Regulatory Ambiguity and Corruption

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Abstract

Corruption "in the fabric" of a regulatory system refers to a situation in which a regulatory agency seeks to extract rents for itself by interpreting and enforcing its statutory authority in an ambiguous manner. Regulatory ambiguity is associated with the creation of superfluous and apparently random loopholes which affect private agents under circumstances which are difficult to predict, and hence hard to avoid. This paper examines the role of regulatory ambiguity in the behavior of a self-interested regulatory authority by means of a model in which the regulatory authority extracts a fee for enforcing or voiding private agreements, in light of circumstances which have occurred after the agreement was formed, according to a system of rules which can be either ambiguous or clear.

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"The one great principle of the English law is, to make business

for itself." -- Charles Dickens, *Bleak House* (1853)

I. Introduction

Corruption is generally interpreted among economists to mean the illicit buying or selling of public property for private gain (Cadot, 1993; Shleifer and Vishny, 1993). However, a broader definition of corruption might also encompass the licit behavior of public agencies possessing broad yet ambiguously defined regulatory powers, who meddle in and complicate private transactions in order to extract rents for themselves. A regulatory authority with broadly defined powers may seek to extract rents for itself by creating superfluous and apparently random loopholes and pitfalls which affect private agents under circumstances which are difficult for the latter to predict, and hence hard to avoid. Corruption "in the fabric" of a regulatory system does not depend on the illicit sale of privileges, but rather on the licit creation of ambiguous and unpredictable regulatory structures, in order better to provoke disputes which the regulatory authority itself will subsequently be called upon to intermediate and resolve.

This paper examines the nexus between regulatory ambiguity and corruption via a model in which a regulatory authority extracts a fee for enforcing or voiding private agreements, in light of events which have occurred after the agreement was formed, according to a system of rules which can be either ambiguous or clear. In this context, the operation of clearer

rules is more predictable *ex ante* by the contracting parties themselves, while the operation of more ambiguous rules is less predictable.

The analysis in this paper is based on a contracting game in which two private parties agree to a mutual exchange of services. Once a contract is formed, one party immediately performs its contractual obligations, and the second party promises to perform its reciprocal obligations at a specified later time. Subsequently, when this performance comes due, the latter decides either to perform as promised or to default completely. In the remainder of the paper, I will refer to the party who performs first as the *creditor*, and to the party who promises subsequent performance as the *debtor*. This terminology is intended simply to denote the order of the parties' expected performance under the contract. Intuitively, the debtor owes performance *of some kind* to the creditor, though not necessarily the repayment of a cash loan. For example, the model in this paper can be applied to product licensing or manufacturing joint ventures, where one party (the creditor) invests in production facilities and may also license proprietary technology to another (the debtor), who agrees to produce products conforming to the creditor's quality standards and promises not to appropriate the creditor's technology.

To enforce a contract in default, the creditor must petition the appropriate regulatory authority, hereafter the *State*, for redress. If the creditor initiates a regulatory proceeding, then both the creditor and the debtor face uncertainty about whether the State will hold the default to be permissible or impermissible, and consequently to void or enforce the contract. If the State enforces the contract, then the creditor receives his full private value of contract performance (net of the initial outlay), and

the debtor suffers a penalty. Otherwise, if the State refuses to enforce the contract, then the creditor loses his prior performance, and the debtor obtains a private default valuation. The creditor's private performance valuation corresponds to the maximum amount of money that the creditor would be willing to pay to enforce performance by the debtor. The debtor's private default valuation depends on the circumstances in which default occurs, and includes the value of appropriating the creditor's prior performance under the contract. Regardless of outcome, the creditor pays the State a fixed fee to adjudicate any default.

The State functions as a monopoly provider of binding arbitration, or equivalently as the highest court of appeal, for contractual disputes between private parties. Given the preceding model of private contracting, the self-interested State seeks to design a profit-maximizing regulatory structure by choosing jointly a degree of regulatory ambiguity and an adjudication fee to maximize its own expected payoff from resolving challenges to contracts in default. The State's optimal choice of regulatory ambiguity and fee depends on the effect of both factors on the frequency of contract formation, the frequency of default, and the likelihood that the State will be called upon to resolve actual defaults.

Roughly speaking, the self-interested State will seek to create a regulatory system which encourages the kind of disputes whose resolution can command large fees from the disputants themselves. In designing such a regulatory system, the State faces a fundamental tradeoff. Taking into account equilibrium contracting behavior, higher levels of regulatory ambiguity result in higher equilibrium default rates and hence more opportunities for State intervention, but support lower adjudication fees.

Contrariwise, in order to support higher adjudication fees, the State must promulgate clearer regulations which result in lower equilibrium default rates. In view of the equilibrium tradeoff between regulatory ambiguity and sustainable adjudication fees, the State in effect must choose either to regulate unambiguously at higher fees, or ambiguously at lower fees.

The State's choice of an optimal level of regulatory ambiguity raises a fundamental question in the positive study of law and economics: Does a self-interested regulatory authority prefer to administer unambiguous rules directed at realizing efficient behavior among the regulated; or ambiguous rules which introduce spurious noise into the delineation of permitted and proscribed activities? To date, most theoretical research in the field of law and economics has been normative, aiming to characterize efficient legal rules or enforcement strategies.[1] In contrast, the analysis in this paper has a positive orientation. My goal is to determine whether it is in the interest of a regulatory authority, possessing monopoly power over the resolution of private disputes, to regulate efficiently.

In the context of my analysis, the idea of regulatory ambiguity relates specifically to regulatory practice, as distinct from the "black letter" content of statutory regulations. Statutory authority which is conditioned

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[1] An efficient regulatory system is one which codifies and enforces norms of private behavior to maximize social welfare (Posner, 1986, Chapter 2). The normative approach to law and economics predicated on regulatory efficiency is articulated in Becker (1968), Stigler (1970), and Posner (1973). Later research has applied the efficiency standard to the design of socially optimal rules and enforcement strategies in many different settings. See, for example, Polinsky and Shavell (1979, 1992), Rubinfeld and Sappington (1987), Kaplan and Shavell (1994), Mookherjee and Png (1994).

on "reasonable" behavior, "foreseeable" hazards, or "substantial" damages necessarily requires construction by the regulatory authority before one can predict whether a given agreement or action will be permitted or voided under specific circumstances. In this connection, broad regulatory authority enables and facilitates, but does not force, ambiguous regulatory practice. Nor does ambiguous regulatory practice necessarily require either a detailed and complicated code of regulations, or expressly randomized decision-making on the part of regulators. Deterministic regulatory enforcement which expresses complex and highly differentiated rules of interpretation and construction may be opaque and *apparently* random from the perspective of the regulated. In practice, outcomes of specific cases may depend on detailed factual circumstances which support a chain of reasoning whose conclusion is difficult for nonspecialists (or outsiders) to predict.[2]

Section II presents the model of private contracting in which eventual defaults can be referred to the State for resolution. Equilibria for this model, which depend on the State's chosen levels of regulatory ambiguity and the adjudication fee, are characterized in Section III. Section IV analyzes the State's profit-maximizing choice of regulatory ambiguity and fees in two

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[2]   In practice, regulatory ambiguity is often associated with simple, yet vague and potentially broad statutory authority. A particularly dark example of this phenomenon, described in Solzhenitsyn (1973), was Article 58 of the former Soviet Criminal Code, "which summed up the world not so much through the exact terms of its sections as in their extended dialectical interpretation." Article 58 proved capable of such broad interpretation that it was possible to interpret any private conversation as an attempt to begin a subversive organization, and failure to report any conversation overheard among others as collaboration.

different situations, depending on whether the value of the contract in default, represented as the creditor's private performance value, is either unobservable or partially observable. I summarize my main results and offer concluding comments in Section V.

II. Private Contracting with Enforcement by the State

This section describes a contracting game between private parties who rely on the State to resolve eventual disputes. Successive stages of the contracting game are presented below under separate headings, and shown in extensive form in Figure 1. There follows a brief discussion of efficient default in the context of the contracting model, and a reinterpretation of the contracting model as a model of hierarchical review of regulatory decisions.

A. *Description of the Contracting Game*

Contract Formation

The creditor initially decides whether to enter a contract with the debtor. Both the creditor and debtor are risk neutral. If a contract is not entered, the game ends with a payoff of 0 to both parties. If a contract is entered, then the creditor immediately performs his contractual obligations, incurring an outlay of s, and the game continues. The debtor's passive role in contract formation will be justified by aspects of the model to be described later, which guarantee that the debtor can obtain a payoff of at least zero in any contingency which arises under the contract.

Performance or Default

This stage is reached if a contract is formed. With probability δ, circumstances that arise after the contract is formed, but before performance is due from the debtor, justify efficient default on the part of the debtor. Default is efficient under conditions in which both contracting parties would agree *a priori* to void the contract: for example, in contingencies where performance would be excessively expensive for the debtor.[3] I assume that circumstances justifying efficient default are observable to the debtor and verifiable by the State on review, but unobservable to the creditor.

When the debtor's performance is due, he must decide either to perform as promised or to default completely. There are three possibilities. If circumstances justifying efficient default have occurred, the debtor always defaults. Such a default will be called *efficient*.[4] If such circumstances have not occurred, the debtor chooses either to honor the contract or to default. A default which is not efficient will be called *opportunistic*.

If circumstances justifying efficient default have not occurred and the debtor chooses to honor the contract, then the game ends with payoff

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[3] This idea of efficient breach of contract follows Ulen (1984).

[4] Later, I will assume that the State always permits efficient defaults; whence it is always optimal for the debtor to default in these situations. Thus, a distinction arises between defaults which are economically efficient, and defaults which are "efficient" in the narrow sense that the debtor knows that the State will permit them. I address this distinction in the discussion in Part B, and argue in Section IV that it is likely to be innocuous in view of the State's optimal behavior.

$(\tilde{v}_c - s) > 0$ to the creditor and 0 to debtor.[5] The creditor's value of contract performance $\tilde{v}_c$ is known privately to himself.[6] From the point of view of both the debtor and the State, $\tilde{v}_c$ obeys the distribution function $F(v) = \mathcal{P}(\tilde{v}_c \leq v)$, with density function $f(v) = F'(v)$ and support on the interval $[\underline{v}_c, \bar{v}_c]$.

If the debtor defaults, either efficiently or opportunistically, then the game continues.

Acquiescence or Challenge

This point is reached if the debtor defaults on the contract. The creditor knows that the debtor has defaulted, but does not know if the default was efficient or opportunistic. The creditor must decide whether to bring a regulatory action in order to attempt to enforce the contract.

If the creditor acquiesces to the default (does not challenge), then the game ends. In the case of default with acquiescence, the creditor's payoff is -s, the lost value of his prior performance. The debtor's payoff is 0 if the default was actually efficient, and $v_D > 0$ if it was opportunistic.

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[5]   The debtor's zero payoff from honoring the contract provides a benchmark for comparing payoffs from other actions. The course of play is not affected if the debtor's payoff from honoring the contract is positive.

[6]   Most importantly for my analysis, the creditor's performance value $\tilde{v}_c$ will be the maximum amount that the creditor would pay to enforce the contract in the event of default. The performance value thus defined differs from the "objective" market value of the contracted services because it also reflects the value to the creditor of future plans whose realization is contingent on contract performance.

If the creditor undertakes a regulatory challenge to the debtor's default, then the State will decide to enforce or void the contract. The State's determination of permissible defaults, and hence its decision whether to enforce or void the original contract, is based on a deterministic system of rules which takes into account circumstances which have arisen after the contract was concluded but before performance was due from the debtor. It is assumed that all efficient defaults are permissible, and that both the creditor and debtor know this.

In addition to efficient defaults, the State may also permit opportunistic defaults under any circumstances it chooses. The State evaluates the circumstances attending an opportunistic default according to a set of rules whose operation is equally predictable to both creditor and debtor.[7] From the point of view of both contracting parties, given that circumstances justifying efficient default have not occurred, the State enforces the contract against opportunistic default with probability ϵ, and permits an opportunistic default with probability $(1-\epsilon)$. Hereafter, ϵ will be called *regulatory clarity* (similarly, $(1-\epsilon)$ is *regulatory ambiguity*).

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[7] A defaulting debtor does possess an informational advantage over the creditor, but only to the extent that the former knows if the default is efficient. In a similar framework, Bebchuk (1984) considers the likelihood of a negotiated settlement between the parties, a possibility which I do not allow. Mao (1995) studies private contracting in the presence of regulatory favoritism: that is, regulatory enforcement which is overtly biased in favor of one party or the other. In contrast, regulatory ambiguity is neutral in the sense that it directly favors neither party. The connection between regulatory ambiguity and informational asymmetry will be discussed further in Section IV.

Perfect regulatory clarity (ϵ = 100%) means that the State permits only efficient defaults.

Without regard to the final judgement, the creditor pays an adjudication fee ℓ to the State for undertaking any regulatory challenge. If the State decides to uphold the original contract, then the creditor's payoff is $\tilde{v}_c$-s-ℓ, the net private value of contract performance minus the adjudication fee; and the payoff to the debtor is -k < 0, a penalty.[8] If the State decides to permit the debtor's default, then the contract is simply voided. In this event, the creditor's payoff is -(s+ℓ), a loss equal to unrecompensed prior performance plus the adjudication fee. The debtor's payoff is 0 if the default was efficient, and v_D if it was opportunistic.

B. Discussion

Setting the debtor's payoff to zero in circumstances of efficient default is an inessential normalization. Strictly speaking, any default is "efficient" which is known to be permitted by the State under circumstances privately observable to the debtor. Consequently, changing the debtor's payoff in situations of efficient default would not affect the course of play, provided that it remains greater than the payoff from honoring the contract. In Section IV, I argue that the State optimally restricts the scope of "efficient" defaults in the above sense to circumstances where default is efficient in the usual sense that the creditor and debtor would

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[8] A penalty exacted from the debtor does not increase the payoff to anyone else. This applies to penal servitude, or to the loss of reputation following an adverse public judgement which limits the ability of an opportunistically defaulting debtor to enter future contracts.

agree *a priori* to void the original contract. Thus, the State does have a legitimate role to play in settling contract disputes among private parties: it can verify objectively whether circumstances justifying the debtor's efficient default, but unobservable to the creditor, have actually occurred.

It is possible to reinterprete the contracting model to apply also in situations where the regulatory decisions of a lower-level authority are subject to appeal and review at a higher level. In this reinterpretation, the "debtor" becomes the regulatory authority who initially applies a set of rules to a particular claimant, the "creditor". If dissatisfied with the lower-level decision, the claimant may appeal it for review to a superior authority, who assumes the role of the "State". Thus, the contracting model may be used to represent the interaction between trial courts and appeal courts, or between lower and upper levels in the decision-making hierarchy of any regulatory agency: for example, public agencies charged with interpreting tax codes, customs duties, and product quality standards.

III. Equilibrium Contracting, Default, and Challenge

This section describes equilibria in the contracting game for given values of the adjudication fee ℓ and regulatory clarity ϵ. To avoid trivialities, I assume that ℓ and ϵ are both strictly positive. This means that from the creditor's point of view, regulatory challenge in the event of the debtor's default is neither free nor pointless.

A. *Types of Equilibria*

As is clear from Figure 1, the sequence of play which occurs after a contract is entered constitutes a subgame of the overall contracting game. This follows from two key aspects of the game's information structure. A

defaulting debtor knows whether his default is efficient or opportunistic, but does not know if the creditor will subsequently challenge the default. Likewise, a creditor decides to acquiesce or challenge a default without knowing if it is efficient or opportunistic.

For given values of the adjudication fee ℓ and regulatory clarity ϵ, the creditor enters the contract only if his expected payoff in the resulting equilibrium of the post-contract subgame is nonnegative. Supposing that a contract has been formed, I denote by β the conditional probability that the debtor will default opportunistically, given that circumstances justifying efficient default do not arise. Similarly, α denotes the conditional probability that the creditor will undertake a regulatory challenge, given that the debtor defaults. An equilibrium in the post-contract subgame is a strategy pair (α^*, β^*) for the creditor's rate of challenge and the debtor's rate of default which maximizes the expected payoff to each side in view of the other's behavior. A *contracting equilibrium* of the overall game is an equilibrium (α^*, β^*) of the post-contract subgame in which the creditor's expected payoff is nonnegative.

Any contracting equilibrium must have $\alpha^* > 0$ and $\beta^* > 0$. Otherwise, $\alpha^* = 0$ provokes $\beta^* = 1$, whereby the debtor appropriates the creditor's prior performance with certainty. Likewise, $\beta^* = 0$ implies $\alpha^* = 0$ in view of $\ell > 0$, which then leads to the same contradiction. Consequently, any contracting equilibrium exhibits strictly positive frequencies of opportunistic default and challenge. If $\beta^* = 1$, contract formation plus acquiescence results in certain appropriation of the creditor's prior performance. Consequently, $\beta^* = 1$ implies $\alpha^* = 1$ in any contracting equilibrium.

Given that circumstances justifying efficient default have not occurred, the debtor's expected payoff from defaulting opportunistically is

$$(1 - \alpha\epsilon)v_D - \alpha\epsilon k. \tag{1}$$

In equilibrium, if (1) is strictly positive with $\alpha = \alpha^*$, then the debtor always defaults opportunistically, and hence $\beta^* = 1$. The debtor is indifferent between honoring the contract and defaulting opportunistically, and thus chooses $\beta^* \in (0,1]$, if

$$\alpha^* = \frac{v_D}{\epsilon(v_D + k)}. \tag{2}$$

The creditor's decision whether to acquiesce or challenge in the event of default depends on his private value of contract performance. For a creditor whose contract performance value is $\tilde{v}_C$, acquiescence in the event of default yields the expected payoff

$$(1-\delta)(1-\beta)\tilde{v}_C - s, \tag{3}$$

while challenging a default yields the expected payoff

$$(1-\delta)[(1-\beta) + \beta\epsilon]\tilde{v}_C - [\delta + (1-\delta)\beta]\ell - s. \tag{4}$$

The derivative of (4) with respect to $\tilde{v}_C$ is strictly greater than the same derivative of (3). This monotonicity, or single-crossing, property assures that if regulatory challenge is optimal for a given creditor valuation, then it is also optimal for all higher creditor valuations. Similarly, if acquiescence to default is optimal for a given creditor valuation, then it is also optimal for all lower creditor valuations. In an equilibrium with $\alpha^* < 1$, an interval of high-valuation creditors contracts

and challenges in the event of default, and an adjacent interval of creditors with lower performance valuations contracts and acquiesces in the event of default. Finally, there may remain an interval of creditors whose performance valuations are so low that they choose not to contract.

I next define several contract performance values which are useful in characterizing contracting equilibria: v^{ACQ} is the contract performance value of a creditor who obtains zero payoff from entering a contract and acquiescing in the event of default; v^{CHL} is the contract performance value of a creditor who obtains zero payoff from entering a contract and challenging in the event of default; and v^{IND} is the contract performance value of a creditor who is indifferent between acquiescence and challenge, given that a contract has been entered. From (2) and (3):

$$v^{ACQ} = \frac{s}{(1-\delta)(1-\beta)} \; ,$$

$$v^{CHL} = \frac{s + [\delta + (1-\delta)\beta]\ell}{(1-\delta)[(1-\beta) + \beta\epsilon]} \; ,$$

and

$$v^{IND} = \frac{[\delta + (1-\delta)\beta]\ell}{(1-\delta)\beta\epsilon} \; .$$

A contracting equilibrium exists whenever regulatory clarity ϵ is sufficiently high relative to the adjudication fee ℓ. Subject to this observation, a contracting equilibrium corresponding to a given fee/clarity pair (ℓ, ϵ) is unique, and its character depends on the level of regulatory clarity ϵ in relation to the lower threshold $\underline{\epsilon} = v_D/(v_D+k)$, as described below.

If regulatory clarity ϵ is strictly greater than $\underline{\epsilon}$, then $\beta^* = 1$ with $\alpha^* = 1$ would yield strictly negative expected payoff to the debtor. Thus, in a contracting equilibrium with $\epsilon > \underline{\epsilon}$, the debtor strictly randomizes between contract observance and opportunistic default according to $0 < \beta^* < 1$. To support this indifference, the equilibrium probability α^* of regulatory challenge by the creditor must be

$$\alpha^* = \underline{\epsilon}/\epsilon < 1 . \tag{5}$$

The equilibrium probability β^* of opportunistic default by the debtor is therefore determined implicitly via

$$\alpha^* = \left. \frac{1 - F(v^{IND})}{1 - F(v^{ACQ})} \right|_{\beta = \beta^*} \tag{6}$$

using the value of α^* from (5). In a contracting equilibrium with $\epsilon > \underline{\epsilon}$, opportunistic default and regulatory challenge are both strictly randomized: $0 < \alpha^* < 1$ and $0 < \beta^* < 1$. The structure of a randomizing contracting equilibrium is shown in Figure 2a.

If regulatory clarity ϵ is strictly less than $\underline{\epsilon}$, then the debtor's expected profit from opportunistic default is positive even if the creditor challenges with certainty. Thus, a contracting equilibrium with $\epsilon < \underline{\epsilon}$ is degenerate in the sense that both opportunistic default and challenge occur with certainty ($\alpha^* = 1$ and $\beta^* = 1$). Figure 2b shows the canonical structure of a degenerate contracting equilibrium.

In the special case that regulatory clarity ϵ exactly equals $\underline{\epsilon}$, existence of contracting equilibrium also implies nonuniqueness.[9] However, this possibility is unimportant in the following analysis, and will be ignored.

The possibilities for randomizing and degenerate contracting equilibria are summarized in the following proposition.

Proposition 1. *For given levels of the adjudication fee ℓ and regulatory clarity ϵ, suppose that a contracting equilibrium exists.*

(i)   *If $\epsilon > \underline{\epsilon}$, then the contracting equilibrium is unique and strictly randomizing: $0 < \alpha^* < 1$ and $0 < \beta^* < 1$. Equilibrium rates of opportunistic default and challenge are determined by (5) and (6).*

(ii)   *If $\epsilon < \underline{\epsilon}$, then the contracting equilibrium is unique and degenerate: $\alpha^* = 1$ and $\beta^* = 1$.*

For given values of the adjudication fee ℓ and regulatory clarity ϵ, let $\mathcal{P}^*$ be the equilibrium rate of contract formation. Obviously, $\mathcal{P}^* = 0$ in a noncontracting equilibrium. In a contracting equilibrium, the rate of

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[9]   A contracting equilibrium with $\epsilon = \underline{\epsilon}$ must have $\alpha^* = 1$; otherwise, a challenge rate strictly less than one would induce opportunistic default with certainty. For ℓ sufficiently low, there exist multiple randomizing contracting equilibria with $\alpha^* = 1$ and $0 < \beta^* < 1$. β^* may assume any value between the lower limit $\underline{\beta}$ at which $v^{ACQ} = v^{IND}$ [$= v^{CHL}$] (this is a limiting case of the equilibrium structure in Figure 2b), and the upper limit $\bar{\beta}$, which is the lesser of one and the value of β at which $v^{CHL} = \bar{v}$ (this is a limiting case of the equilibrium structure in Figure 2a). If $\bar{\beta} = 1$, then the set of contracting equilibria includes a degenerate equilibrium in which default and challenge both occur with certainty.

contract formation depends on whether challenge is certain or uncertain in the event of default. On the basis of the preceding discussion, a contracting equilibrium (α^*, β^*) exhibits

$$
\mathcal{P}^* = \begin{cases} 1 - F(v^{ACQ}|_{\alpha=\alpha^*, \beta=\beta^*}) & \text{if } \alpha^* < 1 \\ \\ 1 - F(v^{CHL}|_{\alpha=\alpha^*, \beta=\beta^*}) & \text{if } \alpha^* = 1 . \end{cases} \tag{7}
$$

B. The Insignificance of Degenerate Contracting Equilibria

For $\epsilon > \underline{\epsilon}$, a randomizing contracting equilibrium always exists if the adjudication fee ℓ is sufficiently low. However, for $\epsilon < \underline{\epsilon}$, the only possible type of contracting equilibrium is degenerate, and such an equilibrium may fail to exist for any positive value of ℓ.

In a degenerate contracting equilibrium, a creditor with performance valuation $\tilde{v}_c$ who enters the contract receives the expected payoff $(1-\delta)\tilde{v}_c\epsilon - s - \ell$. This expected payoff must (at least) be positive for the creditor with the highest performance valuation $\bar{v}$. Therefore, setting ℓ to zero, a necessary (and sufficient) condition for existence of degenerate contracting equilibria is

$$
\underline{\epsilon} > \frac{s}{(1-\delta)\bar{v}} . \tag{8}
$$

From (8), degenerate contracting equilibria will fail to exist if threshold regulatory clarity $\underline{\epsilon}$ is small in comparison to the creditor's initial outlay as a percentage of the maximal performance valuation net of the likelihood of efficient default. Condition (8) is difficult to satisfy, which indicates that degenerate contracting equilibria are unlikely to occur in practice.

To demonstrate this point, I consider an extreme example. First, normalize the creditor's initial outlay to s = 1, so that the creditor's performance value can be interpreted as an expected internal rate of return under the contract. With a maximal creditor valuation as high as $\bar{v}$ = 2.00 (representing a 100% rate of return on the initial outlay) and efficient default rate δ = 1%, existence of a degenerate contracting equilibrium requires $\underline{\epsilon}$ > .505. A degenerate contracting equilibrium fails to exist if the penalty rate k is at least as large as the debtor's default value v_D, which implies $\underline{\epsilon}$ ≤ .5.

IV. Optimal Regulatory Ambiguity

How should the State choose its adjudication fee ℓ and regulatory clarity ϵ in order to maximize its own expected payoff? For the purposes of the present analysis, the State's expected payoff is taken to be simply the expected value of its revenues obtained from the adjudication of disputes between the creditor and the debtor. Such revenues arise only if the contract is formed, the debtor defaults, and the creditor challenges the default. Thus, the State's expected payoff is

$$\pi(\ell,\epsilon) = \mathcal{P}^*[\delta + (1-\delta)\beta^*]\alpha^*\ell , \qquad (9)$$

where $\mathcal{P}^*$, β^*, and α^* indicate equilibrium values for the rates of contract formation, opportunistic default, and regulatory challenge resulting from the fee/clarity pair (ℓ,ϵ).

From the discussion in Section III, degenerate contracting equilibria fail to exist *unless* the penalty rate k is low relative to the debtor's default value v_D, and the maximum creditor performance value $\bar{v}$ is large

relative to the initial outlay s.[10] Hereafter, I assume that degenerate
contracting equilibria do not exist. Accordingly, the State maximizes its
expected revenue by choosing among levels of regulatory clarity ϵ above the
minimum threshold $\underline{\epsilon}$, which results in randomizing contracting equilibria.[11]

In the following, it is convenient to define $\phi^* \equiv \delta + (1-\delta)\beta^*$ as the
aggregate rate of default in the (randomizing) equilibrium (α^*, β^*) which
results from (ℓ, ϵ). Applying equilibrium condition (6) to (9), the State's
expected profit in a randomizing equilibrium can be represented as

$$\pi(\epsilon, \ell) = \underline{\epsilon}\phi^* \mathcal{P}^* \left[\frac{\ell}{\epsilon} \right]. \tag{10}$$

A. Unobservable Creditor Valuations

The contracting model of Section II assumes that both the debtor and the
State perceive the creditor's value of contract performance as a random
variable $\tilde{v}_c$ distributed according to $F(\cdot)$ on the interval $[\underline{v}, \bar{v}]$. Since
neither the debtor nor the State has more precise information about the
valuation of contract performance to specific creditors, such as might be

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[10]   A penalty rate k that is low relative to the debtor's default value
v_D produces a low threshold efficiency level $\underline{\epsilon}$. Assuming that the efficient
default rate δ is small, I ignore its influence in the present discussion.

[11]   My calculations of parametric examples show that even in situations
where degenerate contracting equilibria are possible, the State obtains
higher expected revenue over choices of regulatory efficiency and fees which
yield randomizing contracting equilibria. However, I am not able to prove
that randomizing equilibria ($\epsilon > \underline{\epsilon}$) yield higher expected revenue to the
State than degenerate equilibria ($\epsilon < \underline{\epsilon}$) in all situations.

gleaned from their observable characteristics, the basic model depicts a

situation in which individual creditor valuations are unobservable.

For a given level of regulatory clarity $\epsilon \in (\underline{\epsilon}, 100\%]$, define $\ell(\epsilon)$ to be

the adjudication fee which maximizes the State's expected revenue in a

contracting equilibrium. Similarly, for a given adjudication fee ℓ, $\epsilon(\ell)$

indicates the State's revenue-maximizing level of regulatory clarity. The

adjudication fee ℓ is *feasible* if $\epsilon(\ell)$ is well-defined: that is, if ℓ can

support a contracting equilibrium with *some* level of regulatory clarity

$\epsilon \in (\underline{\epsilon}, 100\%]$.[12] The following proposition is proved in the Appendix.

Proposition 2. *For any feasible adjudication fee ℓ:*

(i) $\quad \dfrac{\partial \pi}{\partial \delta} (\ell, \epsilon(\ell)) < 0.$

(ii) *If $\epsilon(\ell) < 100\%$, then $\pi(\ell, \epsilon(\ell))$ is strictly increasing in ℓ.*

According to Proposition 2(i), for any feasible adjudication fee, the

State's clarity-optimized expected revenue is negatively related to the rate

of "efficient" default δ.[13] It follows that the self-interested State will

interpret circumstances justifying "efficient" default as narrowly as

possible, thus minimizing δ. The intuition behind this result is simple.

Since "efficient" defaults are known to be permissible and occur under

circumstances privately observable to the debtor, enlarging their scope

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[12]   An adjudication fee ℓ is feasible if it is not too high. Formally,
ℓ is feasible if it yields a contracting equilibrium when accompanied by
perfect regulatory clarity, $\epsilon = 100\%$.

[13]   As before in Section II, I use quotation marks to distinguish
defaults which are "efficient" in the formal sense of the contracting model
from those which are economically efficient.

increases the debtor's informational advantage. This makes the creditor less likely to challenge a default, which hurts the State's revenues. Consequently, the State optimally restricts the scope of permitted defaults under circumstances privately observable to the debtor to contingencies in which the debtor's default is genuinely efficient in the sense that, if default were not permitted, the contracting parties would not voluntarily enter the contract.

Ironically, in view of the preceding discussion, some positive probability of efficient default is essential to State's role in dispute resolution. If $\delta = 0$, then a degenerate contracting equilibrium is possible in which the debtor never defaults, and the creditor credibly promises that he *would* challenge any default, regardless of the adjudication fee. Alternatively, if the penalty k represents a loss to the debtor due to exclusion from future contracting opportunities, then the creditor could simply announce that any observed default, necessarily opportunistic, will be punished. In either case, the State's role becomes superfluous.

In effect, Proposition 2(i) implies that the State does not profit from regulatory uncertainty which confers an informational advantage on the debtor. Consequently, the State's interest in maximizing its payoff from dispute resolution naturally reduces to choosing an optimal degree of regulatory ambiguity: that is, regulatory uncertainty which constitutes pure noise from the perspective of the affected parties.

Proposition 2(ii) shows that the State's expected payoff $\pi(\ell, \epsilon(\ell))$ is strictly increasing along the clarity-optimized path $(\ell, \epsilon(\ell))$ for $\epsilon(\ell) < 100\%$. Consequently, choosing its adjudication fee jointly with regulatory clarity, the State maximizes expected revenue with perfect

regulatory clarity, ϵ = 100%. Thus, with unobservable performance values, the revenue-maximizing State does choose to regulate unambiguously; but also sets a high adjudication fee. The high fee induces low-value creditors to acquiesce in the event of default, which leads debtors to default opportunistically in spite of the absence of regulatory loopholes.

In order to elucidate further the relation between the level of the adjudication fee ℓ and the State's expected payoff $\pi(\ell, \epsilon(\ell))$, I examine in detail a pair of parametric examples. Both examples are similar except that performance valuations to creditors are uniformly higher in the second example than in the first. In Example I, $\tilde{v}_c$ is uniformly distributed on [1.10,1.20]; in Example II, $\tilde{v}_c$ is uniformly distributed on [1.15,1.25]. In both examples, δ = 3%, s = 1, and k = $3v_D$. Thus, $\underline{\epsilon}$ = 25%, whence only randomizing contracting equilibria are possible in each example via (8).

In the following discussion, $\underline{\ell}$ indicates the limit for $\ell(\epsilon)$ as ϵ decreases to $\underline{\epsilon}$.[14] With this definition, $(\underline{\ell}, \ell(100\%)]$ is the range of adjudication fees for which the associated optimal levels of regulatory clarity vary without constraint between the limiting values $\underline{\epsilon}$ and 100%.

In both examples, for different feasible values of the adjudication fee ℓ, Table 1 shows the associated optimal levels of regulatory clarity $\epsilon(\ell)$ and payoffs to the State $\pi(\ell, \epsilon(\ell))$, together with equilibrium values of the rate of contract formation $\mathcal{P}^*$, the debtor's aggregate default rate ϕ^*, and the creditor's rate of regulatory challenge α^*.[15] The relation between the

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[14] Similarly, $\bar{\ell}$ can be defined to be the maximum feasible adjudication fee (see note 6). Since $\pi(\bar{\ell}, 100\%) = 0$, it will be true that $\ell(100\%) < \bar{\ell}$.

[15] Numerical contracting equilibria in this paper were calculated

adjudication fee ℓ and the State's clarity-optimized payoff $\pi(\ell,\epsilon(\ell))$ is graphically represented in Figure 3a. The equilibrium default rate ϕ^* along the clarity-optimized path $(\ell,\epsilon(\ell))$ is nearly invariant in both examples for $\ell \in (\underline{\ell},\ell(100\%)]$: $\beta^* \approx 7.3\%$ for $\tilde{v}_c \sim U[1.10,1.20]$, and $\beta^* \approx 10.3\%$ for $\tilde{v}_c \sim U[1.15,1.25]$. In Example I, the State earns maximized expected revenue 1.83% with the adjudication fee $\ell_I^* = 83\%$;[16] in Example II, the revenue maximum of 3.08% is realized with the adjudication fee $\ell_{II}^* = 94\%$. These adjudication fees correspond to the respective values of $\ell(100\%)$ in each example.

The relative invariance of the aggregate default rate ϕ^* (and hence the opportunistic default rate β^*) on the clarity-optimized path $(\ell,\epsilon(\ell))$ for $\ell\in(\underline{\ell},\ell(100\%)]$ helps to explain why the State increases its expected payoff with greater regulatory clarity and higher adjudication fees. With ϕ^* constant, the threshold contract value for acquiescence v^{ACQ}, and hence the equilibrium rate of contract formation $\mathcal{P}^*$ are also constant. Subject to this constraint, (10) implies that the State's expected payoff will increase along the path $(\ell,\epsilon(\ell))$ if and only if the optimal adjudication fee increases *more* than proportionately with increased regulatory clarity. Comparing the equilibrium condition (6), it is seen that with v^{ACQ} constant, the threshold performance valuation v^{IND}, which indicates indifference between acquiescence and challenge in the event of default, must increase as regulatory clarity ϵ increases. An increase in the equilibrium value of v^{IND} implies that the

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using software written in the *Mathematica 2.2* programming language. This software is available from the author on request.

[16]   In the following, the State's adjudication fees and expected payoffs are expressed as percentages of the creditor's initial outlay, s = 1.

adjudication fee rises more than proportionately with the level of regulatory clarity, whence the State's expected payoff also rises.

Relaxing the constraint that the default rate ϕ^* be strictly constant along the clarity-optimized path $(\ell, \epsilon(\ell))$ for $\ell \in (\underline{\ell}, \ell(100\%)]$ does not alter the conclusion that the State's expected payoff increases as the adjudication fee increases. For Example I (with low creditor performance values), Table 1 shows that ℓ increases more than proportionately with $\epsilon(\ell)$, though by less than the amount that would be implied by strict constancy of the equilibrium default rate. Consequently, the induced equilibrium default rate falls slightly (and hence the equilibrium contract probability $\mathcal{P}^*$ slightly rises) as regulatory clarity increases. In Example II (with high creditor performance values) , the optimal contract frequency $\mathcal{P}^*$ equals one along the clarity-optimized path $(\ell, \epsilon(\ell))$ for $\ell \in (\underline{\ell}, \ell(100\%)]$. Since the value of $\mathcal{P}^*$ is determined by ϕ^* (via v^{ACQ}), ϕ^* is therefore completely invariant across different fee levels along the clarity-optimized path in Example II.

While both examples confirm that the State's expected payoff $\pi(\ell, \epsilon(\ell))$ increases with the adjudication fee ℓ, it is also apparent that the magnitude of this increase is small. In percentage terms, the State's expected payoff is also approximately invariant along the clarity-optimized path $(\ell, \epsilon(\ell))$ for $\ell \in (\underline{\ell}, \ell(100\%)]$.

This quantitative result is not coincidental. If the distribution of creditor valuations were concentrated at a single point, then the State's expected payoff would be exactly identical at every (randomizing) contracting equilibrium along the clarity-optimized path. In this situation, the State is completely indifferent to the level of its adjudication fee, provided that regulatory clarity can be adjusted to compensate. In Examples I and II, the

approximate invariance of the State's expected payoff along the clarity-optimized path demonstrates a substantial degree of convergence to this limiting case.

The following proposition treats the limiting case of an degenerate distribution of creditor performance values. It is proved in the Appendix.

Proposition 3. *Suppose that all potential creditors have the same contract valuation* $v_c > s$. *For adjudication fees* $\ell \in (\underline{\ell}, \ell(100\%)]$,

(i) *Optimal regulatory clarity* $\epsilon(\ell)$ *increases exactly in proportion with* ℓ.

(ii) *In clarity-optimized contracting equilibria resulting from* $(\ell, \epsilon(\ell))$,

the aggregate default rate and payoff to the State are constant:

$$\phi^* = (v_c - s)/s \ \text{and} \ \pi(\ell, \epsilon(\ell)) = \underline{\epsilon}[(1-\delta)v_c - s].$$

B. Partially Observable Creditor Valuations

Suppose that a certain characteristic $\tilde{z}$, commonly observable to the creditor, debtor, and State, contains information about the creditor's private performance valuation $\tilde{v}_c$. The equilibrium behavior of the creditor and debtor will be sensitive to this characteristic as follows. If the realization of $\tilde{z}$ signals a low performance value for the creditor, both parties anticipate a lower rate of challenge in the event of default; hence the equilibrium rate of opportunistic default increases and the rate of contract formation declines. Conversely, if the realization of $\tilde{z}$ signals a high performance value for the creditor, both parties anticipate a higher rate of challenge in the event of default; whence the equilibrium rate of opportunistic default falls and the rate of contract formation increases. In view of these reactions, the State optimally conditions its adjudication fee and regulatory clarity on the observed value of $\tilde{z}$.

According to the foregoing analysis, the State would ideally prefer to offer perfect regulatory clarity $\epsilon(\tilde{z}) = 100\%$ in all contingencies for $\tilde{z}$, while adjusting the adjudication fee $\ell(\tilde{z})$ according to the conditional distribution of $\tilde{v}_c$ given $\tilde{z}$. A higher conditional distribution for the creditor valuation $\tilde{v}_c|\tilde{z}$ would provoke a higher adjudication fee $\ell(\tilde{z})$. This fee structure implies that in two contract disputes with the same factual circumstances but different stakes in interest $\tilde{v}_c|\tilde{z}$, the State would resolve both disputes identically while assessing different fees. In practice, the State may be unable to implement such a pricing strategy, which could be perceived to violate an elementary principle of fairness that enforcement of identical substantive regulations (implied by constancy of ϵ) should not be subject to fee discrimination based on the value of the disputed claim.

Reflecting this concern for fairness, I consider the situation in which the State maximizes its expected payoff with a uniform adjudication fee ℓ, while adjusting the level of regulatory clarity $\epsilon(\tilde{z})$ contingent on $\tilde{z}$. In effect, this means that the State is free to apply different standards of precision or slackness in regulatory enforcement according to the anticipated value of the stake in interest $\tilde{v}_c|\tilde{z}$, but is precluded from practicing direct fee discrimination.

With partial information about the creditor's performance valuation, the general outline of the State's revenue-maximizing strategy is clear. I assume that increasing realizations of $\tilde{z}$ are associated with increased distributions of creditor values $\tilde{v}_c|\tilde{z}$. If the level of regulatory clarity as well as the adjudication fee were chosen to be uniform, then higher values of $\tilde{z}$ would be associated with lower rates of opportunistic breach, since the adjudication fee would be comparatively low in these contingencies. To

offset this effect, the State optimally reduces the level of regulatory clarity at higher realizations for $\tilde{z}$, effectively encouraging higher rates of opportunistic breach by increasing the frequency of regulatory loopholes.

As an example, I assume that the observable characteristic $\tilde{z}$ signals that the creditor belongs either to the low-valuation population of Example I or the high-valuation population of Example II. This means that $\tilde{v}_c|\tilde{z}=1 \sim U[1.10,1.20]$ and $\tilde{v}_c|\tilde{z}=2 \sim U[1.15,1.25]$. To complete the example, I assume that both classes of creditor performance valuations are equally likely, whence $\mathcal{P}(\tilde{z}=1) = \mathcal{P}(\tilde{z}=2) = 50\%$.

If the State sets a uniform adjudication fee, then it optimally chooses $\ell^{**} = 83.2\%$ together with $\epsilon^{**}(1) = 100\%$ and $\epsilon^{**}(2) = 88.4\%$, and obtains an expected payoff of 2.45%. Comparing Table 1, notice that optimal uniform adjudication fee ℓ^{**} with clarity discrimination is only slightly larger than the optimal fee for the homogeneous population of low-valuation creditors, but that optimal regulatory clarity to high-value creditors $\epsilon^{**}(2)$ is significantly reduced from 100%. This results from the relative invariance of the State's payoff to its adjudication fee along the clarity-optimized path for the high-value subgroup of creditors (See Figure 3b).

Strikingly, the State's expected payoff with a uniform adjudication fee and clarity discrimination is virtually identical to its first-best payoff with flexible fees and perfect clarity for both creditor classes. Under the first-best approach with fee discrimination, the State's expected payoff is .5(1.83%) + .5(3.08%) = 2.45% (the difference in expected payoffs appears first in the thousandth's place). The examples show that when the States expected payoff is relatively invariant along the clarity-optimized paths of

different creditor classes, clarity discrimination substitutes almost
perfectly for fee discrimination.

In contrast, if the State chooses a uniform adjudication fee while
maintaining perfect regulatory clarity in both contingencies for $\tilde{z}$, then the
resulting optimal fee ℓ^{***} = 92.3% together with $\epsilon^{***}(1) = \epsilon^{***}(2)$ = 100%
yields an expected payoff of only 2.10%. This is a proportional reduction of
14.3% in comparison with the State's expected payoff with a uniform fee and
clarity discrimination. The drop in the State's expected payoff results from
the reduced rate of contracting in the subgroup of low-value creditors. With
ℓ^{***} = 92.3% and $\epsilon^{***}(1)$ = 100%, the equilibrium rate of contracting among
low-valuation creditors is only 45%; as opposed to 87% with ℓ^{**} = 83.2% and
$\epsilon^{**}(1)$ = 100% under clarity discrimination. Thus, when creditor performance
valuations are partially observable, the State's ability to apply regulatory
loopholes specifically in situations of high expected performance valuations
can result in both a lower uniform adjudication fee and a higher rate of
contract formation than would occur with fee uniformity and perfect
regulatory clarity.

V. Concluding Comments

If a regulatory authority can vary its adjudication fee according to
observable characteristics signalling a claimant's willingness to pay, then
it optimally provides uniformly unambiguous regulatory enforcement at high
and variable fees. This conclusion supports, albeit rather cynically, the
proposition that a self-interested regulatory authority seeks to regulate
efficiently, in the sense that it enforces clear and predictable delineations
between permitted and prohibited defaults on private contracts, while

limiting permitted defaults to those which are efficient. However, the optimality of efficient regulation depends on the regulatory authority's ability to charge different fees to claimants according to the expected values of their stakes in interest, even if the cases they present are substantively identical.

The situation is different if the regulatory authority cannot directly discriminate with respect to fees, either in consideration of fairness or because its fees are set exogenously. If the regulatory authority must charge a uniform fee to all claimants, then it optimally discriminates with respect to the ambiguity of regulatory enforcement according to circumstances which are related to the value of the stake at issue. The ability to discriminate with respect to regulatory interpretation and enforcement, and hence with respect to regulatory ambiguity in practice, substitutes for overt fee discrimination. The examples show that the degree of ambiguity in regulatory enforcement is likely to be higher when the stake at interest is more valuable. Thus, a regulatory authority with uniform fees is more likely to pronounce simple (clear) summary judgements in low-value disputes, while reserving more detailed (ambiguous) scrutiny for high-value disputes. Stated bluntly, a self-interested regulatory authority applies regulatory loopholes more frequently when more money is at stake.

Finally, the regulatory authority's payoff from ambiguity discrimination can be relatively invariant over a broad range of fee levels, and may closely approximate the first-best payoff from fee discrimination. Under these conditions, the regulatory authority is *almost* indifferent to the level of its fees, provided that it remains free to adjust its enforcement standards accordingly. In this situation, legislative attempts to set low regulatory

fees may simply lead to more erratic enforcement, with little net effect on the frequency of disputes or the income of the regulatory authority.

A regulatory authority's relative indifference between different degrees of ambiguity in enforcement, with appropriately adjusted fees, has troubling practical implications. Absent a strong preference for regulatory clarity, the choice of regulatory regime may be driven in practice by considerations outside the scope of the formal model in this paper. In this spirit, there is a potential bias favoring regulatory ambiguity, which serves to conceal overt bribery and corruption of the traditional sort. A regulatory regime in which ambiguous rules are subject to broad interpretation lends itself to the pursuit of special arrangements and dispensations based on connections and interest; a more transparent system in which rules and their consequences are predictable does not. In a climate of regulatory ambiguity, outcomes which are actually based on favoritism or bribery can be passed off as the result of objective evaluation of particular circumstances in individual cases.

In this way, corruption "in the fabric" of a regulatory system is complementary with the practice of overt trading in private interests by the people charged with its enforcement. In formerly communist countries of Central and Eastern Europe, people have become accustomed to believe that the formal structure of regulatory codes or institutions makes little difference to their function: Formal structures are always manipulable; what really matters are the interests of the people in control. In such an environment, a delicate preference for regulatory clarity, based on the ability to practice fee discrimination, will offer little resistance to the temptation for individual self-enrichment through bribery and influence peddling, which thrive better in the indulgent half-light of regulatory ambiguity.

Appendix

Proof of Proposition 2. The State's expected payoff in the randomizing contracting equilibrium which results from adjudication fee ℓ and regulatory clarity $\epsilon > \underline{\epsilon}$ is $\pi(\ell,\epsilon) = \epsilon \mathcal{P}^* \phi^* [\ell/\epsilon]$. In the following, threshold creditor valuations v^{ACQ} and v^{IND} refer to the contracting equilibrium (α^*,β^*) which results from (ℓ,ϵ); while $\mathcal{P}^* = 1 - F(v^{ACQ})$ and $\phi^* = \delta + (1-\delta)\beta^*$ are the probabilities of contract formation and default in the same equilibrium.

For a given adjudication fee ℓ, let $\epsilon(\ell) \in (\underline{\epsilon},100\%]$ be the degree of regulatory clarity which maximizes the State's expected payoff. We have

$$\frac{\partial \ln\pi}{\partial \ln\ell} (\ell,\epsilon(\ell)) = \frac{\partial \ln\pi}{\partial \ln\phi^*} \cdot \frac{\partial \ln\phi^*}{\partial \ln\ell} + 1 \; ; \tag{A1}$$

while the optimality of $\epsilon(\ell)$ implies that

$$\frac{\partial \ln\pi}{\partial \ln\epsilon} (\ell,\epsilon(\ell)) = \frac{\partial \ln\pi}{\partial \ln\phi^*} \cdot \frac{\partial \ln\phi^*}{\partial \ln\epsilon} - 1 \tag{A2}$$

$$\geq 0 \; ,$$

with strict equality to zero in (A2) whenever $\epsilon(\ell) < 100\%$.

Differentiating the equilibrium condition (6) yields

$$\frac{\partial \ln\phi^*}{\partial \ln\ell} = \frac{f(v^{IND})v^{IND}}{f(v^{IND})v^{IND}\delta(\phi^*-\delta)^{-1} + f(v^{ACQ})v^{ACQ}\alpha^*\phi^*(1-\phi^*)^{-1}} > 0 \tag{A3}$$

and

$$\frac{\partial \ln\phi^*}{\partial \ln\epsilon} = - \frac{f(v^{IND})v^{IND} + \alpha^*\mathcal{P}^*}{f(v^{IND})v^{IND}\delta(\phi^*-\delta)^{-1} + f(v^{ACQ})v^{ACQ}\alpha^*\phi^*(1-\phi^*)^{-1}} < 0 \; . \tag{A4}$$

Comparison of (A2) and (A4) establishes that $\frac{\partial \ln \pi}{\partial \ln \phi^*}(\ell, \epsilon(\ell)) < 0$. Notice that this conclusion applies even if $\epsilon(\ell) = 100\%$.

Applying once more to the equilibrium condition (6), it is easy to show that $\frac{\partial \phi^*}{\partial \delta} > 0$. This simply says that increasing the probability of efficient default also increases the aggregate probability of default in the resulting contracting equilibrium. Thus,

$$\frac{\partial \pi}{\partial \delta} = \frac{\partial \pi}{\partial \phi^*} \frac{\partial \phi^*}{\partial \delta} < 0,$$

which proves (i).

Next, observe from (A3) and (A4) that

$$\frac{\partial \ln \phi^*}{\partial \ln \ell} + \frac{\partial \ln \phi^*}{\partial \ln \epsilon} = - \frac{\alpha^* \mathcal{P}^*}{\text{DENOM}} < 0 ,$$

where DENOM is the common denominator of the partial derivatives in (A3) and (A4).

By the envelope theorem, $\pi'(\ell, \epsilon(\ell)) = \pi_1(\ell, \epsilon(\ell))$, where the subscript indicates partial differentiation. Whenever $\epsilon(\ell) < 100\%$, adding (A1) and (A2) gives

$$\frac{\partial \ln \pi}{\partial \ln \ell}(\ell, \epsilon(\ell)) = \frac{\partial \ln \pi}{\partial \ln \phi^*} \left[\frac{\partial \ln \phi^*}{\partial \ln \epsilon} + \frac{\partial \ln \phi^*}{\partial \ln \ell} \right] > 0 ,$$

which proves (ii). $Q.E.D.$

Remarks: Using the same method of proof as above, it is also possible to show that the State's expected payoff is increasing in regulatory clarity ϵ along the fee-optimized path $(\ell(\epsilon), \epsilon)$. Formally, one obtains the counterpart to Proposition 2(ii): $\pi'(\ell(\epsilon), \epsilon) > 0$ for all $\epsilon \in (\underline{\epsilon}, 100\%]$. Because the

State's choice of an optimal regulatory fee $\ell(\epsilon)$ is unbounded from above, the counterpart proposition for the fee-optimized path applies even if $\epsilon = 100\%$. It is clear that the global maximum for the State's expected payoff occurs along the fee-optimized path with $\epsilon = 100\%$ and $\ell = \ell(100\%)$. Comparing Proposition 2(ii) with its counterpart, the optimal regulatory fee $\ell(100\%)$ must exceed $\hat{\ell}$ on the clarity-optimized path $(\ell, \epsilon(\ell))$ for which $\epsilon(\hat{\ell}) = 100\%$. However, for both examples in the text, the difference between $\ell(100\%)$ and $\hat{\ell}$ is negligible.

Proof of Proposition 3. Suppose that the distribution of creditor valuations $F(\cdot)$ is degenerate at $v_c > s$. Consider a randomizing contracting equilibrium resulting from the adjudication fee ℓ with regulatory clarity ϵ. Equilibrium condition (5) is unaffected; while (6) becomes simply $v^{IND} = v_c$, from which

$$\phi^* = \frac{\delta v_c}{v_c - (\ell/\epsilon)} \, .$$

If ℓ is fixed and ϵ variable, then the State maximizes its expected payoff by choosing $\epsilon(\ell)$ such that the representative creditor enters the contract and earns (almost) zero expected profit. For $\ell \in (\underline{\ell}, \ell(100\%)]$, the clarity-optimized contracting equilibrium with $(\ell, \epsilon(\ell))$ is thus characterized by full participation, $\mathcal{P}^* = 1$, and zero expected payoff to the creditor,

$$(1-\phi^*)v_c - s = 0.$$

Combining the equilibrium and zero-profit conditions yields

$$\frac{\ell}{\epsilon(\ell)} = \frac{(1-\delta)v_c^2 - sv_c}{v_c - s} \, ,$$

from which $\epsilon(\ell)$ increases proportionately with ℓ, and $\phi^* = (v_c - s)/s$. Finally, $\pi(\ell, \epsilon(\ell)) = \epsilon \mathcal{P}^* \phi^* [\ell/\epsilon(\ell)] = \underline{\epsilon}[(1-\delta)v_c - s]$. $Q.E.D.$

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Table 1. Contracting Equilibria with Varying Adjudication Fees

A. *Low Range of Performance Valuations:* $\tilde{v}_C \sim U[1.10,1.20]$

	Adjudication Fee							
	20%	30%	40%	50%	60%	70%	80%	90%[*]
Optimal Clarity	25.3%	37.2%	49.1%	60.9%	72.8%	84.6%	96.5%	100%
Payoff to State	1.73%	1.78%	1.80%	1.81%	1.82%	1.83%	1.83%	1.62%
Contract Frequency	85.6%	86.3%	86.7%	86.9%	87.0%	87.1%	87.2%	57.7%
Default Frequency	10.3%	10.2%	10.2%	10.2%	10.2%	10.1%	10.1%	12.5%
Challenge Frequency	98.7%	67.2%	51.0%	41.1%	34.3%	29.5%	25.9%	25.0%

B. *High Range of Performance Valuations:* $\tilde{v}_C \sim U[1.15,1.25]$

	Adjudication Fee							
	20%[*]	30%	40%	50%	60%	70%	80%	90%
Optimal Clarity	25.0%	33.2%	43.6%	53.9%	64.3%	74.7%	85.1%	95.5%
Payoff to State	2.11%	2.95%	2.99%	3.02%	3.04%	3.05%	3.06%	3.07%
Contract Frequency	100%	100%	100%	100%	100%	100%	100%	100%
Default Frequency	10.5%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%
Challenge Frequency	100%	75.4%	57.4%	46.3%	38.9%	33.5%	29.4%	26.2%

Notes: Adjudication fees and payoffs are percentages of the creditor's initial outlay s. In both examples: s = 1.00, δ = 3%, and k = $3v_D$; thus $\underline{\epsilon}$ = 25%.

[*] Starred adjudication fees lie outside the interval $(\underline{\ell}, \ell(100\%)]$.
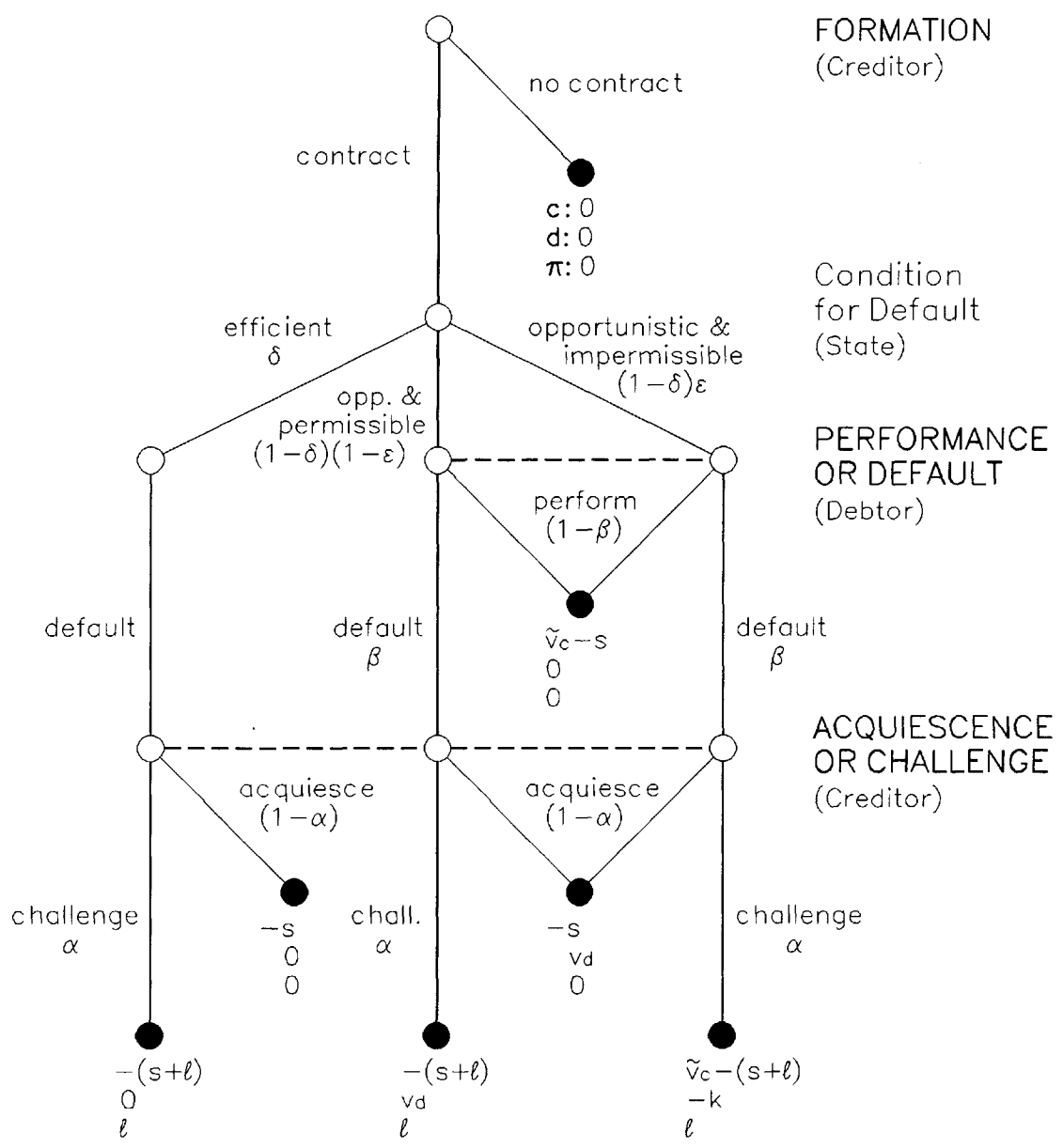
Figure 1. The Contracting Game

A. Randomizing

E[payoff]

form & challenge

form & acquiesce

Creditor's
performance value

0

$\underline{V}$ V^{ACQ} V^{CHL} V^{IND} $\overline{V}$

B. Degenerate

E[payoff]

form & challenge

Creditor's
performance value

V^{IND} V^{CHL}

0

$\underline{V}$ V^{ACQ} $\overline{V}$
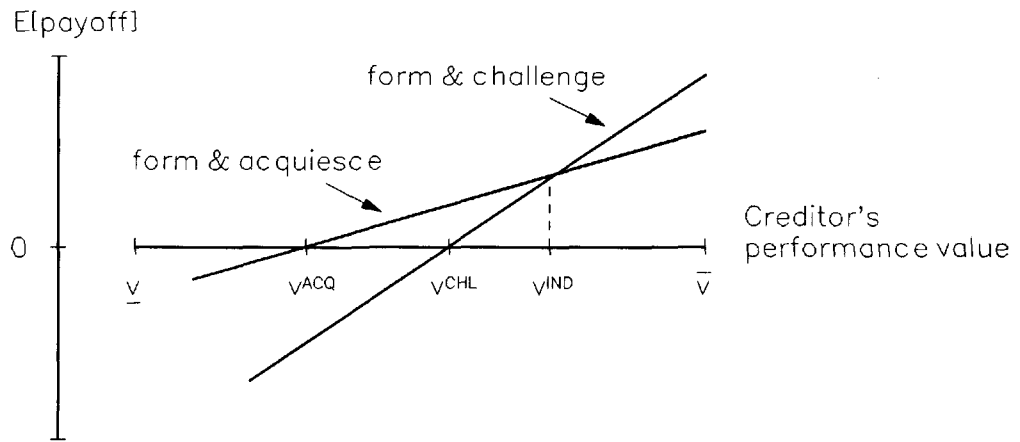
form & acquiesce
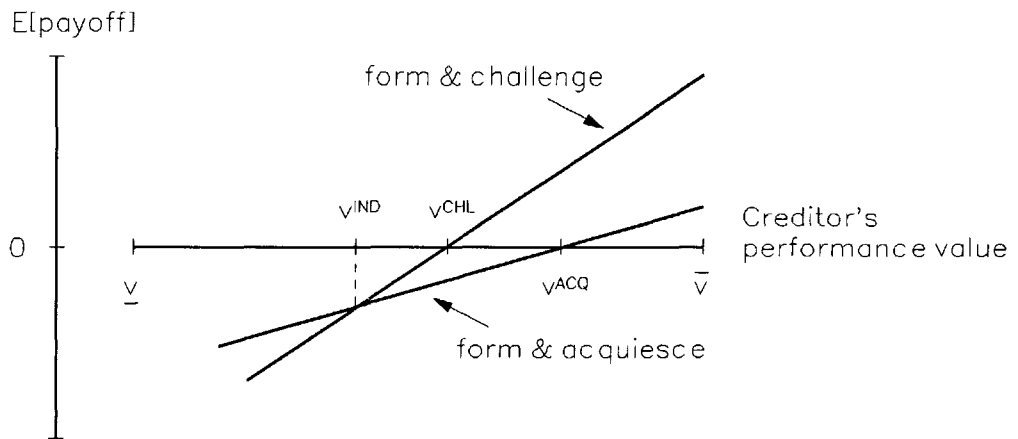
Figure 2. Types of Contracting Equilibria

A. Optimal Regulatory Clarity

$\varepsilon(\ell)$

100%

75%

U[1.10,1.20]

50%

U[1.15,1.25]

$\underline{\varepsilon}$=25%

10%   40%   70% ℓ^{**} 100% ℓ

B. Expected Payoff to the State

$\pi(\ell,\varepsilon(\ell))$

3.4%

2.9%

U[1.15,1.25]

2.4%

U[1.10,1.20]

1.9%

1.4%

10%   40%   70% ℓ^{**} 100% ℓ
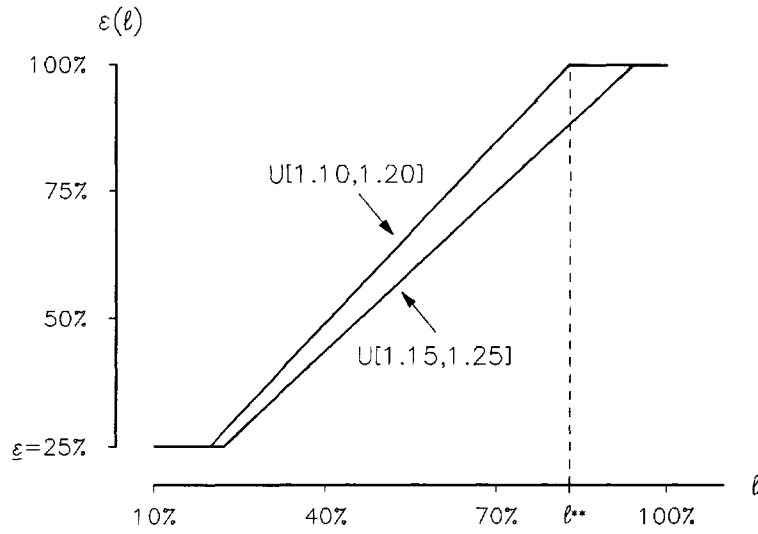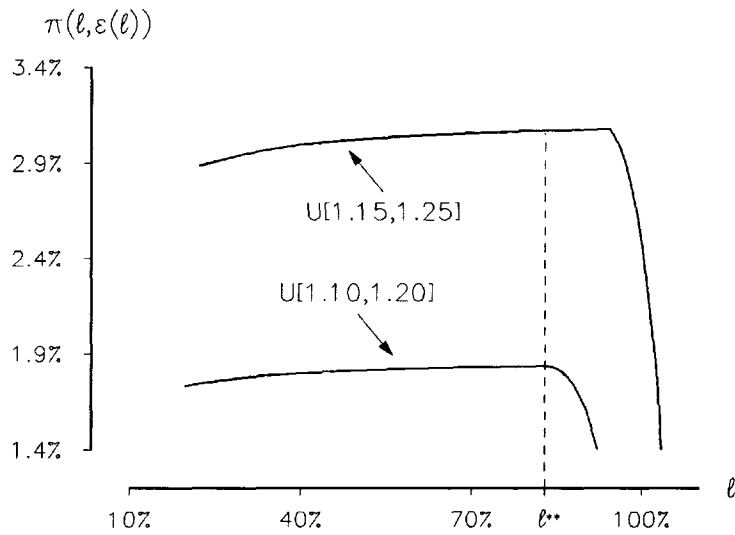
Figure 3. The Fee / Clarity Tradeoff

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　　　-M. Mare

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　　　-R. Perotti

760.　Regulatory Ambiguity and Corruption
　　　-L. Herk [Institute on East Central Europe] (Oct.)