Class Action Waivers and Private Antitrust Litigation*

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Abstract

The paper analyzes the effect of class actions and class action waivers on firms' ability to collude and fix market prices. We model class action as a mechanism that allows plaintiffs to lower their litigation costs. The paper shows that when the cost of individual litigation is sufficiently low, firms endure lawsuits in equilibrium and swallow the litigation costs as just another cost of doing business. In this case, firms have an incentive to allow class actions and this is also socially optimal. By contrast, when the cost of individual litigation is above a threshold, the firms set the market price so that future litigation is deterred. In this case, firms may want to impose class action waivers (and disallow class actions). By doing so, they can raise the market price and increase their profits, but this is socially sub-optimal. Various extensions, such as possible settlement, asymmetric information, contingent fee payments, fee shifting, and damages multiplier, are also examined.

JEL Codes: TBD

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1 Introduction

In litigation against firms, plaintiffs may be able to consolidate the lawsuits into a single class action, so as to achieve economies of scale and other benefits.[1] Examples include products liability lawsuits, pricing fixing and other antitrust lawsuits, lawsuits by employees against an employer alleging, for instance, discrimination, and securities class actions by shareholders.[2] Many prospective-defendant companies have attempted to "manage" the threat of lawsuits and class actions by requiring consumers (or employees) to sign class action waivers (usually through mandatory individual arbitration) at the time of product purchase (or contract signing). And since the US Supreme Court has upheld such arrangements in *Concepcion* and *Italian Colors*[3] class action (and class arbitration) waiver arrangements have proliferated (Gilles (2005)). The issue has become even more controversial when Consumer Financial Protection Bureau recently adopted a rule that bans mandatory individual arbitration clauses (that prohibits class actions) in consumer financial contracts,[4] while the US Supreme Court upheld mandatory, individual arbitration clauses in employment contracts.[5]

This paper examines the effect of class actions and class action waivers in the context of antitrust lawsuits. The analysis focuses on possible pricing fixing (collusion) by firms in a product market and the effect class action and its waiver have on the firms' ability to charge supra-competitive prices. Class action is modeled as a mechanism that allows the consumer-plaintiffs to capture the economies of scale and lower the total (and per-plaintiff) cost of litigation. The paper shows that whether the firms will require the consumers to waive their right to bring a class action depends on the consumers' individual litigation cost (without class action) and the degree of economies of scale that can be achieved through class action. If the cost is sufficiently low, firms endure litigation in equilibrium and treat litigation as just another cost

[1] See for example Dam (1975), Miller (1998), Bone (2012), and Rosenberg and Spier (2014).

[2] Although the class action system is well established, it has always been controversial. Many scholars and practitioners have argued that the system is inefficient and engenders a new level of agency problems, that between plaintiffs and their representative lawyers.

[3] See *ATT Mobility LLC v. Concepcion*, 563 U.S. 333 (2011) and *American Express Co. v. Italian Colors Rest.*, 133 S. Ct. 2304 (2013).

[4] Consumer Financial Protection Bureau (CFPB) is a federal agency formed in accordance with the Dodd-Frank Act after the recent financial crisis and is in charge of overseeing and regulating consumer financial contracts, such as credit card agreements and mortgage contracts. After a notice and comment period, the bureau issued a rule ("Arbitration Agreements Rule"), prohibiting mandatory arbitration clause in certain consumer financial contracts, on July 10, 2017. The rule is currently being challenged in US Congress.

[5] See *Epic Systems Corp. v. Lewis*, – S. Ct. – (2018) (holding that mandatory, individual arbitration clauses in employment contracts are consistent with both the Federal Arbitration Act and the National Labor Relations Act).

of doing business. When that is the case, firms will have an incentive to allow class actions (i.e., not require the consumers to sign a waiver) and doing so also increases social welfare. On the other hand, when consumers' individual litigation cost is sufficiently high, firms would want to avoid litigation in equilibrium and have an incentive to require a class action waiver (prohibit class actions). The waiver increases the per-plaintiff litigation cost, thereby allowing the colluding firms to increase the market price, which, in turn, decreases social welfare.

Our analysis shows that it is not in the society's interest to always allow or ban class action waivers (or always reduce the plaintiff's litigation cost). The optimal policy depends on the type of equilibrium. When the litigation cost (with class action) is already sufficiently high, so that the firms avoid litigation in equilibrium, allowing class action waivers will only decrease welfare by allowing the firms to charge an even higher price (and create a larger deadweight loss). In such a setting, class action waivers should be disallowed. On the other hand, when the litigation cost (with class action) is sufficiently low, so that the firms endure litigation in equilibrium, class action waivers can possibly allow the firms to push litigation off the equilibrium by sufficiently raising the litigation cost. In that case, class action waivers can actually increase social welfare. With litigation pushed off the equilibrium, there is no longer the welfare loss that stems from the litigation cost and this can actually increase social welfare.

The second scenario—where class action waivers can increase social welfare—is easiest to explain with a simple example. Suppose, with class action waivers, consumers' litigation cost is so high that the firms never have to worry about getting sued and can charge unbridled monopoly price. In that case, the social welfare loss will stem solely from too few purchases, i.e., the conventional deadweight loss under monopoly. Now, suppose, when we allow class actions, the economies of scale are so great that the per-plaintiff litigation cost is near zero (or negligible). In this case, firms will be unable to avoid litigation and will take litigation as just another cost of doing business. However, the collusive (modified monopoly) price that the firms charge will be based not only on the cost of production but also on the firms' litigation cost; and the higher the total cost, the higher the modified monopoly price, and the lower the social welfare. Furthermore, even though the plaintiffs' litigation cost is negligible, firms have to incur litigation cost in equilibrium. Compared to the case with no litigation, social welfare will be lower both because of the fewer purchases and the firms' litigation cost.

The paper considers both forward-looking (sophisticated) consumers, who foresee that they will be able to bring suit ex post and receive future damage payment ("rebate") from the firms, and myopic (less sophisticated) consumers, who do not

foresee being plaintiffs in litigation and do not take the possible "rebate" into account when they are making the purchase decision. We show that the firms are (weakly) worse off when consumers are myopic and we are more likely to be in the regime where the firms would want to keep litigation off the equilibrium and impose class action waivers. Intuitively, the firms will raise the market price to reflect the future damage payments to the consumers and the costs of litigation. Since consumers do not anticipate receiving future damage awards, the quantity demanded by myopic consumers is smaller. Since allowing litigation does not increase demand with myopic consumers, firms are more likely to want to avoid litigation and class action waivers become more useful. We show further that social welfare may be either lower or higher with myopic consumers.

We also extend the basic analysis is several ways. First, our main analysis assumes that all lawsuits go to trial. In a world of frictionless settlement, the threat of litigation does not deter collusion and cannot improve social welfare. In reality, however, settlement is not frictionless, and so private antitrust litigation will have some deterrent effect. In that light, we examine the problems of asymmetric information between the consumer-plaintiffs and firm-defendants and the possible settlement failure. Furthermore, although our main model assumes that the litigants pay the fixed costs of legal services, the same results hold with contingent fee attorneys and a perfectly competitive market for legal services. When the market for legal services is not perfectly competitive and the contingent fee attorneys earn some rent in equilibrium, on the other hand, firms are worse off and become more likely to impose class action waivers. Fee-shifting rules and damage multipliers are also discussed.

Our model is closely related to those that investigated the real effects of treble damages in private antitrust litigation. Breit and Elzinga (1974) and Easterbrook (1985) have argued that far-sighted consumers will take into account future damage awards when making their purchase decisions.[6] In models with costless litigation, Salant (1987) and Baker (1988) show formally that damage remedies have neutral welfare consequences. Besanko and Spulber (1990) show that this neutrality does not hold when the cartel has private information about the costs of production and expected damages are under-compensatory (an assumption that we maintain as well). None of these papers characterize the full equilibrium with costly litigation, explore the comparative statics, or derive the welfare implications presented here.[7]

[6]Easterbrook (1985, 451) notes that if consumers "have perfect information and enforcement is costless, they view the future recovery as a cents-off coupon attached to each purchase."

[7]Spulber (1989, 592) briefly discusses litigation costs and how they constrains the firms' markup.

2 The Model

Suppose there is a unit mass of consumers. Each consumer demands at most one unit of the good and has valuation $v \in [0, \overline{v}]$. The valuations are distributed according to a strictly positive and differentiable probability density function $f(\cdot)$ and corresponding cumulative density function $F(\cdot)$. Conditional on equilibrium price p, the aggregate demand is given by

$$D(p) = \int_p^{\overline{v}} f(v)dv$$

There are $N > 1$ firms in the market with the identical, constant marginal cost of $c \in [0, \overline{v})$. Both the number of firms (N) and the constant marginal cost (c) are common knowledge. Firms sell homogeneous products and compete through prices. We also assume that consumers costlessly observe all posted prices and other non-price terms (such as a class action waiver) in the market.

We now define some important notation. If the equilibrium market price is p and the marginal costs are c, then the aggregate industry profit is given by

$$\Pi(p, c) = \int_p^{\overline{v}} (p - c)f(v)dv = D(p)(p - c) \tag{1}$$

Without any collusion, the unique Bertrand equilibrium is given by all firms charging $p = c$ and earning zero profits. With perfect collusion, on the other hand, the firms would agree to set the price at the monopoly level

$$p^m(c) = \arg\max \Pi(p, c). \tag{2}$$

Finally, social welfare is

$$W(p, c) = \int_p^{\overline{v}} (v - c)f(v)dv. \tag{3}$$

From the social welfare function, the first-best outcome is obtained (social welfare is maximized) when $p = c$.

Suppose that there are antitrust laws that allow consumers to collect damages when firms collude and the market price is above marginal cost, $p > c$. Consumers who have purchased the product can then sue the firms to collect damages $d = \theta(p - c)$ where $\theta \in (0, 1)$. There are different interpretations of the parameter θ. It could simply be the probability that the plaintiffs will successfully present evidence of collusion. Alternatively, $\theta < 1$ could reflect court error or a pro-defendant bias

where the court gives a "haircut" of $1-\theta$ to the actual overcharge. By tweaking notation, it could also reflect a biased assessment by the court of the defendants' costs. Note that since $\theta < 1$, the expected damage award is not fully compensatory. We will see shortly that the assumption also implies that the firms are not completely deterred from colluding on price. We will allow $\theta \geq 1$, for instance, through supra-compensatory damages, later in the paper.

Litigation is expensive for both the consumers and the firms. The litigation costs per unit sold are $k_p > 0$ for the consumers (the plaintiffs) and $k_d > 0$ for the firms (the defendants). We assume that $c + k_d < \overline{v}$, and let $k = k_p + k_d$ be the total per unit litigation cost. Given the positive litigation cost, consumers will bring suit if only if it is profitable, $k_p < \theta(p-c)$. When indifferent ($k_p = \theta(p-c)$), we assume that consumers do not bring suit. Note that while each consumer places a different valuation on the product, each consumer's cost of litigation is the same. This assumption is made for simplicity. We interpret class actions as a mechanism that reduces the plaintiffs' litigation costs (k_p). Also, for now, we assume that only the consumers who have purchased the product can bring suit. We will relax this assumption later in the paper.

The timing of the game is as follows. At $t = 1$, the N firms offer to sell homogeneous products at price, p, and with or without a class action waiver. We implicitly assume that the firms are acting in their joint interest, and have mechanisms to enforce their collusive agreement.[8] The offer terms are observed by all consumers. At $t = 2$, the consumers decide whether to purchase the product. After purchasing the product, at $t = 3$, consumers decide whether to bring suit to collect damages for any overcharges. If lawsuits are brought, the per-unit litigation costs $k_p > 0$ and $k_d > 0$ are borne and per-unit damages $d = \theta(p - c)$ are paid at $t = 4$. There is no time discounting. The solution concept is subgame perfect Nash equilibrium.

We consider two cases. First, we consider forward-looking consumers, who apply higher-level reasoning and foresee being plaintiffs in ex post litigation. Those consumers will treat any future damage award, minus the litigation cost, as a (expected) rebate when making their purchase decisions. By contrast, we also consider "myopic" (less sophisticated) consumers who do not foresee being plaintiffs in litigation. That is, myopic consumers assume that there will be no ex post litigation and no rebate. After the purchase, however, they will bring suit if it is in their interest to do so. For each of these two cases, we will perform comparative statics on the plaintiffs' litigation costs (k_p).

[8] They might accomplish this through repeated interaction, for example.

2.1 Forward-Looking (Sophisticated) Consumers

Suppose that consumers understand fully at the time of purchase that there will be an opportunity to sue in the future for overcharges. If $p \leq c + k_p/\theta$ or $k_p \geq \theta(p-c)$, lawsuits are prohibitively expensive. Knowing that they will not bring suit, consumers purchase the product if and only if $v \geq p$. If $p > c + k_p/\theta$, on the other hand, we get $k_p < \theta(p-c)$ and consumers are willing to pay the litigation cost of k_p to collect the damages of $\theta(p-c)$ through the lawsuit. In anticipation of this, consumer will purchase the product if and only if $v \geq p - \theta(p-c) + k_p$. This is the *effective price* that consumer pays for the product after accounting for the "rebate" and the litigation cost. In general, the effective price may be written as follows:

$$x(p) = \begin{cases} p & \text{if } p \leq c + k_p/\theta \\ (1-\theta)p + \theta c + k_p & \text{if } p > c + k_p/\theta \end{cases} \tag{4}$$

Note that $x(p)$ is a strictly increasing function of p (since $\theta \in (0,1)$) but there is a discontinuity at $p = c + k_p/\theta$.

Given the effective price, we can also characterize the firms' aggregate profits as a function of p. If $p < c + k_p/\theta$, the firms' aggregate profits are $\Pi(p,c) = D(p)(p-c)$ as defined above. When $p > c + k_p/\theta$, the firms' effective profit margin per unit sold, after taking into account the future litigation cost and damages, is $p - c - \theta(p-c) - k_d$. Using the definition of $x(p)$ and remembering that $k = k_p + k_d$, the firms' effective profit margin can be written as $x(p) - c - k$.[9] When $p > c + k_p/\theta$, the firms' profit is $\Pi(x(p), c+k) = D(x(p))(x(p) - c - k)$. In the following analysis, it is useful to represent the firms' profits as a function of the effective price, $x(p)$:

$$\text{Profit} = \begin{cases} \Pi(x,c) & \text{if } x \leq c + k_p/\theta \\ \Pi(x, c + k_p + k_d) & \text{if } x > c + k_p/\theta \end{cases} \tag{5}$$

The firms and the consumers together are bearing litigation cost $k = k_p + k_d$ and the firms' aggregate profit function reflects this.

Note that, just like the effective price $x(p)$, the firms' (aggregate) profit function is also discontinuous at $p = c + k_p/\theta$. When $p < c + k_p/\theta$, consumers do not bring lawsuits, so that $x(p) = p < c + k_p/\theta$ and the firms' profits reflect the production costs only, $\Pi(p,c)$. When the price is slightly higher, so that $p = c + k_p/\theta + \varepsilon$ where $\varepsilon > 0$ is very small, consumers bring lawsuits. In that case, we get $x(p) = p + (1-\theta)\varepsilon > c + k_p/\theta$. Taking the limit as the price approaches $p = c + k_p/\theta$ from above, the (aggregate) profit function is $\Pi(p, c+k) < \Pi(p,c)$.

[9] Rearranging (4) gives $p = \frac{x(p) - \theta c - k_p}{1-\theta}$, and plugging this expression into $(1-\theta)(p-c) - k_d$ gives the result.

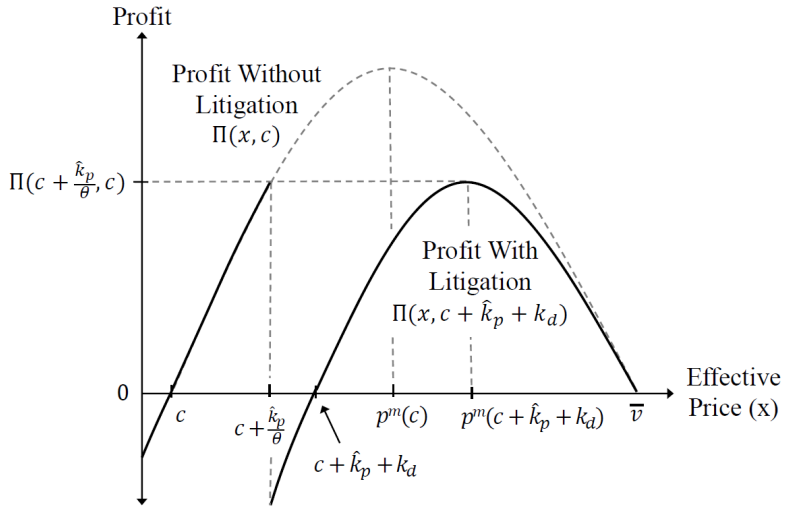


Figure 1: Definition of $\widehat{k}_p$

We now define and important piece of notation. Let $\widehat{k}_p$ to be the implicit solution of the following equation:

$$\Pi\left(c+k_p/\theta,c\right)=\Pi\left(p^m(c+k),c+k\right) \tag{6}$$

where $k=k_p+k_d$. The left-hand side of (6) represent the aggregate profits the firms earn if they charge $p=c+k_p/\theta$. Since $k_p=\theta(p-c)$ in this case, no lawsuits are filed and consumers purchase the product if and only if $v\geq c+k_p/\theta$. The right-hand side of (6) represents the maximal profits for (hypothetical) firms with marginal costs $c+k$. The condition given in (6) is illustrated graphically in Figure 1. The upper parabola represents the firms' aggregate profits when there is no litigation. As k_p rises, the firms' aggregate profits will trace along that parabola from the left hand side. The peak of the lower parabola represents the firms' maximized profit when they allow litigation in equilibrium (by charging $p>c+k_p/\theta$). As k_p falls, the lower parabola will converge to the upper parabola. When $k_p=\widehat{k}_p$, the aggregate profits they can generate while bypassing litigation (represented by the top of the bold line on the upper parabola) are the same as the maximum profits they can earn while allowing litigation (represented by the peak of the lower parabola). The following Lemma shows that $\widehat{k}_p$ exists and is unique.

Lemma 1. *There exists a unique* $\widehat{k}_p\in(0,\theta(p^m(c)-c))$ *that satisfies (6).*

Proof of Lemma 1. Consider the left-hand side of (6). When $k_p=0$ the left-hand side is $\Pi(c,c)=0$, and when $k_p=\theta(p^m(c)-c)$ the left-hand side is $\Pi(p^m(c),c)$,

the monopoly profit without the threat of litigation. The left-hand side is a strictly increasing function of k_p for all $k_p \in [0, \theta(p^m(c) - c))$. Now consider the right-hand side of (6). First, since $k = k_p + k_d > 0$, we have $\Pi(p^m(c+k), c+k) \in [0, \Pi(p^m(c), c))$. Further, since $c + k_d < \overline{v}$, we know that when $k_p = 0$, $\Pi(p^m(c+k), c+k) > 0$. Conditional on $\Pi(p^m(c+k), c+k) > 0$, when we differentiate $\Pi(p^m(c+k), c+k)$ with respect to k_p, with the envelope theorem, we get $-D(x(p)) < 0$ whenever $\Pi(p^m(c+k), c+k) > 0$. Hence, the right-hand side is strictly decreasing with respect to k_p whenever $\Pi(p^m(c+k), c+k) > 0$ and is equal to zero otherwise. Taken together, there is a unique $\widehat{k}_p \in (0, \theta(p^m(c) - c))$ that solves equation (6) implicitly. □

The threshold plaintiff litigation cost, $\widehat{k}_p$, plays an important role in our analysis of the firms' pricing strategy. When $k_p < \widehat{k}_p$, because the consumers' litigation cost is sufficiently low, the firms are better off allowing lawsuits in equilibrium and realizing profits $\Pi\left(p^m(c+k), c+k\right)$: the right-hand side of (6) is larger. As k_p rises, $p^m(c+k)$ also rises, while $\Pi\left(p^m(c+k), c+k\right)$ falls. On the other hand, when $k_p > \widehat{k}_p$, firms will set the price just high enough to eliminate lawsuits in equilibrium: the left-hand side of (6) is larger. As k_p rises, both $c + k_p/\theta$ and $\Pi\left(c + k_p/\theta, c\right)$ rise. When $k_p \geq \theta(p^m(c), c)$, the firms can charge the unconstrained monopoly price without having to face any lawsuits. This allows us to establish the following result.

Proposition 1. *The prices, litigation decisions, firm profits, and social welfare depend on the plaintiffs' litigation costs k_p as follows:*

1. *If $k_p < \widehat{k}_p$, the effective price is $p^m(c+k)$ and lawsuits are brought in equilibrium.*[10] *Firm profits are $\Pi(p^m(c+k), c+k)$ and social welfare is $W(p^m(c+k), c+k)$.*

2. *If $k_p \in [\widehat{k}_p, \theta(p^m(c) - c))$, the price is $c + \frac{k_p}{\theta}$ and no lawsuits are brought. Aggregate firm profits are $\Pi(c + \frac{k_p}{\theta}, c)$ and social welfare is $W(c + \frac{k_p}{\theta}, c)$.*

3. *If $k_p \geq \theta(p^m(c) - c)$, then the price is $p^m(c)$ and no lawsuits are brought. Aggregate firm profits are $\Pi(p^m(c), c)$ and social welfare is $W(p^m(c), c)$.*

The results of the proposition are straightforward. When the consumer-plaintiffs' litigation cost is in the highest region, $k_p \geq \theta(p^m(c) - c)$, the firms can simply collude on the monopoly price of $p^m(c)$ and consumers will not sue since lawsuit is prohibitively expensive. The colluding firms are insulated from litigation in this case. When $k_p < \theta(p^m(c) - c)$, on the other hand, there will be litigation if the firms charge $p^m(c)$. The firms have two choices. First, they could drop their (colluded) price to

[10] At the time of purchase, consumer pays a price of $\frac{p^m(c+k) - \theta c - k_p}{1-\theta} > p^m(c+k)$.

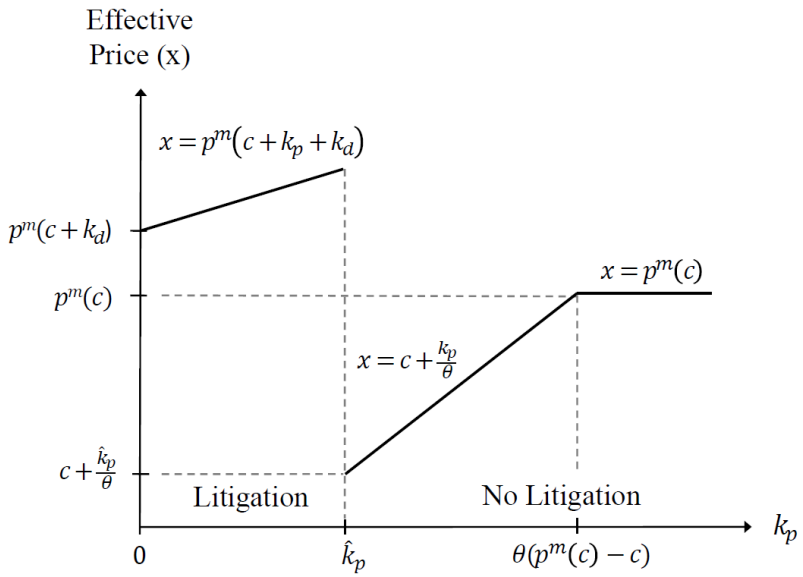


Figure 2: The Effective Price

avoid litigation altogether. Second, they might accommodate litigation and raise their price to reflect the costs of litigation. The firms' choice depends on the magnitude of k_p.

Figure 2 shows the equilibrium effective price as a function of the plaintiff's litigation costs, k_p. When the plaintiff's litigation costs are low, $k_p < \widehat{k}_p$, then the firms accept that current sales will generate future litigation. The colluding firms treat the litigation costs and the future damage payments as just another cost of doing business, and set price accordingly. In this case, the effective price is $p^m(c + k_p + k_d)$, the monopoly price when the unit cost is $c + k_p + k_d$. When the plaintiff's litigation cost is in the middle region, $k_p \in [\widehat{k}_p, \theta(p^m(c) - c))$, the firms find it worthwhile to set the price just low enough to deter lawsuits, $p = c + k_p/\theta$. When the plaintiff's litigation cost is in the high region, $k_p \geq (p^m(c) - c)$, the the firms are unconstrained by future litigation and set the price at the monopoly level, $p^m(c)$.

Figure 3 shows aggregate firm profits and social welfare as a function of the plaintiff's litigation cost, k_p. When $k_p < \widehat{k}_p$, in equilibrium, consumers file suit after purchasing the product. Notice that the firms' profits are falling as k_p rises in this region, just as they would if the firms' production costs were to increase. Increasing the plaintiff's litigation costs in this range also harms social welfare directly (since litigation is even more wasteful) and indirectly through an increase in the effective price and the associated reduction in demand. Note also that even as k_p goes to zero,

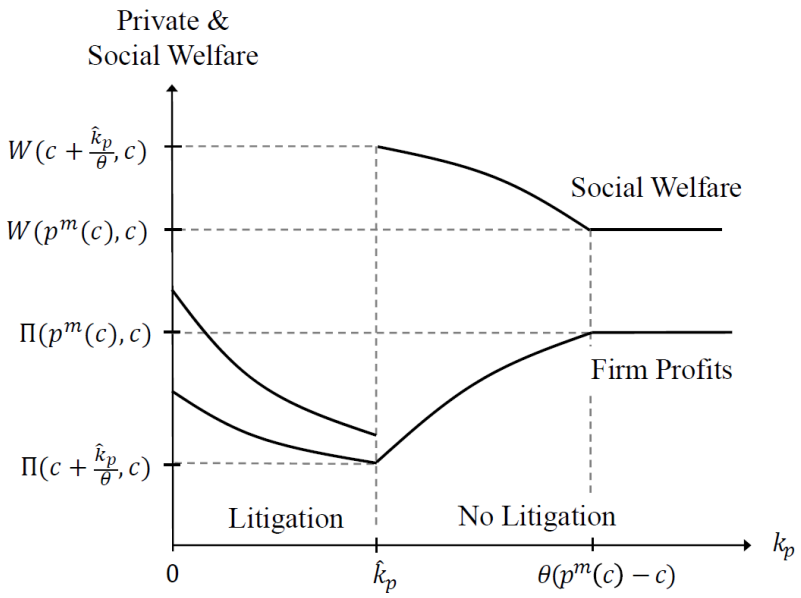


Figure 3: Private and Social Welfare

both the social welfare and the firm profits stay below those under the unconstrained monopoly price ($p^m(c)$). The reason is that even when $k_p = 0$, firms still face a positive litigation cost ($k_d > 0$), which generates a welfare loss from litigation and also imposes a higher marginal cost on the firms ($c + k_d$), thereby reducing the aggregate demand.

When the plaintiff's litigation cost is in the middle region, $k_p \in [\widehat{k}_p, \theta(p^m(c) - c))$, the firms lower their prices to $c + k_p/\theta$ in order to avoid litigation. This helps consumers and also increases social welfare, as shown by the discontinuity of the social welfare function at cost $\widehat{k}_p$. The increase in social welfare comes from two sources: (1) more consumers purchasing the product because the price is lower; and (2) no welfare loss from litigation. When k_p rises in this middle region, firms are better off (since they can raise their prices closer to $p^m(c)$ and still avoid lawsuits) but harms consumers and creates a larger dead-weight loss, reducing social welfare. In contrast to the first region, $k_p < \widehat{k}_p$, social welfare and firm profits diverge as k_p grows. Finally, when the consumer-plaintiff's litigation costs are in the highest region, $k_p > \theta(p^m(c) - c)$, then the firm can charge the monopoly price $p^m(c)$ and avoid litigation.

Proposition 2. *Firm profits are maximized when the plaintiff litigation costs are sufficiently high, $k_p \geq \theta(p^m(c) - c)$. The firms charge the monopoly price, $p^m(c)$, and no lawsuits are brought. Social welfare is maximized when plaintiff litigation costs are*

$\widehat{k}_p$. *The firms charge* $\widehat{p} = c + \frac{\widehat{k}_p}{\theta} < p^m(c)$ *and no lawsuits are brought.*

The firms would clearly like to squelch all possible litigation and charge the unrestricted monopoly price of $p^m(c)$. This is possible when the costs of litigation k_p are prohibitively high. With $k_p \geq \theta(p^m(c) - c)$, consumers will not bring suit even if the firms were to charge $p^m(c)$. In that case, firms can engage in unbridled collusion and earn profits of $\Pi(p^m(c), c)$. Suppose instead, in the opposite extreme of $k_p = 0$. In this case, consumers will bring lawsuits whenever $p - c > 0$. The firms and the forward-looking consumers will internalize the firms' litigation costs (k_d). The firms will raise the actual price to the point where the effective price paid by consumers is $p^m(c + k_d)$ and the profits would be $\Pi(p^m(c + k_d), c + k_d)$, which is strictly less than $\Pi(p^m(c), c)$.

Interestingly, it is not in society's interest for the plaintiff's litigation costs to be too small. If plaintiffs could costlessly bring litigation against the firms for overcharges, the firms would not simply give up and charge marginal cost. Instead, they will accept litigation as another cost of doing business and will raise their prices to reflect this. According to Proposition 1, if $k_p = 0$, the effective price charged by the firms would be $p^m(c + k_d) > p^m(c)$ and social welfare would be $W(p^m(c + k_d), c + k_d) < W(p^m(c), c)$. So society is strictly worse off when plaintiffs can costlessly bring lawsuits. Since social welfare is decreasing in the plaintiff's litigation costs in the lowest region, we know that the socially optimal litigation cost is not in the lowest region. In the middle region, $k_p \in [\widehat{k}_p, \theta(p^m(c) - c))$, the firms set the price to just deter litigation, $p = c + k_p/\theta < p^m(c)$. Society is better off when k_p is smaller, since the price and the deadweight loss will be correspondingly smaller, too. So the socially optimal litigation cost is $k_p = \widehat{k}_p$.

This reasoning allows us to evaluate class actions and class action waivers. So far, we have assumed that each consumer will bring a lawsuit on an individual basis. Now suppose, instead, that the consumers can bring a class action against the firms for colluding on price. We can model class action as reducing the individual litigation cost from k_p to Δk_p where $\Delta \in (0, 1)$.[11] If, instead, firms require consumers to sign a class action waiver (and the consumers do so as a condition of purchase), we assume that the consumers' individual litigation cost remains the same as before. The following corollary shows how the firms' incentive in imposing class action waivers can either be consistent with or diverge from the social welfare objective.

[11] When plaintiffs' multiple lawsuits are consolidated into a single class action, not only do the plaintiffs get the benefit of economies of scale, so could the defendants. We can also allow the defendant-firms' litigation cost to decrease, but the substantive results will not change.

Corollary 1. *Suppose the firms can require class action waivers from consumers as a condition of sale, thus raising the consumers' cost of bringing private antitrust lawsuits.*

1. *When $k_p \leq \widehat{k}_p$, firms will not require class action waivers. Both the firm profits and social welfare are higher without the waiver.*
2. *When $\widehat{k}_p < k_p < \theta(p^m(c)-c)$, firms may or may not require class action waivers. The effect of class action waivers on firm profits and social welfare is ambiguous.*
3. *When $\theta(p^m(c) - c) \leq k_p$, firms will require class action waivers. Firms profits are (weakly) higher and social welfare may be either higher or lower with the waiver.*

The reasoning behind the statements in the corollary is fairly straightforward. From Proposition 2, whether or not the firms will require the consumers to sign a class action waiver depends on the consumer's individual litigation cost. The easiest case is when $k_p \leq \widehat{k}_p$. In this case, because litigation takes place in equilibrium and the firms treat that as another cost of doing business, it is in their interest to lower the litigation cost, for instance, by allowing consumers to bring a class action. Interestingly, as the individual litigation cost decreases from k_p to Δk_p, not only will the firms' aggregate profits increase, but the social welfare also increases. The increase in social welfare comes from the fact that the deadweight loss from litigation has gotten smaller and also that the lower marginal cost leads to a lower equilibrium price, thereby serving a larger consumer base.

On the opposite end, when $k_p \geq \theta(p^m(c) - c)$, because the consumers' litigation cost (without class action) is sufficiently high and the firms can realize unconstrained monopoly profit, firms have no incentive to allow class actions. When Δ is small, doing so will only allow litigation and strictly decrease the aggregate profit. When Δ is sufficiently close to one, firms will be indifferent. Waiving the right to bring class actions may not be in the society's interest, however. Even though $k_p \geq \theta(p^m(c)-c)$, if $\widehat{k}_p \leq \Delta k_p < \theta(p^m(c) - c)$, for instance, allowing consumers to bring class actions and forcing the firms to lower the price to $p = c + \Delta k_p/\theta$ will improve welfare.

Finally, when the consumers' litigation cost (without class action) falls in the middle region, $\widehat{k}_p < k_p < \theta(p^m(c) - c)$, whether or not the firms will require a class action waiver depends on both k_p and the magnitude of Δ. If, for instance, $k_p \approx \theta(p^m(c)-c)$ and $\Delta k_p = \widehat{k}_p + \epsilon$, firms will ask class action waivers from consumers and this will increase firm profits while decreasing social welfare. On the other hand,

if $k_p = \widehat{k}_p + \epsilon$ and $\Delta k_p \approx 0$, firms will not ask class action waivers (i.e., allow the consumers to bring class actions) and this will increase firm profits. Social welfare will be lower without the class action waivers, however. In sum, when $\widehat{k}_p < k_p < \theta(p^m(c) - c)$, firms may or may not require class action waivers, and whether they do so or not, social welfare will be lower.

2.2 Myopic (Less Sophisticated) Consumers

Now suppose that consumers are myopic (less sophisticated), and are not aware at the time that they purchase the product that they will have an opportunity to bring a lawsuit in the future.[12] The consumers decide whether to purchase the product solely on their valuations (v) and the price (p), so the demand is always $D(p)$. After they purchase the product, they then learn that there was price fixing and make a choice about whether to sue the firms.

In terms of evaluating the social welfare in this context, we will do it from an ex post perspective. Thus, any damage award paid by the firm and received by the consumers has a neutral effect on welfare (although it was not anticipated by consumers ex ante). Social welfare can therefore be evaluated by looking at the quantity sold and the litigation costs that are spent, rather than grappling with misperceptions of consumers at the time of purchase.

As before, if $p < c + k_p/\theta$, then lawsuits have negative expected value and so consumers do not sue. The firms' aggregate profits are $\Pi(p, c) = D(p)(p - c)$. If $p > c + k_p/\theta$, then consumers will bring suit and recover damages of $d = \theta(p - c)$. The profit margin in this case is $p - c - \theta(p - c) - k_d$. The firms' profits when $p > c + k_p/\theta$ are $D(p)[(1 - \theta)(p - c) - k_d)] = (1 - \theta)\Pi\left(p, c + \frac{k_d}{1-\theta}\right)$. Taken together, we get:

$$\text{Profit} = \begin{cases} \Pi(p, c) & \text{if } p \leq c + k_p/\theta \\ (1 - \theta)\Pi\left(p, c + \frac{k_d}{1-\theta}\right) & \text{if } p > c + k_p/\theta. \end{cases} \tag{7}$$

Profits are, as before, a discontinuous function price. When the price rises and crosses the threshold $p = c + k_p/\theta$ then firm profits fall for two reasons. First, the firms have to pay a rebate $\theta(p - c)$ to the consumers. Second, the firms need to pay litigation costs k_d. This drop in profits for the firms is particularly severe since consumers do not expect to bring suit at the time that they are purchasing the good. In the previous

[12] Although we call these consumers "myopic," given the amount of information consumers may need, at the time of the purchase, to determine whether they may be able to bring suit ex post, such assumption may not be unrealistic in many settings.

section, the forward-looking consumers increased their demand for the product in expectation of the rebate. With myopic consumers, this does not happen.

We now characterize the monopoly price as a function of the plaintiff-consumer's litigation cost, k_p. We first define $\widetilde{k}_p$ to be the implicit solution of the following equation:

$$\Pi\left(c+\tfrac{k_p}{\theta},c\right)=(1-\theta)\Pi\left(p^m\left(c+\tfrac{k_d}{1-\theta}\right),c+\tfrac{k_d}{1-\theta}\right) \tag{8}$$

The left-hand side of (8), which is identical to the left-hand side of (6), represents firm profits when $p=c+k_p/\theta$ and the consumers do not sue. Recall that this is the highest price that can be charged that will avoid future lawsuits. The right-hand side of (8) is the maximized value of the firm profits in (7) when consumers bring suit (even though they did not expect to at the time of the purchase).

As in the case with forward-looking consumers, an implicit solution to (8) exists, is unique, and satisfies $\widetilde{k}_p \in (0, \theta(p^m(c)-c)$. To see why, note that when $k_p=0$, the left-hand side of (8) is $\Pi(c,c)=0$. As k_p rises, the left-hand side rises and reaches its maximum value of $\Pi(p^m(c),c)$ when $k_p=\theta(p^m(c)-c)$. The right-hand side of (8) does not depend on k_p, is strictly positive, and is smaller than $\Pi(p^m(c),c)$. With $\widetilde{k}_p$, we have the following result.

Proposition 3. *The prices, litigation decisions, firm profits, and social welfare depend on the plaintiffs' litigation costs k_p as follows:*

1. *If $k_p<\widetilde{k}_p$ then the price is $p^m\left(c+\frac{k_d}{1-\theta}\right)$ and lawsuits are brought. Firm profits are $(1-\theta)\Pi\left(p^m\left(c+\frac{k_d}{1-\theta}\right),c+\frac{k_d}{1-\theta}\right)$ and social welfare is $W\left(p^m\left(c+\frac{k_d}{1-\theta}\right),c+k\right)$.*

2. *If $k_p\in[\widetilde{k}_p,\theta(p^m(c)-c))$ then the price is $c+\frac{k_p}{\theta}$ and no lawsuits are brought. Firm profits are $\Pi(c+\frac{k_p}{\theta},c)$ and social welfare is $W(c+\frac{k_p}{\theta},c)$.*

3. *If $k_p\geq\theta(p^m(c)-c)$ then the price is $p^m(c)$ and no lawsuits are brought. Firm profits are $\Pi(p^m(c),c)$ and social welfare is $W(p^m(c),c)$.*

As in the case with forward-looking consumers, the threshold litigation cost $\widetilde{k}_p$ plays an important role when consumers are myopic. It is interesting to compare the firm profits, prices, and consumer welfare with myopic consumers to forward-looking consumers. To facilitate this, we first compare $\widehat{k}_p$ to $\widetilde{k}_p$ in the following Lemma.

Lemma 2. *The threshold value of k_p for myopic consumers is smaller than the threshold for forward-looking consumers, $\widetilde{k}_p<\widehat{k}_p$.*

Proof of Lemma 2. Compare equations (6) and (8) defining $\widehat{k}_p$ and $\widetilde{k}_p$, respectively. The left-hand sides are identical. The right-hand side of (6) is $\max D(p)(p-c-k)$ where $k = k_p + k_d$. This is strictly larger than $\max D(p)[p-c-k-\theta((p-c)-k_p)]$, which is the right hand side of (8). It follows that $\widetilde{k}_p < \widehat{k}_p$. □

The reasoning behind Lemma 2 is straightforward. When litigation is allowed in equilibrium, even though the firms bear the litigation cost, they do not get the benefit of increased demand. This implies that the firms will generally prefer to push the litigation off the equilibrium. Next, we compare the market outcome when consumers are myopic to the outcome when consumers are forward-looking. The following proposition shows that the firms are (at least weakly) worse off when consumers are myopic and thus do incorporate the possibility of litigation into their purchase decisions than when the consumers are forward-looking.

Proposition 4. *When $k_p < \widetilde{k}_p$, then firm profits are lower with myopic consumers than with forward looking consumers. Social welfare is higher with myopic consumers than with forward-looking consumers if and only if $\frac{k_p}{k_d} < \frac{\theta}{1-\theta}$. When $k_p \in [\widetilde{k}_p, \widehat{k}_p)$ then firm profits are lower and social welfare is higher with myopic consumers than with forward-looking consumers. If $k_p \geq \widehat{k}_p$ then firm profits and social welfare are the same with myopic and with forward-looking consumers.*

Proof of Proposition 4. Suppose $k_p < \widetilde{k}_p < \widehat{k}_p$. Firm profits are $\max D(p)(p-c-k)$ when consumers are forward looking and $\max D(p)[p-c-k-\theta((p-c)-k_p)]$ when consumers are myopic. The latter is smaller than the former. Social welfare is higher with myopic consumers if and only if $p^m(c+\frac{k_d}{1-\theta})$ is smaller than $p^m(c+k+p+k_d)$. This is true when $c+\frac{k_d}{1-\theta} < c+k+p+k_d$ or $\frac{k_p}{k_d} < \frac{\theta}{1-\theta}$. Suppose $k_p \in [\widetilde{k}_p, \widehat{k}_p)$. When consumers are myopic, the firm sets $p = c + k_p/\theta$ and no suits are brought. When consumers are forward-looking, the firm could adopt the same strategy and set $p = c + k_p/\theta$ and get the same profits as with myopic consumers. But the firm does not do that when consumers are forward looking. The firm finds it more profitable to set $p = c + k_p/\theta$ although lawsuits will be brought. By revealed preference, the firm's profits are higher when the consumers are forward looking. Social welfare is lower because (i) prices are higher and (ii) litigation costs are borne. □

The firms face two adverse effects when they raise the price of the product. First, consumers scale back their purchases. Second, the firms will need to pay a rebate to consumers in the future and also bear litigation costs k_d when they are sued. When $k_p \in [\widetilde{k}_p, \widehat{k}_p)$, firms that would have charged a high price and accepted the fact of litigation when consumers are forward looking will instead charge a low price to avoid litigation when they are myopic. This raises social welfare.

When the plaintiffs' litigation costs are very low, $k_p < \widetilde{k}_p$, then there will be litigation in equilibrium whether consumers are myopic or forward looking. The firms are clearly worse off with myopic consumers since myopic consumers are less likely to purchase the product. Social welfare may be lower or higher, depending on the ratio of the litigation costs. If the defendant-firms' litigation cost is zero, then (from the firms' perspective) they are in a profit sharing deal with the plaintiffs where the firm keeps $(1-\theta)D(p)(p-c)$, so the firms set the monopoly price $p^m(c)$. With forward-looking consumers, the price would be higher, $p^m(c+k_p)$ since consumers would anticipate bearing their own litigation costs and this would be incorporated into the firms pricing strategy. So, social welfare is higher with myopic consumers. When k_d grows, the firm will distort its price upwards when consumers are myopic, lowering social welfare relative to that for forward-looking consumers.

Proposition 5. *Suppose that consumers are myopic and do not anticipate being plaintiffs in litigation. Firm profits are maximized when the plaintiff litigation costs are sufficiently high, $k_p \geq \theta(p^m(c)-c)$. The firms charge the monopoly price, $p^m(c)$, and no lawsuits are brought. Social welfare is maximized when plaintiff litigation costs are $\widetilde{k}_p$ implicitly defined in (8). The firms charge $\widetilde{p} = c + \frac{\widetilde{k}_p}{\theta} < p^m(c)$ and no lawsuits are brought.*

3 Extensions

After having analyzed the basic models, in this section, we consider several extensions. The extensions include: (1) possible settlement under symmetric information; (2) the effect of asymmetric information between the firms and the consumers (allowing for different "types" of plaintiff-consumers) on settlement; (3) plaintiff-attorneys who receive compensation based on the litigation outcome (contingent fee compensation); (4) fee shifting (English rule) between the plaintiff-consumers and the defendant-firms, where the loser pays the fees of the winner; and (5) damage multipliers, such as treble damages.

3.1 Settlement under Symmetric Information

In the main model with forward-looking consumers, cases go to trial whenever $k_p < \theta(p-c)$ and the firms endure lawsuits in equilibrium when $k_p < \widehat{k}_p$. But since trials impose a deadweight loss, the parties would have an incentive to bargain with each other and settle out of court. By settling, the plaintiff and defendant avoid paying litigation costs k_p and k_d, respectively. We will now show that while settlements allow the parties to eliminate the deadweight loss ex post, when information is symmetric

and bargaining is frictionless (so that the parties always settle), firms will be able to achieve monopoly profits $\Pi(p^m(c), c)$ regardless of the level of the litigation costs.

We model settlement negotiations using simple Nash bargaining. When the plaintiff has a credible threat to go to trial, the least the plaintiffs would be willing to accept to settle the case is $\underline{s}(p) = \theta(p - c) - k_p$, and the most the defendants would be willing to pay is $\overline{s}(p) = \theta(p - c) + k_d$. Letting $\alpha \in [0, 1]$ represent the defendant's bargaining power, the case will settle for $s(p) = \alpha\underline{s}(p) + (1 - \alpha)\overline{s}(p) = \theta(p-c)+k_d-\alpha(k_p+k_d)$. So, following the logic of the previous section, the effective price paid by the forward-looking plaintiffs is $x(p) = p - s(p)$ and the firms' expected profit margin is $p - s(p) - c = x(p) - c$. As the following Proposition shows, when consumers are forward-looking, by choosing the actual price p, so that the effective price $x(p) = p^m(c)$, the firm can achieve the monopoly profits. On the other hand, if the consumers are myopic, the firms will not be able to realize the unconstrained monopoly profits.

Proposition 6. *Suppose the the consumers and the firms engage in Nash settlement bargaining under symmetric information with $\alpha \in [0, 1]$ representing the firms' bargaining power.*

1. *If the consumers are forward-looking and $p^m(c) > c + k_p/\theta$, in equilibrium, all cases settle at $s(p) = \alpha\underline{s}(p) + (1 - \alpha)\overline{s}(p) = \theta(p - c) + k_d - \alpha(k_p + k_d)$, and the firms charge $p = \frac{1}{1-\theta}(p^m(c) - \theta c + k_d - \alpha(k_p + k_d))$, realizing $\Pi\left(p^m(c), c\right)$.*

2. *If the consumers are myopic and $p^m(c') > c + k_p/\theta$, where $c' = c + \frac{(1-\alpha)k_d-\alpha k_p}{1-\theta}$, in equilibrium, all cases settle at $s(p) = \alpha\underline{s}(p) + (1 - \alpha)\overline{s}(p) = \theta(p - c) + k_d - \alpha(k_p + k_d)$, and the firms charge $p = p^m(c')$. The firms' equilibrium aggregate profit is given by: $(1 - \theta)\Pi\left(p^m(c'), c'\right)$.*

Proof of Proposition 6. Suppose the consumers are forward-looking and that the equilibrium price is sufficiently high that the plaintiffs have a credible threat to go to trial: $p > c+k_p/\theta$. When the suit is filed, under symmetric information Nash bargaining, the case settles for $s(p) = \alpha\underline{s}(p)+(1-\alpha)\overline{s}(p) = \theta(p-c)+k_d-\alpha(k_p+k_d)$. Ex ante, the effective price paid by the plaintiffs is $x(p) = p-s(p)$ and the firms' expected profit margin is $p-s(p)-c = x(p)-c$. Suppose the firms choose $p = \frac{1}{1-\theta}(p^m(c)-\theta c+k_d-\alpha(k_p+k_d))$. A simple algebra shows that $x(p) = p^m(c)$ and the firms earn $\Pi\left(p^m(c), c\right)$. When $p^m(c) > c + k_p/\theta$, consumers have a credible litigation threat.

Now suppose the consumers are myopic and that the equilibrium price is sufficiently high (i.e., $p^m(c') > c + k_p/\theta$) that the consumers have a credible threat to go to trial. Just as in the case with forward-looking consumers, the cases will settle for

$s(p) = \alpha \underline{s}(p) + (1-\alpha)\overline{s}(p) = \theta(p-c) + k_d - \alpha(k_p + k_d)$. This implies that, ex ante, firms will choose p to maximize $(1-\theta)D(p)(p-c')$. The profit-maximizing price is given by $p^m(c')$ where $c' = c + \frac{(1-\alpha)k_d - \alpha k_p}{1-\theta}$, which yields the aggregate profit of $(1-\theta)\Pi\left(p^m(c'), c'\right)$. □

Given that all cases settle under symmetric information, the parties do not incur any litigation cost in equilibrium. When the consumers are forward-looking, the firms can raise the price to take into account the "rebate" the consumers expect to receive through settlement. With no litigation cost in equilibrium, this allows the firms to realize the unconstrained monopoly profit. Furthermore, with forward-looking consumers, because the consumers fully understand the implications of signing a class action waiver (i.e., that they will face a higher litigation cost ex post) and take that into consideration when making the purchase decision, firms will be indifferent as to whether to impose a class action waiver. Either way, the firms will be able to realize the full monopoly profit.

When the consumers are myopic, on the other hand, because the consumers do not take into account the future settlement rebate into consideration when making the purchase decision, the demand will be determined by the posted price p: the consumers will simply compare v with p. Given that each consumer will take back $(1-\theta)(p-c)$ ex post and the firms cannot raise the price based on this rebate, the firms' profits are lower. The firms' marginal cost is also affected by the expected settlement. When $\alpha \leq \frac{k_d}{k_d+k_p}$, firms will face a higher marginal cost and their aggregate profit will be strictly lower compared to the case with forward-looking consumers. On the other hand, when the firms' bargaining leverage is sufficiently strong, i.e., α close to 1, the firms will actually have a lower marginal cost than without litigation: $c' = c + \frac{(1-\alpha)k_d - \alpha k_p}{1-\theta} < c$ when α is close to 1. When θ is also sufficiently small, the firms' aggregate profit can actually be higher with myopic consumers.

Firms' incentive to impose class action waivers and their effect on social welfare also change with myopic consumers. First, conditional on $\theta(p-c) > k_p$ in equilibrium, unless $\alpha = 0$, the larger the k_p, the lower the c', and the higher the aggregate profits for the firms. Second, a larger k_p implies that the firms become more willing to push litigation off the equilibrium and set $p = c + k_p/\theta$. Hence, with myopic consumers, the firms will always (at least weakly) be willing to impose class action waivers on consumers. Given that all cases settle under symmetric information in equilibrium, although there is no welfare loss from litigation, because the firms get to collude on a higher price with a higher k_p, social welfare will decrease with class action waivers. This is in contrast to the case when the consumers are forward-looking, where both the firm profits and social welfare are invariant with respect to class action waivers.

3.2 Settlement under Asymmetric Information

In the previous section, we assumed that the plaintiff-consumers and defendant-firms were bargaining under symmetric information. Because they always settled the lawsuit, the firms were, in turn, able to realize the unconstrained monopoly profit. In this extension, we relax the assumption that the parties are symmetrically informed and allow the plaintiff-consumers to be privately informed about the merits of their claims.[13] More specifically, suppose there are two types of plaintiffs, meritorious and frivolous. The frivolous plaintiffs were not harmed (e.g., they did not purchase the product due to low v and so proof of purchase is impossible to obtain), and will not collect damages at trial (but would pay k_p). Let $\lambda(p) \in (0,1)$ represent the equilibrium fraction of consumers with frivolous claims.

Consider first a protocol where the defendants makes a take-it-or-leave-it offer to the privately informed plaintiffs. The plaintiffs then decide individually whether to accept the offer or reject it. Plaintiffs who reject the offer can decide to either drop the case or go to court. Under this bargaining protocol, if the defendants make the offer, they will either offer $s = 0$ (refuse to settle) and take the meritorious plaintiffs to trial, or offer $s = \theta(p-c)-k_p$ and settle with everyone. If they do the former, with rational consumers, we have the initial results (with no settlement) back. If they do the latter, although there will be no litigation in equilibrium, unlike the symmetric information case, the firms can no longer realize an unconstrained monopoly profit (unless the plaintiffs' litigation cost is sufficiently high). The reason is two-fold. First, the total amount of settlement payment is higher since the firms are settling both meritorious and frivolous claims. Second, because rational consumers know that they will be able to collect $\theta(p-c)-k_p$ even when they do not purchase, this leads them to behave like myopic consumers, thereby reducing the overall demand.

Proposition 7. *Suppose only the consumers know whether they have a meritorious claim and, in case there is a lawsuit, the firms get to make a take-it-or-leave-it settlement offer. Unless $k_p \geq \theta(p^m(c)-c)$, firms cannot realize the unconstrained monopoly profit.*

Proof of Proposition 7. Foremost, just as in the case without settlement, firms can avoid litigation by setting $p = c + k_p/\theta$. In case any consumer brings suit, the firms know that the claim is frivolous and can refuse to settle (offer to settle at $s = 0$). Assuming that the firms charge $p > c + k_p/\theta$, so that there is lawsuit in equilibrium, if the the firms offer to settle at $s = 0$, only the consumers with meritorious claims will proceed to trial, and the equilibrium is the same as in the case without settlement.

[13] We can alternatively allow the defendant firms to be privately informed over the production cost, so that the plaintiffs would be initially unaware whether collusion has taken place. Besanko and Spulber (1980), for instance, adopts such a setting in examining the effects of damage multipliers.

Suppose that the firms offer to settle at $s = \theta(p-c)-k_p$. Since the rational consumers know that they will be able to receive $\theta(p-c)-k_p$ for certain even when they do not purchase the product, they will purchase only if $v - p + \theta(p-c) - k_p \geq \theta(p-c) - k_p$. The inequality simplifies to $v \geq p$. Hence, $\lambda(p) = 1 - D(p)$. When the firms settle with all consumers at $s = \theta(p-c) - k_p$, their expected profit becomes $D(p)(p-c) - (\theta(p-c) - k_p)$. Note that, compared to the case where consumers have no right to bring suit, the expected profit is lower by $(\theta(p-c)-k_p)$. The optimal price (p^*) is determined from the first order condition of $D'(p^*)(p^*-c) + D(p^*) - \theta = 0$. This implies that $p^* < p^m(c)$ and $D(p^*)(p^*-c) - (\theta(p^*-c) - k_p) < \Pi(p^m(c), c))$.

Combining both results, firms have three choices. First, they can set $p = c + k_p/\theta$ and avoid litigation in equilibrium. If $k_p \geq \theta(p^m(c)-c)$, firms can realize the unconstrained monopoly profit without having to worry about facing any lawsuits in equilibrium. If $k_p < \theta(p^m(c)-c)$, firms will earn less than full monopoly profit. Second, they can set $p > c + k_p/\theta$ and refuse to settle (offer $s = 0$) in case lawsuit is brought. In this case, the firms will earn the same profit as in the case without settlement: $\Pi(p^m(c+k), c+k)$ Third, they can set $p = c + k_p/\theta$, settle with all consumers at $s = \theta(p-c) - k_p$ and realize (weakly) less than the unconstrained monopoly profit. Between the second and the third options, the second option will be chosen when $\lambda(p)$ is sufficiently high. Unless $k_p \geq \theta(p^m(c) - c)$, firms earn strictly less than unconstrained monopoly profit. □

From the proof of Proposition 7, we see that, when only the consumers know whether they have a meritorious case and the firms get to make a take-it-or-leave-it settlement offer to the consumers, we have three possible equilibria: (1) firms set $p = c + k_p/\theta$ and avoid litigation; (2) firms set $p = p^m(c+k) > c + k_p/\theta$ and refuse to settle (i.e., offer to settle at $s = 0$); and (3) firms set $p = p^* > c + k_p/\theta$, where $p^* < p^m(c)$, and settle with both types of plaintiffs at $s = \theta(p^* - c) - k_p$. With respect to the first two types of equilibrium, firms' incentive in imposing class action waivers is the same as the case without the possibility of settlement. In case we are in the third type of equilibrium, because the firms charge $p^* < p^m(c)$ and earn $D(p^*)(p^*-c) - (\theta(p^*-c) - k_p) < \Pi(p^m(c), c))$, firms will have an incentive to impose class action waivers. When k_p increases to $k_p + \epsilon$, with $\epsilon > 0$ but small, assuming that we stay in the same type of equilibrium, firms' aggregate profit also increases by ϵ. At the same time, because all cases settle and the firms' optimal price (p^*) is unaffected by changes in k_p, there is no change in social welfare: class action waiver functions as a pure transfer from the consumers to the firms.

Finally, if we, instead, assume that the plaintiffs make a take-it-or-leave-it offer, there will not exist a fully-separating (revealing) equilibrium. This is because the

frivolous plaintiffs (those who did not purchase the product) would not reveal themselves to be such. When plaintiffs with meritorious claims make a certain (positive) settlement offer, frivolous plaintiffs have nothing to lose by mimicking the meritorious type. In case their settlement offer is rejected by the firms, they can simply drop the suit. On the other hand, there could be a pooling equilibrium, depending on λ, where all plaintiffs make a settlement offer equal to the expected loss for the defendants, i.e., $\lambda(\theta(p-c)+k_d)$.[14]

3.3 Contingent Fee Attorneys

Suppose that instead of paying a fixed fee of k_p directly, the plaintiffs hire lawyers under a contingent fee of $\beta \in (0,1)$, which represents the lawyer's share of the recovery. We can assume that the lawyers bear the cost k_p of prosecuting the case. Suppose further that lawyers come from a competitive market: they bid for the right to represent clients and clients choose lawyers who offer the lowest contingent fee. (For the moment, we are assuming away the problems of moral hazard.) When the firms set a price of $p > c$ and a lawyer brings the case to trial, the lawyer would receive $\beta\theta(p-c) - k_p$ in expectation. Since the market for legal representation is competitive, the lawyers will bid the contingent percentage down to $\beta(p) = k_p/[\theta(p-c)]$. The plaintiff's payoff from pursuing the case is $\theta(p-c) - \beta\theta(p-c) = \theta(p-c) - k_p$. Thus, the plaintiff will pursue the case if an only if $k_p < \theta(p-c)$ as before. When this inequality holds, the effective price paid by the consumer is $x(p) = (1-\theta)p + \theta c + k_p$, just as before, and all of the same results are obtained.

Even if the legal services market is not perfectly competitive (or due to moral hazard concerns), such that the plaintiff lawyers capture some rent in equilibrium, i.e., $\beta(p)\theta(p-c) > k_p$, to make it worthwhile for the plaintiff-lawyer pair to file lawsuit, we still need $\theta(p-c) > k_p$. Litigation decision, therefore, will remain unchanged. When the lawyers capture a positive rent ($\beta(p)\theta(p-c) > k_p$), however, the effective price paid by the consumer in case there is litigation is higher compared to the case with perfectly competitive legal services market: $p - (1-\beta)\theta(p-c) > p - \theta(p-c) + k_p$. With a higher effective price, both the aggregate demand and the firms' profits will be lower. It becomes more attractive for the firms to push litigation off the equilibrium by setting $p = c + k_p/\theta$, and the threshold $\widehat{k}_p$ is lower compared to the case with perfectly competitive legal services market.

[14] For the pooling equilibrium to occur, among others, we need $\theta(p-c) - k_p \leq \lambda(\theta(p-c)+k_d)$, since, otherwise, it is better for the plaintiffs with meritorious claims to proceed to litigation rather than settle. Also, when class action is allowed, there could also be issues on class action formation and opt-out, as shown in Che (1996).

3.4 Fee Shifting

In the main analysis, the plaintiff and the defendant each paid their own litigation costs regardless of the outcome at trial. This is the rule typically used in the United States (the American Rule). Suppose instead that the loser in litigation must reimburses the winner for the litigation costs (the English Rule). In this case, assuming that θ represents the plaintiff's probability of winning at trial, the plaintiff's and defendant's expected litigation costs are $(1-\theta)(k_p+k_d)$ and $\theta(k_p+k_d)$, respectively. A change from the American Rule to the English Rule may increase or decrease prices, profits, and social welfare depending on whether θ is smaller than or greater than $\frac{k_d}{k_p+k_d}$. If $\theta > \frac{k_d}{k_p+k_d}$, then the plaintiff is likely to win at trial and so the plaintiff's expected litigation costs are lower under the English Rule than the American Rule. If $\theta < \frac{k_d}{k_p+k_d}$, then the plaintiff is likely to lose at trial and so the plaintiff's expected litigation costs are higher under the English Rule.

To incorporate fee-shifting, we need to make just a few adjustments to the original model. With the English Rule, consumers will bring lawsuit when $p > c + \frac{1-\theta}{\theta}(k_p + k_d)$. Conditional on consumers having a credible lawsuit, the effective price that the consumers pay is equal to $x(p) = (1-\theta)p+\theta c+(1-\theta)(k_p+k_d)$ and the firm's effective profit margin is equal to $x(p) - c - k$. To derive the new $\widehat{k}_p$, the firms can either charge $p = c + \frac{1-\theta}{\theta}(k_p + k_d)$ and disallow litigation or maximize profit conditional on litigation, i.e., maximize $\Pi(x(p), c+k) = D(x(p))(x(p) - c - k)$. This generates the equation comparable to (6), where the new $\widehat{k}_p$ implicitly solves the following equation:

$$\Pi\left(c + \tfrac{1-\theta}{\theta}(k_p + k_d), c\right) = \Pi\left(p^m(c+k), c+k\right) \tag{9}$$

Note that the right hand side is the same as before. In comparing the left hand side, if $k_p < \frac{1-\theta}{\theta}k_d$, we get $c + \frac{1}{\theta}k_p < c + \frac{1-\theta}{\theta}(k_p + k_d)$, and the firms will be able to charge a higher price under the English Rule. The opposite will be true when $k_p > \frac{1-\theta}{\theta}k_d$. In short, the left hand side will be larger under the English Rule for small k_p but smaller for large k_p. This makes it uncertain whether the $\widehat{k}_p$ for the English Rule will be larger or smaller than the $\widehat{k}_p$ for the American Rule. Nevertheless, a unique $\widehat{k}_p$ for the English Rule will exist and the rest of the analysis will follow.

With respect to fee-shifting, one unique aspect about private antitrust lawsuits in the US is that it utilizes one-way fee-shifting for the benefit of the plaintiffs. Under Clayton Act §4(a), when the plaintiffs prevail, they are entitled to recover "the cost of suit, including a reasonable attorneys fee" from the defendants. The defendants, on the other hand, do not recover their expenses from the plaintiffs when they prevail and are subject to the American rule. With plaintiff-friendly, one-way fee-shifting, the plaintiff's and defendant's expected litigation costs become $(1-\theta)k_p$ and k_d+_p,

respectively. Now the consumers will bring suit when $p > c + \frac{1-\theta}{\theta}k_p$, and the new $\widehat{k}_p$ will be determined by:

$$\Pi\left(c + \tfrac{1-\theta}{\theta}k_p, c\right) = \Pi\left(p^m(c+k), c+k\right) \tag{10}$$

Compared to either the no fee-shifting or the symmetric (two-way) fee-shifting regime, $\widehat{k}_p$ will be higher. With lower plaintiff litigation cost, keeping litigation off the equilibrium becomes less attractive for the firms and they become more likely to allow litigation in equilibrium.

3.5 Damage Multipliers

In private antitrust suits, plaintiffs are sometimes entitled to recover multiple times the actual harm suffered (e.g., treble damages under Clayton Act §4(a)). While multiple damages provide a stronger ex post incentive to the consumers to bring suit, previous literature has cast doubt on whether it works as deterrence (Easterbrook (1985), Salant (1987), and Baker (1988)). The basic story, similar to ours with forward-looking consumers, is that, with higher damages, consumers would become willing to pay more for the product and the firms can charge a higher price ex ante, so that, in the end, firms realize the same expected monopoly profit and the consumers obtain the same expected surplus. What is important in the analysis, however, are the assumptions that (1) the ex post private litigation is costless and (2) there is less than full deterrence. This is similar to the variation where all cases settle and the parties do not incur any litigation cost in equilibrium.

In the initial model, θ was the expected fraction of the overcharge, $p - c$, awarded to the plaintiffs in litigation. Plaintiffs were awarded $\theta(p - c)$ if they went to trial. We can reflect damage multipliers by adjusting the θ parameter. For example, if there is a 25% chance of winning the cases, and compensatory damages are awarded (100% of the overcharge) if case is won, then $\theta = .25 \times 1 = .25$. If, on the other hand, treble damages are awarded (300% of the overcharge) if the case is won, then $\theta = .25 \times 3 = .75$. The bigger the damage multiplier, the higher the θ. With a sufficiently generous damage multiplier, we may even have $\theta \geq 1$. As the following proposition shows, once we allow for both the firms and the consumers to incur litigation costs (k_p and k_d), the neutrality result will no longer hold. Furthermore, whether the firms will impose a class action waiver will depend crucially on θ.

Proposition 8. *When $\theta < 1$, as θ rises, $\widehat{k}_p$ increases, and firms become more likely to allow litigation in equilibrium. When $\theta \geq 1$, firms will set $p = c + k_p/\theta$ and avoid litigation in equilibrium $\forall(\theta, k_p)$.*

Proof of Proposition 8. Suppose $\theta < 1$ and consider the equation (6). When we differentiate the right hand side with respect to θ, with the envelope theorem, we get: $\frac{\partial}{\partial\theta}\Pi(p^m(c+k), c+k) = 0$. When we differentiate the left hand side with respect to θ, we get: $\frac{\partial}{\partial\theta}\Pi(c + k_p/\theta, c) < 0$. Hence, as θ rises, $\widehat{k}_p$ increases, and the firms are more likely to allow litigation in equilibrium.

Now suppose $\theta \geq 1$. We get $\Pi(x(p), c+k) = D(x(p))((1-\theta)(p-c) - k_d) < 0 \; \forall p > c$. It is no longer profitable to allow litigation in equilibrium. The optimal strategy for the firms is to set $p = c + k_p/\theta$, avoid litigation in equilibrium, and realize a positive profit. □

From the proof for Proposition 8, we see that when $\theta < 1$, because there is under-deterrence, when the firms allow litigation in equilibrium, the neutrality result holds: as θ rises, firms increase the price to offset the more generous rebate and earn the same aggregate profit. At the same time, pushing litigation off the equilibrium becomes less attractive, since as θ rises, the profit margin (given by k_p/θ) decreases. Hence, with $\theta < 1$, as θ rises, firms become more likely to allow litigation in equilibrium ($\widehat{k}_p$ rises). This also implies that, with respect to class action waivers, in a broader parameter space (or k_p space), firms will have an incentive to reduce the consumers' litigation cost (k_p) which will also increase welfare. With under-deterrence, firms are less likely to impose class action waivers.

On the other hand, when $\theta \geq 1$, it is no longer in the firms' interest to allow litigation in equilibrium. If they do so and set price above marginal cost, they realize a negative profit: we get complete (or over) deterrence. However, given the positive litigation cost, firms can still set $p = c + k_p/\theta$, push litigation off the equilibrium, and earn a positive profit (with the profit margin of k_p/θ). This is true regardless of θ or k_p. Given that the size of consumers' litigation cost directly translates to the size of profit margin, firms will have a strong incentive to increase k_p as much as they can. With complete deterrence ($\theta \geq 1$), therefore, firms will surely impose class action waivers on consumers.

4 Concluding Remarks

The paper has examined the effect of class actions and class action waivers in the context of private antitrust lawsuits, in particular, lawsuits against collusion among competitors. Class action waivers, often through mandatory individual arbitration clauses, have received much attention especially since the US Supreme Court has endorsed such private ordering mechanism. The paper has shown that whether the firms will require the consumers to waive their right to bring a class action depends

on the consumers' individual litigation cost. Furthermore, depending on the circumstances, firms' incentive in seeking class action waivers can be aligned with the social objective, for instance, when the consumers' litigation costs are relatively low so that the firms treat litigation in equilibrium as just another cost of doing business. The paper has also shown that the core results remain robust to possible settlements, contingent fee attorneys, fee shifting, and damages multiplier.

While the current focus of the paper was on price fixing and private antitrust lawsuits, the analysis is applicable to other settings where the firms' pre-sale behavior can affect the terms of trade. Examples include product design (product liability and consumer financial contracts (CFPB)), false advertising (*Concepcion*), employment (*Epic Systems*), and unlawful monopolization (*Italian Colors*). In the products liability setting, for instance, firms may fundamentally lack sufficient ex ante incentives to design safer products.[15] The class action can be an effective mechanism for aligning the firm's private incentives with those of society. If firms can block consumers from using the class action mechanism, forcing them to pursue individual actions, then product safety is clearly compromised. Firms also have a strong incentive to minimize or eliminate product liability lawsuits ex post.[16] We plan to broaden our analysis to other settings where pre- and post-sale behavior of the firm could play an important role in choosing the litigation regime (e.g., asking for a class action waiver).

[15]In Choi and Spier (2014), competitive firms reduce safety levels in order to cream-skim the low risk consumers. In Hua and Spier (2018), firms tailor the product to suit the needs of the marginal consumer instead of the average consumer. Safety is suboptimal if the marginal consumer has a lower willingness to pay for safety than the average consumer. In Hamada (1975), consumers systematically underestimate product risks. In these and other settings, products liability induces firms to design safer products.

[16]The ex post incentive to minimize or eliminate product liability lawsuits for the firm that has produced a (likely) defective product is clear. Even for the firm that has produced a (likely) non-defective product, to the extent that there could be frivolous litigation, the firm would want to minimize or eliminate product liability lawsuit ex post.

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