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**Opportunistic Termination**

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# Opportunistic Termination

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## Abstract

If a seller delivers a good non-conforming to contract, European and US warranty law allows consumers to choose between some money transfer and termination. Termination rights are, however, widely criticized, mainly for fear that the buyer may use non-conformity as a pretext for getting rid of a contract he no longer wants. We show that this possibility of “opportunistic termination” might actually have positive effects. Under some circumstances, it will lead to redistribution in favour of the buyer without any loss of efficiency. Moreover, by curbing the monopoly power of the seller, a regime involving termination might increase welfare by enabling a more efficient output level in a setting with multiple buyers. These potential benefits are absent if renegotiation is possible.

*Keywords:* breach remedies, warranties, termination, redistribution, antitrust.

*JEL-Classification:* K12, C7, L40, D30.

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# 1 Introduction

It is quite common that a buyer does not get what he has contracted for: The seam of a dress may become unstitched shortly after purchase, the new DVD player may start to skip after one year, or a piece of furniture may not be built according to the contracted design.

The legal remedies available to the consumer in such cases of non-conforming delivery are governed by warranty law as laid down in Directive 1999/44 of the European Community.<sup>1</sup> It stipulates a mandatory regime across all member countries which gives the victim of non-conforming delivery the right to choose between expectation damages and termination (hereafter EDT regime). If the buyer chooses expectation damages he receives a monetary compensation so that in terms of utility he is in the same position as if the contract had been duly performed.<sup>2</sup> If the buyer chooses termination this will lead to restitution, i.e. he will return the good to the seller and recover the price paid.<sup>3</sup> A similar regime - although not mandatory - applies in the US and is laid down in Article 2 of the Uniform Commercial Code (see e.g. Priest, 1978).<sup>4</sup>

Although there are other remedies available to the buyer in the event of non-conforming delivery, we focus on the buyer's option to choose between monetary compensation and termination for a number of reasons. First, in all member states of the European Community, parties at some point have the choice between monetary compensation and termination, whereas the availability of other remedies varies across jurisdictions (see Friehe and Tröger, 2008).<sup>5</sup> Second, the EDT regime literally applies if the delivered goods are non-conforming

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<sup>1</sup>Directive 1999/44 was published in the Official Journal of the European Communities, 7.7.1999, L 171/12 ff. See e.g. Parisi (2004) for an overview.

<sup>2</sup>Note that Article 3 (5) of EC Directive 1999/44 does not speak of "expectation damages" but of "appropriate reduction of the price". There is even a distinct remedy named "price reduction" in civil law jurisdictions. In our paper we will use "expectation damages" largely in order to make the paper comparable to the existing literature. Moreover, it is recognized that, in practice, price reduction leads to roughly the same result as expectation damages for partial breach (Kropholler, 2006, §281 Rz 5; RegBegr BT-Drucks 14/6040, 226).

<sup>3</sup>EC Directive 1999/44 uses the term "rescission" instead of "termination". We do not want to enter into the niceties of legal terminology (Farnsworth, 2004, §8.15 n. 2) and will use "termination" synonymous with "cancellation" and "rescission".

<sup>4</sup>The right to reject under UCC 2-601 is qualified by the possibility of contractual modifications such as liquidated damages (UCC 2-718) or other limitations on remedies (2-719). Such restrictions are ruled out if the buyer is a consumer by Recital 7 of the Preamble of European Directive 1999/44. Among merchants termination rights may be varied by agreement just as under the UCC. Moreover, merchant buyers may lose their right to terminate if they do not inspect goods immediately after delivery and notify the buyer of any non-conformity (see, e.g. §377 of the German HGB).

<sup>5</sup>In English sales law, the buyer may demand subsequent performance but can also immediately choose damages or termination (see Section 48A and 48B of chapter 54 of the Sale of Goods Act of 1979 as amended). In German sales law the buyer is first *compelled* to give the seller a chance to restore conformity by either repair or replacement before he can choose between termination and monetary compensation (see §§323 (1), 441 (1) BGB). These differences among member states can arise because the directive only stipulates minimum standards for consumer protection and therefore does not bring about a complete harmonization.

and cannot be restored to conformity by either repair or replacement. This is a realistic scenario. For example, if there is a flaw in the weave of cloth or the cut of a suit, it is normally very difficult if not impossible to repair. At the time when the buyer returns the good, replacement will often not be an option, as for example when the fashion has already changed.<sup>6</sup>

European warranty law is rather generous. It allows the buyer of movable goods to fall back on the legal warranty for at least 2 years. Within the first 6 months after purchase, the burden of proof is even shifted onto the seller. Hence, if the buyer invokes the warranty, the seller has to prove that the good was conforming upon delivery. This is clearly more generous than is needed to avoid the risk of “opportunistic handshakes” where sellers deliver goods that are not conforming to the contract forcing buyers to accept those goods, albeit at a reduced price, under expectation damages. Generous termination rights are therefore widely criticized by lawyers, mainly for fear that the buyer may terminate opportunistically by using non-conformity as a pretext for getting rid of a contract he no longer wants (see e.g. Priest, 1978; Parisi, 2004; Wehrt, 1995; Schlechtriem/Schmidt-Kessel, 2005).

As “opportunistic termination” is considered to be unequivocally negative, there are a variety of policy proposals to reduce its incidence. One example, is to only allow for termination if non-conformity exceeds a certain threshold.<sup>7</sup> Another more indirect approach is to shorten the time limit for invoking non-conformity.<sup>8</sup> Finally, requiring that the seller be notified of any non-conformity as soon as it is discovered by the buyer also makes opportunistic termination less likely.<sup>9</sup> As any restriction of termination rights has the effect of driving EDT in the direction of a pure expectation damages regime (hereafter ED regime), we can evaluate these policy proposals by comparing a mandatory EDT with a mandatory ED regime. Moreover, the ED regime offers an interesting benchmark, as it is the default remedy of common law and was shown to perform reasonably well under many different circumstances (see Schweizer, 2006 and the literature cited therein).

Interestingly, we find that the possibility of opportunistic termination might actually have positive effects. Under some circumstances, it will lead to *redistribution* in favour of the buyer without any loss of efficiency. We therefore present an exception to the general argument that contractual remedies cannot be used to redistribute income as parties would

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<sup>6</sup>Moreover, EDT is of interest as it reflects the traditional Roman model of Aedilitian remedies and thus the core of continental sales law

<sup>7</sup>Article 3 (6) of the EC Directive 1999/44 disallows termination if the non-conformity is "minor". In common law the prerequisite for termination is "material breach" (see Farnsworth, 2004, § 8.15).

<sup>8</sup>Note that the buyer will only resort to opportunistic termination if his valuation for the good has decreased within the warranty period. Shortening the time limit will reduce the probability that this happens.

<sup>9</sup>Recital 19 of the Preamble of the EC Directive 1999/44 allows countries to introduce a two-month term of decadence within which the buyer must inform the seller of the lack of conformity after having discovered it. Many countries have not made use of this provision.

always adjust the contract price such that payoffs reflect their respective bargaining power (e.g. Craswell, 1991; Polinski, 1983, p. 108). Moreover, by curbing the monopoly power of the seller, a regime involving termination *increases welfare* by enabling a more efficient output level in a setting with multiple buyers. Hence, contractual remedies can act as a substitute for price regulation.

In our model, we consider risk neutral and symmetrically informed parties who can trade one unit of a good of a certain quality. Quality is either explicitly specified in the contract or equal to standard quality which the courts would assume by default. At the outset, both the buyer's valuation and the seller's ability to deliver the good in conforming quality are uncertain. The seller can, however, increase the probability of conforming delivery by investing in quality assurance. The uncertainty of the buyer's valuation captures the possibility that circumstances relevant for the buyer's valuation change between the conclusion of the contract and the time when non-conformity is invoked. If, for example, somebody buys furniture tailored to his house, the value of these goods to him will be much lower if he has to move. The same applies if a buyer discovers another good which he likes even more than the one he has originally bought (Shavell, 1980, p. 470). Yet, even if the buyer's valuation is low and quality non-conforming, we assume that the buyer values the good more than the seller. Hence, trade is always efficient *ex post*. This assumption reflects the fact that returned goods will often have a very limited scrap or resale value. We allow for renegotiation in a later extension but for most of the paper we shall assume that *renegotiation is prohibitively costly*. The contracting problem, therefore, is to induce efficient investment incentives and to make sure that parties trade *ex post*.

In this setting, it is well known that a contract stipulating price and quality and a legal regime which requires the breaching party to pay expectation damages will achieve the first best if - as in our case - it is the investing party who breaches the contract (Shavell, 1980). The underlying reason for this result is that ED makes the investing seller a residual claimant of the trade surplus. Accordingly, a trivial first-best solution can also be achieved under EDT: Parties could simply set a price low enough to prevent the buyer from choosing termination and compensate the seller by agreeing on a lump sum side payment.<sup>10</sup> However, such payments are not possible under the EDT regime. If a party terminates, all payments made under the contract - including any lump sum side payment - are reversed as a matter of law.<sup>11</sup> This eliminates an often used instrument to split the *ex ante* gains of trade without

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<sup>10</sup>See Edlin (1996) for the general idea of using lump sum side payments in order to achieve first-best solutions in the context of contract remedies.

<sup>11</sup>See e.g. Schlechtriem and Schmidt-Kessel (2005), AT Para. 525. As it is often legally impossible to promise the exchange of payments in a separate agreement which is shielded from the main contract there is no easy way to circumvent this. Yet, Edlin (1996) suggests, that under the consideration doctrine of common law this would be possible by setting up a separate contract with a separate consideration. Still, for

affecting incentives. Parties might therefore be forced to simultaneously determine incentives and distribution such that "ex ante bargaining power influences not only the distribution of the pie, but also its size"(Aghion and Tirole, 1994, p. 1192).<sup>12</sup>

Under ED, it makes no difference whether lump sum side payments are possible or not as the damage measure sets the right incentives independent of the price. Hence, price can be used as an instrument to distribute the expected surplus according to the parties' ex ante bargaining power. Yet, a problem potentially arises under the EDT regime: For first best, the price must be set low enough for the buyer not to choose termination. However, absent lump sum side payments, we would expect the seller not to be willing to set such a low price, especially if his bargaining power is high. Yet, we shall see that he will frequently go along with the low price nevertheless. This result is driven by a *discontinuity* in the seller's payoff function. As he sets the price higher than a certain threshold, termination will be part of the buyer's equilibrium strategy. If, as assumed, renegotiation is prohibitively costly, this will make his expected payoff jump down. The seller will therefore often refrain from pushing the price beyond that threshold. He prefers a *smaller share of a larger pie to a bigger share of a smaller pie*.<sup>13</sup> Hence, EDT can lead to a redistribution in favour of the buyer without sacrificing the first best. Given this result, it is not particularly surprising that switching from ED to EDT can increase social welfare in a setting with multiple buyers by breaking the seller's monopoly power.

This paper makes two contributions to the literature. First, it is quite common that contract law provides the non-breaching party with the option to choose between two or more remedies. Yet, the existing economic literature, with the noteworthy exception of Ayres and Madison (2000) and Avraham and Liu (2006), has so far largely focused on *exclusive* regimes, i.e. regimes where only *one* legal remedy is available to the victim of breach.<sup>14</sup> As warranty law is of huge practical relevance and happens to be governed by largely the same

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our purposes, it is hard to imagine that consumers will resort to this technique in their everyday shopping activity. Note that an example of a lump sum side payment that could not be reversed is advisory service prior to the sale. Yet, for our purposes, this transfer would go into the wrong direction.

<sup>12</sup>Note that we do not motivate the impossibility of lump sum side payments by citing wealth constraints as in Aghion and Tirole (1994). Rather in our case, the assumption is backed up by legal reality.

<sup>13</sup>Notice the seller cannot a contingent contract that adjusts the price given the buyer's ultimate valuation. If such contracts were possible termination would not occur even if a termination option exists. Such contracts are ruled out by law. The mandatory warranty regime explicitly establishes the option to choose between compensation and termination. A contingent contract which would adjust the price with ex-post valuation would effectively replace that option with a pure compensation scheme violating Recital (7) which declares any direct and indirect waiver or restriction of the rights of D 1999/44/EC non-binding on the consumer.

<sup>14</sup>See e.g. Shavell (1980), Shavell (1984), Rogerson (1984), Edlin and Reichelstein (1996) and Che and Chung (1999) who explore the relative performance of different exclusive remedy regimes under various assumptions about the nature of investment, the nature of the breach decision and the possibility of renegotiation. We are only aware of one other model (Avraham and Liu, 2006) which - like ours - compares a regime of optional remedies with an exclusive remedy.

*optional* legal regime in both the United States and the European Community, there is a gap to fill. Second, it is commonly held (e.g. Parisi, 2004) that there are three main functions of legal warranties: Brown (1974) showed that warranties can be used to efficiently allocate the risk of product defect, given the parties' risk attitudes (insurance function), Spence (1974) and Grossman (1981) pointed to the revelation of private information regarding product quality (signalling function) and Priest (1981) argued that warranties provide incentives for the production and preservation of quality (incentive function). The possibility that legal rules can sometimes be designed to control the market power of sellers and hence serve an *antitrust function* has so far gone unnoticed.<sup>15</sup>

The paper is organized as follows: Section 2 describes our model. After working out the benchmark case in Section 3, we compare the ED and EDT regime in Section 4. Section 5 derives our main result that the introduction of EDT can lead to a redistribution in favour of the buyer. The implications of this result are subsequently discussed in Section 6. Extensions in Subsections 7.1 and 7.2 offer two important caveats to our analysis by showing that the positive effect of opportunistic termination hinges on the assumptions that devaluation due to non-conforming delivery is not too high and that renegotiation is not possible. Subsection 7.3 shows that both the possibility and the impossibility result derived in the paper are quite general. Section 8 concludes.

## 2 The Model

We consider a seller and a buyer who can trade one unit of a good of a certain quality. Both the buyer's valuation and the seller's ability to deliver the good in conforming quality are uncertain. The buyer's valuation  $\tilde{V}$  is exogenous. It will be either high ( $\bar{V}$ ) with probability  $\lambda$  or low ( $\underline{V}$ ) with probability  $1 - \lambda$ .<sup>16</sup> While the buyer's valuation is strictly positive ( $\underline{V} > 0$ ), we assume that the good has zero value to the seller. The probability  $\gamma(c)$  that the seller is able to deliver the good in conforming quality is an increasing and concave twice differentiable function of the seller's investment (where  $\gamma(0) = 0$ ,  $\lim_{c \rightarrow \infty} \gamma(c) = 1$ ,  $\gamma'(0) = \infty$ ,  $\gamma'(\infty) = 0$ ). We further assume that, if the delivered good is non-conforming,

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<sup>15</sup>There is, however, a prominent literature on exclusive dealing which either explicitly or implicitly relates contract rules to antitrust. The basic insight of that literature is that an incumbent seller and a buyer can use contracts in order to extract surplus from a potential entrant reducing the probability of entry (e.g., Aghion and Bolton, 1987; Rasmusen et al, 1991; Spier and Whinston, 1995; Segal and Whinston, 2000; Simpson and Wickelgren, 2007).

<sup>16</sup>Note that  $\tilde{V}$  does not depend on whether delivery will be conforming or not. Rather it captures the possibility that circumstances relevant for the buyer's valuation change between the conclusion of the contract and the time when he can invoke non-conformity.

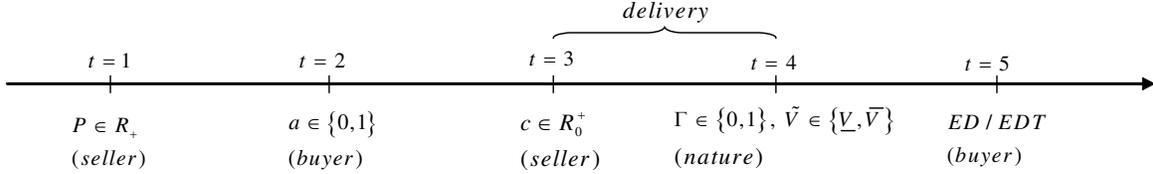


Figure 1: Timeline.

the buyer's valuation, whether low or high, is reduced by a factor  $\delta \in (0, 1]$ .<sup>17</sup> All parameters are observable and verifiable except for  $c$  which is not verifiable.

In the first period (see Figure 1), the seller makes a take-it-or-leave-it price offer  $P$ .<sup>18</sup> If the buyer rejects ( $a=0$ ) he will earn his reservation utility  $u$  and the seller will get 0. If the buyer accepts ( $a=1$ ), the seller chooses  $c$  and delivers the good. Subsequently, the buyer's valuation and the quality of the good are realized.<sup>19</sup> If the good is conforming to the quality specified in the contract ( $\Gamma = 1$ ) the buyer receives the good and pays the contracted price. If the good is non-conforming ( $\Gamma = 0$ ) the buyer can choose the legal remedies available under either the ED or the EDT regime. In Section 4 we will explain in detail how these remedies affect payoffs.

The negotiation set-up in stage 1 and 2 can be motivated by assuming that each seller has monopoly power over his specific good, but an imperfect substitute is available to the consumer from which he can derive expected utility  $u$ . Note, that  $u$  can be interpreted as a parameter for market structure. High  $u$  can be associated with highly competitive markets where the consumer always has a close substitute at hand. Low  $u$  captures the case of uncompetitive markets where either no or only very imperfect substitutes for the seller's product are available.<sup>20</sup>

The timing of our model assumes that the contract is made before the seller makes his investment. This will, e.g., be the case if the consumer orders a tailor made suit. Often, however, the seller will first produce the good and then conclude the contract. If we assume that investments become relationship specific only after the investment decision - say at the

<sup>17</sup>This implies that the value of the non-conforming good is strictly positive, i.e. we exclude the possibility that the loss due to non-conforming delivery exceeds the value of the conforming good.

<sup>18</sup>We assume that it is not possible to write a contingent contract  $P(\tilde{V})$ . Indeed, such a contract might not hold before the court, because it would circumvent mandatory termination rights of consumer law.

<sup>19</sup>We assume that a possible defect is hidden to both the buyer and the seller and only surfaces after delivery. Therefore the seller cannot wait until quality is realized and then set the price.

<sup>20</sup>The need to explicitly model the negotiation stage follows directly from ruling out lump sum side payments. If the buyer chooses termination, the law requires that all payments made under the contract be reversed. Of course, lump sum side payments will still be effective if the buyer chooses ED. Yet, as can be seen in Figure 2, this is already captured in our model as we can reinterpret  $P$  as a net price which equals  $P^* + T$  where  $P^*$  would be the contract price and  $T$  the up-front payment.

time of delivery - we can show that the results of our model will still hold. This assumption is rather plausible as the resale value will often decrease as the good is unpacked and starts to be used.

### 3 Benchmark

First, as a benchmark, we work out the decisions that maximize social welfare. As, by assumption, the buyer's valuation of the good will always be higher than the valuation of the seller, it is socially optimal that parties always trade ex post. The socially optimal investment decision  $c_0$  maximizes expected social payoff:

$$c_0 \in \arg \max_c \Pi_{Total}(c) = \arg \max_c E\tilde{V} - c - (1 - \gamma) \delta E\tilde{V}. \quad (1)$$

Note that expected social payoff equals the buyer's expected valuation minus investment cost and expected devaluation due to non-conforming delivery. Differentiating we can write the following FOC for the socially optimal investment level  $c_0$ :

$$\delta E\tilde{V}\gamma'(c_0) = 1. \quad (2)$$

In the following we shall consider the effect of introducing legal regimes, ED and EDT.

## 4 Legal Regimes

### 4.1 Payoffs

If the buyer rejects the seller's price offer ( $a = 0$ ) he will earn his reservation utility  $u$ , and the seller's payoff will be zero. If the buyer accepts the offer ( $a = 1$ ) and the seller delivers the good in conforming quality ( $\Gamma = 1$ ), the seller will get price minus his cost of investment,  $P - c$ , and the buyer receives the value of the conforming good minus price,  $\tilde{V} - P$  (see Figure 2). If the buyer delivers the good in non-conforming quality ( $\Gamma = 0$ ), and the buyer asks for expectation damages (ED), the seller has to pay compensation, such that, in terms of utility, the buyer is in the same position as if the good had been delivered in conforming quality. The seller's and the buyer's payoffs are  $P - c - \delta\tilde{V}$  and  $\tilde{V} - P$  respectively. If the buyer chooses termination (T) he winds up with zero payoff and the seller loses his investment  $c$  (Remember our assumption that the good has no resale or scrap value).<sup>21</sup>

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<sup>21</sup>It is straightforward to show that it can never be optimal for the buyer to breach the contract, which is why we have not explicitly added this option in Figure 2. Results are available on request.

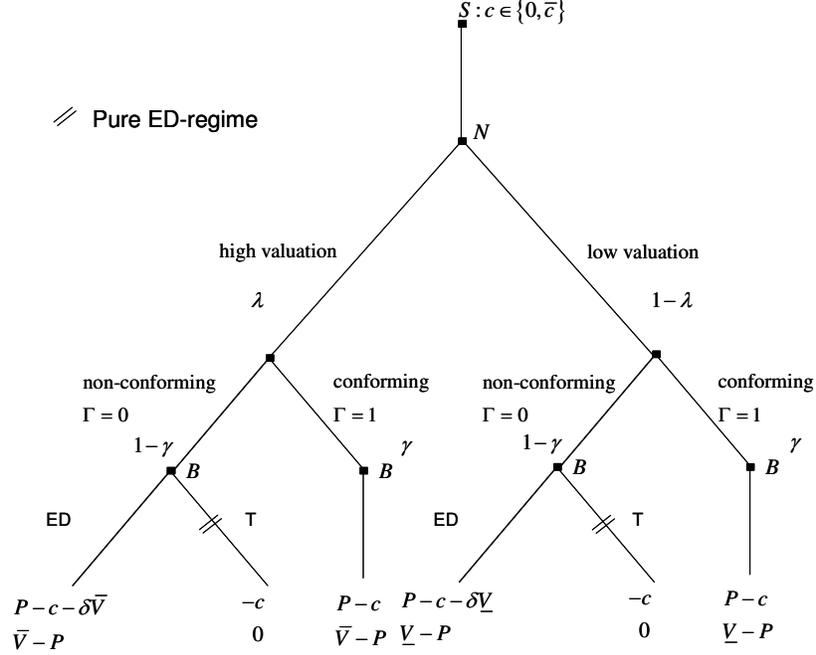


Figure 2: Subgame starting from the seller's investment decision.

## 4.2 ED-regime

We solve the game by backwards induction. The seller's expected payoff under ED is price minus cost minus the expected damage payment:

$$\Pi_S^{ED}(c) = P - c - (1 - \gamma) \delta E\tilde{V}. \quad (3)$$

Comparing (3) with (1), we see that it differs from the expected social payoff by  $E\tilde{V} - P$  which is independent of the investment decision. Therefore, ED always induces the seller to choose the first-best investment level:

$$c_{ED} = \arg \max_c \Pi_S^{ED}(c) = c_0. \quad (4)$$

The buyer accepts the offer whenever his expected payoff exceeds his reservation utility,  $\Pi_B^{ED} = E\tilde{V} - P \geq u$ . As the seller's payoff increases in  $P$ , it is optimal for him to offer a price for which the buyer's participation constraint is binding:

$$P_{ED}(u) = E\tilde{V} - u \quad (5)$$

provided that his own participation constraint is satisfied. Inserting (5) into (3), it can be seen that:

$$\Pi_S^{ED}(P_{ED}) \geq 0 \iff \Pi_{Total}^0 \geq u \quad (6)$$

which means that the seller's participation constraint is satisfied whenever there are potential gains of trade. The subgame perfect equilibrium under ED can therefore be characterized by the following lemma:

**Lemma 1** *The ED regime achieves first-best allocation, price will be set at  $E\tilde{V} - u$  and the buyer earns his reservation utility.*

### 4.3 EDT-regime

Suppose that the good is delivered in non-conforming quality. Then, under EDT, the buyer chooses between expectation damages and termination at stage 5. Termination will only be optimal for him if his valuation turns out to be lower than the price,  $\tilde{V} < P$ . Yet, in order for termination to occur in equilibrium, it is not sufficient that the buyer *wants* to terminate. He must also have the legal opportunity to do so, i.e. performance has to be non-conforming ( $\Gamma = 0$ ). Hence, the probability of termination increases in the seller's price offer and decreases in his investment in quality:

$$\pi_T = \text{prob} \left\{ \tilde{V} < P \right\} [1 - \gamma(c)]. \quad (7)$$

**Notice that the probability of termination depends only on  $\tilde{V} < P$  rather than on  $(1 - \delta)\tilde{V} < P$  because the buyer can get damages for a non-conforming good.** The seller's expected payoff under EDT can then be written as follows:

$$\Pi_S^{EDT} = P - c - (1 - \gamma) \delta E\tilde{V} - \pi_T \left( P - \delta E \left[ \tilde{V} \mid \tilde{V} < P \right] \right). \quad (8)$$

It equals the seller's payoff under ED (see expression 3) minus the expected effect of termination: If the buyer chooses termination the seller will not get the price, but neither will he have to pay any damages. Note that this last term will always be negative. Finally, total payoff under EDT is:

$$\Pi_{Total}^{EDT} = E\tilde{V} - c - (1 - \gamma) \delta E\tilde{V} - \pi_T (1 - \delta) E \left[ \tilde{V} \mid \tilde{V} < P \right] \quad (9)$$

where  $(1 - \delta) E \left[ \tilde{V} \mid \tilde{V} < P \right]$  is the expected social loss whenever the buyer terminates. As we assume that valuation can either be  $\underline{V}$  or  $\overline{V}$  with  $\overline{V} > \underline{V} > 0$  and it is obvious that the buyer would never accept a price  $P > \overline{V}$  in equilibrium, we shall consider cases  $P \leq \underline{V}$  and  $\underline{V} < P \leq \overline{V}$ :<sup>22</sup>

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<sup>22</sup>See Appendix 7.3.1 for an extension to the case where  $\tilde{V}$  is continuously distributed over the interval  $[0, \overline{V}]$ .

a) **Case  $\mathbf{P} \leq \underline{\mathbf{V}}$ .** If  $P$  is smaller than  $\underline{V}$ , which is the lowest possible realization of  $\tilde{V}$ , the buyer's valuation *always* exceeds the price. It therefore follows from expression (7) that the probability of termination is zero. Inserting  $\pi_T = 0$  into equation (8) thus gives us:<sup>23</sup>

$$\Pi_S^a(P, c) = P - c - (1 - \gamma) \delta E\tilde{V} = \Pi_S^{ED}(c). \quad (10)$$

Hence, if  $P < \underline{V}$ , payoffs under EDT are just the same as under ED (see 3). It immediately follows that it is optimal for the seller to choose first-best levels of investment,  $c_a = c_0$ . Finally, total expected payoff is:

$$\Pi_{Total}^a(c) = E\tilde{V} - c - (1 - \gamma) \delta E\tilde{V} = \Pi_{Total}^0(c). \quad (11)$$

b) **Case  $\underline{\mathbf{V}} < \mathbf{P} \leq \overline{\mathbf{V}}$ .** If  $P$  is set between  $\underline{V}$  and  $\overline{V}$ , the price will exceed the buyer's valuation if the low state  $\underline{V}$  is realized. The probability of termination will therefore be:

$$\pi_T(c) \equiv (1 - \lambda)(1 - \gamma), \quad (12)$$

the expression for the seller's expected payoff simplifies to:

$$\Pi_S^b(c) = P - c - (1 - \gamma) \delta E\tilde{V} - \pi_T(P - \delta \underline{V}) \quad (13)$$

and the total expected payoff is given by:

$$\Pi_{Total}^b(c) = E\tilde{V} - c - (1 - \gamma) \delta E\tilde{V} - \pi_T(1 - \delta) \underline{V}. \quad (14)$$

Note that the last term

$$\phi_P \equiv \pi_T(1 - \delta) \underline{V} \quad (15)$$

measures the expected ex post inefficiency due to termination. Differentiating expression (13), we can write the following FOC for the investment decision  $c_b$  which maximizes the seller's expected payoff:

$$\gamma'(c_b) = 1 / \left[ \delta E\tilde{V} + (1 - \lambda)(P - \delta \underline{V}) \right]. \quad (16)$$

Comparing (16) with the benchmark condition (2), it follows from the concavity of  $\gamma(\cdot)$  that the seller overinvests,  $c_b > c_0$ . Hence, setting a price  $P > \underline{V}$  gives rise to ex-ante inefficiency:

$$\phi_A \equiv (c_b - c_0) - [\gamma_b - \gamma_0] \delta E\tilde{V}, \quad (17)$$

where  $\gamma_b \equiv \gamma(c_b)$  and  $\gamma_0 \equiv \gamma(c_0)$ .

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<sup>23</sup>The superscript in  $\Pi_S^a$  reminds us that this is conditional on case a).

Summarizing cases a) and b) and using expression (17), the seller's payoff under EDT can be written as:

$$\Pi_S^{EDT} = \begin{cases} \Pi_S^a = \Pi_S^{ED}(P, c_0) = P - c_0 - (1 - \gamma_0) \delta E\tilde{V} & \text{if } P \leq \underline{V} \\ \Pi_S^b = \Pi_S^{ED}(P, c_0) - \phi_A - \pi_T(P - \delta\underline{V}) & \text{if } P > \underline{V} \end{cases}. \quad (18)$$

This payoff function exposes an interesting feature of the EDT regime. For  $P \leq \underline{V}$  the seller's payoffs under ED and EDT are identical and increasing in price. However, as  $P$  is raised above  $\underline{V}$ , termination occurs with positive probability under EDT, and the seller's payoff jumps down, as  $P - \delta\underline{V} > 0$  for all  $P > \underline{V}$ . Payoff under ED, however, continues to rise smoothly in  $P$  (see Figure 3).

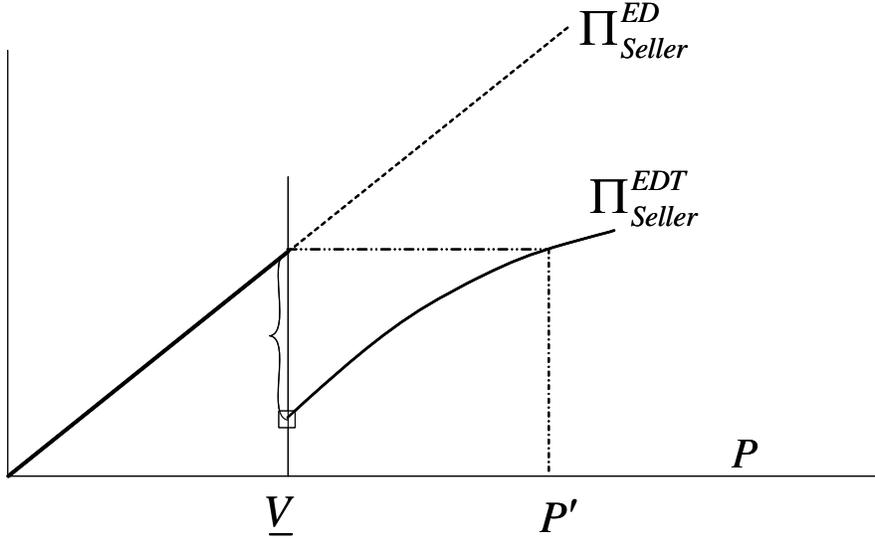


Figure 3: Seller's payoff under ED v. EDT depending on price.

Therefore, whereas under ED the seller always chooses the highest price that satisfies the buyer's participation constraint (see Lemma 1) this can be different under EDT. Indeed, it might be in the seller's interest to set the price at  $\underline{V}$ , which is the highest price for which he can avoid termination, rather than at a higher price  $P(u) > \underline{V}$ , which sets the buyer to his reservation utility. In Figure 3 this happens for  $P(u) \in (\underline{V}, P']$ .

## 5 Redistributive Effect

In the previous section we solved the subgames induced by ED and EDT starting from the seller's investment decision. We showed that EDT leads to a discontinuity in the seller's payoff function which might have a moderating effect on the seller's price offer. This provides the intuition for our main result which we will derive in the remainder of this section by

solving the game induced by EDT through stages 2 and 1. In essence, we will show that switching from ED to EDT may lead to redistribution from the seller to the buyer without sacrificing first best. Although increasing the consumer's welfare is often seen as desirable in its own right,<sup>24</sup> we shall also be concerned with overall welfare improvement. Switching from ED to EDT might also raise social welfare in a setting with multiple buyers.

The redistribution effect from switching to EDT is quite general and also occurs in settings where the valuation of the buyer is continuously distributed (see Appendix 7.3.1). However, the claim that redistribution comes at little or no efficiency loss depends on distributional assumptions. Inefficiency tends to be low if valuation is a binary random variable or drawn from bimodal distributions functions with high probability masses at one high and one low level of valuation.

**Assumption 1.** Throughout this section we shall assume that the first-best social payoff  $\Pi_{Total}^0 \equiv \Pi_{Total}^0(c_0)$  exceeds a certain threshold level  $\bar{u}$ :<sup>25</sup>

$$\Pi_{Total}^0 \geq \bar{u} \equiv E\tilde{V} - \underline{V}. \quad (19)$$

Notice that  $E\tilde{V} - \underline{V}$  is the buyer's payoff if the seller voluntarily sets a lower price. The assumption guarantees that the total gains of trade are sufficient to cover the buyer's payoff in that case. Otherwise the seller's payoff would be negative and his participation constraint could not be satisfied. If this condition does not hold, the redistribution effect cannot occur, and the mandatory termination option can only lead to inefficient returns and lower trade volume (see extension 7.1). In order to understand what Assumption 1 requires note that (19) is equivalent to assuming that the highest price  $\underline{V}$  for which termination can be avoided is high relative to the expected damage payment under ED:

$$\underline{V} - c_0 \geq [1 - \gamma(c_0)] \delta E\tilde{V}. \quad (20)$$

By the definition of  $c_0$ , it follows that a sufficient condition for this to hold is:

$$\delta \leq \frac{\underline{V}}{[1 - \gamma(0)] E\tilde{V}} > 0. \quad (21)$$

We see that it is more likely for Assumption 1 to hold, the lower the devaluation due to non-conforming delivery, the higher the valuation of the good in the low state and the less likely the good is to be defective. The assumption would probably hold in the market for clothes where defects such as small flaws in the weave do not devalue the product entirely,

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<sup>24</sup>See e.g. Recital 29 of the EC Merger Regulation 139/2004. I thank Daniel Zimmer for drawing my attention to this fact.

<sup>25</sup>We will later see that the redistribution effect only occurs if  $u < \bar{u}$ , that is, if the seller's monopoly power is high enough.

and the consumer can still, for example, make use of a warm jacket, even if he cancels the winter vacation for which he had originally bought the jacket. However, the assumption would not hold, in the market for electronic gadgets, which either work perfectly or not at all. Note that the latter case is also an example of a case where, though the assumption does not hold, expected inefficiency due to the termination option will be low. Goods will be returned if they are non-conforming, but non-conforming goods are worth little to the buyer so that not much value is destroyed.

**a) Case  $P \leq \underline{V}$ .** The buyer accepts the seller's offer in stage 2 if he earns at least his reservation utility  $u$ . As we assume that the seller sets a price  $P \leq \underline{V}$  such that termination never occurs in equilibrium, we can write this condition using equations (10) and (11):

$$\Pi_B^a(c_0) = \Pi_{Total}^a(c_0) - \Pi_S^a(c_0) = E\tilde{V} - P_a \geq u. \quad (22)$$

Note that the seller's payoff increases in price. Hence, provided that his own participation constraint is satisfied, the seller sets  $P_a$  such that the buyer's participation constraint is binding unless this price would exceed  $\underline{V}$ :

$$P_a = \min \left[ E\tilde{V} - u, \underline{V} \right]. \quad (23)$$

Hence, we can derive the following lemma which characterizes candidates for subgame perfect equilibrium under EDT. The equilibrium depends on whether or not the buyer's reservation utility  $u$  exceeds threshold level  $\bar{u} \equiv E\tilde{V} - \underline{V}$ .<sup>26</sup>

**Lemma 2** *Assume that the seller sets a price  $P \leq \underline{V}$  such that, in equilibrium, no termination occurs under EDT and total payoff is socially optimal: i) If  $u \geq \bar{u}$  the seller demands the same price as under ED ( $E\tilde{V} - u$ ) and the buyer earns his reservation utility  $u$ . ii) If  $u < \bar{u}$ , the seller sets price at  $\underline{V}$ , which is lower than under ED, and the buyer earns a positive rent.*

**Proof.** i) By expression (23), it follows from  $u \geq \bar{u}$  that  $P_a = E\tilde{V} - u$ . This is equal to the price under ED (see Lemma 1). We only have to check whether the seller's participation constraint will also be satisfied. Inserting  $P_a = E\tilde{V} - u$  into expression (22) we get  $\Pi_S^a(c_0) = \Pi_{Total}^0(c_0) - u \geq 0$ , which holds whenever there are potential gains of trade. ii) It follows from  $u < \bar{u}$  that  $\underline{V} < E\tilde{V} - u$ . Hence, expression (23) implies that the seller sets price  $P_a = \underline{V} < E\tilde{V} - u = P_{ED}$ . Inserting  $P_a = \underline{V}$  into (22) it follows from  $u < \bar{u}$  that the buyer will earn a positive rent. Finally, using (10), the seller's participation constraint is given by  $\Pi_S^a(\underline{V}, c_0) = \underline{V} - c_0 - (1 - \gamma) \delta E\tilde{V} \geq 0$ . Adding  $E\tilde{V} - \underline{V}$  on both sides, the condition can be rewritten as  $\Pi_{Total}^0 > E\tilde{V} - \underline{V}$  which holds by Assumption 1. ■

<sup>26</sup>Note that the lemma only characterizes candidates for subgame perfect equilibrium as we have so far not established whether the seller ever sets a price  $P \leq \underline{V}$  in equilibrium.

The intuition of the lemma is the following: If markets are very competitive in the sense that close substitutes are available, the seller's power to set prices is very limited. Even, when setting the buyer to his reservation utility, the price will still be low enough for termination never to occur in equilibrium. If, however, there are no close substitutes, pushing down the buyer's payoff to his reservation utility would involve setting a rather high price. Yet, at such a price, termination would occur in equilibrium. Hence, a seller who wants to prevent termination has to lower the price to  $\underline{V}$ , leaving a positive rent to the buyer.

**b) Case  $\underline{V} < P \leq \bar{V}$ :** Now, assume that the seller chooses a price  $P > \underline{V}$  such that termination occurs with positive probability. At stage 2, it is optimal for the buyer to accept any offer that gives him at least his reservation utility  $u$ . Using expressions (14) and (13) we can write:

$$\Pi_B^b(c_b) = \Pi_{Total}^b(c_b) - \Pi_S^b(c_b) = E\tilde{V} - P + \pi_T(P - \underline{V}) \geq u. \quad (24)$$

One can see from equation (13) that the seller's payoff  $\Pi_S^b$  is increasing in  $P$ . Therefore, in equilibrium, the seller will demand a price  $P_b$  at stage 1 such that condition (24) is binding:

$$P_b = \frac{E\tilde{V} - u - \pi_T \underline{V}}{1 - \pi_T} \quad (25)$$

provided that his participation constraint:

$$\Pi_S^b(c_b) = \Pi_{Total}^b(c_b) - u \geq 0 \iff \Pi_{Total}^b(c_b) \geq u \quad (26)$$

is satisfied. Hence, the following lemma characterizes a candidate for subgame perfect equilibrium:

**Lemma 3** *Assume that the seller sets a price  $P > \underline{V}$  such that termination can occur in equilibrium and total payoff is less than socially optimal. If  $u \leq \Pi_{Total}^b(c_b)$  the seller sets price:*

$$P_b = \frac{E\tilde{V} - u - \pi_T \underline{V}}{1 - \pi_T} \quad (27)$$

*which is higher than the price under ED. The buyer earns his reservation utility  $u$ .*

**Proof.** The only claim left to prove is that  $P_b > P_{ED} = E\tilde{V} - u$ . Note that this is equivalent to  $E\tilde{V} - \underline{V} > u$ . Using the fact that condition (24) holds with equality, we can write:

$$u = E\tilde{V} - P_b + \pi_t(P_b - \underline{V}) = E\tilde{V} - \underline{V} - (1 - \pi_T)(P_b - \underline{V}) \quad (28)$$

which is smaller than  $E\tilde{V} - \underline{V}$  for all  $P_b > \underline{V}$ . ■

The intuition of the lemma is as follows: Given that the seller sets a price which is higher than  $\underline{V}$ , termination occurs with positive probability. This leads to ex post inefficiency  $\phi_P$

because the good sometimes ends up with the seller (see expression 15). As the seller has to leave the buyer his reservation utility, this entire welfare loss is absorbed by the seller. Knowing that, by increasing investment, he can lower the probability of termination, the seller overinvests, leading to ex-ante inefficiency  $\phi_A$  (see expression 17). Finally, the price demanded by the seller is higher than under ED as the buyer receives the valuable option to return the product in the low state. If valuation is continuous, returning the good will also be part of the buyer's equilibrium strategy if the seller voluntarily sets a lower price than the price that would set the buyer to his reservation utility. Therefore, even in cases where switching from ED to EDT leads to redistribution, the price under EDT may be higher than under ED. The redistribution in those cases comes in the form of conferring a valuable option onto the buyer while only slightly increasing the price.

**Equilibrium.** So far we have only characterized candidates for subgame perfect equilibrium *conditional* on the seller setting a respective price of  $P \leq \underline{V}$  or  $P > \underline{V}$ . This still leaves open the question which price is actually set under EDT in equilibrium, and how this affects allocative efficiency and the distribution of surplus relative to ED. For convenience, let  $\phi \equiv \phi_A + \phi_P$  denote the total inefficiency due to the possibility of termination. We can then derive the following proposition:

**Proposition 1** *If Assumption 1 holds, switching from ED to EDT has the following effect: a) For an intermediate range of market structures,  $\bar{u} - \phi \leq u < \bar{u}$ , prices decrease from  $E\tilde{V} - u$  to  $\underline{V}$ . The first-best allocation is preserved, but the distribution of surplus changes in favour of the buyer. b) For highly competitive markets,  $u \geq \bar{u}$ , changing the regime has strictly no effect. c) For very uncompetitive markets,  $u < \bar{u} - \phi$ , EDT may lead to higher prices and inefficient allocation, while putting the onus of the efficiency loss exclusively on the seller.*

**Proof.** We start by proving claim b): We know from the proof of Lemma 3 that the equilibrium in that lemma implies  $u < E\tilde{V} - \underline{V} \equiv \bar{u}$ . Hence, for  $u \geq \bar{u}$ , part i) of Lemma 2 is the only candidate for subgame perfect equilibrium. For  $u < \bar{u}$ , however, there are two candidates for equilibrium: Part ii) of Lemma 2 and, provided that  $u \leq \Pi_{Total}^b(c_b)$ , Lemma 3. A sufficient condition for part ii) of Lemma 2 being the equilibrium is that the seller prefers setting the price at  $\underline{V}$  rather than at  $P_b$ :

$$\Pi_S^a(\underline{V}, c_0) \geq \Pi_S^b(P_b). \quad (29)$$

By definition, setting price at  $P_b$  implies that the buyer's participation constraint is binding. Hence, we can rewrite condition (29) by inserting  $\Pi_S^b(P_b) = \Pi_{Total}^b(c_b) - u$  and rearranging:

$$u \geq \Pi_{Total}^b(c_b) - \Pi_S^a(\underline{V}, c_0). \quad (30)$$

Using equations (14) and (10), we get:

$$u \geq E\tilde{V} - \underline{V} - \left[ (c_b - c_0) - [\gamma(c_b) - \gamma(c_0)] \delta E\tilde{V} \right] - [\pi_T (1 - \delta) \underline{V}], \quad (31)$$

which by expressions (17) and (15) can be rewritten as  $u \geq \bar{u} - \phi$ . Therefore, part ii) of Lemma 2 characterizes the subgame perfect equilibrium of the EDT game for  $\bar{u} - \phi \leq u < \bar{u}$ . This vindicates claim a) of the proposition. To see claim c) of the proposition, observe that for  $u < \bar{u} - \phi$ , the seller prefers to set a price  $P_b$ . Hence, Lemma 3 describes the subgame perfect equilibrium of the EDT game for  $u < \bar{u} - \phi$ , provided that the seller's participation constraint is satisfied (see 26):

$$\Pi_{Total}^b(c_b) \geq u.$$

This will indeed always be the case. To see this, note that total payoff if the seller sets the price at  $P_b$  equals total payoff under the benchmark case minus the sum of the ex-ante and ex-post inefficiency:  $\Pi_{Total}^b(c_b) = \Pi_{Total}^0 - \phi$ . Using condition  $u < \bar{u} - \phi \iff \phi < \bar{u} - u$  and Assumption 1, we see that  $\Pi_{Total}^b(c_b) > \Pi_{Total}^0 - \bar{u} + u \geq u$ . Yet, as  $\bar{u} - \phi$  may be negative, there may not exist any  $u \geq 0$ , for which  $u < \bar{u} - \phi$ . Hence, this region does not necessarily exist. ■

Figure 4 illustrates the proposition by plotting the buyer's and the seller's payoff as a function of the buyer's outside option  $u$ . One can think of  $u$  as the value of the closest substitute also able to be interpreted as a parameter of the prevailing market structure. If markets are very competitive (high  $u$ ), most of the surplus is captured by the buyer under both ED and EDT. In the extreme case where  $u$  equals the entire production surplus, the seller even winds up with zero payoff. As markets become less competitive, the seller can set higher prices and his payoff increases under the ED regime (left hand side). In the extreme case where  $u = 0$ , the seller captures the entire production surplus.

Under EDT (right hand side), the seller also initially increases his payoff by setting a higher price as the market becomes less competitive. Yet, beyond threshold level  $\bar{u}$ , pushing the buyer down to his reservation utility implies setting a price at which termination occurs with positive probability. This would make the seller's payoff jump down. Therefore, the seller does not increase the price for  $\bar{u} - \phi \leq u < \bar{u}$ , and the buyer's payoff remains the same despite his outside option deteriorating. Finally, as markets become very uncompetitive, the opportunity to capture almost the entire production surplus may overcompensate the seller for the efficiency loss due to termination. If this is the case, the seller pushes the buyer to his reservation value and absorbs the entire loss in welfare. Therefore, under EDT, not only the distribution but also the size of the total payoff may be a function of  $u$ .

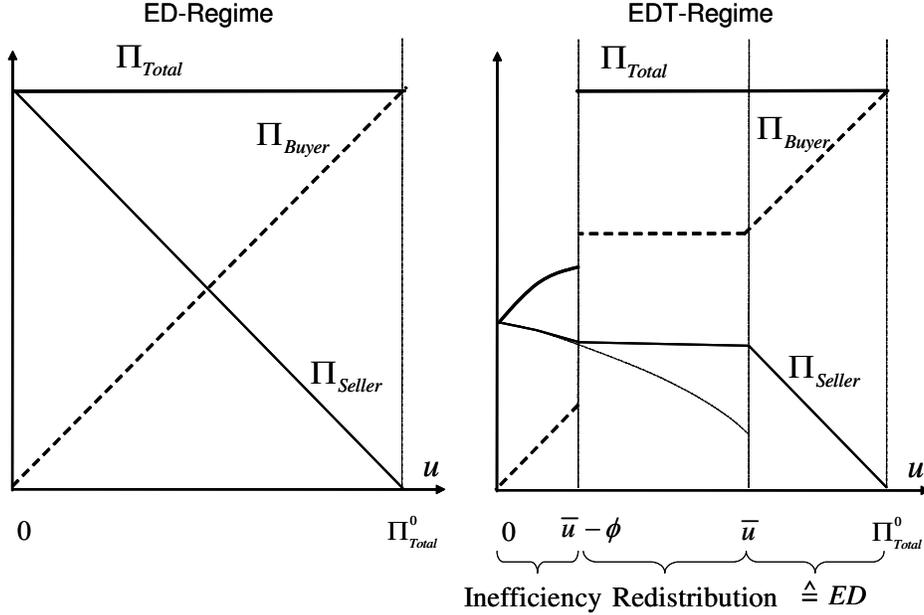


Figure 4: Payoff under ED and EDT depending on buyer's reservation utility  $u$ .

## 6 Discussion

For low devaluation due to non-conforming delivery (Assumption 1), switching from ED to EDT has an attractive feature: It curbs the monopoly power of the seller for an intermediate range of market structures. Depending on distributional assumptions this can occur with little loss of welfare (in the binary case no welfare is sacrificed at all). If, however, markets are highly competitive, distribution will not be affected. Yet, failure to limit the seller's share in the gains of trade will be largely irrelevant under such circumstances. However, depending on the assumed distribution of buyer's valuations, inefficient ex-post trade may arise. The inefficiency generally increases with price but may also be completely absent (as in the case of the binary model). For markets which are close to outright monopoly, changing from ED to EDT may decrease welfare. This, however, may not be of too much concern if these markets are under the scrutiny of antitrust authorities, and prices will therefore be regulated or set under the threat of regulation. Moreover, consistent with our findings, Article 1 (2b) of the EC Directive 1999/44 exempts classic natural monopolies from its scope. Similar provisions existed for public transport. Therefore, the attractiveness of the EDT regime lies in its capability to limit the monopoly power of sellers in markets which traditionally operate below the radar screen of antitrust authorities. Moreover, this may be achieved without creating too much distortive effects on competitive markets.

It is not surprising that curbing the monopoly power of the seller may also lead to

efficiency gains in a model of multiple buyers with different valuations. The seller under ED does not always trade when trade would be efficient. Attracting the low-value buyer will only be desirable for the seller if the additional profit outweighs the loss incurred by also reducing the price for the high-value buyer. EDT might potentially alleviate the problem as we know from Proposition 1 that there exists a region  $u < \bar{u}$  where the seller sets a lower price  $\underline{V}$ . Hence, the margin that the seller has to sacrifice in order to accommodate the low-wealth customer is smaller than under ED. Yet, there is also a countervailing effect of EDT. As the seller absorbs the entire inefficiency and the low-valuation buyer sometimes terminates under EDT, the seller also stands to gain less from trading with an additional buyer. Hence, the trade volume may also decrease under EDT. The overall effect of switching from ED to EDT on the volume of trade depends on distributional assumptions.

## 7 Extensions

### 7.1 High Devaluation

In this section we shall see that switching from ED to EDT is much less attractive if Assumption 1 does not hold. This is the case if the devaluation due to non-conforming delivery is rather high or, equivalently, if the expected damage payment under ED is high relative to the price for which termination can just be avoided. We will prove the following proposition:

**Proposition 2** *If Assumption 1 does not hold, switching from ED to EDT has the following effect: If markets are competitive,  $\Pi_{Total}^0 - \phi < u \leq \Pi_{Total}^0$ , the seller will not engage in production despite potential gains of trade. If markets are less competitive,  $u \leq \Pi_{Total}^0 - \phi$ , trade occurs at a higher price than under ED, the good is sometimes inefficiently returned and the seller overinvests. The buyer earns his reservation utility  $u$ .*

**Proof.** First, we will prove that if Assumption 1 does not hold ( $\Pi_{Total}^0 < \bar{u} \equiv E\tilde{V} - \underline{V}$ ) the seller will never set a price  $P \leq \underline{V}$ . Assume the opposite: If  $P \leq \underline{V}$  is to be an equilibrium, the seller's participation constraint must be satisfied  $\Pi_S^a(P) \geq 0$ . As the seller's payoff rises in  $P$ , a necessary condition for this to hold is  $\Pi_S^a(\underline{V}) \geq 0$ . Using equation (10) this can be rewritten as  $\underline{V} - c - (1 - \gamma)\delta E\tilde{V} \geq 0$ . Adding  $E\tilde{V} - \underline{V}$  on either side and using expression (11) and  $\bar{u} = E\tilde{V} - \underline{V}$ , this becomes  $\Pi_{Total}^0 \geq \bar{u}$ , which contradicts our earlier assumption. If the seller is to set price at  $P_b$  his participation constraint  $\Pi_{Total}^b \geq u$  must be satisfied (see Lemma 3). As  $\Pi_{Total}^b$  equals benchmark payoff minus the inefficiency due to termination this can be rewritten as  $\Pi_{Total}^0 - \phi \geq u$ . It follows that trade will occur at price  $P_b$  for  $0 \leq u \leq \Pi_{Total}^0 - \phi$  and no trade occurs for  $\Pi_{Total}^0 - \phi < u \leq \Pi_{Total}^0$  despite potential gains of trade. Finally, we know from Lemma 3 that  $P_b$  is higher than the price under ED and that termination occurs in equilibrium. ■

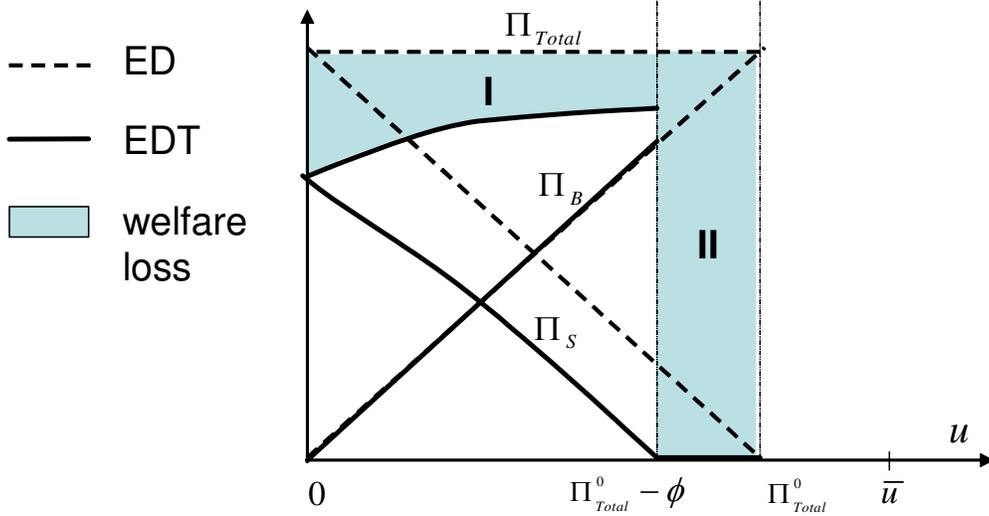


Figure 5: Expected payoff ED v EDT if Assumption 1 does not hold.

The intuition of the proposition is as follows: If the price is set sufficiently high the good will sometimes be returned. All returns are inefficient because the buyer values the good more than the seller (area I in Figure 5).<sup>27</sup> For simplicity, we assumed that the good has no scrap or resale value, so that in the case of a return total surplus is zero ex post and negative in the interim because of investments. If there are enough returns, the zero surplus occurs so frequently that the expected surplus is below the outside option despite potential gains of trade (area II in Figure 5).<sup>28</sup>

## 7.2 Renegotiation

In order to study how the possibility of renegotiation influences our analysis, we shall assume that the parties can renegotiate inefficient allocations at no cost. As the ED regime always leads to the ex-post efficient trade decision, there is no scope for renegotiation. However, if the buyer has chosen termination under EDT, parties will now renegotiate in order to reverse this decision. As the good has no value to the seller, the surplus from renegotiation is the value of the good minus the devaluation due to the non-conformity. This surplus is assumed to be split among the parties at an exogenously given fixed ratio, with the seller receiving a share  $\alpha \in [0, 1]$ .<sup>29</sup> Hence, if the good is delivered in non-conforming quality, termination

<sup>27</sup>Notice that the the deviation from first-best investment levels is second-best efficient as the seller is a residual claimant. So, the unique source of inefficiency is inefficient returns.

<sup>28</sup>We assume that the outside option is only available ex ante in the form of the expected value derived from the consumption of a generic good.

<sup>29</sup>The same ex post bargaining set-up was used by Edlin and Reichelstein (1996).

will only be optimal for the buyer if:

$$\tilde{V} - P < (1 - a)(1 - \delta)\tilde{V}. \quad (32)$$

The probability of termination is therefore:

$$\pi_T = \text{prob} \left\{ \tilde{V} < \frac{P}{\delta + \alpha(1 - \delta)} \right\} [1 - \gamma(c)] \quad (33)$$

and the seller's expected payoff under EDT can then be written as:

$$\hat{\Pi}_S^{EDT} = P - c - (1 - \gamma)\delta E\tilde{V} - \pi_T \left( P - [\delta + \alpha(1 - \delta)] E \left[ \tilde{V} \mid \tilde{V} < \frac{P}{\delta + \alpha(1 - \delta)} \right] \right). \quad (34)$$

It equals the seller's payoff under ED (3) minus the expected effect of termination: If the buyer chooses termination, the seller loses price  $P$  but also saves  $\delta\tilde{V}$  as he does not have to compensate the buyer for the non-conformity. Moreover, he receives a share of the renegotiation surplus,  $\alpha(1 - \delta)\tilde{V}$ .

When the outside option of the buyer is high enough, the seller can only set a price  $P \leq \bar{P} \equiv [\delta + \alpha(1 - \delta)]\underline{V}$ . At this price, the buyer will never choose termination such that the payoffs under both ED and EDT coincide. This can be seen by inserting  $\pi_T = 0$  into equation (34):

$$\hat{\Pi}_S^a(P, c) = P - c - (1 - \gamma)\delta E\tilde{V} = \hat{\Pi}_S^{ED}(c). \quad (35)$$

It immediately follows that the seller's payoff function increases in  $P$  and that it is optimal for the seller to choose first-best investment levels  $\hat{c}_a = c_0$ . As the buyer's outside option deteriorates beyond a certain threshold (when markets become less competitive), the seller has the opportunity to set a price  $P > \bar{P}$  in which case the buyer chooses termination with probability  $\pi_T(c) = (1 - \lambda)[1 - \gamma(c)]$  and the seller's expected payoff simplifies to:

$$\hat{\Pi}_S^b(c) = P - c - (1 - \gamma)\delta E\tilde{V} - \pi_T [P - \bar{P}] \quad (36)$$

(Note that the positive effect of termination on the seller's payoff function is equal to the threshold price  $\bar{P}$ ). The seller will choose investment  $c_b$  at stage 3 which maximizes his expected payoff  $\hat{\Pi}_S^b$ . Differentiating expression (36) we can write the following FOC:

$$\gamma'(\hat{c}_b) = 1 / \left[ \delta E\tilde{V} + (1 - \lambda)(P - \bar{P}) \right]. \quad (37)$$

Comparing (37) with the benchmark condition (2), it follows from the concavity of  $\gamma(\cdot)$  that setting a price  $P > \bar{P}$  gives rise to ex-ante overinvestment,  $\hat{c}_b > c_0$ . As  $\bar{P}$  increases in  $\alpha$  the distortion decreases as the seller's ex-post bargaining power goes up. We shall now prove the following proposition:

**Proposition 3** *If renegotiation is possible at no cost, the seller's payoff under EDT continuously increases in price  $P$ . Hence, the seller always sets the buyer to his reservation utility even if this implies that termination occurs in equilibrium. As  $u$  falls below a certain threshold level, the seller overinvests into quality resulting in a welfare loss. The welfare loss decreases in the seller's ex-post bargaining power  $\alpha$ .*

**Proof.** It follows from expressions (35), (36) and (37) that  $\hat{\Pi}_S^b(\hat{c}_b) \rightarrow \hat{\Pi}_S^a(\bar{P}, c_0)$  for  $P \rightarrow \bar{P}^+$ . Hence, the seller's payoff function is continuous at  $P = \bar{P}$ . It follows immediately from expression (35) that the seller's payoff increases in  $P$  for  $P \leq \bar{P}$ . In order to prove that the seller's payoff also increases in price for  $P > \bar{P}$ , we take derivatives of expression (36) with respect to  $P$ . Using the envelope theorem, we get:

$$\frac{d}{dP} \hat{\Pi}_S^b(c_b) = 1 - (1 - \gamma(c_b))(1 - \lambda) > 0. \quad (38)$$

An analogous argument can be made for the second threshold level  $[\delta + \alpha(1 - \delta)]\bar{V}$  and is therefore omitted.<sup>30</sup> ■

The intuition of the proposition is as follows: When the buyer's outside option is high, the seller will only set a low price and the buyer will never choose termination under EDT. Hence, the payoffs under ED and EDT coincide. As the buyer's outside option deteriorates beyond a certain threshold (when markets become less competitive), the seller has the opportunity to set a price for which termination occurs with positive probability. When parties cannot renegotiate we have shown that the seller may voluntarily set a lower price leaving a positive rent to the buyer. This is because the seller's payoff function jumps down as the price is raised beyond a certain threshold level. No such discontinuity arises if renegotiation is possible. Indeed, the seller's payoff increases in price and he always pushes the buyer down to his reservation utility. The underlying reason for this difference is the following: In both cases, a seller who sets the buyer to his reservation utility absorbs any welfare loss. Yet, if renegotiation is possible, the only source of inefficiency is overinvestment and, as nobody forces the seller to increase his investment beyond the socially optimal, he will do so only if he can thereby increase his payoff. Hence, the negative effect of overinvestment on the seller's payoff function can only be of second order.

We have shown that the possibility of opportunistic termination may be welfare increasing if renegotiation is prohibitively costly and welfare decreasing if renegotiation is possible. Both scenarios are realistic depending on the circumstances: Renegotiation is, for example, common between a construction firm and its client, if there are small deviations from the architect's plan. Yet, experience also shows that declaring or threatening termination can

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<sup>30</sup>See Appendix 7.3.2 for an extension to the case where  $\tilde{V}$  is continuously distributed over the interval  $[0, \bar{V}]$ .

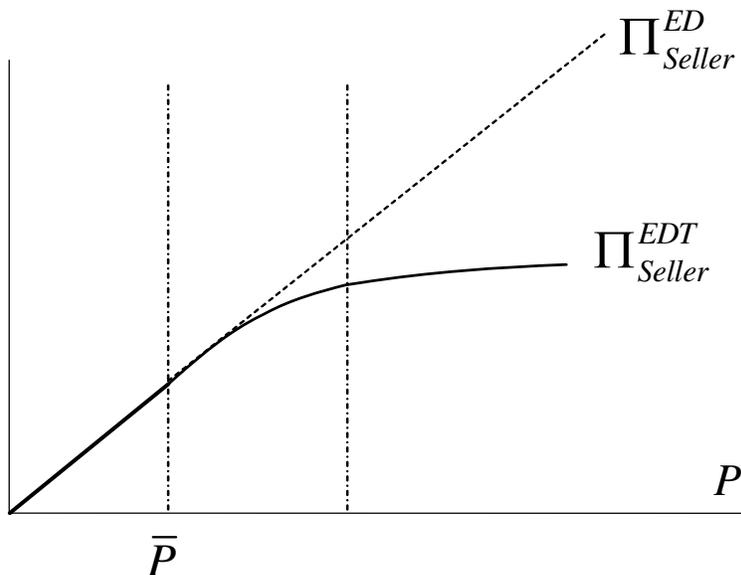


Figure 6: Seller's payoff under ED v. EDT with renegotiation.

ruin the parties' relationship to a point where renegotiation is no longer possible. Moreover, buyers often have to deal with agents (say, call center employees) who are not empowered to negotiate on behalf of the seller. Hence, the results of Propositions (1) and (3) can be jointly interpreted as defining a trade-off for determining how generous termination rights should be, given that sometimes the renegotiation and sometimes the non-renegotiation scenario will be pertinent. As negotiations are more common between merchants than between consumers and merchants the trade-off requires relatively more generous termination rights for consumers. This conclusion is reinforced by the result that distortions under renegotiation increase in the buyer's (ex-post) bargaining power as consumers' bargaining power vis-à-vis companies is likely to be low compared to merchant buyers. This policy implication is well in line with the regime proposed by Llewellyn (1937), the drafter of the UCC, but runs contrary to the recommendation by Bebchuk and Posner (2006). Bebchuk and Posner (2006) argue that, in competitive consumer markets, it is efficient to have clauses that strongly restrict the termination rights of consumers if the parties have an informational advantage over courts. By effectively giving the merchant seller discretion about how to process requests by the buyer to return the product, it is possible to keep buyer opportunism in check while sellers' reputational concerns will dissuade them from abusing their discretionary power. If the buyer is a merchant himself, he will also be bound by reputational concerns and buyer termination rights can therefore be relatively more generous for merchant buyers. While we tend to agree with the observation that seller companies care more about their reputations than consumer buyers, our analysis questions the general validity of their underlying claim

that buyer opportunism unambiguously leads to inefficiencies. In fact, our model makes the point that opportunistic termination may lead to positive effects. Moreover, negative effects are most likely to dominate between merchants. Moreover, our analysis may justify why the EC Directive 1999/44 on the Sale of Consumer Goods only disallows termination for “minor” non-conformities while a recent draft of a common European contract law which would apply outside the business-consumer relationship sets a higher threshold by requiring “fundamental” non-performance.<sup>31</sup>

## 7.3 Continuous Distribution Function

### 7.3.1 Continuous $\tilde{V}$ without renegotiation

We will now show that the basic effects identified in the binary model is also present if the buyer’s valuations is modelled as a continuous random variable. Assume that  $\tilde{V} \sim F(\cdot)$  is continuously distributed over the interval  $[0, \bar{V}]$ . Then the seller’s payoff function (8) can be written as follows:

$$\Pi_S^{EDT} = P - c - (1 - \gamma) \delta E\tilde{V} - (1 - \gamma) \left[ F(P) P - \delta \int_0^P \tilde{V} dF \right]. \quad (39)$$

The investment decision  $c_{EDT}$  which maximizes the seller’s payoff is given by the following first-order condition:

$$\gamma'(c_{EDT}) = \frac{1}{\delta E\tilde{V} + F(P) P - \delta \int_0^P \tilde{V} dF}. \quad (40)$$

As  $\gamma'(c_{EDT}) < \gamma'(c_0) = 1/\delta E\tilde{V}$ , it follows from the concavity of  $\gamma(\cdot)$  that the buyer overinvests relative to the benchmark,  $c_{EDT} > c_0$ . Differentiating  $\Pi_S^{EDT}$  with respect to  $P$  using the envelope theorem, we get:

$$\frac{d}{dP} \Pi_S^{EDT} = 1 - (1 - \gamma_{EDT}) [F(P) + (1 - \delta) P f(P)]. \quad (41)$$

We can see from expression (41) that the seller’s payoff does not necessarily increase in price. Depending on distributional assumptions, redistribution can occur without creating too much inefficiency. The payoff function is more likely to decrease if the probability of conforming delivery is small (small  $\gamma$ ), the devaluation due to the non-conformity is small (small  $\delta$ ), the probability density is high (high  $f(P)$ ), or the market power of the seller increases. As long as the seller’s payoff increases in price, the buyer gets exactly the same payoff as under ED. Yet, the seller’s payoff is distorted downwards as he absorbs the ex-post inefficiency. This inefficiency increases in price and depends on the distributional assumptions (Figure 7). It tends to be low in a bimodal distribution with high probability mass at high and low valuations  $\bar{V} > \underline{V} > 0$  (as in the binary model).

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<sup>31</sup>See Art 8:103 (b) of the Principles of European Contract Law (Lando and Beale, 2000).

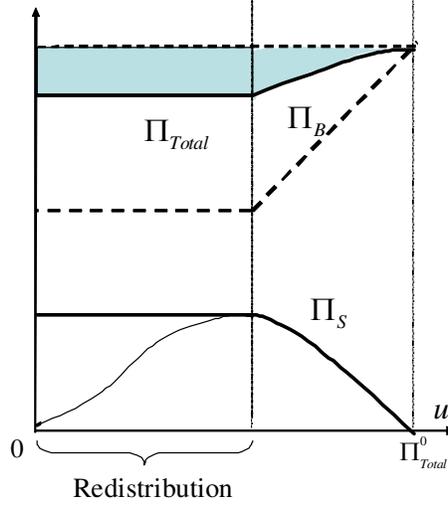


Figure 7: Payoff under EDT: continuous case.

### 7.3.2 Continuous $\tilde{V}$ with renegotiation

If  $\tilde{V} \sim F(\cdot)$  is continuously distributed over the interval  $[0, \bar{V}]$ , the seller's payoff function (34) if renegotiation is possible can be written as follows:

$$\hat{\Pi}_S^{EDT} = P - c - (1 - \gamma) \delta E\tilde{V} - (1 - \gamma) \int_0^{\frac{P}{[1 - (1 - \alpha)(1 - \delta)]}} P - [1 - (1 - \alpha)(1 - \delta)] \tilde{V} dF. \quad (42)$$

Rewriting and inserting  $\beta \equiv [1 - (1 - \alpha)(1 - \delta)]$  gives us:

$$\hat{\Pi}_S^{EDT} = P - c - (1 - \gamma) \delta E\tilde{V} - (1 - \gamma) \int_0^{P/\beta} P - \beta \tilde{V} dF. \quad (43)$$

The investment decision  $\hat{c}_{EDT}$  which maximizes the seller's payoff is given by the following first-order condition:

$$\gamma'(\hat{c}_{EDT}) = \frac{1}{\delta E\tilde{V} + \int_0^{P/\beta} P - \beta \tilde{V} dF}. \quad (44)$$

Note that  $\int_0^{P/\beta} P - \beta \tilde{V} dF$  decreases in  $\alpha$  but will always be positive. Hence,  $\gamma'(\hat{c}_{EDT}) < \gamma'(c_0) = 1/\delta E\tilde{V}$ . It then follows from the concavity of  $\gamma(\cdot)$  that the buyer overinvests relative to the benchmark,  $\hat{c}_{EDT} > c_0$ .

Differentiating  $\hat{\Pi}_S^{EDT}$  with respect to  $P$ , we have to distinguish two cases. If  $P/\beta < \bar{V}$  and using the envelope theorem, we get:

$$\frac{d}{dP} \hat{\Pi}_S^{EDT} = 1 - (1 - \hat{\gamma}_{EDT}) F(P/\beta) > 0.$$

If  $P/\beta \geq \bar{V}$  we get:

$$\frac{d}{dP} \hat{\Pi}_S^{EDT} = \hat{\gamma}_{EDT} > 0. \quad (45)$$

In both cases, we see that the seller's payoff increases in  $P$ . Hence, as in the binary model, we can conclude that the redistribution effect cannot occur if renegotiations are possible.

## 8 Conclusion

We have shown that the consumer does not necessarily pay the bill for the expansion of his rights from ED to EDT. Quite to the contrary, his share of the trade surplus may actually increase. Moreover, by curbing the monopoly power of the seller, the redistribution effect can also improve welfare. Namely, it may enable a more efficient trade volume in a setting with multiple buyers. Thus private law can have an antitrust effect. This provides an argument for mandatory termination rights as stipulated in the EC Directive 1999/44. Indeed, as the effect is to curb monopoly power of the seller, the EDT regime would never be the outcome of free negotiations in uncompetitive markets.

Yet, our analysis also shows that major inefficiencies can occur. EDT may create ex-post inefficient trade and distortions of investments into quality. The effects on overall trade volume are ambiguous. The relative strength of positive and negative effects depends on parameter values and distributional assumptions. However, our results are noteworthy still because most commentators consider opportunistic termination an unambiguously negative phenomenon. We also prove an impossibility result limiting the scope of potential welfare improvement. If parties can renegotiate ex-post, the identified positive effect cannot occur. On a more general theoretical level, our analysis explores the distributional effects that may occur, if a very common assumption in contract theory, namely the possibility of lump sum side payments is lifted.

A policy question of some importance is how generous termination rights should be. We find an argument for having relatively more generous termination rights in the business-to-consumer relationship than in the business-to-business relationship. This policy implication runs contrary to the recommendation by Bebchuk and Posner (2006) but is well in line with the regime proposed by Llewellyn (1937), the drafter of the UCC. Moreover, it may justify why the EC Directive 1999/44 on the Sale of Consumer Goods only disallows termination for "minor" non-conformities while a recent draft of a common European contract law which would apply outside the business-to-consumer relationship sets a higher threshold by requiring "fundamental" non-performance.

Finally there is an interesting implication for contracting even if EDT is not mandatory. One could easily imagine that two companies making a deal have a commercial team which bargains over the price, a technical team which works out the exact specification of the good to be traded and a legal team which agrees on the legal remedies which govern the transaction. Our analysis suggests that, given a package of product characteristics and legal

remedies, parties cannot just freely bargain the price. We have shown, that inserting a termination clause into the contract will restrict the set of prices that reasonable parties are able to agree upon. This effect depends on the probability of non-conformity which in turn is determined by the technical specification of the good. We therefore predict that contract negotiations in uncompetitive markets will be an integrated process which comprehensively deals with commercial, technical and legal issues.

Another - empirically testable - implication would be that retail companies who, either by firm policy or law, are required to offer the same termination rights for all of their products will earn lower mark-ups on goods which are likely to become defective (e.g. clothes) than on goods where this is not the case (e.g. cosmetics). This difference should be more pronounced as termination rights become more generous. We leave testing these empirical hypotheses to further research.

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