Standardized Enforcement: Access to Justice vs Contractual Innovation ♣

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Abstract

We model the different ways in which precedents and contract standardization shape the joint development of markets and the law. In a setting where more resourceful parties can distort contract enforcement, we find that the introduction of standard contracts reduces enforcement distortions 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 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 central idea in economics is that the efficiency of private mechanisms such as markets (Arrow 1964, Debreu 1959) or bargaining (Coase 1960) relies on the use of contingent contracts. If these contracts are unavailable, private mechanisms are impaired (Townsend 1979, Grossman-Hart 1986). The economic role of contracts places courts at center stage, because poor court enforcement may indeed contribute to hinder the use of contingent contracts (Gennaioli 2009). This idea raises one key question: how do alternative legal systems affect contracting and economic efficiency?

To address this issue we combine ideas from contract theory, which has largely abstracted from courts (Bolton and Dewatripont 2005, p.3) and law and economics. We build on a transaction between the buyer and seller of a good in which quality-contingent pay is needed to induce the seller's effort. The quality of the good depends on many conflicting pieces of evidence. As a result, a party can distort judicial estimates of quality by presenting selected pieces of evidence in court. In this setting, unequal evidence-collection ability, which may due to the parties' differential resources or information, distorts contractual incentives and hinders gains from trade.

We study two legal systems aimed at reducing these enforcement problems. The first regime, which we call *laissez faire*, relies on precedents. Much legal thinking views precedents as promoting judicial consistency and efficiency (Hayek 1960, Posner 1973). In our model precedents attach a predictable judicial interpretation to pieces of evidence used by litigants in the past. By contracting only on precedents, parties can thus avoid enforcement distortions. In the same regime, parties can choose to "opt out" of precedents and write an innovative contract that is contingent on factors not yet considered by courts. Although innovative contracts are vulnerable to enforcement distortions, they can be useful when precedents are highly incomplete.

The second legal regime, which we call *standardization*, combines precedents with the codification of the enforcement of specific contracts. This regime, 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 the standard contract is contingent on a few, preset pieces of evidence that judges are trained to interpret ex-ante. Thus, in this regime parties avoid

[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

enforcement distortions not only by contracting on precedents but also by using the standard contract. Innovative contracts continue to be an option for the parties.

In this setup we then ask: How do laissez faire and standardization shape the impact of unequal litigation ability? How do they affect contractual innovation? How do they affect the evolution of contracts, precedents and welfare over time?

We find that under *laissez faire* legal evolution works as follows. Initially, when there are no (or few) precedents, all contingent contracts are virtually subject to enforcement distortions. This prevents very unequal parties from contracting. However, as long as roughly equal parties write innovative contracts, the litigation of the latter creates new precedents which render the interpretation of more pieces of evidence predictable. Over time, precedent creation reduces enforcement distortions, allowing more parties to contract.[2] In the limit, contracts are fully complete and parties reach the first best regardless of inequality. The problem, though, is that convergence is slow and enforcement uncertainty persists for a long time, consistent with recent evidence on torts and contracts (Niblett 2010 et al., Niblett 2009).

In this setup, introducing the standard contract reduces enforcement distortions relative to laissez faire, exerting two effects. First, it fosters contracting among very unequal parties, who would not contract under laissez faire. Second, it crowds out the use of innovative contracts by moderately unequal parties. Indeed, by providing a distortion-free form of state contingency, the standard contract reduces the *private* benefit for parties to write innovative contracts, as the latter are subject to distortions.

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

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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.

[2] Along these lines, Tufano (2003) argues that the decisions of U.S. judges in the 19th century 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] Section 3 will clarify two important aspects. 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 arises even, and perhaps especially, if the standard contract is updated as precedents accumulate.

In our model the co-evolution of the economic and legal systems gives rise to rich dynamics that may shed light on some important phenomena. For instance, the Common Law's ability to support market 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). Section 3 argues that our model may shed light on these facts after one realizes that even if the legal system is time invariant, it can affect 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 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 builds a static model of laissez faire where legal uncertainty allows strong parties to distort contracting and studies the static role of standardization. Section 3 studies the dynamic properties of laissez faire and standardization. Section 4 discusses extensions. Section 5 reviews some real world standardization episodes in light of our model. Section 6 concludes.

We model litigation among unequal parties as an asymmetric contest, in line with early contributions by Tullock (1980) and Dixit (1987). Bernardo et al. (2000) use a context model where parties choose their legal expenditures to derive the optimal burden of proof. Relative to these works, we build on a more detailed description of influence as a process based on the selective presentation of evidence, in the spirit of Daugherty and Reinganum (2000). The upshot of this approach is that it allows us to study: i) the role of standardization in reducing the parties' ability to present selected evidence, and ii) the role of accumulation of precedents in reducing the uncertainty over the way specific pieces of evidence are interpreted.[4]

Our model is also related to the literature on boilerplate and standard contracts. Adieh (2006) views contract standardization as a way to foster coordination among contracting parties. Kahn and Klausner (1997) view standardization as a way to exploit network effects as well as to save on transaction costs. Our model can be

[4] Other papers studying the *static* effects of judicial error when the latter is due to judicial bias or corruption are Gennaioli and Shleifer (2008),Glaeser and Shleifer (2003), Bond (2004), Glaeser and Shleifer (2003), Glaeser, Sheinkman and Shleifer (2003).

viewed as endogenizing the transaction cost of using non-standard contracts in terms of the distortions plaguing their enforcement. Standard contracts are way to reduce such uncertainty and thus enforcement distortions in favor of the strong party.

Finally, we contribute to the literature on legal evolution (e.g. Priest 1977 and Rubin 1977). As Gennaioli and Shliefer (2007), we model precedent creation as a process whereby judges "distinguish" new cases from precedents. As in Hadfield (2006), we view legal evolution as a form of legal training which allows judges to adjudicate in a more efficient and predictably manner. Differently from these works, we focus on the evolution of private contracts (rather than torts) and on the role of contract standardization. The same is true with respect to other recent work on legal evolution, such as Anderlini et al. (2007) and Fernandez and Ponzetto (2007), which also do not consider the role of private contracting and how different legal systems affect the willingness of parties to opt out of the law by contract.

1 The model

Time $t \geq 0$ is continuous. At each instant t a measure one of buyer-seller pairs forms and engages in an interaction involving the supply of a widget (Bolton and Dewatripont 2005, ch. 12). The value of the widget is 0 for the market and v for the buyer B, where v is uniform in $[0, \bar{v}]$ with $\bar{v} \leq 1$. Within instant t, Production occurs in two stages, 1 and 2. In stage 1 the seller S exerts unobservable effort $e \in (0,1]$ at cost $e^2/2 + \bar{v}^2 k > 0$, so there is a fixed cost $\bar{v}^2 k > 0$. In stage 2 the widget is produced with probability e. S learns the widget's value v in stage 1, B learns it in stage 2.

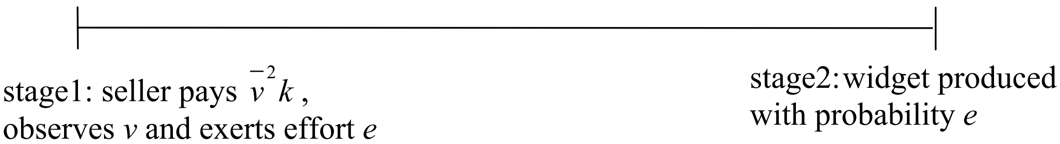

Figure 1: *The two stages at t*

There is a measure one of transactions distributed according to their average value $\bar{v}/2$ with p.d.f. $f_{\bar{v}}(\bar{v})$ in $[0,1]$. The heterogeneity of average value $\bar{v}/2$ clarifies the choice between standard and non-standard contracts but is not necessary to our results.

At a given widget's value of v, the socially optimal effort by S solves:

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

so that first best effort is $e_{fb}(v) = v$. In a transaction $\bar{v}$ the parties' welfare is equal to:

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

We study the case where it is first best optimal to produce the widget by assuming:

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

Given the unobservability of e, to induce S to exert effort parties must fix the widget's price ex-ante, otherwise a hold-up problem arises. Indeed, suppose that B has all the bargaining power in stage 2; then, he can obtain the widget at a zero price ex-post, and S has no incentive to exert any effort. Fixing a constant price $p > 0$ in stage 1 avoids this holdup and ensures positive effort provision but cannot induce first best effort $e_{fb}(v)$ either. In fact, S has no incentive to report the true v at stage 1, so under a constant price S exerts too little effort when $p < v$ and too much effort when $p > v$.

To implement $e_{fb}(v)$, the contract must commit B to pay a contingent price $p(v) = v$.[5] This contract however requires courts to verify v in stage 2. To study how the law shapes courts' verification and contracting, we now introduce two novel ingredients in this otherwise standard setup: the measurement structure of v and the way parties take advantage of it in litigation. The model is intentionally stylized to ensure tractability, which is an important advantage of our approach.

1.1 Signals and precedents

In any transaction $\bar{v}$, the actual value v of the widget depends on a measure $\bar{v}$ of binary signals $s_i \in \{0,1\}$, each of which carries 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…). If the widget's value is v, a measure v of signals is equal to 1, while the remaining $(\bar{v} - v)$ signals are equal to 0. Thus, the average of all signals is equal to the widget's true value v. Signals with lower index i are more likely to take value 0 rather than 1: at any given v, signals with index $i \leq i(v) \equiv \bar{v} - v$ take value 0, those with index $i > i(v) \equiv \bar{v} - v$ take value 1, as shown below for generic $\bar{v}$ and v:

[5] To study court verification we assume, in line with the incomplete contracts literature (Grossman and Hart 1986), that parties do not exploit their symmetric information at $t = 1$ by using revelation games (Maskin and Tirole 1999), including specific performance contracts such as options (e.g. Noldeke and Schmidt 1995). There is a vast debate on the foundations of incomplete contracts, and on whether ex-post renegotiation hinders revelation games, but this debate is outside the scope of our paper.

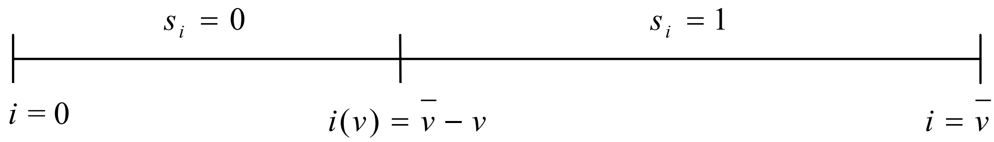

Figure 2*: The structure of signals*

State verification is thus complex because v results from many conflicting signals. Some signals are more informative, others are more favourable to the buyer or the seller. Low indexed signals are likely to be equal to 0, so they are favourable to *B*. High indexed signals are likely to be equal to 1, so they are favourable to *S*.

To draw inferences from the realization of an individual signal, judges should consider its index i. According to Figure 2, evidence $s_i = 1$ says that *at most* a measure i of signals is equal to 0, allowing the judge to infer that the event $v \geq \bar{v} - i$ is true. Evidence $s_i = 0$ says that *at least* a measure i of signals is equal to zero, allowing the judge to infer that the event $v < \bar{v} - i$ is true. Thus, the realization of any given signal allows the judge to infer whether v is above or below a certain threshold. The most informative signal is the "middle" one having $i = \bar{v}/2$, which allows judges to infer whether v is above or below $\bar{v}/2$. One can see this by noting that:

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

Thus, the realization s_i of signal i is least predictive of v (the above covariance is lowest) when i is high or low and most predictive of v when i is intermediate.

This signal structure implies that, by knowing the index i of signals, judges can verify v by looking only at two signal realizations. To see this, note that after observing $s_{i+\varepsilon} = 1$ and $s_{i-\varepsilon} = 0$ ($\varepsilon > 0$), the judge can conclude that v lies in the interval $(\bar{v} - i - \varepsilon, \bar{v} - i + \varepsilon)$, which is arbitrarily close to the true value $v = \bar{v} - i$ as ε goes to zero. This is akin to finding the "critical" signal $i(v) = \bar{v} - v$ that in Figure 2 separates the region where signals are 0 from the one where signals are 1.

In this setting, we study a specific state verification "friction": judges' ignorance of signals' correct interpretation i. In particular, we assume that a judge views all signals as equally informative, so that he has a uniform prior over i.[6] As a

[6] The model is abstract, but its 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. What we seek to capture then is that it might be hard for inexpert judges to determine which quality dimension is more or less relevant for determining v.

result, a judge treats a little informative signals carrying an extreme index i just as a very informative signal whose index i lies in the middle. Such ignorance of signals' informativeness does not matter if a judge can observe all signal values. In this case, he can still find the true v by adding up all signals. As we will see, though, this is infeasible precisely because judges observe (and rule upon) a small subset of signals, which may even be distorted in favour of a party. In this realistic case, the inability of judges to correctly interpret specific pieces of evidence affects state verification.

Given judges' ignorance of the correct interpretation of signals, state verification also depends on precedents. We view precedents as constraints on the interpretation of certain signals. Section 3.1 proves that in a given transaction $\bar{v}$ the body of precedents at time t is described by two numbers $i_t^L, i_t^H \in [0, \bar{v}]$ where $i_t^L \leq i_t^H$ and $i_t^L + i_t^H = \bar{v}$. Signals with index $i \in [0, i_t^L] \cup [i_t^H, \bar{v}]$ are then embodied into precedents while those having $i \in (i_t^L, i_t^H)$ are unsettled.

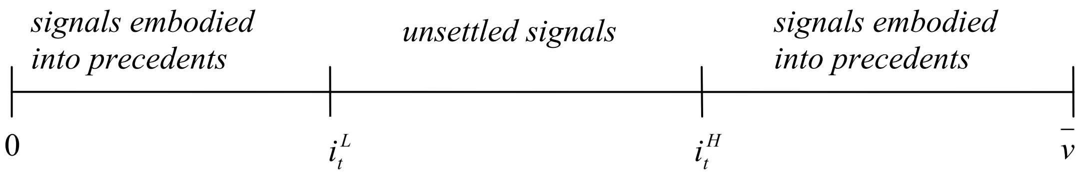

Figure 3: *Precedents at t*

The variable $g_t = i_t^H - i_t^L$ has the intuitive interpretation of the law's incompleteness at t, which plays a key role in shaping the evolution of contracts.

In terms of judicial state verification, precedents at t are summarized by a function $q{:}[0, i_t^L] \cup [i_t^H, 1] \rightarrow Q_t \subset [0, \bar{v}]$ mapping a signal's index i into an interpretation q where Q_t denotes the set of indices embodied into precedents at t. This mapping implies that *all* judges must use evidence $s_i = 1$ to call event $v \geq \bar{v} - q$ and $s_i = 0$ to call event $v < \bar{v} - q$. Even if judges do not know the correct interpretation i of signals, they know the interpretation q attached to it by precedents. The intuition is that, unlike in the case of unsettled signals, judges are trained to recognize precedents ex-ante.[7] Crucially, in our model precedents turn out to be almost surely incorrect (i.e. $q \neq i$), so they ensure predictability but not precision in state verification.

[7] The ability of judges to recognize precedents q does not contradict their lack of knowledge of the signal's true interpretation i, even if there is mapping $q(i)$ linking the two. This notion can be made formally precise by noting that a signal is identified by a measurement procedure m and an interpretation $i(m)$. The key point is that m is observed by judges in court while the mapping $i(m)$ is not.

In the unsettled range $i \in \left(i_t^L, i_t^H\right)$, no mapping is established between a signal and judicial interpretation. As a result, parties do not know in advance how an unsettled signal having true index i will be interpreted by judges, creating a legal uncertainty that is fundamental for state verification and contracting.

1.2 Judicial state verification and contracting

Along with the delivery of the widget, signals s_i are the only pieces of "hard" evidence that courts can verify. In particular, judges use the value of a specific signal s_i to call a specific event. In the case of precedents, such event is pre-set: for example, after observing $s_i = 1$ the judge mechanically calls $v \geq \bar{v} - q$, as mandated by the precedent itself. In the case of unsettled signals instead, the judge chooses which event to call. If parties present an unsettled signal with index $i^* \in \left(i_t^L, i_t^H\right)$, the judge chooses between two courses of actions. First, he can disregard the signal by arguing that it is not material ("critical" in our language). In this case, precedents do not change. Second, he can use signal i^* and attach interpretation q^* to it. The signal is then embodied into precedents: after seeing $s_{i^*} = 1$, future judges must call $v \geq \bar{v} - q^*$, while after seeing $s_{i^*} = 0$, future judges must call $v < \bar{v} - q^*$.

As in Gennaioli and Shleifer (2007), we allow judges to use only one new signal at the time. We also assume that judges do so at zero cost. Thus, even though judges have in principle the option to disregard unsettled signals, in practice they always use exactly one of them (if some unsettled signals are presented in court) so that each dispute involving new signals creates exactly one precedent.[8] This captures the idea that precedents are continuously updated in an incremental fashion.

Given the features, an enforceable contract can only specify that upon delivery of the widget B commits to pay S a price that depends at most on: i) the realization of signals embodied into precedents, and ii) the realization of just one unsettled signal $i^* \in \left(i_t^L, i_t^H\right)$, as judges cannot use more than one unsettled signal at the time.

Precedents map measurement procedure m into an interpretation q, and judges are trained ex-ante to learn the mapping $q(m)$. Of course, the inverse mapping $m = i^{-1}(i)$ implies that precedents specify a reduced form mapping $q(i) = q(i^{-1}(i))$. We are implicitly assuming that parties cannot write an ex-ante contract "instructing" judges about the mapping $i(m)$. The idea is that to understand such mapping judges need prior training. In the absence of such training, they are unable to enforce that contract.

[8]As in Gennaioli and Shleifer (2007), the limit in the number of new signals used in adjudication follows from the costs (effort, risk of reversal) that judges must bear to create precedents.

Generally speaking, then, the contract commits B to pay S - upon delivery of the widget - a price $p\left[(s_q)_{q \in Q_t}, s_{i^*}\right]$ that depends on the realization of all signals q embodied into precedents and of an unsettled signal i^* chosen by parties. It is perhaps most intuitive to see this price schedule as being effectively contingent on the events that judges call after observing $\left[(s_q)_{q \in Q_t}, s_{i^*}\right]$ rather than on the signals' realizations themselves. In this setting, we call non-innovative a contract where the price schedule $p\left[(s_q)_{q \in Q}\right]$ is only a function of precedents. By the very definition of precedents, this contract is predictably enforced by judges. We instead call "innovative" a contract where, at least for some configuration of precedents, the price varies with the realization of an unsettled signal. In particular, as we will see innovative contracts will specify that when an unsettled signal $i^* \in \left(i_t^L, i_t^H\right)$ takes value zero B must pay S a base price $p(s_q,0) = p_t$ and when it takes value one B must additionally pay S a bonus $\Delta_t = p(s_q,1) - p(s_q,0) > 0$, so that the price now effectively depends on the unsettled signal. This gives a precise notion of what it means in our model to "opt out" of the law under laissez faire: it means to contract on a contingency that is not yet embodied into precedents. The problem of writing such an innovative contract is the enforcement uncertainty entailed in the way judges verify unsettled signals.

To see how judges verify unsettled signals and create new precedents, we now illustrate the working of litigation in our model. Upon delivery of the widget, the seller pretends that the buyer pays him also the bonus Δ_t, claiming that signal i^* takes a value of one. B refuses to pay the bonus, claiming that i^* takes a value of zero. Parties go to court to solve their dispute, which determines whether the high or low price is enforced. For simplicity, we assume that litigation is costless.

We view litigation as a contest where B and S present favourable unsettled signals in court: S presents a measure of unsettled signals taking value 1, B a measure of unsettled signals taking value 0. The judge picks one of these signals and chooses how to interpret it, namely which event to call. Concerning signal collection, we assume that parties differ in their ability to collect favourable signals: in any state v, the buyer can freely collect up to a share $x \cdot \beta$ of the available unsettled signals taking value 0, the seller up to a share $x \cdot (1-\beta)$ of the available unsettled signals taking value 1. Parameter $x < 1$ reflects limited collection ability, which is a reduced form for collection costs.

Parameter $\beta \in [0,1]$ captures B's collection advantage relative to S. If $\beta < 1/2$ the seller is better able to collect signals: he may be richer and thus able to hire better lawyers (S may be a large corporation, B a consumer), or more knowledgeable on where to find signals. If $\beta > 1/2$, the buyer is stronger. If $\beta = 1/2$, parties are equal. Inequality varies in the population of buyer-seller pairs, so that different litigation episodes are characterized by a different bias in favour of the buyer or of the seller. In particular, the measure 1 of buyer-seller pairs is distributed according to β as follows:

A.2 *β has a p.d.f. $f_\beta(\beta)$ which is unimodal and symmetric around β* = 1/2.

Besides ensuring tractability, A.2 says that on average B and S have the same litigation ability [$E(\beta) = 1/2$], so that the variance of β captures social inequality.

The signal collection process is therefore summarized by a pair (n_0,n_1) where n_0 is the measure of unsettled signals taking value 0 presented by the buyer, n_1 the measure of unsettled signals taking value 1 presented by the seller. The judge solves the dispute by calling an event as a function of (n_0,n_1). We assume the following "contest success" function: the judge holds for the seller, claiming that $s_{i^*} = 1$ and enforcing the bonus, if S presents more favourable signals than B, namely if

$$n_1 > n_0. \tag{3}$$

When (3) holds, the judge picks any signal $s_i = 1$ presented by S and calls the event $v \geq \bar{v} - i^*$, where i^* is the signal's interpretation. If instead B presents more favourable signals than S, the judge picks a signal $s_{i'} = 0$ presented by B and calls $v < \bar{v} - i^*$, ruling for the buyer. When $n_1 = n_0$ the judge randomly rules for B or S. Thus, the judge looks for the realization of the signal i^* embodied in the contract in the evidence (n_0,n_1) presented by parties.

For now we take this contest success function as given, but Section 4 shows that it can be obtained by assuming that judges are Bayesian and use (n_0, n_1) to infer whether v is above or below its average $\bar{v}/2$. To obtain this result, the key assumption is that do not observe parties' litigation strength β. In this case, A2 implies that (n_0, n_1) is treated at face value, as if parties were equal.[9] More generally, even if judges learn something about β, our main results continue to hold as long as β is not

[9] Our results do not rely on the specific contest success function in (3) and on the assumed technology for collecting evidence. In particular, we have solved a contest model where the judge picks a signal favourable to S with probability $n_1/(n_1 + n_0)$ and parties face a direct (but unequal) cost of collecting signals. The disadvantage of this model is that it does not yield convenient closed form solutions but its results (which are available upon request) are very similar to those of the current model.

perfectly observed by them. The notion that judges do not perfectly observe β is realistic, for powerful parties could for instance secretly hire (and send to court) a straw man with low collection ability, and plays an important role in the analysis, particularly in creating a role for standard contracts.

We now illustrate the working of this setup in the simplest case of the first contracting round at t = 0, when there are no precedents (i.e. $i_0^L = 0, i_0^H = 1$). We postpone the case with precedents to Section 3. Without precedents, all signals are unsettled. As a result in a generic state v there are $(\bar{v} - v)$ unsettled signals taking value 0 and v unsettled signals taking value 1. Given the above signal collection technology, the buyer can then present any measure $n_0 \leq x\beta(\bar{v} - v)$ of signals taking value 0, the seller any measure $n_1 \leq x(1-\beta)v$ of signals taking value 1. Given Equation (3), it is clearly optimal for parties to collect as many signals as possible, so that the seller "wins" if and only if:

$$x(1-\beta)v \geq x\beta(\bar{v} - v) \quad \Leftrightarrow \quad v \geq \hat{v} \equiv \beta\bar{v}, \tag{4}$$

namely when v is high relative to β. Equation (4) says that adjudication is influenced both by the truth v and by the litigants' strength β. For given β, the buyer is more likely to win if v is low because it is easier for him to find favourable signals $s_i = 0$. This is also the case when, for given case facts v, the buyer is more powerful, i.e. β is high. We now study how the adjudication rule in (4) affects contracting and welfare.

2. Optimal contracting under imperfect state verification

We use the previous analysis to study contracting at t = 0. Section 2.1 studies laissez faire, Section 2.2 introduces and studies standardization.

2.1. Inequality and contracting under laissez faire

The sequence of events at t = 0 is as follows. A buyer-seller match forms and parties decide whether to contract or not. In the absence of precedents, the price schedule can only be contingent on a single unsettled signal. As a result, parties only specify a base price p and a bonus Δ by taking Equation (4) as given. Parties know their inequality β. Section 4 confirms our main results in the case where β is realized ex-post and so it is unknown to parties at the contracting stage. After the contract is written, S exerts effort $e_{l.f.}(v)$ (where *l.f.* stands for *laissez faire*). In stage 2 the good is produced and delivered to B with probability $e_{l.f.}(v)$. This setting captures the intuitive idea that in the absence of precedents and judicial training, contracts can only be contingent on "coarse" events, namely on whether the value of the widget is above or below a threshold. The evolution of precedents in the model will relax this constraint, allowing the widget's price to become contingent on progressively finer events, so as to closely track the widget's value *v*.[10]

Given Equation (4), after learning *v* the seller predicts that the judge holds for *S* and enforces Δ if and only if $v \geq \beta\bar{v}$. The sellers' effort is thus 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:

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

namely they maximize the social surplus created by the seller's equilibrium effort in (5). By solving program (6) we find that the optimal contract stipulates:

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

The base price and the bonus increase in the average value of effort $\bar{v}/2$. Regardless of *β*, parties always set Δ > 0: in the absence of precedents all contracts are innovative (of course, this abstracts from other transaction costs of writing innovative contracts).

The base price *p* goes up with *β* to compensate the seller for the buyer's litigation strength. This is done in a way to ensure that at any level of *β* effort provision is correct on average, namely that $E[e_{l.f.}(v)] = \bar{v}/2$. This contractual adjustment, though, is insufficient to ensure first best efficient effort provision. To show this, Figure 3 below plots the seller's effort for $\beta \geq 1/2$ and $\bar{v} = 1$. The 45^o line shows first best effort. Since at *t*=0 judges only call whether *v* is above or below a threshold, contracts are too "coarse." As a result, they induce effort over and under-provision even if parties are equal (*β*=1/2). Crucially, inequality enhances these effort distortions.

[10] We are implicitly disallowing parties to write a contract telling judges to modify their verification rule in (4) in a way to offset *β*. There are two justifications for this. First, since at the enforcement stage judges do not observe *β*, even if parties write such an "handicap rule" in their contract, they will be reluctant to handicap one of the litigants, and particularly to discard verifiable evidence. This is because judges must base their decision on verifiable evidence and, on top of that, parties look identical in court because *β* is not observed. This is connected to the general difficulty with which courts in the real world uphold contract terms altering procedural rules. The second justification, which we directly

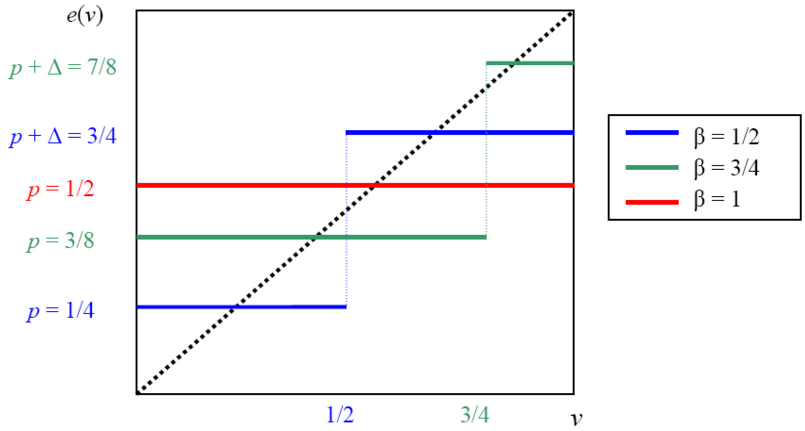

Figure 3: Optimal contract as a function of β for $\bar{v} = 1$

As β increases, the judge becomes less likely to enforce the bonus when v is high (when β = 1 the bonus is never enforced!). As a result, inequality destroys information about v, preventing effort to track the widget's true value v. A similar logic holds as β falls below 1/2. In other words, in our model inequality is costly not because it distributes surplus to the strong party (such distribution is fully undone by the ex-ante contract) but because it renders adjudication less informative, reducing the extent to which effort tracks the widget's value v. The parties' welfare under (7) is equal to:

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

The welfare loss relative to the first best is minimized at β = 1/2 and maximized when inequality is extreme (i.e. if β tends to 0 or 1). We then find:

Proposition 1 *If $k > 15/96$, parties do not contract. If $k \leq 1/8$, parties always 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 $\beta \in (\underline{\beta}, \overline{\beta})$. Parties' welfare falls in $|\beta - 1/2|$.*

Given imperfect adjudication, contracting only occurs if the transaction is valuable (i.e. $k \leq 15/96$). If on the other hand k < 1/8, the ex-ante investment is so cheap that contracting is profitable even if extreme inequality renders effort fully non contingent. From now on we focus on the most interesting case $k \in [1/8, 15/96]$, where β affects the extent of contracting, as plotted in Figure 4 below. By distorting enforcement, inequality hinders the efficiency and the volume of trade. Figure 4 below plots the resulting pattern of contract choice.

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model in Section 4, is that at the contracting stage parties may themselves fail to know the value of β. In this case, parties would be obviously unable to contract on β.

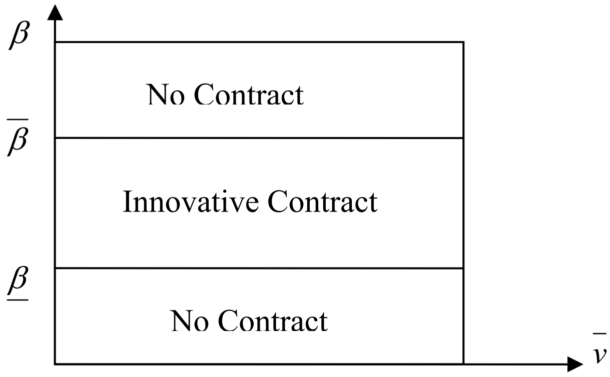

Figure 4: *Contracting under laissez faire*

In Figure 4 contracting does not depend on a transaction's average value $\bar{v}/2$, but this feature will change under standardization. Aggregate social welfare is equal to:

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

A greater variance of β captures greater inequality in buyer-seller matches. Since by Equation (8) the welfare loss in $W(\bar{v},\beta)$ is quadratic in β, a higher variance of β reduces welfare. Higher inequality reduces welfare because: a) there are fewer buyer-seller pairs wish to contract, and b) effort distortions for contracting parties go up.

We now study the role of contract standardization in reducing the costs of inequality in this static setting. Section 3 compares standardization and laissez faire in a dynamic setting where precedents exist and evolve.

2.2 Contract Standardization

Standardization can be undertaken by the public legal system via commercial codification, e.g. by specifying default investor rights (La Porta at al. 1998), or by a private trade association (Bernstein 2001). In both cases, standardization creates off the shelves contracts. Parties then choose whether to use these contracts or to opt-out, writing nonstandard terms. Here we seek to capture the idea that standard contracts are typically based on a few preset contingencies and judges are instructed on how to enforce them. In reality, this is implemented by: i) restricting litigation to specific pieces of evidence, and ii) training judges on how to interpret such evidence. In our model, features i) and ii) can be viewed as an efficient way to soften the costs caused by parties' inequality in signal collection.[11]

[11] 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

Restrictions to admissible evidence [feature i) above] are useful when parties are unequal, but are not sufficient to improve fact finding in our model [i.e. ii) is also needed]. This is because judges do not observe litigation strength β. If judges could perfectly observe β, distortions could be avoided by simply restricting evidence according to the following "handicap" rule: if the buyer is strong (i.e. $\beta > 1/2$) the judge should consider only a share $(1 - \beta)/\beta < 1$ of the signals presented by B, if the seller is strong, the judge should consider only a share $\beta/(1 - \beta) < 1$ of the signals presented by S. In Equation (4), this is enough to eliminate the impact of β on fact finding. Unfortunately, since judges do not know β this rule is infeasible, and judges will have to take evidence at face value.[12]

Setting a plain limit n on the number of signals either party can present is also suboptimal. Such limit will reduce the imbalance in parties' evidence collection, but it will also create an informational waste: if the limit is binding parties present the same number n of signals and the judge must rule at random, regardless of v. Evidence limits are thus not enough; to improve fact finding, one should also improve the ability of judges to interpret specific signals. This is intuitive, because distortions in our model precisely arise due to judges' limited ability to interpret signals.

In line with these arguments, we model standardization as the creation of a contract that is only contingent on the value of a pre-defined signal carrying index $i_S \in [0,1]$. Judges are then trained ex-ante to recognize such signal i_S and parties are forbidden from presenting any non-standardized signal $i \neq i_S$ in court. The standard contract is then mechanically enforced as one of the parties presents only the realization s_{i_S} in court. Given the assumed signal structure, this allows judges to correctly call event $v \geq v_S \equiv \bar{v} - i_S$ if $s_{i_S} = 1$ and $v < v_S$ if $s_{i_S} = 0$, for any litigation strength β. By training judges to recognize i_S, standardization boosts the precision of fact finding. By restricting evidence to i_S, the standard contract prevents strong parties

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.

[12] The same problem arises with respect to rules instructing judges to randomize fact finding based on the discrepancy between the evidence offered by parties. For instance, the judge could be told to rule for S with probability $\beta n_1/[\beta n_1 + (1- \beta)n_0]$. This rule can avoid the influence of β on fact finding in theory but not in practice, for judges are unable to implement it without observing β. Thus, as we already explained in footnote 8, under this rule inequality continues to hinder adjudication and welfare.

from swaying judges by bringing many (other) signals in court.[13] The assumption that only one signal is standardized (rather than a few signals) crudely captures the idea that training judges ex-ante is costly. Naturally, costly training implies that the same signal i_S is standardized for all transactions regardless of their average value $\bar{v}/2$. Thus, the standard contract is one-size-fits-all due to costly judicial training.

In sum, a standard contract (p, Δ, v_S) consists of a base price p and a bonus Δ which is enforced if and only if $v > v_S$. Parties are left free to specify p and Δ. The standard v_S is set before contracting occurs at $t = 0$ by a private or public enforcement body that also trains judges to recognize signal i_S. We perform a general analysis taking v_S as given, but the choice of v_S can be endogeneized by specifying the enforcement body's objective function or choice procedure.[14] Once v_S is set a $t = 0$, the standard contract is updated over time according to the evolution of precedents. We study such updating in Section 3.2. For now, we just consider the effect of the standard v_S at $t = 0$, when no precedent is in place.

At $t = 0$ parties thus maximize their welfare by choosing, depending on their transaction $\bar{v}$ and litigation strength β, between: i) the standard contract, ii) the innovative contract of the previous section, and iii) no contract at all.

Consider now how standardization affects contracting. To begin, note that the standard contract is never used by transactions where $\bar{v} \leq v_S$. In the latter transactions the standard signal s_{i_S} always takes a zero value. As a result, the bonus is never enforced and effort is constant at p. This is suboptimal because, as we saw in Section 2.1, even very unequal parties want a positive bonus to be sometimes enforced. Thus, the standard contract can only be used in transactions where $\bar{v} > v_S$. If the standard contract is used, parties set p and Δ to maximize social welfare. By analogy with Equation (6) (replacing $\bar{v}\beta$ with v_S) this implies that:

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

[13] Indeed, if parties presented many signals, judges could not commit to call an event based only on i_S. This is best seen when Equation (3) arises from judges trying to establish whether v is above or below average. In this case (which is studied in Section 4), judges seeing many signals in addition to i_S would not pay attention to the latter whenever $v_S \neq \bar{v}/2$ because in this case i_S is often not informative on whether v is above or below average.

[14] In one natural reference, v_S is set by majority voting among buyer-seller pairs at $t = 0$, much as if the latter are members of a trade association. Since the best standard for $\bar{v}$ is $v_S = \bar{v}/2$, the vote targets the standard to the median transaction, i.e. $v_S = v^*/2$ where $f_{\bar{v}}(v^*) = 1/2$. See Footnote 14 for details.

The bonus increases in the average value of effort for parties, the base price increases in v_S. If v_S is so high that the bonus is seldom enforced, parties boost the seller's effort by setting a higher base price. For $\bar{v} > v_S$, welfare under the standard is equal to:

$$W(\bar{v}, v_S) = \bar{v}^2 \left[\frac{1}{6} - k - \frac{1 - 3(v_S / \bar{v}) + 3(v_S / \bar{v})^2}{24} \right]. \quad (11)$$

In contrast to *laissez faire*, welfare does not depend on β, so that standardization effectively insulates trade from the parties' inequality. This does not of course imply that the standard contract is always better than the innovative one.

In particular, social welfare in (11) is maximized when the standard is equal to the transaction's average value [i.e. when $v_S = \bar{v}/2$]. The social loss relative to the first best increases as the ratio $v_S / \bar{v}$ gets further away from 1/2. The ratio $v_S / \bar{v}$ plays the same role of β in Equation (8). When $v_S / \bar{v}$ is well above 1/2, the standard contract is biased for the buyer; in fact, in this case the bonus is seldom enforced and effort poorly tracks the widget's value v. If $v_S / \bar{v}$ is well below 1/2 the standard is pro-seller; in this case, the bonus is enforced too often, which excessively boosts the seller's effort, which also causes distortions. Note that the cost of the standard is due to its one-size-fits all nature: different transactions would need different thresholds v_S, but this requires extensive and thus costly training.

Parties prefer the standard contract to no contract [i.e. (11) is positive] when:

$$\frac{\bar{v}}{2} \in \left[\frac{v_S}{2\bar{\beta}}, \frac{v_S}{2\underline{\beta}} \right], \quad (12)$$

where $\bar{\beta}$ and $\underline{\beta}$ are the thresholds of Proposition 1. Equation (12) says that parties prefer no-contract to the standard when the latter is too biased, which means $v_S / \bar{v} > \bar{\beta}$ in the case of pro-buyer bias and $v_S / \bar{v} < \underline{\beta}$ in the case of pro-seller bias. Thus, the standard contract is better than no contract if v_S is sufficiently close to $\bar{v}/2$.

The choice between the standard and the innovative contracts formally involves comparing (11) and (8). Together with (12), this comparison implies that:

Proposition 2 *Given v_S, the standard contract is used in transaction $\bar{v}$ by a buyer-seller match β when $v_S / \bar{v}$ is sufficiently close to* 1/2 *and β is sufficiently far from* 1/2.

Formally, this occurs when $\bar{v} \in [v_S / \bar{\beta}, v_S / \underline{\beta}]$ *and either* $\beta \geq \max[v_S / \bar{v}, 1 - v_S / \bar{v}]$ *or* $\beta \leq \min[v_S / \bar{v}, 1 - v_S / \bar{v}]$ *holds. Otherwise, parties contract as in Proposition* 1.

The proof is in the appendix. To understand this result, consider Figure 4 below:

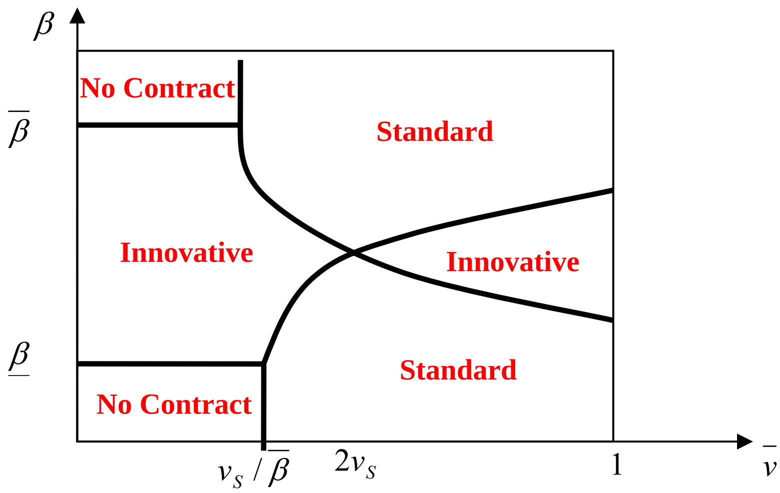

Figure 5: *contracting under standardization for* $\underline{\beta} < v_S < 1/2$

If $\bar{v} \leq v_S / \bar{\beta}$, the standard contract is too suboptimal for the parties' transaction. As a result, it is not used by parties. In this range, standardization is irrelevant and parties do not contract at all if their inequality is large. If instead $\bar{v} > v_S / \bar{\beta}$, the standard contract always dominates no-contract. Now parties use the standard contract provided inequality $|\beta - 1/2|$ is sufficiently large, namely in the lower and upper parts of Figure 5 and provided $|v_S - \bar{v}/2|$ is sufficiently small. If instead inequality is low (i.e. $\beta \approx 1/2$) and/or v_S is far from $\bar{v}/2$ the innovative contract is used.

Proposition 2 and Figure 5 stress an intuitive trade off between the standard contract's inflexibility and its ability to avoid enforcement distortions. If parties are sufficiently equal, they prefer the flexibility of the innovative contract, especially if the standard is unsuitable for their transaction. If parties are very unequal, they avoid enforcement distortions by using the standard provided the latter's 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 at $t = 0$ because it expands the 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:

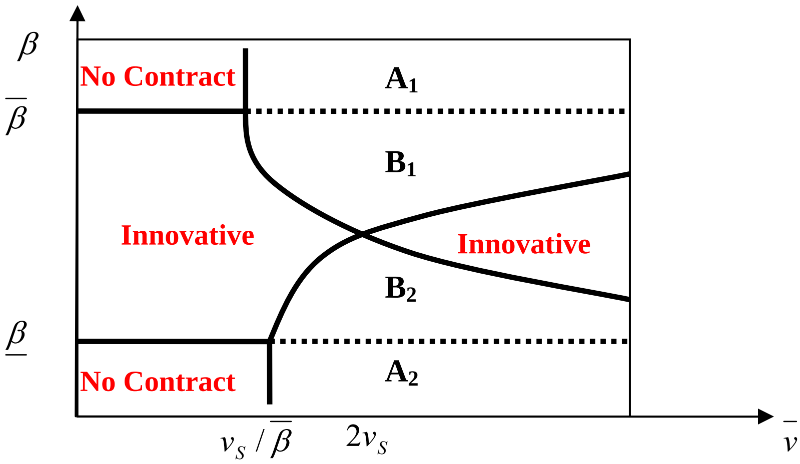

Figure 6: *static effects of standardization*

A comparison with Figure 4 immediately reveals that in regions A_1 and A_2 the standard contract improves welfare by allowing very unequal parties (who would not contract under laissez faire) to contract. In regions B_1 and B_2 the standard contract improves welfare for parties that under laissez faire write an innovative contract but, given their relatively high inequality, benefit from the lower enforcement distortions of the standard contract. The distinction between these two effects will be crucial to evaluate the dynamic effects of standardization.

Naturally, the static benefit of standardization is higher if the distribution of matches $f_\beta(\beta)$ is more concentrated on extreme values of β. Thus, 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, especially in unequal societies, but crowds out the use of innovative contracts.[15] Equipped with this basic intuition, we can now move on to the dynamic analysis.

3. The Evolution of Precedents and Contracts

[15]We have already discussed that majority voting would yield a standard which is optimal for the median transaction. The socially optimal standard is instead the one that maximized aggregate social welfare. It is beyond the scope of our paper to study the property of the socially 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 the benefit of fostering contracting in high value transactions versus that of fostering it in low

3.1 Contracting and Legal Evolution under Laissez Faire

We study the evolution of precedents and contracts under laissez faire in two steps. First, we consider how parties contract at $t > 0$ when some precedents are in place. Second, we study how precedents evolve over time as a function of contracting.

As shown by Figure 3, if in transaction $\bar{v}$ there are some precedents, judges interpret signals $i \in \left[0, i_t^L\right] \cup \left[i_t^H, \bar{v}\right]$ according to mapping $q: [0, i_t^L] \cup [i_t^H, \bar{v}] \rightarrow [0, \bar{v}]$. That is, upon observing the signal carrying index i, judges predictably call $v < \bar{v} - q$ if such signal takes value 0, and $v \geq \bar{v} - q$ if it takes value 1. Even if the event called by judges may not be the correct one (i.e. $q \neq i$), the predictability created by precedents allows parties to write the following signal-contingent contract $p(s_q)$:

$$\text{If } s_{q(i-\varepsilon)} = 0 \text{ and } s_{q(i+\varepsilon)} = 1 \text{ for arbitrarily small } \varepsilon > 0\text{, then } p = \bar{v} - i, \tag{13}$$

for all $i \in \left[0, i_t^L\right] \cup \left[i_t^H, \bar{v}\right]$. Note that Equation (13) allows parties to approximate the first arbitrarily precisely for all states $v = \bar{v} - i$, where i belongs to precedents. In fact, as shown by Figure 2, if the signal carrying index i-ε is equal to 0 and the signal carrying index i+ε is equal to 1, then the value of the widget is equal to $\bar{v} - i$ and so is the first best price. When precedents are correct, i.e. if $q(i) = i$, Equation (13) is just an application of this logic. But even if some or all precedents are incorrect, Equation (13) simply translates this first best policy in the "language" of precedents. Thus, the benefit of precedents in our model does not stem from their precision, but from their ability to create a predictable mapping $q(i)$ between specific pieces of evidence and their interpretation, which allows parties to contract optimally on them.

Effectively, the contract of Equation (13) induces judges to perfectly verify the widget values $v \leq \underline{v}_t \equiv \bar{v} - i_t^H$ and $v \geq \bar{v}_t \equiv \bar{v} - i_t^L$ in the way represented below:

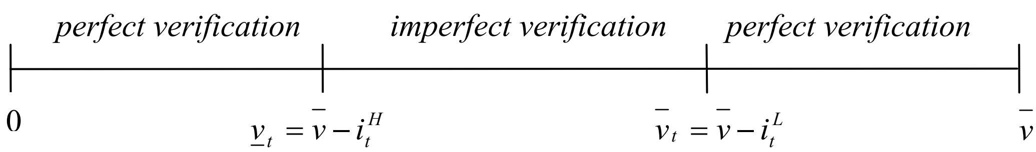

Figure 7: *precedents and the verification of v*

value ones. 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 6 and 7.

Interestingly, the law's incompleteness $g_t = i_t^H - i_t^L$ captures precisely the measure of widget values that judges cannot perfectly verify at t, i.e. $g_t \equiv \bar{v}_t - \underline{v}_t$.

If Equation (13) describes the contract terms written by the parties in the range of precedents, the optimal contract must also specify what to do in the unsettled range $v \in [\underline{v}_t, \bar{v}_t]$, which corresponds to the case where $s_{q(i_t^H)} = 1$ and $s_{q(i_t^L)} = 0$. To write a non-innovative contract, parties just set a base price p_t in this range. If instead parties write an "innovative" contract, they specify on top of the base price p_t a bonus Δ_t if and only if an unsettled signal $i^* \in [i_t^L, i_t^H]$ takes value 1. Since judges cannot recognize unsettled signals, the enforcement of the bonus is subject to distortion.

In analogy with Section 2.1, when litigating in $v \in [\underline{v}_t, \bar{v}_t]$, B collects $x\beta(\bar{v}_t - v)$ unsettled signals taking value 0, S collects $x(1-\beta)(v - \underline{v}_t)$ unsettled signals taking value 1. S then wins when he collects more signals than B, and thus Δ_t is enforced if:

$$v \geq \hat{v}_t \equiv (1-\beta)\underline{v}_t + \beta\bar{v}_t \tag{14}$$

The stronger is B (the higher is β) the less likely is S to obtain the bonus. Since, as we will soon see, precedents are symmetric [i.e. $\underline{v}_t = \bar{v} - \bar{v}_t$] we can rewrite (14) as:

$$\hat{v}_t \equiv \frac{\bar{v}}{2} + \left(\beta - \frac{1}{2}\right) g_t \,. \tag{15}$$

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

$$p_t = \left[(3/4)\bar{v}_t + (\beta/2 - 3/4)g_t\right] \quad \Delta_t = g_t/2 \tag{16}$$

Once more, p_t increases in β, to an extent that increases in the law's incompleteness g_t. Greater incompleteness increase the range over which β distorts fact finding, requiring a stronger adjustment of the base price to improve effort provision. Laissez faire still induces parties to "opt out" and write innovative contracts:[16] the bonus is always positive and increases in g_t because the latter proxies for the effort gap the bonus must induce. Figure 8 below plots the innovative contract and effort when there are some precedents. In the range of precedents, effort is at the first best; elsewhere, distortions arise because only a two-part price schedule can be used.

[16] 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.

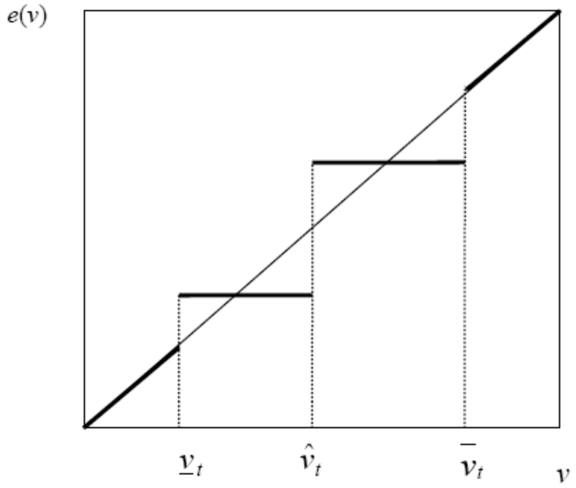

Figure 8: *optimal contract at* $t > 0$

Social welfare is equal to:

$$W_t(\bar{v},\beta) = \bar{v}^{-2}\left[\frac{1}{6} - k - g_t^3 \frac{1-3\left(\hat{v}_t/\bar{v}\right)+3\left(\hat{v}_t/\bar{v}\right)^2}{24}\right]. \qquad (17)$$

If $g_t = 1$, welfare is the same as in Equation (8). As g_t falls, precedents improve welfare by reducing enforcement uncertainty, which allows parties to write finer contracts.

As g_t falls over time, contracts become more contingent and effort provision improves, as Figure 9 below shows for three points in time (with $g_0 = 1 > g_{t_0} > g_{t_1}$):

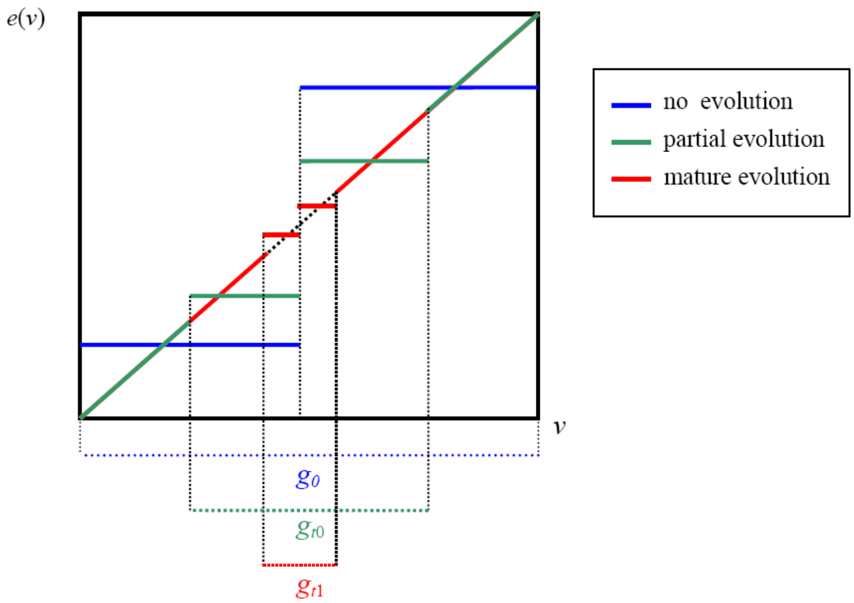

Figure 9: *contractual evolution*

We now derive the dynamics of g_t, which summarize legal evolution in our model. Since precedents accumulate thanks to the litigation of innovative contracts, to find the law of motion of g_t we must determine the extent to which innovative contracts are used and litigated at different points in time. 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. As precedents accumulate, more unequal parties find it profitable to contract because the predictability ensured by precedents reduces enforcement distortions. In this sense, legal evolution acts as a substitute of standardization.

Given these contract choices, we now derive the evolution of precedents. To do this, we must first determine what specific signals parties collect in litigation episodes. Note that it is (weakly) ex-post optimal for *B* to collect signals carrying the lowest index *i* and for *S* to collect signals with the highest index *i*. This strategy increases each litigant's probability of winning because low indexed signals are favourable to the buyer, while high indexed signals are favourable to the seller.[17] This argument vindicates Figure 2 because it implies that precedents accumulate starting from extreme values of *i*, so that the stock of precedents at *t* can be summarized by the two numbers $i_t^H \geq i_t^L$. Since precedents rely on partisan evidence collection by litigants, they foster the use of signals that are not necessarily objectively informative. That is, since precedents are a by product of litigation, they should not be expected to embody the socially optimal case facts. This has important consequences for the comparison between laissez faire and standardization.[18]

We can now solve for the full path of precedents. To do so, we assume that each transaction $\bar{v}$ develops its own body of precedents as buyer-seller pairs to this transaction litigate. This assumption greatly simplifies our analysis without affecting our main results. The appendix indeed proves:

[17] 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.

[18] 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.

Proposition 4 *Given a transaction* $\bar{v}$*, at any t≥0, we have that* $i_t^H = \bar{v} - i_t^L$. *From initial condition* $g_0 = 1$ *the law's incompleteness evolves according to the law:*

$$\dot{g}_t = -g_t \cdot \left[F(\overline{\beta}_t^{LF}) - F(\underline{\beta}_t^{LF})\right], \tag{18}$$

Where F(β) is the c.d.f. of β.

Precedents evolve symmetrically, namely $i_t^H = \bar{v} - i_t^L$ which implies $\underline{v}_t = \bar{v} - \bar{v}_t$. This is due to the assumed symmetry of the distributions of litigation strength $f_\beta(\beta)$ and of the widget's value *v*, which implies that the measure of low indexed signals collected by buyers across all litigated cases (*β*,*v*) is on average equal to the measure of high indexed signals collected by sellers.

Our model yields a very intuitive expression for the rate at which precedents accumulate. According to Equation (18), precedent creation is equal to the product of the volume $\left[F(\overline{\beta}_t^{LF}) - F(\underline{\beta}_t^{LF})\right]$ of innovative contracts written at time *t* by parties times the fraction g_t of these contracts that are litigated.[19] As a result, precedents accumulate at a faster rate the more innovative contracts are used and the greater is legal incompleteness, as both factors foster litigation.

Propositions 3 and 4 highlight a virtuous interaction between legal evolution and contracting. On the one hand, legal evolution (i.e. a reduction in g_t) fosters economic activity, inducing more parties to write innovative contracts. On the other hand, an increase in the volume of contracting boosts litigation. This progressively refines the law, strengthening legal evolution. This process reduces legal uncertainty and renders contracts more complete until the ideal benchmark of complete contracts is attained in the long run. Indeed, the unique steady state of Equation (18) is $g_\infty = 0$.

Besides improving effort provision by the seller at any given *β*, legal evolution reduces the impact of inequality over time. Figure 10 below demonstrates this point by plotting, for a given transaction, social welfare in (17) for different levels of *β*. Very unequal parties initially do not contract, so they cannot benefit from early stages of legal evolution, as represented by the flat dark blue line. After some legal evolution has occurred, though, highly unequal parties start to contract as well.

[19] 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.

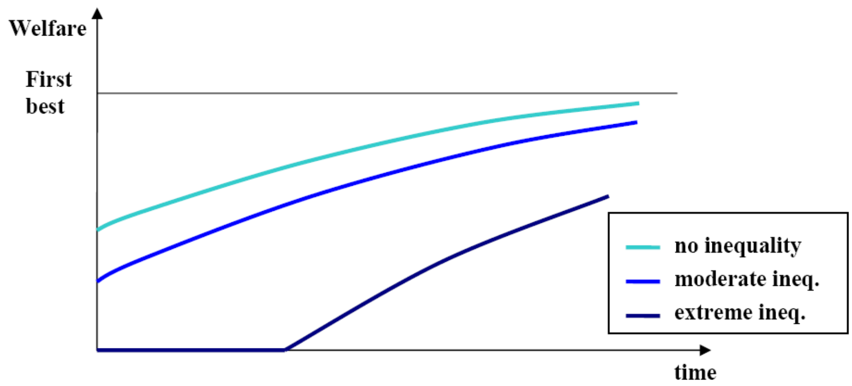

Figure 10: *inequality and legal evolution*

In the long run, contracts are complete and all parties attain the first best, regardless of inequality.[20]

3.2 Contracting and Legal Evolution under Standardization

Consider the working of standardization under legal evolution. Depending on incompleteness g_t, parties choose between the standard contract, the innovative contract and no contract at all. In a dynamic setting, the standard contract can be introduced in two ways: by assuming that the standard contract v_S introduced at t=0 is not revised afterwards, or by assuming that it is continuously updated with precedents. In the latter case, parties can contract on the value of the widget for $v \notin \left[\underline{v}_t, \bar{v}_t\right]$ just as in the case of an innovative contract, but they can also contract on whether v is above or below v_S, which is useful if v_S belongs to the unsettled region $\left[\underline{v}_t, \bar{v}_t\right]$.

If the standard contract is time invariant, it yields parties the welfare level of Equation (11). With an evolving standard, instead, parties' welfare at t is equal to:

$$W_t(\bar{v}, v_S) = \bar{v}\left[\frac{1}{6} - k - g_t^3 \frac{1 - 3\left(v_S / \bar{v}\right) + 3\left(v_S / \bar{v}\right)^2}{24}\right]. \tag{19}$$

In the spirit of Equation (17), when the standard contract is updated with precedents its efficiency improves as g_t falls, eventually reaching the first best at $g = 0$.[21]

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[20] 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.

[21] 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.

To show that our main results do not rely on a specific type of standardization, we study the model under both assumptions and stress when they deliver different results. For simplicity, we restrict our analysis of contracting and evolution for the case $\underline{\beta} < v_S \leq 1/2$ depicted in Figure 5 and also assume that $v_S / \bar{v} < \underline{\beta}$. The latter assumption implies that the standard contract is always preferred to no-contract and thus it is used by at least some parties at $t = 0$. The Appendix then proves:

Proposition 5 *For given $\bar{v}$, if at t = 0 the standard contract v_S is introduced, then at every t≥0 there are two thresholds $\underline{\beta}_t^S$ and $\bar{\beta}_t^S$, so that the innovative contract is used for $\beta \in \left(\underline{\beta}_t^S, \bar{\beta}_t^S\right)$ 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 $\bar{\beta}_t^{LF} \geq \bar{\beta}_t^S$. If the standard contract is updated over time, $\underline{\beta}_t^S = v_S / \bar{v}$ and $\bar{\beta}_t^S = 1 - v_S / \bar{v}$.*

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

Consistent with Figure 5, standardization induces all parties to contract regardless of β. Thus, for any given extent of legal incompleteness g_t standardization expands the volume of trade relative to laissez faire. In addition, and again consistent with Figure 4, 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), for in this case the innovative contract is particularly unappealing. If instead the standard contract is updated with precedents, the choice between the standard and the innovative contract is time invariant and identical –at any given g_t– to the one formally described in Proposition 2. In sum, 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.

Point ii) above describes a key dynamic implication of this static crowding out effect: by reducing the use and litigation of innovative contracts, standardization stifles precedent creation and thus legal evolution. This implies that there is a trade-off between the static and dynamic efficiency of standardization. Setting a statically efficient standard can exacerbate crowding-out, hindering future legal and contractual innovation. We confirm this intuition by proving in the appendix that:[22]

Proposition 6 *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* $v_S^* \in (\underline{\beta}, \bar{v}/2)$ *such that for* $v_S > v_S^*$ *we have* $0 < t^* < +\infty$.

3.3 Discussion

Proposition 6 conveys two fundamental ideas. First, relative to laissez faire, standardization yields an initial static benefit that persists for some time. As previously noted, this benefit consists in boosting the volume and efficiency of trade among unequal parties. The persistence of such benefit suggests that precedents are not an effective mechanism to reduce legal uncertainty in the short run. This is because, as shown by Figure 7, at early stages precedents consist of partisan but little informative signals. As a result, precedent accumulation is too slow and leaves ample room for enforcement distortions to persist. By contrast, standardization coordinates judicial learning on a signal that is 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 a while, vanishing only after many precedents are accumulated.

Second, the benefit of standardization becomes smaller and smaller over time, to the point that it may even become negative! This is due to the fact that standardization slows down legal evolution by crowding out the use of innovative contracts by moderately unequal parties (regions B_1 and B_2 in Figure 6).[23]

Once these effects are combined, our model generates a reversal whereby welfare is initially lower under laissez faire but legal evolution is faster in such regime, so that laissez faire catches up and in some cases overtakes standardization. The evolution of aggregate welfare under the two regimes is graphed below.

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

[23] 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).

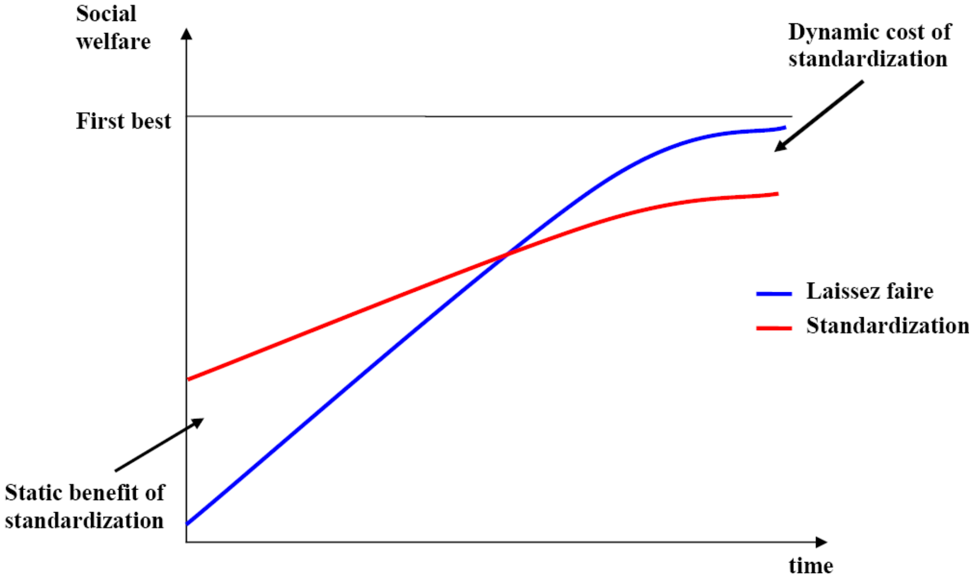

Figure 12: *evolution of laissez faire and standardization*

Proposition 6 also shows that in unequal societies the cost of standardization takes longer to materialize, for in these societies the static benefit of standardization is larger. Additionally, at any given transaction $\bar{v}$ standardization is more likely to be costly the greater is the static efficiency of the standard, i.e. the lower is $|v_S - \bar{v}/2|$. Intuitively, the more statically efficient is the standard, the stronger is the crowd out effect and thus the dynamic cost of standardization. This does not imply that standardization is welfare decreasing. It is easy to show that in our model one can always suitably find a standard v_S that improves discounted social welfare relative to laissez faire. The message of Proposition 6 is that in evaluating the effects of standardization one should strike a balance between its static and dynamic effects.

More broadly, our model provides a tractable tool for analyzing how the volume and efficiency of contracts evolve via the mutual interaction of the legal and economic systems. On the one hand, law affects the volume and efficiency of trade by shaping contract enforcement. On the other hand, the volume and profitability of trade determine legal evolution by shaping the use of novel commercial practices. This interaction is absent from existing models of legal evolution, which abstract from contracting (Gennaioli and Shleifer 2007, Ponzetto and Hernandez 2009) or give it a marginal role (Anderlini et al. 2008).

These ideas provide a useful 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 research program has been confronted with two key questions. First, why should the law affect commercial transactions if contracting parties are often allowed to opt out of it (Easterbrook and Fischel 1991)? Second, if Common and Civil Law systems are structurally different, why does their relative performance vary so much over time? Indeed, Rajan and Zingales (2003) stress that Civil Law were not inferior to Common Law systems and if anything had an edge over the latter in the early XX century. La Porta et al. (2008) then document that the Common Law achieves dominance in the second half of the XX century. Finally, Coffee (2001) highlights, among others, that there has been a convergence among developed legal systems in recent years.

Our model gives a potential answer to both questions after one realizes that – even if all legal systems are to some extent codified – Common Law systems are *relatively* less codified than Civil Law ones.[24] With respect to the first question, our model suggests that parties may be unable to opt out of existing legal arrangement precisely because innovative contracts are subject to enforcement distortions. Crucially, opting out should be easier in the comparatively less codified Common Law systems. In line with this notion, recent work shows that the Common Law indeed fosters the use of innovative financial contracts (Lerner and Schoar 2005). Regarding the second question, our model suggests that the different extents to which Common and Civil Law systems encourage parties to opt out of existing arrangements may exert an important impact on legal evolution, shedding some light on the relative performance of the two systems.

The predictability afforded by standardization can help explain the initial edge of a more standardized regime like the Civil Law one. The faster rate of commercial experimentation and innovation characterizing a less codified system such as the Common Law one can help explain why at some point such regime may come to dominate the latter. This is due to the greater legal and commercial innovation characterizing the less codified Common Law systems. Finally, at mature commercial stages, legal adaptability becomes very incremental and the two regimes converging toward the same steady state, so that difference between the two become tenuous.

Existing explanations for the performance of Common and Civil Law systems rely either on their degree of state interventionism (La Porta et al. 2008), or in the role

[24] 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

of political factors (Rajan and Zingales 2003). Our story instead focuses on the link between economic and legal adaptability and innovation. There might be ways to empirically test these different hypotheses. An attempt to stress the role of adaptability and innovation in the performance of legal systems has recently been made by Beck and Levine (2005).

4 Extensions

We now prove that our main results obtain when we change two assumptions: i) we assume that the litigation strength of *B* and *S* is realized after the contract is signed, and ii) we assume that the judge is Bayesian and adjudicates in an attempt to guess whether v is above or below its average $\bar{v}/2$. As we will see, case ii) allows us to obtain the context success function of Equation (3).

Consider first, for a given state verification policy, what contract is written by parties if the latter do not know what litigation strength β will realize. We assume for simplicity that the seller privately learns β while exerting effort e and B learns β in stage 2 (similar results are obtained when β is learned by all in stage 2 but the algebra is more cumbersome). We perform our analysis for $v \in \left[\underset{\rightarrow}{v}, \vec{v}\right]$, where $\underset{\rightarrow}{v}$ and $\vec{v}$ are two thresholds $0 < \underset{\rightarrow}{v} < \vec{v} < \bar{v}$ such that $\vec{v} + \underset{\rightarrow}{v} = \bar{v}$. This is equivalent to solving for the optimal contract when the stock of precedent is summarized by $\underset{\rightarrow}{v}$ and $\vec{v}$. Thus, the results of this section can be easily imported into the previous dynamic analysis.

As in Section 3, there is a threshold $\hat{v}(\beta) = (1-\beta)\underset{\rightarrow}{v} + \beta\vec{v}$ in the range $v \in \left[\underset{\rightarrow}{v}, \vec{v}\right]$ such that the buyer wins if and only if $v \le \hat{v}(\beta)$. Parties then set their contract (p, Δ) by knowing the adjudication rule and the distribution of β into account. Formally, this implies that they solve the problem:

$$\max_{p,\Delta} \int_0^1 \left\{ \int_{\underset{\rightarrow}{v}}^{\hat{v}(\beta)} \left[pv - p^2/2\right](1/\bar{v})dv + \int_{\hat{v}(\beta)}^{\vec{v}} \left[(p+\Delta)v - (p+\Delta)^2/2\right](1/\bar{v})dv \right\} f_\beta(\beta)d\beta \quad (20)$$

After some algebra, one finds that (20) is maximized when:

$$p = \frac{(\vec{v} + \underset{\rightarrow}{v})}{2} - \frac{(\vec{v} - \underset{\rightarrow}{v})}{4}(1-4\sigma) \quad \Delta = \frac{(\vec{v} - \underset{\rightarrow}{v})}{2}(1-4\sigma), \quad (21)$$

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).

where $\sigma = \text{var}(\beta) < 1/4$. The only difference with the previous model is that now contract distortions are determined by the variance of litigation strength. Higher σ reduces the extent to which the contract is contingent (i.e. the bonus) and increases the base price. This latter effect is due to the fact that greater volatility causes dispersion in effort costs which (by the convexity of the cost function) reduce effort on average. To dampen this effect, *S* must be compensated by setting a higher base price.

To see the welfare cost of σ, note that (20) can be written as $E_\beta\left[V(\hat{v}(\beta))\right]$, where $V(\hat{v}(\beta))$ is the integrand in (20). By using the envelope theorem one finds:

$$d^2V(\hat{v}(\beta))/d\beta^2 = -(\vec{v} - \underleftarrow{v})\Delta,$$

which implies that welfare is concave in β. Thus, greater randomness in pro-buyer bias σ_β reduces social welfare. Just like systematic bias, also random bias undermines contracting, confirming the results of Section 2 with respect to this new enforcement distortion. Under this formulation the model is less tractable, but all of its main results hold (including the fact that as legal evolution shrinks the interval $\left\lfloor \underleftarrow{v}, \vec{v} \right\rfloor$ social welfare improves).

Consider now point i), namely the adjudication policy of a Bayesian judge trying to assess whether *v* is above or below average. Suppose that the judge observes n_0 signals taking value 0 and n_1 signals taking value 1. Since *B* and *S* present all of the signals they collect then,[25] given the assumed signal collection technologies of Section 1.2, the judge knows that $n_1/n_0 = (1-\beta)\cdot v/\beta(\bar{v} - v)$. The problem is that since the judge does not know β, he cannot perfectly infer *v* from the ratio n_1/n_0. However, by knowing the distribution of β, the judge can make a statistical inference on *v* based on the fact that:

$$v = \bar{v} \cdot n_1 \cdot \beta/[n_0(1-\beta) + n_1\beta]. \tag{22}$$

The above equation implies that $v \geq \bar{v}/2$ if and only if $n_1 \cdot \beta \geq n_0(1-\beta)$, so that:

$$\Pr[v \geq \bar{v}/2] = \Pr[\beta \geq \underline{\beta} = n_0/(n_0+n_1)] = \int_{\beta \geq \underline{\beta}} f_\beta(\beta)d\beta. \tag{23}$$

Since by assumption the judge minimizes the probability of error, he finds that $v \geq \bar{v}/2$ if and only if $\Pr[v \geq \bar{v}/2] > 1/2$. Given the symmetry of $f_\beta(\beta)$, Equation (23) implies that the judge finds $v \geq \bar{v}/2$ if and only if:

[25]This is optimal if a party wins with increases her probability of winning by presenting more signals. We will see that in equilibrium this is indeed the case.

$$n_1 \geq n_{0,} \tag{24}$$

which is precisely the contest success function of Equation (3).

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 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; a richer characterization of legal aspects is thus a natural direction for future work. One 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 $\bar{\beta}$ with $\underline{\beta}$ < 1/2 < $\bar{\beta}$, such that parties contract if and only if $\beta\geq\underline{\beta}$ and $\beta\leq\bar{\beta}$. The thresholds $\underline{\beta}$ and $\bar{\beta}$ are then equal to:

$$\underline{\beta}=\frac{1}{2}+\frac{\sqrt{5-32k}}{2}\qquad \bar{\beta}=\frac{1}{2}+\frac{\sqrt{5-32k}}{2}$$

It is then easy to see that $\underline{\beta}$ + $\bar{\beta}$ =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 $\bar{v}\in[v_S/\underline{\beta},v_S/\bar{\beta}]$. 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 $\bar{v}>v_S/\bar{\beta}$, which determines A_2 in intersection with area $\beta\notin[\underline{\beta},\bar{\beta}]$ (where in the absence of v_S parties do not contract). If $\beta\in[\underline{\beta},1/2]$ the standard contract is used for $\beta\leq\min[v_S/\bar{v},1-v_S/\bar{v}]$. 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 $\beta\in[1/2,\bar{\beta}]$, the standard contract is used for $\beta\geq\max[v_S/\bar{v},1-v_S/\bar{v}]$. 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 $\beta\notin(\underline{\beta},\bar{\beta})$], 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 $\beta\in(\underline{\beta},\bar{\beta})$ and $\beta\geq\max[v_S/\bar{v},1-v_S/\bar{v}]$ or $\beta\leq\min[v_S/\bar{v},1-v_S/\bar{v}]$]. If 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 $\underline{v}_t, \bar{v}_t$, and then study the parties' choice of whether and how to contract in different legal regimes. Given mapping $q(i):\left[0,i_t^L\right)\cup\left(i_t^H,1\right]\rightarrow[0,1]$. 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 in line with Equation (13), which can be parsimoniously be written for all precedents as:

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

Where the above contract also specifies terms for the middle range of legal uncertainty, where parties 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 falls in g_t and in $|\beta - 1/2|$. Parties prefer the non-standard contract to no-contract if $W(\beta, g_t) \geq 0$. This condition identifies two thresholds $\bar{\beta}_t^{LF}, \underline{\beta}_t^{LF}$ such that the parties prefer the non-standard contract if and only if $\beta \in \left(\underline{\beta}_t^{LF}, \bar{\beta}_t^{LF}\right)$. Property $\underline{\beta}_t^{LF} \leq 1/2 \leq \bar{\beta}_t^{LF}$ 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 $\underline{\beta}_t^{LF}$ = $\bar{\beta}_t^{LF}$ =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 $\underline{\beta}_t^{LF}$ + $\bar{\beta}_t^{LF}$ = 1. Finally, since $W(\beta, g_t)$ increases in β for $\beta \geq 1/2$, $\underline{\beta}_t^{LF}$ increases and $\bar{\beta}_t^{LF}$ decrease in g_t.

Proof of Proposition 4.

Each litigation episodes involved the creation of one new precedent that uses one of the signals collected by parties. As a result, for a given $\bar{v}$ in litigated cases won by buyers the accumulation of signals is equal to the number of disputes where the true v is below the threshold of Equation (4) averaged across all the value of β in the population of contracting parties. This implies that the measure of new precedents created by winning buyers in legal system $X = LF$, S is equal to:

$$\int_{\underline{\beta}^X}^{\bar{\beta}^X} \int_{\underline{v}}^{\hat{v}(\beta)_t} f(\beta) dv d\beta = g_t \left[F(\bar{\beta}_t^X) - F(\underline{\beta}_t^X)\right] E\left[\beta \middle| \beta \in (\bar{\beta}^X - \underline{\beta}^X)\right], \tag{25}$$

where $F(\beta)$ is the distribution function of β. Accordingly, the measure of new precedents created by winning sellers in legal system $X = LF, S$ is equal to:

$$\int_{\underline{\beta}^X}^{\overline{\beta}^X}\int_{\hat{v}(\beta)}^{\overline{v}_t} f(\beta)dvd\beta = g_t\left[F(\overline{\beta}_t^X) - F(\underline{\beta}_t^X)\right]E\left[(1-\beta)\middle|\beta \in (\overline{\beta}^X - \underline{\beta}^X)\right], \qquad (26)$$

Crucially, note that since the distribution of β is symmetric around ½ and in each legal system we have that $\overline{\beta}^X + \underline{\beta}^X = 1$, which implies that:

$$E\left[(1-\beta)\middle|\beta \in (\overline{\beta}^X - \underline{\beta}^X)\right] = E\left[\beta\middle|\beta \in (\overline{\beta}^X - \underline{\beta}^X)\right] = 1/2,$$

As a result, across the entire population of cases the new precedents created by winning buyers are always equal to the new precedents created by the population of winning sellers. This implies that $\underline{v}_t = 1 - \overline{v}_t$ for every t. Since precedents collected by sellers come from the top of the interval of unsettled signals, (26) implies that:

$$\dot{\overline{v}}_t = -g_t\left[F(\overline{\beta}_t^X) - F(\underline{\beta}_t^X)\right]E\left[1-\beta\middle|\beta \in (\overline{\beta}_t^X - \underline{\beta}_t^X)\right]dt, \qquad (27)$$

Applying the same logic to the new precedents created by buyers we have that the law of motion of the law's incompleteness is equal to:

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

Proof of Proposition 5

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 $\beta \in \left(\underline{\beta}_t^S, \overline{\beta}_t^S\right)$. 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 $\beta = 1/2$.

Proof of Proposition 6

Since social welfare is multiplicative in $\overline{v}$, we now carry out our analysis only for the case $\overline{v} = 1$, but the analysis is valid for any given transaction $\overline{v}$. 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:

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

The above condition is only valid for t < – (1/2φ)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:

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

Using the definition of φ (i.e. its dependence on v_S), one finds that that the left hand side increases from 0 to +∞ 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 ½ (to $\bar{v}/2$ for $\bar{v} \neq 1$). Thus, there is a $v_S^* < 1/2$ ($v_S^* < \bar{v}/2$ for $\bar{v} \neq 1$) 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

Adieh, Robert, 2006, The Strategy of Boilerplate, *Michigan Law Review,* 104, pp. 1033-1074.

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

Bernardo, A., E. Talley, and I. Welch. A theory of legal presumptions. Journal of Law, Economics, and Organization, 16(1):1, 2000

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

Dixit, Avinash, 1987, Strategic behavior in contests. *The American Economic Review*, 77(5):891{898.

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, 2010, The Evolution of a Legal Rule, *Journal of Legal Studies*, June.

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.

Tullock, Gordon, 1980, Efficient rent seeking. *Toward a theory of the rent-seeking society* 97:112.