Standardized Enforcement: Access to Justice vs Contractual Innovation ♣

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Abstract

We model the evolution of contracts and of the legal system to compare the role of precedents and contract standardization in supporting market development. In a setting where more resourceful parties can distort contract enforcement, we find that the introduction of standard contracts reduces enforcement risk relative to precedents, exerting two effects: i) it statically expands the volume of trade, but ii) it hampers commercial and legal innovation by crowding out the use of innovative contracts. We show that the legal system can crucially shape not only the static working of markets but also the joint development of markets and the law, and offer a rationale for the large scale commercial codification that occurred in Common Law systems in the XIX century during a period of booming commerce and long distance trade.

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0. Introduction

A fundamental idea in economics is that the efficiency of private arrangements such as markets (Arrow 1964, Debreu 1959) or bargaining (Coase 1960) relies on the use of contingent contracts. If these contracts are unavailable, private arrangements are seriously impaired (Townsend 1979, Grossman and Hart 1986). In this view courts have a key economic role. Indeed, parties may be forced to use non-contingent contracts precisely to protect themselves against poor verification and enforcement of contractual contingencies (Gennaioli 2009). This notion raises one crucial question: how do alternative enforcement regimes affect contracting and economic efficiency?

We address this issue by combining ideas from contract theory, which has largely abstracted from courts (Bolton and Dewatripont 2005, p.3) and law and economics. We build on the classical transaction between the buyer and seller of a good in which quality-contingent pay is needed to induce the seller's effort. The good's quality depends on many ambiguous signals. Crucially, the party stronger in litigation can sway judicial estimates of quality by obtaining a favorable interpretation of a signal. Unequal litigation ability, which can be due to parties' differential resources or information, distorts quality-contingent incentives, hindering gains from trade.

We study two legal regimes aimed at reducing these enforcement problems. The first, *laissez faire*, regime, relies on precedents. Much legal thinking views legal evolution as promoting judicial efficiency, consistency and private contracting (e.g. Hayek 1960, Posner 1973). Recent studies however detect an unpredictability of precedents not only in torts (Niblett 2009 et al.) but also in contracts (Niblett 2009). To soften such unpredictability, the second regime combines precedents with the *standardization* of the enforcement of specific contracts. This regime – often attained by public or private commercial codification – creates a set of cheap to enforce contracts, whose provision is viewed as a main goal of contract law (e.g. Schwartz and Scott 2003).[1] In our model, precedents and standard contracts ensure predictable interpretation of at least few signals, but parties can choose to write innovative contracts contingent on more signals. This strategy, akin to what legal scholars call "opting out", crucially allows us to endogenize the joint evolution of contracts and the legal system.

Under *laissez faire*, contractual evolution works as follows. Initially, there are

[1]An extreme view holds that contract law is irrelevant as contracts can specify provision concerning also their enforcement. In our model, contract law (or private arbitration) provides judges with the necessary training to enforce specific contingencies. It is difficult if not impossible for atomistic parties to provide such training due to scale economies, coordination and public good problems.

few precedents, so that the enforcement of highly contingent contracts is very uncertain. This uncertainty creates room for strong enforcement distortions, preventing very unequal parties to contract. If however some roughly equal parties write innovative contract clauses, the litigation of the latter creates new precedents that clarify judicial interpretation of additional signals. This renders enforcement progressively more predictable, reducing distortions.[2] In the limit, contracts are fully complete and parties attain the first best, irrespective of inequality. The problem, though, is that convergence is not immediate, so that – as in the aforementioned evidence (e.g. Niblett 2009) – under laissez faire strong enforcement risk persists for a long time.

In this setup we view standardization as the creation of a contract contingent on a few but informative signals that judges are trained to interpret ex-ante. The standard contract reduces legal uncertainty relative to precedents, exerting two basic effects. First, it fosters contracting among parties that are so unequal that they would not contract under laissez faire. Second, it crowds out the use of innovative contracts by moderately unequal parties. Under laissez faire these parties write an innovative contract, but once the standard contract is introduced they switch to it as the latter, while also being contingent, is less subject to enforcement risk. That is, standardization reduces the *private* benefit for parties to opt out and write innovative contracts.

These effects shape the static and dynamic impact of standardization. On the one hand, standardization statically improves welfare by expanding the volume and efficiency of contracting. On the other hand, standardization stifles contractual and legal innovation to such an extent that after some point social welfare may be higher under laissez faire.[3] This highlights a tradeoff between the static and the dynamic efficiency of standardization. If social inequality is strong, precedents alone are not a reliable basis for contracting and to jump start markets society must give up some contractual and legal innovation for greater legal certainty and market volume.

Our model shows that the co-evolution of the economic and legal systems can give rise to rich and intriguing dynamics that may potentially shed light on a variety of important phenomena. For instance, the Common Law's ability to support market

[2] As an example of this mechanism, Tufano (2003) argues that the 19th century decisions of U.S. judges to reorganize failed railroad in spite of creditors' foreclosure rights was a key stimulus for the creation of new contracts such as contingent charge securities and voting trusts.

[3] It is worth stressing two aspects of our model that will be clarified in Section 3. First, the benefit of standardization is due to free riding among litigants, as precedents initially clarify the interpretation of little informative (but partisan) signals, not of the socially optimal ones. Second, the dynamic cost of standardization is not due to the fact that the standard is not updated as precedents accumulate.

development (La Porta et al. 2008) has been questioned on the grounds that: i) at the turn of the XX century markets in the more codified Civil Law systems were at least as developed as those in their Common Law counterparts (Rajan and Zingales 2003), and ii) there seems to have been substantial legal convergence among rich, developed economies in recent years (Coffe 2001). In Section 3 we argue that our model may shed light on these facts after one realizes the impact of commercial codification on legal and economic evolution. Of course, the welfare impact of commercial codes is much harder to assess, but Section 5 shows that our model can shed light on the standardization efforts undertaken also in major Common Law systems in the XIX century, to support markets during a period of booming commerce and long distance trade.

The paper is organized as follows. Section 2.1 shows a basic static model of laissez faire where in the presence of massive legal uncertainty unequal resources distort enforcement and contracting. Section 2.2 studies the role of standardization in this static setup. Section 3 compares the dynamic properties of laissez faire and standardization. Section 4 presents two extensions. Section 5 reviews some real world standardization episodes in light of our model. Section 6 concludes.

Literature Review Some papers study the *static* effects of judicial error when the latter is due to bias (Gennaioli 2009, Gennaioli and Shleifer 2008), corruption (Glaeser and Shleifer 2003, Bond 2004), or litigants' inequality (Daugherty and Reinganum 2000, Glaeser and Shleifer 2003, Glaeser, Sheinkman and Shleifer 2003). Other papers study the *dynamics* of precedents (Gennaioli and Shleifer 2007, Priest 1977 and Rubin 1977) or of judges' human capital (Hadfield 2006). There is little work on the dynamics of alternative legal systems. Anderlini et al. (2007) and Fernandez and Ponzetto (2007) compare precedents to statutes. Rather than comparing these two polar systems, we study how precedents, codes and contracts evolve, which is key in commercial fields of law, where parties can opt out of the law by contract.

1 The Model

We build on a standard production transaction (see Bolton and Dewatripont 2005, ch. 12). A buyer B and a seller S contract over the supply of a tailored widget whose market value is 0. For B the widget's value v is uniformly distributed in $[0,\bar{v}]$ where $\bar{v} \leq 1$. To produce the widget, the seller must spend $\bar{v}^2 k > 0$ to undertake an

unobservable human capital investment at $t = 0$. At $t = 1$, v is realized, observed by all, and S exerts a production effort $e \in [0,1]$ at cost $e^2/2$, so that the widget is produced with probability e at $t = 2$. The overall timing is therefore:

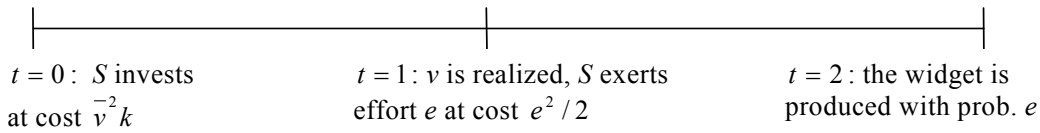

Figure 1

A measure one of transactions $\bar{v}$ is distributed with p.d.f. $f_{\bar{v}}(\bar{v})$ in $[0,1]$. Heterogeneity in transactions' average value $\bar{v}/2$ clarifies the choice between the standard and non-standard contracts, but our results go through also if all transactions share the same $\bar{v}$.

Consider a transaction of generic value $\bar{v}$. Conditional on investing at $t = 0$, the socially optimal level of effort by S when the widget's value is equal to v solves:

$$\max_{e(v)} ev - (1/2)e^2 \tag{1}$$

First best effort is equal to $e_{fb}(v) = v$, and ex-ante social welfare from production is:

$$\int_0^{\bar{v}} \left[e_{fb}(v)v - (1/2)e_{fb}(v)^2 \right](1/\bar{v})dv - \bar{v}^2 k = \bar{v}^2 \left(\frac{1}{6} - k \right) \tag{2}$$

We study the case where it is socially profitable to produce the widget by assuming:

A.1.: $k < 1/6$.

In the first best, S invests at $t = 0$, and at t=1 he exerts effort $e_{fb}(v)$. Parties may try to implement this outcome by negotiating the widget's delivery price at $t = 1$, after v is realized. This strategy, though, creates a standard hold-up problem. To show this starkly, we assume that B has all the bargaining power ex-post. This implies that after v is realized B can set price $p = v$ for delivery of the widget at t=2 and, contextually, tax S in a lump sum fashion at t=1. This way S exerts first best effort but B extracts the whole surplus. Obviously then, S has no incentive to invest at t=0.

To avoid hold-up, parties can write a contract at $t = 0$ committing B to pay only the delivery price $p(v) = v$. This avoids lump sum taxation of S at t=1, inducing him to exert first best effort and investment. Crucially, this contingent contract relies on courts' ability to verify v.[4] To study the role of the law in state verification and

[4] In line with court practices and Hart and Moore (1998), we assume that courts cannot force trade (contracting is at will). Specific performance contracts may allow to attain the first best even under

contracting, we now introduce two novel ingredients in this otherwise standard setup: the measurement structure of v and the way parties take advantage of such structure in contractual litigation. The model is purposely stylized so as to ensure analytical tractability, which is an important advantage of our approach.

1.1 State Verification

In any transaction $\bar{v}$ the widget's value depends on the realization of a measure $\bar{v}$ of binary signals $s_i \in \{0,1\}$ each of which is identified by an index $i \in [0,\bar{v}]$ and captures just one among the many factors affecting v (e.g. the state of B's current or future demand, B's production costs, etc…). Signals work as follows: if the widget's value is v, exactly a measure v of signals is equal to 1 while the remaining $(\bar{v}-v)$ signals are equal to 0. The average value of all signals is thus always equal to the widget's true value v. Crucially, signals with lower index i are more likely to take value 0 than 1: for any given v, all signals with index $i \le i(v) \equiv \bar{v}-v$ take value 0, all signals with index $i > i(v) \equiv \bar{v}-v$ take value 1, as shown below for generic $\bar{v}$ and v:

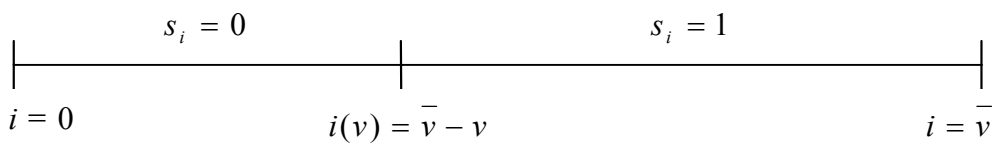

Figure 2

This setup captures two ideas. First, state verification is complex because v results from many conflicting signals taking values 0 and 1. Second, some signals are more informative, others more biased for the buyer or the seller. Low indexed signals are very likely to be equal to 0, so they are favourable to B. High indexed signals are by converse very likely to be equal to 1, so they are favourable to S.

This implies that when interpreting a signal judges should discount its bias. To see this, note that if a signal with index i^* is equal to 1, there are *at most* i^* signals equal to 0; if instead the same signal is equal to zero, there are *at least* i^* signals equal to zero. A judge observing such signal should then infer $v \ge \bar{v}-i^*$ in the former case, $v < \bar{v}-i^*$ in the latter case. Thus, little information is conveyed if a high or a

imperfect verification of v by using options (e.g. Noldeke and Schmidt 1995). In reality, imperfect courts can also undermine specific performance contracts by erring in setting different allocations. To focus on the problems associated with verifying v, we assume specific performance contracts away.

low index signal takes its most likely values (1 and 0, respectively). Indeed, note that:

$$\mathrm{cov}(s_i, v) = \frac{1}{2}\left(i - \frac{i^2}{\bar{v}}\right),$$

so that extreme indices are very little informative about v (the above covariance is low) while the most informative signal is the middle one carrying index $i = \bar{v}/2$.

Of course, and this is the very essence of the problem, every signal is somewhat informative (the above covariance is zero only for $i = 0, \bar{v}$), but to draw the correct inference from a generic signal s_i judges should know the event $v \geq \bar{v} - i$ about which the signal is informative. We henceforth refer to i as the correct interpretation of a signal.[5] One important property of our model is that every signal is fully revealing at a certain v, in the sense that at such v state verification can be made arbitrarily precise if judges could just identify the "critical" signal carrying index $i(v) = \bar{v} - v$. This is the signal separating the region in which signals are 0 from the region in which signals are 1. In this case parties can attain the first best by setting:

$$p(v) = \bar{v} - i(v), \tag{3}$$

which by assumption implements the optimal long term contract $p(v) = v$ at every v.

1.2 Judicial State Verification

The source of contractual incompleteness in our model is a form of judicial lack of expertise which we articulate around two assumptions. First, judges can only deliver a judgement by using at most two signals. This assumption reflects a natural cognitive limit on judges' ability to base decisions on many disparate factors, and prevents judges from verifying v by aggregating all signals. Crucially, this cognitive limit only implies that judges should consider the informativeness of signals when deciding a case. In fact, we just saw that – provided signals' indices are known– judges can still attain virtually perfect verification by adjudicating on the basis of only two signals located around the critical one. It is here that our second and main assumption bites. Specifically, due to limited expertise, judges do not know the informativeness of a specific signal as opposed to its bias for of a party. Formally,

[5] To aid formalization we keep the model abstract, but our signal structure is intuitive. For instance the value of a high index signal may capture the presence (if the signal is one) or absence (if the signal is zero) of a basic and easy to provide quality dimension. Intuitively, then, only the absence of such

judges cannot recognize a signal's index i.[6] Crucially then, whether a signal is more or less informative is determined in court as a function of parties' ability to litigate.

In court, parties present favourable signals (s_i is *verifiable*). Under a broad interpretation, these signals can be viewed as legal arguments. Crucially, parties' ability to collect signals is not equal: at any given widget's value the seller can collect a share x_S of the v signals taking value 1, the buyer a share x_B of the $(\bar{v}-v)$ signals taking value 0. If $x_S > x_B$, S is stronger than B and vice versa. Section 4 derives this formulation from first principles in a model with different signal collection costs.

This setup captures an unregulated litigation process in which parties present as many favourable signals as they can. Here we focus on ex-post litigation, postponing the study of the optimal contract and its enforcement to the next section. This abstraction is possible because judges cannot distinguish signals so that – irrespective of the ex-ante contract – the trial outcome will be dichotomous, mapping the parties' evidence into a decision that picks the preferred contractual outcome for B or S. Litigation can be viewed as occurring with respect to signals' informativeness, in the sense that the judge awards the case by recognizing that one of a party's favourable signals is "critical" for the enforcement of the contract. Our key assumption is that judges are swayed by the party that overall presents more favourable evidence. We formalize this notion by assuming that the party presenting more signals wins in court.[7] As a result, the seller wins when:

$$x_S v \geq x_B(\bar{v}-v) \quad \Leftrightarrow \quad v \geq \hat{v} \equiv \frac{x_B}{x_B + x_S}\bar{v} \equiv \beta\bar{v}, \tag{4}$$

and the buyer wins otherwise. Here β measures the inequality between B and S. If $\beta < 1/2$, S is richer than B (S may be a large corporation, B a consumer) so that it may hire more or better lawyers, or simply know better than B where to collect favourable signals. If $\beta > 1/2$, the opposite is true. Parties know β in advance, but Section 4 proves that similar results obtain if parties' relative strength is uncertain.

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dimension is informative about quality. Of course, it might be hard for inexpert judges to determine which quality dimension is more or less informative, which is what Section 1.2 seeks to capture.

[6] We are implicitly assuming that parties cannot write an ex-ante contract "instructing" judges on how to interpret and use specific signals. The basic idea here, which is clarified in Section 2.2 is that judges cannot recognize different signals without receiving prior training, so they cannot enforce this contract.

[7] To rationalize (4) one can view litigation as a debate, signals as arguments. When S presents a signal equal to 1, B offsets it with a signal equal to 0, a counterargument. The judge ignores conflicting

Expression (4) shows that two factors shape trial outcomes in this model: the case facts v and inequality β. The true state v determines the likelihood that different parties collect favourable signals: B is more likely to win if v is low because in this state it is easier for him to find favourable signals with $s_i = 0$. On the other hand, B is more likely to win in any state the greater his strength β.[8]

2. Optimal Contracting under Imperfect State Verification

We now study *static* contracting. Section 2.1 studies laissez faire when no precedents have yet been created, Section 2.2 studies standardization in this setup.

2.1. Inequality and Contracting under Laissez Faire

Consider a laissez faire regime where parties contract in the absence of prior legal evolution. This amounts to assuming that judges cannot recognize *any* signal as in Section 1.2. At $t = 0$, parties decide whether to contract or not. Their contract is then enforced at $t = 1$. Since adjudication is dichotomous, parties cannot do better than by specifying a base payment p and a bonus Δ. The bonus is paid to S if and only if he wins in court. We call contracts specifying $\Delta > 0$ "innovative" to distinguish them from the less contingent contracts setting $\Delta = 0$. The reason for this will become clear in Section 3, but the basic idea is that a contract is innovative when its enforcement relies on courts; contracts featuring $\Delta = 0$ are indeed mechanically enforced (this is trivially true now as $\Delta = 0$ identifies a fully non contingent contract).

Based on expression (4), after learning v the seller predicts the trial outcome: he expects to lose and obtain p if $v < \beta\bar{v}$, he expects to win and obtain $p + \Delta$ if $v \geq \beta\bar{v}$. The sellers' effort choice is therefore equal to:

$$e_{l.f.}(v) = \begin{cases} p & if \quad v \leq \beta\bar{v} \\ p + \Delta & if \quad v > \beta\bar{v} \end{cases} \tag{5}$$

By taking (5) into account, parties to transaction $\bar{v}$ write an ex-ante contract solving:

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signals until only one party has spare signals and wins the case. This model yields convenient closed forms, but Section 4 shows that similar results obtain if judges pick signals randomly.

[8] We are implicitly assuming that adjudication does not factor in the different ability of parties to collect evidence. There are two justifications for this assumption. First, judges cannot deliberately disregard signals as the latter are verifiable. Second, it may be difficult for judges to evaluate the inequality-induced bias of the evidence, especially due to random variation in the value v and of idiosyncratic variation in x_S, x_B. Section 5 formally studies the latter case.

$$\max_{p,\Delta} \int_0^{\beta\bar{v}} \left[pv - p^2/2\right](1/\bar{v})dv + \int_{\beta\bar{v}}^{\bar{v}} \left[(p+\Delta)v - (p+\Delta)^2/2\right](1/\bar{v})dv \qquad (6)$$

The above expression is simply the social surplus created by the seller's equilibrium effort in (5). By maximizing (6) we find that the optimal contract stipulates:

$$p = \beta(\bar{v}/2) \quad \Delta = \bar{v}/2 \qquad (7)$$

The base price and bonus increase in the average effort value $\bar{v}/2$. Note that parties always specify $\Delta > 0$ irrespective of inequality because it is always optimal for them to condition effort on at least some piece of information. In the absence of any legal evolution, all written contracts are optimally innovative. Crucially, though, the optimal base p increases in β to minimize the distortions caused by inequality. Intuitively a higher β implies that the bonus is enforced less often. Hence, to restore the seller's incentives, parties stipulate a higher p. Does this contractual reaction neutralize the impact of β on welfare? To answer this question, we plot the optimal contract and S's effort as a function of β when $\beta \geq 1/2$ and $\bar{v} = 1$.

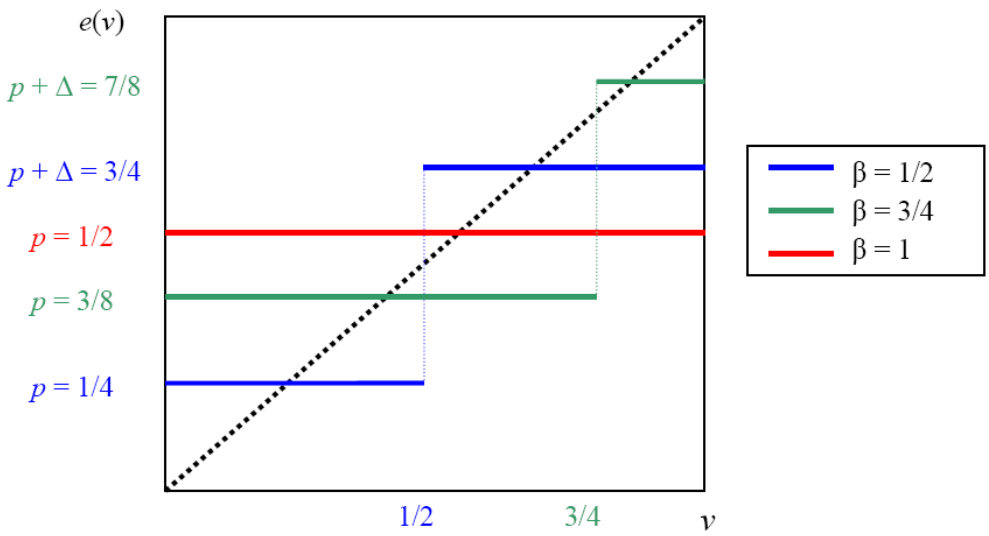

Figure 3

The 45° line represents first best effort. Judicial inability to identify signals reduces the extent to which contracts are state contingent, causing over and under-provision of effort. This is evident if parties are equal ($\beta = 1/2$). As β increases, though, B wins more often in court and the contract becomes even less contingent, exacerbating effort distortions. When $\beta = 1$, effort becomes fully non-contingent. As a result, even if the ex-ante contract tries to reduce enforcement distortions, inequality remains costly because it reduces the extent to which effort tracks the widget's value. A similar logic holds as β falls below 1/2. Indeed, parties' welfare under (7) is equal to:

$$W(\bar{v},\beta)=\bar{v}^{2}\left[\frac{1}{6}-k-\frac{1-3\beta+3\beta^{2}}{24}\right], \tag{8}$$

The rightmost term in square brackets measures the welfare loss relative to the first best. Such loss is minimized at $\beta=1/2$. Greater inequality $|\beta-1/2|$ among parties reduces welfare by making it harder for the contract to provide *S* with proper state contingent incentives. If inequality is huge (i.e. if β tends to 0 or 1), effort is fully non contingent. We then find:

Proposition 1 *If $k>15/96$, parties do not contract. If $k\in(1/8,15/96]$, there are two thresholds $\underline{\beta}$ and $\overline{\beta}$ ($\underline{\beta}<1/2<\overline{\beta}$), such that parties contract if and only if $\beta\in(\underline{\beta},\overline{\beta})$. If $k\leq 1/8$, parties always contract. Parties' welfare falls in $|\beta-1/2|$.*

Since adjudication is imperfect, even if parties are equal contracting only occurs if the transaction is sufficiently valuable (i.e. $k\leq 15/96$). At the same time, if $k<1/8$ the ex-ante investment is so cheap that everybody contracts irrespective of inequality. This is he case in which gains from trade exist even if effort is fully non contingent. In the rest of the paper we focus on the most interesting case $k\in[1/8,15/96]$, where β affects the extent of contracting, as graphically shown below as a function of $\bar{v}$:

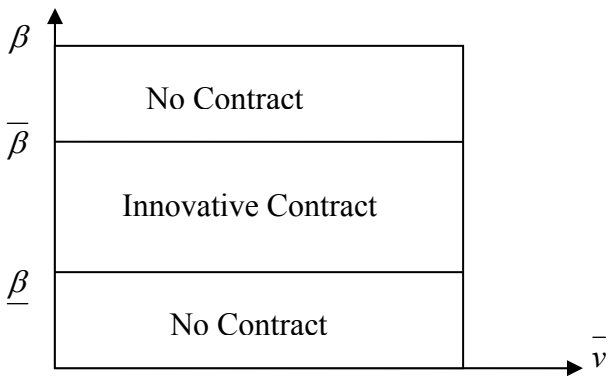

Figure 4

By causing costly enforcement distortions, inequality reduces not only the efficiency but also the volume of contracting. Aggregate social welfare is then equal to:

$$\int_{\underline{\beta}}^{\overline{\beta}}\int_{0}^{1}W(\bar{v},\beta)f_{v}(\bar{v})f_{\beta}(\beta)d\bar{v}d\beta, \tag{9}$$

where $f_\beta(\beta)$ is the density of interactions with adjudication bias β. A greater variance of β in the population captures greater inequality among contracting parties. Since –

by expression (8) – $W(\bar{v},\beta)$ is quadratic in β, the variance of β reduces welfare. Intuitively, when β takes extreme values, welfare falls because: a) fewer buyer-seller pairs wish to contract, and b) distortions among contracting parties go up.

We study two regimes aimed at reducing enforcement distortions. The first, which we introduce next, relies on the top down standardization of the enforcement of specific contracts. The second is inherently dynamic and relies on precedent creation as a bottom up way to bind judges to follow a preset enforcement policy. This latter regime arises from the repetition of the setup just studied, so we call it *laissez faire*. Section 3 studies legal and economic evolution under laissez faire and standardization.

2.2 Contract Standardization

Standardization is often undertaken either by the public legal system through commercial codification, e.g. by specifying a set of default investor rights in financial contracting (La Porta at al. 1998), or by a private trade association (Bernstein 2001). In both cases, it provides off the shelves contracts parties can use unless they explicitly opt-out of them. Our model stresses two key features of real world standardization patterns. First, standard contracts typically consist of detailed terms based on a few pre-specified contingencies. Second, judges are given detailed instructions on how to enforce these contracts. These features combine a restriction in admissible evidence to few preset signals and the training of judges to recognize them, both of which can be viewed as limiting the role of parties' unequal signal collection ability.[9]

In line with these features we model the standard contract as using only one signal with index i_S that judges are trained to recognize ex-ante. Judges are also forbidden from using any signal $i \neq i_S$ not included in the standard contract. Judicial training is costly, so only a few signals can be standardized (only one for simplicity). In the previous signal structure, these assumption imply that the standard contract allows the bonus Δ to be enforced if and only if $v > v_S = \bar{v} - i_S$.

Crucially then, the standard contract is not valuable in transactions where

[9] It would be extremely difficult for atomistic parties to attain these goals by contract. First, it is hard to contract on litigation procedures such as evidence admissibility rules, as public courts often refuse to enforce these terms (Scott and Triantis 2005). Second, it is even harder for atomistic parties to train all judges to recognize specific signals. Niblett (2005) confirms this notion by showing that even in a developed legal system such as the U.S. one, public courts introduce great uncertainty in the enforcement of private standardization (i.e. arbitration clauses), suggesting that for standardization to be viable a form of cooperation by the public legal system may be necessary.

$\bar{v} \leq v_S$. In these transactions, signal i_S is fully uninformative because it implies that the bonus is never enforced and effort is always equal to *p*, frustrating the parties' desire to pay a positive bonus in some states. The problem of the standard contract is its one-size-fits all nature: ideally, each transaction $\bar{v}$ would need a different standard but this would be too costly, requiring extensive judicial training on many signals.

If $\bar{v} > v_S$ and the standard contract is used, in analogy with the previous analysis parties set contract terms p, Δ so as to induce *S* to exert effort in a way that maximizes their ex-ante welfare. This implies that:

$$p = v_S / 2 \quad \Delta = \bar{v} / 2. \tag{10}$$

The base price increases in v_S. Intuitively, if under the standard contract the bonus is enforced less often, parties write a higher base price to as to improve the seller's incentives. For $\bar{v} > v_S$, parties' welfare under the standard contract is:

$$W(\bar{v}, v_S) = \frac{\bar{v}^2}{6} - \bar{v}^2 k - \frac{\bar{v}^2 - 3\bar{v}v_S + 3{v_S}^2}{24}. \tag{11}$$

In contrast with the non-standard contract, social welfare does not depend on β, so that standardization effectively insulates trade from the parties' inequality.

In equilibrium, contracting results from the choice between: i) the standard contract, ii) the innovative contract, and iii) no contract at all. Parties prefer the standard contract to no contract [i.e. expression (11) is positive] when:

$$\frac{\bar{v}}{2} \in \left[\frac{v_S}{2\overline{\beta}}, \frac{v_S}{2\underline{\beta}} \right], \tag{12}$$

where $\overline{\beta}$ and $\underline{\beta}$ are the thresholds of Proposition 1. Expression (12) says that when the optimal standard $\bar{v}/2$ for transaction $\bar{v}$ is much larger or much smaller than v_S (remember that $2\overline{\beta} > 1$ and $2\underline{\beta} < 1$), then the standard contract enforces the bonus too often or too seldom, inducing a distortion which is at least as large as the one caused under laissez faire by an extreme pro-seller or pro-buyer bias. Hence, parties only prefer the standard contract to no contract if $\bar{v}/2$ and v_S are sufficiently close.

To study the choice between standard and innovative contracts, we then reasonably assume that hybrid contracts combining the standardized signal with non-standardized ones suffer from sufficiently severe legal uncertainty that they are not

used.[10] Formally, this implies that the choice between the standard and innovative contract involves comparing (11) and (8). Together with (12), this comparison shows:

Proposition 2 *Given* v_S*, the standard contract is used when* $\bar{v} \in [v_S/\bar{\beta}, v_S/\underline{\beta}]$ *and when either* $\beta \geq \max[v_S/\bar{v}, 1 - v_S/\bar{v}]$ *or* $\beta \leq \min[v_S/\bar{v}, 1 - v_S/\bar{v}]$*. If instead* $\beta < \max[v_S/\bar{v}, 1 - v_S/\bar{v}]$ *and* $\beta > \min[v_S/\bar{v}, 1 - v_S/\bar{v}]$ *and/or* $\bar{v} \notin [v_S/\bar{\beta}, v_S/\underline{\beta}]$*, the parties' contract choice is the same as in Proposition* 1.

The proof is in the appendix. To aid the understanding of this result, consider Figure 4 below, which displays contract choice when $\underline{\beta} < v_S < 1/2$:

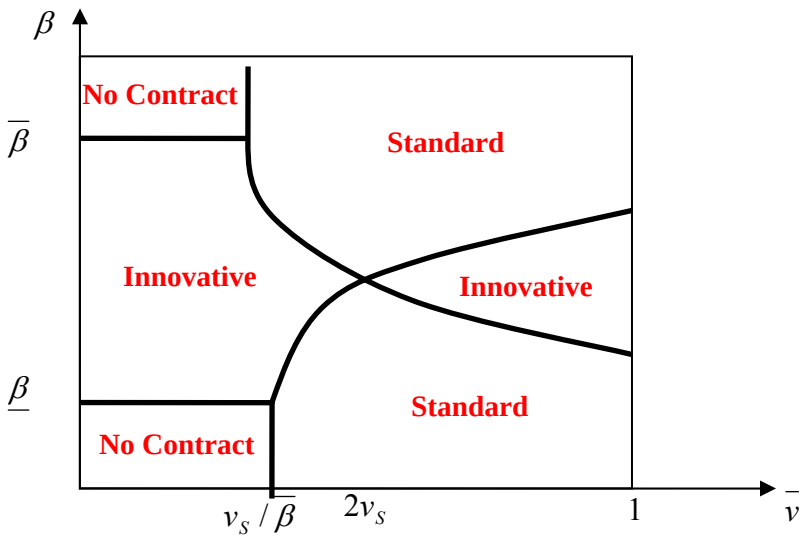

Figure 5

If $\bar{v}/ \leq v_S/\bar{\beta}$, not only is the standard contract not used, but parties do not contract at all if their inequality is large, so that in this range standardization is irrelevant. If instead $\bar{v} > v_S/\bar{\beta}$, parties use the standard contract provided inequality is sufficiently large, namely in the lower and upper parts of Figure 5. In this region, though, the use of the standard contract falls as $\bar{v}/2$ gets further away from v_S (the standard contract is always used when $\bar{v}/2 = v_S$). Here the standard contract is better than no contract, but parties may prefer an innovative contract if the standard contract is sufficiently suboptimal for their transaction and if their inequality is low.

[10]The realism of this assumption finds support in the history of leasing. This contract originated in common law countries but its diffusion was very problematic in the more codified civil law countries due to the legal uncertainty caused by its mix of features typical of standard sale and a rental contracts.

Generally speaking, Proposition 2 and Figure 5 say that parties trade off the standard contract's inflexibility, namely its inability to deal with their specific transaction, with its ability to avoid enforcement distortions. If parties are not too unequal and/or their transaction is too different from the standard contract, they use the innovative contract at the cost of some enforcement distortions. If instead parties are highly unequal, they use the standard contract provided its discrepancy with their transaction is not too large, otherwise they prefer not to contract at all.

Although the standard contract is not always used, its introduction improves welfare because it expands parties' contracting options. In particular, we have that:

Corollary 1 *Standardization statically improves welfare, the more so the greater is the variance of* β. *Standardization allows: i) formerly non-contracting parties to contract and ii) some formerly contracting parties to improve their welfare.*

The proof is in the appendix. Figure 6 below graphically illustrates this result:

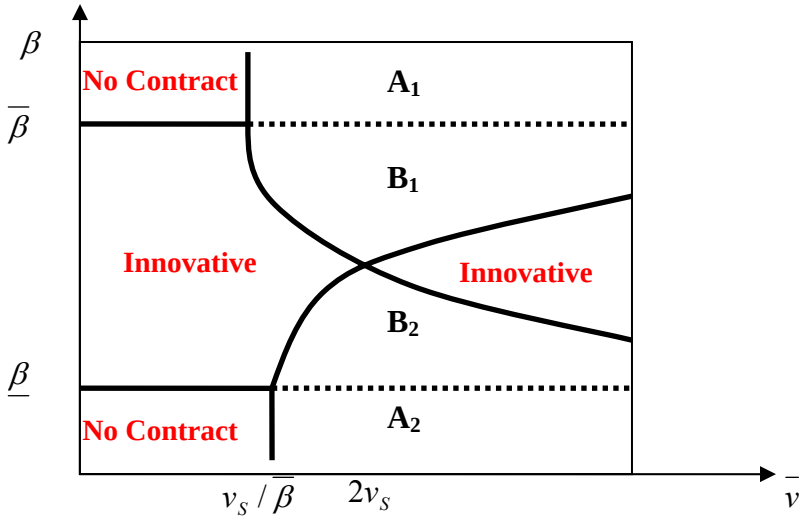

Figure 6

In regions A_1 and A_2 the standard contract improves welfare by allowing contracting among very unequal parties that would not contract under laissez faire. In regions B_1 and B_2 the standard contract improves the welfare of parties that under laissez faire would write an innovative contract but that, given their relatively high inequality, benefit from the lower enforcement distortions of the standard one. The distinction between these two effects is crucial to evaluate the dynamic effect of standardization.

Although Corollary 1 says that standardization is always beneficial in a static sense, the appendix shows that such benefit varies depending on the characteristics of the economy. Greater inequality, captured by a distribution $f_\beta(\beta)$ more concentrated on extreme values of β, increases the static benefit of standardization. Accordingly, if

inequality is sufficiently large, a higher mass of transactions with large value (i.e. $\bar{v} > v_S / \bar{\beta}$) increases the benefit of standardization. In sum, standardization can be seen as a way to reduce the enforcement distortion caused by inequality among litigants. By so doing, standardization statically boosts contracting and welfare – the more so in unequal societies – but crowds out the use of innovative contracts.[11] Equipped with this basic intuition, we can now move to the dynamic analysis.

3. The Evolution of Precedents and Contracts

Consider an infinite repetition of the previous transaction in continuous time. At any $t \geq 0$, buyer-seller pairs meet, contract, litigate. The stock of precedents and the presence of a standard contract are the relevant state variables. We now illustrate how precedents accumulate both under laissez faire and standardization.

In our setup judges enforce an innovative contract by holding that one signal is most informative among those presented by the party collecting more evidence. Thus, a precedent naturally maps the true index *i* of the signal picked by a judge to render a decision into a judicial interpretation of its informativeness, represented by index $q \in [0,1]$. That is, if a judge picking s_i holds that in transaction $\bar{v}$ (where $\bar{v}$ is for simplicity observed by judges) such signal determines if the widget's value *v* is greater or smaller than a judicially set value $v_q = \bar{v} - q$, the same signal s_i is recorded in the precedent with an index *q*, where the latter is potentially different from the signal's true index *i*. From then on, all judges use the physical measurement procedure registered as s_q - whose true index, remember, is *i* – to verify if *v* is greater or smaller than v_q. By ensuring predictability, precedents prevent inequality of weapons to distort the verification of whether *v* is greater or smaller than v_q; indeed, the party unfairly losing the case can at zero cost collect s_q and win the case based on the precedent. Of course, the problem is that judges may be swayed by strong parties and thus misinterpret signals when setting precedents in the first place, i.e. $q \neq i$.

This setup captures two ideas. First, precedents render adjudication of certain case facts more predictable. Hence, legal evolution is similar to standardization, as

[11] It is beyond the scope of our paper to study the optimal standard, but we solved for it when *f(v)* and $f_\beta(\beta)$ are uniform (results are available upon request). The optimal v_S trades off fostering contracting in high vs. low value transactions. As $\underline{\beta}$ goes up, fostering contracting is very difficult and preserving high value transactions is more important (v_S goes up). At the optimum $\underline{\beta} < v_S < 1/2$, as in Figures 5 and 6.

judges are trained to recognize the signals s_q and to use them according to precedents. Second, precedents ensure predictability but not necessarily justice. This is important as it implies that any benefit of precedent accumulation in our model does not mechanically rely on judges taking correct decisions.

Consider the stock of precedents at a given time t, focusing for simplicity only on transaction $\bar{v} = 1$. Our focus is legitimate: judges recognize $\bar{v}$, so that precedents are transaction specific. Obviously, the entire stock of precedents depends on what signals parties find it profitable to present in court. In this respect, note that it is (weakly) ex-post optimal for buyers to always collect signals with the lowest index i and for sellers to collect signals with the highest index i. The former signals take value 0 and are favourable to buyers, the latter signals take value 1 and are favourable to sellers. Since judges cannot recognize signals by their informativeness, this strategy increases each litigant's probability of winning.[12] This idea captures a key feature of precedents: since their accumulation relies on the parties' selective production of evidence ex-post, it may be plagued by the use of narrow and little informative signals because during litigation parties are biased toward presenting favourable signals, not objectively informative ones. More generally, being a by product of litigation, precedents should not be expected to embody the socially optimal case facts (i.e. signals). As we shall see, this has important consequences for the comparison between laissez faire and standardization.[13] For now, however, simply note that the previous observation implies that the stock of precedents at any given t takes the form:

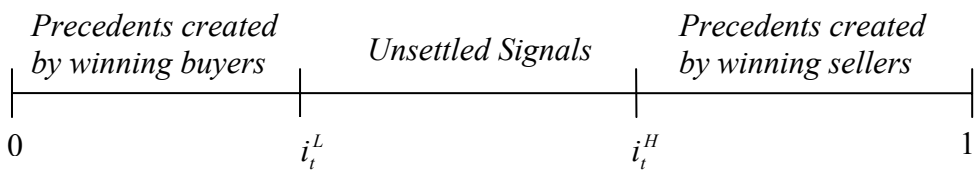

Figure 7

Figure 7 represents signals according to their true index i, not to the judicially attributed index q. The stock of precedents at t embodies all signals whose index is

[12] Collecting extreme signals is *strictly* optimal for parties when signal collection occurs without them (fully) knowing the realized v of the widget. In this case a party collecting extreme signals minimizes the probability that he discards some of the signals collected because they are unfavorable to him.

[13] For simplicity we assumed that parties are short lived and so they do not internalize the future social cost of presenting uninformative evidence in court. Even with long lived parties, though, this internalization would be greatly diluted by the fact that judges pick signals at random, so they are unlikely to pick the most informative ones. More generally, all we need for our main results to go though is that litigants under-provide informative signals relative to the social optimum.

below threshold i_t^L and those whose index is above threshold i_t^H. The former signals are included into precedents in disputes won by buyers (who collect low *i* signals), the latter in disputes won by sellers (who collect high *i* signals). The number $g_t \equiv i_t^H - i_t^L$ captures the measure of signals not yet incorporated into precedents, intuitively measuring the law's "incompleteness" at time *t*.

Our discussion of signals in Section 1.1 implies that at given thresholds i_t^L, i_t^H judges can use the relevant information to perfectly verify *v* if $v \le \underline{v}_t \equiv 1 - i_t^H$ and if $v \ge \bar{v}_t \equiv 1 - i_t^L$, and to determine if $v \in \left[\underline{v}_t, \bar{v}_t\right]$ or not. Indeed, suppose for a moment that signals are perfectly recorded into precedents, i.e. *q* = *i*. Then, if a party is obtaining an unfairly adverse state verification at $v \notin \left[\underline{v}_t, \bar{v}_t\right]$, he could induce the judge to correctly verify the state by simply collecting two signals arbitrarily close to the critical index $i(v) = 1 - v$. As shown by Figure 7, when $v \notin \left[\underline{v}_t, \bar{v}_t\right]$ the judge recognizes these two signals and, since precedents entail their correct interpretation, he correctly infers the underlying state *v*, irrespective of the parties' inequality. Graphically, judges' potential verification ability at thresholds i_t^L and i_t^H is equal to:

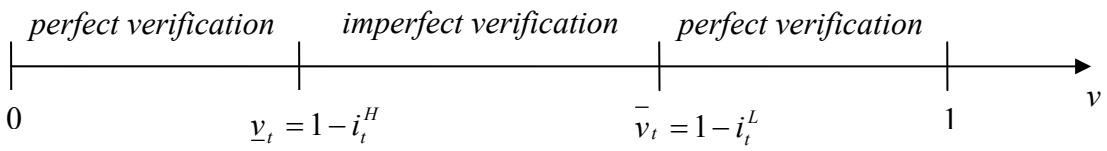

Figure 8

Interestingly, note that the law's incompleteness g_t precisely captures the measure of widget values that judges are incapable to perfectly verify at time *t*, i.e. $g_t \equiv \bar{v}_t - \underline{v}_t$. Figure 8 suggests that the accumulation of precedents improves the *potential* of judicial verification, but the key question is whether judicial misinterpretation of signals (i.e. the fact that $q \ne i$) can prevent parties from being able to exploit such potential. We now address this question by studying how the stock of precedents affects contracting when $q \ne i$. This analysis also enables us to find how i_t^L and i_t^H are endogenously determined in different legal regimes.

3.1 Contracting and Legal Evolution under Laissez Faire

Can erroneous precedents impair the parties' ability to contract? The answer is not, because parties can contract ex-ante around erroneous precedents. Intuitively, if *q* =

$q(i)$ is the mapping between a signal's true and attributed index, parties can write a contract pricing signal $q(i)$ the same way signal i should be optimally priced. For instance, the contract will say that if signal $q(i\text{-}\varepsilon)$ takes value 0 and signal $q(i\text{+}\varepsilon)$ takes value 1 for small ε, the judge should enforce price $p = 1–i$. Indeed, this is the case where signal i is critical and $1–i$ equals the widget's value v, so that the first best price is enforced. In other words, according to precedents a combination of signals $q(i\text{-}\varepsilon)$ and $q(i\text{+}\varepsilon)$ may verify whatever event about v, but parties – knowing the *true* event this combination verifies – will correctly price it in their contract. More generally, the appendix shows that parties can always write a contract contingent on index q that enforces the first best price for $v \notin [\underline{v}_t, \bar{v}_t]$, fully exploiting the potential of Figure 8. The key point is that in commercial transactions precedents reduce contracting costs by simply generating predictability, as documented by Kahn and Klausner (1997).

After some accumulation of precedents has occurred, parties can thus avoid all enforcement problems but still attain some beneficial state contingency by specifying a base price and a set of adjustments to such price contingent on precedents. This contract implements first best effort in $v \notin [\underline{v}_t, \bar{v}_t]$ and a constant effort provision otherwise. An alternative strategy is for the parties to write a slightly more contingent contract by adding to the previous contract also a bonus. This is what constitutes an innovative contract after some legal evolution has occurred. The goal of the bonus is to render effort provision more contingent and thus more efficient in the range $v \in [\underline{v}_t, \bar{v}_t]$. The problem, though, is that in this range the stronger party can exploit judges' inability to recognize signals with index $i \in [i_t^L, i_t^H]$ so as to sway the enforcement of the bonus. Thus, the problems associated with legal uncertainty are still present, but over a smaller measure of signals. This notion provides a well defined idea of what it means in our model to "opt out" of existing laws under laissez faire: it means to contract on a contingency that is not yet embodied into precedents.

In analogy with Section 2.1, an innovative contract at any time t can only specify a base price p_t if v is in the sub-interval $[\underline{v}_t, \hat{v}_t]$ and a bonus Δ_t on top of it when v is in the sub-interval $[\hat{v}_t, \bar{v}_t]$, where threshold $\hat{v}_t$ is endogenously determined by a straightforward extension of the model of Section 2. To see this, note that when litigating in $v \in [\underline{v}_t, \bar{v}_t]$ the buyer collects $x_B(\bar{v}_t - v)$ novel signals taking value 0, the

seller collects $x_S(v-\underline{v}_t)$ novel signals taking value 1. Since the seller wins when he collects more signals than the buyer, the bonus is enforced whenever:

$$v \geq \hat{v}_t \equiv (1-\beta)\underline{v}_t + \beta\bar{v}_t \tag{13}$$

The stronger is *B*, the lower is the probability that *S* obtains the bonus. As we will soon see, precedents are symmetric [i.e. $\underline{v}_t = 1-\bar{v}_t$] so that we can rewrite (13) as:

$$\hat{v}_t \equiv \frac{1}{2} + \left(\beta - \frac{1}{2}\right) g_t \tag{14}$$

By taking $\hat{v}_t$ into account, parties set p_t and Δ_t to maximize expected social welfare in $\left[\underline{v}_t, \bar{v}_t\right]$, much in the spirit of expression (6) for the case $v \in \left[0, \bar{v}\right]$. At the optimum:

$$p_t = 1-(1-\beta)g_t \quad \Delta_t = g_t/2 \tag{15}$$

Once more, the base price increases in β, but now its level is higher than in Section 2 because it is enforced only for $v > \underline{v}_t$. The bonus is positive, confirming that under laissez faire it is always optimal for contracting parties to write an innovative contract. Such contract is subject to enforcement risk, but its design minimizes the cost of such risk, allowing parties to benefit from greater state contingency.[14] The bonus is smaller than in Section 2, because the effort gap the bonus must induce is also smaller. Below we graph the form of an innovative contract and its induced effort provision.

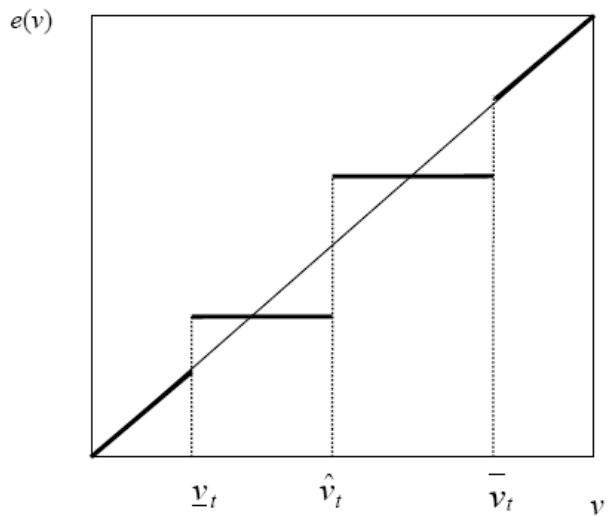

Figure 9

The figure shows that precedents allow to track first best effort for extreme values of *v*, relegating legal uncertainty to the range $\left[\underline{v}_t, \bar{v}_t\right]$. Not "opting out" means specifying

[14] This feature is not important, as all of our main results do not depend on the *absolute* but on the *relative* degree of contractual innovation prevailing under laissez faire and standardization.

a constant price (effort) in this range, which we just established to be suboptimal for parties. The optimal contract is instead innovative and specifies two prices (effort levels) in the same range, yielding ex-ante welfare equal to:

$$\frac{1}{6} - k - g_t^3 \frac{1 - 3\hat{v}_t + 3\hat{v}_t^2}{24} \tag{16}$$

This convenient expression says that in the absence of precedents (g_t =1), welfare is identical to the previous expression (8). However, by reducing g_t precedents improve welfare by allowing parties to write more detailed contracts, reducing the range over which the strong party distorts enforcement. More generally, the appendix proves that:

Proposition 3 *Fix* g_t. *Then, under laissez faire there are two thresholds* $\underline{\beta}_t^{LF}$ *and* $\overline{\beta}_t^{LF}$ *(*$\underline{\beta}_t^{LF} \leq 1/2 \leq \overline{\beta}_t^{LF}$*) such that parties contract if and only if* $\beta \in \left(\underline{\beta}_t^{LF}, \overline{\beta}_t^{LF}\right)$. $\underline{\beta}_t^{LF}$ *increases and* $\overline{\beta}_t^{LF}$ *decreases in* g_t. *At* $g_t = 0$ *the first best is attained at any* β.

Under laissez faire, greater legal completeness (i.e. lower g_t) expands the volume of contracting by reducing enforcement distortions. In this sense, spontaneous legal evolution is a substitute of standardization. As precedents accumulate, $\underline{\beta}_t^{LF} < \underline{\beta}$ and $\overline{\beta}_t^{LF} > \overline{\beta}$, implying that precedent creation allows more unequal parties to contract.

Given the above contract choice, we can endogeneize the instantaneous change in the stock of precedents at time t and thus the entire path of legal evolution. Since each episode of litigation under an innovative contract is associated with the use of a novel signal by a judge, the measure of novel signals used by judges in any period – and thus the measure of new precedents – is equal to the volume of litigation. By assuming that the distribution of pro-buyer bias $f(\beta)$ is symmetric around β = 1/2 one finds that the total number of precedents accumulated in an infinitesimal time interval dt yields a reduction of legal uncertainty equal to:

$$\dot{g}_t = -g_t \left[F(\overline{\beta}_t^{LF}) - F(\underline{\beta}_t^{LF}) \right], \tag{17}$$

Where $F(\beta)$ is the distribution function of β. Intuitively, since litigation of innovative contracts is the engine of legal evolution, precedent creation is equal to the product between the amount of litigation g_t under innovative contracts times the volume

$F(\overline{\beta}^{LF}) - F(\underline{\beta}^{LF})$ of innovative contracts written.[15] With the initial condition $g_0 = 1$, expression (17) determines the time path of legal evolution. One key property of (17) is that, provided some contracting takes place at $t = 0$, g_t decreases over time eventually converging to fully complete law (i.e. $g = 0$). The resulting evolution of the optimal contract and effort is graphically represented below:

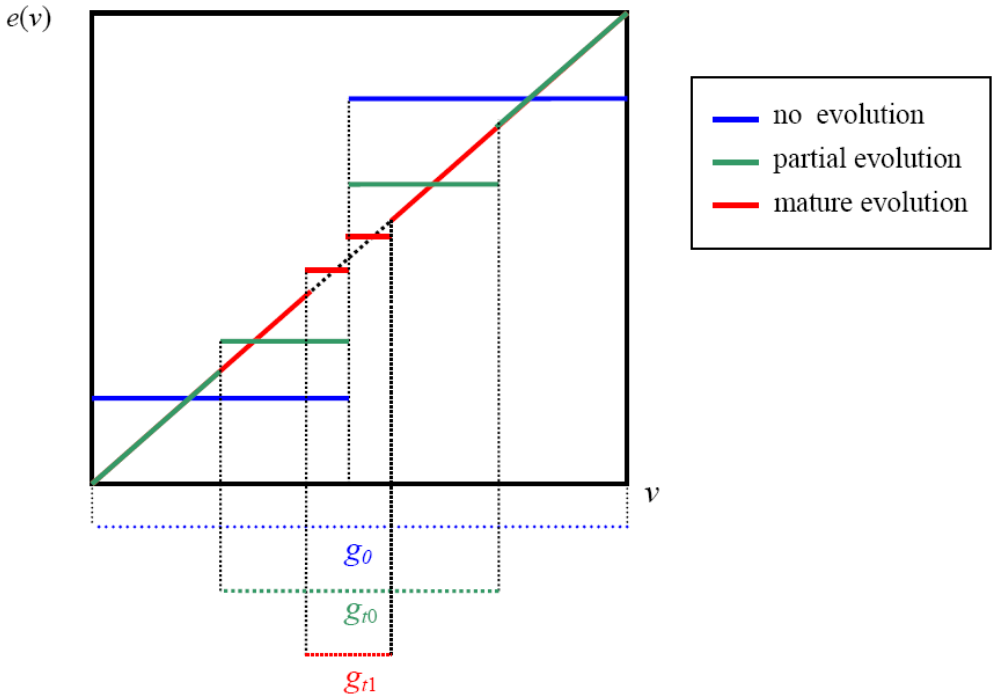

Figure 10

The above figure illustrates the key features of the co-evolution of contracts and laws in our model. On the one hand, greater use of innovative contracts progressively refines the law. This effect, captured in expression (17) by a greater measure of parties using innovative contracts, is likely to be especially strong when social inequality is small and/or transactions are more productive, as measured for instance by a lower setup cost k. On the other hand, Figure 10 shows that legal evolution progressively renders contracts more complete, reducing the range of legal uncertainty. In the long run, the ideal benchmark of fully complete contracts is attained. Using (16), it is immediate to appreciate that under laissez faire the reduction in legal uncertainty g_t improves the welfare of contracting parties over time. Below we plot this effect for parties characterized by different levels of inequality β:

[15] We are implicitly assuming that all litigants go to court. This simplifying assumption, which is shared by most of the recent literature on legal evolution, is however not crucial. Our main results only require that in each period a fraction of the cases in (18) goes to court.

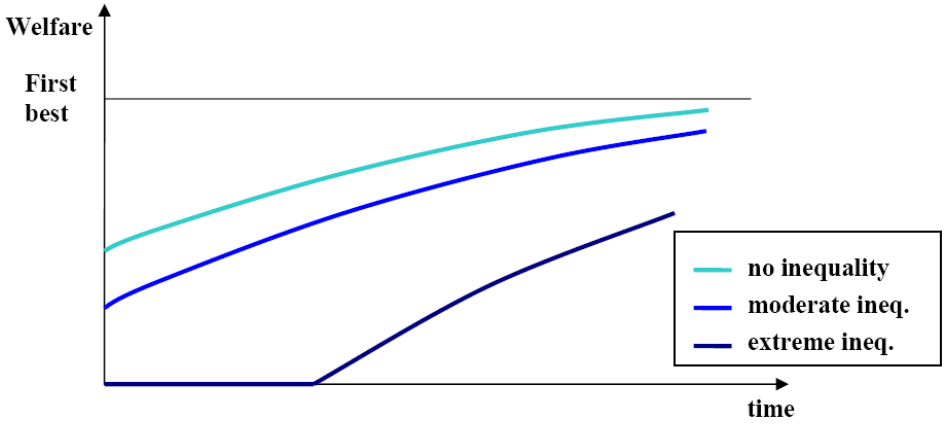

Figure 11

The parties' welfare (weakly) improves at all levels of inequality. Crucially, since very unequal parties initially do not contract, they cannot benefit from early stages of legal evolution, as represented by the flat dark blue line. Once sufficient legal evolution has occurred, though, highly unequal parties start to contract as well. By improving both the efficiency and the volume of contracting, legal evolution allows all parties to attain the first best in the long run, irrespective of inequality. Contractual innovation thus spurs legal evolution and progressively increases the predictability of enforcement, eventually leading to fully complete contracts.[16]

3.2 Contracting and Legal Evolution under Standardization

How does standardization work once legal evolution is taken into account? To answer this question, suppose that at any point in time, and depending on the law's incompleteness g_t, parties choose between the standard contract, the innovative contract and no contract at all. For the same arguments used in Section 2.2, under standardization the innovative contract is the same as the one under laissez faire. There are two basic ways to introduce the standard contract it in this dynamic setup. The first is to assume that the standard contract v_S is introduced at t=0 and never revised afterwards. The second is to assume that the standard contract is continuously updated with precedents. The difference between these cases concerns the relationship between legal evolution and the efficiency of the standard contract. In the former case, the parties' welfare under the standard contract is always equal to

[16] Fully complete contracts and the first best are not attained in the long run if the transaction changes over time or if precedents depreciate. In these cases, provided the rate of change/depreciation is not implausibly high, there would be some steady state legal uncertainty. It would still be true, though, that legal evolution progressively renders contracts more complete and allows parties to get closer to the first best, which is the essential feature our model is trying to capture. The formal analysis of the model with steady state legal uncertainty is available upon request.

expression (11) evaluated at $\bar{v}=1$. In the latter case instead, parties' welfare under the standard contract at time *t* is equal to:

$$\frac{1}{6}-k-g_t^3\frac{1-3v_S+3v_S^{\ 2}}{24}, \tag{18}$$

In the spirit of expression (16), when the standard contract is updated with precedents its efficiency improves over time as g_t falls, eventually reaching the first best.[17] To show that our main results do not rely on a specific type of standardization, we study the model under both assumptions and remark when they deliver different results. We begin by studying the pattern of contract choice and thus of legal evolution attained under standardization. The Appendix proves the following crucial properties:

Proposition 4 *If at t = 0 the standard contract* v_S *is introduced (with* $\underline{\beta}<v_S\leq 1/2$*), for every t≥0 there are two thresholds* $\underline{\beta}_t^S$ *and* $\overline{\beta}_t^S$*, so that the innovative contract is used for* $\beta\in\left(\underline{\beta}_t^S,\overline{\beta}_t^S\right)$ *and the standard contract is used otherwise. This implies that:*

i) *Under standardization, the innovative contract is used less than under laissez faire. Formally, for every t,* $\underline{\beta}_t^{LF}\leq\underline{\beta}_t^S$ *and* $\overline{\beta}_t^{LF}\geq\overline{\beta}_t^S$*. If the standard contract is updated over time,* $\underline{\beta}_t^S=v_S$ *and* $\overline{\beta}_t^S=1-v_S$*.*

ii) *Under standardization legal evolution is slower than under laissez faire. Formally, it follows the law of motion* $\dot{g}_t=-g_t\left[F(\overline{\beta}_t^S)-F(\underline{\beta}_t^S)\right]$

Consistent with Proposition 2 (and Figure 4), standardization induces all parties to transaction $\bar{v}=1$ to contract, regardless of β. Even in a dynamic setting, standardization strictly expands the volume of trade relative to laissez faire, at least in the short run. In addition, and again consistent with Proposition 1, at any point in time parties use the innovative contract *only if* they are sufficiently equal. If the standard contract is time invariant, unequal parties rely on it especially if the law is undeveloped (i.e. g_t is large) because greater legal completeness renders innovative state contingent contracts more appealing even to unequal parties. If instead the standard contract is updated with precedents, the choice between the standard and the innovative contract

[17] Expression (18) is only valid until $v_S\in\left[\underline{v}_t,\bar{v}_t\right]$, otherwise the standard contract is equivalent to a non-innovative contract under laissez faire, so that the two legal regimes are identical. We will later see that in transaction $\bar{v}=1$ this case never occurs in finite time provided $v_S=1/2$.

is time invariant and identical – at any given g_t – to the one formally described by Proposition 2. Besides the specific assumption on the standard contract's evolution, point i) confirms in a dynamic setting the idea of Figure 5: standardization expands the volume of contracting but it also *crowds out* the use of innovative contracts.

Crucially, point ii) above describes a key dynamic consequence of this static crowding out effect: by reducing the use and litigation of innovative contracts, standardization stifles precedent creation and thus legal evolution. This is due to the static efficiency of the standard contract, which provides a form of state contingency that is not subject to enforcement distortions, thus being preferred by sufficiently unequal parties to the innovative contract. This implies that there may be an intriguing trade-off between the static and dynamic efficiency of standardization. Setting a statically efficient standard may exacerbate crowding-out, boosting future under-innovation. We confirm this intuition by proving in the appendix that:[18]:

Proposition 5 *When the standard contract is updated with precedents, there exists a threshold* $t^* \in R_+ \cup \{+\infty\}$ *increasing in Var(β) such that social welfare at time t is higher under standardization than under laissez faire if and only if* $t < t^*$. *There is a threshold* $v_S^* \in (\underline{\beta}, 1/2)$ *such that for* $v_S > v_S^*$ *we have that* $0 < t^* < +\infty$.

This result conveys two messages. First, the introduction of a standard contract yields – relative to laissez faire – a static benefit that becomes smaller over time, eventually becoming negative. Although the main intuition for the benefit of standardization is already in Corollary 1, the above result additionally says that such benefit persists for some time. That is, spontaneous legal evolution is not an effective mechanism to reduce legal uncertainty in the short run. The intuition is that, as shown by Figure 7, at early stages of legal evolution precedents consist of partisan but little informative signals, which leave a wide range of legal uncertainty and thus ample room for enforcement distortions to persist. By contrast, standardization coordinates judges *ex-ante* on identifying a signal that is obviously imperfect but still more informative than the evidence presented in court by litigants (as long as v_S does not take extreme values). In this sense, the benefit of standardization lasts for long, vanishing only after many precedents are accumulated. As previously stressed, at some point the benefit of standardization relative to laissez faire disappears (or becomes negative)

[18] Similar effects, but also more complex algebra, are present if the standard contract is not updated.

due to the slowdown in legal evolution caused by the crowding out of contractual innovation.[19]

The combination of these effects thus generates a reversal whereby welfare is initially lower under laissez faire but then faster legal evolution allows such regime to catch up and in some cases even to overtake standardization. Intuitively, Proposition 5 shows that in more unequal societies it takes more time for this catch up to occur, as in those societies the static benefit of the latter regime is larger. Hence, alternative enforcement regimes affect the co-evolution of contracts and precedents, shaping the speed at which the long run steady state is reached. The evolution of aggregate welfare under the two regimes is graphed below.

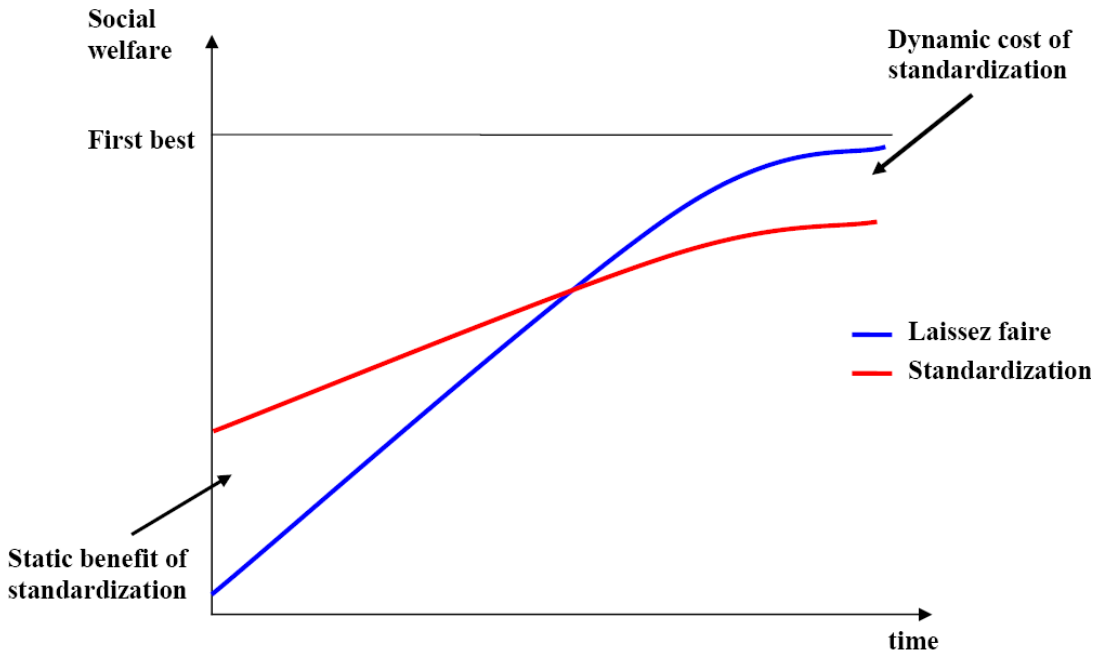

Figure 12

Besides suggesting the possibility of reversals, the second key message of Proposition 5 is that standardization is more likely to feature a dynamic cost (i.e. to be overtaken by laissez faire) the greater is the static efficiency of the standard contract, as measured by the distance between v_S and 1/2 (recall that 1/2 is the statically optimal standard for transaction $\bar{v} = 1$). This formally verifies our previous conjecture, namely that the more statically efficient is the standard, the stronger is the crowd out effect and thus the larger the dynamic cost of standardization. By converse, the less

[19] To belabour the point, one could say that standardization is statically beneficial by solving free riding among litigants ex-post (who do not want to bear the cost of showing informative signals) while laissez faire is dynamically beneficial by solving free riding among contracting pairs ex-ante (who do not internalize the future social consequences of their contract choice).

statically efficient is the standard, the weaker is the crowd out effect and the smaller the dynamic cost of standardization. This result does not imply that standardization is welfare decreasing. Indeed, it is easy to show that in our model some degree of standardization is always optimal (formally, one can always find a v_S such that standardization improves discounted social welfare). The more nuanced message of Proposition 5 is that in evaluating the consequences of standardization one should strike a delicate balance between its static and dynamic effects.

3.3 Discussion

Our model provides a tractable framework to study how the extent and efficiency of contracting evolve over time via the mutual interaction of the legal and economic systems. On the one hand, the enforcement regime affects the volume of contracting and the use of innovative contracts. On the other hand, the economic system, parameterized by the inequality among contracting parties or by the profitability of investment opportunities, determines the extent to which parties are willing to engage in novel commercial practices thereby affecting legal evolution.

Existing formal work on legal evolution does not capture this two way interaction as it either completely disregards contracting (Gennaioli and Shleifer 2007, Ponzetto and Hernandez 2009) or relegates it to a marginal role (Anderlini et al. 2008). By stressing the central role of contracting our model provides an interesting perspective on the law and finance literature, which shows that over the course of the XX century Common Law legal systems have fostered the development of financial and other markets (La Porta et al. 2008). Since its inception, this field of research has been confronted with two important questions. First, why should the law affect commercial transactions if contracting parties can often freely opt out of it (Easterbrook and Fischel 1991)? Second, if these legal systems are structurally different, why should their relative performance vary so much over time, with a comparability of the two systems if not an initial edge of Civil Law in the early XX century (Rajan and Zingales 2003), being followed by a predominance of Common Law over the course of the century, culminating then into an apparent convergence (e.g. Coffee 2001) among developed and mature legal systems?

Our model of economic and legal evolution has the potential to answer both of these questions. At one level, our model suggests that the reason why parties may be unable to opt out of existing legal arrangement is that innovative contracts are subject

to enforcement risk. Crucially, our model further suggests that opting out should be relatively easier in the comparatively less codified Common Law systems.[20] In line with this idea, recent micro studies show that venture capital contracts stipulating a contingent control allocation, which constitute one of the most recent financial innovations, are more used in Common Law systems (Lerner and Schoar 2005).

Interestingly, our model suggests that such different willingness of parties to opt out of existing legal arrangements can have far reaching consequences for the evolution of contracts and laws in different legal systems, as illustrated by Figure 12. In the first place, the greater predictability afforded by standardization can help explain the initial edge of standardized regimes. In the second place, the faster rate of commercial experimentation and innovation characterizing less codified systems can help explain why after some point welfare may be higher in the latter regimes, also thanks to the legal innovation that new commercial practices have spurred. Finally, at mature commercial stages, legal adaptability becomes only incremental and the two regimes start converging toward the same steady state. These dynamics may help explain why the relationship between the law and economic development may be complex and non-linear. On the one hand, the law is likely to have its greatest impact at early and intermediate stages of economic development, but in different directions, with laissez faire prevailing at intermediate stages. On the other hand, it is important to distinguish the law's impact on the volume of trade – in which codification is likely to at least initially have an edge – from its impact on the efficiency or productivity of economic transactions, where the gains of laissez faire can be marked.

Of course, our analysis is mostly theoretical and this discussion is not meant to directly confront existing explanations of the economic role of the law, which either rely on time varying political factors (Rajan and Zingales 2003) or on the different degree of state interventionism that characterizes different legal systems (La Porta et al. 2008). We simply wish to point out that our perspective on the joint evolution of the economic and legal systems offers a parsimonious hypothesis to think about these important questions. There might be ways to empirically test this hypotheses against alternative explanations. An attempt along related but distinct lines has been recently made by Beck and Levine (2005).

[20] This is a relative statement, in the sense that statutes are also used in Common Law systems. Comparative legal scholars however stress the greater scope of codification in Civil Law systems, also

4 Extensions

4.1 Random Litigation Strength

Suppose that at the time of contracting the pro-debtor bias β is randomly distributed in $[0,1]$. We solve the case where parties contract over range $[\underline{v},\bar{v}]\subseteq[0,1]$ to show that our results naturally extend to the dynamic model. Parties set their contract (p,Δ) by taking the entire distribution of β into account. That is, they solve:

$$\max_{p,\Delta}\int_0^1\int_{\underline{v}}^{\hat{v}(\beta)}\left[pv-p^2/2\right](1/\bar{v})dv+\int_{\hat{v}(\beta)}^{\bar{v}}\left[(p+\Delta)v-(p+\Delta)^2/2\right](1/\bar{v})dvf(\beta)d\beta \qquad (23)$$

where $\hat{v}(\beta)=(1-\beta)\underline{v}+\beta\bar{v}$ stresses the dependence of the litigation outcome on the realized β. After some algebra, one finds that maximization of (22) implies:

$$p=\frac{1}{2}+\frac{(\bar{v}-\underline{v})}{2}\frac{\mu_\beta^2-\mu_\beta+\sigma_\beta}{\mu_\beta}\qquad \Delta=\frac{(\bar{v}-\underline{v})}{2}\frac{\mu_\beta-\mu_\beta^2-\sigma_\beta}{\mu_\beta-\mu_\beta^2};$$

where $\mu_\beta=E(\beta)$ and $\sigma_\beta=\mathrm{var}(\beta)$. Thus, it is still the case that when *B* is on average stronger [μ_β goes up], then *p* increase. For $\sigma_\beta>0$, however, μ_β also affects the bonus, increasing it if and only if $\mu_\beta<1/2$. Intuitively, randomness benefits weak buyers, requiring a higher bonus to induce *S* to exert effort. Finally, higher σ_β dilutes incentives, triggering an increase in *p* and a reduction in Δ.

To study the welfare impact of μ_β and σ_β, note that (23) can be written as $E_\beta[V(\hat{v}(\beta))]$, where $V(\hat{v}(\beta))$ is the objective inside the integral. One can then find:

$$dV(\hat{v}(\beta))/d\beta=(\bar{v}-\underline{v})[p+\Delta/2-\hat{v}(\beta)]\quad d^2V(\hat{v}(\beta))/d\beta^2=-(\bar{v}-\underline{v})\Delta$$

By the envelope theorem, the first derivative says that social welfare in (23) increases in μ_β when the latter is is below a certain threshold and decreases with it otherwise. Thus, systematic inequality reduces welfare. The second derivative instead shows that welfare is concave in β. Thus, greater randomness in pro-buyer bias σ_β reduces social welfare. Thus, like systematic bias, also random bias undermines contracting, confirming the results of Section 2 with respect to this new enforcement distortion.

4.2 Direct Cost of Gathering Signals

We now study the model when parties face explicit signal collection costs and

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due – for instance –to the greater reliance of Civil Law statutes on precise bright line rules as opposed to standards. See Schlesinger et al. (1988).

judges pick one signal at random (rather than holding for the party brining more signals). Suppose that the buyer and seller's marginal cost of collecting signals are θ_B and θ_S, respectively, where $\sigma = \theta_B / \theta_S$ is *S*'s relative strength in this new model. If *B* presents n_B signals taking zero value and *S* presents n_S of signals taking value 1, when the judge randomly picks one signal the expected price paid to S is:

$$\frac{n_S}{n_S + n_B}\Delta + p \tag{18}$$

B and *S* draw signals randomly (that is without knowing a priori whether their value is 0 or 1). Thus, in any v the seller presents n_S signals taking value one by spending $\theta_S n_S /(v - \underline{v})$, the buyer presents n_B zero signals by spending $\theta_B n_B /(\bar{v} - v)$. This assumption captures the idea that it is harder to find new signals as legal uncertainty narrows down. Then, the equilibrium number of signals solves:

$$\max_{n_S} -\frac{n_S}{n_S + n_B}\Delta - p - \theta_S \frac{n_S}{(v - \underline{v})} \tag{19}$$

$$\max_{n_B} -\frac{n_S}{n_S + n_B}\Delta - p - \theta_B \frac{n_B}{(\bar{v} - v)} \tag{20}$$

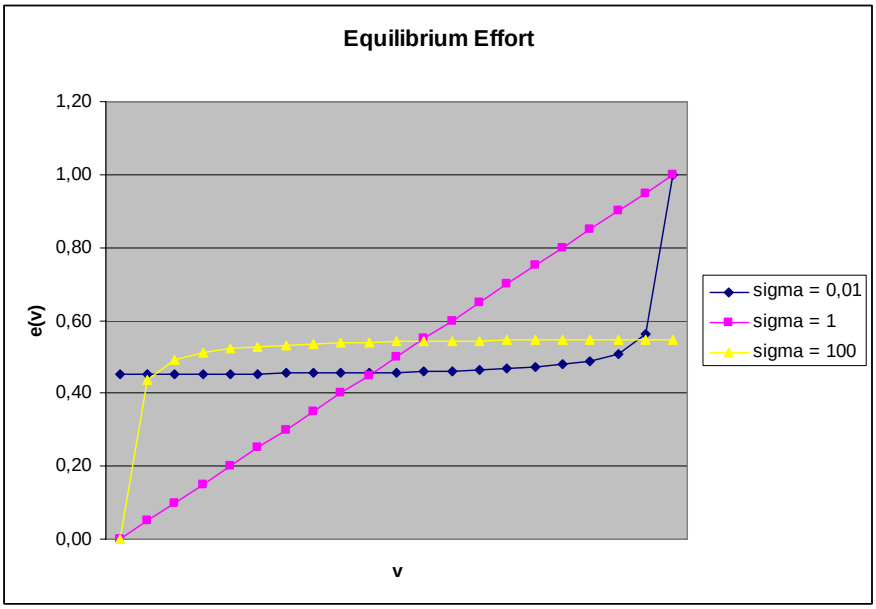
Each party trades off the benefit of presenting more favourable signals with the cost of collecting them. The first order conditions of the race between *S* and *B* imply that in equilibrium in state v the bonus is enforced with probability:

$$\frac{n_S}{n_B + n_S} \equiv \mu(v) = \frac{\sigma(v - \underline{v})}{\sigma(v - \underline{v}) + (\bar{v} - v)}, \tag{21}$$

which is identical to what one would obtain by substituting in the left hand side above the signal gathering policy assumed in Section 2, which confirms the validity of our earlier simplifications. By taking into account the way expression (21) affects the expected payment to the seller, it is possible to find that the optimal contract specifies $p = E(v) - \Delta E[\mu(v)]$ and $\Delta = \frac{\mathrm{cov}[\mu(v), v]}{\mathrm{var}[\mu(v)]}$, where expectations are computed for $v \in [\underline{v}, \bar{v}]$. The seller's optimal effort level is thus equal to:

$$e(v) = E(v) + \frac{\mathrm{cov}[\mu(v), v]}{\mathrm{var}[\mu(v), v]}\{\mu(v) - E[\mu(v)]\} \tag{22}$$

Expression (22) is complex to handle analytically (hence our shortcut assumption of Section 3), but the figure below – which simulates (22) for $\sigma = 0{,}1$ for $\sigma = 1$ and for $\sigma = 100$ – shows that the main properties resemble those of Section 3:[21]



Inequality of weapons causes effort to be little state contingent, generating its over-provision at low values of v and its under-provision at high values of v. Since the optimal contract tries to de-bias enforcement, this pattern occurs both when the seller is weak (i.e. when $\sigma = 0{,}1$) and when the seller is strong (i.e. when $\sigma = 100$). The main difference with the case studied in Section 3 is that now if $\sigma = 1$ parties attain the first best because judges' assessment is on average unbiased at any v.

5. Some Real World Episodes of Contract Standardization

This section presents some historical evidence corroborating our key idea that standard contracts and commercial codes can be viewed as ways to reduce legal uncertainty and thus to foster the creation of new markets. We mainly focus on standardization efforts undertaken in Common Law legal systems because these regimes are traditionally less codified than their Civil Law counterparts, permitting a better identification of the drivers of codification.

We are mainly interested in what is perhaps the largest movement toward commercial codification in modern history, the so called "golden age of commercial codification" (Gutteridge 1935), which occurred in the XIX century in the leading

[21] The figure plots the expression (22) against first best effort for a number of values of σ in $[0,+\infty)$.

world economies and in some of their colonies. Many of these standardization episodes occurred in common law countries, involving mother countries such as Britain, British colonies such as India and later spreading to the U.S, which enacted uniform commercial legislations culminating in Llewellyn's Uniform Commercial Code. A similar U.S. reform undertaken for analogous reasons was the Sales of Goods Act of 1893 (Hilbert, 1920).. The leading view of legal thinkers and legal historians in interpreting those events is precisely that codification of commercial law created a reliable basis for contracting and market development by harmonizing and standardizing sources and by facilitating an understanding of the law to both judges and the public (Diamond, 1968). Crucially, in historically more unequal societies codification was seen as providing the fundamental tool to eliminate en mass privileges and servitudes reflecting the traditional power of landowners, and encumbered the active use and transfer of assets necessary for trade and industry (e.g. Horwitz 1977). In this sense, the efficiency considerations highlighted by our model may have played some role in triggering these reforms as the XIX century was precisely a period of booming industry and long distance trade, where creating a reliable contractual infrastructure was crucial to foster the development of new markets. We now review two specific episodes of contract codification to see in detail the main drivers and instruments of standardization.

5.1 The Indian Codification of Contract Law

The English admirers of the French Code Civil, including Bentham and Lord Macaulay, believed that – by producing fairer and more reliable enforcement – standardization would encourage trade across the diverse peoples and nations of British colonies. Under their influence, the British Empire strictly codified criminal and contract law in India in the XIX century to overhaul a chaotic juridical situation. Under the original Law Charters of India, English, Muslim and Hindu residents were to be governed by their own laws in matters of contract. Soon there was broad dissatisfaction with this principle. Traditional laws differed across religions and casts, and had minimal tradition of supporting formal contracting, while common law had a residual role. Contractual litigation was seen as producing arbitrary resolutions, and made contracting very difficult. After a Penal Code based on a draft by Macaulay was enacted, its success led impulse to codify contract law.

The Indian Contract Act and the Evidence Act of 1872 imposed on Indian

judges a strict statutory interpretation of contracts which took precedence on other sources of case law, including common, Hindu and Moslem law as well as local traditions. It stipulated general principles to define and resolve contractual conflicts, set explicit rules on supplying evidence to court, and provided templates in the form of "illustrations" to highlight how judicial decisions should be guided. The authors of the India Law Commission admitted that 'we have deemed it expedient to depart…. from English law in several particulars.' A main example was to encourage trade by eliminating excessive litigation arising from diverse sources of law. The Act simplified interpretation on specific issues relative to the more nuanced common law practice, such as in the area of contractual damages for non performance. In England, judges had discretion on determining whether contractual provisions represented damages or penalties, which were enforced differently depending on circumstances. This required more extensive evidence gathering and legal argument.

The Indian Contract Act significantly simplified the enforcement of property transfers when a buyer in good faith acquired an asset from someone in possession who was not the legitimate owner (a form of *market ouvert*). Even if its adoption was not voluntary, the codification of Anglo-Hindu law was warmly received in India as a more rational system of law (Derret, 1968). Codes drawn from the Indian Contract Act were subsequently introduced in East Africa and other colonies.

Consistent with our model, contract standardization in India can be seen as an attempt to reduce legal uncertainty arising from conflicting laws and insufficient jurisprudence. Interestingly, the Indian Negotiable Instruments Act preceded the equivalent British Bills of Exchange Act (Encyclopedia Britannica, 1911). One possible explanation for this timing is that the greater inequality as well as lower judicial expertise prevailing in India made standardization more urgent there.

5.2 The Bills of Exchange Act of 1882

The Bills of Exchange Act of 1882, "codifies the greater portion of the common law relating to Bills of Exchange, Cheques, and Promissory Notes". Before this code, English law relative to bills of exchange, promissory notes and cheques was to be found in 17 statutes dealing with specific issues, and about 2600 cases scattered over some 300 volumes of reports. This codification remarkably simplified the law and reduced its ambiguity, and was certainly supportive of the diffusion of financial contracting (Diamond, 1968). The code also created template contracts which could

be voluntarily chosen over general contracting under common law.

The extensive commentary to the Act allows some insight in identifying its effect on the common law contracting rules. In the British version the authors went at excruciating pain to restate the supremacy of the common law: *The rules of the common law, including the law merchant,* ***save in so far as they are inconsistent with the express provisions of this Act****, shall continue to apply..* Yet they also clearly indicated that *where a rule is laid out in express terms (in the Act)… the general (i.e. common law) rule ought not to be applied in ..limiting its effect…*

A clear case of innovation relative to common law practice is mentioned in the commentary to the Act and refers to §29(2), the case when under common law "a signature to a bill obtained by force and fear is valueless even in the hand of an innocent third part". In contrast, the Act established that any promissory note conform to the Act held by an acquirer in good faith is always valid independently from any irregularity in intermediate endorsements of the bill. Basically, this ensured entitlement by any holder, independently from the legitimacy of all previous transfers. Another innovation of the Act is that it establishes the default rule that each bill of exchange is negotiable unless explicitly excluded by the text, while before negotiability had to be explicitly included in the text. The spirit of the Bill of Exchange Act is thus also consistent with the notion that contract standardization ensured access to justice and more reliable enforcement by reducing the uncertainties involved in contract litigation.

6. Conclusions

We offer an analysis of the causes and consequences of commercial codification. We have shown that a strict codification of the enforcement of specific contracts may contribute to a legal orientation which becomes rigid and formalistic, and suppresses contractual innovation (Beck and Levine, 2005). Contrasts between local law and a rigidly codified doctrine may hinder the efficient development and enforcement of contract law and practice. However, we have also shown that some degree of standardization which preserves a general freedom of contract is beneficial in terms of access to the law and expansion in the scale of transacting, as the global move toward codification that occurred in the XIX century seems to suggest.

To ensure analytical tractability, we have chosen a stylized representation of the law, so that a richer characterization of legal aspects may be constitute a natural

goal of a future research project. At the same time, we wish to stress that the tractability of our model allow also more economically-oriented extensions of the analysis of the joint evolution of the economic and legal systems. For instance, our model could be included in a standard neoclassical setup so as to study the impact of legal and economic development on the evolution of a country's capital stock and aggregate productivity. The greater volume of activity characterizing codified regimes may initially allow them to grow more by virtue of greater factor accumulation but more adaptable regimes may later perform better due to their greater efficiency of contracting and thus productivity. This might yield rich testable implications which may be useful to structure a systematic analysis of the impact of legal systems on the patterns of economic development.

Another interesting application of our setup concerns the optimal pace of standardization. Our analysis suggests that two principles may be part of an optimal legal standardization strategy. First, standardization should not only simplify and formalize local arrangements but also coordinate private sector players toward novel and mutually beneficial contract terms. Second, in order not to stifle contractual innovation prematurely, standardization might occur after market experimentation has already created a reliable set of contracts. Thus, one key role of standardization is also to extend the use of local, contractual innovations to a broader merchant community. This latter idea can help explain why the response of codification to economic changes tends to come with a lag relative to private arrangements.

More generally, we believe that the broad message of our model as well as of the experience of the "golden age of commercial codification" holds some relevance for the effort of many developing countries to strengthen their capacity for contract enforcement in light of endemic inequality and legal uncertainty. It may justify an approach to create standardized templates with narrowly defined enforcement to enhance trade opportunities and encourage contracting among strangers. This is a necessary mechanism for the emergence of an advanced division of labor and product specialization, and for the diffusion of tradable securities.

6. Appendix

Proof of Proposition 1. The parties' welfare under the non standard contract is:

$$W(\bar{v},\beta)=\bar{v}^{-2}\left[\frac{1}{6}-k-\frac{1-3\beta+3\beta^2}{24}\right]$$

Social welfare falls in $|\beta-1/2|$. As a result, no party contracts when $W(\bar{v},1/2)<0$, which yields the condition $k>15/96$. By contrast, the parties always contract when $W(\bar{v},1)\geq 0$, which yields the condition $k\leq 1/8$. For $k\in(1/8,15/96]$, the parties contract if and only if inequality is sufficiently low. In particular, it is easy to see that there are two thresholds $\underline{\beta}$ and $\overline{\beta}$ with $\underline{\beta}<1/2<\overline{\beta}$, such that parties contract if and only if $\beta\geq\underline{\beta}$ and $\beta\leq\overline{\beta}$. It is easy to see that $\underline{\beta}+\overline{\beta}=1$.

Proof of Proposition 2. By comparing (8) and (10), notice that parties prefer the standard contract over the non-standard one when $(\hat{v}-v_S)(\hat{v}+v_S)\geq\bar{v}(\hat{v}-v_S)$. If $\hat{v}\geq v_S$, the standard contract is preferred for $\bar{v}\leq\hat{v}+v_S$. If instead $\hat{v}<v_S$, the standard contract is preferred when $\bar{v}\geq\hat{v}+v_S$. These conditions imply that if $\beta\geq v_S/\bar{v}$ the standard contract is preferred for $\beta\geq 1-v_S/\bar{v}$. If instead $\beta<v_S/\bar{v}$, the standard contract is preferred for $\beta<1-v_S/\bar{v}$. The standard contract is preferred to no contract at all for $\bar{v}\in\left[v_S/\underline{\beta},v_S/\overline{\beta}\right]$. Consider the drawing of Figure 4. Recall that Figure 4 is drawn by assuming $\underline{\beta}<v_S<1/2$. In this case, the standard contract is preferred to no contract for $\bar{v}>v_S/\overline{\beta}$, which determines A_2 in intersection with area $\beta\notin\left[\underline{\beta},\overline{\beta}\right]$ (where in the absence of v_S parties do not contract). If $\beta\in\left[\underline{\beta},1/2\right]$ the standard contract is used for $\beta\leq\min\left[v_S/\bar{v},1-v_S/\bar{v}\right]$. This condition identifies the increasing curve $1-v_S/\bar{v}$ for $\bar{v}\leq 2v_S$ and the decreasing curve $v_S/\bar{v}$ otherwise. Those two curves delimit B_2. If $\beta\in\left[1/2,\overline{\beta}\right]$, the standard contract is used for $\beta\geq\max\left[v_S/\bar{v},1-v_S/\bar{v}\right]$. This condition identifies the decreasing curve $v_S/\bar{v}$ for $\bar{v}\leq 2v_S$ and the increasing curve $1-v_S/\bar{v}$ otherwise. Those two curves delimit B_1.

Proof of Corollary 1. The benefit of the standard contract is equal to the integral with respect to $\bar{v}$ of the gain $W(\bar{v},v_S)$ realized by parties who in the absence of the standard contract would not contract [i.e. parties such that $\beta\notin(\underline{\beta},\overline{\beta})$], and the integral with respect to $\bar{v}$ of the gain $W(\bar{v},v_S)-W(\bar{v},\beta)$ realized by parties who in the absence of the standard contract would use a non-standard contract [i.e. such that $\beta\in(\underline{\beta},\overline{\beta})$ and $\beta\geq\max\left[v_S/\bar{v},1-v_S/\bar{v}\right]$ or $\beta\leq\min\left[v_S/\bar{v},1-v_S/\bar{v}\right]$]. If the variance of distribution $f(\beta)$ increases (for given mean), then the benefit of contract standardization goes up because: a) the size of both areas above increases, and b) because the benefit from switching to the standard contract from a non-standard one increases as well [recall that $W(\bar{v},\beta)$ decreases in the variance of β].

Proof of Proposition 3. We first illustrate the form of the optimal non-standard

contract for given $\underline{v}_t, \overline{v}_t$, and then study the parties' choice of whether and how to contract in different legal regimes. Suppose that the relation between the judicially attributed index q and the signals' true index i is described by a mapping $q(i): [0, i_t^L) \cup (i_t^H, 1] \to [0,1]$. The parties then include in the contract the mapping $i = q^{-1}(q)$ associating to each attributed index q the signal's true index i. Then, the optimal ex-ante contract belongs to the family:

$$\begin{aligned} & i = q^{-1}(q) \\ & p(v) = 1 - i(v) \quad \textit{for} \quad i(v) \in [0, i_t^L) \cup (i_t^H, 1] \\ & (p_t, \Delta_t) \qquad\quad \textit{for} \quad i(v) \notin [0, i_t^L) \cup (i_t^H, 1] \end{aligned}$$

Intuitively, the ability of judges to recognize precedents implies that judges can also recognize the critical signal when the latter is one of the precedents. In those contingencies, the pricing of the widget is perfect. In the uncertain range instead, the parties can only specify a base payment and a bonus.

For given g_t and β, under an optimal contract belonging to the above family [i.e. for an optimal choice of (p_t, Δ_t)] the parties' welfare is equal to:

$$W(\beta, g_t) = \frac{1}{6} - k - g_t^3 \frac{1 - 3\hat{v}_t + 3\hat{v}_t^2}{24}$$

Which is obtained by substituting (15) into (17). The above expression decreases in g_t and in $|\beta - 1/2|$. The parties prefer the non-standard contract to no contract when $W(\beta, g_t) \geq 0$. This condition identifies two thresholds $\overline{\beta}_t^{LF}, \underline{\beta}_t^{LF}$ such that the parties prefer the non-standard contract if and only if $\beta \in (\underline{\beta}_t^{LF}, \overline{\beta}_t^{LF})$. Property $\underline{\beta}_t^{LF} \leq 1/2 \leq \overline{\beta}_t^{LF}$ follows from the fact that for any g_t the welfare of contracting parties is maximized at $\beta = 1/2$. For some parameter values, such as when $g_t = 1$ and k > 15/96 nobody finds it profitable to contract and so $\underline{\beta}_t^{LF} = \overline{\beta}_t^{LF} = 1/2$. On the other hand, as the law becomes sufficiently developed, i.e. $g_t \leq 24(1/6 - k)$ everybody contracts, regardless of inequality. Since the welfare of contracting parties is symmetric in $|\beta - 1/2|$, it is always true that $\underline{\beta}_t^{LF} + \overline{\beta}_t^{LF} = 1$. Finally, since $W(\beta, g_t)$ increases in β for $\beta \geq 1/2$, $\underline{\beta}_t^{LF}$ increases and $\overline{\beta}_t^{LF}$ decrease in g_t.

Proof of Proposition 4.

Taking the Proof of Proposition 3 into account, consider now the choice between the standard and the non standard contract. Under v_S the parties' welfare is the same as expression (12) when evaluated at $\overline{v} = 1$. As a result, the parties use the non-standard contract if and only if $W(\beta, g_t) \geq W(1, v_S)$. Previous arguments imply that there exist two thresholds $\underline{\beta}_t^S$ and $\overline{\beta}_t^S$ such that the non standard contract is used for $\beta \in (\underline{\beta}_t^S, \overline{\beta}_t^S)$. Previous arguments also imply that $\underline{\beta}_t^S \leq 1/2 \leq \overline{\beta}_t^S$ and that $\underline{\beta}_t^S$ increases and $\overline{\beta}_t^S$ decrease in g_t. In addition, since parties' welfare under the standard contract falls with $|v_S - 1/2|$, also the use of the standard contract does. It is interesting to note that when $g_t = 1$, if $v_S = 1/2$ the parties strictly prefer the standard to the non standard

contract for every $\beta \neq 1/2$ and they are indifferent for $\beta = 1/2$.

Expression (B) already shows the accumulation of low indexed precedents in cases where buyers win. Now consider the signals accumulated by winning sellers. The volume of litigation episodes won by buyers:

$$\int_{\underline{\beta}^X}^{\overline{\beta}^X} \int_{\hat{v}(\beta)}^{\overline{v}_t} f(\beta) dv d\beta = g_t \left[F(\overline{\beta}_t^X) - F(\underline{\beta}_t^X) \right] E\left[(1-\beta) | \beta \in (\overline{\beta}^X - \underline{\beta}^X) \right], \qquad \text{(B)}$$

where $F(\beta)$ is the distribution function of β and $X = LF$, S indicates the legal regime the parties are in. As a result,

$$\dot{\overline{v}}_t = -g_t \left[F(\overline{\beta}_t^X) - F(\underline{\beta}_t^X) \right] E\left[1-\beta | \beta \in (\overline{\beta}_t^X - \underline{\beta}_t^X) \right] dt, \qquad \text{(C)}$$

When $f(\beta)$ is symmetric, $E\left[\beta | \beta \in (\overline{\beta}^X - \underline{\beta}^X)\right] = E\left[1-\beta | \beta \in (\overline{\beta}^X - \underline{\beta}^X)\right] = 1/2$. As a result the flow of precedents in (B) and (C) by winning buyers and sellers, respectively, is identical and thus $\underline{v}_t = 1 - \overline{v}_t$ for every t. The dynamics of legal uncertainty is then:

$$\dot{g}_t = \dot{\overline{v}}_t - \dot{\underline{v}}_t = -g_t \left[F(\overline{\beta}_t^X) - F(\underline{\beta}_t^X) \right] dt$$

Proof of Proposition 5.

Suppose that at time $s > 0$ legal evolution under laissez faire has reached level $g^* \equiv (4-24k)^{1/3}$ such that all parties contract irrespective of inequality β. From now on legal evolution under laissez faire follows $dg_t/dt = -g_t$. Thus, expression (16) implies that at any $t > s$ aggregate social welfare under laissez faire is equal to:

$$W_t^{LF} = \frac{1}{6} - k - g^* \frac{e^{-3(t-s)}}{24} \int_0^1 (1 - 3\beta + 3\beta^2) dF(\beta)$$

Under standardization, legal evolution is $dg_t/dt = -g_t[F(1-v_S) - F(v_S)]$. Thus, since the non-standard contract is used by a measure $\varphi \equiv F(1-v_S) - F(v_S)$ of parties we find that:

$$W_t^S \leq \frac{1}{6} - k - g^* \frac{e^{-3\varphi(t-s)}}{24} \left[(1-\varphi)(1 - 3v_S + 3v_S^2) + \int_{v_S}^{1-v_S} (1 - 3\beta + 3\beta^2) dF(\beta) \right]$$

The inequality is due to the fact that legal evolution under standardization is slower than under laissez faire, so in the former regime $g_s < g^*$. Using the two expressions above, it is easy to find that at time t>s social welfare is higher under laissez faire if:

$$3(1-\varphi)(t-s) \geq \ln \frac{\int_0^1 (1 - 3\beta + 3\beta^2) dF(\beta)}{(1-\varphi)(1 - 3v_S + 3v_S^2) + \int_{v_S}^{1-v_S} (1 - 3\beta + 3\beta^2) dF(\beta)} \equiv \ln(v_S)$$

The above condition is only valid for $t < -(1/2\varphi)\ln(1-2v_S)$: beyond this time social welfare under standardization grows at the same rate as under laissez faire. By using these conditions we obtain that laissez faire dominates standardization if:

$$3(1-\varphi)\left[-\frac{1}{2\varphi} \ln(1-2v_S) - s \right] \geq \ln \frac{\int_0^1 (1 - 3\beta + 3\beta^2) dF(\beta)}{(1-\varphi)(1 - 3v_S + 3v_S^2) + \int_{v_S}^{1-v_S} (1 - 3\beta + 3\beta^2) dF(\beta)} \equiv \ln(v_S)$$

Using the definition of φ (i.e. its dependence on v_S), one finds that that the left hand side increases from 0 to $+\infty$ as v_S goes from 0 to 1/2. By contrast, the right hand side decreases from 1 to less than 1 as v_S goes from 0 to 1/2. Thus, there is a $v_S^* < 1/2$ such that, for $v_S > v_S^*$ the above inequality holds. This implies the existence of threshold $t^* > 0$ as stated in the proposition. It is immediate to see that greater social inequality [i.e. greater Var(β)] increases the value of t^* by increasing the value of the right hand side above.

References

Arrow, Kenneth, 1964, The Role of Securities in the Optimal Allocation of Risk Bearing, *Review of Economic Studies,* 31, 91-6.

Anderlini, Luca, Leonardo Felli and Andrea Riboni, (2007): "Case Law or Statute Law?" *mimeo*, London School of Economics

Beck, Thorsten and Ross Levine, 2005, "Legal Institutions and Financial Development", *Handbook for New Institutional Economics*, Eds: Claude Menard and Mary M. Shirley, Norwell MA: Kluwer Academic Publishers.

Bernstein, Lisa (2001), "Private Commercial Arbitration Law in the Cotton Industry: Creating Cooperation through Rules, Norms and Institutions", *Michigan Law Review*.

Bolton, Patrick and Mathias Dewatripont, 2005, *Contract Theory*, MIT Press.

Coase, Ronald, 1960, The Problem of Social Cost, *Journal of Law and Economics* 3, 1-44

Coffee, John jr., 2001, The Rise of Dispersed Ownership, the Role of Law and the State in the Separation of Ownership and Control, *Yale Law Journal*, vol 111.

Daughety, Andrew and Jennifer Reinganum (1999), "On the Economics of Trials: Adversarial Process, Evidence and Equilibrium Bias", *Journal of Law, Economics and Organization*, Vol. 16(2), October 2000

Debreu, Gerard, 1959, *The Theory of Value: An Axiomatic analysis of General Equilibrium*. New York: Wiley.

Dawson, John, 1968, The Oracles of the Law, University of Michigan Law School, Ann Arbor, MI (Reprinted in 1986 by William S Hein & Co., Buffalo, New York

Derrett, Duncan. 1968. *Religion, Law, and the State in India*. London. Faber & Faber

Diamond, Aubrey L. (1968) "Codification of the Law of Contract", *The Modern Law Review*, Vol. 31, No. 4 (Jul., 1968), pp. 361-389

Easterbrook, Richard, and Daniel Fischel, 1991, *The Economic Structure of Corporate Law*, Harvard University Press.

Encyclopedia Britannica, Bill of Exchange (www. 1911 encyclopedia.org).

Gennaioli, Nicola, (2009), "Optimal Contracts with Enforcement Risk", mimeo, UPF.

Gennaioli, Nicola and Andrei Shleifer, (2006) "The Evolution of Common Law", *Journal of Political Economy*

Glaeser, Edward and Andrei Shleifer, 2003, "The Rise of the Regulatory State", *Journal of Economic Literature*, pp. 401-425

Glaeser, Edward and Andrei Shleifer, 2002, "Legal Origins", *Quarterly Journal of Economics* no 117, pp1193-1230

Glaeser, Edward, Jose Scheinkman, Andrei Shleifer, 2003, The Injustice of Inequality, *Journal of Monetary Economics: Carnegie-Rochester Series on Public Policy.*

Grossman, Sanford, and Oliver Hart, 1986, The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration, *Journal of Political Economy*, 94, 691-719.

Hadfield, Gillian K (2006), "The Quality of Law: Judicial Incentives, Legal Human Capital and the Evolution of the Law", mimeo

Hart, Oliver and John Moore, 1998, Foundations of Incomplete Contracts, *Review of Economic Studies*, 66, 115-138.

Hilbert, Courtenay, (1920) Unification of Commercial Law, *Journal of Comparative Legislation and International Law*, series 3, Vol 2 no 1, pp. 77-80

Horwitz, Morton, 1977, The Evolution of American Law, 1780-1850, Oxford University Press

Kahn, Marcel and Michael Klausner, 1997, Standardization and Innovation in Corporate Contracting (or The Economics of Boilerplate), *Virginia Law Review*, 83.

Klerman, Daniel M. and Mahoney, Paul G., "Legal Origin?" (March 2007), University of Southern California CLEO Research Paper No. C07-5

LaPorta, Rafael, Florencio Lopez-de-Silanes and Andrei Shleifer, "The Economics Consequences of Legal Origins", *Journal of Economic Literature*, forthcoming, 2008

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny, "Law and Finance", *Journal of Political Economy*, (1998) 106:6, 1113-55.

Lerner, Josh and Antoinette Schoar, 2005, "Does Legal Enforcement Affect Financial Transactions? The Contractual Channel in Private Equity", *Quarterly Journal of Economics*.

Niblett, Anthony, Richard Posner and Andrei Shleifer, 2009, TheEvolution of a Legal Rule, mimeo, Harvard University.

Niblett, Anthony, 2009, Inconsistent Contract Enforcement, mimeo, Harvard University.

Noldecke, Georg and Klaus Schmidt (1995) "Option Contracts and Renegotiation: A Solution to the Hold-Up Problem," *RAND Journal of Economics* vol. 26, 163-179.

Priest, George, 1977, The Common Law Process and the Selection of Efficient Rules, *Journal of Legal Studies* 6, 65-82.

Rajan, Raghuram, and Luigi Zingales. 2003. *Saving capitalism from capitalists*. London, UK: Random House.

Rubin, Paul H. 1977. Why Is the Common Law Efficient. *Journal of Legal Studies* 6.

Schlesinger, Rudolph, Hans Baade, Mirjam Damaska and Peter Herzog, (1988), *Comparative Law*, New York, The Foundation Press, Inc.

Schwartz, Alan and Robert Scott, (2003), Contract theory and the Limits of Contract Law, *Yale Law Journal*, vol. 113.

Scott, Robert and George Triantis, 2005, Incomplete Contracts and the Theory of Contract Design, *Case Western Law Review*, 56.

Townsend, Robert, 1979, Optimal Contracts and Competitive Markets with Costly State Verification, *Journal of Economic Theory*, 21, 265-293.

Tufano, Peter, 2003, "Financial Innovation", *Handbook of Economics and Finance*, Elsevier.