions compared to each plaintiff who proceeds, if at all, without these crucial litigation advantages.

2.2.2. Spillover Action Scenario

It might be supposed that even though plaintiffs proceed independently on a decentralized basis, they nevertheless could overcome the pro-defendant bias of separate action adjudication if they have the benefit of full spillovers across their claims, say from costless free riding or sharing of work product. That surmise is mistaken. Assuming perfect, costless spillovers between the plaintiffs in this scenario, we show that a greater expenditure by Plaintiff 1 improves not only his or her odds of succeeding at trial but also to an equivalent degree the odds Plaintiff 2 prevailing in his or her lawsuit. But, the pro-defendant bias will persist to significantly distort potential outcomes. The total amount spent by the plaintiffs will yield the same common question work product that a plaintiff without spillover benefits would produce by investing that amount. In other

36 This is proven more generally in the Appendix. In the absence of spillovers, the plaintiffs will each spend $c_1 = c_2 = 2x/9$ in equilibrium and the defendant will spend $c_d = 4x/9$. Note that although in equilibrium the plaintiffs spend the same amount as the defendant in total, $c_1 + c_2 = 2x/9 = c_d$, the probability that each plaintiff wins is 1/3.

words, regardless whether the plaintiff is the one financing or free riding on the common question work product, neither will have an incentive to spend more in developing work product than would be optimal to maximize his or her individual claim.

Specifically, we assume that the probabilities that Plaintiff 1 and Plaintiff 2 will prevail at trial, p_1 and p_2, are given by:

$$p_1 = \frac{c_1 + c_2}{c_1 + c_2 + c_d} \text{ and } p_2 = \frac{c_1 + c_2}{c_1 + c_2 + c_d}. \quad (6)$$

The numerators in the expressions are the combined expenditures of the two plaintiffs, while the denominators are the aggregate expenditures of the three parties. Note that an extra dollar of spending by Plaintiff 1 bolsters the strength of Plaintiff 2's claim by just as much as it strengthens the case of Plaintiff 1. Similarly, additional spending by Plaintiff 2 improves the odds of Plaintiff 1.

Note further that in expression (6), the plaintiffs enjoy positive spillovers equivalent to those the defendant enjoys. Spillovers can certainly help to level the playing field between the plaintiffs and the defendant. Our earlier example without spillovers required each plaintiff to individually match the defendant's litigation spending in order to attain a win rate of 50 percent. To achieve parity, the plaintiffs would need to spend twice as much, in aggregate, as the defendant. With perfect spillovers, however, the plaintiffs can achieve the same win rate by each spending half as much as before. If the defendant spends $c_d = 10$, for example, the plaintiffs need only spend 5 each rather than the 10 that they each must spend in the absence of spillovers.

If the plaintiffs and defendant maintained their total level of spending as in the previous section with independently prosecuted actions, $c_1 = c_2 = 40$ and $c_d = 80$ then the outcome would be symmetric here: a plaintiff's probability of prevailing would be $(40 + 40)/(40 + 40 + 80) = 0.5$. The plaintiffs would prevail half of the time, and the defendant would prevail the other half of the time. This, however, will not be the equilibrium outcome. If plaintiffs fail to *centralize* their stakes and investment decisions and instead spend to maximize their claim-specific payoffs only, the total of their respective investments will fall short of what they could potentially recover in the *aggregate* and hence individually from litigating the common questions collectively.

Importantly, we show that a structural bias exists even when plaintiffs enjoy full spillovers between their claims. If the plaintiffs make their private investment decisions to maximize their individual returns rather than the aggregate return, then the plaintiffs will fail to internalize the full benefits of the spillovers. Suppose that in deciding how much to invest, Plaintiff 1 considers only his or her individual payoff, not the benefit that spending will have on Plaintiff 2. Since Plaintiff 1 would bear the entire cost of his or her investment but only

receive a share of the benefit, Plaintiff 1 will underinvest in litigation relative to maximizing the aggregate payoff, and his or her share of it. In other words, there would be a public goods problem where the plaintiffs choose to spend less than what they would consider to be collectively optimal. Notably, Plaintiff 2 who receives free work product will not convert the "savings" into a marginal investment on his or her individual claim that Plaintiff 1 would find uneconomical to make. In the model, and in reality, when plaintiffs invest independently, on a decentralized basis, the defendant will wield an investment advantage over each of them in separate actions because it centralizes defense expenditures on common questions to maximize the aggregate return across all claims it expects to face.

Plaintiff Investment Incentives

Proceeding as before, Plaintiff 1 will choose c_1 to maximize his or her net return from litigation,

$$\left(\frac{c_1 + c_2}{c_1 + c_2 + c_d}\right)x - c_1. \tag{7}$$

The first term in this expression is the plaintiff's expected award at trial, the probability of winning $(c_1 + c_2)/(c_1 + c_2 + c_d)$ multiplied by the damages x, and the second term is Plaintiff 1's litigation expenditure.[37]

Suppose, as we did in the previous section, that $x = 180$ the defendant spends $c_d = 80$ and the plaintiffs each spend $c_1 = c_2 = 40$, so each plaintiff's probability of prevailing is 0.5. The expected payoff for each plaintiff would be $(0.5)(180) - 40 = 90 - 40 = 50$ in this hypothetical, which is higher than in the case of independent actions. It is easy to see that this outcome is not sustainable. In particular, each plaintiff has a unilateral incentive to reduce his or her level of litigation spending below 40. In fact, if Plaintiff 1 believed that Plaintiff 2 would spend $c_2 = 40$ and that the defendant would spend $c_d = 80$, then *Plaintiff 1 would spend nothing at all*; he or she would free ride on the efforts of Plaintiff 2 and would contribute nothing at all to the class litigation effort. When Plaintiff 1 raises his or her expenditure from $c_1 = 0$ to $c_1 = 1$, the probability that Plaintiff 1 will win would rise from $40/(40 + 80) = 1/3 = 0.333$ to $41/(41 + 80) \approx 0.339$. Plaintiff 1's expected damage award is higher as well, 60.99 versus 60, but as

37 Setting the marginal benefit of investment equal to the marginal cost gives the optimal expenditure of Plaintiff 1, $c_1 = \sqrt{c_d x} - c_d - c_2$. Plaintiff 2 would have a symmetric investment level. Taken together, we see that Plaintiff 1 and Plaintiff 2 would jointly invest $c_1 + c_2 = \sqrt{c_d x} - c_d$. Since the plaintiff's expenditures are perfect substitutes for each other in the case of spillover actions, the marginal private benefit to Plaintiff 2 of increasing c_2 by one dollar depends on the plaintiffs' *aggregate expenditures*, $c_1 + c_2$, not on the *allocation of this amount* between the two plaintiffs. This is proven more generally in the Appendix.

before the marginal benefit, 0.99, is smaller than the marginal cost of that dollar of extra spending. So, to summarize, if Plaintiff 1 believed that Plaintiff 2 would spend $c_2 = 40$, then Plaintiff 1 would spend $c_1 = 0$.[38]

So how much would the plaintiffs choose to invest if $x = 180$ if they expect the defendant to spend $c_d = 80$? With perfect spillovers, there are in fact multiple equilibria of the game between the plaintiffs. It is certainly an equilibrium for Plaintiff 1 to spend $c_1 = 40$ and for Plaintiff 2 to spend nothing at all, as illustrated in the last paragraph. Indeed, there is a range of Nash equilibria, all with the property that $c_1 + c_2 = 40$. We will focus on the symmetric Nash equilibrium where $c_1 = c_2 = 20$ in the following discussion.[39]

Defendant Investment Incentives

Now consider the investment incentives of the defendant. Suppose that the defendant expects that the two plaintiffs will invest c_1 and c_2, so the defendant's total expected payments are

$$2\left(\frac{c_1 + c_2}{c_1 + c_2 + c_d}\right)x + c_d. \tag{8}$$

The first term reflects the expected damage payments at trial to the two plaintiffs, and the second term is the defendant's litigation expenditure.[40] Comparing expression (8) to expression (7), we see that the defendant's investment incentives are stronger than the plaintiffs' incentives. As before, this stems from the fact that the defendant reaps the gains from his or her investments in two lawsuits instead of just one.

When $c_1 = c_2 = 20$, so $c_1 + c_2 = 40$, the defendant's optimal litigation expenditure is $c_d = 80$, the same as in the case of independent actions.

38 What would Plaintiff 2 spend if he or she expected Plaintiff 1 to spend $c_1 = 0$? It is not hard to see that Plaintiff 2 would, in fact, spend $c_2 = 40$. When $c_1 = 0$, Plaintiff 2's expected net return at trial is $c_2/(c_2 + 80)]1800c_2$, so his or her incentives are identical to what they would be in the case of purely independent actions.

39 There is a theoretical justification for focusing on the symmetric outcome: when the litigation efforts of the two plaintiffs are close but not perfect substitutes for each other, there is a unique symmetric equilibrium of the game. In the limit as the investments become closer and closer substitutes, the equilibrium that converges to $c_1 = c_2 = 20$. In the technical Appendix, we show that when there are less-than-perfect spillovers, there is a unique equilibrium for where $c_1 = c_2 = 40/(1 + \theta)$ where $\theta < 1$ captures the degree of spillovers between the claims. When $\theta = 0$, then $c_1 = c_2 = 40$ as we saw in the case of independent actions. When θ approaches 1, so the litigation efforts of the two plaintiffs become closer substitutes for one another, the equilibrium outcome remains unique and converges to $c_1 = c_2 = 20$. In this sense, the existence of multiple equilibria when $\theta = 1$ is a knife-edged result. Therefore, we believe it makes sense to focus on the unique symmetric equilibrium with perfect spillovers.

40 The investment level that minimizes this expression is $c_d = \sqrt{2(c_1 + c_2)x} - (c_1 + c_2)$.

Although the plaintiffs enjoy perfect spillovers, doubling the return from one dollar of spending, they spend only half as much as they did under independent actions. These two effects exactly offset one another, and the defendant's incentives are unchanged; he or she chooses c_d to minimize his or her expected payments, $2[(20 + 20)/(20 + 20 + c_d)]x + c_d$, as before.

Nash Equilibrium

In the Nash equilibrium of our numerical example, the plaintiffs spend $c_1 = c_2 = 20$ and the defendant spends $c_d = 80$. With spillover actions, the plaintiffs jointly spend the same amount of money that just one plaintiff would have spent with an independent action. To put it another way, holding the expenditures of the defendant fixed, each plaintiff spends just half as much with spillover actions as they would under independent actions. The plaintiffs certainly benefit from the litigation cost savings, relative to the scenario with no spillovers at all.

But the outcome at trial remains asymmetric with the plaintiffs winning less than half the time. Indeed, the probability that a plaintiff will prevail, $(20 + 20)/(20 + 20 + 80) = 1/3$, is exactly the same as in the previous section on independent actions. The presence of perfect spillovers by itself does not eliminate the asymmetry between the plaintiffs and the defendant.[41] When the plaintiffs choose their investments on a decentralized basis to maximize their individual returns, there is a free rider problem where the plaintiffs invest too little (relative to what would be collectively optimal). The defendant retains a strategic advantage in litigation.

2.3. Class Action Scenario

With class actions, we assume that the plaintiffs enjoy the benefits from both perfect spillovers between the claims and centralizing the choice of legal expenditures c_1 and c_2 to maximize their aggregate net return from litigation.[42] Note that the plaintiffs spend more money here, in aggregate, than they did in

41 More generally, each plaintiff spends half of what they spent in the case of individual actions, $c_1 = c_2 = x/9$, while the defendant spends exactly the same amount as before, $c_d = 4x/9$. Since the aggregate spending of the plaintiffs is $c_1 + c_2 = 2x/9$, the probability that each plaintiff is unchanged from the previous case, 1/3.

42 It is shown in the Appendix that given damages x and defense spending c_d, the plaintiffs would jointly want to spend $c_1 + c_2 = \sqrt{2c_d x} - c_d$. The defendant would want to choose to spend $c_d = \sqrt{4c_p x} - 2c_p$ if he or she expects the plaintiffs to spend $c_1 = c_2 = c_p$. In the Nash equilibrium of the game, the plaintiffs spend $c_1 = c_2 = x/4$, so $c_1 + c_2 = x/2$, and the defendant spends the same amount, $c_d = x/2$.

the two previous common question scenarios. There is clear intuition for this result. With spillovers, the marginal incentive to invest in litigation is higher than in the case of no spillovers, since a dollar of spending raises the probability of winning in two lawsuits instead of one. Furthermore, with centralized decision making by the plaintiffs, the aggregated stakes focus investment incentives coherently on maximizing the aggregate, not claim-specific net expected payoff from litigating the common questions and the natural temptation of one plaintiff to free ride on the efforts of another—an important counterweight to plaintiffs' prospect of optimizing benefits in the case of spillover actions—is controlled. With perfect spillovers and centralized decision making in a class action, the playing field is leveled; the probability that the plaintiffs will prevail at trial is 1/2.

Plaintiff Investment Incentives

Suppose the plaintiffs choose their investments, c_1 and c_2, to maximize their joint expected return:

$$2\left(\frac{c_1 + c_2}{c_1 + c_2 + c_d}\right)x - c_1 - c_2. \tag{9}$$

Suppose, as in the previous two sections, that $x = 180$ and the defendant spends $c_d = 80$. If the plaintiffs each spend $c_1 = c_2 = 40$ each plaintiff's probability of prevailing would be $(40 + 40)/(40 + 40 + 80) = 0.5$. The expected collective payoff for the plaintiffs $2(0.5)(180) - 40 - 40 = 180 - 80 = 100$ in this numerical example. In contrast to the logic of the previous section on spillover actions which explored individual incentives and showed that the plaintiffs would *reduce their individual spending below* $c_1 = c_2 = 40$, now the two plaintiffs have a collective incentive to *raise their aggregate level of litigation spending above* $c_1 + c_2 = 80$. To see why, suppose that $c_1 + c_2 = 81$. The probability that a plaintiff will prevail at trial is now $(81)/(81 + 80) \approx 0.503 > 0.5$. The expected damage awards for the two plaintiffs would then rise from $2 \times (0.5)(180) = 180$ to $2 \times (0.503)(180) = 181.1$. The marginal increase in the expected damage award, 1.1, exceeds the marginal cost of the extra dollar of litigation spending. So if the plaintiffs expect the defendant to spend $c_d = 80$, the plaintiffs would want to spend more than 80, in aggregate. In fact, the plaintiffs would raise their collective investments to almost 90 here.[43]

43 The plaintiffs would spend $c_1 + c_2 = \sqrt{2c_d x} - c_d = \sqrt{2 * 80 * 180} - 80 \cong 89.7$.

Defendant Investment Incentives

As in the previous sections, the defendant chooses his or her investment to minimize his or her total expected payments,

$$2\left(\frac{c_1 + c_2}{c_1 + c_2 + c_d}\right)x + c_d. \tag{10}$$

Note that this expression is exactly the same as expression (8) for spillover actions. He or she will choose to invest to the point where the marginal benefit of that investment, the reduction in the probability that the plaintiffs will prevail multiplied by the damage award, is exactly offset by the marginal cost.

Although expression (10) is the same as before, it should be clear that defendant's expenditures are likely to differ. With spillover actions, we verified that in the Nash equilibrium, the plaintiffs would choose to invest $c_1 + c_2 = 40$ and the defendant invested $c_d = 80$. With class actions, the plaintiffs are likely to invest significantly more. Suppose that the defendant expects the plaintiffs to spend $c_1 + c_2 = 90$. Would the defendant want to spend more than $c_d = 80$? If the defendant raised his or her expenditure from 80 to 90, the probability that a plaintiff will prevail falls from 53 percent to 50 percent. The corresponding expected damage payments would fall from $2(0.53)(180) \cong 191$ to $2(0.5)(180) = 180$. The benefit for the defendant, a reduction in the damage award of almost 11, outweighs the additional cost. One can verify that $c_d = 90$ is the optimal level of investment for the defendant in this case.

Nash Equilibrium

When the plaintiffs form a class action, the Nash equilibrium of the contest between the defendant and the two plaintiffs leads to an equilibrium where the plaintiffs spend $c_1 + c_2 = 90$ and the defendant spends $c_d = 90$.[44] Knowing that the plaintiffs have an incentive to spend more in a class action than in the previous case of a spillover action defendant increases its expenditures too.[45] It follows that a plaintiff's likelihood of winning at trial is equal to 1/2.[46] And,

44 With perfect spillovers and joint decision-making, we have that $c_1 + c_2 = 90$ is jointly optimal for the plaintiffs. They may achieve this in a variety of ways, including contractual obligations between the two plaintiffs or by a formal joinder with limitations on the ability of a player to opt-out. The allocation of litigation costs, $c_1 + c_2 = 90$, between the two players would be the subject of negotiation.

45 The defendant's best response or reaction curve is upward sloping in the relevant range, suggesting strategic complementarity of the investment decisions.

46 Our lottery contest success function is symmetric in its treatment of plaintiffs and defendants, leading to a fifty percent win rate when plaintiffs succeed in obtaining class action certification of their claims. However, our model can incorporate an asymmetric contest success function. The framework can be adapted to situations where the baseline likelihood of winning differs from fifty

Table 1. Summary of results for two plaintiffs

		Aggregate Litigation Expenditures		Plaintiff Win Rate	Net Return (average per claim)	
		Plaintiffs	Defendant		Plaintiffs	Defendant
Non-Common Question Litigation		45×2 = 90	90	50%	45	– 135
Common Question Litigation	Independent Actions	40×2 = 80	80	33%	20	– 100
	Spillover Actions	20×2 = 40	80	33%	40	– 100
	Class Actions	45×2 = 90	90	50%	45	– 135

thus, as depicted in Table 1, marshaling perfect spillovers and centralized class-wide decision making, the plaintiffs are no longer at a strategic disadvantage relative to the defendant.[47]

Table 1 summarizes the results elaborated in this section for the example where $x = 180$.

3. EXTENSION OF BASIC ANALYSIS

In this section, the model will incorporate more realistic assumptions to show the extent of pro-defendant bias in the separate action process. In order of consideration, we examine biasing effects under generally prevailing conditions of common question litigation, in particular increasing numbers of solo actions, sequential expenditures on litigation, non-class procedural alternatives to class action, settlement, and the potential for NEV claims. Application of the basic analytic powers of the model to the real world dynamics of common question litigation (which are conventionally ignored) in these contexts demonstrates not merely that pro-defendant biasing effects pervade the system of separate action adjudication, but that, relative to the stylized world of common

percent without changing the qualitative nature of our results. Suppose that the plaintiffs' claims were substantively frivolous in the sense that with equal expenditures by the parties, the plaintiff's likelihood of winning is remote. We can address this by reinterpreting the expected damages, x, to include a baseline level of quality of the plaintiffs' claims. So, expected damages of $180 may in fact represent a ten percent chance of winning $1,800 but none of our results would change. If the probability of winning $1,800 was instead one percent, however, then the expected damages would be $18 instead of $180. Since the stakes of the claim are only 1/10 of their original value, then as described above the equilibrium expenditures would be 1/10 as large. So our model implies that frivolous claims with low expected damages correspond to lower levels of litigation spending.

47 It is important to note, however, that relative to spillover actions, the incremental spending is much higher for the plaintiffs than for the defendant. In the example, plaintiffs spend a total of 50 more with class actions, compared to the defendant's incremental expenditure of 10. This is a general result due to the first-order effect from plaintiffs overcoming structural barriers to their fully capturing the benefits from spillovers and centralized investment decisions.

question litigation, we considered in Section 2, the biasing force can be magnified at the defendant's option, as an unintended consequence of procedural reform, or simply as a matter of course in reality.

3.1. More Plaintiffs Suing Separately Means More Structural Bias Against Them

It is not difficult to see that as the number of plaintiffs suing separately increases, so does the intensity of structural bias against them. That is, as the number of plaintiffs becomes large, the plaintiffs' claims become essentially worthless. Suppose that there are 100 plaintiffs in total instead of just two pursuing common question claims independently in separate actions.[48] As before, each plaintiff has a claim with damages of 180.[49] If the defendant expected the plaintiffs to spend 40 each as they did before, the defendant would spend over 800 defending against the claims. The defendant's incentive to spend is stronger since every dollar spent impacts the outcome of 100 cases instead of just 2. Anticipating that the defendant's incentives to invest are stronger than before, the plaintiffs will scale back on their individual investments. In the new Nash equilibrium, summarized in Table 2, the plaintiffs spend about 1.8 each and the defendant spends approximately 176. The probability that a plaintiff will win at trial is about 1 percent, much lower than before, and a plaintiff's net return is negligible, just under 0.02.[50]

48 Hypothesizing 100 common question claims is realistic, *see, e.g.*, Magnunson-Moss Act 15 U.S.C. §§ 2304, 2310 (d)(3) setting minimum standards for consumer warranties and authorizing their enforcement by class action brought by 100 or more named plaintiffs as class representatives. Common question litigations frequently involve large numbers of claims. See Conte & Newberg (2002) (reporting that Rule 23 is frequently invoked to certify classes numbering in the hundreds, or thousands, or even millions).

49 Suppose there are N plaintiffs with damages of x each. As before, if a plaintiff believes that the defendant will spend c_d, the plaintiff will spend $c_p = \sqrt{c_d x} - c_d$. If the defendant expects that the plaintiffs will spend $c_1 = c_2 = \cdots = c_N = c_p$, then the defendant will spend $c_d = \sqrt{N c_p x} - c_p$. Solving these equations simultaneously gives $c_d = [N/(N+1)]^2 x$ and $c_p = [N/(N+1)^2]x$. The plaintiff win rate is $1/(1+N)$ and a plaintiff's net return is $x/(1+N)^2$.

50 The plaintiffs are better off with spillover actions, since they will spread the litigation costs among themselves in equilibrium. Instead of spending $[N/(N+1)^2]x$ each, they will each spend $[1/(N+1)^2]x$. The defendant's expenditure is the same as for independent actions, $c_d = [N/(N+1)]^2 x$. The plaintiff win rate is still $1/(1+N)$ but a plaintiff's net return is higher, $Nx/(1+N)^2$. When $N=9$, the plaintiff's net return is 16.2. When $N=99$, the plaintiff's net return would fall to 1.8.

Note we are assuming the parties' investment is variable, they can be scaled up or down (continuously in model) and hence there are no absolutely or practically fixed-cost barriers. In the more realistic case where such barriers exist, but do not themselves preclude solo action, the magnification of pro-defendant bias can operate or be exploited by the defendant to drive any claim, however much it might otherwise be economically viable as a solo action, below such barriers to foreclose suit altogether. *See* Section 3. 5.

Table 2. Summary of results for 100 plaintiffs

		Aggregate Litigation Expenditures		Plaintiff Win Rate	Net Return (average per claim)	
		Plaintiffs	Defendant		Plaintiffs	Defendant
Non-Common Question Litigation		45×100 = 4500	4,500	50%	45	– 135
Common Question Litigation	Independent Actions	1.76×100 = 176	176	1%	.02	– 3.5
	Spillover Actions	.0176×100 = 1.76	176	1%	1.7	– 3.5
	Class Action	4,500	4,500	50%	45	– 135

3.2. The Timing of Litigation Expenditures

The main analysis of our article assumes that the parties, the plaintiffs and the defendant, all chose their litigation expenditures simultaneously in the separate action scenarios. This section explores what would happen if we still assume full spillovers, but allow the litigants to choose their expenditures in sequence. Two alternatives will be explored: first, the defendant commits to its expenditures before plaintiffs do; second, plaintiffs pursue phased investment strategies amongst themselves. Our central conclusions are that sequential expenditures will not abate, but rather probably will aggravate the pro-defendant biasing effects. When the defendant pursues a phased investment strategy, spending or credibly threatening to spend before the plaintiffs, it can completely destroy the value of their claims. Allowing sequential spending by plaintiffs can yield various outcomes (depending on the assumption of just one or, more realistically, multiple rounds of spending) relative to the pro-defendant biasing effects under simultaneous investments that will not make them better off, but rather in all likelihood make them worse off.

3.2.1. Defendant Sinks Litigation Expenditures First

Recall that with common-question litigation with the parties investing simultaneously, the defendant was at a structural advantage when the plaintiffs engaged in independent or spillover separate actions. With independent actions, for example, the plaintiffs spent $c_p = 40$ each and the defendant spent $c_d = 80$, yielding a probability of winning of 1/3. The defendant's total payments were (1/3) (180) + (1/3) (180) + 80 = 200, and the net return of each plaintiff was (1/3)(180) – 40 = 20. With spillovers, the defendant's total payments remain the same at 200, but the net return of each plaintiff was (1/3) (180) – 20 = 40.

When the parties invest sequentially, however, the defendant's structural advantage in common question litigation becomes even stronger. If it actually does or credibly threatens (e.g., by agreement with a liability insurer) to sink its litigation expenditures before plaintiffs make any significant investments, the

defendant would rationally raise its level of spending dramatically, in the example by investing $c_d = 180$ instead of 80. Such a show of strength on the part of the defendant would render the plaintiffs' investments worthless, and neither would spend anything at all.[51] The defendant's total payments, the litigation expenditures of 180 with no additional liability, are smaller than its total payments with simultaneous investments, 200. Thus, the defendant can achieve a first-mover advantage in common question litigation with independent and spillover actions.[52]

Given that the vast majority of common question litigations involve a large number of would-be claimants—too many for voluntary coordination or joinder to be practical—and as such present the paradigmatic case for collectivized adjudication, it is useful to emphasize that the defendant has no sequential investment advantage when the plaintiffs pursue their cases in a class action. Recall that with simultaneous investments, the defendant spent $c_d = 90$ and the plaintiff class spent $c_1 + c_2 = 90$. If the defendant were to commit to spend $c_d = 180$ in a class action, the plaintiffs would respond by lowering their centralized joint investment to approximately 76, not all the way down to zero. The benefit to the defendant from the reduced liability would fall far short of the 90 in additional investment costs, precluding it from initiating the "first-mover" strategy. Intuitively, with a class action, the plaintiffs choose their investments cooperatively to maximize their joint return. As a consequence, the plaintiffs are less inclined to back off when the defendant takes aggressive actions, negating the incentives of the defendant to take aggressive actions to begin with.[53]

3.2.2. Plaintiffs Choose their Litigation Expenditures in Sequence

Plaintiffs choosing their investments simultaneously is admittedly a strong assumption. In practice, common question claims, for example, asserting

51 If the plaintiff spent $c_p = 0$, the probability of winning would be $0/(0 + 180) = 0$ and the plaintiff's net return would be 0 as well. If the plaintiff invested even a modest amount, say $c_p = 10$, the net return would be negative. The probability of winning would rise from 0% to $10/(10 + 180) = 5.3\%$ and the expected damage award would rise to 9.7, but this benefit is smaller than the additional cost so the plaintiff will spend zero. One can show this result generally. Anticipating that the plaintiffs will spend $c_1 = c_2 = \sqrt{c_d x} - c_d$, the defendant will choose its expenditure to minimize total payments, $2[(\sqrt{c_d x} - c_d)/\sqrt{c_d x}]x + c_d = 2(x - \sqrt{c_d x}) + c_d$. The derivative of the first term, $\sqrt{x/c_d}$, is the marginal benefit of investment and the marginal cost is one. This marginal benefit is smaller than one for all $c_d < x$. Therefore, the defendant would invest $c_d = x$ and the plaintiffs will invest $c_1 + c_2 = 0$.

52 The asbestos and cigarette litigations are the most well-known examples of defendants sinking outsized investments to project an unassailable defense, and prove its overpowering force against any plaintiff foolhardy enough to file a claim. *See* Kluger (1997); Rosenberg (1985); *see also* Report (1999).

53 It can be shown that with class actions, the sequence of moves has no effect on the equilibrium outcome. The defendant spends $c_d = x/2$ and the plaintiffs spend $c_1 + c_2 = x/2$ as well.

products liability, usually accrue and are often commenced sequentially. Moreover, even in cases with simultaneous actions, plaintiffs can often control the timing of their investment decisions. To consider the more realistic case of serial litigation, we assume that plaintiffs in separate actions with full spillovers sequence their investments and analyze what if any the implications such strategic interplay between plaintiffs might have for the defendant's litigation advantage from its asymmetric centralized classwide stake and incentives.

Take the simplest situation where Plaintiff 1 must commit to an investment c_1 first, before Plaintiff 2 commits to invest c_2. How would Plaintiff 1 exploit this "first-mover" opportunity to maximize his or her litigation payoff, and how would doing so effect the degree of pro-defendant bias against both plaintiffs? With spillover actions, recall that if $c_d = 80$ then the plaintiffs, choosing investments simultaneously, would invest $c_1 + c_2 = 40$, resulting in a 33 percent chance of each winning 180 at trial. Multiple equilibria could arise in this situation satisfying the property that $c_1 + c_2 = 40$, but we focused on the symmetric Nash equilibrium where each plaintiff spent 20.[54] If Plaintiff 1 could move first in this scenario, committing its investment before Plaintiff 2, then Plaintiff 1 would commit to invest nothing at all, $c_1 = 0$. Plaintiff 1 would do this rationally, anticipating correctly a work product windfall when Plaintiff 2's turn came to invest, because he or she will optimally spend $c_2 = 40$. In other words, when investing sequentially in the spillover scenario, the first plaintiff would choose to free-ride on the efforts of the second plaintiff.[55] Thus, whether they spend a total of 40 sequentially rather than simultaneously against the defendant's investment of 80, plaintiffs' prospects at trial remain the same with each having a 33 percent chance of separately winning 180. Although having the first-mover opportunity certainly benefits Plaintiff 1 in costlessly exploiting Plaintiff 2's investment, the resulting structural bias in the adjudication of common question claims and the detrimental social consequences for deterrence and compensation are unchanged.

Now consider the still more realistic situation in which we relax the assumption that each plaintiff has exactly one opportunity to invest—Plaintiff 1 moved first to make a binding and irreversible investment of c_1 and then Plaintiff 2 chooses to invest c_2, at which point the game ended. Suppose instead the first plaintiff could revise his or her investment decision after seeing what the second plaintiff did, and the second plaintiff could do likewise after seeing the reaction of the first plaintiff, and so on and so forth. Interesting investment dynamics emerge from this altogether realistic interactive decision making. The plaintiffs

54 There are also mixed-strategy equilibria.

55 This would, in fact, be the unique subgame perfect equilibrium of the game.

might try to jockey to be in the position of investing nothing or at least less than the optimal amount, each attempting to free-ride on the investments of the other. The game would resemble "chicken", where each plaintiff hopes that the other will "flinch" first, and invest heavily in developing the common question case for liability, with the results ranging between both investing up to 40 each or nothing at all. If, however, some time constraint, like the running of a limitations period, forced plaintiffs to an "eleventh hour" choice, marking the very last chance for them to invest, then the situation would resemble the one explored earlier of simultaneous spending. In any case, the defendant would maintain its structural advantage in separate actions with spillovers, including its first-mover option to sink a large, forbidding investment.

3.3. Non-class Procedural Alternatives to Class Action

In *American Express*, the Court underscored the requirement that courts should determine the superiority of class action relative to other available methods for adjudicating common question claims.[56] In particular, the Court indicated that the problem of fixed-cost barriers to solo actions (individual arbitrations in *American Express*) could be addressed through the use of non-class procedures instead of class action. It suggested, for example, that the prohibitive cost for minimally competent counsel (or for key expert testimony) could be overcome by using a fee-shift rule, presumably operating one-way imposing a winning plaintiff's costs on the defendant.[57] In addition, courts and commentators have suggested using punitive or other enhanced damage awards[58] and collateral estoppel[59] as non-class procedural alternatives. However, exemplifying the

56 See FRCP, Rule 23(b) (3) (conditioning certification on a finding that "class action is superior to other available methods for the fair and efficient adjudication of the controversy").

57 *Id.* at 2318 (Kagan, J. dissenting). The Court also suggested mechanisms that would spread the expense of a relatively fixed cost across all claims. However, as we have shown in considering the separate action spillover scenario, such procedures reduce the costs for plaintiffs to bring solo suits, but still leave them at the mercy of the defendant's bias-created superior litigation power, which grows ever stronger as each additional plaintiff files suit. Thus, a defendant might voluntarily adopt a non-class alternative, for example by waiving a filing fee or providing plaintiffs with free access to a comprehensive discovery-document repository, that would not only defeat class certification and sustain its superior litigation power over plaintiffs, but also garner plaudits for its seeming generosity. See Korn & Rosenberg (2013) (noting that the defendant could even increase its investment advantage by voluntarily adopting a rule shifting costs to a winning plaintiff).

58 *See, e.g.*, Hylton (2007); Nagareda (2002).

59 *See, e.g.*, Bone (1992); George (1980) (proposing non-mutual, offensive issue preclusion as alternative to class action); *Katz v. Carte Blanche Corp.*, 496 F. 2d 747 (3rd Cir. 1974); cf., *Hardy v. Johns-Manville Sales Corp.*, 681 F.2d 334, 348 (5th Cir. 1982) (denying application of non-mutual, offensive issue preclusion where it was unclear whether the prior ruling actually resolved the issue for which preclusion is being asserted).

conventional approach, the Court and commentators alike never take account of the brute relevant fact of litigation, the defendant's centralized investment advantage. Hence, the Court has failed to recognize that even if these non-class mechanisms overcome the fixed-cost barrier, all nonetheless leave the pro-defendant bias in place. Moreover, by raising the amount at stake in the solo action, the non-class procedures may operate or enable defendants to magnify its force.

3.3.1. *Fee-Shifting.*

We start by assuming a one-way fee-shift rule taxing the defendant for "reasonable" legal fees and expenses incurred by the winning plaintiff.[60] Under this rule, both litigants have a stronger relative incentive to invest than they would under the American style rule. To see why, let us reconsider the separate action scenario with two plaintiffs. Assuming that the plaintiffs will spend the same amount, $c_1 = c_2 = c_p$, the defendant will respond by choosing its investment to minimize it total exposure,

$$2\left(\frac{c_p}{c_p + c_d}\right)(x + c_p) + c_d. \tag{11}$$

Comparing this expression to expression (5) shows that the fee-shift rule has increased the stakes of litigation for the defendant. If the defendant loses, it must pay c_p to each plaintiff in addition to the damages x. As a consequence, the defendant has a natural incentive to spend more so as to avoid this loss.[61]

Now consider the plaintiffs. Plaintiff 1 will choose his or her expenditures to maximize:

$$\left(\frac{c_1}{c_1 + c_d}\right)x - \left(\frac{c_d}{c_1 + c_d}\right)c_1. \tag{12}$$

If the plaintiff wins, he or she receives the damages x and does not bear any litigation costs—these costs are externalized to the defendant. If the plaintiff loses, the litigation costs are not shifted so the plaintiff loses c_1 in this case.

60 We ignore the parties' costs of litigating questions relating to the court's computation and award of the reimbursable amount. Use of fee-shifting rules by US courts typically depends on express authorization by statute or contract between the parties. *See*, *Alyeska Pipeline Service Company v. Wilderness Society*, 421 U.S. 240 (1975). For examples of statutes authorizing one-way fee-shifting in favor of plaintiffs, see 28 U.S.C. §1988 (b) (authorizing attorney fee awards to plaintiffs who prevail in civil rights actions against USA); Magnunson-Moss Warranty Act, 15 U.S.C. § 2310 (requiring defendant in consumer warranty action to reimburse prevailing plaintiff's attorney fees and other legal costs).

61 The defendant will spend $c_d = \sqrt{2c_p(x + c_p)} - c_p$.

These two terms can be combined, and the plaintiff's net return can be rewritten as:

$$\left(\frac{c_1}{c_1 + c_d}\right)(x - c_d). \tag{13}$$

Importantly, the pro-defendant bias is not eliminated with the one-way fee shift rule. As in Section 2, suppose that the damages are $x = 180$ and suppose further that in view of the individual-recovery stake, the court establishes that up to $c_p = 40$ can be "reasonably" shifted from a winning plaintiff to the losing defendant.[62] (Recall that $c_p = 40$ was the amount spent by each plaintiff in the separate action scenario without fee shifting.) The defendant, knowing that he or she will need to pay the plaintiffs' litigation costs in the event of losing, will spend $c_d = 93$ which is higher than in the separate action scenario.[63] Note that the bias in favor of the defendant is even larger than before, since the probability that the plaintiffs win is $40/(40 + 93) = 0.30$.[64]

More often, fee-shift rules operate bi-laterally, on a two-way basis.[65] We note that the fixed-cost barriers that come most readily to mind, the hard-and-fast, court or statutorily pre-set fees for filing, transcript preparation, process servers, and the like are routinely shifted from the winning to the losing party pursuant to governing procedural rules and consequently such costs are less likely on their own (in the absence of the pro-defendant bias) to foreclose solo action

62 In the absence of a "reasonable" expenditure cap, the potential for increased (and possibly excessive) spending by the plaintiff is evident: When $x - c_d > 0$, or in our example when $c_d < x = 180$, then the plaintiff's returns from spending an extra dollar are positive and so the plaintiff would be inclined to spend without bound. When $x - c_d < 0$, however, the plaintiff's returns from spending an extra dollar are negative and the plaintiff would spend nothing.

63 The plaintiff's net return is 26, which is higher than before, and the defendant's return per claim is –113, so deterrence is stronger than before. The plaintiff would not spend more than 40. In the pure separate action scenario without fee shifting in Section 2, if the defendant spent 93, the plaintiff would spend 36.

64 Suppose instead that the court found it reasonable for winning plaintiffs to shift up to $c_p = 90$ to the losing defendant, which is the level of their investment in the class action scenario. The defendant would spend $c_d = 130$ and the probability that the plaintiffs win would rise to 0.41. If, in the absence of a reasonable expenditure cap, the plaintiffs could shift all their expenses, then three litigants would each spend $c_1 = c_2 = c_d = 180$. (When $c_d = 180$ the plaintiffs are exactly indifferent over their own level of spending.) Interestingly, although the probability of winning will be fifty percent in this case, this fee shift rule is not in the plaintiffs' interest since their net payoff is zero. Although the plaintiffs achieve a win rate that is higher than would occur without fee shifting, their costs of litigation are four times as great. Moreover, as discussed earlier, if the defendant could commit to sinking its investments first, then by spending just over 180 the defendant can get the plaintiffs to essentially drop their claims altogether.

65 *See, e.g.*, *Christianburg Garment Co. v. EEOC*, 434 U.S. 412 (1978).

than commonly assumed.[66] Consistent with the general feature of a loser-pays rule, the two-way rule increases the stakes and incentives to invest, but it also has the effect that every dollar of spending by one party is at least in part externalized to the other with the consequence of magnifying the pro-defendant bias. Recall that the defendant in the separate action scenarios played out in Section 3 was at a strategic advantage and outspent each plaintiff, lowering his or her win rate to 33 percent. Given this advantage, the defendant would surely have an incentive to invest an additional dollar because there is a 67 percent chance that plaintiff will lose in which case the extra dollar will be shifted to the plaintiff. In other words, with a 67 percent chance of winning, the defendant effectively pays only thirty-three cents for every dollar it spends on litigation—an "investment subsidy" of 67 percent. The plaintiffs will spend more as well, since their costs will be shifted to the defendant 33 percent of the time. Given the defendant's greater marginal investment incentive, the fee-shifting rule magnifies the effect of structural bias driving each plaintiff's win rate below 33 percent. The skew may become even more pronounced with increasing filings of solo actions. With 100 plaintiffs and a plaintiff win rate of 1 percent, the defendant's average one cent per dollar cost would greatly increase its relative marginal incentive to invest and accordingly, the structural bias in its favor.

3.3.2. Enhanced Damages

Multiplying the award of damages by some factor, for punitive or other special reasons or generally as with treble damages in antitrust cases, provides another non-class means of preventing solo actions from being foreclosed by relatively high fixed-cost barriers to suit. In the strict terms of the model, if the stakes were to double, then the equilibrium litigation expenditures of the plaintiffs and defendant would double as well. This is simply another example in litigation of the natural inclination of investors to spend more money on the margin when the value of the asset, for litigants the claim in question, grows larger. Since the two sides spend proportionally more, the likelihood that the plaintiffs win remains at 33 percent with separate actions. We conclude that multiplying damages will not significantly affect the level of pro-defendant bias that plaintiffs would otherwise face. Note, however, that deterrence may be promoted as

66 *See Taniquchi v. Kan Pacific Saipan, Ltd.* 132 S. Ct. 1997 (2012) (listing among the costs taxable against the losing party under FRCP, Rule 54(d), clerk, court reporter, and docket fees; printing, witness travel, and document exemplification and copying expenses; and court-appointed expert compensation.). To be sure, cost-shifting does not guarantee access for the very small claim. It will depend on its provable merits. For example, a $30 claim will not benefit from exercise of the cost-shifting rule to overcome the federal district court filing fee of $350 under 28 U.S.C. § 1914, unless the plaintiff's likelihood of winning at trial exceeds 92 percent.

the defendant will bear greater liability and litigation cost than it would in the absence of the damage multiplier.[67]

Under still more realistic assumptions, however, the defendant may wield its structurally endowed investment advantage to magnify the bias against plaintiffs. Given that in the real world the quality of a litigation good like assistance of counsel will vary with price, it is likely that the defendant with classwide investment incentives will derive disproportionately greater benefit from paying a premium compared to the individual plaintiff constrained by the expected value of his or her claim. Moreover, as we have shown, the defendant's biased advantage increases greatly with the number of plaintiffs bringing solo actions, and can become absolutely preemptive if the defendant sinks a large expenditure in preparation of the common defense before plaintiffs make their respective investments.

3.3.3. *Collateral Estoppel*

The version of collateral estoppel known as non-mutual offensive issue preclusion has, since receiving Supreme Court endorsement,[68] been advanced as a non-class alternative to class action. Pursuant to this rule of preclusion, a common defendant who litigates and loses a common question claim is thereafter precluded from relitigating the common issue (question) resolved by the prior case in actions subsequently brought by non-party plaintiffs. The virtue of this procedure as a non-class alternative is its operation as a formal means for plaintiffs to free-ride on each other's work product that enables, and indeed, strongly motivates their bringing solo actions.[69] Thus, although offensive issue preclusion resembles class action in extending binding effects of a judgment against (though not in favor of) the defendant secured by one plaintiff to benefit all non-party plaintiffs, it differs in all of the essential ways that structure collective adjudication to be bias free, while incorporating the features of the separate action process that stack it in defendant's favor. In short, because offensive issue preclusion entails numerous plaintiffs prosecuting their common question claims in separate actions, this collateral estoppel rule does not per force diminish the defendant's asymmetric investment advantage and

67 If the imposition of punitive damages was accompanied by decoupling, for example, where a proportion of the award to the plaintiff is paid into the forum state treasury, then the bias would be exacerbated. See, e.g., Ga. Code, Title 51 §51-12-5.1 (splitting punitive award 25 percent for plaintiff and 75 percent for state). The defendant's stakes would be larger than the plaintiff's, so the defendant would spend proportionally more. On decoupling proposals, see, e.g., Choi and Sanchirico (2004); Rosenberg (2002c).

68 *Parklane Hosiery v. Shore*, 439 U.S. 322 (1979).

69 See, Bone (2012); see also Mullenix (1986).

the consequent adjudicative bias in its favor. Rather, the defendant will marshal the centralized aggregate investment on the common question defense to devalue or even crush out the first and all succeeding plaintiffs' claims in the same way and degree as it would in the absence of the collateral rule.[70]

The inferiority of offensive issue preclusion as an alternative to class action is implied by our model. Imagine that there are 100 plaintiffs, and that a win by the first plaintiff will automatically generate a win for the remaining 99 plaintiffs. In our model, the defendant can defeat all 100 plaintiffs by spending 180 in the first trial. As was discussed earlier in the context of sequential investments where the defendant could sink litigation costs before the plaintiffs, this will lead the first plaintiff to spend nothing at all, thereby losing the first case. In the wake of the defendant's initial victory against the first plaintiff, each subsequent plaintiff will spend nothing either, leading to a string of consistent plaintiff losses. Note that all 100 plaintiffs are even worse off in this scenario than they were with separate actions.

In practice, offensive issue preclusion can, as we note above in regard to other non-class alternatives to class action, exacerbate or mitigate the impact of pro-defendant biasing on the net expected value of the plaintiffs' claims. Notably, the plaintiffs' payoff may be significantly affected if defendant's managers are risk-averse regarding the prospect of losing the first and therefore only trial, and thus incurring "classwide" liability for a large amount of aggregate damages. It might be thought the defendant would surely seek to avoid the risk by quickly settling all claims for a premium, just as the Supreme Court supposes would happen under the "in terrorem" pressure from the risk of the single classwide trial in class actions.[71] Whatever the validity of the Court's conjecture, a question lying beyond the scope of this article, the attempt at functional analogy breaks down in any event because in contrast to class action, offensive issue preclusion leaves the defendant free to exploit its asymmetric investment advantage. Thus, instead of paying a settlement premium to avoid a single

70 It has been argued (Posner 1977; Spurr 1991) that in an offensive issue preclusion regime, a defendant facing a sequence of plaintiffs suing separately on common question claims and who if it loses the first case would be precluded from relitigating its common defense in any succeeding case will have stronger incentives to invest than it would in the absence of the rule and consequently will gain an advantage over the plaintiff in litigation of the first case. See also Che & Yi (1993). As our analysis shows, the asymmetric investment incentive in the first trial is neither a special creation of the collateral estoppel rule nor is it a burden on the defendant. Rather, the defendant's disproportionate investment incentive is a structurally intrinsic feature of separate action adjudication of common question claims and a strategically advantageous opportunity for biasing adjudication against the plaintiff.

71 *See, e.g.*, *AT&T Mobility*, 131 S. Ct. at 1752 (positing that the potentially large aggregate judgment for liability and damages in a single classwide trial in class actions imposes "in terrorem" ("blackmail") pressure on defendants to settle even weak claims).

classwide collateral estoppel trial in the first case, the defendant may greatly increase its centralized investment to further drive down the first and subsequent plaintiff's chance of winning, possibly to the point of rendering all claims worthless as separate actions.[72]

Similarly, even in the absence of managerial risk aversion, offensive issue preclusion magnifies the defendant's aggregate expected liability above its exposure in the standard separate action process. The inflationary effect of offensive issue preclusion results simply because the first trial exposes the defendant to classwide liability, in contrast to the first trial in the standard process where the stakes are limited to the particular plaintiff's potential recovery.[73] This effect is compounded if a court were to use the version of offensive issue preclusion that predicates the preclusive effects upon any plaintiff win, even though the defendant has prevailed previously in one or more cases.[74] Yet, paying a settlement premium is not the defendant's only option. Instead, given the inflated stakes, it may further exploit its asymmetric investment advantage to outspend the plaintiff by an even wider margin, minimizing its total liability and litigation cost exposure, even to the point of eliminating it entirely.

72 *See also* Section 3.2.1 and 3.5. The circumstances of each common question claim litigation will determine the defendant's choice to follow a biasing or settlement strategy or some combination of both to minimize its total litigation cost and liability exposure.

73 Suppose that in the standard process without offensive issue preclusion there are two plaintiffs with common question claims, each having a 50 percent chance of winning $100 at trial. Assuming there are completely independent trials (such that if the first plaintiff loses, the second plaintiff still has a 50 percent chance of winning), then the defendant's total expected liability would be $100 (50% x $100 + 50% x $100). By comparison, under offensive issue preclusion, the first plaintiff has a 50 percent chance of winning $200 while the second plaintiff still has a chance of winning $100, but it is contingent on the first plaintiff losing. Thus, the defendant's total expected liability increases to $125 (50% x $200 + 50% (50% x $100)). From the opposite perspective, offensive issue preclusion may operate as a pro-plaintiff bias. Note that while the first plaintiff has the chance to win $100 with a 50 percent probability, the second plaintiff's chance of winning $100 is 75 percent (50% x $100 in first trial + 50% (50% x $100) in the second trial).

74 *See* Note (1978). To illustrate, assume three common question claims for $100 each, all of which turn on a single common issue that plaintiffs have a 50 percent probability of winning at trial. In the absence of offensive issue preclusion, the claims would be litigated and resolved serially and independently, resulting in total expected liability for the defendant of $150 (Trial #1: $100 x 50% + Trial #2: $100 x 50% + Trial #3: $100 x 50%). However, using an offensive issue preclusion rule that attaches preclusive effects to a plaintiff's win on any claim in the series up to and including the penultimate one—in the example, a win on the first or second claim—inflates the plaintiffs' probability of success. In the example, the defendant's expected liability is determined by the interdependent outcomes of the first and second trials, aggregating to $212.50. In Trial #1, the defendant has a 50 percent chance of losing $300 + a 50 percent chance of winning and proceeding to Trial #2, where it has a 50 percent chance of losing $200 + a 50 percent chance of winning and proceeding to Trial #3 where it has a 50 percent chance of losing $100. Concerned about the unfairness of repeatedly placing the defendant in jeopardy of losing the balance of aggregate damages in succeeding trials, the Supreme Court in *Parklane*, *supra* note 68, strongly advised against using this version of offensive issue preclusion and indeed it has rarely been applied.

3.4. Settlement

The main analysis of our article proceeded under the assumption that all cases go to trial. Although the litigants could modify their levels of investment in anticipation of trial, they could not avoid these costs altogether through settlement. To assess the extent of pro-defendant biasing effects in the separate action process, we adjust our assumptions to reflect the real world of litigation, in which most triable claims settle before trial, probably the majority of them before suit. [75] Relaxing the assumption that trial resolves all claims enables us to examine pro-defendant biasing effects on settlement. Beyond showing that the bias skews settlement outcomes in defendant's favor, we offer new insights into its strategic choice between the timing of investment and settlement, and settling claims on an individual or group basis.

It is important to emphasize that the key results of our analysis, namely the existence of a structural bias that operates in favor of defendants in common-question litigation, is robust to the possibility of settlement. The parties' settlement contracts would reflect the underlying fundamentals of the case, the mode of action, and the parties' rational expectations of the investment incentives created by these factors. Since the plaintiffs are at a disadvantage when proceeding separately, they would likely settle their respective claims for less than they would in a class action.

To see how this works in our model, suppose first that the plaintiffs are pursuing a *class action* against the defendant. As summarized in Table 1, when the damages are $x = \$180$ for each plaintiff, then we saw that his or her share of the 90 classwide investment would be 45 and the defendant would spend 90, and the corresponding probability of winning was one half. Each plaintiff received a net return of $(1/2)(\$180) - \$45 = \$45$, and the defendant made total payments of $(1/2)(\$180) + (1/2)(\$180) + \$90 = \$270$, or \$135 per plaintiff. In a world with frictionless bargaining, we would expect the plaintiffs (or class counsel on their behalf) to settle for an amount between \$45 and \$135 each. Ignoring differences in bargaining power, it would be reasonable to expect settlement per claim at the mean of this range, \$90.[76]

75 Surveys of the settlement of litigation literature include Hay & Spier (1998), Spier (2007), Daughety (2000), Daughety & Reinganum (2005). Che & Spier (2008) consider a model of settlement between a defendant and multiple plaintiffs in the presence of plaintiff-side scale economies, and argue that the defendant can coerce the (decentralized) plaintiffs into settling their claims for too little. Stremitzer (2008) shows that this result may be sensitive to the timing of moves. Che (2002) looks at informational advantages from class formation in the settlement of claims.

76 If the settlement outcome depended on the bargaining power of the two sides, then the amount defendant would pay per plaintiff would range from close to the lower bound of \$45, where it had all of the bargaining power and could make take-it-or-leave-it offers, to near the top of the range at \$135, where the plaintiffs were in the catbird seat.

Suppose instead that the plaintiffs are pursuing *separate actions* (for simple illustration, without spillovers) against the defendant. The plaintiffs would spend \$40 each, the defendant would spend \$80, and the corresponding probability of winning would be 1/3. Each plaintiff would receive a net return of (1/3)(\$180) − \$40 = \$20, and the defendant's total payments would be (1/3)(\$180) + (1/3)(\$180) + \$80 = \$200 or \$100 per plaintiff. Note that the associated bargaining range with independent actions, [\$20, \$100], is lower, that is, skewed downward at the top and bottom, than the bargaining range for class actions, [\$45, \$135], reflecting the structural bias that favors the defendant. Therefore, we would expect that the settlement value to be lower as well, around \$60 at the mean.

The possibility of settlement does raise a number of interesting and subtle issues, particularly concerning the defendant's choice regarding not only how much to spend on its common defense before offering to settle, but also whether and with whom, individuals or group, to settle. Thus, the defendant may have the option to follow the sequential investment strategy we discussed above. In such a case, it could dramatically up the ante and reject settlement on any terms, other than the plaintiffs' unconditional surrender. In the more realistic case of many claims, for example 10, and given the choice between settling each claim for 60 and paying out a total of 600, the defendant might instead actually (or credibly threaten) to sink 150, lowering a given plaintiff's expected net recovery to 38 (21% × 180), thereby rendering his or her claim economically infeasible to bring as a solo action.

Alternatively, the defendant might pursue cost savings from settlement. To maximize its payout from settlement, the defendant must choose between settling with plaintiffs individually or on a group ("global") basis. Important insights emerge from examining the effects of this choice on the defendant's structurally biased advantage and hence its payoff from settlement. In particular, the defendant is better off settling claims as a group, that is, by making a "tender offer" to all plaintiffs conditioned on a high percentage or even all of them accepting it, rather than proffering the terms on an individual basis for each plaintiff to independently accept or reject. Our comparative structural advantage analysis provides a new explanation for why the rational, group approach is indeed defendant's dominant strategy in practice today.[77]

77 *See*, Rheingold (2009) ("Nothing is more natural than for the defendant in [a mass tort litigation] to want to offer an attorney who represents a number of plaintiffs a lump sum which will settle all the cases."). For example, the Merck pharmaceutical company facing roughly 50,000 mass tort claims for heart-related risks involving its painkiller Vioxx offered a capped aggregate payout of \$4.85 billion to settle them on condition that at least 85 percent of the claimants in certain claim categories as well as 85 percent of claimants overall accepted the terms. See Settlement Agreement Between Merck & Co., Inc. and the Counsel Listed on the Signature Pages Hereto (November 9, 2007). http://

For the sake of simple illustration, assume the two claim litigation against a common defendant possessing all of the bargaining power, such that it can credibly make a take-it-or-leave-it offer driving the plaintiffs to the low end of the given settlement range, in the example 20. The new point of interest here is that in contemplating making individual offers to each plaintiff of 21, the defendant must consider the dynamic that acceptance by one plaintiff (Plaintiff 1) will thereby transform the case against the other (Plaintiff 2) from a *common question* litigation into what is in effect a *non-common question* litigation, thereby eliminating (or, in separately settling one claim after another brought by numerous plaintiffs, reducing) its asymmetric investment advantage. (Pro-defendant bias arises when the defendant anticipates that more than one common question claim will be independently prosecuted against it.) Left to litigate against one plaintiff rather than two, and thus no longer the beneficiary of asymmetric centralized stakes and investment incentives, the parties will choose to invest as they would in the non-common question scenarios; the defendant will spend less than it would in the common question context, investing 45 instead of 80, while Plaintiff 2 will spend more than he or she would in that scenario, investing 45 instead of 40. Plaintiff 2 clearly benefits at the defendant's expense from this change in the state of play. When both parties invest 45, the plaintiff's probability of winning at trial increases from 1/3 to 1/2, raising his or her expected net recovery from 20 to 45 ($50\% \times 180 - 45$).

Despite its superior bargaining leverage, the defendant is unlikely to avoid this dilemma, as it is rational for one of the two plaintiffs to reject the settlement offer of $21. To see this more concretely, suppose that before the litigants make their investment decisions, the defendant offers to settle with each plaintiff for $21. Table 3 represents the plaintiffs' independent decisions to accept or reject settlement offers as a simple game. If both plaintiffs accept the settlement offers, they each get $21 as shown in the upper left of the table. If both plaintiffs reject the settlement offers, they will prosecute their separate action claims in *common question* litigation against a structurally advantaged defendant and receive net returns of $20 ($1/3 \times 180 - 40$), as shown in the lower right of the table. If one plaintiff accepts and the other rejects, the plaintiff who accepts gets $21 and the other plaintiff nets $45 from a "*non-common question*" trial.

www.merck.com/newsroom/vioxx/pdf/Settlement_Agreement.pdf. Prior to issuing the settlement offer, Merck marshaled a "no-holds bar" aggregate common defense, which it deployed in a number of trials and appeals to demonstrate the weakness of the plaintiffs' case. Alex Berenson, "Analysts See Merck Victory in Vioxx Settlement," *New York Times* (10 November 2007) (reporting Vioxx trial and appeal results indicating a less than 5 percent chance of plaintiffs winning significant recovery). Plaintiffs' settlement acceptance rate likely exceeded the 85 percent threshold (or "walkaway") condition by long shot. *See* "Vioxx Settlement on Track as 44,000 Sign Up," *New York Times* (4 March 2008).

Table 3. Settlement of common question litigation.

		Plaintiff 1's Decision: Accept	Plaintiff 1's Decision: Reject
Plaintiff 2's Decision	Accept	\$21 \$21	\$45 \$21
	Reject	\$21 \$45	\$20 \$20

Would both plaintiffs accept or reject the settlement offers of \$21 each? The answer is "No". If the first plaintiff accepted the settlement offer of \$21, the second plaintiff would be in the enviable position of having a non-common question claim that is worth \$45. So that second plaintiff would surely be better off rejecting the offer of \$21. It is also not an equilibrium result for the plaintiffs to both reject the settlement offers. If the first plaintiff rejected the \$21 settlement offer, then the second plaintiff would rather accept the offer of \$21 than receive a net payoff of \$20 from prosecuting the claim in a *common question* context. In the Nash equilibrium, one plaintiff accepts the \$21 settlement offer and the other plaintiff rejects it and receives a payoff of \$45; the defendant's total litigation cost payout is 156 ($50\% \times 180 + 45 + 21$).[78]

Now consider the defendant's comparative structural advantage in following the group, tender offer strategy. If one or both plaintiffs reject the offer of 21, they will face a defendant able to exploit its full structurally biased, *common question* litigation advantage against them. Failure to settle means the defendant would invest 80 resulting in each plaintiff expecting net recovery of 20. Neither would prefer this outcome to settlement. The group settlement strategy rewards the defendant by lowering its total litigation payout of 156 when offers are made on an individual, yes or no, basis to 42 when they are made on to the group basis.

The only outstanding question relates to the credibility of the defendant's threat to make the optimal *common question* investment of 80; if push comes to shove would defendant back down and offer to settle on the individual basis described above. In other words, is the latter the cheaper course of action for defendant to follow? Given that the plaintiffs would accept an offer of 21 each if the defendant actually invests (sinks) 80, it is clearly better off sticking by its group-settlement guns. By following the individual settlement strategy, the defendant could expect total *common question claim* settlement and

78 There is also a mixed-strategy equilibrium where the two players randomize between accepting and rejecting.

non-common question claim trial costs of 156. Whereas, by adopting the "tender offer" strategy, the defendant lowers its total *common question claim* settlement costs to 122 (80 + 21 + 21).[79]

3.5. Negative Expected Value Claims

Finally, we apply the structural bias analysis to claims that, because litigation costs exceed expected recovery, are economically infeasible for plaintiffs to bring as solo actions. It is conventionally supposed such NEV claims are a natural consequence of market forces that govern access to court for all civil claims, common question or otherwise. As the Court in *American Express* reminded, the day-in-court ideal does not promise an "affordable procedural path" to obtaining a legal remedy.[80]

However, a limited exception from the scythe of market forces is made for the proverbial $30 claim.[81] The assumption is that these claims never have a meaningful opportunity to get to market because they are absolutely foreclosed at the threshold by relatively fixed, process-related litigation costs, such as the fee for filing a complaint or hiring even minimal competent counsel. But for these determinate charges, according to the conventional view, the very small claim would pose no normative problem, as the economic viability of solo action would then depend, as it does for all claims, on costs that are essentially variable, scalable up or down, and "people would just invest less when the stakes were less".[82] Hence, as discussed above, the role for class action is sharply restricted to overcoming this fixed-cost barrier—of course, only upon a showing that non-class alternatives for bringing solo actions are unavailable and the stringent requirements for certification are fully met. By aggregating many such small common question claims into one large enough to cover the fixed cost, by achieving cost savings from scale economies, and by spreading the expense among all benefited plaintiffs, class action can reduce per claim costs sufficiently to provide each plaintiff with a positive, if typically tiny, expected payout at the end of the day.[83]

79 Note that once the defendant makes the optimal common question litigation investment of 80, it can use an individual or group strategy without changing the common question settlement dynamic.

80 *See American Express*, 133 S. Ct. at 2309.

81 *See Amchem*, 521 U.S. at 616; *see also Carnegie v. Household Intern.*, Inc., 376 F.3d 656, 660 (7th Cir. 2004) (Posner, J. observing that "The *realistic* alternative to a class action is not 17 million individual suits, but zero individual suits, as only a lunatic or a fanatic sues for $30").

82 *See* Posner (1977).

83 *Id.*

We dispute the conventional view of NEV claims as a normative anomaly that poses only a special problem for the idealized separate action process, and correspondingly provides only a special, anomalistic, and last resort role for class action. Common question NEV claims are not simply a consequence of fixed-cost barriers exceeding some given, fixed small expected recovery that foreclose a plaintiff's ability to sue solo. Indeed, such barriers are largely irrelevant to the economic feasibility of suing solo to prosecute not only very small claims, but all claims, regardless of the amount in controversy. Rather, NEV claims are most relevantly a function of the defendant's centralized control over the classwide stakes and *variable* cost investments. It is this prospect of pro-defendant biased adjudication that generally determines the fate of any common question claim as to whether it loses or retains economic feasibility as a solo action. Even if fixed-cost barriers were removed, virtually any claim that turned on variable cost investments—that is, all claims that present some litigable common question—would nonetheless stand a good chance of being rendered worthless.

To illustrate these points, suppose that the defendant faces 100 common question claims in the separate action scenario, so each plaintiff's probability of succeeding on a claim worth 180 is 1 percent yielding expected net recovery of 0.02 without spillovers or 1.7 with full spillovers. Any plaintiff, who might consider bringing a solo action for such a negligible recovery, would surely not even have to think twice before nixing the idea if the price for such variable-cost litigation goods as lawyers and experts, included opportunity costs (or if there also were some fixed costs). Applying this analysis to high expected value claims, say for 180,000 each, would produce the same results in our model, and in reality. With the defendant ratcheting up its investment, there will be a proportionally commensurate reduction in expenditures by each plaintiff. Whatever small net recovery would result in model would quickly be more than offset in reality by the opportunity cost built into the price of higher quality litigation goods as well as by some amount of fixed costs.[84]

84 A plaintiff with a claim that is meritorious, but not worth prosecuting to solo trial, might nonetheless sue to settle. This so-called nuisance value settlement strategy involves a demand that the defendant pay over some amount less than it would spend in defense to force the plaintiff to drop the case or have a court oust it. See Rosenberg and Shavell (1985). Assume two claims in the separate action process with spillovers, if the plaintiff's spend 20 each the defendant might well offer 30 to each plaintiff rather than spend 80 in defense. However, in addition to wielding the collectively financed aggregate investment, the defendant can also exploit the other structural advantage of superior scale economies to thwart this strategy. See *id.* at 10. This counter to the nuisance value settlement strategy is particularly potent when the defendant confronts many solo suits. Thus, if there are 100 claims over which the defendant can spread its common claim investment of 80, it would pay nothing more than a pittance to settle a given claim, far less than the plaintiff would spend in forcing the defendant to make a nuisance value payoff.

4. SOCIAL WELFARE EVALUATION

Having shown why, how, and the extent to which separate actions rather than class actions bias adjudication of common question litigations in defendants' favor, we are now in a position to comment on the social welfare implications of that choice. Positing the social function of civil liability as seeking the minimization of total accident and law enforcement costs, we consider the effects of the different modes of action on two major factors: litigant expenditures and deterrence.[85]

4.1. Litigant Expenditures

Our model yields important insights, as summarized in Table 1, regarding the comparative levels of total spending by both plaintiffs and the defendant in independent versus separate actions and in those scenarios versus class action.[86] In the example, as between independent and spillover separate actions, plaintiffs spend less in total in the latter, 40 compared to 80 in the former. On the assumption of costless transfers of work product between plaintiffs, spillover separate actions represent an unqualified social welfare improvement. Relative to independently prosecuted separate actions, spillover separate actions eliminate the cost of duplicative effort, while plaintiffs have the same probability of winning at trial, 1/3, in both scenarios. And, because plaintiffs' total effective investment and resulting case quality remain constant across independent and spillover separate actions, the defendant will spend the same in both scenarios. However, despite reducing plaintiffs' per-claim as well as society's overall litigation costs, spillover separate actions lack the critical class action investment advantage, centralized control over stakes and spending decisions and hence leave free-rider and other collective action problems intact, with the consequence that pro-defendant biasing effects will persist and, in many cases, magnify.

By contrast, the choice to adjudicate common question claims in a class action instead of separate actions may well lead the defendant as well as plaintiffs to spend more than they would in separate actions, increasing their total investment

85 Minimizing total accident and law enforcement costs serves to maximize social welfare, and *ex ante*, to increase the well-being of everyone in society. *See* Fried & Rosenberg (2003). For a comprehensive elaboration of this social welfare justification and explanation for use of civil liability and a critique of anti-consequentialist approaches, *see* Kaplow & Shavell (2001).

86 Litigants spend more than money; plaintiffs invest time and emotional resources, while defendants incur costs from managers and technical staff diverted to work on litigation matters rather than their normal employment tasks and from harm to financial credit and marketplace reputation. However, for the sake of simplifying the analysis, we generally focus on direct economic expenditures on litigation.

expenditures in many cases. As we explain and the model demonstrates, both parties will generally increase investments in developing their respective cases on the common questions. There are good, straightforward reasons for plaintiffs to spend considerably more in litigating the common questions in class actions. In contrast to independent and spillover actions, class action fully centralizes plaintiffs' stakes, investment incentives and decisions, and spillovers across all claims, enabling them to spend the optimal amount that maximizes the aggregate, classwide, and therefore their individual per-claim return from litigating the common questions.[87] The optimal investment that maximizes one claim for $100 is likely to be far less than the optimal expenditure that maximizes the expected classwide recovery at trial (or in settlement) from 1,000 claims for $100 and promises higher individual net recovery making plaintiffs better off than they would have been in separate actions.

Our running example illustrates the point. Recall that the most plaintiffs would spend in independent separate actions is 80 to achieve total expected recovery of 120 ($1/3 \times 360$), whereas in the class action plaintiffs would spend 90, increasing their probability of winning at trial to 50 percent, for total expected recovery of 180 ($1/2 \times 360$). However, compared to the net payoff of 40 in independent (or even 80 in spillover) separate actions, the net payoff of 90 for plaintiffs plainly makes the additional marginal investment in class action worthwhile.[88]

It is also likely that the defendant will spend more on the common defense in a class action than in separate actions.[89] Facing a stronger case against it, one

87 The calculation of court-awarded fees in class actions should provide empirical confirmation of our central conclusion that, acting collectively for collective gain, plaintiffs will naturally spend and expect to recover more in the class action than the sum of what they would spend and expect to recover in separate actions, whether proceeding independently or with full spillovers. Courts compensate class counsel's expenditure of many more hours than he or she would spend in a separate action, implying that the greater investment is reasonably necessary to maximize the classwide recovery. Thus, a court might find, for example, that the attorney who would work for 100 hours at $250 per hour in each of 80 separate actions should be compensated for investing 10,000 hours at $250 per hour given the aggregate stakes in the class action involving 80 plaintiffs. For analysis of data on class counsel fees, see Fitzpatrick (2010a); Silver & Miller (2010) (examining fee awards in MDL cases). Cf., *AT&T Mobility*, *supra* note 12, at 1749 (observing that class counsel reaps "far higher fees" representing a class of arbitration claimants than the attorney would in representing plaintiffs separately in individual arbitrations).

88 From the maximum expected recovery perspective, plaintiffs' class action investment of 90 is optimal relative to their effective investment in independent separate actions scenario of 40 (80 minus the deadweight cost of 40 in duplicative effort). Compared to the results from the independent (and spillover) separate actions, the marginal increase of 50 in the class action raises plaintiffs' total expected recovery on the margin by 60 or, in other words, increases total expected net recovery by 10.

89 An important empirical as well as analytical exception concerns cases in which the defendant could crush out the filing of any claims by sinking (or credibly threatening to sink) an investment in the common defense that significantly exceeded the total it would otherwise rationally spend in

mobilized by a centralized classwide investment and spillovers that not only maximizes the classwide expected recovery but also eliminates pro-defendant biased adjudication, the defendant will often find it advantageous to make a higher marginal aggregate investment. Thus, in the example, when the plaintiffs proceed by class action and optimally increase their spending and commensurately the quality of their case, the defendant rationally increases its investment from 80 to 90. It should be emphasized that the defendant, despite its unhappiness in spending more than it otherwise would in the separate action scenarios, is not thereby investing inefficiently. Rather, in accord with our realistic depiction of the parties' interactive investment decisions, the defendant's higher investment in the class action is optimal; it maximizes the expected classwide value of litigating the common questions given the effectiveness of the plaintiffs' centralized, greater optimal investment. Thus, in the class action, if the defendant refused to budge from 80 and invest 10 more while anticipating the plaintiffs to invest 90, its probability of winning at trial would drop from 50 percent to 47 percent, with its expected liability rising from 180 to (approximately) 191.

As we have noted, by centralizing plaintiffs' control over all claims, class action nullifies the defendant's asymmetric opportunity to reap greater gains from classwide investment and scale economies. Thus far we have focused on the investment effects showing that the plaintiffs and hence the defendant are likely to spend more in a class action than they would were the common question claims litigated in separate actions. However, in assessing the parties' overall total expenditures in class versus separate actions—in other words, in assessing the litigation costs attributable to gaining bias-free class action adjudication—it is important to distinguish the costs of investments they incur to increase their respective probabilities of winning at trial, expenditures correlated with the relative quality of their respective cases on the common questions, from the total overall costs they bear in the litigation which also include outlays and burdens due to inefficient duplicative effort. Because centralized scale economies largely eliminate the latter, wasteful spending, it is likely that total overall litigant spending in class action will fall substantially below the level incurred for bringing economically viable claims in separate actions.

To see the litigation efficiencies of class action, compare its scale economy benefits to those provided by the spillover separate action. Both procedures eliminate plaintiffs' duplicative investment effort in building the case for

litigating those claims. Because the class action eliminates this "preemptive strike" option, the defendant will spend comparatively less in the collective adjudication process than in the separate action scenarios where its structural bias advantage creates an investment incentive to destroy the economic viability of plaintiffs' claims.

liability on the common questions. For example, in the separate action process, the work product developed by the first-mover plaintiff in discovery will be costlessly (unrealistic, but assumed for the sake of argument) transferred by free-riding or voluntary cooperation to benefit successive plaintiffs. Similarly, in a class action, class counsel's discovery work product will be costlessly transferred to benefit all class members. However, the benefits from class action scale economies extend well beyond the transfer of work product among plaintiffs or even to plaintiffs, as defendants gain as well. Thus, in the class action the work product is not simply developed and communicated from one to all; rather it is directly applied for the legally binding benefit of one and all. In the spillover separate action scenario, successive plaintiffs will have to proceed independently of each other, hiring separate counsel, initiating separate suits, filing and arguing separate motions, presenting evidence in separate trials and so forth to effectively benefit from the freely acquired (but qualitatively deficient compared to class action) work product in respectively making their separate cases on liability.[90] And while the defendant's centralized control over its common question defense in the separate action scenarios enables it to benefit from both types of scale economies—investment and application of beneficial work product across all claims—it nonetheless will likely bear significant costs due to plaintiffs' duplicative efforts in filing and prosecuting separate suits.[91] Class action relieves defendants from bearing such needlessly duplicative expenses.[92]

90 Except for successive plaintiffs needing to hire separate counsel and file separate suits, non-mutual, offensive collateral estoppel provides scale economies nearly equal those of class action, although, as we show, pro-defendant bias warps adjudication in collateral estoppel but not class actions. See Section 3.3.3.

91 See *Amchem*, 521 U.S. at 598 (recounting among the "most objectionable aspects of asbestos litigation" that "the same issues are litigated over and over; transaction costs exceed the victims' recovery by nearly two to one; exhaustion of assets threatens and distorts the process; and future claimants may lose altogether"). Indeed, capitalizing on the territorial and temporal dispersion of their separate actions, plaintiffs effectively employ a "spread the defense" strategy in large-scale litigations that uses—and sometimes deliberately increases—the defendant's separate action costs as a cudgel to add further pressure for it to settle on a group or global basis.

92 *See* Report (1999). We emphasize that, in stark contrast to the conventional view, class action provision of bias-free adjudication does not depend on the validity or extent of scale-economy cost-cutting advantages from collectivization. To be clear, we fully agree that class action scale economies produce cost-cutting benefits and, of course, that lowering the expense of litigation without compromising the deterrence and compensation objectives of civil liability enhances social as well as litigant welfare. But, as shown above, pursuing a cost-cutting policy without plaintiff-side centralization, for example by using non-class procedures to lower litigation costs and promote separate actions would leave the pro-defendant bias in full force and effect. Moreover, class action achieves its anti-bias function regardless of the extent to which its scale economies cut costs. Class action does all of the heavy lifting necessary to achieve bias-free adjudication by centralizing control over the plaintiff-side stake to eliminate asymmetric investment incentives. Beyond that formal organizational point, the centralized stakeholders and investors will prosecute and

4.2. Deterrence

The model clearly demonstrates the deterrence benefits of using class action to overcome the defendant's structurally biased advantages in the separate action process.[93] Given that achieving optimal deterrence of unreasonable risk by means of civil liability requires the targeted risk-taker to internalize ex ante the total expected social costs of accident, structurally biasing the outcome of litigation in the defendant's favor will on average dilute the needed threat of liability and hence the risk-taker's incentives to take reasonable precautions. And, as we show, the problem of under-deterrence in the separate action process tends to grow more severe with the filing of each new claim. If only one plaintiff files a claim, then the defendant would have zero advantage. But, when a second claim is filed, the defendant is motivated to spend up to twice as much as the plaintiffs' aggregate expenditure in spillover actions. With 100 plaintiffs bringing spillover claims, the defendant might spend as much as 100 times more than the plaintiffs' aggregate expenditures, rendering claims virtually worthless (Table 2). Moreover, when there are numerous claims and claim-specific fixed costs such as filing fees or opportunity costs increasing the price of

defend against claims free of systematic bias even if the parties choose to resolve them in the same disaggregated, individualized and wastefully redundant way they normally would in the separate action process. *See* Korn & Rosenberg (2013) (showing that pro-defendant-biased adjudication of common question claims resulting from the Supreme Court's enforcement of no-class action arbitration clauses can be remedied by courts appointing class counsel to prosecute the claims in individual arbitrations). Courts, of course, need not go to the extreme of eliminating class action scale economies; they can curtail them to reduce potential downside effects of streamlined process without diminishing bias-free adjudication. Thus, the benefits from exploiting class action scale economies by resolving all claims in a single classwide trial may entail significant costs, such as decreasing the reliability of aggregate liability and damage determinations; preventing the defendant (and courts) as well as plaintiffs from gaining knowledge and experience through multiple rounds of litigation; constraining plaintiffs' autonomy and chance to have an individual day in court, and increasing the parties' risk-bearing costs. Because class action secures bias-free adjudication by centralization alone, courts can avoid these (actual or perceived) adverse effects from the single classwide trial, for example by phasing, decoupling, or sampling common and non-common question determinations; by resolving all claims under Multidistrict Litigation procedures, 28 U.S.C. § 1407; or by simply relegating them to the traditional separate action process. *See* Rosenberg (2014); Hay & Rosenberg (2000).

93 On the assumption of substantial correspondence with deterrence effects, we do not directly consider the consequences for compensation (or even for net wealth transfers) from the choice to adjudicate common question claims by class action rather than separate actions. This approach is warranted by the conventional understanding of the compensation objective of civil liability, which we adopt for present purposes, that ignores its basic conflict with the deterrence objective and with the social goal of promoting the availability of optimal accident insurance. For a critical social welfare analysis of these conflicts, *see* Shavell (2004); Polinsky & Shavell (2010); Reinker & Rosenberg (2007).

variable-cost goods such as counsel, many otherwise economically viable common question litigations will turn into losing propositions.

Class action effectively remedies this deterrence problem. With symmetric investment incentives in class actions, plaintiffs can fully exploit centralized control over their collective stakes, investments, and spillovers. Litigating the common questions from that posture, plaintiffs can negate the pro-defendant bias and maximize their aggregate expected recovery, thereby increasing the defendant's total costs from liability and litigation to promote the social objective of optimal deterrence.

This point is readily illustrated by our basic example with two plaintiffs. Suppose that to avoid causing 360 in total harm to both plaintiffs, the defendant at an ex ante stage must spend 150, nothing less. The defendant's investment in precautions is clearly socially appropriate, because the harm avoided exceeds the cost of avoiding it. Thus, civil liability would serve the deterrence objective by threatening imposition of more than 150 in damages. To both simplify analysis and provide a triable defense, suppose further that the rule governing plaintiffs' claims is strict liability limited to risks that were reasonably foreseeable at the relevant ex ante point in time.

Ignoring litigation costs for the moment, it is evident that were plaintiffs required to prosecute their claims in separate actions, their common question litigation would fail to achieve the deterrence objective. Facing a threat of expected liability for aggregate damages of 120 (360 discounted by a 2/3 probability of succeeding on the common question of reasonably foreseeable risk), the defendant would lack the legal incentive to make the socially appropriate investment of 150 in precautions. By comparison, if the defendant anticipated being sued by plaintiffs in a class action, its expected liability exposure would rise to aggregate, classwide total damages of 180 (360 discounted by 1/2 chance of succeeding on the common question of reasonably foreseeable risk) which would serve as sufficient sanction to induce the reasonable expenditure of 150 on precautions. Thus, class action succeeds in achieving optimal deterrence in situations where separate actions provide insufficient incentives to avoid causing harm.[94]

94 The plaintiffs and defendant in this example could make themselves better off by agreeing to cap their respective expenditures at the level that would achieve the same trial outcome as their higher investments would have produced. Recall that the litigation contest has the structure of a prisoners' dilemma. If the plaintiffs and the defendant somehow could agree to reduce their litigation spending to, say, 10 each, then they both would be better off. The probability of prevailing would still be 50 percent, but the plaintiffs' aggregate net return would be 50% (180) + 50%(180) − 10 = 170, while the defendant's net return would be the sum of −50%(180), – 50%(180), – 10 = – 190. This would be true more generally for any continuous contest success function, $p(c_p,c_d)$, that is increasing in c_p and falling in c_d. Given any two investment levels, it is possible to reduce both investments while

Even though the cost of precautions are worth bearing to achieve a greater reduction in the cost of harm, the question remains whether in view of the relatively greater litigant (and probably judicial) expenditures, use of class action rather than separate actions is socially optimal, that is, whether on comparative functional evaluation of the two modes of civil liability law enforcement, collective adjudication minimizes the sum of accident and law enforcement costs. Answering this question requires taking account of litigation expenditures by the parties, and comparing the net deterrence value from enforcing civil liability—deterrence value minus the costs of precautions and expenditures by litigants—in both the separate action and class action scenarios.[95] To the extent society needs a deterrence contribution to law enforcement from bias-free civil liability, our analysis shows that class action will supply the most cost-effective mode of adjudicating common questions litigations.

Applying this analysis to the example sustains the evaluation of the social optimality of enforcing the law by class action rather than separate action adjudication of common question claims. Despite entailing 120 in litigant

leaving the probability unchanged. From the social welfare perspective, however, the parties' spending cap agreement may have deleterious consequences. Among several major concerns is that in restricting their investments, the parties would be limiting the quality as well as quantity of information upon which courts could rely in carrying out their lawmaking and enforcement duties. *See* Posner (2011). This suggests the need for courts to oversee spending and other agreements by litigants that could adversely affect the public functions of adjudication. In this regard, it is useful to note that one of the social benefits of class action is the enhanced managerial power of courts to adjust the modes, quality, and quantity of proof and other procedural aspects of the proceedings. *See, e.g.*, FRCP, Rule 23 (d) (1) ("the court may make appropriate orders . . . determining the course of the proceedings or prescribing measures to prevent undue repetition or complication in the presentation of evidence or argument").

95 The net-deterrence benefit question applies not just to class action versus separate actions, but to choices about civil liability functions, design, and application generally, and indeed to the choice to use civil liability at all. For analysis of this basic inquiry, see Shavell (1997). A more complete net-deterrence value analysis would entail taking account of costs to the public such as for administering courts and to litigants for bearing risk, including the expense for first-party and liability insurance. However, determining the overall comparative net deterrence advantage of class action over separate actions in any type of case or specific common question litigation would require inquiry into numerous other difficult-to-evaluate factors, including cost savings from class action scale economies, whether the governing rule is negligence or strict liability, and the effect of deterrence on reducing the chance of litigation as well as accident. A comparative advantage analysis of law enforcement options would then come into play, entailing assessment of the marginal deterrence contribution from civil liability relative to publicly funded enforcers such as administrative agencies, market reputational and other disciplining effects, and the care-taking impetus from social mores. For discussion of the complex of factors and intricacies involved in such a comparative law-enforcement assessment, *see, e.g.,* Polinsky & Shavell (2010); Fried & Rosenberg (2003); cf. Rosenberg (2007) (outlining the questions posed by the choice between negligence and strict liability for promoting deterrence objectives in managing the risks from rail transport of hazardous substances).

expenditures, spillover separate actions, the most efficient separate action scenario, leads to vastly higher overall social costs than class actions. Anticipating separate actions and the resulting pro-defendant bias, the defendant will fail to take precautions leaving plaintiffs to bear total harm of 360. Thus, the overall cost to society from adjudicating claims in separate actions would be 480. With class action adjudication, the defendant expects to bear 180 in classwide damages, providing the needed legal incentive for it to invest 150 in precautions so as to avoid causing an accident. Overall social cost in the class action scenario is limited to the socially productive expenditure of 150 in precautions, far less than 480. This example shows that ex ante deterrence benefits from class action can overwhelm ex post litigation cost "savings" in separate actions to enhance the well-being of everyone in society.

5. CONCLUDING COMMENTS

Our rent-seeking model, though stylized, provides fundamental insights into the way separate action adjudication causes, and class action adjudication solves, structural bias favoring defendants in the adjudication of common question claims. Notably, the model demonstrates defendants' structurally biased investment advantages over plaintiffs proceeding outside of a class action, and elucidates the dominant consequences for actual practice. The showing that pro-defendant bias increases with the number of affected plaintiffs is particularly relevant for common questions litigations given that they typically comprise many thousands of claims. Also, in accord with the modeled dynamics, defendants, in especially large-scale cases, will sink (or credibly threaten to sink) a large investment at the start or in anticipation of litigation so as to confront plaintiffs with such a formidable common question defense that most if not all will forgo suit altogether. The model offers new insights into tactics used by defendants to maintain the structurally biased investment leverage, such as preconditioning group and global settlement offers on acceptance of terms by all or at least a very large fraction of plaintiffs.

Our argument supporting class action differs dramatically from the conventional view. According to that view, "the very core of the class action mechanism is to overcome the problem that small recoveries do not provide the incentive for any individual to bring a solo action by aggregating the relatively paltry potential recoveries into something worth someone's (usually an attorney's) labor".[96] In other words, the traditional analysis emphasizes the bias resulting from the operation of formally *fixed costs* of litigation (e.g., filing

96 *See Amchem*, 521 U.S. at 616.

and service of process fees, or such practical, categorical fixed costs as the opportunity cost for minimally competent counsel) in precluding claims with lower expected value ("NEV" claims).[97] In contrast, our analysis emphasizes the source of bias resulting from the defendant's centralized investment advantage regarding the *variable costs* of litigation (e.g., maximizing aggregate qualitative and qualitative value from such needed legal services and ventures as experts, discovery, and lawyers). Thus, our model demonstrates that the conventional view mistakes the nature and extent of the problem as limited to claims with very small potential recoveries. To the contrary, we show that non-class adjudication systemically and pervasively devalues all claims, even those that would otherwise be economically viable as solo actions.

As would be true of any attempt to rigorously describe such a complicated and dynamic skein of practice as common question litigation, our model's depiction of reality is restricted by certain assumptions.

To begin with, the separate action scenarios do not exist in the completely decentralized form depicted in the model. Competent plaintiff attorneys are likely to proceed by independent separate actions only in the very early stages of litigation when suits are few and far between, sometimes concealing their efforts from potential competitors to thwart free-loading and poaching.[98] Eventually, solo going plaintiffs may gain some benefit from each other's work product via voluntary exchanges between them and court records of parallel actions. However, the spillover benefits that plaintiffs gain from these exchanges is likely to fall far short of the benefits assumed by the model. In the model, the plaintiffs make uncoordinated, simultaneous expenditures that yield spillovers, which virtually by invisible hand cumulate incrementally into the optimal solo—as opposed to classwide—claim investment on the common questions. Although plaintiff attorneys have mutual interests in establishing voluntary exchanges, private collaborative arrangements have high transactions costs. These include the costs of negotiating agreements among counsel to allocate the benefits and burdens of the joint enterprise, coordinating their various, often far-flung, and sometimes strategically conflicting litigation activities,

97 *See also* Posner (2011) (observing that "[v]ery small claims would create no problem for the legal system were it not for the fixed component in the costs of litigation; litigants would simply invest less when the stakes were smaller.")

98 *See, e.g., Smith v. Bayer Corporation*, 131 S. Ct. 2368 (2011) (noting the separate filing of two class actions presenting the same common question claims in different courts in the same state yet without either putative class counsel knowing of the other's suit until the common defendant moved to preclude certification of one case based on prior denial of certification in the other). Defendants may also conceal filing of early suits in an effort to suppress or at least delay triggering the emergence of widespread litigation by paying a premium for sealed settlements that remove the stronger plaintiff attorneys as well as claims from the potential field of action.

and guarding against their free-riding, defection, self-dealing, and trading of inside information.[99] Another significant feature of real world common question litigation is market share aggregation. In some types of litigation, plaintiffs' attorneys compete against each other in soliciting and assembling their respective market shares of claims (often referred to as "inventories"), with the effect of reducing the number of separately financed and controlled actions and thereby reducing the defendant's asymmetric investment advantage.[100] However, there is no warrant in reality for arguing that such market aggregation can adequately replace class action; indeed, the contention merely concedes the pro-defendant biasing problem while offering an inferior, costly solution. First, soliciting claims entails substantial (mostly duplicative) expenditures that restrict (and effectively levy a tax on) market-aggregated claims to those involving relatively high potential recoveries—a market aggregation constraint that intensifies with increasing competition between attorneys and variation among claims in law, fact, and time and place of accrual. Second, even when competing attorneys have significant incentives to invest in acquiring large market shares of claims, free-riding and the other collective action costs and problems noted above will operate to prevent one attorney from gaining anywhere near dominant let alone monopoly control. Market aggregation thus operates at great cost to fragment the plaintiff side into a number of separately controlled and financed inventory actions, each comprising numerous claims, that may hamper but will not disarm the defendant from wielding its structurally biased investment advantage to slant adjudication in its favor.

Plaintiff-side fragmentation also occurs when class members exclude themselves (opt-out) from a class action. Opt-out like market aggregation imposes high transaction costs on plaintiffs while operating in reverse to destroy rather than build plaintiffs' opportunity for countering the pro-defendant bias. Indeed, the intensity of the resulting structural biasing effect of opt-out may be even greater than in the market aggregation scenario, depending on the timing of the defendant's class action investment and the number of plaintiffs opting out and separate actions they file. If the defendant makes (sinks) its class action investment before opt-out takes place, then, as demonstrated by the model, it may gain an insurmountable investment advantage over plaintiffs

99 Coffee (1987). In the Appendix, we show that our results are robust to partial spillovers among claims.

100 We note that this market expression of plaintiffs' preference (demand, willingness-to-pay) for prosecuting their claims in the aggregate refutes claims that their purported "autonomy" interests in individualized control and treatment are actually threatened by class action and, contrariwise, promoted by the Court's day-in-court ideal of solo actions. For further evidence of the disjuncture between the supposed "ideal" and individual choice in regard to having one's own day in court, see Eisenberg & Miller (2004) (reporting that the rate of opt-out from class action is generally law).

who opt out in significant numbers to prosecute their claims in separate actions.[101]

Given the evident benefits of class action and detriments of proceeding by separate action, the question arises why a plaintiff would rationally decide to opt-out of the class. One straightforward explanation is that a class action defector might avoid the substantial costs of litigation while enjoying gains from free-riding on the class action work product. Indeed, when the investments and efforts of class counsel spillover beyond the boundaries of the class action, there could be sufficiently strong opt-out incentives as to completely unravel the class action. For example, consider the opt-out incentives in the class action comprising 100 members wherein, as depicted in Table 2, plaintiffs spend 4,500 in total, or 45 each, for a 50 percent chance of winning at trial. The first plaintiff to opt out could free-ride on the efforts of the remaining 99, obtaining the same somewhat less than 50 percent chance of winning they obtain, while sharing none of the somewhat less than 4,500 cost they must bear; the second opt-out plaintiff free-rides on the class action work product financed by the remaining 98 class members, achieving the same somewhat further decreased expected recovery they do but sharing none the somewhat further reduced costs they bear; and so forth.[102]

Finally, we assumed that class action fully corrected the problem of asymmetric investment incentives by achieving organizational parity on the plaintiff-side with the defendant, that is we equated centralizing the plaintiff-side stake and investment incentive with unity of interest between the collective investor (class counsel) and stakeholder (class members). In reality, of course, the interests of the class investor and stakeholders (or among them) do not necessarily cohere. Indeed, they may often diverge significantly to prevent complete centralization and thus preserve some degree of pro-defendant bias under current class action rules and practice. Notably defendants generally retain their investment advantage in class actions because they not only own the full stake in the common

101 The conditioning of class action certification on full discovery and bench trial of the substantive merits of key common question issues, as required by *Wal-Mart* and most recently in *Halliburton v. Erica P. John Fund, Inc.*, 134 S. Ct. 2398 (2014), provides defendants with additional motivation to sink classwide investments early on—at or before the stage of opposing certification—before plaintiffs undertake separate action litigation upon opting out or after denial of the class action. Relatedly, in seeking certification putative class counsel also makes a classwide investment on the merits of key common question issues encouraging class members to opt-out to free-ride on that work product.

102 Another plausible explanation for the plaintiffs' pursuit of separate actions comes from the agency problems and conflicts of interest between plaintiffs and their attorneys. Plaintiff attorneys who are not among the lawyers serving as class counsel, and consequently would earn no fees from the common question claims involved, will have a natural incentive to "under-sell" prospective opt-outs on the benefits of staying in the class. At the same time, the plaintiffs may lack both the wherewithal and the incentive to evaluate and compare the relative expected net recoveries from separate versus class action.

defense but also typically have (or hire) the expertise and means to check their lawyer's slack or self-serving representation. Thus, because the court-awarded contingent percentage fee that compensates class counsel in most class actions promises a return for the lawyer of less than 100 percent of the recovery, usually below the market rate of 33–40 percent , and because the court lacks information needed to effectively monitor the adequacy of class counsel's representation, the classwide investment will likely fall far short of the optimal that maximizes the chance of winning at the common question trial (Fitzpatrick 2010a).[103] Similarly, in contrast to the normally strong oversight provided defendants by their in-house counsel and liability insurers, plaintiffs normally have little or no ability to prevent self-dealing by their lawyers. The risk for plaintiffs is that the court's contingent fee award and their own as well as the court's lack of information create incentives for the class counsel to strike a "sweetheart" settlement deal with the defendant, whereby both gain at the expense of class members' interests in maximizing the recovery (and society's interest in deterrence; see Hay and Rosenberg 2000).[104] It should be noted that neither of these "agency" problems is endemic to class action or results from the asymmetric investment incentive structure that biases the separate action process in favor of defendants; both pervade the civil liability system arising in every type of non-common as well as non-class action common question litigation and regardless of whether the plaintiff attorney's compensation derives from court order or contract.[105]

* * *

103 The extent of the shortfall due to the percentage fee will depend on whether the court award reimburses class counsel for expenses reasonably incurred to maximize the total, not merely the percentage-related fraction, of the expected classwide recovery.

104 The widespread consensus calling for solving the sweetheart settlement problem by assigning the choice between class action trial and settlement to the class representative or class members' vote via objection or opt-out fail to recognize that plaintiffs are burdened by self-conflicted motivations that impairs their credibility in threatening trial to induce a higher settlement offer. In particular, plaintiffs may well sell themselves out and accept the defendant's low-ball settlement offer rather than press the classwide claim to trial and bear class counsel's fees and expenses if they win.

105 *See, e.g.*, Erichson & Zipursky (2011); Hay & Spier (1998); Hensler (1989); Schwartz & Mitchell (1970). Consequently, we regard these issues of plaintiff-side lawyer–client conflicts of interest as lying beyond the scope of the article and refrain from discussing them in detail. For extended treatment of these problems and proposals to solve them by restructuring class action fee awards (and non-class adjudication of common question claims), see Fitzpatrick (2010b) (advocating that courts award the total recovery to class counsel in negative expected value class actions). See also Macey & Miller (1991) (proposing ex post assignment of the class action by auction); Reinker & Rosenberg (2007) (proposing unlimited insurance subrogation as an ex ante means of assigning common question claims to first-party government and commercial insurers).

The formal analysis presented here is unapologetically stylized. The stark mathematical characterization of the investment decisions of the plaintiffs and defendant was intended to capture the fundamental disadvantage faced by plaintiffs in common-question litigations adjudicated in the separate action process. When pursuing separate actions, plaintiffs tend to free-ride on the efforts of others and thus jointly underinvest relative to what is in their mutual interest. The simple rational choice framework allowed us to clarify the effects of class action, not just on the plaintiffs' investment levels but also on the strategic responses of the defendant, and to demonstrate the superiority of class action over collateral estoppel, fee-shifting, and the other non-class procedures conventionally proffered as class action alternatives. With better theoretical and practical understanding of why and how to structure a bias-free mode of adjudicating common questions litigations, a major and possibly the most important type of civil action, the needed work in revising policy and reforming process can proceed in a socially responsive and responsible way.

REFERENCES

Baye, Michael R., & Heidrun Hoppe. 2003. The Strategic Equivalence of Rent-Seeking, Innovation, and Patent-Race Games. *Games Econ. Behav.* **44**, 217–226.

Baye, Michael R., Dan Kovenock, & Casper G. de Vries. 1996. The All-Pay Auction with Complete Information. *Econ. Theor.* **8**, 201–304.

Bernardo, Antonio E., Eric Talley, & Ivo Welch. 2000. A Theory of Legal Presumptions. *J. Law Econ. Organ.* **16**, 1–49.

Bone, Robert G. 1992. Rethinking the "Day in Court" Ideal and Nonparty Preclusion. *N. Y. Univ. Law Rev.* **67**, 193–293.

———. 2012. Class Action. In Chris William Sanchirico (*ed.*), *Procedural Law and Economics*, 350. Cheltenham: Edward Elgar Publishing Co.

Che, Yeon-Koo. 2002. The Economics of Collective Negotiations in Pretrial Bargaining. *Int. Econ. Rev.* **43**, 549–576.

Che, Yeon-Koo, & Kathryn E. Spier. 2008. Exploiting Plaintiffs Through Settlement: Divide and Conquer. *J. Inst. Theor. Econ.* **164**, 4–23.

Che, Yeon-Koo, & Jong Goo Yi. 1993. The Role of Precedents in Repeated Litigation. *J. Law Econ. Organ.* **9**, 399–424.

Choi, Albert, & Chris William Sanchirico. 2004. Should Plaintiffs Win What Defendants Lose? Litigation Stakes, Litigation Effort, and the Benefits of Decoupling. *J. Legal Stud.* **33**, 323–354.

Coffee, John C. Jr 1987. The Regulation of Entrepreneurial Litigation: Balancing Fairness and Efficiency in the Large Class Action. *Univ. Chicago Law Rev.* **54**, 877–937.

Conte, Alba, & Herbert Newberg. 2002. *Class Actions*, 4th edn. Thomson-West: Egan MN, pp. 243–46.

Dam, Kenneth W. 1975. Class Actions: Efficiency, Compensation, Deterrence and Conflict of Interest. *J. Legal Stud.* **4**, 47–73.

Daughety, Andrew F. 2000. Settlement. In Boudewijn Bouckaert, & Gerrit De Geest (*eds.*), *Encyclopedia of Law and Economics*, vol. 5. Cheltenham: Edward Elgar Publishing Co, pp. 95–158.

Daughety, Andrew F., & Jennifer Reinganum. 2005. Economic Theories of Settlement Bargaining. *Annu.Rev. Law Soc.* **1**, 35–59.

Dixit, Avinash K. 1987. Strategic Behavior in Contests. *Am. Econ. Rev.* **77**, 891–898.

Eisenberg, Theodore, & Geoffrey Miller. 2004. The Role of Opt-Outs and Objectors in Class Action Litigation: Theoretical and Empirical Issues. *Vanderbilt Law Rev.* **57**, 1529–1567.

Erichson, Howard M., & Benjamin Zipursky. 2011. Consent versus Closure. *Cornell Law Rev.* **96**, 265.

Farmer, Amy, & Paul Pecorino. 1999. Legal Expenditure as a Rent-Seeking Game. *Public Choice* **100**, 271–288.

Fitzpatrick, Brian T. 2010a. An Empirical Study of Class Action Settlements and Their Fee Awards. *J. Emp. Legal Stud.* **7**, 811–846.

———. 2010b. Do Class Action Lawyers Make Too Little? *Univ. Pennsylvania Law Rev.* **158**, 2043–2083.

Fried, Charles, & David Rosenberg. 2003. *Making Tort Law: What Should Be Done and Who Should Do It.* Washington DC: American Enterprise Institute Press.

Galanter, Marc. 1974. Why the "Haves" Come Out Ahead: Speculations on the Limits of Legal Change. *Law Soc. Rev.* **9**, 95–160.

Garfinkel, Michelle R., & Stergios Skaperdas. 2007. Economics of Conflict: An Overview. In Todd Sandler, & Keith Hartley (*eds.*), *Handbook of Defense Economics: Defense in a Globalized World*, vol. 2. Amsterdam: North Holland, pp. 650–709.

George, Lawrence C. 1980. Sweet Uses of Adversity: Parklane Hosiery and the Collateral Class Action. *Stanford Law Rev.* **32**, 655–686.

Hamdani, Assaf, & Alon Klement. 2005. The Class Defense. *California Law Rev.* **93**, 685–742.

Hay, Bruce L., & Kathryn E. Spier. 1998. Settlement of Litigation. In Peter Newman (*ed.*), *The New Palgrave Dictionary of Economics and the Law*, vol. 3. London: Macmillan Reference Limited, pp. 442–451.

Hay, Bruce L., & David Rosenberg. 2000. "Sweetheart" and "Blackmail" Settlements in Class Actions: Reality and Remedy. *Notre Dame Law Rev.* **75**, 1377–1408.

Hensler, Deborah R. 1989. Resolving Mass Toxic Torts: Myths and Realities. *Univ. Illinois Law Rev.* **75**, 89–104.

Hersch, Joni, & W. Kip Viscusi. 2007. Tort Liability Litigation Costs for Commercial Claims. *Am. Law Econ. Rev.* **9**, 330–369.

Hillman, Arye, & John G. Riley. 1989. Politically Contestable Rents and Transfers. *Econ. Polit.* **1**, 17–40.

Hirshleifer, Jack. 1989. Conflict and Rent-Seeking Success Functions: Ratio vs. Difference Models of Relative Success. *Public Choice* **63**, 101–112.

Hirshleifer, Jack, & John G. Riley. 1992. *The Analytics of Uncertainty and Information.* Cambridge, UK: Cambridge University Press.

Hylton, Keith N. 2007. Reflections on Remedies and Philip Morris v. Williams. *Rev. Litig.* **27**, 9–36.

Kalven, Harry, Jr. & Maurice Rosenfeld. 1941. The Contemporary Function of the Class Suit. *Univ. Chicago Law Rev.* **8**, 684–721.

Kaplow, Louis, & Steven Shavell. 2001. Fairness versus Welfare. *Harvard Law Rev.* **114**, 961–1388.

Katz, Avery W. 1988. Judicial Decisionmaking and Litigation Expenditure. *Int. Rev. Law Econ.* **8**, 127–143.

Kluger, Richard. 1997. *Ashes to Ashes: America's Hundred-Year Cigarette War, the Public Health, and the Unabashed Triumph of Philip Morris.* New York: Vintage.

Konrad, Kai A. 2009. *Strategy and Dynamics in Contests.* Oxford: Oxford University Press.

Korn, David, & David Rosenberg. 2013. Concepcion's Pro-Defendant Biasing of the Arbitration Process: The Class Counsel Solution. *Univ. Michigan J. Law Reform* **46**, 1151–1201.

Lee, Emery G. III, & Thomas Willging. 2010. Litigation Costs in Civil Cases: Multivariate Analysis. *Report to the Judicial Conference Advisory Committee on Civil Rules.* Federal Judicial Center. http://ssrn.com/abstract=1606846 or http://dx.doi.org/10.2139/ssrn.1606846.

Macey, Jonathan R., & Geoffrey P. Miller. 1991. The Plaintiffs' Attorney's Role in Class Action and Derivative Litigation: Economic Analysis and Recommendations for Reform. *Univ. Chicago Law Rev.* **58**, 1–118.

Miller, Arthur R. 1979. Of Frankenstein Monsters and Shining Knights: Myth, Reality and the "Class Action" Problem. *Harvard Law Rev.* **92**, 664–694.

Miller, Geoffrey P. 1998. Class Actions. In Peter Newman (*ed.*), *The New Palgrave Dictionary of Economics and the Law*, vol. 1. London: Macmillan Reference Limited, pp. 257–262.

Mullenix, Linda S. 1986. Class Resolution of the Mass-Tort Case: A Proposed Federal Procedure Act. *Texas Law Rev.* **64**, 1039–1100.

Nagareda, Richard A. 2002. Autonomy, Peace, and Put Options in the Mass Tort Class Action. *Harvard Law Rev.* **115**, 747–830.

Note. 1978. A Probabilistic Analysis of the Doctrine of Mutuality of Collateral Estoppel. *Michigan Law Rev.* **76**, 612–693.

Osborne, Martin. 2003. *An Introduction to Game Theory*. Oxford: Oxford University Press.

Parisi, Francesco. 2002. Rent-Seeking Through Litigation: Adversarial and]Inquisitorial Systems Compared. *Int Rev Law Econ.* **22**, 193–216.

Polinsky, Mitchell A., & Steven Shavell. 2010. The Uneasy Case for Product Liability. *Harvard Law Rev.* **123**, 1437–1492.

Posner, Richard A. 1973. An Economic Approach to Legal Procedure and Judicial Administration. *J. Legal Stud.* **2**, 399–458.

———. 1977. *Economic Analysis of Law*. New York: Aspen Publishers.

———. 2011. *Economic Analysis of Law*. New York: Aspen Publishers.

Prescott, J.J., Kathryn E. Spier, & Albert Yoon. Forthcoming. Trial and Settlement: A Study of High Low Agreements. *J. Law Econ.*

Reinker, Kenneth S., & David Rosenberg. 2007. Unlimited Subrogation: Improving Medical Malpractice Liability by Allowing Insurers to Take Charge. *J. Legal Stud.* **36**, 261–289.

Rheingold, Paul D. 2009. *Litigating Mass Tort Cases*, § 14:17. Eagan, MN: West.

Report of the Advisory Committee on Civil Rules and the Working Group on Mass Torts. 1999. 187 F.R.D. 293.

Rosenberg, David. 1984. The Causal Connection in Mass Exposure Cases: A "Public Law" Vision of the Tort System. *Harvard Law Rev.* **97**, 849–929.

———. 1985. The Dusting of America: A Story of Asbestos—Carnage, Cover-up, and Litigation. *Harvard Law Rev.* **99**, 1693–1706.

———. 2002a. Avoiding Duplicative Litigation of Similar Claims: The Superiority of Class Action vs. Collateral Estoppel vs. Standard Claims Market, *Harvard Law School, Public Law Research Paper* No. 44; *Harvard Law and Economics Discussion Paper* No. 394.

———. 2002b. Mandatory-Litigation Class Action: The Only Option for Mass Tort Cases. *Harvard Law Rev.* **115**, 831–897.

———. 2002c. Decoupling Deterrence and Compensation Functions in Mass Tort Actions for Future Loss. *Virginia Law Rev.* **88**, 1871–1919.

———. 2007. The Judicial Posner on Negligence versus Strict Liability: Indiana Harbor Belt Railroad Co. v. American Cyanamid Co. *Harvard Law Rev.* **120**, 1210–1222.

———. 2014. A Sampling-based System of Civil Liability. *Theor. Inquir. Law* **15**, 636–667.

Rosenberg, David, & Steven Shavell. 1985. A Model in Which Suits Are Brought for Their Nuisance Value. *Int. Rev. Law Econ.* **5**, 3–13.

Schwartz, Murray L., & Daniel J.B. Mitchell. 1970. An Economic Analysis of the Contingent Fee in Personal-Injury Litigation. *Stanford Law Rev.* **22**, 1125–1162.

Shavell, Steven. 1997. The Fundamental Divergence Between the Private and the Social Motive to Use the Legal System. *J. Legal Stud.* **26**, 575–612.

———. 2004. *Foundations of Economic Analysis of Law*. Cambridge, MA: Harvard University Press.

Shepherd, George B. 1999. An Empirical Study of the Economics of Pretrial Discovery. *Int. Rev. Law Econ.* **19**, 245–263.

Silver, Charles, & Geoffrey P. Miller. 2010. The Quasi-class Action Method of Managing Multi-district Litigations: Problems and a Proposal. *Vanderbilt Law Rev.* **63**, 107–177.

Skaperdas, Stergios. 1996. Contest Success Functions. *Econ. Theor.* **7**, 283–290.

Solum, Lawrence B. 2004. Procedural Justice. *Southern California Law Rev.* **78**, 181–322.

Spier, Kathryn E. 2007. Litigation. In A. Mitchell Polinsky, & Steven Shavell (*eds.*), *The Handbook of Law and Economics*. Amsterdam: North-Holland, pp. 265–345.

Spurr, Stephen J. 1991. An Economic Analysis of Collateral Estoppels. *Int. Rev. Law Econ.* **11**, 47–61.

Stremitzer, Alexander. 2008. Exploiting Plaintiffs through Settlement: Divide and Conquer: Comment. *J. Inst. Theor. Econ.* **164**, 27–30.

Tullock, Gordon. 1980. Efficient Rent Seeking. In James Buchanan, Gordon Tullock, & Robert Tollison (*eds.*), *Towards a Theory of the Rent-Seeking Society*. College Station: Texas A&M University Press, pp. 97–112.

APPENDIX

This appendix generalizes the intuitions and example in article. Suppose that the probability that Plaintiff 1 will prevail at trial is given by

$$p_1(c_1, c_2, c_d) = \frac{c_1 + \theta c_2}{c_1 + \theta c_2 + c_d}, \tag{A1}$$

whereby c_1, c_2, and c_d are the expenditures of the two plaintiffs and the defendant, and $\theta \in [0, 1]$ is a parameter capturing the degree of spillovers between the plaintiffs.[106] When $\theta = 0$, there are no spillovers and the probabilities correspond to expression (1). When $\theta = 1$, there are full spillovers and the probabilities correspond to expression (2). Similarly, the probability that Plaintiff 2 will

106 Since the denominator, $c_1 + \theta c_2 + c_d$, is weakly larger than the numerator, $c_1 + \theta c_2$, the probability is necessarily bounded between zero and one.

prevail at trial is symmetric and given by:

$$p_2(c_1, c_2, c_d) = \frac{c_2 + \theta c_1}{c_2 + \theta c_1 + c_d}. \tag{A2}$$

As described in the text, we will consider the Nash equilibrium of the game where the three litigants choose their expenditures simultaneously. We will explore two cases. In the first, the plaintiffs choose their expenditures independently of each other to maximize their individual returns. In the second case, the plaintiffs choose their expenditures jointly. This will allow us to explore in more detail the roles of spillovers and joint decision making.

Decentralized Plaintiff Decision Making

Suppose the two plaintiffs choose their expenditures in to maximize their individual expected payoffs at trial. In other words, Plaintiff 1 chooses c_1 to maximize his or her expected damage award at trial minus his or her litigation costs, without concern for any benefits that his or her litigation spending will have for the other plaintiff. Plaintiff 1's payoff may be written as

$$p_1(c_1, c_2, c_d)x - c_1 = \left(\frac{c_1 + \theta c_2}{c_1 + \theta c_2 + c_d}\right)x - c_1. \tag{A3}$$

Plaintiff 1 will choose c_1 to maximize this expression, given the expectation that the other plaintiff and the defendant will choose to spend c_2 and c_d, respectively. In other words, Plaintiff 1 will choose to invest to the point where the marginal benefit of an extra dollar of expenditure, namely the increase in the probability multiplied by the damages, is exactly equal to the marginal cost,[107]

$$\frac{c_d}{(c_1 + \theta c_2 + c_d)^2}x = 1, \tag{A4}$$

Solving for c_1 establishes that Plaintiff 1's preferred expenditure, c_1, depends on the expenditures of the other plaintiff and the defendant according to the following best-response or reaction curve:

$$c_1 = R_1(c_2, c_d) = \sqrt{c_d x} - c_d - \theta c_2. \tag{A5}$$

Note that as the stakes of the case, x, grow larger then Plaintiff 1 will spend more money on litigation. This makes sense—with larger stakes, the marginal value of an extra dollar of investment is larger (this is driven by the higher probability of winning at trial). Note that Plaintiff 1's preferred choice of trial expenditure, c_1, is decreasing in the expenditure of Plaintiff 2. This follows from

107 One can derive this expression by taking the first derivative of Plaintiff 1's payoff function with respect to c_1, holding the other litigants' investments fixed.

the structure of the probability function, $p_1(c_1, c_2, c_d)$; when Plaintiff 2 spends more, then the marginal return to Plaintiff 1 is lower. It follows that the two plaintiffs' expenditures are "strategic substitutes" for each other. It is also interesting to note that the right-hand side of this expression is initially increasing but then decreasing in the defendant's expenditures c_d. Suppose that $x = 180$, and consider an extreme situation where the plaintiff expects the defendant to spend nothing, $c_d = 0$. In this case, the plaintiff can assure himself or herself a 100 percent win rate with a tiny investment—a penny, say. At the other extreme, if $c_d = 180$ then expression (A5) tells us that the plaintiff would not spend more than zero.[108] For intermediate levels of defendant spending, the plaintiff will find it worthwhile to invest in litigation, however.

Similarly, if Plaintiff 2 is only concerned with his or her individual payoff, his or her preferred expenditure is:

$$c_2 = R_2(c_1, c_d) = \sqrt{c_d x} - c_d - \theta c_1. \tag{A6}$$

Taking the defendant's expenditure c_d as fixed for a moment, if the plaintiffs choose their expenditures simultaneously, then in the Nash equilibrium each plaintiff would choose to spend:

$$c_p = \frac{\sqrt{c_d x} - c_d}{1 + \theta}. \tag{A7}$$

This is the unique point where the two best-response curves cross each other. This expression is consistent with the numerical example used in the article. When $x = 180$ and $c_d = 80$, then this becomes $c_p = 40/(1 + \theta)$. So with no spillovers ($\theta = 0$), the plaintiffs invest $c_1 = c_2 = c_p = 40$, and with full spillovers ($\theta = 1$) the plaintiffs invest $c_1 = c_2 = c_p = 20$. Note that $c_1 = c_2 = c_p = 20$ is the equilibrium in the limit as θ approaches 1.

It is also interesting to explore how the plaintiffs' expenditures depend on the expenditures of the defendant, c_d. When $c_d = 0$, then plaintiffs will win their claims with 100 percent certainty, even if their expenditures are infinitesimally small. Starting at the point where $c_d = 0$, the plaintiffs' incentives to spend money on their claims increases if they expect the defendant to spend more money as well. The plaintiffs' incentive to spend on litigation is dampened, however, when the defendant's expenditures are large. When $c_d = x$, however, then the plaintiffs would rationally refrain from spending anything at all. The plaintiffs' (aggregate) best-response curve is first increasing and then decreasing in c_d.

108 If the plaintiff spent one dollar on litigation, the plaintiff's expected damage award would rise by less than one dollar, rendering the investment unprofitable. This is because the marginal benefit of investment is increasing in c_d when c_d is small but decreasing in c_d when c_d is large.

The defendant minimizes his or her expected payments given his or her beliefs about the expenditures of the two plaintiffs, c_1 and c_2, $p_1(c_1, c_2, c_d)x + p_2(c_1, c_2, c_d)x + c_d$. Substituting the expressions for the probabilities from above, this expression may be rewritten as:

$$\left(\frac{c_1 + \theta c_2}{c_1 + \theta c_2 + c_d}\right)x + \left(\frac{\theta c_1 + c_2}{\theta c_1 + c_2 + c_d}\right)x + c_d. \tag{A8}$$

If the defendant expects the two plaintiffs to spend equal amounts, $c_1 = c_2 = c_p$, then the defendant will choose to spend

$$c_d = \sqrt{2(1+\theta)c_p x} - (1+\theta)c_p. \tag{A9}$$

This is the value that minimizes the defendant's expected payments.[109] Solving the system of equations, we find that the Nash equilibrium levels of spending for the plaintiffs and defendant, respectively, satisfy

$$c_1 = c_2 = c_p = \frac{2x}{9(1+\theta)} \quad \text{and} \quad c_d = \frac{4x}{9}. \tag{A10}$$

The plaintiffs expenditures are falling in θ, the degree of spillovers between the claims. The defendant's expenditure does not depend on the spillover parameter directly. Note that the defendant is at a strategic advantage in when the plaintiffs do not coordinate with one another: the probability that a plaintiff will win at trial is 1/3. One can also calculate the payoffs for the plaintiffs, π_1 and π_2, and the defendant, π_d, respectively:

$$\pi_1 = \pi_2 = \left[\frac{1}{3} - \frac{2}{9(1+\theta)}\right]x \quad \text{and} \quad \pi_d = \frac{-10x}{9}. \tag{A11}$$

Centralized Plaintiff Decision Making

Suppose that the plaintiffs choose their expenditures, c_1 and c_2, cooperatively to maximize their joint expected return from litigation, $p_1(c_1, c_2, c_d)x + p_2(c_1, c_2, c_d)x - c_1 - c_2$. Their joint payoff may be written as

$$\left(\frac{c_1 + \theta c_2}{c_1 + \theta c_2 + c_d}\right)x + \left(\frac{\theta c_1 + c_2}{\theta c_1 + c_2 + c_d}\right)x - c_1 - c_2. \tag{A12}$$

If the two plaintiffs are fully coordinating their decisions, they will invest to the point where the marginal benefit of an extra dollar, which include both the

109 Differentiating the expression for the defendant's total payments with respect to c_d and setting the derivative equal to zero identifies this value.

effect on Plaintiff 1's expected award at trial (as reflected in the first term in the expression) and the effect on the Plaintiff 2's expected award (as reflected in the second term). Using simple calculus, we take partial derivatives of this expression with respect to c_1 and c_2 and set them equal to zero, yielding two first-order conditions

$$\frac{c_d}{(c_1+\theta c_2+c_d)^2}x+\frac{\theta c_d}{(c_2+\theta c_1+c_d)^2}x=1 \tag{A13}$$

and

$$\frac{\theta c_d}{(c_1+\theta c_2+c_d)^2}x+\frac{c_d}{(c_2+\theta c_1+c_d)^2}x=1. \tag{A14}$$

Solving these two equations simultaneously gives the following solution:

$$c_1=c_2=c_p=\frac{\sqrt{(1+\theta)c_d x}-c_d}{1+\theta}. \tag{A15}$$

Similarly, the defendant minimizes his or her expected payments, $p_1(c_1, c_2, c_d)x+p_2(c_1, c_2, c_d)x+c_d$. If the defendant expects the two plaintiffs to spend equal amounts, $c_1=c_2=c_p$, then it is straightforward to show that the defendant will choose to spend

$$c_d=\sqrt{2(1+\theta)c_p x}-(1+\theta)c_p. \tag{A16}$$

Solving the system of equations, we find that the equilibrium levels of spending for the plaintiffs and defendant, respectively, satisfy

$$c_1=c_2=c_p=\frac{2(1+\theta)}{(3+\theta)^2}x \text{ and } c_d=\frac{4(1+\theta)}{(3+\theta)^2}x. \tag{A17}$$

When $\theta=0$ (no spillovers) then $c_1=c_2=c_p=40$ and $c_d=80$. When $\theta=1$ (full spillovers) then $c_1=c_2=c_p=45$ and $c_d=90$.

Finally, note that the defendant is at a strategic advantage in when the plaintiffs do not coordinate with one another: the probability that a plaintiff will win at trial is $(1+\theta)/(3+\theta)$. One can also calculate the payoffs for the plaintiffs, π_1 and π_2, and the defendant, π_d, respectively:

$$\pi_1=\pi_2=\left(\frac{1+\theta}{3+\theta}\right)^2 x \text{ and } \pi_d=-\frac{2(1+\theta)(5+\theta)}{(3+\theta)^2}x. \tag{A18}$$