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Efficiency of Online Dispute Resolution : A Case Study*

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Abstract

The emergence of the Internet as a commercial phenomenon has resulted in an explosion of interest in *Online Dispute Resolution*. Online Dispute Resolution (ODR) consists of a variety of settlement methods which use the electronic environment to resolve conflicts. The aim of the paper is to evaluate the economic performance of a specific process elaborated by one of the main companies in the ODR world : *Cybersettle*. Cybersettle is a technology-administrated process in which an automated algorithm evaluates bids from the parties and settles the case if the offers are within a prescribed range. While Cybersettle offers an interesting alternative to the legal recourse, our analysis shows that the proposed settlement system plagues human interaction and creates some crucial inefficiencies. The implications of these results are then used to discuss the competition on the market for "electronic justice" and the potential role of reputation mechanisms.

Key words: Online Dispute Resolution, Regulation of Internet, Electronic Commerce, Bargaining.

JEL classification: C78, D74, K41, O31.

"The notion that most people want black-robed judges, well-dressed lawyers, and fine panelled courtrooms as the setting to resolve their dispute is not correct. People with problems, like people with pains, want relief, and they want it as quickly and inexpensively as possible." WARREN E. BURGER, former Chief Justice, United States Supreme Court.

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1 Introduction

The rapid growth of business-to-consumer electronic commerce over the past few years has raised a number of concerns for businesses and consumers. One of the main problem concerns the applicable law in an increasing number of transactions. The characteristics of the Internet make traditional dispute resolution through judicial procedures unsatisfactory for many controversies that arise in e-commerce. Cross-border online shopping is confronted to specific problems (including misrepresentation, non-delivery of goods and difficulty to obtain refunds), and such Internet-based transactions create legal uncertainty about which jurisdiction is competent (Johnson and Post 1996, Froomkin 1997). The lack of effective consumer redress when the parties are in different countries is a major barrier to consumer confidence in dealing with all but the most well-known and trusted brands. All parties (businesses, consumers and governments) recognize that, in order to develop e-commerce, consumer confidence must be improved. Thus, the problem of cross-border disputes must be resolved[1].

In this context, one can observe an explosion of interest in Online Dispute Resolution (ODR). Soon after goods and services started to be sold over the Internet, it became obvious that online transactions need the same support as face-to-face transactions. It was acknowledged that the growing Cyberspace required institutions much like the offline world. Here, the consumer can return to the store to get a defective product replaced. If the store refuses to replace it, the consumer can take the matter to court. Online there are no such institutions to resolve the dispute.

ODR represent an attempt to fill this gap. There were developed by private and public sectors. In practice, private companies were founded to provide ODR services (including, for instance, Cybersettle and SquareTrade)[2]. For example, Cybersettle claims that is has facilitated 100 000 transactions representing more than 750 million dollars in settlements[3]. But at the same time, public and para-public organizations also issued standards calling for e-commerce companies to integrate ODR into business practices (see, for example, ECODIR, ICC, ICCAN, and NAFTA). In practice, auctions websites were the first e-

[1] Indeed, 62% of the European consumers declare that the lack of legal protection is the main reason for not purchasing goods online (OCDE 2002). Furthermore, despite the rapid growth in business-to-consumer e-commerce sales, they still account for a very small share of overall transactions. For example, in United States, where most Internet transactions take place, business-to-consumer penetration is just 0.48% of retail sales (Coppel 2000).

[2] Websites: http://www.cybersettle.com/ and http://www.squaretrade.com/ respectively.

[3] The confidentiality which characterizes the ODR procedures (in general) creates important limitations to get more precise field data. Indeed, privacy and confidentiality prevent public access to dispute resolution proceedings and the publication of settlements.

commerce environments to make use of ODR. These sites are particularly vulnerable to conflict because the transaction environment usually connects the buyers and sellers and then leaves them alone to work out the details. Suppose that you purchase a product from an auction site. First, it is difficult to identify the sellers, and to know whether or not they are telling the truth about the item they want to sell. Furthermore, there are rarely repeated relationships between buyers and sellers, so most of the exchanges take place between strangers. Because of this anonymity and lack of personal contact, consumers who participate in this type of commerce expose themselves to a high level of risk and it is difficult to interact in a relationship of trust. This is the primary reason for which auction sites have developed a variety of tools to reassure buyers and sellers. *Escrow accounts*, where money is held by a neutral third party until the goods are delivered, help to solve the problem of fraudulent sellers. *Ratings* show the trading partners who do not know each other a record of the other side's positive or negative feedback from prior transactions. Hence, feedback profiles become a means by which honest sellers can be (eventually) distinguished from dishonest ones. Furthermore, if sellers obtain higher prices as their feedback profile is more positive, then the existence of feedback forums themselves provides a positive incentive to sellers for good performance (Houser and Wooders 2000, Keser 2002). But these methods cannot prevent all the conflicts and auction sites have also developed ODR systems, such as SquareTrade for eBay.

Our main concern is to evaluate the economic performance of a specific process elaborated by the main company in the ODR world: Cybersettle. Cybersettle consists of proprietary software which utilize the Internet as a means to (more efficiently) engage parties in *automated negotiation* of monetary sums. The resolution process begins when a claimant registers with the ODR provider. The provider then uses the information provided by the claimant to contact the defendant party and invite him/her to participate in online dispute resolution. If the other party accepts the invitation, they will then file a response to the claimant's complaint. From this point, the software accepts sealed offers from the parties and determine whether a settlement occurs according to the following bargaining rule. Acting independently and without prior communication, plaintiff and defendant submit price offers b_P and b_D respectively. The Cybersettle software then analyzes these proposals and adds $\delta\%$ to b_P in order to create a *settlement range* between the plaintiff's demand and the calculated *maximum settlement amount*[4]. If the defendant's offer is strictly greater than the maximum settlement amount ($b_D > b_P(1+\delta)$), then

[4] The parameter δ will be called the *settlement factor*. Although Cybersettle considers that $\delta = 20\%$, we keep a general value for this parameter ($\delta \in [0, 1]$) in order to analyze the effect that δ may have on bargaining behavior.

the case is settled for this amount ($b = b_P(1+\delta)$). If the defendant's offer is within the settlement range ($b_P \leq b_D \leq b_P(1+\delta)$), then the case is settled for the average of the two proposals ($b = (b_P + b_D)/2$). In this latter case, the bargaining rule determines the settlement price by splitting the difference between the parties' proposals. In order to shed some light on how disputants respond to the incentives of this innovative settlement mechanism and analyze its efficiency properties, we formulate a rather simple model of bargaining under *incomplete information*, yet sufficient to capture many of the important elements of the automated negotiation process. As explained above, the bargaining situation that we examine is that of two parties, a plaintiff and a defendant, negotiating over the price at which the plaintiff will sell his claim to the lawsuit. In literature, one mechanism that has been proposed to structure two-person bargaining under conditions of two-sided incomplete information is the well-known *sealed bid k-double auction*. The sealed bid k-double auction is a one-parameter family of bargaining rules for determining the terms of trade when a single seller and a single buyer voluntarily negotiate the transfer of an indivisible item. Under this mechanism, buyer and seller simultaneously choose bids p_B and p_S, respectively. Trade occurs if and only if $p_B \geq p_S$; in this case, the buyer pays the seller $p = kp_B + (1-k)p_S$, where $k \in [0,1]$. In other words, when the settlement factor is set equal to 0, the Cybersettle procedure investigated in our paper reduces to the sealed bid k-double auction mechanism where $k = 0$ (where the seller sets the price unilaterally if an agreement is reached). Starting with the seminal paper by Chatterjee and Samuelson (1983), considerable theoretical attention has been given to the sealed-bid mechanism (Leininger *et al.* 1989, Satterthwaite and Williams 1989) and, recently, a number of authors have experimentally investigated its empirical properties (Daniel *et al.* 1998, Rapoport *et al.* 1998, Seale *et al.* 2001, Parco 2004, and many others)[5]. We depart from these previous studies precisely by focusing the analysis on the role that the settlement factor may have on the individuals' bargaining behavior.

Indeed, our main insightful results show that the *design* of Cybersettle creates two possible sources of *inefficiencies*: the existence of incomplete information and the impact of the settlement factor on the defendant's bargaining behavior. Given incomplete information, not all mutually beneficial agreements can be attained *via* the procedure. Even when the defendant values the damage more highly than the plaintiff, a successful agreement may be impossible. Additionally, we present comparative statics results indicating the effect on the parties' bargaining behavior of changes in the parameter δ. As δ increases, the defendant's offer decreases, leading the occurrence of a settlement to be less

[5] For a survey, see Schotter (1990) and the collection of papers in the book *Bargaining with Incomplete Information* edited by Linhart *et al.* (1992).

likely. The key point is that the Cybersettle bargaining structure creates a negotiation situation similar to the *prisoner's dilemma*: each party has a strong individual incentive to exploit strategically the settlement factor and to adopt aggressive positions, which leads to a collective inefficient result. Surprisingly, these results suggest that Cybersettle is not a relevant settlement tool, while we show that a part of inefficiency may be eliminated by choosing a different conflict resolution mechanism, which has been proposed by Chatterjee and Samuelson (1983). In other words, parties would be able to capture a larger portion of the potential gains from agreement by using it rather than Cybersettle.

The remainder of the paper is organized as follows. Section 2 describes the ODR world and discusses the role of technology in conflict resolution. Section 3 lays down our model, and derives our main results concerning the equilibrium strategies and the welfare implications of Cybersettle. The implications of these results are used finally in Section 4 to discuss the competition on the market for electronic justice and the potential role of reputation mechanisms.

2 What is Online Dispute Resolution ?

The Internet allows creating new kinds of spaces in virtual form. Some of these online spaces, such as the virtual resolution space, are already the focal point of great activity but the problem is to build and design them in an efficient way. In fact, the tools and techniques of dispute resolution can be viewed along a spectrum, ranging from options where the parties are totally in control of the process and the outcome, to options where a third party decision-maker is totally in control of both the process and the outcome. *Mediation* and *arbitration* are the most frequently used Alternative Dispute Resolution (ADR) systems. They involve a range of processes that allow a third party to work with the parties in dispute. A large part of the expertise of any third party consists of information management. In arbitration, there is a fairly clear process of receiving information, evaluating information, and reaching a judgment. In mediation, the process is more flexible since the mediator makes recommendations and does not impose any agreement to the parties.

Katsh and Rifkin (2001) have introduced the idea that technology acts as a "fourth party". Arbitrators and mediators are often referred as "third parties" in a dispute because they are the third participants in the process, in addition to the two litigants. When ODR is introduced, the technology can also play a major role in managing the process and setting the agenda, so it becomes the fourth party. This idea is interesting because it indicates the significant role technology can play in guiding litigants toward agreement (technology is not just about replicating face-to-face interactions). In addition to facilitate the interaction process, online practitioners need to think through the various communication options available and design a communication environment that can address the issues under discussion and the dynamic between the parties. ODR system designers came to realize that, in addition to play a crucial role in shaping the environment around the parties' interaction, ODR technology could itself also play a facilitative role. New methods for helping the parties to reach an agreement began to appear online, methods that did not require a human involvement to operate. This development is significant because many of the rules that were developed regarding effective ADR practice presumed that the process was being run by a human (arbitrator or mediator). If the process is instead being run by a machine, then the challenges are entirely different. While face-to-face negotiations are usually fairly uniform, online negotiations can vary widely. The ODR environment changes the frame of the bargaining process significantly. Online negotiations can parallel to face-to-face negotiations by putting the parties into an unstructured communication environment which simply uses technology as the communication medium for a traditional process such as arbitration or mediation. However, online negotiations can also place parties into automated negotiation procedures which use algorithms to drive the negotiation process and settle the dispute (without the participation of a neutral third party). In recent years, many ODR companies have emerged to offer such a process of dispute resolution: a blind-bidding process in which an automated algorithm evaluates bids from the parties and settles the case (for the median amount) if the offers are within a prescribed range (for example 20%). If the proposals are not within the prescribed range, then the bids are annulled and neither side knows the other's offer. Before it begins, both parties are fully informed of the way the process works and they agree to be legally bound by all settlements arising from the negotiations.

It is interesting to remark that ODR is not only a valuable resource for online activities, but also offers a forum for offline undertakings as well. Whereas ODR's origins lie in disputes that arose online and for which traditional means of dispute resolution were largely unavailable, it has also come to be used in offline based arbitrations and mediations. In practice, operators rapidly realized that what works for online disputes can also be applied to offline conflicts. Such a point may be illustrated by considering the insurance claims. Once an accident occurs, the insurance companies deal first with the parties involved and then with each other. Negotiation between insurance companies to resolve differences over payment obligations, called subrogation, is a complex and a costly process. The majority of these negotiations between insurers are successful in reaching a resolution (in the United States only one-third of claims become lawsuits and only 2% of these lawsuits are decided by a court verdict). Awards in insurance cases are also very important: unlike e-commerce disputes, where claim values in the business-to-consumer context are usually under 500 euros and in business-to-business under 10 000 euros, insurance disputes are often much higher in value (100 000 euros and up, especially in medical or environmental cases). The industry is under enormous pressure due to costs. Consequently, integrating ODR into the insurance claims resolution process could save important administrative costs. This is probably the main reason for which the insurance industry became the largest user of automated dispute resolution mechanisms. Moreover, because so many cases involve monetary values, it is relatively simple to build a technology-administered process that allows participants to resolve their conflict despite the depersonalized process. The largest ODR company that has emerged so far is Cybersettle which has focused primarily on this market (Rule 2002). The aim of the next section is to analyze the economic performance of this innovative bargaining mechanism.

3 Economic Analysis of Cybersettle

In Section 3.1, we first describe the Cybersettle bargaining structure and the theoretical framework we use to analyze this settlement system. Our principal aim is to characterize the efficiency of Cybersettle by studying how the parties fare, individually and collectively, under this system. This analysis is conducted in Section 3.2.

3.1 Theoretical Framework and Bargaining Rule

Framework. Following the pioneering approach of Chatterjee and Samuelson (1983), we frame the Cybersettle settlement tool as a double auction game under incomplete information. We consider two individuals, a defendant (D) and a plaintiff (P), who bargain over the price at which the plaintiff will sell his claim to the lawsuit. Let v_D denote the defendant's reservation price (the greatest sum he is willing to pay for the damage). Similarly, let v_P denote the plaintiff's reservation price (the smallest monetary sum he will accept in exchange for the damage). The valuations of the damage of the defendant and plaintiff are their private information: each party knows his own reservation price, but his uncertain about his adversary's, assessing a subjective probability distribution over the range of possible values that his opponent might hold. Specifically, each party regards the opponent's reservation value as a random variable drawn from an independent uniform distribution defined on $[0, 100]$, and these distribution functions are *common knowledge*[6]. The incom-

[6] That is, each side knows these distributions, knows that they are known by the other side, knows that the latter knowledge is known, and so forth (Aumann 1976).

plete information approach provides a useful framework to take into account some key features of actual negotiations: the fact that each bargainer is uncertain about his adversary's payoff and the possible occurrence of "unreasonable" bargaining outcomes, such as breakdowns in negotiations, even when mutually beneficial agreements are possible. Like most of the theoretical literature on bargaining, we restrict attention to identical bargains, such as the individuals' valuations are drawn from the same distributions. While it would be interesting to consider asymmetric situations, our framework is a useful idealization and a starting point for other investigations[7].

In this framework, bargaining behavior depends on a player's reservation price, his assessment of the opponent's reservation price, the knowledge of the opponent's assessment, and the bargaining rule considered by the Cybersettle process.

Bargaining Rule. Acting independently and without prior communication, the defendant submits an offer b_D while the plaintiff enters a demand b_P. The Cybersettle software then analyzes these proposals and adds $\delta\%$ to b_P in order to create a settlement range between the plaintiff's demand and the calculated maximum settlement amount. If the defendant's offer is strictly greater than the maximum settlement amount ($b_D > b_P(1+\delta)$), then the case is settled for this amount ($b = b_P(1+\delta)$). If the defendant's offer is within the settlement range ($b_P \leq b_D \leq b_P(1+\delta)$), then the case is settled for the average of the two proposals ($b = (b_P + b_D)/2$). In this latter case, the bargaining rule determines the settlement price by splitting the difference between the parties' proposals. If the proposals diverge ($b_D < b_P$), then no agreement is struck. In this case, there is no sale and no money trades hands since each player's payoff from disagreement is zero. In order to summarize and illustrate conveniently this bargaining rule, let us take an example. Following the Cybersettle mechanism, we suppose that $\delta = 20\%$ and consider the three cases mentioned above[8]:

[7] For example, we could consider the case where the support of the player i's *prior* distribution is included in the support of the player j's prior distribution (Daniel *et al.* 1998, Rapoport *et al.* 1998, Seale *et al.* 2001). Such a situation approaches one-sided uncertainty with j having little uncertainty about the reservation values of i, and i having relatively higher uncertainty about j's valuations. This information disparity should not modify the efficiency properties of Cybersettle but may have *distributive* consequences by providing j a greater bargaining strength that he will use to exaggerate his reservation values more than i and increase his relative share of the realized gains from agreement. Indeed, it is a commonly accepted truism that in bargaining situations "information is power".

[8] For more details, see the general demonstration available on the Cybersettle's website (http://www.cybersettle.com/demo/generaldemo.asp).

Case	Offer b_D	Demand b_P	Maximum settlement	Result
1	\$28,000	\$22,000	\$26,400	Settlement for \$26,400 $b_D > b_P(1+\delta) \rightarrow b = b_P(1+\delta)$
2	\$24,000	\$22,000	\$26,400	Settlement for \$23,000 $b_P \leq b_D \leq b_P(1+\delta) \rightarrow b = (b_P + b_D)/2$
3	\$18,000	\$22,000	\$26,400	No Settlement $b_D < b_P \rightarrow$ No agreement

In the event of an agreement (cases 1 and 2), each individual earns a profit measured by the difference between the agreed price and his reservation value ($v_D - b$ for the defendant and $b - v_P$ for the plaintiff). In the event of no agreement (case 3), each earns a zero profit. The payoffs to both the defendant and the plaintiff are then:

$$\phi_D = \begin{cases} v_D - b_P(1+\delta) & \text{if } b_D > b_P(1+\delta) \\ v_D - (b_P + b_D)/2 & \text{if } b_P \leq b_D \leq b_P(1+\delta) \\ 0 & \text{if } b_D < b_P \end{cases} \tag{1}$$

$$\phi_P = \begin{cases} b_P(1+\delta) - v_P & \text{if } b_D > b_P(1+\delta) \\ (b_P + b_D)/2 - v_P & \text{if } b_P \leq b_D \leq b_P(1+\delta) \\ 0 & \text{if } b_D < b_P \end{cases} \tag{2}$$

Our principal aim is to study how the parties fare, individually and collectively, under the Cybersettle bargaining rule and to investigate the efficiency properties of equilibrium strategies. In order to conduct our analysis in a simplified manner, we deliberately omit from our model various other elements of the Cybersettle procedure that would also have some role and impact on the issue under study. Especially, we make three (additional) assumptions which, while limiting, simplify the analysis of and discussion on the strategic interaction between the two parties in Cybersettle.

Assumptions. First, we substitute a single-stage bargaining representation for the multi-stage procedure considered in Cybersettle (which provides three "rounds" to the parties for reaching an agreement). This assumption is based on the following motivation. Through abstracting from the dynamics of the negotiation process, the single-stage bargaining framework emphasizes the basic strategy trade-off faced by each player: by making a more aggressive offer, a player earns a greater profit in the event of an agreement but, at the same time, increases the risk of disagreement, depending on the value of the settlement factor. We conjecture that the dynamic nature of Cybersettle should create a *learning process* during negotiations, inducing a positive effect from an efficiency standpoint by increasing the likelihood of a settlement. The intuition behind this idea is simple: while no proposal is ever revealed to the opposing party in the Cybersettle mechanism, the occurrence of a disagreement is regarded as a *signal* which must be used to update the other bargainer's private information and thus to adjust subsequent actions. The key point is that the occurrence of a disagreement should lead the prior beliefs to be updated pessimistically and the likelihood of concessionary behavior to be enhanced[9].

Second, we assume, without loss of generality, that there is no direct cost for the parties from using the settlement service - this is a simplifying modelling assumption. Currently, the Cybersettle system uses a wide range of fee structures - that is, a submission fee (incurred only by the defendant or claim professional) and a settlement fee (incurred by both parties if and only if a successful settlement is reached) - whose the amounts depend essentially on the claim type and settlement value.

Finally, we implicitly assume throughout this paper that the agreement struck *via* the Cybersettle process is binding for the parties. Indeed, the actual users of such a service have to agree in writing to be legally bound by all settlements arising from negotiations. Therefore, settlements are binding on both parties and preclude them from seeking redress in court for the same claim. In addition, parties are barred from bringing any other suit arising from the same facts from which the claim arose. The implications of this assumption are discussed in Conclusion.

All these assumptions have been introduced for algebraic convenience and could be relaxed without altering the gist of our arguments (see, in particular, note 14). The model we explore here is rather simple, yet sufficient to derive the basic insights. There are many options to enrich the analysis, however we have chosen to keep the theoretical framework as simple as possible in order to focus on the parties' bargaining behavior and present the results characterizing the efficiency of Cybersettle in a sharper manner.

[9] In other words, when no agreement is reached in period j, each party might infer from it some information concerning his adversary's reservation value and adjust his proposal in period $j+1$ ($j = 1, 2$). The plaintiff (resp. defendant) might use a failure in period j as an indication that the defendant's (resp. plaintiff's) valuation is below (resp. above) a certain value and therefore should adopt a more reasonable behavior in period $j+1$ in order to increase the chances of reaching an agreement.

3.2 Bargaining Behavior and Efficiency

Depending on his reservation price, each bargainer i chooses a strategy $b_i(v_i)$ in order to maximize his expected profit ($i = D, P$). Then, a pair of strategies constitutes a *Nash equilibrium* if neither individual can increase his expected gain by unilaterally altering his chosen strategy (Nash 1951). The pair of strategies which together form an equilibrium in Cybersettle is the following[10]:

$$b_D^*(v_D) = \frac{72}{83}v_D \text{ and } b_P^*(v_P) = \frac{50}{123}v_P + \frac{144000}{3403} \tag{3}$$

This result shows that the defendant's offer is biased downward with his reservation price while the plaintiff's asking compensation is biased upward with respect to his valuation: the Cybersettle bargaining rule does not promote honest behavior implying that each party makes a truthful proposition (such as $b_i = v_i$ for all v_i; $i = D, P$). Furthermore, given that an agreement is reached if and only if $b_D \geq b_P$, manipulating the equilibrium strategies shows that an agreement occurs in equilibrium if and only if:

$$v_D \geq \frac{2075}{4428}v_P + \frac{2000}{41}$$

In other words, even when the defendant values the damage more highly than the plaintiff, a successful settlement may be impossible. This implies that there is no Nash equilibrium of the Cybersettle mechanism in which an agreement occurs if and only if it is efficient (if and only if $v_D \geq v_P$). Given incomplete information, not all mutually beneficial agreements can be attained *via* bargaining and the Cybersettle system is not *ex post* efficient (some available settlements will be inevitably lost). The key point is that Cybersettle creates a bargaining situation similar to the prisoner's dilemma. Both parties know that while their optimal independent behavior is to play strategically, they could be better off by bidding truthfully. However, they also know that each proposal they make involves a trade-off between increasing the odds of a successful agreement (accomplished by placing a bid closer to their reservation value) and increasing their share of the joint gain should a settlement is reached (enhanced by placing a more aggressive bid). In this context, honesty does not pay: it is rational for defendant and plaintiff to sacrifice some feasible settlements if they desire to maximize their equilibrium expected profits. The lost available agreements are represented by the shaded area in Figure 1.

[10] For a proof of this result, see Appendix 5.1 (recall that $\delta = 20\%$).

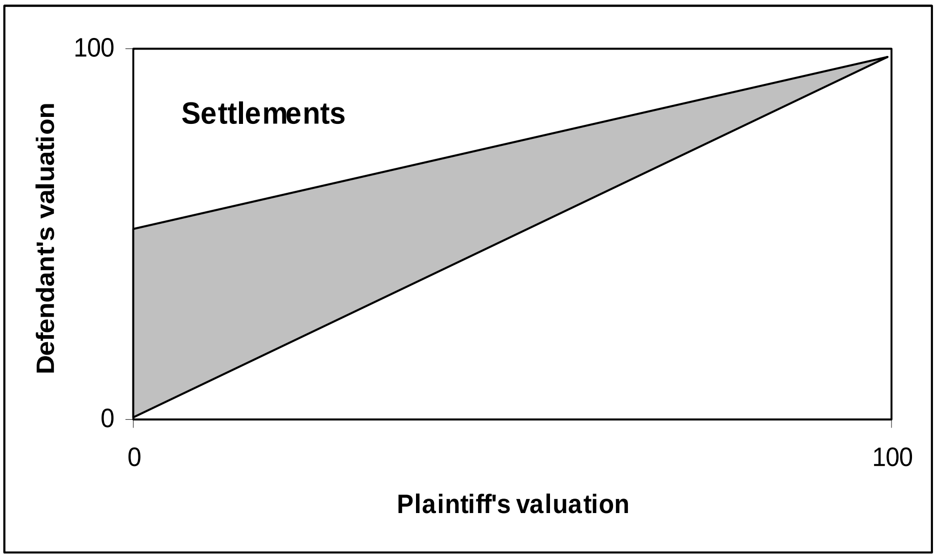

FIGURE 1. The settlement zone in Cybersettle.

From these arguments, we can infer further results relative to the efficiency of the Cybersettle process and derive several insights concerning whether or not it is optimal for the parties to choose Cybersettle as a conflict resolution mechanism. Let the efficiency of Cybersettle be defined as the ratio of the expected gains from the agreement in the equilibrium (the expected total profits of the two parties) to the potential maximum expected gains from agreement (the latter would be realized if each party bids his true valuation in the *first-best* situation).

Dividing the equilibrium combined expected profits by the potential combined expected profits shows that the Cybersettle procedure extracts only 78.1% of the potential group profit (inducing a 21.9% loss in expected gain)[11]. It is rather easy to get some intuition for why a number of mutually beneficial agreements will be missed under the Cybersettle system. In fact, the design of Cybersettle creates two possible sources of inefficiencies: the existence of incomplete information (as mentioned above) and the impact of the settlement factor on the defendant's bargaining behavior. First, the inefficiency due to incomplete information is a well-known result in bargaining theory which has been demonstrated by Myerson and Satterthwaite (1983). The authors consider bargaining problems of bilateral monopoly under uncertainty and show it is generally impossible to have an allocation mechanism that is *incentive-compatible*, *individually-rational*, and *ex post* efficient (in the sense that it transfers the object to the buyer if and only if his valuation for the object is higher)[12]. Second, the settlement factor puts a downward pressure on the defendant's offer

[11] For a proof of this result, see Appendix 5.2.

[12] In other words, with incomplete information, Coase's Theorem fails to apply and even the optimal

which moves away from his true valuation (leading the occurrence of a settlement to be less likely). A comparative statics analysis can confirm that, as δ increases, the slope of the defendant's strategy decreases causing his bargaining position to become more aggressive:

$$\frac{\partial b_D(v_D)}{\partial \delta} = -\frac{4(1+\delta)}{\left(3\delta^2+6\delta+2\right)^2} v_D \leq 0, \text{ since } \delta > 0 \text{ and } v_D \in [0,100]$$

The defendant's equilibrium strategy is sensitive to changes in the settlement factor in a natural way. In the case where $\delta = 0$, it is straightforward to show that the defendant's strategy coincides with his reservation value ($b_D = v_D$ for all v_D). The intuition behind this result is the following. When an agreement is reached, the case is settled at price $b = b_P$, therefore the rule is equivalent to granting the plaintiff the right to make a first and final offer that the defendant can accept or reject. In this instance, the transaction price is determined solely by the plaintiff's demand, while the defendant's offer serves only to determine whether there is an agreement or not. The defendant's dominant strategy is then to make a truthful offer in order to maximize the probability of settlement. On the contrary, in Cybersettle (where $\delta = 20\%$), the defendant faces a trade-off since his proposal determines both his profit and the probability of conflict resolution. Therefore, he adopts an under-efficient behavior which consists of offering a compensation lower than his valuation. The impact on the defendant's bargaining behavior of the settlement factor is characterized in Figure 2 which represents the defendant's equilibrium strategy with $\delta = \{0, 20\%\}$.

mechanism will lead to inefficient outcomes with strictly positive probability (Coase 1960).

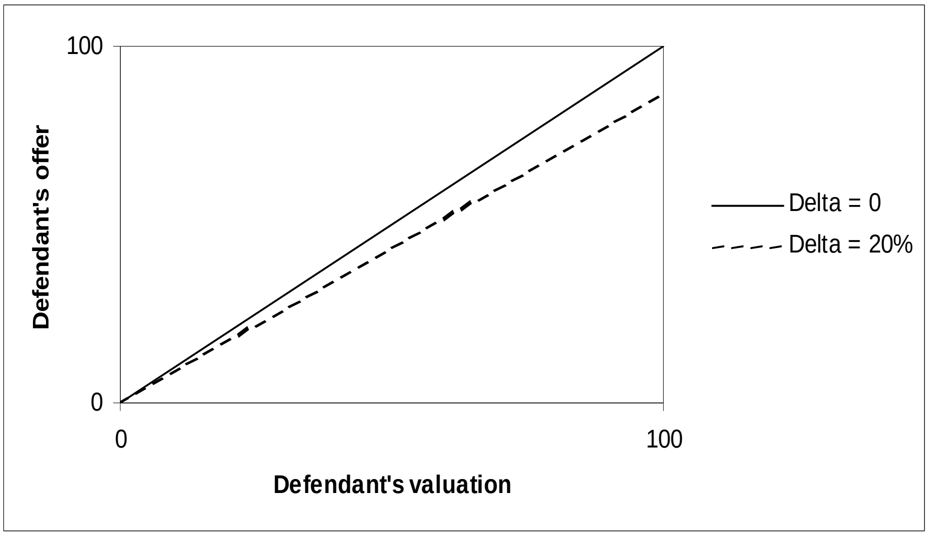

FIGURE 2. The impact of δ on the defendant's equilibrium strategy.

Concerning the plaintiff's demand strategy, one could think intuitively that the defendant's aggressiveness would force the plaintiff to adopt a more concessionary behavior in order to increase the probability to reach an agreement. This is not the case however because the more compromising bargainer, while enhancing his chances of reaching an agreement, does so at the expense of lowering his expected payoff.

Following these arguments concerning the (poor) welfare property of Cybersettle, the key question is whether a part of inefficiency can be eliminated by choosing a different conflict resolution mechanism. The answer is *yes* since Myerson and Satterthwaite (1983) show that the Chatterjee-Samuelson procedure is *second-best* (in the sense that it extracts the maximum group expected profit for all possible bargaining mechanisms)[13]. Therefore, the parties would be better off by using the bargaining mechanism developped by Chatterjee and Samuelson (1983) than by entering in Cybersettle. Indeed, it is possible to show that the Chatterjee-Samuelson procedure extracts 84.4% of the potential group profit which implies that individuals would be able to capture a larger portion of the potential gains from agreement by using it rather than Cybersettle[14].

[13]Furthermore, the Chatterjee-Samuelson mechanism is very simple since it considers the following settlement rule: if $b_D \geq b_P$, then the case is settled at price $b = (b_P + b_D)/2$ (the average of the two proposals). If $b_D < b_P$, then the agreement is not reached.

[14]For a proof of this result, see Appendix 5.3. We conjecture that this conclusion continues to hold if we take into account the dynamic aspect of Cybersettle, analyze a repeated version of the Chatterjee-Samuelson process, and compare the obtained results. Indeed, the efficiency effect of repetition would also be relevant if we consider a multi-stage representation of the Chatterjee-Samuelson mechanism.

4 Conclusion

In this paper, we used the bargaining model with incomplete information proposed by Chatterjee and Samuelson (1983) in order to analyze the economic performance of Cybersettle, which is the main dispute resolution system existing in the online environment. The results obtained in our analysis suggest that the Cybersettle resolution process is not a relevant settlement tool, while the Chatterjee-Samuelson mechanism (which is surprisingly not used in practice) has a strong welfare property. The central idea is that the Cybersettle bargaining rule in combination with the behavioral processes of decision making under uncertainty determine the environment within which the parties negotiate and plague human interaction by creating some crucial inefficiencies. This result may have important implications for policy makers and legislators since it suggests that maintaining such a design is not a good way for increasing the likelihood of a settlement and promoting economic welfare.

This conclusion raises a first crucial issue following the idea that it seems difficult to explain how an inefficient mechanism may be the most successful privately ODR system (Arthur 1989). However, one can think that the Cybersettle process has been set up in order to maximize the profit of the technology's owner and not the social surplus. In this case, if a strong network effect in participating in one ODR system exists, the optimal strategy for a firm to develop its ODR system is to: (*i*) get the biggest market share; and (*ii*) protect its technology in order to avoid new incumbents and pricing competition. Our analysis demonstrates that the Cybersettle technology is suboptimal or at least dominated by the very simple Chatterjee-Samuelson mechanism. However, the key point is that the Cybersettle mechanism is not obvious for the "men of the art" and, consequently, is *patentable* whereas the Chatterjee-Samuelson mechanism is not. Therefore, even though the Cybersettle mechanism is not efficient, it is defendable by creating a significant *barrier to entry*. This is a probably important argument explaining the development of ODR.

Our results raise a second question about the way to enforce the agreements reached *via* Cybersettle and give some elements of reflection about the potential role of public regulation and reputation mechanisms in Cyberspace. Indeed, such automated negotiation systems are offered by private companies on the electronic justice market and are, by definition, contractual. In other words, it is only through the establishment of a contract between parties to a conflict that the latter agree to respect the settlement. Nevertheless, the problem is to know to which extent a private electronic constraint can ensure acceptance of disputing parties to engage in this type of procedure *ex-ante* and to accept the settlement *ex-post*. Currently, nothing can force an agent to settle a conflict by a private electronic system. This is reinforced by the precise fact that agents have alternative solutions represented by courts in the real world. When an agreement is achieved by electronic means, there is not absolute guarantee the litigants will accept the decision, even when they are engaged by contract to respect the agreement. Indeed, it is useless to think that a private electronic constraint will be able to substitute the public one, court intervention which could remain necessary to obtain the execution of a decision when a party refuses to conform to it (Cachard 2002). In fact, the lack of coercion (inherent to private companies) could be problematic in the case of ODR systems proposed by private operators. In this context, we could argue that the reputation mechanisms existing on the Internet would be a powerful way to enforce such contracts. As mentioned in the Introduction, many of the online market sites offer reputation management systems that allow the trading parties to submit a rating of the counterpart's performance. Therefore, we could conjecture that if one of the disputants does not respect the settlement stated by the automated algorithm, then a *naming and shaming* strategy would be powerful enough to enforce it. In this context, it could be interesting to analyze the potential role of such ratings systems on the parties' bargaining behavior in dispute resolution and their acceptance of the settlement.

This paper may be considered as a first step in the investigation of ODR. Indeed, following the above arguments, it is obvious that much more work needs to be done before a clear picture of how the type of mechanisms studied here performs. In this context, we feel confident that the types of question raised by our analysis will be central to the final unravelling of the puzzles presented by the computer-aided bargaining systems available in the Cyberspace.

5 Appendix

5.1 The Parties' Equilibrium Strategies in Cybersettle

Considering linear strategies, we assume that the party i's strategy is $b_i(v_i) = c_i v_i + a_i$ $(i = D, P)$. Then, following (1) and (2), the maximization problems for the defendant and plaintiff are respectively

$$\max_{b_D} \Pi_D = E\phi_D \text{ and } \max_{b_P} \Pi_P = E\phi_P$$

where the expectation is taken with respect to the probability distributions of v_D and v_P.

The first-order conditions for which yield

$$b_D = \frac{2(1+\delta)^2}{3\delta^2 + 6\delta + 2} v_D \text{ and } b_P = \frac{2}{3\delta^2 + 4\delta + 4} v_P + \frac{2(1+\delta)}{3\delta^2 + 4\delta + 4}(a_D + 100c_D)$$

Considering that $\delta = 20\%$, we obtain the equilibrium strategies of the defendant and plaintiff in Cybersettle:

$$b_D^*(v_D) = \frac{72}{83} v_D \text{ and } b_P^*(v_P) = \frac{50}{123} v_P + \frac{144000}{3403} \quad \blacksquare$$

5.2 Efficiency of the Cybersettle Mechanism

We first determine the total expected gains from agreement in the Cybersettle mechanism. Following the Cybersettle bargaining rule, the parties reach an agreement if

$$\begin{aligned} [1]\ b_P &\leq b_D \leq b_P(1+\delta) \\ \text{or } [2]\ b_D &> b_P(1+20\%) \end{aligned}$$

Manipulating the equilibrium strategies in (3) shows that an agreement occurs in the equilibrium if

$$[1]\ \frac{2075}{4428} v_P + \frac{2000}{41} \leq v_D \leq \frac{415}{738} v_P + \frac{2400}{41} \text{ or } [2]\ v_D > \frac{415}{738} v_P + \frac{2400}{41}$$

The corresponding transaction prices are given by

$$\begin{aligned} [1]\ b_1 &= \frac{b_P + b_D}{2} = \frac{25}{123} v_P + \frac{36}{83} v_D + \frac{72000}{3403} \\ [2]\ b_2 &= b_P(1+20\%) = \frac{20}{41} v_P + \frac{172800}{3403} \end{aligned}$$

Therefore, the defendant's expected gain, given some value of v_P, is given by

$$\begin{aligned}\Pi_D/v_P &= \frac{1}{100}\int_{\alpha(v_P)}^{\beta(v_P)}(v_D - b_1)\,dv_D + \frac{1}{100}\int_{\beta(v_P)}^{100}(v_D - b_2)\,dv_D \\ &= \frac{195299}{156857472}v_P^2 - \frac{10375}{45387}v_P + \frac{1773750}{139523}\end{aligned}$$

where

$$\alpha(v_P) = \frac{2075}{4428}v_P + \frac{2000}{41} \text{ and } \beta(v_P) = \frac{415}{738}v_P + \frac{2400}{41}$$

The defendant's *ex ante* expected gain is given by

$$\Pi_D^* = \frac{1}{100}\int_0^{100}(\Pi_D/v_P)\,dv_P \simeq 5.4337$$

Similarly, the plaintiff's expected gain, given some value of v_P, is given by

$$\Pi_P/v_P = \frac{1}{100}\int_{\alpha(v_P)}^{\beta(v_P)}(b_1 - v_P)\,dv_D + \frac{1}{100}\int_{\beta(v_P)}^{100}(b_2 - v_P)\,dv_D = \frac{83}{35424}v_P^2 - \frac{21}{41}v_P + \frac{86400}{3403}$$

and the plaintiff's *ex ante* expected gain is given by

$$\Pi_P^* = \frac{1}{100}\int_0^{100}(\Pi_P/v_P)\,dv_P \simeq 7.5898$$

The total expected profit in Cybersettle is defined as:

$$K^* \equiv \Pi_D^* + \Pi_P^* \simeq 13.02$$

We now determine the total expected gains from agreement in the first-best situation. In the first-best situation, the parties reach an agreement if and only if $v_D \geq v_P$ and the transaction price is given by the average of the two propositions $b = (v_P + v_D)/2$ (Myerson and Satterthwaite 1983).

Therefore, the defendant's expected gain, given some value of v_P, is given by

$$\Pi_D/v_P = \frac{1}{100}\int_{v_P}^{100}(v_D - b)\,dv_D = \frac{1}{400}v_P^2 - \frac{1}{2}v_P + 25$$

and the defendant's *ex ante* expected gain is given by

$$\Pi_D^e = \frac{1}{100}\int_0^{100}(\Pi_D/v_P)\,dv_P \simeq 8.333$$

Similarly, the plaintiff's expected gain, given some value of v_P, is given by

$$\Pi_P/v_P = \frac{1}{100}\int_{v_P}^{100}(b - v_P)\,dv_D = \frac{1}{400}v_P^2 - \frac{1}{2}v_P + 25$$

and the plaintiff's *ex ante* expected gain is given by

$$\Pi_P^e = \frac{1}{100}\int_0^{100}(\Pi_P/v_P)\,dv_P \simeq 8.333$$

The total expected profit in the first-best situation is defined as:

$$K^e \equiv \Pi_D^e + \Pi_P^e \simeq 16.67$$

Therefore, we can compare the total expected profit in the *Pareto-efficient* situation with that in Cybersettle:

$$\textit{Efficiency of Cybersettle} \;\equiv \frac{K^*}{K^e} \simeq 78.1\% \quad \blacksquare$$

5.3 Efficiency of the Chatterjee-Samuelson Mechanism

We first determine the equilibrium strategies in the Chatterjee-Samuelson (CS) system.

Following the CS bargaining rule, the payoffs to the defendant and plaintiff are respectively

$$\varphi_D = \begin{cases} v_D - (b_D + b_P)/2 & \text{if } b_D \geq b_P \\ 0 & \text{if } b_D < b_P \end{cases} \tag{4}$$

$$\varphi_P = \begin{cases} (b_D + b_P)/2 - v_P & \text{if } b_D \geq b_P \\ 0 & \text{if } b_D < b_P \end{cases} \tag{5}$$

As mentioned in Appendix 5.1, we assume that the party i's strategy is $b_i(v_i) = c_i v_i + a_i$ ($i = D, P$). Then, following (4) and (5), the maximization problems for the defendant and plaintiff are respectively

$$\max_{b_D} \Pi_D = E\varphi_D \text{ and } \max_{b_P} \Pi_P = E\varphi_P$$

where the expectation is taken with respect to the probability distributions of v_D and v_P.

The first-order conditions for which yield

$$b_D = \frac{2}{3}v_D + \frac{1}{3}a_P \text{ and } b_P = \frac{2}{3}v_P + \frac{1}{3}(a_D + c_D)$$

We conclude that the equilibrium strategies of the defendant and plaintiff in the CS procedure are:

$$b_D^{**}(v_D) = \frac{2}{3}v_D + \frac{25}{3} \text{ and } b_P^{**}(v_P) = \frac{2}{3}v_P + 25$$

We now determine the total expected gains from agreement in the CS mechanism.

Following the equilibrium strategies, the parties reach an agreement if and only if $v_D \geq v_P + 25$ and the transaction price is given by the average of the two propositions $b = (v_D + v_P + 50)/3$.

Therefore, the defendant's expected gain, given some value of v_P, is given by

$$\Pi_D/v_P = \frac{1}{100}\int_{v_{P+25}}^{100} (v_D - b)\, dv_D = \frac{75}{4} - \frac{1}{4}v_P$$

and the defendant's *ex ante* expected gain is given by

$$\Pi_D^{**} = \frac{1}{100}\int_0^{75} (\Pi_D/v_P)\, dv_P \simeq 7.031$$

Similarly, the plaintiff's expected gain, given some value of v_P, is given by

$$\Pi_P/v_P = \frac{1}{100}\int_{v_{P+25}}^{100} (b - v_P)\, dv_D = \frac{1}{200}v_P^2 - \frac{3}{4}v_P + \frac{225}{8}$$

and the plaintiff's *ex ante* expected gain is given by

$$\Pi_P^{**} = \frac{1}{100}\int_0^{75} (\Pi_P/v_P)\, dv_P \simeq 7.031$$

The total expected profit in the CS procedure is defined as:

$$K^{**} \equiv \Pi_D^{**} + \Pi_P^{**} \simeq 14.06$$

Therefore, we can show that the CS bargaining mechanism is more effective in promoting efficiency than Cybersettle:

$$\textit{Efficiency of the Chatterjee-Samuelson mechanism} \equiv \frac{K^{**}}{K^e} \simeq 84.4\%$$
$$\textit{Efficiency of the Cybersettle system} \equiv \frac{K^{*}}{K^e} \simeq 78.1\% \quad \blacksquare$$

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