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Reputations, Relationships, and Contract Enforcement

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When the quality of a good is at the discretion of the seller, how can buyers assure that the seller provides the mutually efficient level of quality? Contracts that provide a bonus to the seller if the quality is acceptable or impose a penalty on the seller if quality is unacceptable can, in theory, provide efficient incentives. But how are such contracts enforced? While the courts can be used, doing so involves high real costs. Informal enforcement, involving a loss of reputation and future access to the market for any party that defaults on a contract, may often be a better alternative. This paper explores the use of both formal and informal enforcement mechanisms, provides a rationale for a variety of observed market mechanisms, and then generates a number of testable hypotheses.

1. *Introduction*

The ability to enter into binding agreements is recognized as an essential ingredient of economic growth.[1] All countries have developed legal systems that parties can rely on to enforce agreements. Yet, as Simeon Djankov et al. (2002) illustrate, there is enormous variation across countries in the cost of using formal mechanisms to enforce a contract. As a result, parties often resort to informal reputational mechanisms to enforce agreements. The importance of understanding informal contract enforcement is particularly topical given the burgeoning Internet market, where parties often have little recourse to formal courts of law to enforce obligations between buyers and sellers that may not reside in the same country.[2]

This paper provides a synthetic review of the literature on informal contract enforcement and explores the relationship between a concern for one's reputation and the effect of reputation on the efficiency and form of

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[1] See Avner Greif (2005).

[2] See Daniel W. Elfenbein and Josh Lerner (2003) for a discussion of the role of contracts in the organization of the Internet industry. Chrysanthos Dellarocas (2003) provides a useful review of reputation and feedback mechanisms in online markets.

contracts that are enforced informally. The theory begins with George A. Akerlof's (1970) observation that, in many markets, parties cannot observe all the characteristics of a good at the time of sale. He finds that, as a consequence, in many third world markets this problem is solved by relying on long-term relationships and the reputations of sellers. This review brings together two approaches to the study of informal contract enforcement. The first is based upon Benjamin Klein and Keith B. Leffler's (1981) idea that, in a free market, sellers of high quality goods treat their reputation as an asset that losses its value should they choose to supply goods of low quality. The second literature begins with L. G. Telser's (1980) insight that a self-enforcing agreement between two parties can be modeled as an equilibrium in a repeated game.

The idea that long-term relationships and reputations can enhance trade is well appreciated. Exactly how this is achieved in practice is much more complex and less well understood. Much of the literature on informal enforcement focuses on cases in which the sellers with good reputations charge an above-market clearing price. Yet the evidence in support of this model is rather thin. In the case of eBay, where a formal reputation system has been introduced, the effect of reputation on price is rather small (see Patrick Bajari and Ali Hortacsu 2004). Moreover, fraud is still widespread.[3]

Online auctions are relatively new institutions and, hence, it is not surprising that there is still much room for improvement. In particular, if we look at commercial sales contracts that have evolved over a much longer time, we find that they can be very complex and detailed (see Stewart Macaulay 1963). Recent work by Abhijit V. Banerjee and Esther Duflo (2000) finds that, in the case of Indian software suppliers, reputation is important but it is not associated with the quality of the product itself. Reputation depends instead on the level of postsupply service. Therefore, understanding observed contracts requires an analysis of cases that are more complex than the single price model widely used in the literature.

This review highlights recent results about the role that reputations play in enforcing elaborate contracts. The key insight is that reputation should be based upon whether or not a party has breached an agreement and not upon quality per se. When a contract uses *formal enforcement*, breach is the event that gives the harmed party the right to appeal to an impartial third party to obtain monetary damages from the breaching party. The third party may be a court of law or, in the case of international disputes, it may be arbitrators that have been agreed upon in advance. Contract law is concerned with the question of determining whether or not a breach has occurred and, if so, what damages should be given in light of the contract that the parties have signed.

In contrast, under *informal enforcement* the harmed party unilaterally decides that breach has occurred and then carries out actions that harm the reputation of the breaching party. This has the benefit of reducing enforcement costs because punishment can be inflicted immediately. However, in order for the reputational mechanism to work well, it must be the case that the parties do not behave opportunistically. Hence, the evolution of successful informal agreements depends upon a number of interlocking elements, including a mutual understanding of the events that determine contract breach, the actions that the harmed party may take in response to the perceived breach, and, finally, the effect of the harmed party's actions on the breaching party's reputation.

The review is organized around each of these elements. I begin with Oliver E. Williamson's (1975) observation that contract form depends upon the economic

[3] See the recent news story in the *Sunday Times* of London, February 26, 2006, "Ebay Fraud on the Rise," and Loretta Chao (2006).

characteristics of the good or service traded. In section 2, a model of production is introduced that is sufficiently rich to capture the main themes in the literature. The model parameterizes goods and services as functions of the frequency of trade and the relationship between quality and performance.

It is assumed that the seller's effort enhances the quality of the good, measured by the probability that performance is high. A contract is needed because neither the seller's effort nor the probability of high performance is observed at the time of sale. Section 3 discusses three generic contracts that can ensure product quality. These contracts are differentiated by the events that result in a breach of an obligation by either the seller or the buyer:

1. *Standard Sales Contract*: In exchange for a fixed price, the seller agrees to provide goods or services with a specified performance. If performance is not adequate, then the seller has breached the agreement.
2. *Warranty Contract*: The seller agrees to provide the good or service with an explicit warranty. If the good or service fails to perform as agreed upon, then the seller agrees to pay the buyer a prespecified sum. In this case, breach of contract occurs if the seller does not make good on a promised warranty payment.
3. *Bonus Contract*: In addition to the fixed price, the buyer agrees to pay a bonus as a function of the realized quality. Breach of contract occurs if the buyer does not make good upon the bonus payment.

Each contract can be viewed as a legally binding agreement that differs in the events that lead to a breach of contract. In the absence of any contract or reputational concern, the seller would always choose the lowest level of effort. In the case of the standard sales contract, if a breach occurs, then the buyer has the right to ask the seller for damages due to poor performance, which in turn provides an incentive to raise quality. If formal enforcement could be done at no cost, the standard sales contract and the warranty contract would be equivalent when the court sets damages equal to what parties would privately choose for a warranty payment. Thus, in the absence of transactions costs, these three contract forms all implement the efficient level of effort.

Next, I consider in turn how transactions costs, first from informal contract enforcement and then formal contract enforcement, inform the choice of contract form. Section 4 discusses how a seller's or buyer's concern for their reputation enhances contract performance. The basic idea of Klein and Leffler (1981) is that a party that breaches faces a loss in his or her reputation. If one can assign a value to one's reputation, one can reformulate the problem as a one period contract problem in which each party trades off the benefit of breaching against the cost of losing one's reputation. When the seller cannot perfectly determine quality, the simple sales contract is never efficient. Depending upon the characteristics of the good or service, it is optimal to use either a warranty or a bonus contract.

Section 5 reviews the different models of reputational capital. In terms of contract enforcement, one simply needs the breaching party to face some future loss when their reputation is tarnished. Different informal contract enforcement institutions correspond to different mechanisms by which a loss in reputation leads to a cost to the breaching party. This approach begins with a carefully specified game, followed by an analysis of the equilibria of this game. The mechanisms include relational contracts, where all punishments are carried out within a bilateral relationship, and community enforcement, where the other parties in the market participate.

Section 6 provides a brief discussion of formal contract enforcement. The focus is on the literature that explores the trade-off between formal and informal contract enforcement. Djankov et al. (2002) document the huge variation in the quality of formal

enforcement across a large sample of nations. Their results raise an important question about the extent to which formal or informal enforcement are substitutes. A simple model of formal enforcement that parameterizes the quality of law is introduced that allows us to explore this trade-off. The paper concludes with a summary of the results from this literature and questions for future research.

2. *An Illustrative Model*

In this section, I introduce a simple model that illustrates many themes of the literature. The model is sufficiently rich that it includes as a special case the continuous time efficiency wage model of Carl Shapiro and Joseph E. Stiglitz (1984). This will allow comparison of the results of this very popular model with the more formal recent literature that relies on repeated game theory.

Williamson (1975) has emphasized that contract and organizational choice depends upon the characteristics of the good or service exchanged. Thus, I characterize the good or service traded by three parameters: the frequency of trade, the effort of the seller, and the relationship between effort and the ultimate performance of the good or service.

The frequency of trade is the number of times trade/contracting can occur in a period. It is denoted by $f = \frac{1}{\Delta}$ where $\Delta > 0$ is the length of time for a single transaction. I follow Dilip Abreu, Paul R. Milgrom, and David Pearce (1991) and suppose that the flow of benefits and costs, as well as the flow of information, remains fixed. Thus, increasing f decreases the value of a single transaction as well as the amount of information regarding the quality of the good. This allows one to explore the effect of changing the arrival time of information while holding the value of trade per period fixed.

During the period of length $\Delta = \frac{1}{f}$, the seller selects effort q, normalized to be between 0 and 1. This normalization allows one to interpret effort as a probability whenever convenient. As a matter of convention, $q = 0$ denotes low effort, while $q = 1$ denotes high effort. The flow cost of quality is $c(q)$, where $c, c', c'' > 0$ and $c(0) = 0$.

Effort determines the quality and the performance of the good as follows. In each period, there is either a good or bad performance realization, denoted by $\lambda_g(q,f)$ and $\lambda_b(q,f) = 1 - \lambda_g(q,f)$, respectively. It is assumed that the probability of the good state is increasing with effort, namely, $\partial\lambda_g/\partial q > 0$.

Two extreme payoff specifications are considered that correspond to two important classes of goods and services. The first is the class of *normal goods*. These are goods or services that usually perform well but sometimes fail. Modern consumer goods tend to have this feature. More precisely, the buyer receives a flow utility of v from consumption of the good. When poor performance occurs, buyers face a capital loss, L, corresponding either to the harm caused to the buyer (the failure of the good causes an accident) or from the cost of repair. The infrequent likelihood of failure is captured by the assumption

$$\lim_{f\to\infty} \lambda_b(q,f) = 0.$$

For calculation purposes, it is assumed that this probability can be parameterized by the Poisson parameter, $-\gamma(q)$, and, hence, $\lambda_b(q,f) \simeq -\gamma(q)/f$ and $\lambda_g(q,f) \simeq 1 + \gamma(q)/f$. It is assumed that $\gamma(1) \leq 0$ and $\gamma' > 0$.

If one sets $\gamma(1) = 0$ and $\gamma(0) < 0$, then this corresponds exactly to the efficiency wage model of Shapiro and Stiglitz (1984). In that case, if the worker chooses high effort ($q = 1$), the bad event never occurs. When the worker shirks ($q = 0$), the bad event follows a Poisson process. This model is rather restrictive for two reasons. First, even when a worker does not shirk, there may be adverse events. In that case, as is discussed in more detail below, the strategy of paying a high wage to deter shirking will no longer be optimal.

Second, for some types of services, it is the good, not the bad, outcome that is relatively rare. For example, consider research and development activities that lead to industrial patents. For such services, effort is typically unsuccessful, with good outcomes occurring only once in a while. I call this class of goods and services *innovative goods*. In those cases, it is assumed that, when there is a good outcome, there is a capital gain of $G > 0$. This outcome is generated by a Poisson process satisfying $\lambda_g(q,f) \simeq \gamma(q)/f$. In this case, the Poisson parameter satisfies $\gamma(0) \geq 0, \gamma'(q) > 0$ for all $q \in [0,1]$.

Payoffs are expressed in either flow or stock terms, depending on which provides the most convenient expression. Flow terms are in lowercase, while stock terms are in upper case. We can summarize the discounted payoff from trade in period t for the buyer and seller as follows:

$$\text{Buyer: } U_t^B(q_t,f) = d(f)(\nu - p_t) + \begin{cases} \lambda_g(q_t,f)G, & \text{innovative good,} \\ -\lambda_b(q_t,f)L, & \text{normal good,} \end{cases}$$

$$\text{Seller: } U_t^S(q_t,f) = d(f)(p_t - c(q_t)).$$

The term $d(f) = \frac{(1-\delta)}{r}$ is the value of one period of flow returns, and $\delta = e^{-r/f}$ is the one period discount rate. All variables subscripted by t are potentially time varying. The quantity that maximizes the sum of payoffs is characterized by the first-order condition

$$(1) \qquad d(f) \cdot c'(q^*) = \partial\lambda_g/\partial q \times \begin{cases} G, & \text{innovative good,} \\ L, & \text{normal good.} \end{cases}$$

Observe that for high frequency trade the marginal effect of quality upon the probability of a good event is approximated by

$$\partial\lambda_g/\partial q = -\partial\lambda_b/\partial q \simeq \gamma'(q)/f.$$

It is assumed that both the buyer and the seller can observe realized performance *after* trade has occurred. Only the seller can observe effort and the realized quality of the good as measured by the probability of good performance. Thus a contract between the buyer and the seller is needed to ensure that the seller supplies the desired level of quality. This contract will determine the payments, p_t, between the buyer and the seller as a function of the contract terms and conditions.

3. *Breach and Contract Form*

> The duty to keep a contract at common law means a prediction that you must pay damages if you do not keep it and nothing else.
>
> Oliver Wendell Holmes, *The Path of Law*, 1897.

The economic and legal notions of contract are quite distinct. The former is concerned with explaining the structure of actions and transfers as a function of the characteristics of the environment, while the later is concerned with enforcement. The economics literature is not typically very clear about this distinction, yet the difference is crucial to understanding the role of informal enforcement.[4] This section contrasts the economic and legal approaches, and shows how they can be combined to organize the literature on formal and informal contract enforcement.

The economic approach supposes that for each event there is a well defined and feasible monetary transfer and action. The distinction between complete and incomplete contracts turns upon whether or not the contract provides a complete specification of transfers and actions at the time the contract is written. An incomplete contract is one for which some of the terms are determined after trade has begun, typically using a formal model of renegotiation.

[4] See Alan Schwartz (1992) for an excellent discussion of the economic and legal approaches to contract formation.

Formally, both the complete and incomplete contract theories provide a complete specification of actions and transfers that occur in the relationship. A shortcut that is made in both literatures is to assume that any feasible action that is specified to occur, conditional upon a verifiable event, is enforceable. The implicit assumption is that the courts would impose a penalty sufficiently large that parties *choose* to carry out such actions.

This assumption is the dividing line between the economic theory of contract and the theory of contract law. Contract law begins at the point at which one party *breaches* the contract and then asks what remedy (or penalty) should the breaching party pay to the harmed party. Formal enforcement entails the following sequence of actions. First, one party must breach the agreement. At that point, the harmed party must decide whether or not to sue the breaching party. If both parties correctly anticipate the consequence of a court decision then, for the vast majority of cases, there will be a settlement and the harmed party will receive an amount corresponding to what he or she would have got in court. See Benjamin E. Hermalin, Avery W. Katz, and Richard Craswell (forthcoming) for an excellent and comprehensive review of the literature on contract law that addresses these issues.

If there is disagreement regarding the probable outcome in court, then the case might proceed to trial. There is a literature on the law and economics of litigation that explores the conditions under which parties might go to court, and how various legal rules affect settlement and the decision to pursue a suit in court (see Kathryn E. Spier 2006 for an excellent review of this literature). In this paper, I am concerned with the trade-offs between no contract, formal enforcement, and informal enforcement. Thus, I adopt a very elemental model of formal enforcement. Since formal enforcement requires the courts to verify that breach has occurred, there is a cost to writing a formal contract and associated instruments that allow the verification of performance (see Surajeet Chakravarty and W. Bentley MacLeod 2004 for a detailed discussion of construction contracts illustrating this point). Second, when there is a breach, there will be a cost for recovery even if parties avoid a court case. The effect of this on contract form is discussed in more detail in section 6.

An important design element crucial to this discussion is the definition of the breach event. For a given transaction, there will be a number of ways that parties can define breach, the choice of which depends on the enforcement mechanism used. This can be illustrated with the simple model of section 2. Consider the complete contingent contract given by $C = \{P, P_g, P_b\}$, where P is the amount that the buyer pays to the seller (or vice versa if P is negative) when the contract for delivery is agreed upon. The price P_g is paid to the seller at the end of the period if the good has high performance, while P_b is paid if it has low performance. The payoff to the buyer and seller under this contract is given by[5]

$$U_t^B(q_t, f, C) = d(f)v - P + \lambda_g(q_t, f)(G - P_g) - \lambda_b(q_t, f)(L + P_b),$$

$$U_t^S(q_t, f, C) = P + \lambda_g(q_t, f)P_g + \lambda_b(q_t, f)P_b - d(f)c(q_t).$$

Given this contract, a utility maximizing seller will choose effort to satisfy

$$C'(q) = d(f)c'(q) = (P_g - P_b)\partial\lambda_g/\partial q, = d(f)(p_g - p_b)\partial\lambda_g/\partial q.$$

where P_g and P_b are the state contingent prices in stock terms. This expression implies that effort increases with $(P_g - P_b)$. If one sets $(P_g - P_b) = G + L$, the seller chooses

[5] Notice that these expressions are valid for both normal goods, where there is a potential loss ($L > 0$ and $G = 0$) and innovative goods where this is a possibility of lump sum gain from the good ($G > 0$ and $L = 0$).

the efficient level of effort. If trade is efficient, then, given any P_g and P_b satisfying this condition, the parties can choose a trade price, P, that makes them both better off if they trade.

These observations show that when the buyer and seller are risk neutral, as long as the signal of performance is informative, one can achieve the first best. However, it is also the case that the theory cannot always deliver a unique prediction. The principal–agent literature is able to generate a prediction in this case by supposing that the parties are risk averse and, hence, the optimal contract trades off the efficient allocation of risk against efficient effort incentives. A weakness of this theory is that contract form is a function of the risk attitudes of the buyer and seller, information that is very difficult to collect in practice. Moreover, as Robert Gibbons (1997) and Canice Prendergast (1999) observe, there is little empirical evidence to support principal–agent theory.

I show that the Williamson (1975) approach that explicitly allows for transactions costs can result in some testable implications. The key observation is that an enforceable contract must explicitly define breach of contract, which in turn has implications for whether one uses formal or informal contract enforcement. One can effectively review the literature by focusing upon the properties of three generic contract forms: the simple sales contract, bonus contract, and warranty contract.

The simple sales contract sets $P_g = P_b = 0$ and merely requires the seller to supply the good. If sellers vary in their quality in ways that are not observable to the market, then this corresponds to the famous market for "lemons" described by Akerlof (1970). He shows that, when there is heterogeneity in quality, only low quality sellers would enter the spot market for goods and services. This is because the spot-market price would reflect the average quality of the goods traded and, hence, sellers with above average quality exit the market. The same argument applies to the moral-hazard context considered in this paper. Suppose there are no long-term contracts and the seller first chooses quality before entering the market. Quality is now an inherent feature of the good and one can apply Akerlof's adverse selection reasoning to conclude that sellers would never choose high quality if the prices of their goods are fixed by the average quality of goods in the market. There are a number of resolutions to this problem that vary with the definition of the breach event.

One approach is to enforce the contract as written, with the additional promise by the seller that the good will perform. In that case, if the good did not perform, then the seller has breached his or her obligation and the buyer may now sue for damages in a court of law. In those instances, breach is determined by the quality of the good, which in turn is under the control of the seller. The standard remedy in the United States for breach of contract is expectations damages. This is the difference in value between the seller's promise and what the buyer received. In this example, expectations damages would be equal to $G + L$. These damages in turn provide the seller with the incentive to select efficient effort.[6]

Court enforcement is costly, so, if the frequency of poor performance is relatively high and the cost of enforcement greater than the potential recovery, the buyer may not bother with a court case. This observation provides a moral-hazard perspective on Akerlof's market for lemons (that is implicit in the original paper). Namely, if formal enforcement is sufficiently expensive, there may be a complete breakdown in the market if trade is not profitable when effort is low. In other words, the *quality of law* may affect the volume of trade (see Djankov et al. 2002 for evidence on how

[6] It is worth observing that the standard justification for expectations damages is that they provide incentives for *efficient breach*. As William P. Rogerson (1984) observes, expectation damages do not always provide efficient incentives.

the quality of law may affect economic growth).

Klein and Leffler (1981), building upon Milton Friedman's (1962) ideas, argue that, in a free market, sellers who supply goods with poor performance will lose their reputation and hence future sales. This will deter the provision of poor performance. In this model, reputation can be viewed as an asset, which I denote by *RKS*—the reputational capital of the seller. The seller with reputational capital *RKS* charges a higher price that Klein and Leffler interpret as a return to this capital. The value of this capital (and hence the return) becomes zero whenever the seller supplies a good with low performance. The literature on reputation can be viewed as providing different concrete models of reputational capital.

Observe that both formal and informal enforcement entail a contract—an exchange of promises under which the seller agrees to provide a specified level of quality in exchange for a price. The distinction between formal and informal enforcement turns upon the consequences of breach. Under formal enforcement, there is a procedure where the buyer recovers a loss as a function of the seller's breach. Formal enforcement therefore includes any dispute resolution mechanism, including courts, arbitrators, and mediators. Under informal enforcement, the seller is punished via the effect of the breach on his *future* payoff. As a consequence, following I. R. MacNeil's (1974) paper "The Many Futures of Contracts," informal enforcement is often associated with the term *relational contract,* although, as I discuss below, there are a variety of informal mechanisms used in practice to ensure that parties abide by their agreements.

There is a voluminous literature that follows the Klein and Leffler model, beginning with the well-known efficiency wage model of Shapiro and Stiglitz (1984), that supposes that the seller charges a fixed price and the buyer terminates his or her relationship when performance is substandard. Indeed there is a general perception, beginning with Stiglitz's (1987) review of the literature, that informal enforcement is necessarily associated with a quality-assuring price.

As Akerlof (1970) observes, there are many institutions that have evolved to address the problem of assuring adequate quality. Within the context of my simple model, both warranty and bonus contracts, when combined with informal enforcement, can also enhance quality. As I shall show, they can do so more efficiently than a quality-assuring price. The bonus contract, introduced by Clive Bull (1987), $C^B = \{P,B\}$, requires the buyer to pay the seller a price P ex ante, and a bonus B should the good have high performance ($P_g = B$ and $P_b = 0$ in terms of the state contingent contract). If $B = L + G$, then such a contract provides a first best incentive. In this case, as Bull (1987) observes, the *buyer* holds the reputation. We can suppose that, if good performance occurs and the buyer *breaches* his or her obligation to pay the bonus B, then he or she loses reputational capital, which we denote by *RKB*. Not only is bonus pay a theoretical possibility but, as Charles Brown (1992) and MacLeod and Daniel Parent (1999) document, such bonus arrangements are very common in the United States.

Finally, under a warranty contract, the seller offers the contract $C^W = \{P,W\}$, where the buyer pays a price P, and the seller agrees to pay W should the good have low performance. If $W = L + G$, then the seller has an incentive to choose the efficient effort level. For consumer goods, warranties are of course extremely common. (See D. N. P. Murthy and I. Djamaludin 2002 for a review of the literature). Observe that, under a warranty contract, the production of a defective good *does not* result in a breach of contract. Only if the seller refuses to compensate the buyer is there a breach. I shall show below that, in the typical case of goods with positive probability of having a defect, warranty contracts are always superior to the

simple sales contract with a quality-assuring price.

This result is consistent with the ubiquitous use of warranty contracts and may help explain why it has been difficult to obtain direct evidence in favor of the quality-assuring price model. Hence, a complete understanding of how informal enforcement can enhance contract performance requires one to explore the properties of other contract forms in addition to the simple fixed price contract. In general, it is preferable to condition an individual's or firm's reputation on events that can be controlled with certainty, such as bonus pay or warranty payments, rather than on factors that may be difficult to control perfectly, such as product quality. In the next section, the question of how to create and sustain a reputation is discussed in more detail.

4. *Reputational Capital, Contract Form, and Quality*

This section illustrates how one may generalize Klein and Leffler's (1981) idea that a reputation is an asset whose value is destroyed when a seller or buyer breaches their obligation. In doing so, one can show that the issue of performance incentives is separate from the question of how to create and maintain reputational capital.

Empirically this distinction is useful because it generates implications that depend only upon a measure of the size of an individual's or firm's reputational capital. A separate issue will be the market mechanisms that are used to sustain the value of one's reputation.

I begin with the idea that an individual is endowed with a level of reputational capital *RK*, where *RKS* denotes the seller's reputational capital and *RKB* the buyer's reputational capital. This capital maintains its value as long as the individual does not breach his or her contractual obligation. The concept of a contract and associated breach provides a precise way to define what we mean by trust: we trust a person if we can rely upon that person to carry out his or her obligations.

It is assumed that an individual arrives at a transaction with a commonly known reputational capital *RK*. If a person breaches an obligation, then he or she loses all capital and its value becomes zero. Klein and Leffler observe that, if one views reputational capital as an asset, then this implies that the competitive price for a good should include the cost of the reputational capital. This is captured by imputing a return r' to the capital, that in turn may lead to a higher price. This results in an opportunity cost of $r'RK$. When integrated over a period, the per period return on reputational capital is:

$$r'RK \cdot d(f).$$

This return is the *risk adjusted* return on reputational capital.[7] I shall show that, if an agent can perfectly protect the value of his or her capital, then $r' = r$, the risk free return. In some cases, the agent cannot perfectly control the events that may lead to a breach of contract and subsequent loss of reputational capital. In those cases $r' > r$.

Three generic contract forms are considered in the review. Let us begin with the simple sales contract.

4.1 *Sales Contracts*

Klein and Leffler (1981) consider a simple sales contract offered by sellers in a competitive market, where the seller profits are normalized to zero. Under such a contract, the seller agrees to supply a good with high performance at flow price p. The one period payoff from trade is

$$U^S(q,f) = d(f)(p - r'RKS - c(q)) - \delta\lambda_b(q,f)RKS.$$

In this expression, $d(f)$ transforms the flow from one period into a stock, p is the

[7] See Steven Tadelis (1999) for a formal model of reputational capital as a tradeable asset.

flow price, $r'RKS$ is the flow cost of the seller's reputational capital at the risk adjusted rate of return r', $c(q)$ is the cost of quality, and $\delta = e^{-\frac{r}{f}}$ is the one period discount rate. With probability λ_b, the seller produces a good with low performance. Under the Klein–Leffler model, this results in a complete loss of the seller's reputational capital RKS.

Taking reputational capital as exogenous, the quality and price of the good are determined by

$$c'(q) = \frac{\delta}{d(f)} \frac{\partial \lambda_g(q,f)}{\partial q} RKS, \tag{2}$$

$$p = c(q) + \left(r' + \frac{\delta \lambda_b(q,f)}{d(f)} \right) RKS. \tag{3}$$

The first expression follows from the fact that

$$\frac{\partial \lambda_g(q,f)}{\partial q} = -\frac{\partial \lambda_b(q,f)}{\partial q}.$$

Thus we have the quality of the good increasing with the reputational capital of the seller. The second expression shows that the price is equal to the cost of production plus a term that is increasing with the level of reputational capital. The total gain from trade for a sales contract, s^s, as a function of reputational capital and expressed as a flow is given by

$$\begin{aligned} s^s(RKS,f) &= \nu - c(q) \\ &+ \frac{1}{d(f)} \{\lambda_g(q,f)G - \lambda_b(q,f)L - \\ &(r' \cdot d(f) + \delta \lambda_b(q,f))RKS\}. \end{aligned} \tag{4}$$

Under the normalization that each party's alternative payoff is zero, then trade is efficient if and only if $s^s(RKS,f) \geq 0$. The direct effect of reputational capital is to lower the gain from trade. The benefit operates via its effect upon the quality chosen by the seller.

An important case is the continuous time model popularized by Shapiro and Stiglitz (1984). They introduce a continuous time version of the efficiency wage model in which the probability that the employer observes the worker shirking in a period of length Δ is $-\Delta\gamma(0)$. This is a special case of our model for normal goods ($G = 0$, $L > 0$) with no defects occurring when effort is high ($q = 1$) and one lets the frequency of trade grow arbitrarily large. In the Shapiro and Stiglitz model, the reputational capital corresponds to the loss the worker faces when one returns to the pool of unemployed workers. If we take the limit of the flow surplus in this case, one has

$$\begin{aligned} \lim_{f \to \infty} s^s(RKS,f) &= \nu - c(q) \\ &- \gamma(q)L - (r' + \gamma(q))RKS, \\ c'(q) &= \gamma'(q)RKS, \\ p &= c(q) + r'RKS. \end{aligned}$$

As before, an increase in reputational capital results in higher quality and higher prices, a prediction that does not depend upon the frequency of trade. If the market were perfectly competitive, then $p = c(q)$, but in order to provide an incentive to supply high quality the seller earns a quality assuring premium $r'RKS$.

The situation is very different for the case of innovative goods, where $L = 0$, $G > 0$, and the probability of a good event occurring in a period of length Δ is approximately $\Delta\gamma(q)$. In this case, we have the following limits:

$$\lim_{f \to \infty} s^s(RKS,f) = \begin{cases} \nu + \gamma(0)G, & RKS = 0 \\ -\infty, & RKS > 0. \end{cases}$$

In other words, either there is no effort, or the total surplus is unbounded below. The reason is quite intuitive. Incentives under the sales contract are provided by the threat of destroying the seller's reputation whenever there is bad performance. The problem is that, for an innovative good, the probability of bad performance over a short period is close to one.

A version of this result was first shown by Abreu, Milgrom, and Pearce (1991). In a repeated game framework with imperfect

monitoring, they show that, when the likelihood of good news goes to zero over short periods, there are no cooperative equilibria. Parties have two ways to respond to this problem.

If one uses a sales contract for the provision of innovative goods, then parties will choose to set the frequency of trade lower than the feasible level. As noted earlier, an example of this is the employment contract for individuals working in research and development. In that case, one would set the period of evaluation to be longer than for employees involved in the production of normal goods. For example, janitorial staff might be fired if they did not properly perform their tasks in a week, while research and development staff are more likely to be evaluated annually or on a multiyear basis. There are papers that explicitly look at the theory of contract length, although this literature focuses upon either risk factors or the effect of relationship-specific investments upon contract length.

Shapiro (1983) and Rogerson (1983) provide an extensive analysis of the sales contract as a function of the information environment. They find that, as a rule, the lag in information flows to the market implies that, in general, reputation effects, while ensuring a positive level of quality, are not typically sufficiently strong to ensure the first best. In both papers, it is explicitly assumed that buyers learn about product quality only after they have purchased the good.

In practice, most consumer contracts allow for warranty clauses that insure buyers against adverse outcomes. In such cases, a seller's reputation can depend upon whether or not she or he can be relied upon to pay the warranty. Given that the seller can easily control that choice, I shall show that this enhanced control in turn lowers the cost of informal enforcement.

4.2 *Warranty Contracts*

Consider first the informal enforcement of a warranty contract with price term P and warranty payment W. Under this contract, the seller agrees to pay the buyer an amount W whenever the good does not perform. The argument demonstrating that a sales contract may lead to zero provision of quality for innovative goods also applies in this case. Hence, I consider warranty contracts only in the context of a normal good.

Under a warranty contract, breach occurs if the seller does not pay the warranty when the good has low performance. He will choose not to breach if and only if the gain from not paying the warranty, W, is less than the loss of reputational capital:

$$W \leq \delta RKS. \tag{5}$$

Given this, the buyer would refuse any contract that does not satisfy this condition. Thus we may suppose that, in a competitive market, the seller offers a warranty contract commensurate with their reputation, in which case the payoff and first-order condition for effort are

$$U^S(C^W) = P - d(f)(c(q) + r'RKS) - \lambda_b(q,f)W, \tag{6}$$

$$c'(q) = \frac{1}{d(f)} \frac{\partial \lambda_g(q,f)}{\partial q} W. \tag{7}$$

Increasing the warranty increases the incentive the seller has to provide quality. The total gain from trade in flow terms is now given by

$$s(RKS,f,C^W) = \nu - c(q) - \frac{1}{d(f)} \lambda_b(q,f)L - r'RKS.$$

If one compares this expression with expression 4, one can see that the warranty contract results in a more efficient relationship. Under a sales contract, each time there is low performance there is a pure social loss in terms of the seller's reputational capital. In contrast, under a warranty contract this event triggers a transfer to the buyer and, hence, total surplus remains unaffected.

Second, the warranty contract is more efficient when there is heterogeneity in the level of reputational capital. If a seller has a particularly strong reputation for trustworthiness, so that $\delta RKS \geq L$, then it is efficient to set the warranty $W = L \leq \delta RKS$. That is, contracts allow parties with strong reputations to fine tune the terms of the agreement to achieve efficient effort. This is not possible in the Klein and Leffler model based upon the sales contract. There, firms with strong reputations will overinvest in effort to avoid losing their reputation. This has the empirical prediction that the quality of the good does not necessarily vary with the reputation of the seller, although since reputation is priced into the contract, price will vary with reputation.

In cases where the frequency of trade is high ($f \to \infty$), the warranty contract can implement the efficient level of quality. However, as in the case of the sales contract for innovative goods, it is not possible to support a positive level of quality when the frequency of trade is high. In this case, the first best is achieved with the use of a bonus contract.

4.3 *Bonus Contracts*

A bonus contract, $C^B = \{P,B\}$, entails an up-front payment P and a bonus paid by the buyer to the seller when performance is high. In this case, it is the buyer, not the seller, who must hold the reputational capital RKB. In order to mirror the case with warranty contracts, suppose that the buyer is competing with many other buyers to purchase the services of a seller supplying an innovative good. (MacLeod and James M. Malcomson 1989 formally show that, when the buyer is on the long side of the market, the optimal renegotiation proof contract uses a bonus).

In this case, the buyer and the seller have the following payoffs:

$$U^B(q,f,C^B) = d(f)(\nu - p - r'RKB) + \lambda_g(q,f)(G - B),$$

$$U^S(q,f,C^B) = d(f)(p - c(q)) + \lambda_g(q,f)B.$$

The incentive constraint that ensures the buyer does not breach the contract is

$$B \leq \delta RKB, \tag{8}$$

while the seller chooses quality to satisfy

$$C'(q) = d(f)c'(q) = \frac{\partial \lambda_g(q,f)}{\partial q} B. \tag{9}$$

If the buyer's incentive constraint is binding and the bonus is set at the efficient level, $(B = G)$, the flow price of the good is given by:

$$p = \nu - r'RKB.$$

In this case, an increase in the reputational capital of the buyer results in a price reduction. Conversely, the reputational capital of the seller has *no effect* on the price because it is the buyer who makes the substantive decision whether or not to breach the agreement via the bonus decision.

If one lets the frequency of trade increase, one obtains expressions that mirror those in the warranty case.

4.4 *Subjective Evaluation*

The models of informal enforcement I have discussed are based upon a class of models where information is assumed to be nonverifiable yet observable by both parties. George Baker, Gibbons, and Kevin J. Murphy (1994) suggest that these models may also be used to model situations where the buyer (in their case the employer) has a subjective evaluation of performance upon which the employer bases bonus pay to the seller (worker). For simplicity, they suppose that the seller has the same information as the buyer. Hence, punishment in terms of tarnishing the buyer's reputation occurs if and only if the buyer does not pay a bonus, even though the subjective evaluation of the buyer is positive.

The more realistic situation is one for which the buyer and seller have different assessments of performance. What makes these assessments subjective is the fact that they are private information for each individual. The design of an optimal contract with subjective evaluation has been recently done by Jonathan Levin (2003) and MacLeod (2003). Levin (2003) builds upon the theory of repeated games with asymmetric information developed by Michihiro Kandori and Hitoshi Matsushima (1998) and by Olivier Compte (1998) and extends the analysis of MacLeod and Malcomson (1989) to allow for asymmetric information.

Levin shows that the optimal contract, when shocks are i.i.d., takes a simple and intuitive form. Each period the seller receives the same fixed income plus a bonus if the buyer's subjective (and unobserved) performance is above a specified level. If not, the seller is paid his or her fixed price portion of compensation and dismissed. MacLeod (2003) extends this analysis to the risk averse case. In addition, he shows that one can use a reduced form, static model to analyze this problem, much as I have done above.

Asymmetric information places some severe constraints upon the optimal contract. This can be illustrated in a simple two state example taken from section 3 of MacLeod (2003). Suppose that effort q is the probability of a good outcome, that is: $\lambda_g = q$. If the bad outcome occurs, then both seller and buyer know this. If the good outcome occurs, both the buyer and seller have imperfect evaluations regarding whether high performance has occurred. Let γ_{ij} be the probability that the buyer observes signal i and the seller observes signal j, where $i,j \in \{U,A\}$, and U implies unacceptable performance, while A corresponds to the acceptable performance.

Neither the seller nor the buyer can observe the other person's private signal and, hence, the contract must be *incentive compatible* in the sense of Roger B. Myerson (1979). That is, each party must be willing to voluntarily reveal truthfully their subjective evaluations. MacLeod (2003) shows that the optimal incentive compatible contract takes the form of bonus pay:

Proposition. *Suppose that beliefs are positively correlated* ($\gamma_{AA}\gamma_{UU} - \gamma_{AU}\gamma_{UA} > 0$). *Then the optimal contract with subjective performance implementing effort* q *has the form:*

	Seller's Signal A	Seller's Signal U
Buyer's A	$(-b-w, b+w)$	$(-b-w, b+w)$
Signal U	$(-\delta RKB - w, w)$	$(-w, w)$

where the bonus satisfies: $b = C'(q)/(\gamma_{AA} + \gamma_{AU})$; *the optimal amount of reputational capital:* $\delta RKB = C'(q)/\gamma_{AA}$; *and the wage satisfies* $w = C(q) - qC'(q)$.

Contract design with subjective evaluation is formally a problem of making the pay to the seller a function of the private information held by both the seller and buyer. Myerson and Mark A. Satterthwaite (1983) have shown that, in general, there is a social cost to obtaining this information, which in this model is generated by the loss of reputation. The substantive result here is that it is efficient for the buyer to hold the reputation for performance, a reputation that is lost whenever the buyer believes the seller has not performed adequately, while the seller believes performance is acceptable.

In order to have truthful revelation of information, it must be the case that the agent's payoff is *independent* of the information revealed, otherwise he or she would reveal only the information most favorable to her or his payoff. In the case of the seller, all he or she has to do is bad mouth the buyer so that the buyer loses his or her reputation. Conversely, in order that the buyer truthfully reveal his or her information, he must be *indifferent* between paying and not paying the bonus. Given the buyer's reputational capital, *RKB*, this implies that the bonus must satisfy:

$$b = \delta \frac{\gamma_{AA}}{\gamma_{AA} + \gamma_{AU}} RKB.$$

In contrast to the previous case, here we must have an equality and, hence, variations in a buyer's reputation will lead to variations in the bonus paid.

The need to have equality illustrates that equilibria with asymmetric information are quite delicate. The purely game theoretic analyses of Kandori and Matsushima (1998) and Compte (1998) with two-sided asymmetric information are very complex precisely because, in the absence of a contract, mixed strategies must be used to ensure that both parties satisfy the appropriate incentive constraints. Contracts greatly simplify matters because they move all reputation effects to one party and, hence, only one of the two incentives constraints for the revelation of private information is necessarily binding.

Observe that the probability that both parties feel that performance is acceptable is γ_{AA}. For smaller γ_{AA}, the size of the bonus that can be supported with a given level of reputational capital falls. In other words, the cost of obtaining performance is a function of the extent to which the buyer and seller agree regarding the seller's performance.

If $\gamma_{AU} = \gamma_{UA} = 0$, then both buyer and seller always agree and we are in the case for which information is symmetric but unverifiable, as studied in MacLeod and Malcomson (1989). In this case, one can achieve first best quality because the threat to disagree is never exercised in practice. This result illustrates the role that corporate culture and individual beliefs play in determining the efficiency of an organization. Firms that are able to ensure employees have common performance expectations are able to be more productive at a lower cost.

In order to increase the probability of a good signal, it is optimal for the buyer to review the performance of the seller for several periods before making a decision. Hence, optimal contracts for innovative goods when evaluations are subjective entail the use of reviews less frequent than the usual frequency of performance evaluation. Recently, William Fuchs (forthcoming) has extended this insight to endogenize the monitoring period. He finds that it may be optimal for the principal to conceal her or his evaluation of the agent's performance until the end of the period, a practice that is consistent with casual empiricism.

Second, at the time of evaluation, the buyer must report his or her information to the seller. This ensures that, at the beginning of the next period, the seller and buyer will act upon the same information. In contrast, if this were not required, the buyer might condition future actions upon his or her private information. The seller would then be in the position of trying to decode the meaning of the buyer's actions. This creates an extremely complex Bayesian game, which at the moment has no known solution. The requirement that the buyer report his observations to the seller is rather intuitive, and it is consistent with the advice of management texts that encourage managers to provide feedback to employees regarding how their performances are perceived (see, for example, George Milkovich and Jerry Newman 1996).

5. *What is Reputational Capital?*

> Rep·u·ta·tion
>
> 1a : overall quality or character as seen or judged by people in general.
>
> 1b : recognition by other people of some characteristic or ability <has the reputation of being clever>.
>
> Merriam-Webster Dictionary

When breach of contract gives rise to a loss in an individual's reputational capital, I have shown that parties may write a variety of different contracts that enhance the quality of the goods traded. I now move on to the second part of the Klein and Leffler (1981) approach to informal enforcement, namely the creation and pricing of reputational capital.

As we can see from the definition of reputation, it has two distinct meanings, both of which are used in the formal literature. The first of these refers to the general beliefs that others have concerning one's character. In the context of contract enforcement, our concern is with a person's propensity to keep promises or with their reputation for trustworthiness. Klein and Leffler (1981) show that this idea can be modeled as a repeated game in which individuals trust a person because in the past he or she has been trustworthy and, hence, has a reputation for trustworthiness.

This does not necessarily make one's reputation valuable. That can only be the case if individuals with good reputations are able to charge more for their services. Section 5.1 discusses how such a reputation can be sustained and priced in the context of a relational contract formally modeled using the theory of repeated games. In a relational contract, one party trusts the other when the value from future trade is greater than the one period gain from defection. In the context of a repeated game, this is possible if and only if there exists of a set of self-enforcing equilibrium norms that incorporate a notion of *fair trade* or a *fair price*. In the context of a warranty contract, a fair price is one that gives the seller an above market clearing price for the good as compensation for abiding by his or her promise to pay a warranty whenever the good fails. Should the seller fail to perform as promised, then the buyer will no longer purchase from him or her. In this section, I discuss a number of the institutions that reinforce this notion of fairness, including equilibrium unemployment and expensive advertising campaigns.

However, the use of a relational contract is sufficient, but not necessary for the informal enforcement of high quality trade. Section 5.2 discusses the literature that explores the potential for *community enforcement*. That is, if the trusting party is a member of a closed community that exchanges information among members, then a person may be able to maintain a reputation for performance through the offices of the community as a whole. In that case, it may be possible to enforce efficient contracts in a sequence of once-off trades with members of the community, rather than rely upon repeated trade with the same person.

In both cases it is assumed that individuals begin with a good reputation (in other words they are presumed honest until proven otherwise) and *choose* to be trustworthy because of the effect upon their reputation and the future rents they would receive from keeping their reputation intact. It is very common for market participants to be concerned with building a new reputation or repairing a reputation that has gone bad.

The dynamics of reputation formation are discussed in section 5.3. Much of this literature is technically very sophisticated, building upon the models of reputation formation introduced by Milgrom and John Roberts (1982) and David M. Kreps and Robert Wilson (1982). These models introduce dynamics by supposing that individuals come from a population of heterogeneous individuals. A person's reputation is viewed as simply statistical—it is the market's best estimate of an individual's characteristic (corresponding to 1b in the definition of a reputation above). Through repeated interaction, parties learn about each other and are able to tailor their behavior to their updated beliefs. I also discuss some recent work that illustrates how one may acquire a good reputation either through the exchange of gifts or through the purchase of a brand name.

5.1 *Reciprocity, Norms, and Reputation*

This section illustrates how the literature uses repeated game theory to explicitly model Klein and Leffler's (1981) notion of reputational capital. The idea is quite simple. In a competitive market, consumers who are disappointed will leave a firm and go elsewhere. The problem is that, in a perfectly competitive market, firms all earn zero

profits. Since cheating upon product quality will always result in a short term gain, the repeat purchase mechanism by itself cannot ensure high quality.

The game theoretic solution entails two steps. The first is the introduction of a *relational contract.* The idea of a relational contract is introduced by MacNeil (1974) to describe situations that do not fit neatly into the legal notion of a discrete agreement that entails agreement followed by performance. In a relational contract, parties meet repeatedly over time and may modify contract terms as a function of events as they unfold. The economic theory of relational contract focuses upon the enforcement benefits of repeat interaction.

The relational sales contract described by Klein and Leffler (1981) is formally equivalent to the efficiency wage model of Shapiro and Stiglitz (1984). The buyer and seller meet repeatedly at frequency f for the purchase of *normal goods* at a fixed price P. Should the seller in any period provide a good with low performance, then the buyer refuses to trade again with that seller in the future. The seller's reputation is associated with the return from continuing the relationship. This return is generated by a price that is set above the seller's next best alternative. In the context of a labor market model, an efficiency wage is one that is set above the market clearing wage.

This strategy seems straightforward, but two subtle issues need to be addressed to ensure that it is self-enforcing. They are discussed in detail by H. Lorne Carmichael (1985) and Carmichael (1989). The problem is that breach has no effect on future payoffs and, hence, if it was efficient to trade in the past, it remains efficient to trade in the future. Thus, in order for the cessation of trade to be credible, parties must hold a set of self-enforcing beliefs that after one party has breached, future trade is no longer profitable.

This is achieved by associating breach with a loss of reputation. If the seller breaches an agreement, then the loss of the seller's reputation implies that he or she can no longer charge a price premium, and now optimally chooses to supply low quality. The buyer, expecting the seller to supply low quality goods, refuses to pay a price premium after the seller has lost his or her reputation. This mutually reinforcing set of beliefs imply that it is an equilibrium to cease trade after breach has occurred.

Notice how the no-trade equilibrium analysis naturally captures, in fact requires, reciprocity between the buyer and the seller. Recent experimental work, beginning with Ernst Fehr, Simon Gächter, and Georg Kirchsteiger (1997), finds that the ability of both parties to act reciprocally is an important ingredient in sustaining cooperative behavior.

The second necessary ingredient is the acceptance of a fair price norm corresponding to a return on reputational capital that all sellers with good reputations demand, and that buyers are willing to offer. MacLeod and Malcomson (1989) show that such a price can exist under the following set of self-enforcing beliefs. Let P^* be the equilibrium fair price. Buyers offer this price to sellers with good reputations because they believe that sellers who would accept a lower price do not value their reputation and, hence, will supply low quality. Sellers demand such a price, because they believe that buyers who offer a lower price do not respect their good reputation and will not, even if they claim the contrary, buy from them in the future at a high price. Hence, sellers believe that it will not be worthwhile to produce high quality to maintain their reputation with these buyers.

Given these interlocking beliefs, we can derive the value of the reputational capital of a seller under the simple sales contract when the fair price norm is P^*.

The seller's reputation is defined by the value of future trade and solves the following dynamic programming equation:

$$RKS(P^*,q) = P^* - C(q) + \delta\lambda_g(q,f)RKS(P^*,q). \tag{10}$$

The reputational capital of the seller is equal to the current revenue, $P^* - C(q)$ plus the discounted future reputational capital. With probability $\lambda_b(q,f) = 1 - \lambda_g(q,f)$, the good's performance is inadequate and the seller loses his or her reputation.

If one fixes P^*, equation (10) determines the reputational capital as a function of quality. The level of quality, q^*, is determined by the seller's incentive constraint, (2). We can now compute the risk adjusted return on reputational capital from the expression

$$P^* - C(q^*) = d(f)r'RKS.$$

Using (10), one obtains

$$r' = r\frac{(1 - \delta\lambda_g(q,f))}{(1 - \delta)} > r.$$

The fact that with positive probability the seller loses his or her reputation, regardless of effort, implies that the risk adjusted rate of return to reputation capital is greater than the risk free rate of return.

The model does not uniquely determine the price without additional assumptions. Klein and Leffler (1981) argue that this outcome is consistent with a competitive equilibrium when the return on the reputational capital is dissipated by sunk investments into a brand name, either through lavish stores or advertising. Hence, the model itself does not make any predictions regarding the price or quality level, only that there will be a relationship between price, quality, and the level of sunk investments that determine the level of reputational capital.

Shapiro and Stiglitz (1984) suggest that unemployment may be another way to generate a rent for contract enforcement. In this model, workers are paid an above market wage as long as their performance is satisfactory. Loss of reputation is associated with being fired and then having to pass a period in the pool of the unemployed.

A number of papers have explored the empirical implications of this model. Greif (1994) provides a landmark application to the evolution of economic institutions in medieval trade. He argues that the Genovese used a form of efficiency wage contracts that allowed them to hire and trust individuals they employed from outside of their families. Alan B. Krueger (1991) compares the compensation policy in franchises and finds that a company-owned outlet pays more than independent franchisees, consistent with the efficiency wage model if one supposes that monitoring is more costly at the company-owned firm. James B. Rebitzer (1995) finds some additional support for this hypothesis using data from the petrochemical industry. Thomas N. Hubbard (2002) examines the market for auto inspections in California and finds that consumers are skeptical of the service they receive and, consequently, they abandon sellers who have given them unsatisfactory service in the past.

Recently, a number of papers have explored the prediction that price varies with quality using data from eBay, which has an explicit reputational mechanism as part of its online system. Bajari and Hortacsu (2004) provide a useful review of this literature and the results are rather consistent. Mikhail I. Melnik and James Alm (2002), Paul Resnick and Richard Zeckhauser (2002), and Luis Cabral and Hortacsu (2004) all find that there is a positive relationship between price and quality. However, the overall effect appears to be rather small.

The fact that there is remarkably little direct evidence regarding the effect of reputation on price is quite surprising, given the widespread perception that reputation plays an essential role for so many transactions. The work of Banerjee and Duflo (2000) may provide a solution. They find that sellers in the Indian software industry develop a reputation for remediation of services rather than for quality alone. In that industry, firms with long-term relationships use contracts with the feature that each party is responsible for correcting any deficiencies in their code. Their reputation is therefore associated with the extent to which they correct errors, not

the quality of the product "off the shelf."

This result is consistent with the observation in the previous section that both warranty contracts and bonus contracts are more efficient because breach of contract is associated with whether or not there is compensation conditional upon performance, not upon performance as such, which the seller can only imperfectly control.

5.1.1 *Contingent Contracts—Warranties*

If a seller agrees to supply a good of a specified quality, as a matter of law this does not imply that the seller must supply the good or else face inordinate penalties. It is required that the seller make adjustments to the price to compensate the buyer for his or her loss. [8] Hence, breach occurs if and only if the seller supplies substandard quality *and* fails to compensate the buyer adequately. When the likelihood of failure is significant, then it is efficient for a seller's reputation to be associated with this lack of remedial payment, rather than with the defect in the good per se.

While there is a large literature on the optimal structure of warranties, there is little work that explores the enforcement of warranties as part of a relational contract.[9] Beginning with the seminal work of Geoffrey Heal (1977), A. Michael Spence (1977), and Sanford J. Grossman (1981), papers on the theory of warranty contracts make the point that warranties provide a way to solve Akerlof's (1970) market for lemons problem. A warranty provides a risk averse consumer insurance against the adverse consequences from the buying a low quality good. Surprisingly, much of the recent literature on reputation and contract enforcement assumes that warranty contracts are not possible. Here, I briefly consider the implication of warranty contracts for the structure of relational contracts.

[8] This is codified in section 2 of the Uniform Commercial Code of the United States.

[9] See Murthy and Djamaludin (2002) for a recent survey of the literature.

Suppose that the buyer and seller agree to trade a normal good using a warranty contract with terms $\{P^*,W\}$. In this case, the seller's reputational capital solves

$$RKS(P^*,W,q) = P^* - \lambda_b(q,f)W - C(q) + \delta RKS(P^*,W,q) \tag{11}$$

or

$$(1-\delta)RKS(P^*,W,q) = P^* - \lambda_b(q,f)W - C(q).$$

Thus the reputational capital is equal to the discounted value of the one period return, and the risk adjusted rate of return to reputational capital is

$$r' = \frac{P^* - \lambda_b(q,f)W - C(q)}{d(f)RKS} = r.$$

In other words, the cost of reputation is *lower* with a warranty contract than it is with a simple sales contract.

The self-enforcing behavior that supports this outcome requires that the buyer agree to pay a price that is fixed above the cost of production, with the seller's interest being to pay the warranty if and only if

$$W \leq \delta RKS(P^*,W,q).$$

The seller will choose quality that satisfies expression (7) and, hence, the level of quality is an increasing function of the warranty. For this model, there are many self-enforcing prices possible and, hence, the model predicts that there is no necessary connection between price and quality, only between quality and the size of the warranty payment. As long as $W = L$, there will be many equilibria that yield efficient quality.

This is a point that deserves more attention in the literature. As Murthy and Djamaludin (2002) observe, warranty contracts are everywhere around us, an observation that is consistent with the theory of relational contracts. Yet much of the empirical literature has focused upon the simple sales contract.

5.1.2 *Contingent Contracts—Bonus Pay*

Under a bonus pay contract, the buyer pays the seller a reward whenever performance is high. This type of contract characterizes many employment relationships where the employee receives rewards on an irregular basis. In such cases, the reputation is held by the buyer (firm) rather than by the seller (worker). Bull's (1987) is the first paper to explicitly link bonus pay to firm reputation. He makes the point that the party who holds the reputation for good performance is a function of the information available in the market. If it is easier to observe firm behavior, then the firm should hold the reputation for performance. In this case, the optimal relational contract entails pay for performance.

Under the bonus pay contract $C_B = \{P^*, B^*\}$, the dynamic programming equation for the buyer's reputational capital in a relational contract is as follows. For simplicity, suppose that the bonus is set at the efficient level: $B^* = G$. This provides first best incentives to the seller to supply quality via equation (9). In this case, the self-enforcing behavior supporting the price P^* has a slightly different structure.

Suppose that P^* is accepted as the customary price norm. If the seller were to demand a price greater than P^*, then he or she expects the buyer to renege upon his or her agreement to pay a bonus and, hence, refrains from asking for a higher price. As before, there are many possible equilibria. For any price at which the value of reputational capital is greater than the value of good performance ($\delta RKB(P^*, R, q^*) \geq G$), the buyer would choose to pay a bonus when performance is high, rather than risk losing his reputation. As in the case with warranties, the risk adjusted rate of return to reputation is equal to the risk free rate of return ($r' = r$).

The model predicts the lack of a tight relationship between price and quality. Rather, quality is positively correlated with the size of the bonus pay. Second, the analysis predicts that buyers will use bonus pay for innovative goods or services, while warranties are used with normal goods. There is some evidence in the labor literature consistent with the former prediction. Brown (1990) finds that bonus pay tends to be used in jobs where measurement of performance may be imprecise. MacLeod and Parent (1999) extend Brown's work using several data sets containing information on job characteristics. They find that bonus pay is more prevalent in less repetitive jobs and is particularly common in sales and managerial positions. Sales positions correspond closely to our notion of an innovative good. Much of the time a sales person is providing information to prospective buyers, with positive rewards occurring only when a sale is completed. Such an event corresponds to the reward G in the basic model.

When the total gain from trade is less than the value of good performance, then it is not possible to achieve the first best. In an important paper, Baker, Gibbons, and Murphy (1994) observe that in practice one often observes a combination of pay from formal reward mechanisms, such as profit sharing, with discretionary rewards. These formal rewards increase the value of the relationship and expand the conditions under which there is a self-enforcing relational contract. B. Douglas Bernheim and Michael D. Whinston (1998) show that parties may reduce contract contingencies in order to increase the ability of one party to harm the breaching party. Robert E. Scott (2003) supplies some interesting evidence from case law to support this theoretical result.

5.2 *Information and Community Enforcement*

Relational contracts are not the only institution that can be used to create a valuable reputation. The original Klein and Leffler model envisions a situation in which the seller deals with a number of different buyers.

In their model, when the seller breaches upon his or her promise to deliver high quality, it is assumed that all future buyers can observe this action and then refrain from frequenting this buyer. This information assumption is extreme. There are a number of papers that explore different ways one can economize on the information flows needed to support a reputation.

The efficiency wage model of Shapiro and Stiglitz (1984), and its application to medieval Italian trade in Greif (1994), provides an elegant solution to this problem. Rather than assume that outside parties can observe actions within the relationship, the market can make an implicit allocation of blame whenever a separation has occurred. In particular, when an employer–employee separation takes place, it is assumed that the employee is at fault. This implies that the employee cannot immediately find another position at the same wage. The resulting period of unemployment is inefficient, particularly if the worker is highly skilled.

MacLeod and Malcomson (1988) provide another solution to this problem by introducing asymmetric information regarding worker ability in a relational contract setting. In practice, a worker's job title is publicly observable and, hence, can provide a signal of their ability. MacLeod and Malcomson show that there exists an equilibrium at which workers are promoted through a hierarchy of jobs until, as in the Peter Principle, they rise to a level that is inappropriate for their skill. Should they shirk, the worker is dismissed. But now, rather than face unemployment, the worker finds a job immediately, but at a lower level job with less pay. In this case, the reputational rent is the difference in lifetime income between two adjacent jobs on the job hierarchy.[10]

[10] See also Michael Waldman (1984). He shows that when a firm supplies a public signal of worker ability, such as a visible promotion, it must trade off the cost of the promotion arising from matching the market's evaluation of the worker against the benefit of more efficient matching on the job.

Information tracking systems are a very common solution. One of the earliest examples of this, documented by Greif (1994), are the letters between Maghribi traders about others in their group who have breached an agreement. Curtis R. Taylor (2000) suggests that old-boy networks in modern times play a similar role. Daniel B. Klein (1992) discusses credit bureaus and their role in following the behavior of borrowers. Ronald J. Gilson (2003) suggests that venture capitalists build a reputation for high performance that allows them to exert more efficient control over new ventures than they could otherwise.

Marcel Fafchamps (1996) and Fafchamps and Bart Minten (1999) provide some very interesting evidence on commercial contracts in Ghana and Madagascar. In both cases it was found that relational contracts play an important role in enforcement.

Milgrom, Douglass C. North, and Barry R. Weingast (1990) provide a nice model of how such information sharing would work to enforce agreements in the context of private law merchants in medieval times. Kandori (1992), Glenn Ellison (1994), and Masahiro Okuno-Fujiwara and Andrew Postlewaite (1995), building upon the seminal contribution of R. W. Rosenthal (1979), extend the above results to more decentralized information environments that depend, for example, upon word-of-mouth information flows between members of a group. When parties are sufficiently patient, these word-of-mouth mechanisms may be sufficient to support contractual compliance.

When agents are not patient, and information flows are imperfect, then the practical question is whether or not a particular institution can enhance performance. One such situation is requiring hospitals to publish report cards on provider performance. David Dranove et al. (2003) study this institution and point out that if the information is not perfectly correlated with performance, then one will get adverse selection. Namely, physicians will become concerned with their rankings and then

perform defensively but not necessarily optimally.

Ginger Zhe Jin and Phillip Leslie (2003) explore the effect of requiring restaurants in Los Angeles County to display the ratings from regular health inspections. This study is particularly interesting because it illustrates the interplay between regulation and reputation effects. All restaurants in Los Angeles as a matter of course are inspected and will be shut down if they do not meet minimum standards. The new law did not change the procedure used to evaluate restaurants, rather it simply required restaurants to post the results of the health inspection in a prominent place. Even at the best restaurants, diners could see if the establishment earned an A, B, or C. In a short period of time, diners made decisions based upon these ratings, which in turn caused restaurants to pay more attention to maintaining sanitary conditions. Jin and Leslie (2003) find, as a consequence, a significant decline in hospitalizations due to food-borne illnesses.

5.3 *Acquiring a Reputation*

> You can't build a reputation on what you are going to do.
>
> Henry Ford

The repeated game model provides a model of *equilibrium* reputational capital with positive value. Parties can rely upon individuals who have such capital to perform as promised. Yet these models suffer from a number of drawbacks. First, they presume that individuals are infinitely lived. Second, there are typically many equilibria and, hence, there may be a number of contract forms consistent with the predictions of the theory. Finally, the model does not address the issue of how an individual with no reputation might *build* a reputation.

For these reasons, game theorists have focused attention upon dynamic models with asymmetric information. This literature supposes a person's reputation is represented by a probability distribution over possible agent characteristics. The seminal work of Milgrom and Roberts (1982) and Kreps and Wilson (1982) illustrate these ideas in an elegant model of entry deterrence.

In their model, an incumbent monopolist can acquire a reputation to be "tough" by engaging in price wars with potential entrants, even if this is not optimal in the short run. For reputation building to work, potential entrants must believe that there are some strong firms for whom playing tough is optimal. When the play is repeated sufficiently often, weak firms find it optimal to acquire a reputation to play tough early in the game. Potential entrants who observe tough behavior will thereby be deterred from further entry. This idea has been extended to a number of contexts, including the repeated prisoner's dilemma game (Kreps et al. 1982), trust (Kreps 1990), and collective reputations (Jean Tirole 1996).

The papers by Anat R. Admati and Motty Perry (1991) and Joel Watson (1999) illustrate how these ideas may be used to model reputation building. Parties begin with low stakes trade and then, as they update their beliefs regarding their partner's character, the level of trust and trade can increase as long as neither party behaves in an untrustworthy fashion. Tadelis (1999) introduces a clever model of brand name reputation that can be bought and sold in the market. In his model, firms can avoid having to build a reputation. They simply buy it on the open market. However, in order for there to be a market, there must be turnover in brand names, which can only occur if there is some chance that a firm will not perform as promised. As with the previous literature, a crucial element in his model is uncertainty regarding the characteristics of the individuals. In the absence of uncertainty, there would be nothing to learn and, hence, parties would not have an incentive to perform in order to build their reputation.

This point was first made by Bengt Holmström (1999) in his critique of Eugene F. Fama (1980). He shows that reputations

based upon learning cannot in general ensure market efficiency. In a world where individual characteristics are fixed over time, the incentive effect of reputation building declines as the market's estimate of an individual's character becomes more precise. Jeffrey C. Ely and Juuso Valimaki (2003) make a similar point in the context of the market for experts. In their example, the expert is a mechanic who faces a dilemma when servicing a car with a minor mechanical problem. Should he do an inexpensive or expensive repair? Since the customer cannot observe the fault, the customer can only learn something about the mechanic if he does the cheap repair when the car actually needed the expensive repair. When an expensive repair is carried out and is effective, the customer cannot tell the difference between the cost-saving and cost-increasing mechanic. Ely and Valimaki then show that it is not possible in those circumstances for the mechanic to build a reputation to always perform the repair that is best for the consumer.

These examples illustrate the ability of these game theoretic models to capture some features of observed behavior but also exhibit a number of serious shortcomings. First, the problem of contract design is typically assumed away—parties either agree upon a fixed, noncontingent price, or the game form is specific ex ante. As discussed above, contracts in practice are typically much more complex than a single fixed price.

These models also have a certain fragility. Their predictions very much depend upon the underlying beliefs, the structure of individual types, and the available strategies. Such data is assumed to be exogenous to the model, yet it is not clear how parties would ever acquire this information. Moreover, as Charles F. Manski (1993) has shown, models with social interactions can be identified only under very extreme assumptions and, hence, it is not clear if these models can be empirically tested. The learning models that have been estimated, such as Henry S. Farber and Gibbons (1996) or Joseph G. Altonji and Charles R. Pierret (2001), typically assume no social interaction. These papers show that markets do incorporate signals of worker ability into wages. The extent to which one can empirically implement a model with reputation building is an open question.

In contrast, the ingredients for the Klein and Leffler model are less complex and potentially observable. Contract form is a function of observable characteristics of the good to be traded. The notion of reputational capital is similar to human capital—it is a rent that a party receives for being trustworthy. Although reputation may be difficult to observe directly, as Krueger and Lawrence H. Summers (1988) argue, one may impute to a reputational mechanism rents that cannot be explained by the observable characteristics of workers. Finally, the social norms that support a reputational equilibrium, such as the refusal to accept a price cut, are also observable, as recently documented by Truman F. Bewley (1995).

6. *Formal Enforcement*

Beginning with Robert M. Townsend (1979) and Ronald A. Dye (1985), there are a number of papers that suppose the cost of writing an insurance contract is a function of the number of contingences. As a consequence, many risks are not included in the contract and the contract is incomplete relative to the first best. Luca Anderlini and Leonardo Felli (1994) take a different approach and suggest that a contract can be viewed as an algorithm for computing terms for each contingency. They show that the optimal contract is not computable in the sense that contract conditions can be determined using a finite number of steps. Pierpaolo Battigalli and Giovanni Maggi (2002) extend this work and construct a theory of contract formation from basic assumptions regarding the technology of

contract formation. Bajari and Tadelis (2001) introduce a model in which the degree of contract completeness is modeled as an investment decision made ex post. Their contribution provides a formal bridge between the costly state verification literature and the literature on holdup.

In Dye (1985) and in Bajari and Tadelis (2001), it is assumed that costs are paid ex ante, while Townsend (1979) supposes that verification costs are paid ex post at the time the event occurs. Using this model, Douglas Gale and Martin Hellwig (1985) provide conditions under which the use of debt contracts is optimal. Recently, Stefan Krasa and Anne P. Villamil (2000) have shown that the costly state verification model can be viewed as a special case of a model with endogenous enforcement.

All of these models assume that, once information is publicly known, the courts can enforce the contract as written. There is also a literature that explores the role of the courts in reaching a settlement when there is asymmetric information. Robert D. Cooter and Daniel L. Rubinfeld (1989) provide a review of the earlier literature, with Spier (1992), Andrew F. Daughety and Jennifer F. Reinganum (1993), and Daughety and Reinganum (1995) providing more recent contributions. The question is how one should design the rules to encourage efficient settlement rather than litigation. These rules can be viewed as part of the more general problem of increasing the *quality* of the law, a problem that is further reinforced by the work of Djankov et al. (2002). They find that the cost of litigating a simple contract (in their case a lease agreement) varies widely from country to country.

The literature on costly state verification suggests that the variation in litigation costs differs in both ex ante and ex post costs of contract enforcement. At the ex ante stage, enforcement by the courts typically, although not always, requires the parties to write the salient features of their agreement in a contract.[11] In addition, if the contract requires payments as a function of a quality measure, then the parties may need to invest in an explicit monitoring system. Let these costs be given by $K_A(Q)$, where Q denotes the quality of the law. It is assumed that these costs fall with Q. Also suppose that the parties bear these costs equally. Any asymmetries in bargaining power would allow these costs to be reallocated via the contract price.[12]

Once these costs have been sunk, then by definition the events that determine the quality of the good are observed. This does not necessarily imply that one has an enforceable contract. Suppose that the contract requires the seller to compensate the buyer for a \$100 defect. The cost of using the courts to collect such an amount is very high and, hence, we would not expect such a payment to be enforced. However, if the defect results in a loss of \$10,000, then it is likely to be worthwhile pursuing the seller if he or she refuses to pay. This can be modeled by supposing that the ex post expected cost of recovery is a function of the quality of law, denoted by $K_P(Q)$. This cost has the following interpretation. If parties use a bonus contract requiring the buyer to pay the seller B, then the seller incurs a cost $K_P(Q)$ of collection, which implies that the buyer pays B while the seller nets $B - K_P(Q)$.

The situation is reversed with a warranty contract. When a defect occurs, the buyer must spend time and effort to collect the warranty W. The value of $K_P(Q)$ represents this cost. Observe that, if $K_B(Q) > W$, then

[11] Courts will enforce oral agreements, however such enforcement requires evidence regarding the terms of the agreement, something clearly more easily achieved with a written agreement.

[12] There is a literature that explores the effect of cost allocation rules on litigation. These rules have an effect because asymmetries may make it impossible to tailor the cost allocation rule ex ante. See Spier (2006) for an extensive discussion of this literature. In our model, parties can contract upon the allocation of these costs ex ante and, hence, in the absence of wealth constraints, they will not have an effect on the overall performance of the contract.

the buyer would never bother to collect the warranty. A contract is considered formally enforceable if the courts can verify that breach has occurred *and* the threat to take a case before a court is credible:

Definition. *A contract that calls for a payment P_E from i to j if event E occurs is formally enforceable if and only if the writing costs $K_A(Q)$ have been sunk into contract formation, and $P_E \geq K_P(Q)$.*

For simplicity, I abstract away from the important issue of renegotiation. Rather, one may view these costs as reduced-form representation of formal enforcement that includes renegotiation costs. If we suppose that parties engage in a war of attrition during renegotiation, then all rents that might be gained by avoiding court are dissipated through the process of renegotiation. This greatly simplifies the subsequent analysis.

Consider first the case of a normal good ($G = 0, L > 0$), where there is a potential loss of L if the bad event occurs. Suppose parties agree that the quality should be q and they divide equally the fixed cost of writing a contract.[13] Under a bonus contract $\psi = \{q,P,B\}$, the payoffs to the seller and buyer in stock terms are:[14]

$$U^S(f,q,\psi) = P + (B - K_P(Q))\lambda_g(f,q) - C(f,q) - K_A(Q)/2,$$

$$U^B(f,q,\psi) = V(f) - P - B\lambda_g(f,q) - L\lambda_b(f,q) - K_A(Q)/2.$$

It is assumed that the seller pays half of the fixed costs of writing a contract. In this case, the total gains from trade do not depend upon the bonus B and, hence, it can be set to ensure that the seller chooses the agreed-upon quality, with the total gain from trade given by:

$$S^{bonus}(f,q,\psi) = V(f) - K_P(Q)\lambda_g(f,q) - L\lambda_b(f,q) - C(f,q) - K_A(Q). \quad (12)$$

Now suppose that the parties instead use a warranty contract, $\psi = \{q,P,W\}$, where W is paid by the seller to the buyer if the good is defective. The payoffs to the buyer and seller in stock terms are

$$U^S(f,q,\psi) = P - W \cdot \lambda_b(f,q) - C(f,q) - K_A(Q)/2,$$

$$U^B(f,q,\psi) = V(f) - P + (W - L - K_P(Q))\lambda_b(f,q) - K_A(Q)/2.$$

In this case, the total gain from trade is

$$S^{warranty}(f,q,\psi) = V(f) - (L + K_P(Q))\lambda_b(f,q) - C(f,q) - K_A(Q). \quad (13)$$

The maintained hypothesis for normal goods is that the bad events are rare by definition, that is $\lambda_g > \lambda_b$, implying $K_P(Q)\lambda_g(f,q) > K_P(Q)\lambda_b(f,q)$, from which we conclude that the warranty contract is more efficient.

The warranty is set to ensure that the seller chooses the desired level of quality and, hence, satisfies the first-order conditions for quality:

$$C'(f,q) = -W\frac{\partial\lambda_b(f,q)}{\partial q}. \quad (14)$$

From (13) it follows that the first best entails $W = (L + K_P(Q))$. The optimal warranty is equal to the cost of the loss plus the fixed cost of recovery. In this case, transactions costs raise the warranty payment and associated quality above what it would be in the absence of enforcement costs. An increase in the quality of law, holding all else fixed, will result in a *decrease* in the quality of goods traded, because the marginal cost of using the law falls, reducing marginal enforcement costs. While this result may seem a bit counterintuitive, the effect is similar to the one observed in U.S. tort law, where it is claimed that excessive medical malpractice awards have led to doctors

[13] The rule for dividing the contracting costs does not affect the results, because the relative power of the parties determines the overall division of the gains from trade via the contract price P.

[14] That is $V(f) = d(f)\nu$ and $C(f,q) = d(f)c(q)$.

practicing defensive medicine (see Daniel Kessler and Mark McClellan 1996).

Moreover, it does not imply that *average* quality falls with the quality of the law. The effect of the law on quality applies only to those goods with an enforceable warranty term. There is also a selection effect. When the quality of law is low, fewer firms use enforceable contract terms, and hence in those cases the quality of the delivered good is at the lowest possible level. On average, we are likely to see low quality law associated with low quality goods.

The result for innovative goods and services is similar. In those cases, the good event is relatively rare and, hence, the optimal contract with enforcement costs is a bonus contract that pays the seller an amount B whenever there is a good outcome, denoted by $\psi = \{q,P,B\}$. The payoffs to the buyer and seller, respectively, are

$$U^S(f,q,\psi) = P + (B - K_P(Q))\lambda_g(f,q) - C(f,q) - K_A(Q)/2,$$

$$U^B(f,q,\psi) = V(f) - P + (G - B)\lambda_g(f,q) - K_A(Q)/2.$$

The corresponding social surplus is:

$$S^{bonus}(f,q,\psi) = V(f) + (G - K_P(Q))\lambda_g(f,q) - C(f,q) - K_A(Q). \tag{15}$$

In those instances, since the seller must sue the buyer to get recovery, the incentive constraint incorporates the fixed enforcement costs and we have

$$C'(f,q) = (B - K_P(Q))\frac{\partial \lambda_g(f,q)}{\partial q}. \tag{16}$$

Thus, in order to maximize the surplus (15), bonus pay, B, is set equal to the reward G, and does not vary with the quality of law. Since the quality of law does affect the first-order conditions, the optimal quality of delivered goods falls when the quality of law falls. When the reward G is close in magnitude to $K_P(Q)$, the first-order conditions imply that the optimal q is close to zero. Given the fixed costs of contract formation, $K_A(Q)$, parties would not use a formal contract. When it is profitable to use a contract, observe that the marginal return to quality,

$$(B - K_P(Q))\frac{\partial \lambda_g(f,q)}{\partial q},$$

is increasing in Q. Hence, an increase in the quality of law results in an increase in the quality of the good supplied.

In either case, when the ex ante fixed costs of writing a contract outweigh the benefits, there will be no contract. In that case, the cost of using a contingent contract leads to lower quality goods on sale or, in the extreme case, a complete breakdown in trade as illustrated by Akerlof (1970).

In summary, the basic model of transactions costs arising from the cost of writing contingent contracts makes the following predictions regarding how an increase in the quality of law affects economic performance, holding all else constant:

1. For normal goods it is optimal to use a warranty contract. The quality of goods traded with warranties *falls* with an increase in the quality of law, although the total volume of trade (and number of warranty contracts) is expected to increase.
2. For exchanging innovative goods it is optimal to use a bonus contract. In this case, an increase in the quality of law increases both the quality and volume of trade.

6.1 *Formal versus Informal Enforcement*

The classic study by Macaulay (1963) shows that, even when there is a well-functioning legal system, relational contracts can enhance the level and quality of exchange. What is much less clear is how the quality of legal enforcement interacts with relational contracts to affect the overall output in an economy. Olivier Blanchard and Michael Kremer (1997) observe that disorganization during transitions make it difficult for new

relationships to form, which in turn contributes to economic decline in the short run. They point out that the problem is most severe with complex goods, where formal enforcement is more difficult. Gerard Roland and Thierry Verdier (1999) argue that rapid changes in Eastern Europe after the collapse of the Soviet Union made it difficult to establish new relationships, resulting in an initial decline in output. Simon Johnson, John McMillan, and Christopher Woodruff (2002) present some evidence about how firms respond to the problems of incomplete contracts in transition economies. They find that relational contracts are important, and that they can be enhanced in some cases by having increased access to courts. They also find that, when the quality of law is low, there is greater reliance upon informal or relational contracts. However, their work does not explicitly address the relationship between formal and informal enforcement.

In general, these results suggest a positive *complementarity* between formal enforcement and the efficacy of relational contracts. They also illustrate the central role that relational contracts play in enhancing trade. In contrast, there is also a literature that highlights the costs of formal enforcement and how informal enforcement may act as a *substitute* for formal enforcement. Akerlof (1982) suggests that one can view above-market clearing wages as a form of gift exchange with workers who agree to supply high quality effort in return.

Rachel E. Kranton (1996) studies a situation in which individuals can move between a market setting with formally enforced contracts and a network setting where trade is enforced via a reciprocity norm. She illustrates that, when the two coexist, the outcome may not be efficient. In particular, if goods in the market are poor substitutes for each other, then there may be only reciprocal relations, even though market exchange is more efficient. Conversely, there is a range of substitutability for the goods traded under which it is efficient to use reciprocal exchange. Yet the market may crowd out such exchange.

Joel Sobel (2006) introduces a model that explores the trade-off between formal and informal enforcement that builds upon Carmichael and MacLeod (1997). Carmichael and MacLeod (1997) show that in a market setting, with endogenous formation of relationships, there is an unique evolutionary stable equilibrium that entails parties making sunk investments ex ante. What is unusual about their results is that these investments have no effect upon the current relationship, but are a social institution that arises endogenously to make starting a new relationship expensive. Sobel goes on to show that the introduction of formal enforcement can lower the cost of forming a new relationship and increase overall social surplus.

This section illustrates the interplay between relational and formal enforcement of contracts that underlie these arguments and how they affect the *quality* and *quantity* of trade as a function of the *quality* of law. These effects can be illustrated with our simple model of exchange developed above. The key ingredient for efficient trade using either formal or informal enforcement is the total gains from trade. We can explore the interplay between formal and informal enforcement by supposing that there are a large number of goods for which the effect of quality is the same, but for which the total gain from trade can vary.

More formally, suppose the flow returns from trade of an innovative good can be rewritten as

$$(17) \quad s(f,q,\nu) = \nu - s^* + g(f,q) - c(q),$$

where $g(f,q) = \lambda_g(f,q)G/d(f)$ is the flow return from good outcomes, and $s^* = \max_{q\geq 0} g(f,q) - c(q)$ is the flow gains from trade at the efficient level of quality. Suppose that v is the only source of exogenous heterogeneity among the goods. Let $V(\nu)$ be a

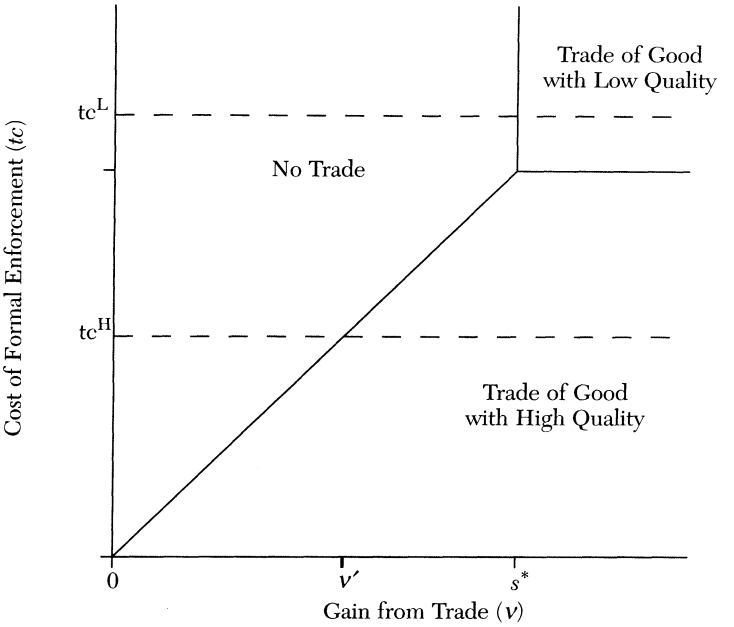

Figure 1. Effect of Transactions Cost on Trade with Formal Contracts

continuous, decreasing function denoting the quantity of goods with value v or greater. The introduction of s^* normalizes the payoffs so that it is efficient to trade at the efficient level of quality if and only if $v \geq 0$. Hence, the efficient volume of trade is $V^* = V(0)$.

Now, consider the effect of costly enforcement with formal contracts. Let the quality of the law be parameterized by the expected fixed cost in flow terms of writing and of enforcing a contract.[15] If the good is normal, then the warranty payment enforcing the efficient level of quality is assumed to be larger than the enforcement cost. Hence, when parties trade they will always agree to have the efficient level of quality produced.

Under these conditions, trade at high quality occurs if and only if the gains from trade are greater than the cost of enforcement:

$$s(f,q,v) \geq tc. \tag{18}$$

The interplay between the quality of law and its effect on the level and the quality of trade is illustrated in figure 1. When the quality of law is low, illustrated by $tc^L > s^*$, the law has no effect upon either the level or quality of trade. In that case, one is in the Akerlof (1970) market for lemons situation and only the lowest quality goods, whose value, v, exceeds s^*, are traded. This generates a volume of trade $V(s^*)$.

Now suppose that the quality of law increases, and the resulting contract formation and enforcement cost now falls to $tc^H < s^* < tc^L$. In that case, goods with valuation satisfying

$$v \geq tc^H, \tag{19}$$

will be traded. These trades will have bonus or warranty terms that ensure high quality and result in a total volume of trade $V(tc^H) > V(s^*)$. Thus, an increase in the quality of law would result in an increase in both the quality of goods and the volume of trade.

[15] Formally, $tc = K_A(Q) + \rho K_F(Q)$, where ρ is the probability that a contract clause is enforced. For simplicity of exposition, suppose that ρ does not depend upon the quality of law and, hence, tc can be viewed as an independent parameter representing the quality of law.

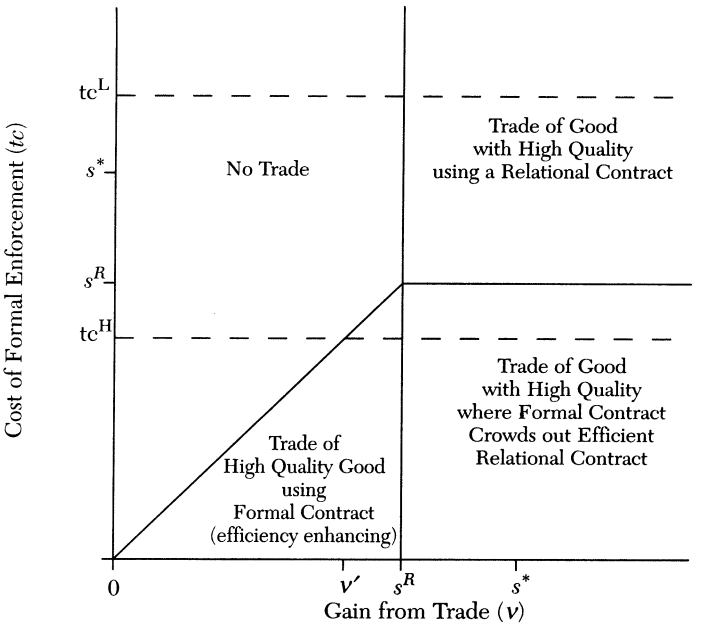

Figure 2. Effect of Transactions Cost on Trade with Formal and Relational Contracts

Relational contracts are potentially superior to formal contracts because they allow parties to avoid the cost of using the legal system. However, the quality of the good traded is an increasing function of the surplus from the relationship as measured by the reputational capital in (11). Suppose that the amount of reputational capital needed to support the efficient level of quality, denoted by s^R, is less than the total potential surplus in the market, s^*.[16] If the quality of law is sufficiently poor ($tc \geq s^*$), then, in the absence of any relational contracts, only goods with characteristics $v \geq s^R$ will trade at quality $q = 0$. Since $s^R < s^*$, this implies that goods with characteristics $v > s^R$ can be traded using a relational contract that enforces the efficient level of quality, q^*.

This is illustrated in figure 2. When $v < s^R$, one cannot use relational contracts to achieve the first best. In that case, high quality trade occurs only if the cost of formal enforcement is sufficiently low, as given by the triangle on the lower left.

Now consider the case of $v \geq tc$ and $s^* \geq tc \geq s^R$. In that case, parties prefer trade with a formal contract enforcing high quality to no trading or to trade with a low-quality good. Should a relational contract break down, parties have to pay tc to use a formally enforceable contract. But since $tc \geq s^R$ this implies that the deadweight loss from a formally enforceable contract is greater than the surplus needed to enforce the relational contract, hence relational contracts are self-enforcing. This is illustrated in the upper right corner region of figure 2.

This also corresponds to the case discussed by Johnson, McMillan, and Woodruff (2002). In this region, firms that are uncertain whether or not their partner might perform can use a formal, legally binding contract before relying upon a relational contract. This might be particularly helpful in situations where firms have lost partners due to

[16] One can compute the surplus needed:

$$s^R = \frac{c'(q^*)}{\delta \frac{\partial \lambda_g(\Delta, q^*)}{\partial q}}.$$

one party reneging upon an agreement. They would use formal contracts until sufficient time has passed to have their reputation restored.

Now, suppose that enforcement costs are less than s^R, i.e., tc^H, as illustrated in figure 2. In that case, the surplus from a relational contract is less than s^R and, hence, there do not exist any self-enforcing contracts because the threat of using a formally enforceable contract undermines the surplus needed to satisfy the incentive constraint (7) or (9). Even though relational contracts are strictly preferred to formal contracts, the existence of formally enforceable contracts can undermine the sustainability of relational contracts. This possibility was first observed by Klaus M. Schmidt and Monika Schnitzer (1995).

These effects are not necessarily unidirectional. Relational contracts require the existence of sufficient gains from trade in order to be self-enforcing. When the parties have a choice between making a contract relational or formal, increasing the quality of law can crowd out efficient relational contracts. More generally, when there are multiple terms in a contract, it may be possible to have some terms enforced using a relational contract and others enforced with legally binding terms. In such cases, as Baker, Gibbons, and Murphy (1994) shows, increasing the quality of law to allow some terms to be legally binding may lead to enhanced efficiency. Bernheim and Whinston (1998) generalize this point and show that parties may choose to make some terms formally unenforceable in order to increase the gains from trade and, hence, allow for the use of more efficient relational contracts. Scott (2003) provides evidence of actual court cases showing that indeed this occurs in practice.

7. *Concluding Discussion*[17]

It is well appreciated that for transactions of modest value, parties may rely upon informal reputational mechanisms for enforcement rather than the legal system. A lesson of the current review is that a complete theory of contract that bridges the gap between contract law and contract economics needs to be attentive to the breach decision and the contractual instruments that parties use to enforce performance. This section briefly reviews these results and discusses future research directions.

There is a tendency for the theoretical literature to focus upon the case in which market participants are restricted to using a single price, and hence reputations are a function only of information about the past performance of the good produced by the seller.[18] The first point is that the single price contract is in general inefficient because the seller always faces a risk of losing his or her reputation even if he or she has performed as promised. This results in a risk adjusted cost to reputational capital that is greater than the risk free rate.

Second, it is more efficient to use a contractual instrument with the feature that the breach decision can be easily observed by market participants, a result that is consistent with the agency literature, such as Holmström (1979), that emphasizes the importance of information quality for determining the efficiency of a contract. Given this result, it is not surprising that the use of warranty and bonus pay contracts is ubiquitous.

This observation leads to a third point—the difficulty of establishing a link between reputation and quality assuring price. Aside from MacLeod and Parent (1999) and the recent paper by Banerjee and Duflo (2000), there is remarkably little empirical work on the interplay between reputation and the use of more complex contractual instruments. This area of enquiry certainly deserves more attention.

Fourth, the work of Abreu, Milgrom, and Pearce (1991), viewed through the lens of

[17] The notion of a contractual instrument discussed here is based upon joint research with Lewis Kornhauser.

[18] See, for example, the recent papers by Tadelis (2003) and Johannes Horner (2002).

TABLE 1
CONDITIONS FOR OPTIMAL CHOICE OF CONTRACTUAL INSTRUMENT

	Fixed Price	Warranty Contract	Bonus Contract
Formal Enforcement	Defects are unlikely, quality of law is high.	Normal Goods, high quality law or high value exchange.	Innovative Goods, high quality law, or high value exchange.
Informal Enforcement	Defects unlikely and efficient for seller to hold reputation. Quality of law is low.	Efficient for Seller to hold Reputation, quality of law low or value of trade low.	Efficient for Buyer to hold Reputation, quality of law low or value of trade low.

contract theory, implies that the best contractual instrument depends upon the likelihood ratio between good and bad signals of product quality. When good signals are more likely, warranty contracts are more efficient. Conversely, when the good signal is a low probability event, bonus contracts are superior. These effects are summarized in table 1.

The paradigm contractual instrument is the simple buyer–seller contract—the agreement to deliver a good of a specified quality in exchange for an agreed upon price. In this case, breach occurs if the quality of the good is unacceptable. Formal enforcement of this contract entails the buyer filing suit, and claiming damages for the harm caused by the delivery of a low quality good. This instrument is efficient when the seller is able to control the quality of the good at a low cost and, hence, the seller is able to control the likelihood of breach, as illustrated in the upper left corner of table 1. If the cost of court enforcement is high, firms may rely upon the repeat purchase institution introduced by Klein and Leffler (1981) and Shapiro and Stiglitz (1984). This corresponds to the lower left corner of the table.

Efficiency may be enhanced using a clause that specifies payments as a function of the performance of the good. Under a warranty clause, the seller agrees in advance to compensate the buyer should the good supplied be defective. In that case, breach occurs not in the event that there is a defect, but in the event that the seller does not make good upon the warranty payment. When the quality of law is high and the promised warranty payment is higher than the cost of a court case, parties may choose formal enforcement of the contract. In the case of most consumer goods, the cost of a court case, even in small claims courts, is likely to be much larger than the value of the good. An open empirical question is whether firms honor these warranty claims because of the fear of harming their reputation or because of the threat of a class-action suit.

Alternatively, the buyer may promise a bonus when performance is high. When contracts are enforced through the legal system, bonus contracts are optimal for the exchange of innovative goods. These are services for which high performance is a relatively rare event. Examples include research provided by a scientist or the sale of large, complex goods, such as military weapons systems or commercial real estate. There are many examples of contracts for which such bonus pay is enforced by the courts. In particular, the doctrine of good faith behavior in labor contracts precludes employers from dismissing employees to avoid paying out a large bonus payment.[19]

It is also very common for bonus pay to be voluntary. This includes tips to waiters and discretionary end-of-the-year bonuses to employees. We still do not understand the extent to which these payments are part of a relational contract nor how employee

[19] See Mark A. Rothstein and Lance Liebman (2003).

performance varies with the size and frequency of such bonus pay (although see MacLeod 2007 for an illustration of how a small amount of trustworthy behavior leads to sharp predictions regarding the form of the optimal relational contract).

A common criticism of the use of repeated game theory to model contracts and reputations is the multiplicity of possible equilibria. Table 1 illustrates that the theory can yield some empirical content. More generally, the review illustrates how models based upon Klein and Leffler's concept of reputational capital are potentially testable because they make predictions that relate observable features of the relationship: the characteristics of the good to be traded (frequency of trade and the likelihood of a defect), the terms of the contract (fixed price, warranty or bonus contract), social norms (the refusal to accept an "unfair price"), and the future return to maintaining one's reputational capital.

Finally, the small literature that explores the trade-off between formal and informal enforcement has been discussed. The literature that explores the efficiency of different legal systems is in its infancy. The notion of a contractual instrument plays an important role, as nicely illustrated in the work of Djankov et al. (2002). They focus upon the costs of formal enforcement of two standard contractual instruments in a large cross-section of countries. It would be interesting to extend this analysis to consider more explicitly the trade-off between formal and informal contract enforcement as Johnson, McMillan, and Woodruff (2002) have done for Vietnam.

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