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GAMES OF BREACH AND THE ROLE OF CONTRACT LAW IN PROTECTING THE EXPECTATION INTEREST

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The circumstances in which zero-sum games, prisoner's dilemma games, and other non-zero-sum games may be appropriate models of the basic nature of contract relationships are clarified. A new class of exchange externalities arising from contract default is proposed. Trade-offs are considered among four competing criteria: trade inducement (promoting trade), incentive maintenance (deterring breach), expectation protection (compensating victims of breach), and Pareto-efficient breach. It is argued that the possibility of breaches whose ramifications extend beyond the immediate partners to the contract argues for a stronger need for contract incentive maintenance in "middleman" economies than where trade patterns are more direct.

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"What happens tomorrow?" she burst out. "Tell me what happens tomorrow," Alice demanded.

"What happens tomorrow?" repeated Humpty Dumpty, questioning the question.

"Yes, I want to know who gets the jam tomorrow."

"Oh, I see. But the box diagram up here shows you that," Humpty Dumpty said, proudly pointing to what was, for him, a most elegantly drawn diagram.

"No, it doesn't; at least, I don't think it does. What it does show me is what today's grocer *thinks* he might get. He *thinks* he is going to get some jam tomorrow in exchange for the jam today he gives up, but can he be *sure*?"

"Of course he can; unless tomorrow's grocer agrees to give up some jam tomorrow, today's grocer can block by refusing to give up any of his jam today."

"But today's grocer has to give up *his* jam first," retorted Alice. "The most he can get is a *promise* of jam tomorrow. *And what is it that makes tomorrow's grocer keep his promise*?"

[Hammond (19), p. 214; last emphasis ours]

I. INTRODUCTION AND OVERVIEW

A number of authors have provided a rationale for the role of a contract law in an exchange economy. Among these authors, Birmingham (5) and Barton (1) have made use of game-theory to model games of breach. Barton, in particular, has provided a theory of the economic basis of damages for breach of contract and why contract law protects the expectation interest. He did this by developing two models: (a) a model for a transaction involving future sale of goods for which a ready market exists—the "market transaction" game; and (b) a model for a transaction involving a sale of custommade goods for which no ready market exists. In working out these two models, Barton examined the actual workings of contract law, compared that with an idealized optimal law of damages, and made recommendations for reform of contract law.

We shall build on this work of Birmingham and Barton in four ways. First, we shall show that within the larger "market transaction" game there are several species of games of breach that can be played; and we shall relate these to a taxonomy of exchange externalities.

Second, rather than modeling the market transaction game as a two-person single-play game, we shall model the game as an N-person iterated game. Specifically, we wish to deal with the case of an N-person marketing network in which producers, intermediaries (middlemen), and final consumers are linked directly and indirectly together in a transactions chain. The extension of the two-person game into an N-person game with intermediaries has important potential extended consequences in that a chain reaction effect may occur so that there may be more than one victim of exchange externalities. It is precisely the vulnerability of N-person games to coordination failure arising from breach that leads us to make the argument that the *deterrence* function ought to play a more important role in contract law, which has traditionally been preoccupied with the *compensation* function. We shall argue that a law of contract which protects the expectation interest often simultaneously performs both the ex ante function of deterrence and the ex post function of compensation. However, an optimal law of contract whose main goal is to facilitate trade and commerce needs to strike a delicate balance between the two functions.

Third, we shall discuss alternative institutional solutions to games of breach, including codes of ethics as functional equivalents of contract law. Finally, using our N-person game model, we shall discuss two areas for possible future research, including certain implications for the efficient functioning of an exchange economy of the trend toward a convergence of tort law with contract law in product liability law.

II. A TAXONOMY OF EXCHANGE EXTERNALITIES AND GAMES OF BREACH

Consider the following market transaction between seller A and buyer B at time t. The terms of the contract are as follows: A promises to transfer to B right to ownership of a specified quantity and quality of a specified commodity, and promises to deliver the goods to B at a specified future date, t + 2. In consideration for A's promise, B promises to pay to A $100 at t + 2 when B receives the goods. In reliance on A's promise to deliver the goods to B at t + 2, B at t + 1 now sells forward his "claims to A's goods contract" to C located in another market, for $115, incurring a total of $10 search and contract-negotiation costs in the process. C, in return for A's promise to deliver the goods at t + 3, promises to pay B $130 at the time when he receives the goods. Assume further that after the contract with B, C at time t + 2 enters into a contract with D, the final consumer, in which C promises to deliver the goods to D at t + 4 in return for $145 which D now pays to C, and let C's incurred search and contract-negotiation costs be $10. In this sequence of transactions between connected pairs of traders, B and C are the profit-seeking middlemen whose profit expectations can be realized when all contracts are honored.[1]

Suppose traders operate in a Hobbesian "state of nature" in which there are no constraints on contractual behavior. In such a setting any trader has the option of making a binary choice of honoring or breaking contracts. Under contract-marketing network uncertainty, breach is a source of coordination failure because plans of some interdependent traders fail to be realized.

Imagine that, at t + 1, A has found an alternative buyer, Y, willing to pay $120 for the same goods. If A honors his contract to deliver goods to B, A will be made worse off by $20. In the absence of constraints on behavior, A will have the incentive to breach the contract with B and recontract with Y. As a result of A's breach, B's profit expectations fail to materialize; B becomes the victim of what we shall call *seller's abrogation externalities*. If the best price for which B could now buy the goods from an alternative seller is $115, and the costs of finding and negotiating with this alternative supplier is $10, then B will choose to breach his contract with C. Because C, too, will incur additional search costs and negotiation costs in finding an alternative supplier, and because that supplier is unlikely to make the goods available at the $130 price initially contracted with B, B's breach of contract also forces C to break his contract with D; so that there will be three victims whose profit expectations have been disappointed because of A's breach of contract.

Imagine an alternative game of breach, in which B fulfills his contract to deliver goods to C but C refuses to accept the goods because in the meantime he has accepted a more attractive offer from another trader. Because of C's breach, B's profit expectations fail to materialize; B becomes the victim of what we shall call *buyer's abrogation externalities*. Imagine a third kind of game of breach in which B, after taking C's money, refuses to deliver the goods to C. Because of B's breach, C becomes the victim of what we shall call *seller's good-defraud externalities*. Imagine a fourth kind of game of breach in which C, after accepting delivery of goods from B, refuses to pay B. In this case, B becomes the victim of what we shall call *buyer's money-defraud externalities*. Imagine a fifth species of games of breach in which A fulfills his contract to deliver goods to B but the goods delivered were an inferior grade. In this case, B becomes the victim of what we shall call *quality externalities*. These different species of externalities arising from breaches of contract fall under the rubric of what we shall call *exchange externalities*. This taxonomy of exchange externalities may be divided into three broad classes: abrogation externalities, fraud externalities, and quality externalities (see Table 1).[2] The taxonomy of exchange externalities in Table 1 will be used to assist us in developing a taxonomy of games of breach based on game-theoretic considerations.

We shall carefully compare the approaches of Birmingham (5) and Barton (1) and discuss both zero-sum and non-zero-sum models of breach (including one model new to the literature) and the circumstances in which each of those models may be appropriate. We shall also suggest how available models can be extended to the N-person case involving a market game with intermediaries (middlemen). We shall, not, however, offer a full analysis for N-person games of breach. Rather, we shall discuss the two-person intermediary-buyer or intermediary-seller segment of various such games, and also present the Birmingham and Barton

Table 1. A Taxonomy of Exchange Externalities

I *Abrogation Externalities*	*II* *Fraud Externalities*	*III* *Quality Externalities*
(a) Seller's abrogation externalities (b) Buyer's abrogation externalities	(a) Seller's goods defraud externalities (b) Buyer's money defraud externalities	Quality externalities

models for purposes of comparison. The differences between these models may be summarized in terms of a three-by-three matrix (see Table 2).

Entries in the first row of the Table 2 matrix are two-person direct exchange games, and that row includes the models and examples considered by Birmingham and Barton. The third row represents N-person indirect exchanges games, that is, games where there are intermediaries. The second row represents a two-person segment (that is, intermediary-buyer or seller-intermediary) of such an N-person game. It is important, however, to note that even the two-person models of breach as a game of direct exchange often, if not invariably, imply a third actor—an impersonal "market" able to buy at the market price. Without a "market" or a third actor or actors able to provide alternative purchases or sales, clearly there would be no incentive for a contracting party to breach except perhaps so as to, by fraud, increase his own consumption.

Entries in the first column of the matrix in Table 2 are zero-sum games. Cells I, IV, and VII are Barton's model of a game of market risk involving trading on a futures market, or extensions thereof. In the simplest form of such a model, represented in Figure 1 below, we have p, the price paid by the buyer to the seller and s, the price available to either party at the time the contract is to be consummated. In such a model (Cell I of Table 1), we have a zero-sum game in that both the buyer and seller, at the time the contract is negotiated, anticipate profit. However, one of them must be in error. The nature of the market transaction is, in fact, a bet as to future movement of market prices. The H (honor) and D (dishonor) terms in Figure 1 refer to abrogation of a contract; that is, if both parties honor the contract one will gain and the other will lose, depending on whether the market price is greater or less than the price initially contracted for. If one party abrogated unilaterally, or if both abrogate the contract, the situation is, in fact, at the (0,0) original no-trade position, *if we neglect transaction costs of contract-negotiation and search and reliance costs* (the costs incurred by a party who, after having negotiated such a contract, engaged in irreparable actions with

Table 2. A Taxonomy of Games of Breach

		Non-zero-sum Games	
	Zero-sum Games	*Prisoner's Dilemma Games*	*Non-Prisoner's Dilemma Games*
	Cell I	Cell II	Cell III
Two-person direct exchange game	Barton's model of market risk in a futures market	A Birmingham-like model of breach as fraud	Barton's model where there are mutual gains to trade and no better alternative trading possibilities for either actor
	Cell IV	Cell V	Cell VI
Two-person segment of N-person indirect exchange game with multiple potential trading partners	A Barton-like model of market risk in a futures market with perfect information	A Birmingham-like model of breach as fraud	1. An adaptation of Barton's model where there are mutual gains to trade but better trading possibilities exist for at least one of the actors because of information imperfections in the market 2. An adaptation of a Barton-like model of market risk in a futures market with imperfect information
	Cell VII	Cell VIII	Cell IX
N-person indirect exchange game with multiple potential trading partners	An extension of Barton's model of market risk in a futures market with perfect information	A Birmingham-like model of breach as fraud	1. An adaptation of Barton's model where there are mutual gains to trade but better trading possibilities exist for at least one of the actors because of information imperfections in the market 2. An adaptation of a Barton-like model of market risk in a futures market with imperfect information

$$\begin{array}{ccc} & & \text{Seller} \\ & & \begin{array}{cc} \text{H} & \text{D} \end{array} \\ \text{Buyer} & \begin{array}{c} \text{H} \\ \text{D} \end{array} & \begin{bmatrix} (s-p,\ p-s) & (0,0) \\ (0,0) & (0,0) \end{bmatrix} \end{array}$$

Figure 1. Barton Model of Breach as a Zero-Sum Game in a Futures Market with No Reliance or Transaction Costs (Cell I)

the expectation that the contract will be fulfilled). When there are substantial reliance costs, the situation involving a breach may be quite severe for the victim of breach, and may indeed force him into bankruptcy.

The second and third columns reflect the two kinds of non-zero-sum situations which we shall wish to distinguish; namely, a Prisoner's Dilemma situation (the P.D.'s defining characteristics are too well known to require repetition here),[3] and non-zero-sum games other than P.D. games.

Birmingham proposed that the two-person game of breach may be modeled as a P.D. game. Barton, on the other hand, has strongly argued that a P.D. model is less appropriate than either a zero-sum model (in the case of the futures trading market) or a non-zero-sum model which is not a P.D. game. We believe that the P.D. model is appropriate only for a very special but very important case of breach: namely, a breach involving fraud. We specify in Figure 2 (representing Cell II of Table 2) a model for a two-person game of breach involving fraud. This model is inspired by Birmingham's work.

In Figure 2, s_1 is the value to the buyer of the goods and s_2 is the value to the seller. We may imagine that the value to the buyer either consists of his ability to resell the goods on some markets known to him or his ability to make use of the goods in his own firm or for his own use. Clearly, if there is to be an expectation of mutual gains to trade, we would posit that s_1, the value to the buyer of the goods, is greater than p, the price paid for the goods by the buyer, which in turn is greater

$$\begin{array}{ccc} & & \text{Seller} \\ & & \begin{array}{cc} \text{H} & \text{D} \end{array} \\ \text{Buyer} & \begin{array}{c} \text{H} \\ \text{D} \end{array} & \begin{bmatrix} (s_1-p,\ p-s_2) & (-p,p) \\ (s_1,-s_2) & (0,0) \end{bmatrix} \end{array}$$

Figure 2. Model of Breach as Fraud, Inspired by Birmingham (Cell II)

than s_2, the value of goods to the seller. In a typical situation involving potential gains from an exchange, both buyer and seller can expect to benefit from the contract. Nevertheless, to the extent that a transaction is not a *simultaneous* exchange of goods for money, either buyer and seller may have the incentive to fraudulently breach the contract (if they are the last to "move") by failing to honor the contract even though the other party has honored the contract. In Figure 2, the D term refers not to abrogation of the contract but to *fraud*. Thus, if the buyer honors the contract and seller dishonors, this means that the seller receives money payment but fails to deliver the goods (seller's goods defraud). Similarly, if the buyer dishonors the contract, this means the buyer didn't pay the seller though he received the goods (buyer's money defraud). The matrix entries are straightforwardly obtained. For example, if the buyer fraudulently dishonors the contract, this involves a situation in which the buyer's payoff is s_1, and the seller's payoff is $-s_2$ (that is, the seller would lose the value of the goods).[4]

Barton's model of two-person exchange where there are potential gains to trade (Cell III of Table 2) is shown in Figure 3 below. However, we have simplified the matrix form from that shown in Barton to eliminate transaction costs and reliance costs, and simplified further by assuming that the buyer does not have alternate suppliers from whom he might purchase or the seller alternative traders to whom he might sell. As in the two-person zero-sum game of market risk shown in Figure 1, the non-zero-sum game shown in Figure 3 involves a situation in which the dishonor strategy involves unilateral abrogation of a contract rather than fraud as in Figure 2. Again, s_1 is the value of the goods to the buyer if he intends the goods for his own consumption; p is the price available to him for resale elsewhere; and s_2 is the value attached to the goods by the seller. We may posit that $s_1 > p > s_2$, at least when the contract is initially signed. Thus, in this game, only if expectations as to the values of s_1 and s_2 change is there any incentive to breach the contract.

We may construct a model analogous to that in Figure 3 in the case

$$
\begin{array}{ccc}
 & & \text{Seller} \\
 & & \begin{array}{cc} \text{H} \qquad\qquad & \qquad \text{D} \end{array} \\
\text{Buyer} & \begin{array}{c} \text{H} \\ \\ \text{D} \end{array} & \begin{bmatrix} (s_1 - p, p - s_2) & (0,0) \\ & \\ (0,0) & (0,0) \end{bmatrix}
\end{array}
$$

Figure 3. Simplified Barton Model of Breach as a Non-Zero Game in a Futures Market with No Reliance or Transaction Costs (Cell III)

$$
\begin{array}{ccc}
 & & \text{(Intermediary) Seller} \\
 & & \begin{array}{cc} \text{H} \qquad\qquad\qquad & \qquad \text{D} \end{array} \\
\begin{array}{c}\text{(Intermediary)} \\ \text{Buyer}\end{array} & \begin{array}{c} \text{H} \\ \\ \text{D} \end{array} & \begin{bmatrix} (s_1 - p,\ p - s_2) & (0,\ p_S - s_2) \\ & \\ (s_1 - p_B,\ 0) & (s_1 - p_B,\ p_S - s_2) \end{bmatrix}
\end{array}
$$

Figure 4. Simplified Model of Breach as a Non-Zero-Sum Game in a Market with Alternative Trading Possibilities and No Reliance or Transaction Costs (Cell VI)

where there are intermediate traders. In Figure 4 (representing the first example given in Cell VI of Table 2), s_1 and s_2 are as before (that is, the prices available to an [intermediary] buyer and an [intermediary] seller), but now both buyer and seller have alternative traders with whom they might contract. Let p_B be the price at which the buyer could buy the goods in other markets and let p_S be the price at which the seller could sell the goods in other markets. If $p_S \leqslant s_2$ and $p_B \geqslant s_1$, we have the situation of Cell III of Table 2 (Figure 3) in which neither buyer nor seller has any alternatives to direct exchange. If $p_S > p$, then the seller has incentive to breach; if $p_B < p$ then the buyer has incentive to breach.[5] If $p \overset{>}{\tilde{S}} p$ *and* $p \overset{<}{\tilde{B}} p$, which is possible in an imperfect information market, then both parties may be better off if the contract between them is canceled. *Only in Cell III of Table 2 (where, recall, $p_S = s_2$, $p_B = s_1$) is there anything like a self-enforcing contract.* Because we assume $S_1 > p > S_2$, the relative values of $P_S(p_B)$ and p will determine the breach incentive on the part of the seller (buyer).

In like manner, it is possible to fill the remaining cells of Row 2 of Table 2 (Cells IV and V) by constructing two-person segments of N-person indirect exchange games which are analogs to each of the basic kinds of two-person games of breach defined in Cells I and II of Table 2. It should also be possible to fill in Row 3 of Table 2 by constructing N-person indirect exchange games with multiple potential trading parties which are analogs to the two-person basic kinds of breach illustrated in Cells I through III. For example, in an N-person extension to the game in Figure 3 we would have a situation in which there are mutual gains to trade but in which, because of the existence of interdependence and interconnectedness of the N-person trading parties, the consequences of a contract breach have important third-party effects for other actors in the system who are directly or indirectly linked by contractual obligations to the original trader who breaches his contract.

III. PROTECTING THE EXPECTATION INTEREST: Compensation, Deterrence, and Trade Inducement

Our taxonomy of exchange externalities and games of breach clearly shows that within the larger market transaction game at least three different games of breach can be played. This implies that different contract law remedies for breach are needed for the internalization of different species of exchange externalities. We shall not offer a full analysis of the different solutions for different games of breach. Rather, we shall focus our attention on the appropriate remedies for one specific class of games of breach, namely, the game which generates "seller's abrogation externalities" using the A-B-C-D marketing transactions chain example we used earlier.

In discussing remedies for breach of contract, it is necessary to distinguish the three kinds of interests that contract law protects: the *restitution interest*, the *reliance interest*, and the *expectation interest*.[6]

Let us re-examine the A-B-C-D example given in Section II. Consider the *restitution interest*. If seller A breaches his contract to deliver goods at time t, B incurs no damages at that point; A need not compensate B. If, however, at time t, B pays $100 to A in return for A's promise to deliver goods at t + 2, and A breaches his contract after taking B's money, then B would become the victim of "goods defraud externalities." A contract law which protects the restitution interest would compel A to return $100 to B, allowing (except for reliance costs) a return to the status quo ante.[7]

Consider next the *reliance interest*. The cost borne by one party as a result of actions based on the expectation that a prior contract will be fulfilled are termed his reliance costs, which we shall denote c_r. Let us return to our earlier example. If A breaches his contract to deliver goods to B at t + 1, B will have suffered out-of-pocket reliance costs of $10, which include search costs and negotiation costs. A contract law which protects the reliance interest would require A to compensate B $10 for his reliance costs. This would restore B to his initial no-trade position.

It is apparent that we could modify the matrices of Figures 1 through 4 to take into account initial search costs (c_s) and initial negotiation costs (c_n) as well as reliance costs (c_r). Rather, however, than doing this for all the models we have previously considered, we shall take Figure 4 as a representative example. We show in Figure 5 the modifications needed to Figure 4 to take into account the existence of transaction, search, and reliance costs. We have used a subscript B for buyer and S for seller, to denote the different costs to each, since in general we would not anticipate these costs to be symmetric. To simplify the rep-

(Intermediary) Seller

$$
\begin{array}{lcc}
 & \text{H} & \text{D} \\
\text{(Intermediary) Buyer} \quad \text{H} & (s_1 - p - c_B,\ p - s_2 - c_S) & (-c_B,\ p_S - s_2 - c_S) \\
\text{D} & (s_1 - p_B - c_B,\ -c_S) & (s_1 - p_B - c_B,\ p_S - s_2 - c_S)
\end{array}
$$

Figure 5. General Model of Breach as Non-Zero-Sum Game in a Market with Alternative Trading Possibilities (Cell VI)

resentation, we shall denote the *sum* of all reliance, search, and negotiation costs simply as c.

It might appear that the existence of search, negotiation, and reliance costs has changed the situation merely by the addition of a (mathematically irrelevant) constant term to each entry of the matrix. That is, $-c_B$ has been added to the buyer's payoff, and $-c_S$ has been added to the seller's payoff. However, this would be an error. These terms are not fixed parameters, and both buyer and seller may be expected to adjust their reliance and search behavior depending upon the nature of the contract provisions affecting damages upon breach. For a full discussion of this point see Shavell (31). Furthermore, the incorporation of the c terms into our model makes explicit the potential for breach having not merely neutral but actually negative consequences.

Now consider the *expectation interest*. Even when contract law protects the reliance interest and also guarantees restitution, this may still leave the victim of breach less well off than if the contract had been honored. For example, in the case above, when A breaches, B is not compensated for his lost profit expectations. Even if he receives damages from A equal to c_r, B would still prefer to have the contract honored. Breaching the contract deprives B of an expected net *profit* of $5.

Since a contract which protects both the restitution and reliance interest always restores a victim to his status quo position, so that a victim of breach is made no worse off than *before* he entered into the contract, why should contract law ever go beyond considerations of equity to protect the expectation interest? To answer this question we need to bear in mind that the law of contracts was evolved mainly to serve the needs of trade and commerce. Its fundamental rationale is to *facilitate trade*. If this aim is dominant, considerations of morality or equity are subsidiary to considerations of Pareto-efficiency. Such considerations require that all potential gains from trade be exploited. If contract law protects the restitution and/or reliance interest and no more, it will customarily fall short of a full exchange-facilitating function and will not result in Pareto-efficient use of resources; in particular it will not necessarily lead to Pareto-efficient breach.

The key point is that failure to protect the expectation interest will fail to yield Pareto-efficient resource allocation. In addition to the arguments about Pareto-efficient breach presented in Shavell (31) we should also note that if a contract can do no better than restore a victim of breach to his status quo position, profit-seeking traders will have an incentive to divert some of their capital from trade to the private protection of contracts in order to protect profit expectations. Such a diversion of resources would increase the out-of-pocket costs of participating in trade, costs which will narrow traders' profit margin. The high costs of contracting under a contract law which does not protect the expectation interest may cause some profit-seeking traders to exit from markets. Furthermore, a contract law which does not protect the expectation interest does not recognize the fact that contractual claims themselves can be bought and sold like commodities for profit, that is, contractual rights themselves are a species of intangible property. If traders have no assurance that their profit expectations can be appropriated as intangible property, this could erode profit-seeking incentives so as to discourage traders from entering into exchanges. Thus a contract law which evolves into one that protects the expectation interest would be superior to one which merely protected the restitution and reliance interest in that it would generally foster efficient breach, encourage profit-seeking traders to emerge, and would also avoid scarce resources being diverted to private protection of contracts.[8]

Another important reason why a contract law which protects the restitution/reliance interest may be inferior to one which protects the expectation interest is that the former may not be effective in *deterring* a trader from violating a contract. We may ask, first, why would an individual unilaterally abrogate a contract and second, why should contract law be concerned with deterring breach? It is clear in the case of Figure 2, where we have a prisoner's dilemma-like situation, that violation of contract is individually rational. It is clear, as well, in Figures 1, 3, and 4 that new information as to the value of goods (perhaps brought about by their use), or opportunities to recontract at a better price, may lead rational individuals to prefer to violate existing contracts in order to seek better ones. Thus, in the earlier A-B-C-D marketing network example we used, trader A, confronted with trader Y who is willing to offer him a higher price of \$120, will have the incentive to breach his contract to deliver goods to B, since A is better off by \$20 even though he has to return \$100 to A. A contract law that protects only the restitution interest will not be able to deter breach in the face of better opportunities for trade offered by alternative trading partners. If contract law protects the reliance interest, A would still have the incentive to breach since after compensating B for \$10 reliance costs, A is still better off by \$10. However, if contract law protects the expectation interest, A would be required to pay a sum of monetary damages equal to the difference between price at t and price at t + 1 (time that A breached contract) which works out to be \$20.[9] In the example given here, the benefits just equal the costs of breach so that A is at the margin of indifference between breaking or honoring the contract. However, given the fact that there are contract-negotiation costs of entering into a contract with Y, the existence of positive transaction costs will provide the incentive for A to honor his contract with B rather than recontract with Y. Thus, a contract law that requires the offending party to recompense the victim of the breach by an amount which will enable the victim to recoup his lost profits changes in an important fashion the expected payoffs to the parties to the contract. We may modify Figure 5 to take into account a law of contracts that protects the expectation interest, as shown in Figure 6.

Let us represent by lower case letter d the damages imposed by society on those who breach a contract. Consider, for example, the case where the abrogator is the seller. If $d \geq p_S - p$, then the seller in Figure 6 will prefer to honor his contract rather than default in order to engage in a more profitable contract at price p. In the matrix shown in Figure 6, *the damages, d, sufficient to guarantee the seller has no incentive to abrogate the contract is not necessarily the amount which would be required to convince the buyer that he would rather have that amount paid to him than have the contract honored.* The buyer would need to be compensated an amount equal to $s_1 - p$. $s_1 - p$ may be $>$, $<$, or $=$ $p - p_S$. We can think of the difference between $p - p_S$ and $s_1 - p$ as the difference between the enforced damages needed to motivate a seller to honor his contract in the presence of more profitable alternatives, and the bribe needed to motivate a buyer to void the contract.[10]

(Intermediary) Seller

$$\text{(Intermediary) Buyer}\quad \begin{array}{c} \\ H \\ \\ D \end{array} \begin{array}{c} \begin{array}{cc} \qquad\qquad H \qquad\qquad & \qquad\qquad D \qquad\qquad \end{array} \\ \begin{bmatrix} (s_1 - p - c_B,\ p - s_2 - c_S) & (d - c_B,\ p_S - s_2 - c_S - d) \\ & \\ (s_1 - p_B - c_B - d,\ d - c_S) & (s_1 - p_B - c_B,\ p_S - s_2 - c_S) \end{bmatrix} \end{array}$$

Figure 6. Generalized Model of Deterrent to Breach (Cell VI)

As Barton (1) puts it:

> There are two goals that might guide the determination of damages for breach . . . : *expectation protection* (the plaintiff should be put in as good a position as if the promise had been honored), and *incentive maintenance* (the defendant should honor his promises). (p. 278)

Now let us return to the second question raised earlier: why should contract law ever concern itself with deterring traders from breach as long as victims are compensated for the breach so that they are restored to a position as if the contract has been honored? If A is to compensate B and restore him to his position "on the contract curve," and himself be made better off, surely this is "efficient breach" [Goetz and Scott (16), Shavell (31)] which is consistent with Pareto-optimality. In an economy in which traders enter into isolated two-person exchanges, there is no good reason to deny the offending party the benefits of his breach as long as the victim is compensated for his profit losses. Thus, we are led to the view that in two-person games of breach, if the expectation interest is protected, the deterrence of breach, per se, is undesirable.

A normative theory of an optimal law of damages must take into account (1) the relative desirability of reducing contract-uncertainty by deterring the likelihood of breach versus (2) the aim of equity in guaranteeing that victims of breach are not unilaterally made worse off (that is, are returned to their initial no-trade position), versus (3) the aim of guaranteeing Pareto-efficient breach of any particular contract, versus (4) the goal of inducing trade. These four functions of contract law may not be compatible. In our view, an optimal law of damages cannot be designed without specifying the relative weights to be attached to the trade inducement, breach-efficiency, deterrence, and equity functions of contract law. It is not sufficient to focus exclusively on Pareto-efficient breach on a contract-by-contract basis.

For example, the protection of the expectation interest may be incompatible with trade inducement. On the one hand, a contract law that guarantees that victims of breach will be compensated fully for their foregone profits (expectation interest) makes contracts attractive to those parties who do not anticipate themselves being desirous of breach. On the other hand, if courts require the breaching party to compensate fully the victim's expectation interest, then we would expect that parties might be reluctant to enter into such contracts, if they had any expectation of the possibility that changed circumstances might motivate breach. The concatenation of these two arguments suggests that imposition of expectation interests compensation will deter some traders from entering into contracts, or will produce a situation in which traders will invest in longer search for an optimum contractual situation. *If the costs of breach are high, then contracts will be sought in which the probability that one will wish to breach is low.*

While protection of the expectation interest may in general be the most desirable rule [see our discussion above and Shavell (31), especially propositions 6 through 8], under the expectation measure the courts are required to ascertain hypothetical values which may be difficult or impossible to calculate.[11] Furthermore, once we model the game of breach as an N-person game with intermediaries, deterrence of breach assumes new importance, since some of those who break contracts (for example, B and C in the example below) may not have the direct option of choosing to honor or not to honor their contracts, or may be able to honor their contracts only by incurring a net loss. In such multiplayer games, breach of contract by one party generates more than one victim of breach. Let us return to our earlier example of a four-trader marketing network. Assume that A chooses to breach his contract with B. Even when A can compensate B for B's loss of profit expectations and himself be made better off, what about B? If B is forced to break his contract with C, he will face a lawsuit from C. B, who will receive $20 in monetary damages from A, will have to compensate C $30 in monetary damages to enable C to recoup lost profits, assuming that C now has to go into the market to buy the goods at a price which has risen to $180. Even when compensated for his reliance costs, A's breach leaves B worse off than before because of B's contractual relation with C. If the net losses to A from having to compensate B are sufficiently large, A may even be forced into bankruptcy if A is made to bear the full cost of ramified damages.

In a complex exchange economy characterized by high degrees of functional interdependence among traders, we believe that the ex ante deterrence function of contract law ought to play a more important role than the traditional ex post compensation function. While the protection of the expectation interest is one way that contract law may achieve a strong deterrence effect, in economies highly vulnerable to coordination failure arising from breach it may even be necessary for courts to resort to nontraditional remedies for breach. These may include compelling specific performance,[12] imposing punitive damages, and enforcing penalty clauses,[13] if we wish to generate efficient breach and avoid the ramified exchange externalities breach may impose on a network of traders [cf. Shavell (31), especially note 12].

The N-person game with intermediary traders is relevant to another approach to a normative theory of optimal law of damages, that which has been suggested by Barton (1). Barton takes the view that in many cases, though not all, contracts can be written *with the expectation of potential risk in mind* and can incorporate penalties for breach based on the amount of damages incurred to date.[14] To the extent that contract prices will reflect these risk considerations, courts need not concern themselves with whether reliance costs, expectation interest, and so forth have been correctly calculated, but need merely enforce existing contract provisions, whatever they may be. Since buyers and sellers will not enter into such contracts without the expectation that they will be better off in so doing, the problem of trade inducement apparently does not present itself and the problem of deterrence is less relevant. However, when breach has ramifications extending beyond the immediate partners to the contract, as in the case of our N-person game with intermediaries, this strategy may not be a socially desirable one, and externalities need not be fully internalized.

IV. ALTERNATIVE INSTITUTIONAL SOLUTIONS FOR GAMES OF BREACH

As soon as we model games of breach as *iterated* games, whether two-person or N-person, we see the possibilities of alternative institutional solutions for games of breach. Consider, for example, a two-person buyer-seller situation, where buyer and seller can expect to engage in repeated trades with each other. In such an iterated game situation, the long-run consequences of cooperation, that is, honoring contracts, is such that one-shot incentives to unilaterally breach contracts or to engage in fraud can, with high probability, be deterred by considerations of potential long-run gain.[15]

Grofman and Pool (18) have looked at sequential prisoner's dilemma games in which one player makes use of a strategy analogous to tit for tat (that is, a strategy in which a player will, with high probability, engage in the same form of behavior on subsequent moves as the other player in the game has engaged in on previous moves). In such a situation, when one actor's behavior is contingent upon the other actor's previous behavior, it is possible to show that a strategy of breach, while it may be optimal in the one-shot case, is no longer optimal in terms of long-run expectations. Thus, in *situations of repeated trade between a limited set of actors we would expect that even in the absence of enforced external sanctions against breach the "discipline of continuous dealings"* [Tullock (34)] *a self-policed system would develop in which contracts would be honored in order to ensure long-run expectations of future profit.*

The discipline of continuous dealings, however, will not act as a sufficient deterrent on traders' behavior in trading situations that require

a great deal of trust among traders, for example, trading under conditions of rapidly fluctuating prices where transactions are on credit. Landa (21) has studied the marketing of smallholders' rubber in Singapore and West Malaysia. The study found that rubber dealers (middlemen) in their recurrent dealings with each other relied on codes of conduct (the Confucian code of ethics), informal communication networks, and an institutional solution (money) to maintain elements of trust.

1. A *Confucian code of ethics*, embedded in kinship/ethnic relations, serves as a functional equivalent to contract law for the protection of contracts.[16] The code is effective: a trader who violates the code of conduct of his group faces possible withdrawal of credit which will force him to conduct his transactions on a cash basis, exclusion from future dealings, or even "expulsion" from the group by way of bankruptcy proceedings initiated by creditors who may choose to take punitive action.

2. *Informal communication networks* serve as the functional equivalent of credit-rating institutions. Information about the reputation of potential or actual trading partners is acquired and disseminated.

The combination of the Confucian code of conduct with the informal communication networks explains why the marketing of smallholders' rubber is dominated by an ethnically homogeneous middleman group with a tightly knit kinship structure. Four clans from the Hokkien Chinese ethnic group dominate the middleman roles: the Tans, the Lees, the Ngs, and the Gans.[17,18] Successful trading groups in less developed economies are *homogeneous* social groups: the East Indians in East Africa, the Syrians in West Africa, the Lebanese in North Africa, the Medici merchant-bankers in fifteenth-century Florence, and the Jews in Medieval Europe.[19] We would expect that individuals belonging to the same ethnic group or sharing the same code of conduct and communications networks would be more likely to be honest in their dealings with each other than would "unconnected" individuals [cf. Buchanan (8), who discusses the limits of morality]. The consequences of defrauding a stranger are less than the consequences of betraying someone who may inform (relevant) others of the person's dishonesty. The latter bears with it the expected cost of subsequent losses of future opportunities for profitable transactions by being ostracized from the group, the opportunity cost of which may be considerable.

3. The *use of money* serves as an institutional solution to contract uncertainty. Landa (23) found that across kinship/ethnic boundaries, where trust is especially problematical, Chinese middlemen resort to the use of money in their continuous dealings with Malay smallholders. The existence of an *ethnically homogeneous Chinese credit economy* side by

side with an *ethnically heterogeneous money economy* highlights the role of *money* in coping with the problem of contract uncertainty, a role not emphasized in contemporary theories of money. Money is an institutional arrangement which substitutes for the need for trust, since a breach of contract cannot occur even between strangers when transactions involve simultaneous exchange of money for goods. Thus if we look again at the matrix of Figure 2 we see that simultaneity of exchange in effect prohibits us from entering the cells in the off diagonal. *In the absence of legal or social mechanisms to deter contract abrogation or fraud, we would anticipate that most transactions would be cash transactions or simultaneous barter exchanges.* If we do not observe widespread breaches of contract in the real world, it is because of the existence of "laws and institutions" that inhibit traders from breach.

V. POTENTIAL APPLICATIONS

The extension of market exchanges from two-person single-shot games to N-person iterated games has been shown to result in a nontrivial modification of approaches to an optimal law of contract and to suggest the feasibility of social institutions which may deter breach. We believe that the use of an N-person iterated game model may yield high payoffs in terms of future research in the area of contract law, and we shall briefly sketch two areas in which such research might prove fruitful.

1. Research in the area of product liability law. This is a particularly fruitful area for exploring the impact of increasing specialization and interdependence among agents linked in vertical distributive chains on the design of an optimal product liability law. A brief outline of the evolution of product liability law in the United States will indicate some of the complexities of interdependence that the law has had to deal with. The following cases were landmark decisions in the evolution of product liability law, each of which involved a distributive chain in which the manufacturer, A, sold his product to an intermediary, B, who in turn sold it to the final consumer, C, who was injured by the product which turned out to be defective.

(a) The case of *Winterbottom v. Wright* (1842)[20] in which the victim, C, was injured when the carriage he was riding overturned because of a defective wheel. The English court held that C could not sue A directly because he had no contract with A. This doctrine of privity of contract in contract law thus necessitates multiple two-person suits along the distributive chain in which C sues B, and B in turn sues A. The evolution of product liability law in the next landmark case eliminated this problem by allowing C to bypass B and to sue A directly.

(b) The *MacPherson v. Buick Motor Co.* (1916) case[21] in which the victim, C, was injured when one of the wheels of his new car fell off. The court held A liable to C for *negligence* under *tort law*. Although multiple suits along the distributive chain were eliminated, a key problem lies in the difficulty the plaintiff had in proving that A was negligent. The next landmark case made it unnecessary to prove that the manufacturer of a defective product is negligent.

(c) The *Henningsen v. Bloomfield Motors, Inc.* (1960) case[22] in which the victim, C, was injured because of a defect in his new car. Suit was successfully brought by C against A directly under the doctrine of *breach of implied warranty* under *contract law*. This landmark case caused the fall of the "citadel of privity" of contract [see Prosser (29)]. Furthermore, the court struck down the standard automobile manufacturers' disclaimer clause restricting liability. Henceforth, *implied* warranty of merchantability and fitness was held to apply to a wide range of products. However, the major problem faced by a potential victim was that the buyer had to give notice within a reasonable time, under the contractual statute of limitations, after he knew or should have known of the breach of warranty. If he did not do so, he would not be able to maintain an action against A. A new basis of liability to cope with this problem was evolved with the next landmark decision.

(d) The *Greenman v. Yuba Power Products, Inc.* (1962) case[23] in which the victim, C, was injured by a defective power tool. The trial court ruled that C could not sue A on a breach of warranty in contract law because he had failed to give timely notice of breach to A. Upon appeal, the California Supreme Court held A *strictly liable in tort* for the injury done to C.

Although American product liability law is still in a state of flux and there are differences in the application of strict liability from state to state, there is a trend toward strict liability in tort. Strict liability in tort is free from the problems of proving negligence, privity of contract, disclaimer clauses that defeat warranties, and contractual statute of limitations problems that had plagued product liability cases in the past. It should be noted, however, that breach of implied warranty under contract law, when stripped of the doctrines of privity, disclaimer clause, and contractual statute of limitations, is in fact "strict liability in contract," indistinguishable from strict liability in tort. In this context, the historical evolution of product liability law had eroded away much of the conventional boundaries separating contract law from tort law, and functionally has caused contract law and tort law to merge together.

In terms of our N-person game model, how might one design an optimal product liability law? The game of breach in a product liability case involves the manufacturer of a defective product imposing "quality externalities" (in the form of personal injury or damage on property) on the victim [see Symposium (32)]. Since intermediaries in the N-person game did not manufacture the defective product, scarce resources are economized when the N-person game is collapsed into a two-person game in which the victim can sue the manufacturer directly under the doctrine of strict liability in tort. By compensating the victim for personal injuries or damage to property, the victim is restored to the status quo and hence product liability law satisfies the goal of equity. But what about the economic impact of strict liability in tort on producers' "profit expectations"?

Manufacturers who distribute their products via intermediaries can reasonably foresee that some of their products will turn out to be defective and hence harm some final consumers. One may predict that the effect of "strict liability in tort" is to achieve a greater internalization of quality externalities by providing incentives for manufacturers to produce safer and more reliable products, or to take out product liability insurance, or both. The higher costs of doing business under strict liability in tort may be passed on to consumers or absorbed by producers. Where the costs are absorbed by producers, reduced profits may deter some otherwise risk-taking and innovating entrepreneurs from investing in the development of new consumer products; not all potential gains from trade would be exhausted. In short, in designing an optimal product liability law, one needs to balance off the benefits of protecting consumers' interests with the costs imposed on producers, as well as specifying the relative weights to be attached to the goals of equity, efficiency, and trade-inducement.

2. Research in the area of formation and dissolution of marriage contracts. Our theory of contract law may even be extended to marriage contracts, where breach of one party to a marriage contract can have serious implications for third parties (namely, children of the marriage) whose existence may render impossible a straightforward restitution to the status quo ante. More generally we may look at the law governing dissolution of marriage (e.g., ease of divorce, rules for alimony, child custody, etc.) in terms of competing claims of restitution, reliance, expectation protection, deterrence, efficient breach, and marriage-inducement considerations.[24]

Thus, for example, family law in the United States has taken a strong interest in protecting the expectation interest involved in third parties, that is, the couple's children. The protection of expectation interest is enforced via child support payments. The problem here is that institutions for the actual enforcement of child support payments are not well developed. Thus there is a move to reform the law.[25] One may predict that

a well-developed family law that protects the expectation interest may deter some men from entering into marriage,[26] may encourage more lengthy search for a potential marriage partner, or may even reduce the incentive of some men to have children.

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NOTES

1. The A-B-C-D model of exchange implies the existence of transaction costs such as search and transportation costs which prevent a direct exchange between the producer and the ultimate consumer, hence the existence of profit-seeking middlemen. The A-B-C-D model of exchange is developed in Landa (20) and elaborated in Landa (22).

2. The last class can be subsumed as a special case of one of the first two classes when we move beyond the simple dichotomous (honor/dishonor) models of contracts shown in Table 2.

3. See, for example, Grofman (17); see also the survey article on economics and game theory by Schotter and Schwodiauer (30).

4. We shall neglect problems arising when there may be doubt that a contract was in fact concluded, or when there is doubt as to whether both parties had full knowledge of the nature of their contract obligations [see, e.g., Bronaugh (7)]. Similarly, we shall neglect the question of whether a statement of intent to void a contract is the same thing as actual noncompliance and should carry with it the same penalties [see, e.g., Note (28)].

We might note that this is not a "game of coordination" because either the buyer or seller will, with full information, prefer not to be in the upper left-hand cell.

5. In Cell II of Table 2, which depicts a two-person Birmingham-like model of breach as fraud, we have potential "goods defraud externalities," "money defraud externalities," and possibly also "quality externalities," where inferior goods are delivered or inadequate recompense made. On the other hand, Cell I and Cell III exhibit "abrogation externalities."

6. The classic article is Fuller and Perdue (14).

7. We assume that the breaching party does so only in expectation of gain. Of course, depending upon the damage arrangements, the victim of breach may or may not feel adequately compensated.

8. For a more detailed discussion of those issues, see Landa (20).

9. This is the principle of mitigation of damages.

10. It is important to note, as Barton does, that only in the case of a zero-sum game (such as a futures market with perfect information), will damages imposed with the intent to provide expectation protection and damages imposed to provide a guarantee of incentive

maintenance be identical. In general, the costs borne by one party injured by breach will not be the same as the benefits accruing to the party who chose to breach the contract.

Similarly, if we look again at Figure 2 and consider the seller's incentive to defraud, we see that damages of s_2 guarantee that the seller will prefer to honor the contract rather than fraudulently violate it, but damages greater than S_1 are sufficient to bribe the buyer to release the seller from the contract.

11. An exception to this might be an N-person iterated game involving traders linked in a transaction chain. If we posit that all traders deal with each other on a recurrent basis, then we must reasonably assume that all traders have information about each other's expectations. Furthermore, profit-seeking traders are themselves *both* sellers and buyers so that they have reasonable expectations about the size of both gains and losses should either they or their trading partner(s) choose to breach a contract. In such a situation, a contract law which protects the expectation interest would require the breaching party to compensate the victim an amount equal to the difference between the price at the time the contract was established and the market price at the time the contract is breached. This satisfies the first rule of the landmark case of *Hadley v. Baxendale* that addresses itself to the question of the "remoteness of damages," the test of foreseeability.

12. Property rights can be protected either by a property rule or a liability rule. For a discussion of this distinction see Calabresi and Melamed (9). As is well known, contract law protects most contractual rights by way of a liability rule rather than a property rule (via compelling specific performance of a contract). Specific performance is invoked in the case of "unique" goods [Kronman (19a)].

13. See the discussion of judges' traditional reluctance to enforce penalty clauses in Goetz and Scott (16); cf. Clarkson, Miller, and Muris (12).

14. See Barton (1) and references cited in note 13 above.

15. For example, in the case of games of kidnap—games which are typically one-shot (no pun intended)—we are familiar with the difficulty of arranging exchange of victim for ransom in the absence of trust that the terms of exchange will be honored.

16. For an economic theory of the ethnically homogeneous middleman group as an institutional alternative to contract law, see Landa (24). See also Birmingham (5) where he discusses the role of Confucian moral law as an analog to the Anglo-American law of contract as a mechanism for deterring breach. See also Macauley (26) who discusses the importance of noncontractual elements in exchange relations.

The role of money as an institutional solution to problems of contract-uncertainty is developed at length in Landa (23). For an analysis of the role of money in substituting for trust in an exchange economy, see Gale (15).

17. There are five major Chinese dialect/linguistic groups within the Chinese community: the Hokkiens, Teochews, Cantonese, Hakkas, and the Hainanese.

18. Related issues arise in the literature on sociobiology in which the claim is made that altruistic behavior will vary with kinship distance as a function of similarity of the genetic pool [Becker (4), Boorman and Levitt (6), Trivers (33) and Dawkins (13)]. We, however, emphasize an egoistic choice calculus that looks at kinship distance in terms of minimizing transaction costs under conditions of contract uncertainty. Thus, we emphasize the importance of social linkages and these may or may not be genetically based; see Landa (24), Carr and Landa (10). Moreover, we emphasize the importance of a shared code of conduct as a basis for trust. Again, a shared code may exist among individuals who are not genetically linked.

19. Carr and Landa (10) have developed a general economic theory of trust embedded in homogeneous social groups. The *ethnic* boundary is a major boundary which defines the *limits* of trust or morality. The authors analyze the emergence of trust when members of homogeneous groups form clublike arrangements in which club sanctions can be imposed on club members who breach contracts. Their theory differs from an argument which posits trusting behavior among kinsmen [see, for example, Becker (3)].

20. *Winterbottom v. Wright*, 10 M. and W. 109, 11 L. J. Ex. 415 152 Eng. Rep. 402 (1842).

21. *MacPherson v. Buick Motor Co.*, 217 N.Y. 382, 111 N.E. 1050 (1916).

22. *Henningsen v. Bloomfield Motors, Inc.*, 32 N.J. 358, 161 A. 2d 69 (1960).

23. *Greenman v. Yuba Power Products, Inc.*, 59 Cal. 2d 57, 27 Cal. Rptr. 687 377 P.2d 897 (1963).

24. It should be noted that the concepts of restitution, reliance, and expectation interests are not usually used in divorce cases, but it is often possible to identify such interests when a marriage is dissolved.

25. For a discussion of these issues, see Mnookin and Kornhauser (27). See also Chambers (11).

26. On the economics of marriage, see Becker (2) and Becker *et al.* (4).

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