

The Quality of Law: Judicial Incentives, Legal Human Capital and
The Evolution of Law

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Abstract

Although many now recognize the role of legal institutions in promoting economic growth and political liberalization in market democracies, relatively little attention is paid to the process by which law is produced over time and the impact of the organization of courts, the judiciary and legal profession on the quality of law. Empirical comparisons between common law and civil code regimes, for example, often do not identify the mechanisms by which these regimes might impact the quality of law. In this paper I develop a model of the adaptation of law that locates the capacity of a system to evolve efficiently in the structure of judicial incentives and the incentives of litigants to invest in evidence and argument that accumulate over time as shared legal human capital. Legal human capital determines the accuracy with which courts are able to respond to local and changing conditions in their interpretation and implementation of legal rules. I demonstrate that high rates of legal error, high costs of producing evidence and argument, or inadequate judicial incentives may lead to a system that fails to adapt appropriately over time, and that systems that are able to generate investments in legal human capital will adapt and reduce legal error more quickly. Extensions are also considered that explore the impact of publication practices, the potential for corruption, increasingly complex law, the role of legislation in prompting legal adaptation, and the possibility for legal human capital to be degraded by investments made by litigants seeking to mislead courts. Applications to the civil code versus common law debate are discussed.

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1. Introduction

As developing countries and countries transitioning from planned economies struggle to develop the institutions that support market democracy, there has been increased attention from economists and legal scholars directed to the question of what legal environments best promote economic growth and stability. Much of this work focuses on the substance of legal rules: the provisions of a constitution, the elements of a corporations or antitrust statute, the law governing the enforcement of contracts or property rights. Relatively little attention is paid to the institutions of the legal system, such as the organization of courts, the judiciary and the legal profession. A recent exception is the legal origins literature (La Porta et al 1997, 1998, 2004, Mahoney 2001, Djankov et al 2002, 2003, Botero et al 2004), which identifies an empirical relationship between economic variables and legal families broadly identified as those rooted in civil law (French, German, Scandinavian) and common law (English). While some strands in this literature are explicitly focused on differences in substantive law (financial or administrative regulations for example) that appear correlated with legal origin, others suggest that differences arise from the institutional features of different legal families, apart from the substantive law they implement. Some writing in the comparative literature on the common law and the civil law suggest, for example, that these regimes differ in the extent to which judges (or juries) are independent of distortionary political control (Glaeser and Shleifer 2002, Mahoney 2001). Others have explored differences in the information available to and the incentives facing judges as opposed to legislators or regulators. Shavell (2005) analyzes the value of judicial discretion when judges have better (ex post) case-specific information than legisla-

tors or regulators but preferences that may diverge from social welfare. Although Shavell's work is framed as a choice between more and less detailed rules (and thus related to an earlier literature comparing the costs and benefits of regulation by rules versus regulation by standards (Diver 1983, Rose 1988, Kaplow 1992)), it is easily interpreted to address the institutional question of how the judicial role should be structured. Anderlini, Felli and Riboni (2006) engage in a very similar type of analysis, supposing that judicial and legislative incentives diverge because although better informed, judges acting *ex post* face time-inconsistency in their preferences and cannot commit to implementing an *ex ante* efficient rule. Anderlini, Felli and Riboni explicitly place this work in the context of the choice between a legal regime based on codes versus one based on judge-made precedents.

The writing in this literature, however, does not attend with any great detail to the particular institutions of a legal regime and the particular institutional mechanisms that might produce a relationship between legal regime and economic welfare are still relatively poorly understood. The work thus far does not explicitly account for the source of judicial incentives and behavior: What institutional mechanisms cause judges to exercise more or less discretion in interpreting a statutory provision, for example? By what mechanism does a legislature that intends for judges to apply strict rules enforce compliance by judges? Nor does the existing literature take into account the problem of judicial competence, the fact that even judges with socially-aligned incentives and access to better information than that available to legislators may make good faith errors in interpreting evidence and exercising discretion in socially optimal ways. Moreover judges are vulnerable to being misled by strategic litigants who may distort the evidence they present or the arguments they make about how a judge should exercise his or her discretion

to interpret or adapt law. Several papers have explored strategic revelation of private information in models of adjudication (Milgrom and Roberts 1986, Shin 1994, Shin 1998, Dewatripont and Tirole 1999, Daughety and Reinganum 2000.) By and large, however, this work has not been integrated into the institutional frameworks of different legal regimes.¹

In this paper I focus specifically on a mechanism by which the detailed institutional structuring of judicial incentives, in light of the potential for judicial error, affects the quality of law. I analyze in particular the dynamic quality of law. Positive economic analysis of the common law has, since Posner (1977), been organized around the claim that the value of the common law is its ability to work out, over time, efficient legal rules. Some authors have rested this claim on the premise that common law judges inherently seek efficiency; often this literature has framed the analysis as an investigation of the different incentives influencing parties interacting with courts and legislatures and as a debate about whether judges or legislators are more susceptible to rent-seeking (Posner 1977, Rubin 1982, Tullock 1997). A recent model by Gennaioli and Shleifer (2005) focuses on the impact of judicial bias on the capacity of common law to evolve to efficiency. Hadfield (1992) considers the capacity of common law to evolve to efficiency when the information generated through litigation is necessarily a biased sample, in contrast to the potential for legislative investigation to be comprehensive. Other authors have rested predictions about the likelihood that the common law will evolve to efficiency on the incentives of litigants to continue challenging inefficient rules (Rubin 1977, Priest 1977, Goodman 1978, Cooter, Kornhauser and Lane 1979). Despite these differences, these models of the evolution of the common law all share a common recognition that courts do not start out with the

right rules. Rather, they move towards them based on the information learned directly or indirectly from litigants who bring cases to them.

The dynamic quality of law is especially important for the evaluation of alternative legal regimes. As Berkowitz, Pistor and Richard (2003) and Botero et al (2003) have emphasized in evaluating the empirical evidence of the growth generated by transplanted legal regimes, the value of a legal regime depends on its ability to adapt to local conditions. Intuitively also, in a changing environment, law must adapt to changing conditions in order to continue to promote economic value in the organization of activities and trade. At its core, a market economy is decentralized in its response to information about the environment. The more important this is to the organization of economic activity, the more important we can expect the adaptability of a legal system to be. This is the insight of the rules versus standards literature, recognizing the value of what judges learn about a heterogeneous environment through adjudication. The point has also been recognized in the legal origins literature: Johnson et al (2000), for example, attribute the differential success in controlling "tunnelling" (the removal of assets from a company by controlling shareholders at the expense of minority shareholders) in civil law and common law countries to the capacity of common law courts to develop more refined regulation of opportunistic behavior based on what is learned in litigation from specific instances of abuse. Given the importance of such 'grass-roots' information, it is essential to understand the capacity of different institutional environments to support the dynamic evolution of a legal regime, and to direct its development to optimal adaptation to local and changing circumstances.

The central mechanism of adaptation in this paper is the equilibrium interaction among three factors: 1) judicial incentives for rule-following and rule-

adaptation, 2) litigant incentives for investing in costly evidence and innovative legal argument and 3) the accumulation of shared *legal human capital*—defined as the sum of litigant investments in evidence and argument— which determines the likelihood of judicial error. Landes and Posner (1976) also develop a model which conceptualizes precedent as a stock of legal capital produced by the investments of lawyers, litigants and judges. The services provided by the stock of legal capital in their model consist primarily in the information precedents provide to future disputants about the likely outcome of their disputes. Here I am focused on the value of legal human capital in generating more precise (efficient) legal rules. In addition, I explicitly address the question of how legal human capital accumulates; Landes and Posner (1976), who concentrate primarily on empirical tests of the depreciation of precedents, take the investment in precedent as exogenous.

The key insight here is that the capacity for a legal regime to generate value-enhancing legal adaptation to local and changing conditions depends on its capacity to generate and implement adequate expertise about the environment in which law is applied. The process by which this happens in a legal regime is an organic and evolutionary one, dependent on institutional design and the equilibrium coordination of the work of judges, lawyers and litigants. Efforts to develop legal regimes to support economic growth and efficiency, therefore, must take into account the impact of legal design on legal human capital and the incentives of lawyers and judges. A focus on the static content of legal rules is inadequate and misleading.

Section 2 constructs a simple model of legal adaptation in the context of legal error and the accumulation of legal human capital. Judicial incentives are modeled as a weighted sum of private returns to rule-following and to error-free

rule adaptation; judges differ in the weights attached to these two possible decisionmaking approaches. Defendants—both those who should be found liable (*bad types*) and those who should not (*good types*)—choose whether to invest in costly evidence and argument to educate the court and persuade a judge to adapt the rule to their circumstances. Their incentive to do so depends on the cost of evidence and argument relative to the amount at stake, and the likelihood that the judge will interpret their evidence and argument as a basis for a finding of no liability. Judicial error is modeled as unbiased uncertainty about a defendant's true type. Because the error is unbiased, good types are more likely than bad types to be seen by judges to be good types and so to benefit from their investment in evidence and argument. Good defendants are therefore more likely to invest than bad defendants. I show that total investment as well the composition of investment (the share of good and bad defendants) depends on the evidence costs relative to the amount at stake. This impacts the rate at which legal human capital accumulates.

Section 3 then turns to examine the factors affecting the spread of rule adaptation over time. The analysis is principally positive: assessing the optimal path for rule adaptation is complex and highly context-dependent. I focus instead on the likelihood of rule adaptation. The incentive for any particular judge to adapt an existing rule is diminished by the risk of type 1 and type 2 errors. I do not explicitly model the learning process for judges; rather I use a reduced form in which the accumulation of defendant investments over time as shared legal human capital changes the likelihood of these errors. In this section of the paper I assume all investments, by both good and bad defendants are *informative*, meaning that they decrease the likelihood of both type 1 and type 2 errors. I show here that

there are three necessary conditions for any rule adaptation to occur in a regime. First, the cost of evidence and argument must not be higher than the amounts at stake. Second, judicial incentives must adequately compensate judges for rule adaptation. Third, judicial error must not be too high; that is, there must be a minimal level of legal human capital available to judges. I also show here that the rate at which rule adaptation spreads depends on the distribution of judicial incentives, the relative cost of evidence and argument, and the level of legal error.

Section 4 considers some extensions of the model intended to capture more detailed interpretations of the institutions that structure legal human capital accumulation and judicial incentives. I show here that the rate at which legal human capital accumulates, and hence the rate at which rule adaptation spreads, depends on the publication and decision writing practices of a legal regime. I also explore here the reduction in the rate at which legal error falls and rule adaptation spreads that may result when investments by bad defendants are disinformative, meaning they degrade the value of legal human capital. Corruption can also reduce the accumulation of legal human capital and the spread of rule adaptation. I also show here that if legal costs increase with the accumulation of legal human capital—something we can expect to happen as legal regimes become more complex and demand greater specialization from lawyers—then accumulation will slow. Finally I consider the possibility that legal rules are adapted not by judges but legislators or administrative agencies. Although this eliminates one of the constraints on rule adaptation, it does not guarantee that rule adaptation becomes effective. It is still necessary for defendants to invest in presenting evidence to courts and for legal human capital to accumulate in order for adapted rules to be implemented in practice and accurately applied.

Section 5 then briefly relates the model to the institutional attributes of civil code and common law regimes, to suggest how the model can be used to deepen our understanding of the comparative costs and benefits of these legal systems. The primary lesson of the model for this debate is to de-emphasize the importance of the common law/civil code classification and to highlight the far more nuanced details of legal regimes that structure judicial incentives and the sharing of legal human capital. This section offers a brief sketch of these differences and points to the need for a more detailed approach to the empirical investigation of the impact of different legal systems on economic welfare. Section 5 then provides some concluding remarks and suggests directions for further research.

2. Model

We are interested in the circumstances in which a legal rule will be adapted to new or changing information about the impact of the rule in practice. For an example in an established legal regime we can think about the shift from a strict or *per se* rule of liability, such as we might find in tort law or in antitrust where specific conduct (selling a product that causes injury, agreeing to restrict sales to a particular territory) triggers liability without regard to the costs or benefits in a particular setting. New information may then arise that suggests that a more refined rule is preferable—in some industries, the costs of precautions to avoid injury outweigh the expected harms from a dangerous product; in some markets, territorial restrictions are efficiency-enhancing because they overcome a free-rider problem among competing retailers in the provision of valuable product information to consumers. For an example in a transitional legal regime we can think about the problem for judges with little experience of markets newly en-

trusted with the task of interpreting a commercial code (interpreting the meaning of contract terms, judging excuses for failed performance, determining remedies etc.) in ways that will support fledgling efforts to shift from the trading relationships established under socialism to the trading relationships that characterize a market economy. Here the new information is the novel considerations of how contract rules (of interpretation, excuses, remedies etc.) impact the efficiency of deals struck between profit-maximizing firms in a free market.

The model of legal evolution is therefore one of rule elaboration, expanding the set of variables to which a legal ruling is sensitive. Gennaioli and Shleifer (2005) consider a similar model of legal evolution, referring to the elaboration of the information on which a ruling is based as the distinguishing of cases based on new material dimensions. Gennaioli and Shleifer, however, assume that judges have full information about the relationship between these dimensions and outcomes and focus on the likelihood that an efficiently elaborated rule will emerge in light of biased judicial preferences over outcomes. What I want to explore here is how new information and expertise about new circumstances—changes in precautionary technology, new theories of vertical restraints, improved understanding about the behavior of profit-maximizing firms, for example—makes its way into a legal system, particularly a legal system in which there is a risk that courts will make mistakes about the new information. Errors for my judges, then, are confined to errors about information; I discuss corrupt judicial preferences briefly in exploring extensions to the basic model.

To make this concrete, assume a multi-period world in which there is a population of judges, plaintiffs and defendants. A defendant's type is described by the pair (x, y) . x is observable to plaintiffs, defendants and judges at zero cost; y is

observable only to defendants. x represents the existing knowledge base, known to all, and y the new information, initially known only to those directly affected by a legal rule. The assumption that the new information is initially known only to those directly impacted by a legal rule is essential, and emphasizes the importance of learning-by-doing or tacit know-how as a critical source of information needed for effective legal regulation. The assumption that this information is exclusive to defendants is not essential and made only for convenience. In many settings, plaintiffs will have access to first-hand knowledge of the impact of a legal rule. The key point is that courts and legal institutions, which do not have direct experience with the impact of a legal rule, must be educated, at a cost, about the effects of the rule by those affected by it. This is a fundamental premise about the importance of at least some legal adaptation happening through the judicial process, as opposed to through legislative change. (I discuss the impact of legislative change when I consider extensions to the basic model in Section 4.)

Defendants with a value of $x \geq x^*$ (a critical value to be defined shortly) are distributed on $[0, \bar{y}]$ according to the cumulative distribution function $F(y)$ with associated density function $f(y)$. The assumption that y is a random variable, and not a choice variable, may be an important restriction. We are interested in how law evolves over time and as discussed in Hadfield (1992), the long-run impact of legal rules on activity levels will generally be to bias the production of information necessary to the evolution of efficient legal rules. In the interests of simplicity and to focus on the generation of legal human capital, I abstract from this effect here. As a matter of interpretation, we can think of x as the defendant's choice variable (product design, territorial restrictions, contract language) and y as an immutable characteristic or exogenous parameter, such as technology, preferences or market

structure.

Courts learn about y through litigation. Defendants can present evidence of, and legal argument about the relevance of, their type y to a court at a cost $k > 0$; on the basis of this evidence, a court reaches a determination of what it believes to be the value of y . Let this induced judicially observed value of y be \hat{y} . \hat{y} is related to y as follows:

$$\hat{y} = y + \theta$$

where θ is a random variable independently and uniformly distributed in each period on $[-\bar{\theta}_t, \bar{\theta}_t]$, $\bar{\theta}_t > 0$. Note that under this specification the observed value \hat{y} may be higher or lower than the true value of y and that the errors made by courts are unbiased. A defendant's true type, however, does affect the court's assessment of type, with high types more likely than low types to be observed to be high types.

Let R_t be the rule used by a court in period t to decide cases. Assume there is an existing legal rule based on the existing knowledge base, $R^x : x \rightarrow D$, where $D > 0$ represents an amount of damages paid by a defendant found liable under the rule. In particular,

$$R^x(x) = \begin{cases} D & \text{if } x \geq x^* \\ 0 & \text{otherwise} \end{cases}$$

The existing rule does not take into account the value of the new information y in determining liability for damages. y is nonetheless a factor in determining the social welfare achieved by a legal decision. In particular, I assume that social welfare, net of the cost of presenting evidence k , is maximized in a given

period when only a subset of those defendants held liable under R^x are held liable, specifically, those for whom $y \geq y^*$. Let $R^y : (x, \hat{y}) \rightarrow D$ where

$$R^y(x, \hat{y}) = \begin{cases} D & \text{if } x \geq x^* \text{ and either } \hat{y} \geq y^* \text{ or no evidence of } y \text{ presented} \\ 0 & \text{otherwise} \end{cases}$$

By definition, if $\hat{y} = y$ and $k = 0$, social welfare is higher in a given period under R^y than under R^x . For expositional ease, the model collapses all judicial error into observational error: courts are assumed to know the optimal value of $y^* \in [0, \bar{y}]$ to maximize social welfare but to face uncertainty in applying the rule accurately. Courts in this interpretation know, for example, that it is optimal not to hold liable in tort those defendants for whom the costs of precaution outweigh the (known) expected harms from an accident, but make mistakes about the costs of precaution in particular cases. This is without loss of generality; the model can be rewritten to represent error in the determination of the optimal value y^* without changing the basic results. I assume that all judges are the same in their propensity for error in a given case. This is also without loss of generality.

For simplicity, I assume that plaintiffs sue all defendants, under either rule, for whom $x \geq x^*$ and that all cases proceed to trial and decision by a judge. The focus of the analysis is then on what happens during litigation. The sequence of the decisions is as follows. In stage 1, the court announces whether it will follow R^x or R^y . I assume that in announcing R^y the court indicates that it is willing to hear evidence and argument about the relevance of y and to take y into account in its decision *if* evidence and legal argument about y are presented; otherwise it will apply R^x . In stage 2, defendants decide whether to invest k or not in producing evidence and legal argument about y . In stage 3, the court hears the evidence—observing x with accuracy in all cases and \hat{y} in those cases in

which defendants choose to present evidence of y —and reaches a decision under its previously announced rule.

The key dynamic of interest in this model is the rate at which legal human capital—meaning the information about defendant’s variable types and the relationship between type and outcome—is accumulated in the legal system and implemented through the elaboration of rules. I assume that past investments by defendants in the production of evidence and legal argument, represented by the per defendant expenditure k , accumulate as legal human capital, K , available to all judges for the purposes of their interpretation of evidence and the application of legal rules. Individual investments in case-specific expertise thus become generalized shared or social human capital. Let Ω_t be the set of defendants who invested in presenting evidence and argument to a court at cost k in period t . Then

$$K_t = K_{t-1} + \int_{\Omega_{t-1}} kf(y)dy$$

The distribution of the error θ is influenced by the shared legal human capital, K , accumulated by the judiciary and legal profession as of a given period t . There are many ways in which this relationship might arise, such as through Bayesian updating of judicial priors or changes in information partitions as a result of new evidence or modifications to assumptions about functional forms caused by legal argument. I do not explicitly model judicial learning; the key insights are based only on a reduced form which relates legal human capital to errors. In particular I assume that there is an initial level of error, $\bar{\theta}_1$ and that

$$\bar{\theta}_t = \bar{\theta}(K_t)$$

Note that this specification assumes that the distribution of error is not affected by the investments in evidence and argument, k , in a given case. This should not be interpreted to mean that current investments by a particular defendant have no impact; rather, it should be interpreted to mean that in order to achieve the distribution determined by the legal human capital accumulated by the judge—to ‘speak’ to the judge—a defendant has to invest the amount k . Note also that I am assuming that the decision to present evidence is not itself fully revealing.² This does not mean that courts do not take any account of the likelihood that defendants of different types will present evidence or that no signalling is possible; as a reduced form, however, I simply represent the information that can be extracted in equilibrium from a presentation of evidence and argument as the error θ .

I will say that legal human capital is *informative* if $\frac{d\bar{\theta}_t}{dK_t} < 0$ and assume that all legal human capital is informative in the basic model: everything a court learns, whether from good or bad defendants, contributes to the ability of courts in the future to accurately interpret the new information about y and apply an elaborated rule appropriately. This validity of this assumption is ultimately a matter of epistemology. Although bad defendants seek to mislead a court about their true type, it may be the case that when reviewed against the backdrop of evidence presented by good types, the efforts of bad types teach a court about how to avoid being misled in the future. Similarly, the evidence and arguments of good types may only be properly evaluated in the context of a body of evidence from multiple cases and interpreted by multiple courts (and possibly others, such as legal commentators.) Without reviewing the evidence and arguments proffered by bad types, for example, it may be difficult to properly limit the generalization of case-specific information presented by good types. Of course, it may also be the

case that the accumulated efforts of bad defendants as a whole are successful in entrenching misconceptions over time. I consider the possibility of disinformation in extensions to the model in Section 4.

2.1. *Rule-based decisionmaking*

Working backwards, we begin with stage 3. Here, a court's decisionmaking is deterministic, based on the previously announced rule and the evidence and legal argument presented. The court therefore holds all defendants liable for damages D if R^x was announced. If R^y was announced, the court holds those defendants liable for damages D for whom evidence about y was presented and for whom $\hat{y} \geq y^*$. Under an announced R^y regime, the court also holds liable those defendants who do not present evidence of y .

The court's decisionmaking in stage 3 is deliberately modeled as rule-based decisionmaking: R^y is applied to the court's observed value of y even though the court may be aware of the error in its observation of y . This is, I believe, descriptive of what it means to decide on the basis of a rule, in light of the facts as found, in legal settings. Courts make determinations that facts are or are not established, often overtly with a recognition of error: courts make factual findings in Anglo-American civil litigation, for example, on the basis of a preponderance of the evidence. They do not adjust the application of the rule for the degree of uncertainty in those factual findings. As an example, suppose a legal rule dictates that a company should be held liable for fraud only if management was aware that its representations to shareholders or contracting partners were false. Suppose that there is testimony from two officers of the company, the first of whom testifies that management was aware the representations were false and the second of whom

testifies that management believed the representations were true. In deciding such a case, the court must make a factual determination that management either did or did not know that the representations were false. If the court determines that it is more likely than not that the first officer is telling the truth—recognizing that there is some possibility that he or she is lying or mistaken—then it will apply the rule to the information it "observes," namely that the first officer is telling the truth, and hold the company liable for fraud, paying the damages then proved by the plaintiff. The rule-bound (some would say principled) court cannot—as an unconstrained decisionmaker can and optimally will—adjust its decision on liability and/or damages to take into account uncertainty about the factual state of the world.

2.2. *Defendants' investments in evidence and argument*

Defendants' decisions about investing k to produce evidence and legal argument about y are made in stage 2. Trivially—but significantly—if the court has announced R^x in stage 1, no defendants invest k . Now consider defendants' decisionmaking when the court has announced that it will apply R^y . Defendants facing R^y will want to invest k if doing so creates a sufficient likelihood that this induces an observed level of y that shifts the court's decision from one of liability to no liability, that is, if it induces $\hat{y} < y^*$. Good defendants thus are those who prefer for courts to have accurate observations about the true value of y . Bad defendants are those who prefer for courts to make observational errors and for whom the benefit of presenting evidence of y is the possibility the court will be induced to make a type 2 error.

Let L_t be the loss incurred by the defendant as a result of litigation. For both

types of defendants the problem is:

$$Min_k EL_t = \begin{cases} \Pr(\hat{y} \geq y^* | y, K_t)D + k & \text{if } k \text{ invested} \\ D & \text{if } k \text{ not invested} \end{cases} \quad (1)$$

Solving this problem, we can derive the following lemma:

Lemma 1 *If a court has announced R^y , a defendant of type y will choose to invest k and present evidence and argument about its type if $k \leq D$ and the following condition is met:*

$$y \leq y^* + \bar{\theta}\left(1 - \frac{2k}{D}\right)$$

Proof. See appendix. ■

Lemma 1 tells us about the determinants of the rate at which defendants will invest in evidence and argument in different environments, assuming judges are receptive to such evidence and argument. As we would expect, lower relative costs of producing evidence and argument encourage investment. Less obviously, as relative legal costs decrease, so too does the mix of evidence coming from good and bad defendants. As the relative costs of evidence and argument decrease, total investment increases, first by expanding to include all good defendants and then by adding more and more bad defendants to the pool of those attempting to persuade a judge to release them from liability based on an application of R^y . The critical value is $\frac{D}{2}$: when $k > \frac{D}{2}$, only good types invest; when $k < \frac{D}{2}$, both good and bad types invest. Intuitively, defendants only invest if there is sufficient likelihood that the court interprets the evidence to be that the defendants' type y is low (below y^* .) The key to this result is the fact that judicial error is unbiased. For a good defendant, this means that half of the time, the judge reads the defendant's type as even lower than it actually is and so the defendant is held not liable. Then in some

fraction of the remaining half of the cases, when the judge reads the defendant's type as greater than it actually is but not by too much, the defendant still is held not liable. Thus the risk of being held liable when presenting evidence of y is less than $\frac{1}{2}$ for a good defendant. For a bad defendant, on other hand, half of the time the judge reads the defendant's type as higher than it is, and holds the defendant liable; and in some fraction of the remaining cases, the judge reads the defendant's type as lower than it is but not by a lot, and the defendant is still held liable. Thus the risk of being held liable when presenting evidence of y is more than $\frac{1}{2}$ for a bad defendant. If the cost of evidence is sufficiently low to warrant an investment by a bad type—which pays off less than half the time—then it must therefore also be low enough to warrant an investment by a good type—which pays off more than half the time. This also explains why the critical value for k is $\frac{D}{2}$: if the cost of evidence is more than half of the damages that will be paid with certainty if no evidence is produced, then the investment is never worth it for bad defendants who expect the investment to pay off less than half the time. If k is less than $\frac{D}{2}$, however, good types always invest because the investment pays off more than half the time.

We can also see from Lemma 1 that the effect of legal error on defendants' incentives to invest depends on the relative cost of evidence and argument. When $k > \frac{D}{2}$, increased legal error ($\bar{\theta}$) decreases total investment; when $k < \frac{D}{2}$, increased legal error increases total investment. Again this follows from the different incentives of good and bad defendants. Good defendants are discouraged from investing by the risk of type 1 errors. Bad defendants are encouraged by the risk of type 2 errors. When legal costs are high and only good defendants invest, increased legal error discourages marginal defendants from presenting evidence for fear of a

type 1 error. When legal costs are low ($k < \frac{D}{2}$), however, good defendants invest regardless of the level of error and the impact of increased error is to encourage marginal bad defendants to invest in hopes of inducing a type 2 error.

Proposition 1 summarizes these results.

Proposition 1 *If legal costs are relatively high ($k > \frac{D}{2}$) only good defendants invest in presenting evidence about y . If legal costs are relatively low ($k < \frac{D}{2}$) all good and some bad defendants invest. Furthermore, when legal costs are relatively high, increased legal error ($\bar{\theta}$) reduces total investment. When legal costs are relatively low, increased legal error increases total investment.*

2.3. Judicial incentives

We can now turn to stage 1 and judges' incentives with respect to the adoption of rules. The choice between R^x and R^y models the evolution of law in terms of the elaboration of legal rules, and their optimal adaptation to new or changing information. Our model of judges needs to capture the incentives for judges to make such changes. We have few satisfactory economic models of what motivates judges.³ Models that look exclusively to the effort costs of judging are in tension with the occupation of judging: judges are expected to expend effort to decide cases and to do so with care. Models that specify financial incentives run into trouble because of the difficulty of describing the relationship between particular decisions and income, particularly for judges with life-tenure or other protections to achieve independence. Models that assume judges act exclusively to satisfy their preferences over policy seem not to capture the basic norms of judging—which are norms because they are widely shared and implemented—requiring judges not to pursue a private policy agenda and to follow rules instead. I avoid these specific

problems by focusing on the particular aspect of judging in which I am interested—the decision whether to follow an existing rule or to adopt an elaborated rule that may increase social welfare—and by constructing a model of judicial incentives that is sufficiently broad to allow for a wide mixture of incentives and motivations. Indeed, part of my goal in constructing this model is to explore how judicial incentives with respect to rule-following are a function of a number of parameters, and importantly related to the risk of judicial error.

Assume there is a continuum of judges indexed by j . In order to develop intuition, I first present a fairly elaborate description of judges which is then simplified. I assume judges enjoy private benefits—be they promotion, prestige, income, personal satisfaction, bribes—that are a combination of the extent to which judges adhere to existing rules and the extent to which judges depart from rules to create social benefits (which may also impose social costs, possibly in excess of the benefits). Suppose in particular that a judge of type j is described by a parameter set $\{\gamma_j, \alpha_j, \delta_{1j}, \delta_{2j}\}$. γ_j is the private return to following the existing rule R^x . α_j is the private return to adopting the new rule R^y and producing a result that avoids type 1 and type 2 errors. δ_{1j} (δ_{2j}) is the private return to adopting R^y and producing type 1 (2) errors, imposing per-period social losses of ω_1 (ω_2). This implies the following utility function for judges, based on the rule ultimately applied (that is, if the judge announces R^y but no evidence of y is

presented, R^x is applied and determines judicial utility):

$$\begin{aligned}
 U_{tj}(R^x) &= \gamma_{tj} \\
 U_{tj}(R^y) &= \begin{cases} \alpha_j & \text{if no type 1 or type 2 error in period } t \\ \delta_1 & \text{if type 1 error in period } t \\ \delta_2 & \text{if type 2 error in period } t \end{cases} \quad (2)
 \end{aligned}$$

I assume all parameters are non-negative (possibly zero) for all types. A value for δ_{1j} (δ_{2j}) less than α_j implies that a judge bears a cost when he or she adopts a rule imposing type 1 (type 2) losses on society; conversely, δ_{1j} (δ_{2j}) greater than α_j captures the idea that a judge benefits from a type 1 (type 2) loss. The latter could arise if, for example, a judge receives a private benefit (such as a bribe, a future business opportunity, prestige with a particular special interest, personal ethical or policy satisfaction) when adopting rule changes that promote the interests of some in society at the (greater) expense of others. I will develop the basic results of the paper under the more restrictive assumption that all judges have socially-aligned incentives with δ_{1j} and δ_{2j} less than α_j and return to the possibility of corrupt judges in section 4, below. Finally, in order to make the exposition simpler, I set $\delta_{1j} = \delta_{2j} = 0$ and normalize $\gamma_j = 1$. In this streamlined version, α_j can be interpreted as the judicial return to rule adaptation relative to rule-following and net of any penalties (or bonuses) assessed for type 1 or type 2 errors. I assume that α is a continuous variable distributed on $[0, \bar{\alpha}]$ according to cumulative distribution function $G(\alpha)$.

In an important sense, judicial utility depends on how those who evaluate judges—litigants, senior judges, the media, politicians, members of the bar—assess the outcome of decided cases. Because only those defendants who should be

held liable under the existing rule are sued in this model, evaluators who look for judges to following the existing rule need only look to the liability result to reach their assessment of a judge. Evaluators who value rule adaptation, however, are assumed to care about the accuracy with which the more complex rule is applied. The realization of a judge's utility thus depends on the rule adopted by the judge and, if R^y is adopted, the accuracy with which the rule is applied, determined by the observational error, θ . Let σ_{1t} be the judge's *ex ante* assessment of the probability that if he or she allows the presentation of evidence about y a good defendant will present such evidence (see Lemma 1) and the observed value \hat{y} will exceed y^* (a type 1 error):

$$\begin{aligned}\sigma_{1t} &= \int_0^{\min(y^*, y^* + \bar{\theta}(1 - \frac{2k}{D}))} \Pr(\theta \geq y^* - y) f(y) dy \\ &= \int_0^{\min(y^*, y^* + \bar{\theta}(1 - \frac{2k}{D}))} (\frac{1}{2} - \frac{y^* - y}{2\theta}) f(y) dy\end{aligned}\quad (3)$$

Similarly, let σ_{2t} be the judge's *ex ante* assessment of the probability that if he or she allows the presentation of evidence about y a bad defendant will present such evidence and the observed value \hat{y} will not exceed y^* (a type 2 error):

$$\begin{aligned}\sigma_{2t} &= \int_{y^*}^{\max(y^*, y^* + \bar{\theta}(1 - \frac{2k}{D}))} \Pr(\theta < y^* - y) f(y) dy \\ &= \int_{y^*}^{\max(y^*, y^* + \bar{\theta}(1 - \frac{2k}{D}))} (\frac{1}{2} - \frac{y^* - y}{2\theta}) f(y) dy\end{aligned}\quad (4)$$

For $k < \frac{D}{2}$, the probability of both types of error is increasing as the level of error, $\bar{\theta}$ increases. For $k > \frac{D}{2}$, the probability of a type 1 error in a given case is increasing in $\bar{\theta}$, while the likelihood that evidence is presented in a particular case is decreasing. I will assume $f(y)$ such that the net effect is that type 1 errors increase with $\bar{\theta}$ and that $f(y)$ is such that it is possible to solve for the level of $\bar{\theta}$ that induces

a given error.⁴ Finally, also for $k > \frac{D}{2}$, the probability of a type 2 error is zero: only good defendants present evidence. I assume, however, that judges are not able to use the mere fact that evidence is presented to identify a defendant's type. Although this seems a strain on equilibrium reasoning (assuming the court observes k), I justify this assumption on the grounds that judges are obliged by rule-based decisionmaking to articulate reasons for their decisions. They cannot base their assessment of a defendant's type on the fact that they present evidence; rather they must articulate an interpretation of the evidence and argument presented that explains the result that they reach. Thus when a good defendant presents evidence a judge may make errors in understanding the evidence and hence be unable to articulate a reason for a finding of no liability.

3. Factors Affecting Rule-Adaptation

I am interested in investigating the conditions under which a legal regime can be expected to adapt rules, shifting from R^x to R^y . The analysis is positive in nature, looking to the evolution of rules that expand the complexity of rules and the evidentiary basis for legal outcomes. I have assumed that, if both x and y are known with certainty and legal costs are negligible, the more complex rule is socially optimal. I will discuss the normative implications of the analysis in light of the errors associated with including y as a consideration in legal decisionmaking in section 3.1, below.

We look first at the factors that affect a judge's decision about whether to follow the existing rule R^x or announce a new rule, R^y . A utility-maximizing judge will choose R^y over R^x in period t when $EU_{tj}^x \leq EU_{tj}^y$, giving us the following lemma:

Lemma 2 *In any given period, t , a judge of type j will adopt the new rule, R^y , indicating a willingness to hear evidence and argument about y , when*

$$\begin{aligned}\alpha_j &\geq \frac{1}{(1 - \sigma_{1t} - \sigma_{2t})} \\ &\equiv \tilde{\alpha}_t\end{aligned}$$

Recall that a judge's utility depends only on the rule that is ultimately applied; if the judge announces R^y but the defendant is not one that chooses to present evidence of y , the rule ultimately applied is R^x . The decision whether to announce R^y , then, depends only on judicial utility in the event evidence of y is presented. Note that any return that the judge experiences as a consequence of being encouraged by norms or judicial evaluation criteria to take into account long-run considerations is folded into the utility function, and in particular α_j . I will say that judicial incentives for a judge of type j *support rule adaptation* if the condition in lemma 2 is satisfied.

We can now investigate the circumstances under which legal rule adaptation will occur and the comparative rate at which rule adaptation will spread in different legal regimes. Proposition 2 summarizes three necessary conditions for any rule adaptation to occur.

Proposition 2 *In order for rule adaptation to occur in a legal regime, three independent conditions must be met: 1) legal costs must not be too high relative to damages ($k < D$); 2) judicial incentives must support rule adaptation for at least some judges at the initial level of judicial error ($G(\tilde{\alpha}_1) < 1$) and 3) the initial level of judicial error must not be too high.*

Proof. See appendix. ■

Proposition 2 stems from the twin conditions that in order for legal adaptation to occur *both* defendants and judges must face an incentive to incur the costs associated with arguing and applying novel factors. For defendants, this cost is the cost of presenting evidence and argument about the novel factor y ; for judges it is the cost of foregoing the safe returns available from sticking with the existing rule, R^x . Even in the absence of legal error, this implies that for defendants the cost of evidence must not be higher than the potential damages ($k < D$) and that at least some judges must face a reward for error-free rule adaptation that exceeds the reward for rule-following ($\bar{\alpha} > 1$). In addition, for both defendants and judges, the potential benefit of arguing and applying novel factors depends on the probability of legal errors. If the cost of producing evidence and argument is high relative to damages ($k \approx D$), for example, then in order for *any* defendants to invest—in particular, in order for the best types with $y \approx 0$ to invest—it must be that initial legal error is not so high that even these defendants run the risk of being mistaken for bad types. This requires that $\bar{\theta}_1 < y^*$. If costs are not so high, a lower upper bound to legal error will support rule adaptation. Similarly, initial legal error must not be so high as to discourage even those judges who experience the highest rewards for successful rule adaptation ($\alpha \approx \bar{\alpha}$). This requires that $\bar{\alpha}_1 < \bar{\alpha}$, implying also an upper limit on $\bar{\theta}_1$.

Proposition 2 focuses on a seemingly extreme circumstance, namely, the potential for a legal regime to remain mired at R^x with no legal adaptation at all. It emphasizes that at least some judges, and at least some defendants, must have an incentive to bear the cost of at least minimal rule adaptation. It is not difficult to imagine, however, that the cost of producing evidence and argument may exceed potential damages; indeed in many circumstances this is the case. (Hadfield

(2000) discusses why this may occur systematically as a result of the sunk-cost auction nature of litigation expenditures.) Moreover, this holds not merely when legal costs are high in an absolute sense, but also when damages are relatively low, pointing to the potential for a regime that fails to attach high penalties to liability to produce the unintended effect of stalling the accumulation of legal human capital and rule adaptation. Similarly, there is nothing *a priori* implausible about the existence of judicial incentives that provide little or no reward for rule adaptation—regimes that strictly understand the function of a judge to be implementation of existing rules will meet this requirement. Nor is it implausible to imagine that, even in the presence of judicial incentives for rule adaptation, legal error in the face of new information or circumstances may be so high as to discourage either defendants or judges or both. The emphasis in Proposition 2 is, in fact, on the number of conditions that must be met simultaneously for a regime to exhibit legal flexibility. Even assuming that a regime generates rewards for judges who take on the task of adapting the law to new circumstances, if legal error is high relative both to the costs of producing evidence and these rewards, a long-run reduction in legal error is required in order for a regime to overcome the stickiness of an existing legal rule. This requires a long-run accumulation of legal human capital. Because legal human capital is endogenously generated, however, a regime may well be stabilized at an equilibrium at R^x .

Although there may be circumstances in which a legal regime fails to adapt, it is nonetheless clear that in any real world comparison between legal regimes we will often be more interested not in a complete failure to adapt but rather in the factors that will affect the speed with which adaptation occurs and the level of judicial error over time. The impact of relative legal costs, judicial incentives and

initial legal error on the rate of rule adaptation are summarized in the next three propositions.

Proposition 3 *If legal costs are lower relative to damages in one legal regime than another, but the distribution of judges and initial legal error are the same in these regimes, then more legal human capital will accumulate and legal error will fall faster in the lower-cost regime.*

Proof. Follows directly from Proposition 1. ■

Proposition 4 *If more judges perceive greater returns to rule adaptation in one legal regime (a pro-adaptation regime) than another, then rule adaptation spreads more quickly, human capital accumulates at a faster rate and legal error falls at a faster rate in the pro-adaptation regime.*

Proof. See appendix. ■

Proposition 5 *If initial legal error is lower in one legal regime than another, but the distribution of judges and relative legal costs are the same in these regimes, then legal human capital will accumulate and legal error will fall faster in the lower error regime, provided legal costs are relatively high ($k > \frac{D}{2}$). If legal costs are relatively low ($k < \frac{D}{2}$), then the rate of legal human capital accumulation and reduction in legal error may be higher or lower in the low error regime.*

Proof. See appendix. ■

The key insight in these three propositions is the dynamic role of legal human capital accumulation in the long-run propensity of a legal regime to adapt rules and reduce legal error. Factors that encourage investment in legal human capital

by defendants and the encouragement of those investments by judges through their willingness to consider novel evidence and legal theories speed legal adaptation. Moreover, legal human capital accumulation is self-reinforcing: as legal human capital accumulates, legal error falls and this encourages further investments by defendants and judges as the risks associated with a new rule decline. Reducing legal costs or increasing damages is thus pro-adaptation. Increasing, even marginally, the number of judges who perceive returns to rule adaptation can have substantial pro-adaptation long-run effects. And, if legal costs are relatively high, reduced initial error encourages both defendants and judges to adapt rules. If legal are relatively low, on the other hand, high initial error might speed adaptation by encouraging (bad) defendants to supply evidence and argument. Assuming, as currently are, that all such evidence ultimately increases legal human capital in a way that improves judicial decisionmaking, adaptation is enhanced.

It is important to recognize that Proposition 4 tells us more than that a regime with more judges who face judicial incentives that encourage rule adaptation will in fact display more rule adaptation. The key insight in Proposition 4 is that the greater orientation of some judges to rule-adaptation encourages more defendants to invest in producing the legal human capital that ultimately encourages even more judges to adapt rules. The process is self-reinforcing, and rule adaptation occurs at an increased rate in tandem with a greater rate of human capital accumulation and a greater rate at which legal errors fall. Because of these reinforcing effects, the set of judges who are willing to adapt rules at what may be a high initial level of error may be quite small. So long as some judges are willing to adapt rules, however, the process of human capital evolution and falling errors is triggered, causing rule adaptation to spread to other judges who see lower rewards

to change. Moreover, the distortionary costs of rule adaptation fall over time, as legal human capital accumulates and legal error falls. This is relevant to an assessment of optimal legal adaptation, to which I now turn.

3.1. *Optimality*

I have shown a set of results that make positive predictions about the possibility of rule adaptation and the comparative rates of rule adaptation in different legal regimes. I have not, however, made claims as yet about the welfare implications of rule adaptation other than to construct a model in which, with perfect information and zero legal costs, it is welfare-maximizing for a court to shift from the existing rule to a new rule, R^y . What else can we say about whether and when it is optimal for a legal regime to display a faster rate of rule adaptation or a faster rate of reducing legal errors?

The first problem for a social planner is to compare R^x to R^y . We have looked at the probability of type 1 and type 2 errors under R^y . Let ρ be the probability of a type 1 error under R^x ; there are no type 2 errors under that rule. Then we can say the following about welfare-maximization in a given case at a given point in time:

Lemma 3 *It is optimal for a court to adopt R^y in a given case if*

$$(\rho - \sigma_1)\omega_1 \geq k + \sigma_2\omega_2$$

Lemma 3 says that it is optimal to shift to the new rule if there is a sufficient reduction in the losses associated with type 1 errors to compensate for two costs: the costs of producing the evidence and argument necessary to implement R^y and

the social losses associated with introducing the potential for type 2 errors. Note that judicial incentives (see Lemma 2) bear no necessary relation to this optimality condition: if a legal regime wants to induce optimal rule choice in a given case, it has to do this by adjusting (if it can) the rewards and penalties facing judges for rule-following and rule-adaptation.

The dynamic nature of the social optimization problem, however, makes it difficult to say whether it is optimal for a legal regime that does not satisfy the condition in Lemma 3 at the initial level of legal error to get onto a path to legal adaptation that is faster rather than slower. This is essentially a problem of optimal capital accumulation, which involves a trade-off between costs incurred today in exchange for benefits enjoyed tomorrow. The costs are the costs of errors when σ_1 and σ_2 are high—meaning premature adoption of R^y involves welfare losses greater than those imposed by the existing rule—and the costs of producing evidence and legal argument, k . If these costs are high and/or if legal errors fall only slowly as legal human capital accumulates, the losses incurred as the system evolves to a point at which Lemma 3 is satisfied are relatively high and it may be optimal for a regime not to evolve, or to evolve more slowly.

This emphasizes the importance of the initial level of legal error. It is important to understand that it might be optimal for a legal regime to remain anchored at an existing rule, or adapt only slowly, and that this may occur not because judges face sub-optimal incentives to adapt the law. Even if there are worlds in which it would be clearly optimal to switch to a new more elaborate rule, by refusing to adjust, judges may be responding appropriately to the initially high rate of legal error in the regime.

Rule adaptation may also be too costly because of the costs defendants incur

in presenting evidence and legal argument, making a flexible approach to rule-change excessively costly from a social perspective. If increasing complexity and specialization, captured by the accumulation of legal human capital, also leads to increased per-case legal costs, then these costs may outweigh the benefits of rule adaptation.

It is clear that the problem of optimal adaptation is complex. The model I have presented identifies the factors affecting optimality—legal costs, damages, the incentives of judges, the likelihood of type 1 and type 2 errors, and the relationship between accumulated legal human capital and legal errors—but it is not possible to say anything general about optimal rule adaptation. Only once we have determined whether it is optimal to adapt rules can we say whether the legal regimes compared in the model lead to better or worse social outcomes.

4. Extensions: Publication, Disinformation, Corruption, Complexity and Legislation

Like all models, the above is a stylized version of real settings that suppresses many elements to develop the key insights about the role of judicial incentives and legal error in the accumulation of legal human capital throughout a legal system and legal adaptation over time. In this section I consider several extensions to the model to address some important attributes that appear to vary between real-world regimes.

4.1. Publication and the Distribution of Information

I have not described an explicit way in which the investments in evidence and legal argument in a particular case accumulate as legal human capital shared

by all judges. Implicitly I am assuming that what one judge learns, all others learn. Moreover, the model assumes that the rate at which investments k are translated into shared legal human capital K is constant across regimes. This process, however, is likely to vary across regimes. The written decision in a case would seem to be a fundamental method by which such communication among judges and lawyers occurs in any legal regime, although there are other methods as well such as meetings, professional interaction and education. One of the apparent differences between legal regimes is the nature of this communication. Modern American common law judges, for example, tend to write long opinions, with extensive descriptions of facts and reasons; a large proportion of these opinions, particularly if they announce a development in the law, are published. By way of comparison, French judges write much shorter opinions, which are exceedingly brief about the facts and may not demonstrate their reasoning at all; in addition, many fewer of these decisions are published. Civil code regimes such as the French, however, involve substantial peer assessment and civil service review, largely missing from common law settings, and the French system in particular appears to involve a lively back-stage (unpublished) exchange of legal reasoning among judges. (For a comparison of the French and American systems in this regard, see Lasser 2004.) The key variable we are interested in, then, is the extent to which the investments in a particular case are translated into shared human capital. I will call that translation "publication" with the caveat that publication is not limited to opinions published in reporters or databases, but could include publication through internal organizational mechanisms in the judiciary and legal profession. This suggests a fairly straightforward proposition about the impact of publication:

Proposition 6 *Ceteris paribus, the lower the rate of publication of facts and reasons in a regime with relatively high legal costs ($k > \frac{D}{2}$), the slower the rate at which rule adaptation occurs and the higher the rate of judicial error. The same result holds for a regime with relatively low legal costs ($k < \frac{D}{2}$) provided that the reduction in publication is sufficiently large relative to the increased investment by bad defendants caused by higher rates of legal error.*

The intuition behind this result is straightforward: if the investments in evidence and legal argument in a given case are not distributed within the legal profession and judiciary, then what is learned about the novel conditions we are representing with the variable y cannot affect the capacity of later courts to evaluate evidence and argument accurately. Lower rates of publication are then equivalent in effect to lower rates of investment in evidence and argument to begin with. The effect of lower publication is blunted to some extent when legal costs are relatively low by the fact that bad defendants are encouraged to invest in evidence by higher rates of legal error. If these investments are nonetheless informative, it might be possible that the increase in total investment by marginal defendants would outweigh the lowered rate at which the investments of all defendants are translated into shared legal human capital, but it seems reasonable to believe that this would rarely be true. This proposition therefore demonstrates a key role for publication of judicial decisions, one generally overlooked in the literature which has tended to emphasize the role of publication in producing legitimacy in judicial decisionmaking and increased certainty for those appearing before courts. The analysis here points to the role of publication in the production of legal human capital and the reduction of legal error over time in a legal regime.

This result depends on the assumption we have maintained throughout that all investments, including those made by bad defendants, are informative and hence something we would want shared widely. If this assumption does not hold, and in particular if a small amount of bad legal human capital has a disproportionate effect in degrading the value of good legal human capital, then it is possible that a regime that restricts the transmission of legal human capital could have a lower rate of error. This is an important consideration because of the role that restrictions on publication and the diffusion of one judge's work may have on regimes dealing with a high probability of corruption. I turn to the problems of disinformation and corruption now.

4.2. *Disinformation*

Legal human capital is *disinformative* if the accumulated legal argument and evidence produced by bad defendants degrades the ability of courts to distinguish between good and bad defendants; this is indeed the objective of the investments made by bad defendants who seek to induce type 2 errors in a given case. If being misled in a particular case accumulates over time in the legal system as a greater tendency to be misled overall, then the translation of case-specific presentations into system-wide legal human capital may be counterproductive.

The question of how the ability to discern good from bad information is affected by the mix of good and bad information presented to a decisionmaker is a complex and largely unstudied one. There is a substantial literature that looks at the capacity for messages to be informative in the presence of strategic behavior. These models, however, consider incentives to reveal information when information can be verified (e.g. Milgrom and Roberts 1986) or the truth of an assertion can

be deduced based on the cost of the signal (Spence 1974) or induced by cheap-talk equilibrium strategies that exploit the correlation between the interests of the sender and the receiver (e.g., Crawford and Sobel 1982, Farrell and Rabin 1996.) Where the structure of the game does not support a revealing equilibrium, nothing is learned and parties in these models choose their actions as if there has been no signal sent.

Here, we are asking a different question, one that is fundamentally about epistemology—the production of knowledge—and in particular the accumulation of shared knowledge within a system. Indeed, if we admit the potential for disinformation, we are interested in what Proctor (1995) terms agnatology—the production of doubt and uncertainty. Proctor develops this idea specifically in the context of efforts by potential defendants (such as tobacco and asbestos manufacturers) to avoid liability by producing evidence for legal or legislative battles that sows doubt about what is reliably known about the harmful effects of their actions.⁵ Exploring the specific mechanisms by which knowledge and doubt are produced is well beyond the scope of this paper, but we can make some basic observations about how the potential for evidence from bad defendants to be disinformative will affect our conclusions about the accumulation of legal human capital, the reduction of legal error and the spread of rule adaptation.

I will say that legal human capital is *disinformative* if $\frac{d\bar{\theta}_t}{dK_t} > 0$. To explore the impact of disinformative legal human capital, I will decompose K_t into two components: legal human capital accumulated from investments by good defendants, K_t^G , and legal human capital accumulated from investments by bad defendants, K_t^B . I assume that all investments by good defendants are informative. Suppose that all investments by bad defendants are disinformative. Intuitively, it seems

reasonable to assume that the net effect of investments by good and bad defendants would then be determined by the ratio of good to bad evidence presented to courts. What can we say about this ratio? We have already seen (Proposition 1) that when $k > \frac{D}{2}$ only good defendants invest in evidence production, implying the following:

Proposition 7 *If legal costs are relatively high ($k > \frac{D}{2}$), all legal human capital is informative.*

This tells us that the more complex questions about the potential for disinformation arise when legal costs are low relative to damages. This is when we will get a mix of good and bad legal human capital. In the absence of an empirical understanding of how people in general—or judges in particular—process good and bad information, it is not possible to say what the impact of the introduction of bad legal human capital will be. But we can explore a few dimensions to the problem.

Suppose for example that bad information does not have a disproportionate effect on the capacity to discern good from bad evidence:

$$\frac{d\bar{\theta}_t}{dK_t} < 0 \text{ if } K_t^G \geq K_t^B$$

Then we can base predictions about the path of legal error and rule adaptation on an assessment of the ratio of good to bad defendants who choose to invest in presenting evidence. Suppose that for a given y^* there are as many good as bad defendants: $F(y^*) = 1 - F(y^*)$. Then we can conclude the following:

Proposition 8 *If legal costs are relatively low ($k < \frac{D}{2}$), investments by bad de-*

defendants are disinformative but do not have a disproportionate effect, and there are equal numbers of good and bad defendants, then the accumulation of legal human capital always leads to reductions in error, $\bar{\theta}$. The rate at which legal error falls decreases as the relative cost of evidence and argument decreases.

This follows because when $k < \frac{D}{2}$ we know from Proposition 1 that if any bad defendants invest, it must be the case that all good defendants also invest and hence (weakly) more evidence is produced by good than by bad defendants. This implies that even though investments by bad defendants are disinformative, on net the accumulated legal human capital is informative. As the relative cost of evidence falls, however, an increasing number of bad defendants invest and the rate at which legal error falls is reduced.

Together, Propositions 7 and 8 tell us that one of the costs of reduced legal expenses or high damages is that, by encouraging more bad defendants to invest, the systemic value of informative investments as a whole is reduced. Furthermore, it is straightforward to see that if the number of good defendants shrinks—meaning that optimally a relatively small group of defendants should be exempted from the operation of the existing rule ($F(y^*) < (1 - F(y^*))$)—then it is entirely possible in a regime with relatively low legal costs for there to be more bad than good legal human capital. This would make legal human capital counter-productive, leading to an increase rather than a decrease in legal error.

To understand how the impact of disinformation plays out in the system over time, it is also important to see that disinformation has a self-reinforcing tendency. Suppose $k < \frac{D}{2}$, meaning that relative legal costs are sufficiently low for a given level of legal error θ_t such that all good defendants and some bad defendants invest in presenting evidence and argument. If these investments are on net

disinformative, error in the next period will be higher. From Lemma 1 we can then see that in that next period we will have an even higher level of investment coming from bad defendants. Increased error encourages bad defendants because it makes it more likely that the court make a type 2 error: because of the uniform distribution of θ_t around zero, the likelihood of the court accurately reading a bad defendant's type as $y > y^*$ is unchanged at $\frac{1}{2}$ but the likelihood that the court underestimates their type by a sufficiently small amount to keep $y > y^*$ is reduced as the range of potential underestimation increases. The limit on this tendency towards increasing amounts of disinformation ultimately will come from judicial incentives: as legal error grows, the incentive for judges to entertain novel evidence and argument will diminish, as more judges find the likely returns to rule-following exceed those of rule-adaptation. The dynamics of this process are a topic for further investigation

4.3. *Corruption*

I have assumed in the development of the results above that all judges have socially aligned incentives, in that they perceive a net benefit from avoiding type 1 and type 2 errors and the losses in social welfare associated with these errors. This assumption that judges are faithful is what allows us to assume that errors are a result of good faith efforts to interpret and apply the evidence and argument presented in a given case, and captured by the distribution of θ . This also allows us to treat the likelihood of error by all judges as essentially the same with respect to accumulated legal human capital. But what if some judges are corrupt? This is a key factor to analyze in any comparative setting given the perceived prevalence of corruption in many developing and transition economies and the critical role

that control of judicial corruption played in the design of civil code regimes such as the French. (Merryman 1985)

Corrupt judges do not base their decisions on a good faith effort to interpret evidence and legal argument and apply a rule; rather they are motivated by considerations of the private returns (psychic or monetary) associated with type 1 and type 2 legal errors. We can interpret the presence of corrupt judges in this model in a few ways. One is to treat the increase in judicial returns to type 1 and type 2 errors as a shift in the distribution of judges to lower values of α . Under this interpretation, the result in Proposition ?? holds, with the prediction that (assuming all legal human capital is informative) rule adaptation will be slower, legal human capital accumulation slower and legal error slower to fall in a corrupt regime.

This interpretation, however, seems a bit strained because it does not take seriously that corrupt judges solve a different utility maximization problem than the one described in the basic problem. As an alternative, we can model the corrupt judge as one who engages in cheap talk with respect to the announcement of rules and results: the judge reaches a legal result based on the private returns to type 1 and type 2 errors, and then announces a rule and reasoning that coincides with the result. In the model above, this means that if the judge's corruption amounts to a bias towards a plaintiff, he or she can simply always announce R^x . If the judge's corruption amounts to a bias towards a defendant, he or she can announce R^y and "observe" $\hat{y} < y^*$. I do not model corruption fully—although this is clearly an essential next step—but it seems clear that corruption either reduces the rate at which defendants will invest in the effort to produce evidence and legal argument or, if pro-defendant judges still need evidence and argument with which

to mask their announced result, the investments produced through corruption are made by bad defendants and especially likely to be disinformative. We could imagine that such investments do not even contribute to the accumulation of legal human capital at all if it is known that the judge's announcement is cheap talk; indeed, the presence of corrupt judges could reduce the rate at which all investments in evidence and argument accumulate as legal human capital, if judges cannot identify corrupt judges and hence must discount the lessons of any given case. We can get to the following conjecture:

Conjecture 1 *The greater the number of corrupt judges in a regime, the lower the rate at which legal human capital accumulates, the higher the rate of judicial error among faithful judges, and the slower the rate at which rule adaptation occurs.*

Note however that if judges must publish facts and reasons for their decisions, then their capacity to mask their corrupt choices may be described by the basic model. If they cannot manipulate the facts, then they must represent their findings as legitimately based on the evidence. Those who are monitoring their work—other judges and lawyers—experience the same observational error θ as a good faith judge. Then defendants will be encouraged to invest in k to cover a corrupt result when they can expect that the judge's monitors will observe a value consistent with a no liability result. And judges will have an incentive to produce a corrupt result only when it is observationally equivalent with a good faith result. Notice then that we can interpret the reduction of legal error as a condition making corruption more difficult, forcing results that are consistent with good faith judging. Moreover, publication then facilitates another mechanism through which legal human capital reduces legal error.

4.4. *Complexity*

Increased legal human capital in this model is intended to capture the increasing complexity of legal knowledge over time, as more is learned about the particular circumstances of defendants and the relationship between those circumstances and the welfare impact of a legal rule. The model has emphasized the positive effects of accumulated legal human capital when it is informative. Even informative legal human capital, however, may have a negative by-product. As legal complexity and sophistication increases, so too may the costs of producing evidence and legal argument. Many studies of the changes in the legal profession in advanced economies over the past decades have noted the increasing specialization of legal practice. (Heinz et al 2005) Specialization can increase legal costs directly, through the increased efforts need to develop evidence and argument, and indirectly, through reduced competition in the market for lawyers (Hadfield 2000).⁶ The model presented above suggests some interesting implications for complexity arising from the mechanisms governing the accumulation of legal human capital.

Suppose that legal costs increase with an increase in the level of legal human capital. As we have seen, increased legal costs reduce the incentive of defendants to invest in evidence and legal argument. If we are in a range to begin with where $k < \frac{D}{2}$ increasing legal costs imply a reduction over time of the share of investment coming from bad defendants, improving the informativeness of the stock of legal human capital without reducing the investments made by good defendants. If legal costs rise sufficiently, we will eventually see the elimination of investments by bad defendants and a constriction of the number of good defendants who will invest. Because per-case investments increase, it is possible that even with the reduction in the number of investors, overall legal human capital may increase.

Even if total investments fall, it is possible that this is a move towards optimality, as the value of marginal increases to legal human capital shrinks at higher levels. Alternatively, if legal costs rise rapidly in response to increases in complexity, we can imagine the potential for investment to be choked off too soon. Again, I leave an investigation of the dynamics of this process for future work, an important one given the concerns with increasing complexity and high legal costs in advanced legal regimes.

4.5. Legislation

The model I have presented focuses on the process of rule adaptation in courts. The theory of civil code regimes, however, is that it is appropriate for legislatures or government agencies, not courts, to adapt rules. It is important, therefore, to consider what the impact might be of introducing the possibility of legislative rule change. In this model, this would imply that legislators announce R^y . This eliminates the problem of ensuring adequate judicial incentives for rule adaptation. But we know that the mere announcement of a rule does not lead to accurate rule implementation when the level of legal human capital is low. If error is observational—as I have assumed—the introduction of a novel factor y challenges the capacity of the courts to achieve the legislature’s intended results. More importantly, however, if legal error is sufficiently high or if legal costs k are high relative to damages D , defendants may have no incentive to present evidence of y to courts, resulting in the continued persistence of R^x in practice. This gives us a simple proposition:

Proposition 9 *Even if a legislature announces R^y at time $t = 1$, if $k > D$ and/or if $\bar{\theta}$ is too high, R^x will be applied by judges for all $t > 1$.*

Note that if the reluctance of defendants to present evidence of y is caused by high legal error, despite the legislative effort to develop a more refined and sophisticated (ultimately a presumably welfare-enhancing) rule, the rule applied in practice stagnates because of the failure of the system to generate the specialized legal human capital necessary to implement the rule with at least an adequate level of accuracy. Furthermore, if judges are penalized for errors in the application of rules and they have methods for limiting the capacity of defendants to present evidence of y , they may do so, further constraining the accumulation of legal human capital.

5. Conclusion

We began with the question of which legal regimes better support economic growth and the development of markets. The analysis in this paper suggests that making progress on that question will require moving beyond the simple dichotomy between common law and civil code regimes that has thus far dominated the literature. This model suggests that the important distinctions between legal regimes are found not in the reliance on code versus caselaw but rather in the institutional determinants of judicial incentives and the capacity for a legal regime to generate investments in legal human capital that reduce legal error. We also see a potentially important interdependence between institutions per se and institutional human capital.

Implications for the Common Law versus Civil Code Debate In general, what we know about the relevant institutional differences between common law and civil code regimes is sparse. I discuss what we know in the working paper

version of this paper. Hadfield (2006) Here I offer the following as generalized descriptions, primarily pointing to the need for further comparative institutional research.

Civil code and common law judges live in different institutional contexts. Common law judges (particularly in general jurisdiction courts) are generally selected through a political process that is open to the public, either through direct election or appointment by elected officials, sometimes based on nomination by a committee that includes members of the public and the bar. They generally are selected from among practicing lawyers, often with a requirement that they have completed a minimum of, say, 10 years of practice; there is no special judicial education or other certification required. Once appointed to a particular court, it is relatively rare for a judge to move to a different court; promotion to a higher court generally follows the same procedures as initial selection into the judiciary. Common law judges are thus by and large evaluated by a public audience that includes those directly affected by its decisions: litigants, lawyers, politicians, etc. These evaluators regularly have access to substantial detail about the judge's decisions, from the widespread availability of public case reports that provide substantial detail about the facts, arguments and reasons that produced a result. Other judges and lawyers also have access to these routinely published case reports when conducting their own work. Access to information about individual judges and their work is aided by the work of the media and expert commentators, both legal and non-legal. Moreover, common law legal process in the first instance generally focuses on a single identifiable judge. This judge controls all decisions in the case, including the admission of evidence. Although there are pre-trial decisions made about process and evidence, all issues about which there are disputed facts are preserved

for litigation and (assuming no settlement) decided in a single event, the trial. All evidence is presented by the parties in the case, and entered into the record in its original form as documents or verbatim testimony. At the appellate stage, specific issues are identified for decision at the time an appeal is accepted and no further facts are developed. Generally reached by multi-judge panels, appellate decisions nonetheless identify the author of the opinion and the identity of the judges who agree with the author on the outcome; concurrences and dissents from the majority opinion are also identified.

Civil code judges exist in a very different setting, a predominantly bureaucratic one. Civil code judges enter the career judiciary directly from their legal education, generally by self-selecting into specialized judicial training and examinations, applying for positions are apprentice judges. Rarely does a judge have experience as a practicing lawyer prior to joining the judiciary. Apprentice judges are then evaluated by senior judges and promoted through the ranks of the judiciary—transferring to other courts or locations or moving into positions of higher authority within a court—on the basis of merit review and seniority. Only at the highest level, is promotion (to a supreme court, for example) based on appointment by an elected official. The more closed process of judicial evaluation is aided by very different practices of decision and publication. Although there may be a lively debate within the judiciary about the facts and arguments in a particular case (Lasser (2004) describes this with respect to the highest French court deciding private and criminal matters, for example) this debate is not by and large played out in a publicly accessible way. Commentators play a key role in the process (their detailed analysis of cases may be published alongside judicial opinions, for example), however they tend to be exclusively legal academics. Civil code judg-

ments tend to be much shorter and to contain much less description of fact and argument than is the norm in common law courts; French judicial opinions, for example, are often only a page long and entirely conclusory. Civil code decisions are also much less frequently published, particularly those from first-instance courts. The decisions that do issue from courts rarely identify an author of a decision; the decision is that of the court, speaking as an institution, rather than an individual judge. Moreover, even in first instance courts, multi-judge panels are common, with no individually identifiable opinion issuing from a particular judge. The work of the court is even further distributed in civil code judges through the frequent use of an examining judge who make hears the evidence (often assuming responsibility for questioning the witnesses) and generates an official summary of the facts; this is then conveyed to a multi-judge panel as the basis for a decision in the case. Civil code judges, unlike common law judges, are empowered to seek out evidence on their own accord (contacting a bank for documents, for example) and are generally thought to exercise greater control over the evidence presented; parties can, however, suggest avenues of inquiry, documents and testimony to the judge. Most importantly, the process of the civil code court is a sequential and incremental one, with a series of hearings at which substantive decisions about disputed factual issues are reached. Thus some issues are weeded out early in the process.⁷

These institutional differences have substantially different implications for the structure of expected rewards for any judge who is not completely indifferent to what others think of their work, the accumulation of legal human capital and the initial error rates affecting judicial decisionmaking.

Judicial rewards As a broad generalization, civil code judges are assessed by a more insulated and homogeneous audience than common law judges, one that has access to information shared professionally as opposed to publicly. We might conjecture that this audience inherently places a greater value on rule-following than rule-adaptation. A public audience, which is composed of those affected by legal decisions and those who have intimate knowledge of the environment in which the legal rule is operating, is likely more interested in the end result of legal decisionmaking and thus in the adaptation of rules to local or changing circumstances. This not to say that either audience is disinterested in the alternative approach to judicial decisionmaking: members of the judiciary in civil code countries no doubt do care about rule adaptation, and members of the public in common law countries do care about whether judges follow rules. It is to say, however, that the distribution of judicial rewards in these institutional environments is likely to be different, and in particular for more judges to derive higher rewards from rule-adaptation in a common law setting than a civil code setting. Furthermore, the anonymity and diffuse participation in decisionmaking that characterizes the work of civil code judges suggests that civil code judges may see lower rewards from rule adaptation. Changes in the law that might garner acclaim are not as easily attributed to a particular judge. Moreover, the capacity to adapt the law by expanding the evidentiary inquiry, the principal form of adaptation in this model, is diffused in the civil code regime. The judge in charge of the evidentiary process may see very few rewards to expanding the inquiry when he or she plays no role in the ultimate decision.

Our knowledge of what goes on in the process of judicial evaluation in most courts, but particularly civil code courts, is very slim indeed. Many compara-

tive studies conclude indeed that a defining difference between the common law and civil code judiciary is a differential orientation to the trade-off between legal certainty and flexibility (Merryman 1985). Legal reasoning in civil code jurisdictions, particularly those based on Germanic legal science, favors a process that extracts and refines abstract principles of law whereas legal reasoning in common law jurisdictions favors outcome-oriented and pragmatic analysis.⁸In this traditional comparative work, the differences between judiciaries are often attributed to culture or ideology; my emphasis here however is on the institutional structures that generate different decisionmaking behavior as a consequence of differences in the audience to which the judge is speaking and the information and orientation of that audience. Others have also suggested that the career civil code judiciary generates different incentives and behavior among judges than does the common law judiciary (Ramseyer and Rasmussen 1997, Georgakopoulos 2000, Posner 2005.)⁹In terms of the model in this paper, even a small difference in judicial rewards may lead to substantial differences in the rate at which legal human capital is accumulated and rules are adapted over time. This suggests a fruitful avenue for future comparative institutional analysis.

Accumulation of legal human capital and legal error rates By and large, common law regimes tend to collect larger amounts of evidence and argument and to share this information more broadly in more enduring published forms than civil code regimes. This follows not only from the different style of opinion writing and publication practices in these regimes, but also from the different processes followed in reaching an ultimate decision. In civil code regimes, the sequential nature of decisionmaking implies that evidence and argument on fewer

issues is ultimately presented to the court and the judicial control over evidentiary presentations implies that what evidence is collected is preserved in a judicial summary rather than its raw state. These institutional differences thus suggest a lower rate at which legal human capital accumulates in civil code regimes. If all evidence and argument presented in particular cases is informative, this implies that judicial error in rule adaptation is slower to fall in civil code regimes. If, however, evidence and argument is potentially disinformative, then restrictions on the distribution of information throughout the civil code regime may protect against error. Indeed, one way of understanding the theory of the civil code regimes greater emphasis on judicial control of evidentiary proceeding, specialized judicial training and the insularity of the professional dialogue among the judiciary, the bar and legal scholars is that it is based on the belief that non-experts in law will introduce error and that expertise will properly filter information.

The model I have presented is built on a premise about information, namely that in a decentralized complex market economy there is information available only through direct grass-roots experience with the impact of legal rules. Moreover, expertise is defined as expertise not with formal legal reasoning but with the real-world consequences of rules for economic welfare; such expertise makes its way into the legal system in this model from the efforts and evidentiary presentations of litigants. It is not something that is brought to the system from formal judicial training. In this context, the common law practice of requiring judges to have generally extensive experience with clients (and thus their problems) suggests that judges may arrive in the judiciary with a higher level of (this type of) legal human capital and that they may experience lower rates of initial legal error in an area of legal change. On the other hand, judges in the civil code regimes are much more

likely to have specialized dockets and to spend their careers developing expertise in particular areas of law; they may also conceivably obtain more structured and formal training in evaluating the social welfare implications of their work than common law judges who cut their teeth in the context of advocacy. The different impact of these very different approaches to judicial education and training is ultimately an empirical question about the nature of value and efficiency in legal rules, suggesting another avenue for future comparative inquiry.

Relative legal costs The model I have presented demonstrates that relative legal costs play a significant role in the process of rule adaptation and legal error. But we have very little comparative information about relative legal costs. In general, it seems that absolute legal costs are higher in common law regimes, particularly the American system. But it also seems that damages in common law regimes, again particularly the American system, are higher than those in civil code regimes. This implies ambiguity about the comparative relative costs. The belief that American society is litigious—a complex claim to assess empirically—may suggest that relative costs are lower in the U.S. system; certainly there is a sense that American courts are flooded with cases and evidence in the form of discovery in comparison with European courts. On the other hand, there is some basis for thinking that civil code regimes are more available to ordinary individuals with small stakes cases than is the case in the high-cost American systems. Again, we need more data to evaluate these claims and work out the predictions of the model.

Directions for further research and policy implications My review of the institutional landscape highlights the need for two important empirical projects.

First, we clearly need to deepen our attention to the specifics of the institutional environments in different countries that affect judicial incentives and the accumulation of legal human capital. Classifying regimes as either civil code or common law is not likely to prove helpful. Rather, we need to know far more, country-by-country, about the structure of judicial rewards and the information available to those who judge the performance of judges and hence influence the structure of judicial rewards and penalties. This suggests a far more refined comparative project than the one that currently engages comparative scholars. The model in this paper suggests that the key variables include the identity of those who evaluate judges and thus determine their reward structure (senior judges? politicians? lawyers? journalists?) and the information available to those evaluators (are decisions published? with what level of detail on factual findings and reasoning? is the information filtered by a judge or available in its original form as verbatim testimony and exhibits?). The structure of courts is important (are judges identified? do they sit alone or in panels? how collegial are courts? are opinions attributable to individual judges? who determines evidentiary questions?) The exposure of judges to the welfare effects of their decisions may also be important (have judges been exposed to the practical problems of clients? do they enter the judiciary directly from their legal education or only after a period of practice? what training do judges have in evaluating evidence about the impact of legal rules and assessing policy questions?) And, critically, how is information learned by judges in a particular case diffused through the system (again, are decisions published and how detailed is the presentation of facts and reasoning?)

With a more refined descriptive catalogue of differences between legal regimes, we will be in a position to conduct a second important empirical project: more

careful study of the relationship between these institutional variables and economic growth. As many have noted, the classification of regimes on the basis of legal origins is somewhat crude and makes it difficult to sort out the effect of a particular legal history from other cultural or human capital imports. The analysis in this paper suggests more specific legal variables—which undoubtedly vary across countries that are otherwise classified as belonging to a particular legal family—on which empirical work can focus in the effort to assess the role of legal factors in economic growth and development. Not only might this help disentangle confounding effects from the inheritance not only of legal rules but also human capital and other cultural attributes, but it may also help to increase the precision of our estimation techniques, as we can make use of the substantial variability in legal regimes, variability that is masked by the macro division into legal families.

Further theoretical work is also clearly needed. I have only made suggestions about how the more complex dynamics at work may play out, both in positive and normative terms. Moreover, in order to simplify the analysis, I have suppressed several features of litigation and the response to litigation that clearly will have an impact on the incentives of judges, the accumulation of legal human capital and the path of legal evolution. Settlement behavior is obviously a critical component of litigation and as many have noted, settlement is not random. It has a systematic effect on the nature of the cases that reach final decision in a court and thus on the information available to courts. Hylton (2006) considers some of these effects of settlement on evolution. Legal rules also affect activity levels, the behavioral choices plaintiffs and defendants make about the conduct implicated by a legal rule. As I have argued elsewhere (Hadfield 1992), this will also affect the information set reaching a court. A more general model would also

relax the assumption that only defendants present evidence and argument, and the strategic behavior that surrounds information revelation to a court. Several economists have explored in particular the impact of signaling, strategic revelation and the competition between plaintiff and defendants on the nature and amount of the evidence presented to a court. (See, for example, Milgrom and Roberts 1986, Shin 1994, Shin 1998, Posner 1999, Daughety and Reinganum 2000) This work has focused on the impact of strategic behavior on the accuracy of a court's determination of the facts in a given case. The model presented in this paper identifies another important effect that may flow from strategic evidentiary behavior, namely the effect on the informative quality of the legal human capital stock and thus on the likelihood of error in the legal system as it evolves. And although I have de-emphasized the importance of the relative reliance on statutes or regulation as opposed to judge-made law because of the exaggeration of this difference in the existing literature, it will ultimately be important in a fuller model to situate the analysis of learning through litigation in the context of legislative determinations about the extent to which regulation will be accomplished through courts as opposed to legislatures and agencies. If, for example, there are significant obstacles to the accumulation of legal human capital that do not confront the development of bureaucratic expertise in legislatures and agencies, optimal legal regulation may involve heavier reliance on statutes and regulations. In the end however, even the most refined statutes require interpretation and application and hence depend on the quality of legal human capital available to judges. Finally, it will be important for further work to assess more carefully the trade-offs between controlling corruption within courts and facilitating the capacity of judges to engage in welfare-promoting rule adaptation. The effort to control corruption is a

key reason for many of the institutional features that Hadfield (2006) identifies as critical to the capacity of a legal regime to learn and adapt over time. But the trade-offs may not be as stark as they first appear. The capacity of a system to detect corruption is also dependent on the level of legal human capital: indeed, this is one of the principal justifications for public and reasoned decisionmaking. Like rule adaptation, the elimination of corruption may be best analyzed as a dynamic problem of structuring the mechanisms that contribute to the organic accumulation of legal human capital.

The policy prescriptions that flow from the analysis I have presented suggest that the choice facing transition and developing economies is not between writing codes or borrowing volumes of caselaw. Rather it is a series of choices about institutional attributes such as the publication and expansiveness of legal opinions, the institutional structuring of judicial incentives for rule adaptation and the mechanisms by which information about the welfare effects of particular rules (or, more to the point, particular interpretations of statutory provisions) makes its way to judges and those who evaluate judges. The model also links the effectiveness of courts to the organization and regulation of the legal profession. Lawyers play a key role in the generation and transmission of specialized legal human capital, specifically expertise about the relationship between legal rules and welfare. As the model makes clear, the adaptation of law to local and changing circumstances over time requires that litigants face incentives to invest in lawyers' efforts to produce evidence and innovate legal arguments. The organization and regulation of the legal profession—the extent to which the market for lawyers is competitive, for example—will influence the path of the law, both through the cost of legal services and the cost of generating a certain level of expertise. Rules governing the

organization of legal practice—limitations on firm size or prohibitions on employment¹⁰ for example—influence the extent to which legal human capital is shared among those in the profession. Professional control over legal ethics will also have an impact on the potential for disinformation in courts. The model also suggests that countries attempting to transition quickly to a legal regime that supports economic growth and market development may need to take specific steps to overcome both inadequate judicial incentives and an initially high level of legal error. Particularly in systems transitioning from socialist or communist governance to market democracy, it is likely that the shared level of legal human capital about the relationship between legal rules and outcomes will be low by virtue of the lack of experience with markets. In these settings, policy efforts to effectively import legal human capital into the profession and judiciary may be necessary. This has implications, for example, for the rules governing the access of foreign lawyers and law firms to practice in the new regime as well as for the access the profession and judiciary has to the work of lawyers and courts in other jurisdictions.

The principal lesson is that law that supports economic growth and market development has to be seen in dynamic terms, as an organic entity that evolves over time in response to local and changing conditions. In order for that process to take place, it is necessary for judges to face incentives that support welfare-improving rule adaptation and for litigants to invest in presenting to courts the evidence and arguments they need to evaluate proposed rules or statutory interpretations. Whether a system is denominated a code system or a common law system, it is the institutions that structure incentives for judges and litigants to learn over time and the mechanisms by which this learning is translated into shared legal human capital that determine the quality of a legal regime.

6. References

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7. Appendix

Proof of Lemma 1: Rearranging the defendant's investment problem, the defendant will invest if $\frac{k}{D} \leq (1 - \Pr(\hat{y} \geq y^* | y, K_t))$, yielding the limit that for any investment to occur it must be that $k \leq D$. $\Pr(\hat{y} \geq y^* | y, K_t) = \Pr(\theta \geq y^* - y | y, K_t) \geq 0 = 0$ if $(y^* - y) > \bar{\theta}$. $\Pr(\theta \geq y^* - y | y, K_t) = 1$ if $(y^* - y) < -\bar{\theta}$. For $-\bar{\theta} \leq (y^* - y) \leq \bar{\theta}$, $\Pr(\theta \geq y^* - y | y, K_t) = \frac{y^* - y}{2\bar{\theta}} + \frac{1}{2}$. Combining these cases yields the condition shown. ■

Proof of Proposition 2: Condition (1) follows directly from Lemma ??
 Condition (2): Let J_t be the set of judges for whom judicial incentives support rule adaptation in period t for a given value $\bar{\theta}_t$. Given the initial level of judicial error $\bar{\theta}_1$, clearly if $G(\hat{\alpha}_1) = 1$, then the set J_1 is empty and all judges announce R^x in period 1. Thus $K_1 = 0$ and $\bar{\theta}_2 = \bar{\theta}_1$. The same result is replicated in all future periods. Condition (3): Consider a distribution with $G(\alpha) = 0$ for some $\hat{\alpha} < \bar{\alpha}$. From Lemma 2 the set J_1 is then empty if $\hat{\alpha}_1 \geq \hat{\alpha}$, implying that $\sigma_{11} + \sigma_{21} \geq 1 - \frac{1}{\hat{\alpha}}$ yields J_1 empty. This inequality with respect to the sum of type 1 and

type 2 errors can then be achieved by setting either equation 3 or equation 4 equal to $1 - \frac{1}{\alpha}$ and solving for the initial level of error $\bar{\theta}_1$. ■

Proof of Proposition 4: Consider two legal regimes, A and A' with $G^A(\alpha) < G^{A'}(\alpha)$ for all α , $G^{A'}(\tilde{\alpha}_1) < 1$, and with the same level of initial judicial error ($\bar{\theta}_1^A = \bar{\theta}_1^{A'}$). If $G^A(\tilde{\alpha}_1) < G^{A'}(\tilde{\alpha}_1)$ then more judges support rule adaptation in period 1 in regime A than in regime A' , giving $|J_1^A| > |J_1^{A'}|$. Given $k \leq D$ some defendants appearing before rule-changing judges invest in producing evidence and argument in period 1; the fact that there are more such judges in A than A' then implies that $K_2^A > K_2^{A'}$. $\bar{\theta}_2^A < \bar{\theta}_1^A$ and $\bar{\theta}_2^{A'} < \bar{\theta}_1^{A'}$, $\sigma_{12}^A < \sigma_{11}^A$, $\sigma_{22}^A < \sigma_{21}^A$, $\sigma_{12}^{A'} < \sigma_{11}^{A'}$ and $\sigma_{22}^{A'} < \sigma_{21}^{A'}$. Thus $\tilde{\alpha}_2^A < \tilde{\alpha}_1^A$ and $\tilde{\alpha}_2^{A'} < \tilde{\alpha}_1^{A'}$ and thus more judges in both regimes are rule-changers in period 1 than in period 2. Moreover, $\bar{\theta}_2^A < \bar{\theta}_1^A$ and $\bar{\theta}_2^{A'} < \bar{\theta}_1^{A'}$ implies that more defendants appearing before rule-changing judges invest in both regimes in period 2 than in period 1. However, $K_2^A > K_2^{A'}$ implies $\bar{\theta}_2^A < \bar{\theta}_2^{A'}$ which implies that $\sigma_{12}^A < \sigma_{12}^{A'}$ and $\sigma_{22}^A < \sigma_{22}^{A'}$. These higher error rates in regime A' in period 2 imply that $\tilde{\alpha}_2^A < \tilde{\alpha}_2^{A'}$. Then $G^A(\tilde{\alpha}_2^A) < G^A(\tilde{\alpha}_2^{A'}) < G^{A'}(\tilde{\alpha}_2^{A'})$ and $|J_2^A| > |J_2^{A'}|$. ■

Proof of Proposition 5: Consider two legal regimes, A and A' with $\bar{\theta}_1^A < \bar{\theta}_1^{A'}$ and with $G^A(\alpha) = G^{A'}(\alpha)$. $\bar{\theta}_1^A < \bar{\theta}_1^{A'}$ implies $\tilde{\alpha}_1^A < \tilde{\alpha}_1^{A'}$ and thus more judges support rule adaptation in period 1 in regime A than in regime A' , giving $|J_1^A| > |J_1^{A'}|$. From Proposition 1, if $k > \frac{D}{2}$ more defendants invest in regime A than in regime A' . Thus $K_2^A > K_2^{A'}$ and the remainder of the result follows from the proof of Proposition 4. If $k < \frac{D}{2}$, we know from Proposition 1 that fewer defendants invest in regime A than in regime A' and the net effect on legal human capital accumulation is ambiguous. ■