

# To litigate or not to litigate? The impacts of third-party financing on litigation

Bruno Deffains\*

Claudine Desrieux<sup>†</sup>

## Abstract

*In this paper, we analyze three different ways to finance litigation, namely (i) self-finance by plaintiffs, (ii) contingent fees arrangements and (iii) third-party financing. We show how they impact the access to justice, and the decision to settle or to go to court, when claims can be meritorious or frivolous. Our results show that third-party financing does not always increase the access to justice for a plaintiff, and may even decrease the equilibrium settlement amount. It also increases the number of frivolous claims.*

**JEL codes:** K0; K41

**Keywords:** Third-party financing; Litigation financing; Frivolous claims; Transaction Costs.

## 1 Introduction

In Europe, the right for an injured party of a tortious or contractual wrongdoing to receive compensation was granted a fundamental value (Protocol 1 of the European Convention of Human Rights (Tuil and Visscher [2010])). However, in practice, the implementation of this fundamental right is far from being satisfactory. Several types of losses do not receive compensation because of the costs necessary to achieve it. In other words, legal fees still represent an economic barrier to pursuing a lawsuit. As an illustration, the english report “Access to Justice” (Lord Woolf [1996], chapter 7) mentions that “the problem of costs is the most serious problem besetting our litigation system (...) Fear of costs deters some litigants from litigating when they would otherwise be entitled to do so and compels other litigants to settle their claims when they have no wish to do so. It enables the more powerful litigant to take unfair advantage of the weaker litigant”. The same fears regarding the high litigation costs are expressed in other countries. A 2007 report on the transparency of costs of civil judicial proceedings in the EU shows that high levels

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\*CREED, University of Paris II Panthéon-Assas and University of Liverpool Management School. E-mail: bruno.deffains@u-paris2.fr

<sup>†</sup>CREED (TEPP), University of Paris II Panthéon-Assas. E-mail: claudine.desrieux@u-paris2.fr, tel: +33 (0)1 44 41 89 91, fax: + 33 (0)1 44 07 83 20. An earlier version of this paper circulated as “Litigation Financing: A Comparative Analysis”.

of litigation costs are a concern in many European states.<sup>1</sup> In Canada, the legal fees of a typical civil case for a three days trial in the Ontario Court is estimated at \$38,200 to the plaintiff (Puri [1998]). These costs can become even higher if we include service of process fees, fees relating to examination of discovery or expert testimony. In the same way, in the U.S., pursuing a civil action in federal court costs an average of \$15,000, the Federal Judicial Center reported last year. Cases involving scientific evidence, like medical malpractice claims, often cost more than \$100,000.<sup>2</sup> Recently, experts have estimated that four-fifths of low-income people in the U.S. have no access to an attorney when they need one.<sup>3</sup>

In such a context, there is a need to find alternative means to fund litigation. Among these means, contingent fees are contracts in which an attorney pays for the litigation costs of a plaintiff. The attorney obtains a percentage of the plaintiff's award if the lawsuit succeeds, but has no compensation if the lawsuit fails.<sup>4</sup> Contingent legal fees are widely used in the US. In around 87% of all torts and 53% of all contractual issues plaintiffs retain their attorney on a contingency basis (Kritzer [1990]). In Europe, contingent fees were strictly forbidden during a long time. However, Germany and the U.K. have recently allowed for them.

Third party financing is another way to finance litigation: it is not the plaintiff nor the attorney but some external "for-profit" funders that pay for the plaintiff's litigation costs in exchange for an agreed share of any recovered proceeds. As under contingent fees, the funders get a percentage of the proceeds only if the claim is successful, either in litigation or in settlement, and get nothing if the claim fails. It is worth noting that third-party financing is not a simple extension of contingent fees arrangements to a larger class of funders. The first difference is that under contingent fees agreements, the attorney retained provides services (*i.e.* he invests his time and resources in prosecuting a case), rather than the funds necessary to procure such services. A second difference is that funders choose to finance litigation with the expectation of a positive return that they compare to alternative investments they could make on the financial market. Traditionally, third party involvement in litigation was prohibited in common law as well as in civil law countries. But things begin to change: In Australia, third party litigation funding has been tolerated since the 1990s in some contexts, such as the disposition by liquidators or trustees in bankruptcy of an insolvent's causes of action. In some American state courts (as in Maine or Ohio), third-party financing is now possible, as well as in England and Wales (ILR [2009b]). The industry of third-party financing is also beginning to develop in Germany.<sup>5</sup> In many European countries (as in France, Italy, Spain, Sweden, Austria or

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<sup>1</sup>The average cost for a civil case in Europe is between 5 000 and 10 000 euros. For more details, see the report on the transparency of costs of civil judicial proceedings in the EU: [https://e-justice.europa.eu/content\\_costs\\_of\\_proceedings-37-en.do](https://e-justice.europa.eu/content_costs_of_proceedings-37-en.do). In this context, the Family Law Bar Association in England fears that legal aid cuts could put domestic abuse victims at risk, since they could not afford costs to go to court (*The Guardian*, 24 October 2011). Still because of the high litigation costs, lawyers in France recently fear for access to justice for the poor (*Le Monde*, 14 September 2013).

<sup>2</sup>"Funders Put Money on Lawsuits to Get Payouts", *The New York Times*, 14 November 2010.

<sup>3</sup>"Addressing the Justice Gap", *New York Times*, 23 August 2011.

<sup>4</sup>This is often referred to as the "no win, no fee" principle. Let us also add that we consider here that the "third party" is a for-profit one. We do not deal with other types of "third parties" as insurance or government. This is consistent with the expression of "third party financing" that is today dedicated to external funders.

<sup>5</sup>The most representative litigation funding company is Allianz ProzessFinanz, that has funded cases including copyrights, contract, labor and employment, trade, corporat, insolvency and commercial matters.

Belgium), law does not appear to prohibit third party financing, but the practice is rare or even non-existent.

The proponents of third-party financing argue that it allows a better access to justice, since it deeply lowers the budgetary constraint of the plaintiffs thanks to the large financial means of the funders. The Jackson report on civil litigation costs<sup>6</sup>, which sought to increase access to justice, gave important public approval for third-party financing: “it may be the most effective means of promoting access to justice for a claim against, say, a multinational pharmaceutical company”. However, as underlined by the Chamber Institute for Legal Reform (ILR [2009a], p.4), increasing the access to courts also “increases the likelihood that any potential defendant will be hauled into court on a meritless claim”. Indeed, critics attack third-party funding on a variety of grounds, including that it increases frivolous lawsuits, is unnecessary, creates conflicts of interest and imperils the relationship between attorneys and clients. In addition, third-party financing implies the coordination of three players (the attorney, the plaintiff and the funder) which raises new costs to organize the relationship.

In this paper, we compare three different ways to finance litigation, namely self-finance, contingent fees and third-party financing. Our comparison aims to establish what are the impacts of each of these systems on (i) the number of plaintiffs accessing to courts, (ii) the equilibrium settlement amounts, (iii) the decision of the defendant to settle or to go to court, and (iv) the probability that an uninjured plaintiff decides to file a (frivolous) claim. We do not aim to explore all possible ways to finance litigation, nor to seek to determine which of these financing systems would be the most socially efficient. We only focus on how third-party financing (whose potential introduction in several countries raises a lot of debates) leads to different incentives for plaintiffs to file a claim, and for defendants to settle or not, compared to self finance or contingent fees arrangements. Our main argument is that coordinating a three-player relationship is more costly than coordinating a bilateral one. To compensate for those higher charges, funders may require a higher rate of return on capital when they finance litigation. Then, third-party financing overcomes the budget constraint of the plaintiff, but leads to another “profitability” constraint: claims have to be profitable enough to be financed so as to support the additional organizational costs. We also extend our model by introducing asymmetric information. We assume that the defendant may face two types of plaintiff: a truly injured one and an uninjured one. The defendant is the only agent who cannot distinguish between a frivolous and a meritorious one. We show that under each litigation financing system, two types of equilibria appear, according to the defendant’s belief of the probability that the claim is meritorious. Our results highlight that the higher the rate of return on capital the funders require under third-party financing, (i) the lower the probability that a plaintiff accesses to court is, and (ii) the lower the equilibrium settlement amount offered by the defendant is. As a consequence, (iii) the higher the probability that the defendant decides to settle rather than to go to court is, and (iv) the higher the probability that an uninjured plaintiff opens a file with the hopes of obtaining a settlement is. This allows us to show that third-party financing may be more beneficial to frivolous claims than meritorious ones, and that it may even lead to higher total litigation costs under some conditions.

The rest of the paper is organized as follows: Section 2 relates our paper to the previous

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In 2004, only 0,4% of cases used third-party financing in Germany as for *Jackson LJ Review of civil litigation costs: Preliminary Report* (2009, p. 564).

<sup>6</sup>Lord Justice Jackson, *Review of Civil Litigation Costs*, April 2010, para 4.4.4.

literature. In section 3, we describe the benefits and costs of third-party financing, and justify why it leads to a higher opportunity cost to raise funds. In section 4, we compare the types of litigation financing when claims are meritorious. In section 5, we consider that claims can be either meritorious or frivolous. Section 6 concludes.

## 2 Literature review

The basic theoretical framework of our model is inspired by Katz [1990] and Miceli [1994]. Katz [1990] presents a model that explains frivolous suits as a result of defendant uncertainty regarding the merits of plaintiffs' claims. We adopt the same definition of a "frivolous lawsuit", *i.e.* a suit that has sufficiently low chance of prevailing at trial so that it would not be brought but is filed only in the hopes of obtaining a favorable settlement. In other words, a frivolous lawsuit is "that of an uninjured plaintiff obtaining a payment to which he is not entitled, at the expense of an uninformed defendant" (Katz [1990]). Miceli [1994] compares two types of litigation financing, namely hourly fees paid by the plaintiff and contingent fees arrangements, when claims can be either meritorious or frivolous. We extend this framework into two directions: first, we introduce a third type of litigation financing, *i.e.* third-party financing under which external funders finance the claim. Second, we introduce a cost constraint on the plaintiff: while Miceli [1994] assumes that a plaintiff can always afford to go to court, we rather consider that a plaintiff cannot finance the cost to go to court above some threshold. This allows us to show that each financing system has two kind of distinguished impacts: an impact on the *ex-ante* probability to *access* to courts, and an impact on the probability that a *frivolous* claim arises, while Katz [1990] and Miceli [1994] do not consider the problem of access to justice for a credit-constrained plaintiff.

Up to now, many papers in the law and economics literature have wondered how to finance litigation (Heyes et al. [2004], Kirstein and Rickman [2004]). Legal aid (Dnes and Rickman [1998], Rickman et al. [1999], Garoupa and Stephen [2004], George [2006]) and insurance (Faure and De Mot [2012], Hylton [2011]) have already been explored. Contingent fees have also been deeply studied (Dana and Spier [1993], Rubinfeld and Scotchmer [1993], Emons [2000], Emons and Garoupa [2006], Emons [2007], Fenn and Rickman [2010], Cotten and Santore [2012]). Third-party financing (as the funding of litigation by external investors) has drawn far less attention. Our paper thus contributes to the emerging economic literature on this topic. Chen and Abrams [2013] is the first empirical paper about third-party financing. Using two sources of variation - *de jure* status of third party litigation funding in different Australian states as well as variation in third party litigation funding from the largest litigation funding firm in Australia - they find evidence that litigation, court caseloads, and court expenditures increase with third party funding. Rubin [2011] shows how overall increasing third party financing of litigation is likely to be harmful, since it would increase external costs such as the costs imposed on defendants. In addition, the type of lawsuits that would likely result from increased third party investment would probably move the legal system away from efficiency. Lyon [2010] looks at how potential negative consequences of third-party financing can be effectively addressed through enforcement of existing ethical and procedural guidelines or by adoption of new regulations. Considering that the interest rates funders charge reflect the funder's information about the strength of the plaintiff's case, Avraham and Wickelgren [2011] analyze a signaling model in which the plaintiff can introduce its funding contract as evidence. They show that

there exists a separating equilibrium in which the funder’s information is fully-revealed. Demougin and Maultzsch [2013] propose to study other agency problems that can be raised under third-party financing, especially between the funder and the attorney. They determine how a combination of contingency fees and third-party financing may be the best way to overcome agency problems and financial constraints of would-be plaintiffs who would like to pursue meritorious claims. Their paper deals with how to discipline attorneys while we rather focus on the consequences of third-party financing on the plaintiffs’ behavior, and do not introduce agency relationship. Instead of focusing on the conflict of interest between the three-player (the attorney, the litigant and the funder), we consider here the opportunity cost to raise funds. This original perspective has been little developed up to now, and we show why it matters as it directly impacts on access to justice for the plaintiffs and on their decision to settle or to go to court.

### 3 Understanding third-party financing

“Third-party financing” corresponds to the funding of litigation by an external investor who has no pre-existing interest in the litigation, usually on the basis that *(i)* the funder will be paid out of the proceeds of any amounts recovered as a consequence of the litigation, often as a percentage of the recovery sum; and *(ii)* the funder is not entitled to payment should the claim fail.<sup>7</sup> We summarize in this section the main arguments regarding the debate about third-party financing.

#### 3.1 Third-party financing: the potential benefits

First, third-party financing can be regarded as a market for buying and selling lawsuits, creating a market for the production of justice (Chen and Abrams [2013]). The main expectation is to allow credit-constrained plaintiffs to access to justice, and thus contributing to reduce litigation undersupply.

In addition, third-party financing could serve to remedy a longstanding imbalance of power that favors defendants. For instance, when an individual plaintiff files a claim against a corporate defendant, financial disparities often represent a barrier to victory for the plaintiff. Third-party financing contributes to place the litigant on a more stable financial footing. Some other benefits are expected. For instance, risk adverse individuals could decline to pursue positive expected value claims, and a transfer of a claim from a risk-averse to a risk-neutral party should yield an increase in total claims pursued. Some claim holders can also be unaware that they possess a meritorious legal claim, and third-party financing provides the funders with the incentives to locate and provide information to those unaware claim holders.

Let us also add that there is undoubtedly a market for litigation finance. Companies<sup>8</sup>

<sup>7</sup>As underlined by Daughety and Reinganum [2014], “there are three primary forms of litigation funding (...) These are: 1) consumer legal funding, wherein a third party provides a non-recourse loan directly to a plaintiff; 2) loans to plaintiffs’ law firms, wherein a funder provides an ordinary secured loan to a law firm, and 3) investments in commercial claims, wherein a funder provides an up-front payment in exchange for a share of the eventual recovery.” While Daughety and Reinganum [2014] focus on the first type of financing, we examine the last kind of funding contract.

<sup>8</sup>Names in the industry are (among others) Allianz ProzessFinanz, Harbour Litigation Funding, IM Litigation Funding, Juridica Capital Management, Burford Capital Limited, Credit Suisse.

that have begun offering such services have enjoyed favorable results. Third party funders generally seek anywhere from 20% to 50% of the claimant’s recovery (ILR [2009b]), which can constitute a return on investment upward of 200%.<sup>9</sup> An example comes from IMF that is the largest litigation funding firm in the Australian market. Its return on investment was superior to 300% between october 2006 and february 2008 (Chen and Abrams [2013]).

### 3.2 Third-party financing: the potential costs

In spite of these potential benefits, third-party financing also leads to serious concerns and difficulties. The first concern is about the possible increase of meritless claims. Because third-party litigation financing increases the overall financing available for litigation and reduces the attorney’s own risk, the incentives for bringing frivolous claims may be increased. This danger may be all the more worrying as financiers “have little incentives to investigate whether the claims they finance are frivolous, because the risk of loss would be spread among hundreds of thousands, if not millions, of funders” (ILR [2009b]). Funders may also be willing to finance claims with a low probability of success but a high potential amount of recovery.<sup>10</sup> A second concern is that the development of third-party financing is also seen as creating a compensation culture driven by profit-seeking financial entities (Veljanovski [2012]). Third-party financing is not insurance but investment: it draws the attention of funders because it is uncorrelated with other asset classes, perhaps mildly counter-cyclical<sup>11</sup>, and offers high (but risky) awards. Only claims with a financial remedy are funded. Actions for specific performance and injunctive relief are not considered for the reason that there was no financial outcome in which to share. Last, a third concern is that the participation of a funder as a third party is likely to cause higher transaction costs than in a two-party scenario like a conventional attorney-client relationship. Transaction costs are here considered as the costs spent to organize the three-player contractual relationship. The reasons why transaction costs should be higher are the following ones:

- In many countries where third-party financing is allowed, two contracts are signed: one between the plaintiff and her attorney and another contract between the plaintiff and the funder.<sup>12</sup> This raises contracting costs compared to contingent fees where there is only one contract between the plaintiff and her attorney.
- Bargaining costs should also increase under third-party financing compared to other financing systems, since many aspects of the relationship with the financier have to

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<sup>9</sup>Julia H. McLaughlin, *Litigation Funding: Charting a Legal and Ethical Course*, 31 *Vt. L. Rev.* 615, 620-21 (2007) (explaining that the financier’s share of any recovery can be more than 200% of the amount financed).

<sup>10</sup>As Mick Smith of third party litigation funder Clunius Captial has observed: “the perception that you need strong merits is wrong - there’s a price for everything” (ILR [2009b], p.12). In the same way, quoting a technical director of a hedge fund, the report of the Chamber institute for Legal Reforms (ILR [2009a], p. 3) states that “*In a typical case[,] a hedge fund, acting on behalf of already wealthy funders, will seek to accumulate yet more money (...) by gambling on the outcome of a legal action for damages. They have no interest in the justice or otherwise of the case -only in the chances of success - as they will demand a share of the damages awarded in return for putting up the stake money.*”

<sup>11</sup>During recessions, agents may get more incentives to misbehave and then offend more plaintiffs leading to an increase in meritorious claims.

<sup>12</sup>See for instance Demougin and Maultzsch [2013]: “it does not come as a surprise that some litigation financing contracts usually include an additional fee in favor of the attorney who has not only to communicate with his client but also with the financier” (p.6).

be negotiated, such as the sharing of the control (and the right to decide) over the claim.

- Another factor of cost increase comes from the litigation risk assessment the funders have to make. While attorneys have obvious expertise in evaluating the meritoriousness and settlement value of litigation, other potential funders need to hire attorneys to conduct this inquiry for them. The risk assessment depends on quite a few uncertain variables: the facts, the current law, the jury pool, the presiding judge, the skills and incentive structure of the opposing counsel, risk aversion of the opposing party, and more generally his incentive to settle (Faure and De Mot [2012]). A detailed analysis of the merits of a claim would lead to high administrative costs.
- During all the procedure, the decision-making is shared between the plaintiff and the funder, which is likely to create conflicts.<sup>13</sup> The interests of the three parties (the plaintiff, the financier and the attorney) may diverge, and solving such conflicts is time-consuming and costly (Waye [2007]). Timothy Hart, Vice President, Accounting & Financial Consulting for Huron Consulting Group, has said that clients may have to relinquish some decision-making authority to the funder and that “the client’s interests may diverge from the funder in that other business reasons may suggest that they might settle a claim for less than the funder has targeted” (ILR [2009a]). Conflicts could also arise between the funders and the attorney, if a third-party financier directs or regulates the attorney’s professional judgment (ILR [2009a,b]).

All these reasons suggest that third-party financing is much more costly to organize than a traditional bilateral relationship. Investors will select claims that are “profitable” enough to overcome these costs. For this reason, they ask a higher “rate of return” on capital when they finance a claim compared to what is expected under contingent fees or self-finance. The legislature about third-party financing mentions that funders are allowed to require a rate of recovery allowing them to finance all their charges (See for instance Nebraska Legislative Bill 1094 or the Maine Legislature (Public Law, chapter 394, H.P. 1186 - L.D. 1703, 123<sup>rd</sup> Legislature)). In the following sections, we modelize how this matters when all cases are known to be meritorious (section 4), and when the claims can be either meritorious or frivolous (section 5).

## 4 Financing litigation when claims are meritorious

In this section, we focus on meritorious claims: we consider a plaintiff (to whom we refer as “she”), who is truly injured and will get a compensation  $D > 0$  when going to trial.<sup>14</sup>

### 4.1 The theoretical framework

The plaintiff can initiate a claim by filing a lawsuit at an initial cost  $f$ . This amount includes the cost of preparing and filing a complain and making the fact of the lawsuit

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<sup>13</sup>In 2006, in *Campbells Cash and Carry Pty Ltd v. Fostif Pty Ltd*, a five-to-two majority of the Australian High Court held that a third-party funder may exercise significant control over the litigation, and that this control is not an abuse of process and does not offend public policy in states that have abolished maintenance and champerty as crimes and torts.

<sup>14</sup>For simplicity, we consider here that the injured plaintiff will get a damage  $D$  with probability equal to one, *i.e.* the judge does not make any mistake. We could alternatively assume that  $D = pJ > 0$  with  $J$  the expected award at trial and  $p \in (0, 1)$  the probability for the plaintiff to win at trial when she is injured.

known to the defendant. A settlement period follows during which the plaintiff and defendant, through their attorneys, attempt to negotiate a settlement. The attorney costs of this period are  $R_p$  and  $R_d$  for the plaintiff and defendant, respectively. As in Miceli [1994], we assume that these costs are time costs that the attorney incurs whether or not a settlement is reached. If a settlement is not reached, the case goes to trial.<sup>15</sup> The plaintiff and defendant incur additional attorney costs of  $C_p$  and  $C_d$ . The plaintiff receives a damage  $D$ . Our theoretical framework involves the following important assumptions: First, the expected damage  $D$  exceeds the plaintiff's filing plus attorney costs, so that a claim is always worth being filed, even if it goes to court:  $D - C_p - R_p - f > 0$ . We make this assumption to focus on the impact of the different litigation financing systems for a claim that deserves to be filed.<sup>16</sup>

Second, the plaintiff and the defendant incur no other costs apart the attorney fees, and there is no disagreement between the plaintiff and the defendant over the judgment at trial (the value  $D$ ) or the costs of trial ( $C_p$  and  $C_d$ ). Information about the costs and the damage is then symmetric.<sup>17</sup>

Third, the market for attorneys is a competitive market: attorneys are identical in ability and their identity does not impact on the size of the damage at trial. Then, the plaintiff's attorney expects to earn zero profits, regardless of the fee arrangement. This assumption is made to isolate the impact of the fee arrangement on the disposition of a case.<sup>18</sup>

Fourth, during the settlement period, the defendant makes a take-it-or-leave-it settlement offer. The assumption of a single offer from the defendant is a restrictive one, but we abstract from this issue because our main goal is not to provide a general solution to the bargaining problem, but to see what determines the decision to settle or to go to court.

Fifth, the plaintiff and the defendant support their own litigation costs.

Sixth, to underline the problem of cost barriers to access to justice, we impose some cost constraints on the plaintiff to go to court. The cost to go to court for the plaintiff  $C_p$  is distributed according to a probability density function  $z$  on  $[C_p^{min}, C_p^{max}]$ , with  $0 < C_p^{min} < C_p^{max}$ . Its value is determined before the plaintiff initiates the claim, and known by all. The variety of possible costs may reflect the variety of possible injuries the plaintiff may suffer from, and then the different types of claims she may hold (even if the claim is meritorious in each case). In other words, for a same expected damage  $D$ , the cost to go to trial may be different according to the type of injury.

We assume that a plaintiff can self finance the initial cost to file a lawsuit  $f$  and the litigation costs during the settlement  $R_p$ . However, she can finance the cost to go to court  $C_p$  up to an amount  $\bar{C}$  (known by all) so that  $C_p^{min} < \bar{C} < C_p^{max}$ .

Then, when  $C_p > \bar{C}$ , the plaintiff cannot finance on her own the litigation, and then does not initiate the claim since she has no credibility to threaten to go to court (unless she

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<sup>15</sup>In this section, the plaintiff will never drop a case rather than go to trial since claims are assumed to be meritorious.

<sup>16</sup>In other words, our concern is not to know whether it is socially efficient or not to file a claim. As discussed in the conclusion, we follow to some extent the U.S. Supreme Court's observation about the "great benefits" of attorney advertising in *Bates* (*Bates v. State Bar Ariz.*, 433 U.S. 350, 376 (1977)) and make it applicable to our framework: "Although [it] might increase the use of the judicial machinery, we cannot accept the notion that it is always better for a person to suffer a wrong silently than to redress it by legal action".

<sup>17</sup>We deserve information asymmetries for section 5. These asymmetries will bear on the nature of the claim (frivolous or meritorious) that is unknown to the defendant.

<sup>18</sup>The assumption of a competitive market for attorneys has been subject to some debates: see Osiel [1990], Hadfield [2000], Crabdall and Winston [2011]. We discuss in conclusion this assumption.



chooses one of the two other litigation financing). Under contingent fees arrangements, the attorney can finance the litigation costs  $R_p$  and the cost to go to court  $C_p$  until an amount  $\bar{C}$  (also known by all), with  $C_p^{max} > \bar{C} > \bar{C}$ . Under third-party financing, the funders may finance  $R_p$  and  $C_p$  with no cost constraint on  $C_p$ .

Last, we make the simplifying assumption that the cost to go to court for the defendant ( $C_d$ ) is constant so as to focus only on the barrier to access to justice for the plaintiff when the cost  $C_p$  is high.<sup>19</sup> Then, in our model, the claim can be that of a corporate defendant and an individual plaintiff.

The timing of the game is as follows:

1. An injury occurs to the plaintiff.
2. The parties learn the cost  $C_p \in [C_p^{min}; C_p^{max}]$  to go to court for this injury.
3. The plaintiff decides to file a claim at cost  $f$  or not.
4. The attorney costs  $R_p$  and  $R_d$  have to be paid.
5. The settlement period occurs.
6. If the settlement fails, the plaintiff goes to court, and then pays the attorney cost  $C_p$ . The defendant's attorney cost to go to trial is  $C_d$  (a constant).
7. The judgement is made and the plaintiff receives a damage  $D$ .

In the following subsections, we examine the *ex-ante* probability that a claim can be financed and the decision to settle or to go to trial under each type of litigation financing.

## 4.2 Equilibrium under self finance

We first determine here the *ex ante* probability (*i.e.* the probability at date 1, before the realization of  $C_p$ ) that a claim can be financed.<sup>20</sup> Under self-finance, the plaintiff can afford to go to trial when  $C_p \leq \bar{C}$ . Since the plaintiff's cost to go to court is distributed according to the probability density function  $z$  (reflecting the type of his injury), parties anticipate that this will occur with a probability  $x_{SF}$  ("SF" stands for "self-finance") such that  $x_{SF} = \int_0^{\bar{C}} z(C_p) dC_p$ . Still at date 1, the parties anticipate that the claim will not be opened with a probability  $(1 - x_{SF}) \in (0, 1)$  because the plaintiff will not credibly threat to go to court. In this situation, the defendant will make no offer during the settlement, so that the plaintiff prefers not to file his claim (that costs  $f$ ).<sup>21</sup>

<sup>19</sup>As many other contributions on third-party financing, we only explore funding of plaintiffs' expenses because the methods and mechanisms of plaintiff-side lending are somewhat different than those on the defense side, and the market is significantly more developed (Lyon [2010], Molot [2009]).

<sup>20</sup>Let's note that the parties learn whether the claim can be financed or not as soon as  $C_p$  is realized: by the time the plaintiff has to decide to go to court or not (at date 3), the realization of  $C_p$  is common knowledge and the parties know whether the plaintiff can afford to go to trial or not.

<sup>21</sup>Since the goal of this paper is to compare the different ways to finance litigation for credit-constrained plaintiffs, we implicitly consider that they cannot borrow money. In other words,  $D - \bar{C}_p - R_p - f - r(C_p - \bar{C}_p) < 0$  where  $r$  is the interest rate. Avraham and Wickelgren [2011] and Grous [2006] also mention that borrowing money from traditional lenders is generally unavailable for plaintiffs that are likely to use third-party financing.

We now determine the settlement amount for claims that have been filed under self-finance. As in Katz [1990] and Miceli [1994], the game is solved by reasoning backwards from its last stage, where the plaintiff must choose between accepting the defendant's offer  $S$  or going to trial.

When going to trial, the plaintiff gets an amount  $D$  of damages since her claim is meritorious. In the previous stage, *i.e.* in the settlement period, the defendant offers a settlement amount  $S_{SF}$  equal to the lowest amount the plaintiff will accept rather than go to trial.<sup>22</sup> This amount is found by equating the marginal value of a trial for the plaintiff,  $D - C_p - R_p - f$ , with the value of a settlement,  $S_{SF} - R_p - f$ . Thus,

$$S_{SF} = D - C_p \tag{1}$$

where  $S_{SF}$  is positive since  $D - C_p - R_p - f > 0$ . Notice that neither the attorney's fee for the settlement period ( $R_p$ ) nor the filing cost  $f$  affect  $S_{SF}$  since they are sunk at the point the plaintiff must accept or reject the offer. In contrast, because the plaintiff avoids paying the trial fee ( $C_p$ ) by settling, the defendant reduces his settlement offer by that amount. Given (1), the plaintiff's net return from the suit is  $D - C_p$  which just equals her expected return from going to trial. This reflects the assumption that the defendant extracts all of the surplus from the settlement.<sup>23</sup>

**Lemma 1.** *Under self-finance, some meritorious claims are not filed because of potential cost barriers. When the costs of litigation do not prevent the access to court, then parties prefer to settle than to go to court to save on additional attorney costs.*

### 4.3 Equilibrium under contingent fees arrangements

Under contingent fees arrangements, the highest amount of cost the attorney can bear is  $\bar{C} > \bar{C}$ . The claim can be credibly filed with an *ex-ante* probability  $x_{CF}$  ("CF" stands for "contingent fees") such that  $x_{CF} = \int_0^{\bar{C}} z(C_p) dC_p$ . Since  $\bar{C} > \bar{C}$ , then  $x_{CF} > x_{SF}$ . This can be interpreted very intuitively: the attorneys can support higher litigation costs than the plaintiff, so that there is a higher probability at the beginning of the game that a claim can be financed under contingent fees arrangements than under self-finance. With probability  $(1 - x_{CF})$ , contingent fees will not allow to finance the cost  $C_p$  and the claim will not be filed.

To determine the settlement amount when the claim is filed under contingent fees, we denote  $\beta_s \in (0, 1)$  the percentage of the recovery the attorney gets when the claim is settled, and  $\beta_t \in (0, 1)$  the share he gets when the case goes to trial.<sup>24</sup>

The expected payoff of the plaintiff when going to trial is then  $(1 - \beta_t)D$ . By denoting

<sup>22</sup>We assume that when the plaintiff is indifferent between going to court and settling, she chooses the settlement.

<sup>23</sup>As it will be shown in subsection 4.5., this assumption about the bargaining game does not impact our general result.

<sup>24</sup>The rate the attorney gets is not the same if the case is settled or goes to court. The American Bar Association (ABA) *Model Rules of Professional Conduct* adopted by the ABA House of Delegates in 1983 states that "a contingent fee agreement (...) shall state the method by which the fee is to be determined, including the percentage (...) that shall accrue to the attorney in the event of settlement, trial or appeal" (Rule 1.5). Emons [2000] (p.21) mentions that "in a typical tort case in the United States, the plaintiff's attorney (...) gets one third if the case is settled without trial, 40% if the plaintiffs wins a trial, and 50% if a judgement for the plaintiff is affirmed on appeal".

$S_{CF}$  her expected return when accepting a settlement, the condition for the equilibrium settlement amount becomes:

$$(1 - \beta_s)S_{CF} = (1 - \beta_t)D \quad (2)$$

At equilibrium, the condition for zero profit for the attorneys operating in a competitive market allows to determine the percentage of recovery they get. The net payoff of an attorney in case of settlement is  $\beta_s S_{CF} - R_p$  so that  $\beta_s = \frac{R_p}{S_{CF}}$ . In the same way, an attorney gets  $\beta_t D - R_p - C_p$  when going to trial, so that  $\beta_t = \frac{C_p + R_p}{D}$ .<sup>25</sup> Then,

$$\begin{aligned} (2) \Leftrightarrow S_{CF} &= \beta_s S_{CF} + D - \beta_t D = R_p + D - C_p - R_p \\ &= D - C_p = S_{SF} \end{aligned}$$

**Lemma 2.** *Under contingent fees arrangements, the probability for an injured plaintiff to access to justice is higher than under self-finance (but is not equal to one), and the equilibrium settlement amount is the same than under self-finance litigation.*

#### 4.4 Equilibrium under third-party financing

Under third-party financing, some external funders finance the claim, and get back a share of the proceeds if the claim is settled or goes successfully to court. However, as stated by McLaughlin [2007] (p.621), “the litigation-funding industry carries heavy costs”. Coordinating three parties (the funder, the attorney and the plaintiff) is more costly than managing a bilateral relationship, as described in subsection 3.2. Two contracts need to be approved and signed, bargaining and administrative costs are likely to increase as well as costly potential conflicts. Many legislatures mention that the rate of return asked by the funders has to take into account those direct and indirect charges.<sup>26</sup> For this reason, we assume that the funders require a minimal rate of return on capital  $k \geq 0$  to finance a claim. We can also interpret  $k$  as the additional profitability rate the investors require (compared to lawyers or plaintiffs) so as to support the indirect charges caused by the coordination of the three-party relationship.<sup>27</sup>

We denote  $\gamma_s \in (0, 1)$  (resp.  $\gamma_t \in (0, 1)$ ) the share of the recovery required by the funders if the claim is settled (resp. if the case goes to trial).<sup>28</sup> During settlement, the defendant

<sup>25</sup>Note that in this case,  $\beta_t$  is hypothetical since no case goes to trial. However, it must be defined in theory so that  $S_{CF}$  can be derived. Moreover, the plaintiff is willing to enter into the agreement since her remaining gain  $(1 - \beta_t)D$  allows her to pay for the cost  $f$  to file a claim:  $(1 - \beta_t)D = D - C_p - R_p \geq f$ . In the same way, at equilibrium,  $(1 - \beta_s)S_{CF} \geq f$  so that the “participation constraint” of the plaintiff is fulfilled.

<sup>26</sup>For instance, in Nebraska (see Legislative Bill 1094) or the Maine Legislature (Public Law, chapter 394, H.P. 1186 - L.D. 1703, 123<sup>rd</sup> Legislature).

<sup>27</sup>Beyond the additional costs they have to support, external investors are likely to require a higher rate of return on investment than the attorneys or the plaintiffs, because their opportunity cost is likely to be higher: funders may more easily diversify their investment and may require the same rate of return on capital they could earn in an alternative investment of equivalent risk. Without providing technical details that would be beyond the scope of this paper, the funders determine the rate of return they require by comparing the investment in litigation to other comparable investments with similar risk profiles to determine the “market” cost of capital. It is commonly equated using the CAPM (capital asset pricing model) formula.

<sup>28</sup>In the U.K., these rates range between 20 % and 40 % of the award/settlement, and in some cases 50 % or higher. In Australia, rates are between 30 % and 60 % (Veljanovski [2012], p.22).

offers a settlement amount  $S_T$  equal to the lowest amount the plaintiff will accept rather than go to trial, *i.e.*  $S_T$  such that:

$$(1 - \gamma_s)S_T = (1 - \gamma_t)D \quad (3)$$

Let us determine the values of  $\gamma_s$  and  $\gamma_t$ . The funders agree to finance a claim if:

$$\frac{\gamma_s S_T - R_p}{R_p} \geq k \quad (4a) \quad \frac{\gamma_t D - R_p - C_p}{R_p + C_p} \geq k \quad (4b)$$

(4a) and (4b) can be interpreted as the participation constraints of the funders. By isolating  $\gamma_s$  and  $\gamma_t$ , we get:

$$\gamma_s \geq \frac{R_p(k+1)}{S_T} \quad (5a) \quad \gamma_t \geq \frac{(k+1)(C_p + R_p)}{D} \quad (5b)$$

However, for the plaintiff to agree to participate, her remaining share of the proceeds has to be high enough to allow her to pay the cost  $f$  to file a claim, *i.e.*:

$$(1 - \gamma_s)S_T - f \geq 0 \Rightarrow \gamma_s \leq 1 - \frac{f}{S_T} \quad (6)$$

$$\text{and } (1 - \gamma_t)D - f \geq 0 \Rightarrow \gamma_t \leq 1 - \frac{f}{D} \quad (7)$$

By assuming that the plaintiff has all the bargaining power<sup>29</sup>, we get  $\gamma_s = \frac{R_p(k+1)}{S_T}$  and  $\gamma_t = \frac{(k+1)(C_p + R_p)}{D}$ . By replacing  $\gamma_s$  and  $\gamma_t$  by their values in (3), we have :

$$S_T(k) = D - C_p(k+1) \quad (8)$$

Let us now precise the conditions under which a claim is filed under third-party financing. Putting equation (8) in equations (6) and (7), and knowing that  $\gamma_s = \frac{R_p(k+1)}{S_T}$  and  $\gamma_t = \frac{(k+1)(C_p + R_p)}{D}$ , the participation constraints of the plaintiff can be reduced to the following condition:

$$D - (C_p + R_p)(k+1) - f \geq 0 \quad (9)$$

Then, parties know at date 1 (before the realization of  $C_p$ ) that third-party financing can be credibly implemented if equation (9) is verified. By isolating  $C_p$  in equation (9), the condition becomes:

$$C_p \leq \hat{C}(k) = \frac{D - f}{k + 1} - R_p \quad (10)$$

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<sup>29</sup>This assumption has no impact on our general results regarding equation (8). Let's assume that the bargaining power of the plaintiff (resp. the funders) is  $z \in (0, 1)$  (resp.  $(1 - z)$ ) and that Nash bargaining occurs. When they share the amount  $S_T$ , the minimum share the plaintiff accepts is  $f$ , while the funders participate only if they get at least  $(k+1)R_p$ . The remaining share of the surplus to split is  $(S_T - (k+1)R_p - f)$ . The plaintiff gets  $f + z[S_T - (k+1)R_p - f]$ . Symmetrically, the funders ask at least  $(k+1)(R_p + C_p)$  if the case goes to court, so that the plaintiff gets  $f + z[D - (k+1)(C_p + R_p) - f]$ . Then, the plaintiff accepts to settle if she gets  $f + z[S_T - (k+1)R_p - f] \geq f + z[D - (k+1)(C_p + R_p) - f] \Leftrightarrow S_T = D - C_p(k+1)$  (Equation (8)).

The *ex-ante* probability (at date 1) to finance a claim under third-party financing is  $x_T(k) = \int_0^{\hat{C}(k)} z(C_p) dC_p$ . Since  $\frac{\partial \hat{C}(k)}{\partial k} < 0$ , then the higher the required rate of return on capital is, the lower the maximum cost  $\hat{C}(k)$  the funders accept to finance is.<sup>30</sup> They select claims that are not too costly, else they could not reach the rate of return on investment  $k$ . We also note that  $\frac{\partial x_T(k)}{\partial k} \leq 0$ : the *ex-ante* probability that a claim can be financed under third-party financing decreases with  $k$ . The higher the rate of return required by the investors is, the fewer claims are likely to be financed: only the most profitable ones will draw their attention.

To sum up, the *ex-ante* probability that a claim is filed under third-party financing is  $x_T(k) = \int_0^{\hat{C}(k)} z(C_p) dC_p$ , and parties agree to settle for  $S_T = D - C_p(k + 1)$ .

#### 4.5 Comparisons of settlement equilibria

We compare here the *ex ante* probabilities that a claim is financed under the different financing systems, and the equilibrium settlement amounts that occur in each case.

From lemma 2, contingent fees increase the probability to finance a claim compared to self-finance. If we now compare the *ex-ante* probability to finance a claim under third-party financing ( $x_T(k)$ ) to the probability under contingent fees ( $x_{CF}$ ), we can determine a threshold above (resp. below) which third-party financing decreases (resp. enlarges) the access to justice. Proof n°1 in the appendix determines this threshold  $\hat{k}$ . It shows that:

$$\begin{aligned} & \forall k \in (0, \hat{k}], x_T(k) \geq x_{CF} \\ \text{and} \quad & \forall k > \hat{k}, x_T(k) < x_{CF} \end{aligned}$$

This can be interpreted as follows: the proportion of claims that can be financed under third-party financing decreases with  $k$ . Then, there is a threshold above which the rate of return on capital required by the investors is so high that third-party financing allows to finance a lower number of claims than contingent fees.<sup>31</sup>

This means that the merit of a claim is not sufficient to be financed by third parties. Because third-party financing raises additional costs compared to the other types of financings (to organize the three-player relationship), claims have to be profitable enough for the funders not to make losses. Even if there is no cost barrier as under self finance or contingent fees arrangements, third-party financing implies a “profitability” barrier that restricts the number of claims that can be filed. Then, this litigation financing does not necessarily enlarge the number of cases that accesses to justice.

Let us now determine whether third-party financing improves the settlement conditions. By ranking the settlement amounts under the different financing systems, we get from equations (1), (2), and (8):

$$S_T(k) \leq S_{SF} = S_{CF} \tag{11}$$

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<sup>30</sup>Let us also note that  $\frac{\partial \hat{C}(k)}{\partial D} > 0$ : the higher  $D$  is, the more willing the funders are to finance a high cost to go to court. However, we assume here that  $D$  depends on the type of injury (and is fixed and exogenous), and does not depend on the type of litigation financing. We deserve such an investigation for further works.

<sup>31</sup>As an illustration of the selection process operated by investors before deciding to finance a claim or not, Chen and Abrams [2013] (p.14) mention that litigation firms generally do not fund cases below \$750,000 in value. This shows that investors select claims to be financed on profitability criteria.

The lower amount under third-party financing comes from the fact that by accepting to settle, the funders avoid to invest  $C_p(k+1)$  at the following period. They save both on the plaintiff's cost to go to court ( $C_p$ ) as well as on the transaction costs they would support by going to court ( $kC_p$ ).

Proof n°2 in the Appendix shows that (11) still holds if we assume Nash Bargaining rather than “take-it-or-leave-it” offer during the settlement period.

**Lemma 3.** *Funders finance claims whose costs allow them to be profitable enough. When a claim is filed and settlement occurs, the settlement amount under contingent fees (or self-finance) is equal or superior to that observed under third party financing.*

Given lemmas 1, 2 and 3, we can establish the following proposition:

**Proposition 1.** *There is no litigation financing system that allows to finance all types of meritorious claims a plaintiff may hold. The access to justice is constrained by a cost barrier under self-finance and contingent fees, and by a “profitability” barrier under third-party financing.*

## 5 Financing litigation when claims can be meritorious or frivolous

Let us now consider a situation where the defendant cannot observe whether the claim of the plaintiff is meritorious or frivolous. Then, the plaintiff can be truly injured or not. For instance, an individual may be involved in an accident but sustained no injuries. Another example is a products liability case in which injury is undisputed, but the plaintiff is not entitled to damages if she was contributorily negligent in using the product (Katz [1990]). We still assume that the judges do not make any mistake: they allow for damages only for meritorious claims, and are able to detect frivolous claims that get no damage. There is then no value to pursue a claim to trial for an uninjured plaintiff. However, it may be profitable for her to file suit in hopes of obtaining a settlement. As defined in section 2, we consider a frivolous claim as that of an uninjured plaintiff obtaining payment to which she is not entitled to, during the settlement period. They are not suits for which the plaintiffs wrongly believe that they are entitled to a recovery. As explained by Katz [1990] (p.4), “in order to explain how frivolous suits can persist, it is necessary to explain why defendants might be willing to offer positive amounts in settlement to a frivolous suitor”.

The timing of the game becomes as follows:

1. A plaintiff can randomly be injured or not in an accident.
2. The cost  $C_p$  for the plaintiff to go to court for such an injury ( $C_p \in [C_p^{min}, C_p^{max}]$ ) is revealed.<sup>32</sup>
3. The plaintiff chooses whether to file a claim at cost  $f$  or not.

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<sup>32</sup>We assume that there is only one possible injury during the accident that occurs, so that an uninjured plaintiff can try to misrepresent as a victim of this injury, but not as a victim of a different injury, whose cost would be different from the value of  $C_p$ .

4. The attorney's costs  $R_p$  and  $R_d$  are paid.
5. The settlement period occurs.
6. If the settlement fails, the plaintiff can drop or pay  $C_p$  to go to trial. The defendant pays  $C_d$ .
7. The judgment is made and the information is revealed: only meritorious claims get the damage  $D$ .

We focus in this section on the number of frivolous suits filed and the consequences on settlement under each type of litigation financing  $i \in \{SF; CF; T\}$ . The assumptions are the same as in the previous section, except that the defendant does not know whether the case is meritorious or frivolous.<sup>33</sup> Yet, the attorney of the plaintiff can observe (and communicate to funders) the merit of the claim.<sup>34</sup> The attorneys accept to finance a case only if they can expect at least zero profits, and the funders finance the claim if they expect a rate of return on capital  $k \geq 0$ . Moreover, whether frivolous or not, the plaintiff has the same cost constraint to finance  $C_p$  as that described in the previous section.<sup>35</sup> What the defendant cannot observe is only an individual plaintiff's type (*i.e.* whether the plaintiff is truly injured or not).

We introduce some other notations:

$\alpha \in (0, 1)$  is the initial probability that an accident occurs at date 1, *i.e.* that a plaintiff is truly injured. This probability is exogenous, known by the defendant, and does not change as regards to the type of financing.

$\theta_i \in [0, 1]$  is the probability with which an uninjured plaintiff files suit under financing system  $i$ . The uninjured plaintiff decides to file a claim if she anticipates that the defendant will prefer to settle rather than to bring the case to court. Then,  $\theta_i$  represents the strategy of the uninjured plaintiff who has to choose between opening a file or not.

$\psi_i \in [0, 1]$  is the probability that the defendant settles under financing system  $i$ . This variable describes the strategy of the defendant.

Then, the equilibrium we use is a sequential equilibrium where  $\theta_i^*$  and  $\psi_i^*$  represent the best responses of the uninjured plaintiff and of the defendant. From the previous notations, we can deduce:

- *The probability that a plaintiff opens a claim:* A plaintiff is truly injured with probability  $\alpha$ . In this case, she always opens a claim as she knows she will get  $D$  when going to trial. With probability  $(1 - \alpha)$ , a plaintiff is uninjured: in this case, she opens a claim with probability  $\theta$ , *i.e.* if she expects that the defendant will prefer to

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<sup>33</sup>We assume that the attorney of the defendant has no access to all the information about the plaintiff so that he cannot determine with certainty the merit of the claim. As in Katz [1990] (p.8), we also abstract from the fact that in an actual lawsuit the defendant may wish to spend resources to investigate the claim's validity, for example by paying for a medical examination or by engaging in civil discovery. Instead, we consider that complete information is likely to be prohibitively costly, so that the defendant can only estimate a probability that the claim is meritorious, and this probability is that remaining after optimal investigation.

<sup>34</sup>Remember that additional costs created by third-party financing comes from expertise to learn the merits of the claims, as described in subsection 3.2.

<sup>35</sup>This implies that the *ex-ante* probability that a claim can be financed under financing system  $i$  is the same as in section 4. This is the probability  $x_i$  (with  $i \in \{SF; CF; T\}$ ) at date 1 that the cost  $C_p$  belongs to the range of costs that *can be* financed under financing system  $i$ . Both truly injured and uninjured plaintiffs elaborate their strategies when  $C_p$  can be financed (which is public knowledge at date 2).

settle rather than to bring the case to court (since she will get no compensation by going to court). Then, the probability that a plaintiff files a claim is  $\alpha + (1 - \alpha)\theta$ .

- *The conditional probability that a plaintiff who files suit is truly injured:* We denote this probability  $\alpha_i^*$  where  $\alpha_i^* = \frac{\alpha}{\alpha + \theta(1 - \alpha)}$  according to the Bayes' rule. Then,

$$\alpha_i^* \geq \alpha \quad (12)$$

## 5.1 Equilibrium under self finance

### 5.1.1 The strategy of the defendant

When a claim is filed, the defendant does not know whether the claim is frivolous or not. He has three strategies:

1. He can either offer the lowest amount an injured plaintiff will accept not to go to court, *i.e.*  $S_{SF}$  as defined in subsection 4.2. Whether the plaintiff is truly injured or not, she will accept the offer. The total cost of this strategy for the defendant is  $S_{SF} + R_d = D - C_p + R_d$ .
2. The defendant can propose  $S_{SF} = \epsilon$  (with  $\epsilon$  being a low positive value,  $\epsilon \approx 0$ ) so that only an uninjured plaintiff accepts.<sup>36</sup> However, a truly injured plaintiff will refuse and will prefer to go to court. The total expected cost of this strategy is  $(1 - \alpha_{SF}^*)\epsilon + \alpha_{SF}^*(D + C_d) + R_d$ , since there is a probability  $(1 - \alpha_{SF}^*)$  that the plaintiff is uninjured and accepts the settlement offer, and a probability  $\alpha_{SF}^*$  that the claim is meritorious, so that the defendant spends costs  $C_d$  to go to court and pays the damage  $D$ .
3. Last, the defendant can make no offer during the settlement period ( $S_{SF} = 0$ ). In this case, if the plaintiff is uninjured, she drops off the case, and she goes to court only if she is truly injured. The total cost of this strategy for the defendant is  $\alpha_{SF}^*(D + C_d) + R_d$ .

The defendant will choose the lowest cost strategy. Making an offer  $S_{SF} = \epsilon$  (the second strategy) is always more costly than making no offer (the third strategy), since in both cases, the defendant has to finance the cost to go to court if the claim is meritorious and pays in addition  $\epsilon$  if the plaintiff is uninjured ( $S_{SF} = \epsilon$ ). The defendant has then to choose between the first and the third strategy, *i.e.* offering  $S_{SF} = D - C_p$  or making no offer ( $S_{SF} = 0$ ) and going to court with an expected cost of  $\alpha_{SF}^*(D + C_d) + R_d$ .

Then, the defendant has better settle when the total expected cost under settlement is lower than the expected total cost when going to court, *i.e.* when:

$$\begin{aligned} D - C_p + R_d &\leq \alpha_{SF}^*(D + C_d) + R_d \\ \Leftrightarrow \frac{D - C_p}{D + C_d} &\leq \alpha_{SF}^* \end{aligned} \quad (13)$$

The threshold value of  $\alpha_{SF}^*$  allowing to separate the two strategies of the defendant is denoted  $t_{SF}^* = \frac{D - C_p}{D + C_d}$ . When  $\alpha_{SF}^* \geq t_{SF}^*$ , then it is cheaper for the defendant to settle

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<sup>36</sup>If she does not accept, she will get zero since she will not go to court, knowing that she will get nothing since her claim is frivolous.



( $\psi_{SF}^* = 1$ ) rather than to go to court. This can be interpreted as follows: the probability that a plaintiff (that has filed a claim) is truly injured is so high that it will be too costly for the defendant to go to trial (where he pays  $D + C_d$  whenever the claim is meritorious). Symmetrically, the defendant goes to trial ( $\psi_{SF}^* = 0$ ) when  $\alpha_{SF}^* < t_{SF}^*$ : the probability that a plaintiff (that has filed a claim) is truly injured is low enough so that it is cheaper to go to court (to verify whether the claim is frivolous or not) rather than to settle. Let us now detail the strategy of the uninjured plaintiff.

### 5.1.2 The strategy of the uninjured plaintiff

The decision of the uninjured plaintiff to open a file or not depends on her own anticipation of the defendant's behavior (to settle or not), since she gains only in case of settlement. To determine her strategy, we need to distinguish two cases:  $\alpha \geq t_{SF}^*$  and  $\alpha < t_{SF}^*$ . Let us first consider that  $\alpha \geq t_{SF}^*$ : the probability that a plaintiff is truly injured ( $\alpha$ ) is higher than the threshold above which the settlement strategy is less costly for the defendant ( $t_{SF}^*$ ). From (12) and (13),  $\alpha_{SF}^* \geq \alpha$  so that  $\alpha_{SF}^* \geq t_{SF}^*$ : the defendant always prefers to settle ( $\psi_{SF}^* = 1$ ).

Since the uninjured plaintiff anticipates this decision, she always files a claim ( $\theta_{SF}^* = 1$ ) to get the settlement amount. The equilibrium is a pure strategy equilibrium: the plaintiff always files a suit ( $\theta_{SF}^* = 1$ ), and the defendant always settles ( $\psi_{SF}^* = 1$ ).

This can be interpreted as follows: the probability that a plaintiff is truly injured is so high that the defendant prefers to settle rather than to go to trial. However, at equilibrium, if the plaintiff is uninjured (which happens with a low probability), she earns a rent.

Let us now consider the case where  $\alpha < t_{SF}^*$ . Since from (12),  $\alpha_{SF}^* \geq \alpha$ , this does not allow to compare  $t_{SF}^*$  and  $\alpha_{SF}^*$ , and then to learn the defendant's strategy to settle or to go to court. We examine here the two possible strategies of the defendant and show that no pure strategies equilibrium exists.

- Suppose first that the defendant always decides to settle. The uninjured plaintiff always files a suit ( $\theta_{SF}^* = 1$ ). Then,  $\alpha_{SF}^* = \frac{\alpha}{\alpha + (1-\alpha)\theta_{SF}^*} = \alpha < t_{SF}^*$ : from (13), it would have been cheaper for the defendant to go to court rather than to settle.
- Suppose now that the defendant always decides to go to court. Then, the uninjured plaintiff never opens a file so that  $\theta_{SF}^* = 0$  and  $\alpha_{SF}^* = 1$ . From (13), in this situation ( $\alpha_{SF}^* \geq t_{SF}^*$ ), it would be cheaper for the defendant to settle.

Then, the only equilibrium is a mixed strategy equilibrium where the defendant decides to settle with some probability, and an uninjured plaintiff files a suit with some other probability. To characterize this equilibrium, we find  $\theta_{SF}^*$  and  $\psi_{SF}^*$  so that the defendant is indifferent between settling and going to trial, and an uninjured plaintiff is indifferent between filing or not filing.

Under self finance, a plaintiff is indifferent between filing or not if:

$$\psi_{SF}^* S_{SF} - R_p - f = 0 \Leftrightarrow \psi_{SF}^* = \frac{R_p + f}{S_{SF}} = \frac{R_p + f}{D - C_p}$$

where  $\psi_{SF}^*$  represents the probability that the defendant chooses to settle at equilibrium.

From (13), the defendant is indifferent between settling and going to court if  $\alpha_{SF}^* = t_{SF}^*$ :

$$\Leftrightarrow \frac{\alpha}{\alpha + \theta_{SF}(1 - \alpha)} = \frac{D - C_p}{D + C_d}$$

$$\Leftrightarrow \theta_{SF}^* = \frac{\alpha(C_p + C_d)}{(1 - \alpha)(D - C_p)}$$

where  $\theta_{SF}^*$  represents the probability that an uninjured plaintiff files a claim under self-finance at equilibrium.

This mixed strategy equilibrium can be interpreted as follows: By sometimes going to court, the defendant decreases the profit of the uninjured plaintiff, so that the uninjured plaintiff opens a claim only with probability  $\theta_{SF}^*$ .

**Lemma 4.** *Under self-finance:*

When  $\alpha \geq t_{SF}^* = \frac{D - C_p}{D + C_d}$ , a pure strategy equilibrium exists:  $\psi_{SF}^* = \theta_{SF}^* = 1$ .

When  $\alpha < t_{SF}^*$ , there is no pure strategy equilibrium but a mixed strategy equilibrium defined as follows:

$$\psi_{SF}^* = \frac{R_p + f}{D - C_p}; \theta_{SF}^* = \frac{\alpha(C_p + C_d)}{(1 - \alpha)(D - C_p)}$$

Proof n°3 in the appendix shows that  $\psi_{SF}^*$  and  $\theta_{SF}^*$  are proper probabilities, defined on  $[0,1]$ .

## 5.2 Equilibrium under contingent fees arrangements

The attorney observes whether the case is meritorious or not. If the case is meritorious, the attorney asks a share  $\beta_s$  of the gains in case of settlement and  $\beta_t$  in case of trial, as defined in section 4.2. However, if the case is frivolous, the attorney asks for a share  $\beta_s^F$  of the settlement amount. The expected profit of the attorney will be  $\psi_{CF}\beta_s^F S_{CF} - R_p$ , where  $\psi_{CF}$  is the probability that the defendant will settle under a contingent fee agreement.<sup>37</sup> The zero-profit condition under perfect competition implies that:

$$\beta_s^F = \frac{R_p}{\psi_{CF} S_{CF}} \quad (14)$$

The rate as defined by (14) is only applied for frivolous claims.<sup>38</sup> We assume that the rates defined between the attorney and the plaintiff are not observable to outsiders, else the plaintiff's type could be found by observing the rate asked by the attorney under settlement.

<sup>37</sup>Let us note that  $\psi_{CF} > 0$  is a necessary condition for the attorney to accept the case. Moreover, contrary to Miceli [1994], we assume that the attorney fees (in case of settlement) are different when the claim is meritorious or not, which explains why our results are slightly different than his. This assumption seems consistent with the idea of free entry and competition among attorneys: plaintiffs may "shop around" for the best rate which reduces opportunities for profit that could emerge if a attorney imposed the rate for frivolous claims to meritorious ones. Also note that, since the plaintiff knows whether she is truly injured or not, attorneys cannot try to misrepresent the merits of a case to the client and negotiates a higher percentage rate.

<sup>38</sup> $\beta_s^F$  is here larger than the rate asked when all the claims are meritorious. This can be explained by the fact that a frivolous case is more risky because the plaintiff gets some compensation only if the case is settled but not if it goes to court.

As in the previous case, the defendant has two strategies: he can choose to settle for  $S_{CF}$  so that the plaintiff always accepts (whatever her type), or he can make no offer during the settlement period and go to court only if the plaintiff is truly injured (so that the expected cost of this strategy is  $\alpha_{CF}^*(D + C_d)$ ). As previously, any offer between 0 and  $S_{CF}$  will be rejected by the truly injured plaintiff and accepted by the uninjured plaintiff. As long as the truly injured plaintiff does not accept it, there is no reason to offer the frivolous one anything at all. Then, the defendant prefers settling than going to court if the expected cost to go to court is higher than the cost to settle:

$$\begin{aligned} \alpha_{CF}^*(D + C_d) + R_d &\geq S_{CF} + R_d \\ \Leftrightarrow \alpha_{CF}^* &\geq \frac{S_{CF}}{D + C_d} = \frac{D - C_p}{D + C_d} \end{aligned}$$

We denote  $t_{CF}^*$  this threshold (above which the defendant always prefers to settle), so that  $t_{CF}^* = \frac{D - C_p}{D + C_d}$ . When  $\alpha_{CF}^* < t_{CF}^*$ , the defendant makes no offer and goes to trial, because the probability that the plaintiff is truly injured is too low and it would be too costly to always settle rather than to go to court to see whether the plaintiff is truly injured. Then, as under self finance, two types of equilibria arise. When  $\alpha \geq t_{CF}^*$ , then the defendant chooses to settle with any plaintiff that files a suit. The plaintiff files a claim, whatever her type. A pure strategy equilibrium exists, defined as follows:  $\theta_{CF}^* = \psi_{CF}^* = 1$ . When  $\alpha < t_{CF}^*$ , the only equilibrium is a mixed strategy equilibrium, as justified in the previous subsection. The uninjured plaintiff is indifferent between filing or not filing if:

$$\begin{aligned} \psi_{CF}(1 - \beta_s^F)S_{CF} - f &= 0 \quad \Rightarrow \psi_{CF}S_{CF} - R_p = f \text{ from (14)} \\ &\Rightarrow \psi_{CF}^* = \frac{f + R_p}{D - C_p} \end{aligned}$$

where  $\psi_{CF}^*$  represents the probability that the defendant chooses to settle at equilibrium under contingent fees arrangements. The defendant is indifferent between settling and going to trial if:

$$\alpha_{CF}^* = t_{CF}^* \Rightarrow \frac{\alpha}{\alpha + (1 - \alpha)\theta_{CF}} = \frac{D - C_p}{D + C_d} \quad (15a)$$

$$\Rightarrow \theta_{CF}^* = \left(\frac{\alpha}{1 - \alpha}\right) \left[\frac{(C_p + C_d)}{(D - C_p)}\right] \quad (15b)$$

where  $\theta_{CF}^*$  represents the probability that an uninjured plaintiff opens a claim at equilibrium, under contingent fees arrangements. Let us note that  $\theta_{SF}^* = \theta_{CF}^*$ ,  $\psi_{SF}^* = \psi_{CF}^*$ , and  $t_{CF}^* = t_{SF}^*$ . The probabilities with which an uninjured plaintiff files a claim and that the claim is settled are the same under contingent fees and self-finance.

**Lemma 5.** *Under contingent fees arrangements:*

When  $\alpha \geq t_{CF}^* = \frac{D - C_p}{D + C_d}$ , a pure strategy equilibrium exists,  $\theta_{CF}^* = \psi_{CF}^* = 1$ .

When  $\alpha < t_{CF}^*$ , there is only a mixed strategy equilibrium such that:

$$\psi_{CF}^* = \frac{f + R_p}{D - C_p}; \theta_{CF}^* = \left(\frac{\alpha}{1 - \alpha}\right) \left[\frac{(C_p + C_d)}{(D - C_p)}\right]$$

### 5.3 Equilibrium under third-party financing

The funders observe whether the plaintiff is truly injured or not. As described in subsection 4.4, the shares of the recovery asked by the funders are  $\gamma_s$  and  $\gamma_t$  for meritorious claims. When a claim is frivolous, the plaintiff may ask to be financed with the hopes to obtaining some settlement. In this case, she gives up a share  $\gamma_s^F \in (0, 1)$  to the funders:<sup>39</sup>

$$\frac{\gamma_s^F \psi_T S_T - R_p}{R_p} = k \Rightarrow \gamma_s^F = \frac{(k+1)R_p}{\psi_T S_T} \quad (16)$$

Let us note that  $\gamma_s^F \geq \gamma_s$ : the funders ask for a higher share of the gains when the claim is frivolous (in comparison to a meritorious claim), because the outcome is more risky. Let us now determine the strategies of each party. The defendant has to choose between settling for  $S_T$  so that the plaintiff accepts (whatever her type), or making no offer so that he goes to court only if the plaintiff is truly injured. We apply the same demonstration as in subsection 5.1. The defendant is indifferent between settling and going to court if  $\alpha_T^*(D + C_d) = S_T$ . This implies:

$$\alpha_T^* = \frac{D - (k+1)C_p}{D + C_d} \quad (17)$$

Let us denote  $t_T^*$  this threshold ( $\frac{D - (k+1)C_p}{D + C_d} = t_T^*$ ), then symmetrically to the previous cases, whenever  $\alpha \geq t_T^*$ , a pure strategy equilibrium exists, so that  $\theta_T^* = \psi_T^* = 1$ . In other words, the probability that a plaintiff is truly injured is so high that the defendant always prefers to settle than to go to court. The plaintiff (whether truly injured or not) files a claim, but the probability that she is truly injured remains high enough for the settlement strategy to be the most appropriate strategy for the defendant.

When  $\alpha < t_T^*$ , *i.e.* when the probability that a plaintiff is truly injured is low, there is only a mixed strategy equilibrium. The best strategy is for the defendant to go to trial with some probability  $\psi_T$  and for the uninjured plaintiff to file a claim with some probability  $\theta_T$ . This equilibrium implies that the uninjured plaintiff is indifferent between filing or not filing, *i.e.*:

$$\begin{aligned} \psi_T(1 - \gamma_s^F)S_T - f = 0 &\Rightarrow \psi_T(S_T - \frac{(k+1)R_p}{\psi_T}) = f \\ &\Rightarrow \psi_T^* = \frac{f + (k+1)R_p}{D - (k+1)C_p} \end{aligned}$$

The defendant is indifferent between settling and going to trial if  $\alpha_T^* = t_T^*$ . This implies:

$$\begin{aligned} \frac{\alpha}{\alpha + (1 - \alpha)\theta_T} &= \frac{D - (k+1)C_p}{D + C_d} \\ \Leftrightarrow \alpha(D + C_d) &= [D - (k+1)C_p]\alpha + (1 - \alpha)[D - (k+1)C_p]\theta_T \end{aligned}$$

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<sup>39</sup>If the settlement fails, the plaintiff drops off the case instead of going to court, since her claim is frivolous. Then, there is no need to define a share of the recovery for the funders in this situation.

$$\Leftrightarrow \theta_T^* = \left(\frac{\alpha}{1-\alpha}\right) \left[\frac{(k+1)C_p + C_d}{D - (k+1)C_p}\right] \quad (18)$$

**Lemma 6.** *Under third-party financing:*

When  $\alpha \geq t_T^*$ , a pure strategy equilibrium exists, so that  $\theta_T^* = \psi_T^* = 1$ .

When  $\alpha < t_T^*$ , we observe a mixed strategy equilibrium, defined as follows:

$$\psi_T^* = \frac{f+(k+1)R_p}{D-(k+1)C_p} \text{ and } \theta_T^* = \left(\frac{\alpha}{1-\alpha}\right) \left(\frac{(k+1)C_p+C_d}{D-(k+1)C_p}\right)$$

## 5.4 Comparison of equilibria

We compare here the thresholds separating pure and mixed strategies ( $t_i^*$ ), the probabilities that the case filed and settled ( $\psi_i^*$ ), and the probabilities that an uninjured plaintiff files a claim under each type of litigation financing ( $\theta_i^*$ ). This comparison allows to show that third-party financing leads to the highest probability of settlement (even when these cases are frivolous), and to the highest probability that an uninjured plaintiff files a claim. Let us first compare the different threshold  $t_i^*$  separating pure and mixed strategies.

$$t_{SF}^* = t_{CF}^* = \frac{D - C_p}{D + C_d} \quad (19a) \quad \text{and } t_T^* = \frac{D - (k+1)C_p}{D + C_d} \quad (19b)$$

Then, it comes that  $t_S^* = t_{CF}^* \geq t_T^*$ . Third-party financing leads to a lower threshold: the proportion of pure strategies equilibria where all claims (whether meritorious or frivolous) settle is then higher.

Second, let us compare the fraction  $\psi_i^*$  of cases filed that settle under mixed strategies. These probabilities are:

$$\psi_{SF}^* = \psi_{CF}^* = \frac{R_p + f}{D - C_p} \quad (20a) \quad \text{and } \psi_T^* = \frac{R_p(k+1) + f}{D - (k+1)C_p} \quad (20b)$$

Then, when  $k = 0$ ,  $\psi_T^* = \psi_{SF}^* = \psi_{CF}^*$ ; and when  $k > 0$ ,  $\psi_T^*(k) > \psi_{SF}^* = \psi_{CF}^*$ : third-party financing leads to a higher probability that a defendant chooses to settle compared to self finance or contingent fees arrangements.<sup>40</sup> Since the equilibrium settlement amount is lower under third-party financing than under alternative financing systems, this creates higher incentives for the defendant to decide to settle rather than to go to court.

Last, we compare the probabilities that an uninjured plaintiff files suit in mixed strategies.

$$\theta_{SF}^* = \theta_{CF}^* = \frac{\alpha(C_p + C_d)}{(1-\alpha)(D - C_p)} \quad (21a) \quad \text{and } \theta_T^* = \left(\frac{\alpha}{1-\alpha}\right) \left[\frac{(k+1)C_p + C_d}{D - (k+1)C_p}\right] \quad (21b)$$

Then, when  $k = 0$ , then  $\theta_T^*(0) = \theta_{SF}^* = \theta_{CF}^*$ , while when  $k > 0$ ,  $\theta_T^*(k) > \theta_{SF}^* = \theta_{CF}^*$ .<sup>41</sup> Third-party financing leads to a higher probability that an uninjured plaintiff files a claim:

<sup>40</sup>We note that  $\frac{\partial \psi_T^*}{\partial k} = \frac{R_p(D-(k+1)C_p) + (f+R_p(k+1))C_p}{(D-(k+1)C_p)^2} \geq 0$ , and  $\psi_T^*(0) = \psi_{SF}^* = \psi_{CF}^*$ . This result seems consistent with the empirical evidence about third-party financing provided by Chen and Abrams [2013]: they find a marked decrease in the average number of appearances each party made before the court in jurisdictions, and interpret it to indicate a corresponding increase in out-of-court resolution between the parties, *i.e.* settlement.

<sup>41</sup>This comes from  $\theta_T^*(0) = 0$  and  $\frac{\partial \theta_T^*}{\partial k} = \frac{\alpha}{(1-\alpha)} \times \frac{C_p(D-(k+1)C_p) + ((k+1)C_p+C_d)C_p}{(D-(k+1)C_p)^2} \geq 0$ .

since the probability that the defendant decides to settle is higher, this creates higher incentives for an uninjured plaintiff to file a claim, with the hopes of obtaining gains through settlement.

**Proposition 2.**

*When  $k > 0$ , the probability that an uninjured plaintiff files a claim is higher under third-party financing than under contingent fees or self-finance.*

This proposition seems consistent with the empirical results of Chen and Abrams [2013]: Of the 123 claims fully or partially funded and closed by IMF (the largest Australian company funding litigations), 83 were settled out of court, 25 were withdrawn or “dropped” and five lost while 10 won at trial. As underlined by Veljanovski [2012], this indicates a relatively high “drop rate” of over 20 %.

## 6 Conclusion

In many countries, legislators wonder whether the introduction of third-party financing will help to overcome the cost barrier to access to justice. Even if external funders have larger means than attorneys, the cost to organize a three-player relationship is higher than a traditional bilateral relationship. Since legislation allows funders to consider both direct and indirect charges when defining the share of the recovery they ask in case of success, they only select claims whose “profitability rate” (or rate of return on capital) is large enough to cover all types of costs they support. Then, our model shows that third-party financing: (i) does not allow to finance all types of meritorious claims, (ii) gives uninjured plaintiffs higher incentives to open a file (compared to the other types of financing), so that it may benefit more to uninjured plaintiffs than to truly injured ones.

This does not mean that third-party financing should be banned. Our model simply shows that by solving a problem (the cost barrier to access to justice), third-party financing is likely to create other difficulties, as the increase of frivolous claims. Our results also show that third-party financing is worthwhile when funders do not require a too high rate of return on capital. However, when their requirement for profitability is high, the difficulties raised by third-party financing are likely to be high (few claims are financed and settlement amounts are low). This may explain why some legislators are reluctant to introduce such a practice.

Our analysis is a first step towards a better understanding of third-party financing, but could be deepened in several ways. For instance, we consider litigation costs mainly as attorney costs. However, in practice, additional external costs may appear (Rubin [2011]). For instance, defendants may support additional opportunity costs of time and efforts. These include time spent in searching files for documents in response to document requests, time spent in preparation for depositions and testimony, and time spent in testimony itself. One could also argue that the attention of the managers will be diverted from profit making endeavors to the lawsuit. Reputational costs are also under silence in our model. Our conclusion about the increase in the incentives of an uninjured plaintiff to file a claim could be softened if we introduce potential reputational costs of supporting frivolous litigation for third-party funders. The risk for the funders is to be associated with nuisance suits, and its involvement in a particular case could undercut the plaintiff’s bargaining power to the extent that it suggests the claim is without merit. However, such

an analysis also calls for strong assumptions, in particular as regards to the structure of information between players in a repeated setting.

More broadly, our theoretical framework is based on assumptions that can be discussed. First, regarding the information structure of the game, many parameters are deterministic and public knowledge ( $D$ ,  $C_p$  once realized,  $\bar{C}$ ,  $\bar{C}$ ,  $R_p$ ,  $f$ ). We could introduce some risk or uncertainty on these parameters that could impact the behavior of the plaintiff, the attorneys or the funders. For instance, funders may more easily support risk than the other agents, which could change the results regarding the decision to finance a claim or the equilibrium settlement amounts. The plaintiff and the attorneys could prefer to transfer the risk regarding the outcome of the claim to some external investors. We need further researches to deal with the consequences of risk and uncertainty in such a model.

Another assumption we make is that attorneys and funders operate on competitive markets. This assumption is discussed in the literature (Osiel [1990], Hadfield [2000], Crabball and Winston [2011]). In our model, if attorneys or funders had market powers, they could put pressure on the plaintiff's decision to settle or to go to court. This could impact the equilibrium settlement amounts.

Moreover, the focus of our paper is on nuisance suits, so that we comment the increase in the likelihood of settlement (under third-party financing) on nuisance suits. Yet, some other positive consequences could be mentioned: more settlement could decrease the total litigation costs by avoiding to go to court. Other benefits could be less congestion at trial and fewer opportunity costs of time and efforts for the parties.

Let us also add that we do not discuss in our model the question of the optimal number of litigation. We take for granted that a plaintiff deserves to be compensated, and that this compensation is higher than the total amount of costs required to get it ( $\forall C_p \in [C_p^{min}; C_p^{max}]$ ,  $D - R_p - C_p - f > 0$ ). As a consequence, we do not discuss whether the increase in the probability to access to justice under third-party financing is socially efficient or not. It is sometimes argued that the additional lawsuits that would occur as a result of third party financing would have more social costs than social benefits (Rubin [2011]). This point deserves further research.<sup>42</sup>

Another extension could be to consider that the amount of money the parties have at disposal to finance their claims may influence the size of the damage, or the probability to win the case. This should call for a model where both parties (*i.e.* the plaintiff and the defendant) could benefit from contingency fees or third-party funders. Then, not only could the litigation costs of the plaintiffs vary, but also that of the defendant ( $C_d$ ). However, this analysis is beyond the scope of this paper, where our primary concerns are the access to justice for truly injured plaintiffs and the number of frivolous claims that are settled in each type of litigation financing system.

To account for the current debates about litigation financing in Europe, we focus on self-finance, contingent fees and third-party financing. However, insurances are also developing to finance litigation ( "before the event insurance" or "after the event insurance" (Faure and De Mot [2012])).

Last, we do not consider in this model the problem of product liability system, when it is the result of a series of legal changes brought about through litigation (especially in *common law* countries). Attorneys acting through their associations may coordinate in-

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<sup>42</sup>A complete analysis of this question would require a complex model taking also into account the social benefit of the change in behavior brought about through the threat of easier access to court thanks to third party financing.

formation, choose and sequence lawsuits in such a way as to create precedents favorable to expansion of law. While some attorneys have contributed to changing the legal rules, some others have been rather “free-riders” by benefiting from these changes without contributing. Third-party funders are likely to be involved in many cases as a method of diversification. This means that they will be able to internalize more of the effects of legal changes than could individual law firms, and so will contribute more to financing litigation leading to policy changes. The danger is that third-party financing could lead to increase the number of inefficient precedents (Rubin [2011]). We intend to take into account these additional effects in further researches.

## Appendix

*Proof n°1 (Proof of subsection 4.5. - First part):*

We show here that  $\exists \hat{k}$ , so that  $\forall k \in (0, \hat{k})$ ,  $x_T(k) \geq x_{CF}$  and  $\forall k > \hat{k}$ ,  $x_T(k) < x_{CF}$ .

$$\begin{aligned} x_T(k) \leq x_{CF} &\Leftrightarrow \hat{C}(k) \leq \bar{C} \\ &\Leftrightarrow \frac{(D-f)}{(k+1)} - R_p \leq \bar{C} \\ &\Leftrightarrow \frac{D-f}{\bar{C} + R_p} \leq k+1 \\ &\Leftrightarrow \frac{D-f-\bar{C}-R_p}{\bar{C} + R_p} \leq k \end{aligned}$$

We denote  $\hat{k} = \frac{D-f-\bar{C}-R_p}{\bar{C}+R_p}$ . Since  $\hat{C}(k)$  is a continuous and decreasing function in  $k$ , then  $\forall k \in (0, \hat{k})$ ,  $x_T(k) \geq x_{CF}$  and  $\forall k > \hat{k}$ ,  $x_T(k) < x_{CF}$ .<sup>43</sup>

*Proof n°2 (Proof of subsection 4.5. - Second Part):*

We show here that the settlement amount under third-party financing is still lower than the equilibrium settlement amounts under contingent fees or self-finance if we use Nash bargaining rather than “take-it-or-leave-it” offer.

Under self-finance, the minimum settlement amount  $S_{SF}$  the plaintiff accepts is  $S_{SF} = D - C_p$  as defined in equation (1). Since settling rather than going to court allows to save on litigation costs ( $C_p + C_d$ ), the parties can share these gains under a Nash-bargaining process, so that the settlement amount becomes  $S_{SF}^{NB} = D - C_p + \frac{C_d+C_p}{2} = D + \frac{C_d-C_p}{2}$ .

Under contingent fees, the minimum settlement amount for the plaintiff is  $S_{CF}$  as defined in (2), and the net gain from settling rather than going to court are still ( $C_p + C_d$ ) so that the settlement amount under Nash Bargaining is  $S_{CF}^{NB} = D + \frac{C_d-C_p}{2}$ .

Last, under third-party financing, gains from settling rather than going to court are higher since settlement allows to save ( $C_d + C_p(k+1)$ ). Using Nash bargaining, the settlement amount would be  $S_T^{NB} = D + \frac{C_d-C_p(k+1)}{2}$ .

As a consequence, equation (11) still holds:  $\forall k \geq 0$ ,  $S_T(k) \leq S_{SF} = S_{CF}$ .

<sup>43</sup>It is straightforward to show that  $\hat{k} > 0$  since  $\bar{C} \in [C_p^{min}, C_p^{max}]$  and  $\forall C_p \in [C_p^{min}, C_p^{max}]$ ,  $D - C_p - R_p - f > 0$ .



*Proof n°3 (Proof of Lemmas 4, 5 and 6):*

Let us show that  $\psi_{SF}^* \in [0, 1]$  and  $\theta_{SF}^* \in [0, 1]$ .

$$\psi_{SF}^* = \frac{R_p + f}{D - C_p}$$

By assumptions,  $D - R_p - C_p - f > 0$ ,  $R_p \geq 0$ ,  $C_p > 0$ ,  $f \geq 0$ , this implies that  $D - C_p \geq R_p + f \geq 0 \Leftrightarrow 0 \leq \frac{R_p + f}{D - C_p} \leq 1$ .

In addition, mixed strategies are defined when  $\alpha \leq \frac{D - C_p}{D + C_d} = t_{SF}^*$ .

$$\begin{aligned} \alpha &\leq \frac{D - C_p}{D + C_d} \Rightarrow \alpha(D + C_d) \leq D - C_p \\ &\Rightarrow \alpha(C_p + C_d) \leq (1 - \alpha)(D - C_p) \\ &\Rightarrow 0 \leq \frac{\alpha(C_p + C_d)}{(1 - \alpha)(D - C_p)} = \theta_{SF}^* \leq 1 \end{aligned}$$

A similar demonstration can show that  $\psi_{CF}^* \in [0, 1]$  and  $\theta_{CF}^* \in [0, 1]$ .

Last, from equation (9), we have  $D - (C_p + R_p)(k + 1) - f \geq 0$ , which implies that  $0 \leq \psi_T^* = \frac{f + R_p(k+1)}{D - (k+1)C_p} \leq 1$ . Since mixed strategies are established under third-party financing when  $\alpha \leq t_T^* = \frac{D - (k+1)C_p}{D + (k+1)C_d}$ , this implies that  $0 \leq \theta_T^* = \frac{\alpha(C_p(k+1) + C_d)}{(1 - \alpha)(D - (k+1)C_p)} \leq 1$ .

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