Abstract: Legal rules do more than provide incentives; they change people. When preferences and norms are endogenously determined via a process of imitation and learning, legal rules, by affecting the market outcome, may affect the dynamics of preference formation. Analyzing the effect of different legal rules should, therefore, go beyond the analysis of the incentives they provide. It should also include an analysis of their effect on the distribution of preferences and norms of behavior. We illustrate this claim by considering a simple market game in which individuals may have preferences that include fairness concerns. We show that different legal rules change not only the pattern of trade in a market game, but also the individuals’ fairness concern. That is, different rules may eventually make individuals care more (or less) about a fair outcome.
Introduction

The economic analysis of law adopts the view that legal rules are incentive mechanisms (see, e.g., Posner (1998), Cooter and Ulen (2002)). They influence individual behavior by shaping the payoff structure associated with alternative courses of action. In this paper we argue that the legal system does more than provide incentives; it also affects the preference profile in the population.\(^1\) That is, different legal systems may affect not just the behavior of individuals but who they are. And, since who you are also affects how you choose to behave, a new indirect influence on behavior is introduced. Such an approach expands the boundaries of Law and Economics introducing the endogenous formation of preferences as part of the analysis.

Lawyers, philosophers and psychologists have long recognized the role of law in shaping norms and preferences. Speaking more generally on government, John Stuart Mill argued that “government itself should be evaluated in large measure by its effects on

\(^1\) In its focus on incentive effects, taking preferences as given or exogenous, the economic analysis of law has followed a basic tenet of neo-classical economics. See, e.g., Becker (1976) (“… all human behavior can be viewed as involving participants who maximize their utility from a stable set of preferences…”), Stigler and Becker (1977), Aaron (1994) (“Social scientists – especially economists – evaluate policies and institutions by examining behavioral responses to incentives, with values, habits, and social norms taken as given and beyond analysis and the reach of public policy.”) and Marschak (1978) (“To enter the field of taste change one ought to find danger exhilarating. The perils are extreme. First the very ground threatens to fall away at one’s feet: the economist, as policy adviser, is suppose to seek efficiency, but whether a given policy is efficient depends upon the preferences of those affected, and those preferences may depend in turn on policy.”)

While neo-classical economics traditionally assumes that preferences are exogenous, economists have long recognized the malleability of individual preferences. See, e.g., Harsanyi (1953-1954) (p. 213: “the Economic Problem of a community… includes also the question of how these scarce resources should be divided between productive operations for satisfying people’s actual wants and measures for changing these wants.”), Sen (1995) (referring to environmental policy questions, Sen writes in pp. 17-18: “There are plenty of “social choice problems” in all this, but in analyzing them, we have to go beyond looking only for the best reflection of given preferences, or the most acceptable procedures for choices based on those preferences. We need to depart both from the assumption of given preferences (as in traditional social choice theory) and from the presumption that people are narrowly self-interested homo economicus (as in traditional public choice theory),” and Bowles (1998) (“Markets and other economic institutions do more than allocate goods and services: they also influence the evolution of values, taste, and personalities.”)
the character of the citizenry.”

2 Focusing on legal policy, traditionally criminal law has been understood as a means of shaping preferences and instilling morality. Jeremy Bentham noted that:

“A punishment may be said to be calculated to answer the purpose of a moral lesson, when, by reason of the ignominy it stamps upon the offence, it is calculated to inspire the public with sentiments of aversion towards those pernicious habits and dispositions with which the offense appears to be connected; and thereby to inculcate the opposite beneficial habits and dispositions.”

3 The understanding that law influences norms and preference is not confined to the criminal justice arena. Summarizing the literature, Kaplow and Shavell (2002) observed:

“The suggestion is often made that, if the law symbolically denounces some preferences or reinforces others by appearing to embody certain viewpoints, individuals will come to adopt different preferences and, in turn, to behave differently.”

4 More recently, the literature on law and social norms has stressed the influence of legal rules on norms and preferences (see, e.g., Cooter (1998), Sunstein (1986, 1996), Huang and Wu (1994)).

5 The broad writing on the influence of legal policy on norms and preferences has largely been founded on the symbolic or expressive impact of law. If the law says that X is “bad” (or illegal), then preferences will ultimately adjust to disvalue X; and conversely, if the law says that X is “good”, then preferences will adjust to value X (see, e.g., Cooter (1998) and Kaplow and Shavell (2002)).

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5 A different approach argues that the assignment of legal entitlements affects preferences via the “endowment effect” and the status-quo bias. For instance, if the law assigns a property right to A in X, then
Building on recent developments in economic theory and evolutionary game theory, we introduce a new mechanism through which law influences the formation of preferences. Following traditional law and economics, we focus on the incentive effects, rather than on the expressive effects, of the law. The law defines the payoffs associated with various choices that people make. But, choices also depend on preferences. For any given payoff matrix, as established by the legal system, different people with different preferences will generally choose different courses of action. And, certain people, with certain preferences, will do better (in material terms, for instance) than other people with different preferences. Assuming that learning, imitation and other forms of cultural transmission shift the preference profile in a given society toward more successful preferences, the link between law and preferences is established.\textsuperscript{6} We propose this payoff-based model of the interaction between law and preferences as an alternative to the expressive law model.

To illustrate the proposed approach, we consider a common scenario. A seller and a buyer negotiate the price of a product. After the contract is signed an “unforeseen” event may occur raising the seller’s cost of performance. Given such an event the seller may ask to renegotiate the contract. The threat point in such renegotiation is determined by the legal rule that specifies the legal remedy in case no agreement is reached in the

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\textsuperscript{6} A similar approach to the interaction between legal policy and preferences has been suggested by Huck (1998) and by Bohnet, Frey and Huck (2001). We extend the analysis by Huck and Bohnet et al. in several dimensions. First, we offer a general conceptualization of the law and preferences interaction, as well as a mathematical framework for analyzing this interaction. Second, our model focuses on the effects of substantive law, as opposed to more abstract features of the legal system, such as the probability of enforcement. Third, we study the interaction between law and a well-documented category of preferences - fairness concerns, as opposed to the remorse-type preferences studies by Huck and Bohnet et al. Fourth, we demonstrate the interaction between law and preferences in a different (and arguably common) legal context. Finally, the forces, which define the stable preference profile, are different than those studies by by Huck and Bohnet et al.
renegotiation phase and the seller decides to breach the contract. The standard law and economics approach considers the incentive effects of different legal rules on the outcome of the renegotiation process and on the seller’s decision whether to perform, or rather breach the contract.

Into this framework we introduce preferences for fairness. We allow for the possibility that individuals wish to be treated fairly, and that they experience disutility whenever they are not so treated. These fairness concerns will affect the market outcome i.e., the original contract price, the seller’s ability to extract a modification in the renegotiation stage as well as the magnitude of the price modification if it is agreed upon.

In particular, fairness concerns reinforce a party’s bargaining position when negotiating the initial contract price, thus providing for a more favorable price. At the renegotiation stage, fairness concerns mostly affect the seller’s bargaining position. On the one hand, preferences for fairness may bolster the credibility of the seller’s threat to breach, thus enabling the seller to extract modifications that would otherwise be impossible to obtain. On the other hand, an excessive fairness concern might lead the seller to demand more than the buyer is willing to concede, leading to a breakdown in renegotiations. Such a breakdown entails inefficient breach and consequently material loss to both parties.

While allowing for the possibility that individuals care about fairness, we do not impose such preferences, but rather derive them endogenously. We assume dynamic preferences formation guided by quasi-evolutionary forces.⁷ We demonstrate that

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preferences for fairness are selected in this evolutionary process. But, moreover, we show that the intensity of the fairness concerns depends on the pertaining legal rules, and specifically on contract law doctrines that determine the remedies for breach of contract. Interestingly, we demonstrate that stronger remedies for breach lead to weaker fairness concerns.

The remainder of the paper is organized as follows. Section 1 develops a general framework where legal rules influence the endogenous formation of preference. Section 2 presents our incomplete contracting (with renegotiation) model with fairness concerns. Section 3 demonstrates how the rules of contract law affect the equilibrium level of fairness concerns. Section 4 concludes.

1. Fairness Concerns and the Endogenous Determination of Preferences

1.1 Preferences with a fairness concern

One of the important conclusions of the recent experimental studies is that people frequently choose actions that do not maximize their monetary payoffs. One of the most convincing examples is the ultimatum game experiment in which people consistently reject “unfair” offers even at the expense of reducing their own payoffs. The intuition explaining this result is that people would like to be treated fairly and that this fairness concern may affect their behavior. For example, Akerlof and Yellen (1990), focusing on the labor market, describe several examples and real life stories in which workers, when treated unfairly, react and respond by reducing the effort they invest. In a more general framework, Rabin (1993) incorporates fairness concerns into players’ utility functions effects of imitation and education on preference dynamics – see, e.g., Cavalli-Sforza and Feldman (1981) and Bisin and Verdier (1998).
and studies the effect of such preferences for fairness on the strategic interaction between the players.

Incorporating fairness concerns into individuals’ preferences requires the introduction of a concept of a “fair outcome”, a measure of unfairness and a utility function that takes into account fairness concerns.

A “fair outcome” or a concept of “fairness” is not an objective term. The perception of “fairness” depends on the social environment (for example on “what other people get”) or on the history of the interaction. At this point we therefore refrain from defining a fair allocation and just assume that each player has a perception of what constitutes a “fair outcome”.

When incorporating fairness concerns into individuals’ preferences one can distinguish between two aspects. The first is a global concern for fair outcomes, which implies that players wish that all players, including their opponents, would receive a fair share. The second is a more individualistic concern that captures the fact that players wish to be treated fairly and suffer if they are not, without any concern about a fair treatment of other players. We will adopt in this work only the latter interpretation of fairness concerns.

Moreover, players do not necessarily agree on the concept of fairness as it may depend on the role they play in the game.

When the interaction involves a division of a given pie between two players then an equal division is an obvious candidate for a “fair outcome”. But our model involves an unforeseen event that affects the pie itself. In such a case there is a conflict between the procedural argument of “keeping our initial agreement” and an allocative argument that claims an equal division of the real pie.


In addition, one should distinguish between a fairness concern and a competitive concern (see for example Frank (1984) and Fershtman, Hvide and Weiss (2002)). A competitive concern is an individual’s concern about his position relative to other players (or players that play directly with him). This effect may look somewhat similar to a fairness concern whenever players associate a “fair pay” with what other
Consider a strategic interaction between two players and assume that the market interaction is affected by the prevailing legal rule $L$. Let $\Theta(L)$ be the outcome of the interaction and let $M_i(\Theta(L))$ be player $i$’s monetary payoff. Let $\Theta_i^F(L)$ be player $i$’s perception of a fair outcome given the legal regime $L$ and let $M_i(\Theta_i^F(L))$ be player $i$’s monetary payoffs when the fair outcome is reached.\(^\text{12}\)

In order to capture fairness concerns we introduce an “unfairness cost”. Player $i$ incur an unfairness cost whenever $M_i(\Theta) < M_i(\Theta_i^F)$. In this case, the unfairness cost will be $\text{Max}\{0, \sigma(M_i(\Theta_i^F) - M_i(\Theta))\}$, where $\sigma \in [0, \infty)$ represents the intensity of the player’s fairness concerns. Player $i$’s utility in such case is given by:

$$U = M_i(\Theta(L)) + \text{Max}\{0, \sigma(M_i(\Theta_i^F(L)) - M_i(\Theta(L)))\}.$$ 

### 1.2 Endogenous determination of preferences with a fairness concern

While our focus is on fairness concerns we will not impose such preferences exogenously but rather derive them endogenously. The dynamics of preferences formation will be affected by the market outcome. The legal rule will affect preferences through its effect on the market outcome.

Consider a population with a large number of individuals who may be of different types. Let $\theta \equiv \{\theta_1, \ldots, \theta_n\}$ be the set of possible types (or preferences). We assume that preferences are of the type described in the previous section. Hence, players may have

\(^\text{12}\) Due to the subjective context-dependent nature of fairness, we allow $\Theta_i^F(L)$ to change from one period of the interaction to the next. We also allow the parties to hold different conceptions of fairness.
different levels of fairness concerns, including no fairness concern at all, or different perceptions of what constitutes a fair outcome. The distribution of types is given by \( q = (q_1, \ldots, q_n) \in Q \), such that \( q_i \) is the percentage of type \( \theta_i \) in the population.

Each period there is a random matching and each pair of players is engaged in some market game (buying and selling for example).\(^{13}\) The outcome of the market interaction is affected by the types of the two players and by the prevailing legal rule \( L \), and will be denoted as \( \Theta(\theta_i, \theta_j; L) \).\(^{14}\) The monetary payoff of a player of type \( \theta_i \) that is matched with a player of type \( \theta_j \) when the legal rule is \( L \) is given by \( M_i(\Theta(\theta_i, \theta_j; L)) \).

The basic structure of the endogenous preferences approach entails that the preference distribution at period \( t+1 \) depends on the preference distribution at period \( t \) and on the outcome of the market game at period \( t \). A process of imitation, learning, evolution or cultural transmission may induce such population dynamics. Since the outcome of the market game is affected by the prevailing legal rule \( L \), the link between \( L \) and the evolution of preferences is established.

We will follow the evolutionary approach and assume that the dynamics of preferences is governed by economic success. In such a case the percentage of people of a certain type increases whenever its monetary gains is larger than the monetary gains of other types of individuals. Letting \( M_i(q, L) \) be the average monetary payoff of players of type \( \theta_i \) we assume that \( q_{i+1} = \prod(q_i; M_1(q_1, L), \ldots, M_n(q_n, L)) \).

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\(^{13}\) In the market interaction we consider only groups of two but one can realize that our analysis may be easily generalized to interactions among larger groups.

\(^{14}\) We assume that for every pair of types and legal rule there is a unique equilibrium that defines the outcome of the game.
For every initial distribution of preferences $q_0$, and a legal rule $L$, we can define $q^f(q_0, L)$ as the limit of the above preference dynamics process. The steady state condition is:

$$q^f(q_0, L) = \Gamma(q^f(q_0, L), M_1(q^f(q_0, L), L), \ldots, M_n(q^f(q_0, L), L)).$$

A preference profile $q^*$ is stable under the legal rule $L$ if there is a small neighborhood of $q^*$ such that for every $q'$ in this neighborhood, $q^f(q', L) = q^*$.

In our analysis we use the above dynamics to associate each legal rule $L$ with a specific type of fairness concern. We define a fairness concern, $\sigma(L)$, such that given the legal rule $L$, a population in which all individuals share a fairness concern of $\sigma(L)$ is evolutionary stable. Namely, if some small group of individuals with a different fairness concern, or no fairness concern at all, enters this population, their monetary gains in the market interaction will be lower than that of players of type $\sigma(L)$. We study the properties of the $\sigma(L)$ function, focusing on the relationship between the prevailing legal rule and the individuals’ fairness concern.

2. The Model

Consider a population with a large number of individuals. In each period a random matching divides this population into pairs, of one seller and one buyer. The market interaction lasts one period during which a trade between the players may takes place. The process of random matching and trading repeats itself every period.

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15 Clearly, this limit does not necessarily exist, but we ignore this issue for now and assume a convergence of the population dynamics process.

16 For a discussion and a formal definition see Maynard Smith (1982) and Weibull (1995).
2.1 The Market Interaction

Consider a seller (he) and a buyer (she) contracting over the sale of one indivisible asset. At time 1 the two parties sign the “original contract” which specifies the delivery of the asset by the seller to the buyer in exchange for a payment, $p$. The value of the asset to the buyer is $v$ while the seller’s cost of creating the asset (or parting from it) is assumed to be $c(<v)$. At this initial contracting stage the players do not anticipate any possible change in the cost of providing the good or in the value of the good to the seller. Thus the “original contract” only specifies the price $p$ that the parties have agreed upon.\footnote{This is clearly an incomplete contract. In particular, the contract is incomplete in the sense that it is not contingency specific, that is, it does not specify the optimal provisions for every possible contingency. See, e.g. Shavell (1984), Hart (1995), Hermelin and Katz (1993), and Ayers and Gertner (1989, 1992).}

After time 1 there is a probability $q$ that a random shock will increase the cost of providing the good to $C > c$. We assume that $v > C$ such that the transaction is still efficient, even after the increase in performance cost. We further assume that this high cost contingency is totally unforeseen by the players and thus cannot be part of the original contract.

If the unanticipated change of circumstances does not occur the players trade the good according to the original contract. If the unanticipated change does occur, the seller may perform the contract at the original price or he may demand a modification of the contract. In such a case the buyer must decide whether to succumb and renegotiate the original contract, or to reject this demand. If the buyer refuses to renegotiate, the seller then must decide whether to perform or breach the original contract. If the buyer agrees to renegotiate, then at time 2 renegotiation commences and the two parties negotiate a
price increase, $\Delta p$. If they reach an agreement the modified contract is executed, otherwise the seller decides whether to perform or to breach the original contract.

Finally, at time 3, if the seller breached the contract, the buyer files suit for the recovery of damages, or for specific performance of the contract. The law determines the remedy for breach of contract. We represent this remedy by $D$, and we hereafter refer to $D$ as the prevailing legal rule. The remedy $D$ is measured in monetary terms and stated gross of the original price, $p$. Thus, litigation implies that the seller gets a monetary payoff of $p - D$ while the buyer gets $D - p$.

2.2 The Original Contract

We first discuss the original contract. We begin by describing the parties’ preferences at time 1. We then derive the contract price, $p$.

2.2.1 Preferences

We assume that players (may) have fairness concerns, with unfairness costs as described in Section 1. Buyers and sellers are assumed to come from a single population, where a common fairness concern $\sigma \in [0, \infty)$ prevails. In the initial stage of the market interaction the buyer and the seller must agree on a sale price, $p$, which determines the division of surplus between the two parties. Hence, in such a case it is natural to define the “equal split of surplus” as the fair outcome for both the seller and the buyer. Given that the

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18 Specific enforcement entails a court-issued injunction forcing the seller to perform under a threat of imprisonment (for contempt of court).
19 In this framework, specific performance is represented by $D = \infty$.
20 Numerous studies have demonstrated that the equal split is considered by many to be the fair outcome. See, e.g., Ochs and Roth (1989), Guth et al. (1982), Kahneman et al. (1986). Frank (1988) has proposed the following definition of a fair transaction: “A fair transaction is one in which the surplus is divided
value of the good for the buyer is \( v \) while the cost of production for the seller is \( c \) an equal split of the surplus yields a fair price of \( \frac{1}{2}(v+c) \).

Thus, the seller’s utility function, given a contract price of \( p \), is given by

\[
U_S(p, \sigma) \equiv y_S + (p - c) - \max\{0, \sigma \cdot \left[ \frac{1}{2}(v + c) - p \right]\},
\]

where \( y_S \) is the seller’s income. Similarly, the buyer’s utility, given a contract price of \( p \), is given by

\[
U_B(p, \sigma) \equiv y_B + (v - p) - \max\{0, \sigma \cdot \left[ p - \frac{1}{2}(v + c) \right]\},
\]

where \( y_B \) is the buyer’s income.

### 2.2.2 The Contract

The contract is determined by a bargaining between the two players. We do not model the bargaining game explicitly. Rather, we simply assume that the parties will agree on a contract price of \( p = \frac{1}{2}(R_S + R_B) \), where \( R_S \) and \( R_B \) are the reservation prices of the seller and the buyer, respectively.\(^{21}\)

The seller will sell the good at a price \( p \) as long as this trade provides him with utility greater than his alternative no-trade utility, \( U_S = y_S \). Thus, the lowest price the seller will be willing to consider is:

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\(21\) This reduced form account of the bargaining game may represent an equal bargaining power assumption. Note, however, that our account of the bargaining outcome is not the only plausible account. At this stage of the game both players agree with the definition of a “fair price” and both suffer if they get less than this outcome. In such a case the fair price can also be a possible candidate for agreement. However, in such a case the agreed contract will not reflect the players fairness concern and the fact that they may differently evaluate deviation from such a price.
The buyer will purchase the good at a price $p$ as long as this trade provides her with utility greater than her alternative no-trade utility, $U_B = y_B$. Thus, the highest price the buyer will be willing to consider is:

$$R_B(\sigma) = \frac{1}{1 + \sigma} \cdot v + \frac{\sigma}{1 + \sigma} \cdot \left[\frac{1}{2} (v + c)\right].$$

Given the parties reservation prices the original contract price will set the “fair price”:

$$p(\sigma) = \frac{1}{2} (R_S(\sigma) + R_B(\sigma)) = \frac{1}{2} (v + c).$$

### 2.3 The Renegotiation Stage

If an “unanticipated” change of circumstances increases the seller’s cost of performance to $C > c$, the seller may try to renegotiate the original contract and to obtain a higher price. However, the buyer will refuse to renegotiate the original contract unless the seller has a credible threat to breach. Let $U^O_S$ and $U^O_B$ denote the utility to the seller and the buyer, respectively, from performance of the original contract, and let $U^B_S(D)$ and $U^B_B(D)$ denote their respective utilities in case of breach. The seller will have a credible threat if and only if $U^B_S(D) > U^O_S$. In such a case the seller prefers to breach the contract rather than to sell the item at the original price.

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22 Note that a seller with no fairness concern, i.e. $\sigma = 0$, has a reservation price $R_S = c$. And, when $\sigma \rightarrow \infty$, a seller will not accept anything below the fair price, i.e. $R_S = (v + c)/2$.

23 Note that a buyer with no fairness concern, i.e. $\sigma = 0$, cares only about the value of performance, i.e. $R_B = v$. And, a buyer with $\sigma \rightarrow \infty$, will not pay anything above the fair price.
If the seller’s threat to breach is credible, the players negotiate a price increase of \( \Delta p \). Let \( U^M_S(\Delta p, \sigma) \) and \( U^M_B(\Delta p, \sigma) \) denote the utility to the seller and the buyer, respectively, from performance of a modified contract that specifies a price increase of \( \Delta p \). We follow the same negotiation procedure as in the first stage. Let \( R^2_s(\sigma; D) \) denote the seller’s reservation price at this stage, such that \( R^2_s(\sigma; D) \) is the minimum price increase that the seller would accept. The seller’s reservation price can be derived from equating the utility from breaching to the utility from performing the modified contract, i.e., \( U^M_S(R^2_s(\sigma; D), \sigma) = U^B_S(D) \). The buyer’s reservation price \( R^2_b(\sigma; D) \) is defined similarly, such that \( U^M_B(R^2_b(\sigma; D), \sigma) = U^B_B(D) \). The buyer will prefer buying at the modified price rather breaching the contract as long as \( \Delta p \leq R^2_b(\sigma; D) \).

When \( R^2_b(\sigma; D) < R^2_s(\sigma; D) \), the minimum price increase demanded by the seller is greater than the maximum price increase that the buyer is willing to pay, and the two players will not be able to agree on a modification. However, when \( R^2_b(\sigma; D) \geq R^2_s(\sigma; D) \), the players would agree on a modified price of:

\[
\Delta p(\sigma; D) = \frac{1}{2} \left[ R^2_s(\sigma; D) + R^2_b(\sigma; D) \right]
\]

We continue to assume that players perceive an equal split of the actual surplus to be the fair outcome. Thus, if the cost of performance rises to \( C \), the fair price becomes

\[\text{\footnotesize\textsuperscript{24}}\text{ We assume that the modified contract is enforceable, as conventional in the incomplete contracts literature (see, e.g., Hart (1995), ch. 2). It should be noted, however, that current law does not unconditionally enforce modifications. Still, modifications that are based on credible threats to breach are likely to be enforced, at least according to one account of the current doctrine (see Bar-Gill and Ben-Shahar (2002a)), and in this model all modifications will be backed by a credible threat.}\]
In such a case, the seller’s utilities from performing the original contract, performing the modified contract and breaching the contract are given by

\[ U_S^O = y_S + p - C - \max\{0, \sigma \cdot \left[ \frac{1}{2}(v + C) - p \right] \}, \]

\[ U_S^M(\Delta p, \sigma) = y_S + p + \Delta p - C - \max\{0, \sigma \left[ \frac{1}{2}(v + C) - (p + \Delta p) \right] \}, \] and

\[ U_S^B(D) = y_S + p - D. \]

And, the buyer’s utilities from performance of the original contract, performance of the modified contract and breach of the contract are given by

\[ U_B^O = y_B + v - p - \max\{0, \sigma \cdot \left[ p - \frac{1}{2}(v + C) \right] \}, \]

\[ U_B^M(\Delta p, \sigma) = y_B + v - p - \Delta p - \max\{0, \sigma \left[ p + \Delta p - \frac{1}{2}(v + C) \right] \}, \] and

\[ U_B^B(D) = y_B - p + D. \]

We can now state the following observation:

**Observation 1:** Assuming \( D > v - \frac{1}{2}(C - c) \).
(i) When $D > C + \sigma \cdot \frac{1}{2}(C-c)$, the seller does not have a credible threat, there will be no modification, and the original contract will be performed.

(ii) When $D \leq C + \sigma \cdot \frac{1}{2}(C-c)$, the seller has a credible threat, the seller’s reservation price is:

$$R_s^2(\sigma; D) = \frac{1}{1+\sigma} \cdot \left[ - (D - C) \right] + \frac{\sigma}{1+\sigma} \cdot \frac{1}{2}(C-c) \left( < \frac{1}{2}(C-c) \right),$$

and the buyer’s reservation price is:

$$R_b^2(\sigma; D) = v - D \left( < \frac{1}{2}(C-c) \right).$$

Therefore -

(a) When $R_s^2(\sigma; D) \leq R_b^2(\sigma; D)$ or $D \leq v - \frac{1}{2}(C-c) + (v-C)/\sigma$, a modification will be reached, and the original contract price will be increased by

$$\Delta p(\sigma; D) = \frac{1}{2} \left[ \frac{1}{1+\sigma} \cdot \left[ - (D - C) \right] + \frac{\sigma}{1+\sigma} \cdot \frac{1}{2}(C-c) + (v-D) \right].$$

(b) When $R_s^2(\sigma; D) > R_b^2(\sigma; D)$ or $D > v - \frac{1}{2}(C-c) + (v-C)/\sigma$, there will be no modification, and the seller will breach the contract.

**Proof:** See the Appendix.

Remarks:

(i) The seller has a credible threat to breach if and only if the fairness concern is sufficiently large, i.e. $\sigma \geq \frac{D-C}{\frac{1}{2}(C-c)}$ (which is equivalent to $D \leq C + \sigma \cdot \frac{1}{2}(C-c)$).

Without a credible threat, there will be no modification, and the seller will perform the

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27 Note that $R_s^2(\sigma; D) \geq 0$ whenever the seller has a credible threat, i.e. whenever $D \leq C + \sigma \cdot \frac{1}{2}(C-c)$. 
original contract. Note that without fairness concerns the seller’s threat to breach would be credible \textit{if and only if} \( C > D \). Allowing for an “unfairness cost” bolsters the credibility of the seller’s threats, so that the seller may have a credible threat even when \( C < D \). In such a case the seller is willing to breach the contract, even though he will suffer a monetary loss, simply because he prefers not to succumb to a contract which he feels is unfair.\(^{28}\)

(ii) Even when the seller has a credible threat to breach the contract the buyer will not necessarily agree to pay more than what was stipulated in the original contract. Indeed, if the buyer could force the seller to perform the original contract by suing for specific performance, or if the buyer could obtain perfectly compensatory damages in case the seller breaches the original contract, then she would never agree to any price increase. However, often the effective legal remedy available to the buyer is significantly under-compensatory, namely \( D < v \).\(^{29}\) In such cases, the buyer may prefer to ensure performance by conceding to a price increase, rather than opting for the prolonged and imperfect litigation process. Generally, when the law provides the buyer with stronger remedies, it reduces the buyer’s loss from breach, and thus lowers the maximum price concession that the buyer will be willing to make at the renegotiation stage to ensure performance.

\(^{28}\) See Bar-Gill and Ben-Shahar (2002b). See also Frank (1988), p. 167: “Suppose we assume that buyers care strongly about fairness as defined. In particular, suppose they have a strong aversion to receiving less than 50 percent of the surplus. (Many people, of course, will feel no difficulty about receiving \textit{more} than half. But as we will see, a surprisingly large number choose a 50-50 split over one that gives them a larger share.) My simple definition of fairness, coupled with the assumed aversion to unfairness, yields a “fairness model” with the following specific prediction: \textit{People will sometimes reject transactions in which the other party gets the lion’s share of the surplus, even though the price at which the product sells may compare favorably with their own reservation price}.”

\(^{29}\) See Schwartz (1979). See also Bar-Gill and Ben-Shahar (2002a), \textit{Austin Instrument, Inc. v. Loral Corp.}, 272 N.E.2d 533, 535 (NY, 1971) (“the threatened party could not obtain the goods from another source and that the ordinary remedy of an action for breach of contract would not be adequate.”)
(iii) At the stage 1 negotiations, a stronger fairness concern could only improve a party’s position. At the stage 2 renegotiations, however, an excessive fairness concern might generate material costs. On the one hand, preferences for fairness may bolster the credibility of the seller’s threat to breach and increase his reservation price, leading to a larger price increase and to a higher material payoff. But, on the other hand, an excessive fairness concern might raise the seller’s reservation price above $R^2_B(\sigma;D)$, leading to a breakdown in renegotiations. Such a breakdown entails inefficient breach and consequently material loss to both parties. The relative importance of these countervailing effects will be determined by the legal rule, $D$. Stronger legal remedies (i.e. a higher $D$) reduce $R^2_B(\sigma;D)$, thus lowering the critical level of fairness concerns, above which negotiations will break down, leading to an inefficient breach.

2.4 Payoffs

Using the above specifications, we can now derive the parties’ ex ante payoffs. The seller’s payoff is:

\[
\Pi_s(\sigma;D) = p - (1-q) \cdot c + q \cdot \begin{cases} 
-C & , R^2_s(\sigma;D) < 0 \\
\Delta p(\sigma;D) - C & , R^2_s(\sigma;D) \in \left[0, R^2_B(D)\right] \\
-D & , R^2_s(\sigma;D) > R^2_B(D) 
\end{cases}
\]

The buyer’s payoff is:

\[
\Pi_b(\sigma;D) = -p + (1-q) \cdot v + q \cdot \begin{cases} 
v & , R^2_s(\sigma;D) < 0 \\
v - \Delta p(\sigma;D) & , R^2_s(\sigma;D) \in \left[0, R^2_B(D)\right] \\
D & , R^2_s(\sigma;D) > R^2_B(D) 
\end{cases}
\]

3. Fairness Concerns and the Legal Rule
We can now utilize the model developed in section 2 to study the implications of different legal rules (i.e. different levels of \( D \)) on the formation of fairness concerns. First, it is important to emphasize that the standard incentive effects of the legal rule are maintained in our model. These effects are briefly discussed in section 3.1, focusing on the interaction between these effects and the parties’ fairness concerns. However, beyond the standard incentive effects, our endogenous preferences framework captures the effects of the law on individuals’ fairness concerns. In section 3.2 we examine the effects of fairness concerns on an individual’s fitness. In section 3.3 we focus on the role of the legal rule in shaping a population’s preferences for fairness.

3.1 Incentive Effects and the Impact of Fairness

As recognized by the law and economics literature, the legal rule provides incentives that affect the parties’ behavior. The legal rule, \( D \), affects the credibility of the seller’s threat to breach, as well as the minimum price increase that the seller will accept when he has such a credible threat. The legal rule also affects the maximum price concession that the buyer will consider. Consequently, the legal rule determines whether a modification will be reached. It also determines the new price, i.e. the terms of the modification, when the renegotiation is successful. The incentive effects of the legal remedy, \( D \), in a model with fairness concerns are summarized in the following observation.

**Observation 2:** Assuming \( D > v - \frac{1}{2}(C - c) \), a higher \( D \) -

(i) Reduces the seller’s stage 2 reservation price; the magnitude of this effect is decreasing in the magnitude of the fairness concern;
(ii) Reduces the buyer’s stage 2 reservation price;

(iii) Reduces the magnitude of the potential price increase in the contract modification stage; the magnitude of this effect is decreasing in the magnitude of the fairness concern.

**Proof:** See the Appendix.

The intuition for these results is as follows. In the renegotiation stage, a higher $D$ worsens the seller’s bargaining position and improves the buyer’s bargaining position. Therefore, a higher $D$ makes it increasingly difficult for the seller to extract a price modification. And, even when the seller has a credible threat, a higher $D$ reduces the magnitude of the price increase that the seller can hope to attain. In addition, a higher $D$ reduces the buyer’s willingness to succumb to a modification (even when the seller has a credible threat).\(^{30}\)

### 3.2 Fairness and Fitness

We assume an indirect evolutionary approach and let preferences be determined endogenously. We further assume that the fitness in this evolutionary process is the players’ monetary payoffs. That is, the percentage of each type in the population changes over time according the economic success of this player type.

We focus on homogenous populations, where all individuals share the same preferences for fairness, $\hat{\sigma}$, as determined by prevalent norms in that population. Since buyers and sellers are taken from a single population (each player has a 50% chance of

\(^{30}\) Moreover, since $|\frac{\partial R_s^2}{\partial D}| > |\frac{\partial R_b^2}{\partial D}| \quad \forall \sigma > 0$, higher damages decrease the range where a modification will be agreed.
being a buyer and a 50% chance of being a seller), the fitness of an individual in this population is given by

$$f(\hat{\sigma}; D) = \frac{1}{2} \left[ \Pi_b(\hat{\sigma}; D) + \Pi_s(\hat{\sigma}; D) \right].$$

Let $f(\sigma; \hat{\sigma}, D)$ be the fitness of a player with a fairness concern $\sigma$, in a population of players with a fairness concern $\hat{\sigma}$.

$$f(\sigma; \hat{\sigma}, D) = \frac{1}{2} \left[ \Pi_b(\hat{\sigma}, \sigma; D) + \Pi_s(\sigma, \hat{\sigma}; D) \right],$$

where $\Pi_s(\sigma, \hat{\sigma}; D)$ is the payoff to a player with $\sigma$, when as a seller he meets a buyer with $\hat{\sigma}$, and $\Pi_b(\hat{\sigma}, \sigma; D)$ is the payoff to a player with $\sigma$, when as a buyer, he meets a seller with $\hat{\sigma}$. Specifically,

$$\Pi_s(\sigma, \hat{\sigma}; D) = p(\sigma, \hat{\sigma}) - (1 - q) \cdot c + q \cdot \begin{cases} -C & , R_s^2(\sigma, \hat{\sigma}; D) < 0 \\ \Delta p(\sigma, \hat{\sigma}; D) - C & , R_s^2(\sigma, \hat{\sigma}; D) \in [0, R_s^2(D)] \\ -D & , R_s^2(\sigma, \hat{\sigma}; D) > R_s^2(D) \end{cases}$$

and

$$\Pi_b(\hat{\sigma}, \sigma; D) = -p(\hat{\sigma}, \sigma) + (1 - q) \cdot v + q \cdot \begin{cases} v & , R_b^2(\hat{\sigma}, \sigma; D) < 0 \\ \Delta p(\hat{\sigma}, \sigma; D) & , R_b^2(\hat{\sigma}, \sigma; D) \in [0, R_b^2(D)] \\ D & , R_b^2(\hat{\sigma}, \sigma; D) > R_b^2(D) \end{cases}$$

### 3.2 Law and Fairness

We now solve for the evolutionary stable fairness concern $\hat{\sigma}$, and study the effects of the legal environment, as captured by the parameter $D$, on the equilibrium fairness level. A population with a fairness concern, $\hat{\sigma}$, is said to be evolutionary stable if and only if for every $\sigma$, $\sigma \neq \hat{\sigma}$: $f(\sigma; \hat{\sigma}, D) < f(\hat{\sigma}, D)$ (e.g., Mainard Smith (1982), Weibull (1995)).

We can now use the above analysis to find the evolutionary stable fairness concern.
Proposition 1: Assuming $D > v - \frac{1}{2} (C - c)$ \(^{31}\) -

(i) A homogenous population with no fairness concern, i.e. with $\hat{\sigma} = 0$, is unstable.

(ii) The unique evolutionary stable homogeneous population shares a fairness concern of $\hat{\sigma}(D) = \frac{v-C}{\frac{1}{2}(C-c)-(v-D)}$;

(iii) A higher level of legal damages, $D$, reduces the common fairness concern in the population.

Proof: See the Appendix.

The intuition for these results is as follows:

(i) A population with no fairness concerns is unstable, since a player with a higher fairness concern will outperform the other members of the population. A greater fairness concern improves the stage 1 prices, without any effect on stage 2, since there will be no credible threat to breach and hence no renegotiation.\(^{32}\)

(ii) The stable fairness concern $\hat{\sigma}(D) = \frac{v-C}{\frac{1}{2}(C-c)-(v-D)}$ is the maximal fairness concern for which the stage 2 renegotiations do not break down (and is defined by

---

\(^{31}\) If $D \leq v - \frac{1}{2} (C - c)$, then since there is no fear of breakdown in the stage 2 renegotiations, any population with a fairness concern $\hat{\sigma}$ can be invaded by a mutant with a higher fairness concern. Therefore, there is no stable population. Or, if we assume a cap $\overline{\sigma}$ on the possible levels of fairness concerns, then the stable population will share a fairness concern of $\overline{\sigma}$. Anyway, there is no effect of $D$ on $\hat{\sigma}$.

\(^{32}\) Assuming that $C < D$, if $C > D$, then a credible threat exists even without fairness concerns (or even with only very weak fairness concerns). In this case, a stronger fairness concern will further increase a player’s payoff by improving her position in the stage 2 renegotiations.
A population sharing this fairness concern cannot be invaded by a mutant with a weaker fairness concern. Such a mutant will be in a less favorable bargaining position in both the stage 1 negotiations and the stage 2 renegotiations. The population is also immune against invasion by a mutant with a stronger fairness concern. The excessive fairness concern will induce breakdown in the renegotiation stage, leading to inefficient breach.

(iii) The upper limit on the population’s fairness concern is imposed by the threat of breakdown in the stage 2 renegotiation, and the resulting inefficient breach, that are a result of excessive fairness concerns. These inefficiencies will occur when the seller, empowered by a strong fairness concern, demands more than the buyer is willing to concede. A higher level of damages, \(D\), reduces the buyer’s loss from breach, and thus lowers the maximum price concession that the buyer will make at stage 2 to ensure performance. To avoid inefficient breaches, a weaker fairness concern will evolve.

4. Concluding Remarks

33 Note that the fitness given \(\hat{\sigma} = \hat{\sigma}_2\) is identical to the fitness given \(\hat{\sigma} = 0\), but the outcome is different. When \(\hat{\sigma} = 0\), there is no modification (if \(C < D\), whereas a modification is agreed upon when \(\hat{\sigma} = \hat{\sigma}_2\).

34 If the mutant has a sufficiently weak fairness concern, then it might not have a credible threat to breach, thus precluding any stage 2 price increase.

35 This stage 2 inefficiency outweighs the stage 1 advantage provided by a greater fairness concern, at least as long as the mutant’s fairness concern is not too high. See the proof of proposition 1 in the appendix.

36 Other less dominant effects of the damages measure, \(D\), include the following. A higher level of damages, \(D\), reduces the seller’s \(T = 1\) reservation price. Therefore, (1) a stronger preference for fairness will be needed to generate a credible threat of breach, i.e. to get \(R_S^2 > 0\); and (2) a stronger preference for fairness will be needed before the seller’s modification demand exceeds the buyer’s maximum concession, i.e. before \(R_S^2 > R_B^2\). In a stochastic environment, where negotiation breakdown at time 1 cannot be prevented with certainty two additional effects appear. When \(D\) is higher, the prospect of failed negotiations at time 1 would be more painful for the seller, supporting a weaker preference for fairness. On the other hand, the prospect of failed negotiations at time 1 would be less painful for the buyer, supporting a stronger preference for fairness.
In the basic law and economics framework individuals’ preferences are exogenously given. Consequently, the economic analysis of law has focused on the incentive effects of legal rules. But, preferences, social norms and other cultural attributes are in constant change, and these changes are not all exogenous. They may be the outcome of imitation, learning and other cultural transmission mechanisms. This paper has argued that legal rules do more than provide incentives. They affect the dynamic formation of preferences and norms. They change people. This understanding extends the traditional setting or boundaries of law and economics. Some focus on the educational aspect of changing preferences. Others perceive endogenous preferences as a tool in overcoming market failures. Without entering this and other important debates, this paper demonstrates that while preference formation will likely remain a controversial subject, one cannot ignore the interdependence between the prevailing legal rules and the preferences that emerge.
25

References


Appendix

Proof of Observation 1:

(i) Comparing (7) and (9), we find that the seller does not have a credible threat to breach when \( D > C + \sigma \cdot \frac{1}{2} (C - c) \). Absent a credible threat to breach, there will be no modification, and the seller will perform the original contract.

(ii) Comparing (7) and (9), we find that the seller has a credible threat to breach when \( D \leq C + \sigma \cdot \frac{1}{2} (C - c) \). When a credible threat exists, the seller’s reservation price, \( R_s^2(\sigma; D) \), can be found by comparing \( U_s^M(\Delta p, \sigma) \) (eq. (8)) and \( U_s^{br}(D) \) (eq. (9)). That is, the seller would prefer performance of the modified contract if and only if \( U_s^M(\Delta p, \sigma) > U_s^{br}(D) \), i.e., iff

\[
y_s + \Delta p - C - \text{Max}\{0, \sigma \cdot \left[ \frac{1}{2} (C - c) - \Delta p \right] \} > y_s + p - D,
\]

or after simplifying iff

\[
\Delta p - C - \text{Max}\{0, \sigma \cdot \left[ \frac{1}{2} (C - c) - \Delta p \right] \} > -D.
\]

Since \( D > v - \frac{1}{4} (C - c) \) implies \( D > C - \frac{1}{4} (C - c) \) (or \( \frac{1}{4} (C - c) + (D - C) > 0 \)), we know that given a price increase \( \Delta p \geq \frac{1}{4} (C - c) \), the seller would prefer performance to breach. In this case, the seller’s reservation price at the renegotiation stage is:

\[
R_s^2(\sigma; D) = \frac{1}{1 + \sigma} \cdot \left[ (D - C) \right] + \frac{\sigma}{1 + \sigma} \cdot \frac{1}{4} (C - c) \left( < \frac{1}{2} (C - c) \right).^{37}
\]

Comparing (11) and (12), we find that when \( D > v - \frac{1}{4} (C - c) \) the buyer’s reservation price is:

\[
R_b^2(\sigma; D) = v - D \left( < \frac{1}{2} (C - c) \right).^{38}
\]

If \( R_s^2(\sigma; D) \leq R_b^2(\sigma; D) \), the parties will agree on a price increase of:

---

37 Note that \( R_s^2(\sigma; D) \geq 0 \) whenever the seller has a credible threat, i.e. whenever \( D \leq C + \sigma \cdot \frac{1}{2} (C - c) \).

38 When \( D \leq v - \frac{1}{4} (C - c) \), the buyer’s reservation price is:

\[
R_b^2(\sigma; D) = \frac{1}{1 + \sigma} \cdot (v - D) + \frac{\sigma}{1 + \sigma} \cdot \frac{1}{4} (C - c) \left( > \frac{1}{2} (C - c) \right).
\]

Since \( R_s^2(\sigma; D) < \frac{1}{4} (C - c) \), \( R_s^2(\sigma; D) \leq R_b^2(\sigma; D) \) and modification is always feasible.
\[ \Delta p(\sigma; D) = \frac{1}{2} \left[ R^2_{\text{DS}}(\sigma; D) + R^2_{\text{DB}}(\sigma; D) \right] = \frac{1}{2} \left[ \frac{1}{1 + \sigma} \cdot [- (D - C)] + \frac{\sigma}{1 + \sigma} \cdot \frac{1}{2} (C - c) + (v - D) \right]. \]

If \( R^2_{\text{DS}}(\sigma; D) > R^2_{\text{DB}}(\sigma; D) \), the parties will not agree on a price increase, and the seller will breach the contract.

QED

**Proof of Observation 2:**

Using the expressions for \( R^2_{\text{DS}}(\sigma; D) \), \( R^2_{\text{DB}}(\sigma; D) \) and \( \Delta p(\sigma; D) \), as derived in observation 1, we obtain:

(i) \[ \frac{\partial R^2_{\text{DS}}}{\partial D} = -\frac{1}{1 + \sigma} < 0 \]

(ii) \[ \frac{\partial R^2_{\text{DB}}}{\partial D} = -1 < 0 \]

(iii) \[ \frac{\partial (\Delta p)}{\partial D} = -\frac{1}{2} \cdot \frac{2 + \sigma}{1 + \sigma} < 0 \]

QED

**Proof of Proposition 1:**

(i) and (ii): The fitness function of an individual with a fairness concern, \( \sigma \), in a homogeneous population that shares a fairness concern, \( \hat{\sigma} \), is:

\[
\begin{align*}
    f(\sigma; \hat{\sigma}, D) &= \frac{1}{2} \cdot \left[ (p(\sigma, \hat{\sigma}) - p(\hat{\sigma}, \sigma)) + (1 - q) \cdot (v - c) + \right. \\
    &\left. \begin{cases}
        v & , R^2_{\text{DS}}(\hat{\sigma}, \sigma, D) < 0 \\
        v - \Delta p(\hat{\sigma}, \sigma, D) & , R^2_{\text{DS}}(\hat{\sigma}, \sigma, D) \in \left[0, R^2_{\text{DS}}(D)\right] \\
        -C & , R^2_{\text{DS}}(\hat{\sigma}, \sigma, D) > R^2_{\text{DS}}(D) \\
        D & , R^2_{\text{DB}}(\hat{\sigma}, \sigma, D) < 0 \\
        q \cdot [-C + \Delta p(\hat{\sigma}, \sigma, D) & , R^2_{\text{DS}}(\hat{\sigma}, \sigma, D) \in \left[0, R^2_{\text{DS}}(D)\right] \\
        -D & , R^2_{\text{DB}}(\hat{\sigma}, \sigma, D) > R^2_{\text{DB}}(D) \\
    \end{cases}
\end{align*}
\]

In an evolutionary stable homogeneous population the common fairness concern \( \hat{\sigma} \) must satisfy: \( \hat{\sigma} \in \arg \max_{\sigma} f(\sigma; \hat{\sigma}, D) \). We thus focus on \( f(\sigma = \hat{\sigma}; \hat{\sigma}, D) \), and check for which
values of $\hat{\sigma}$, $\sigma = \hat{\sigma}$ maximizes the fitness function. As a first step, we derive the two threshold values of $\hat{\sigma}$ that are implied by (16a). The first threshold value is defined by $R^2_s(\hat{\sigma}, \hat{\sigma}, D) = 0$. Using the expression for $R^2_s(\sigma; D)$, as derived in observation 1, we obtain: $\hat{\sigma}_1 = \frac{D - C}{\frac{2}{3}(C - c)}$. The second threshold value is defined by $R^2_s(\hat{\sigma}, \hat{\sigma}, D) = R^2_s(D)$. Using the expressions for $R^2_s(\sigma; D)$ and $R^2_s(\sigma; D)$, as derived in observation 1, we obtain: $\hat{\sigma}_2 = \frac{v - C}{\frac{2}{3}(C - c) - (v - D)}$. Clearly, $\hat{\sigma}_1 < \hat{\sigma}_2$.\(^39\) The two threshold values determine three ranges of $\hat{\sigma}$ that need to be examined:

1) $\hat{\sigma} < \hat{\sigma}_1$: Any homogenous population with a fairness concern in this range is necessarily unstable. A mutant with a greater fairness concern will outperform other members of the population. Such a mutant will attain more favorable stage 1 prices, without any adverse consequences in the renegotiation stage.

2) $\hat{\sigma} > \hat{\sigma}_2$: Any homogenous population with a fairness concern in this range is necessarily unstable, since it can always be invaded by a mutant with a greater fairness concern, $\sigma > \hat{\sigma}$. Members of the population never reach an agreement at the stage 2 renegotiations, leading to inefficient breach. A mutant with a greater fairness concern will likewise fail to reach agreement at the stage 2 renegotiations, but this mutant will attain more favorable stage 1 prices.

3) $\hat{\sigma} \in [\hat{\sigma}_1, \hat{\sigma}_2)$: Any homogenous population with a fairness concern below $\hat{\sigma}_2$ is necessarily unstable. To see this, take the derivative of the fitness function, $f(\sigma = \hat{\sigma}; \hat{\sigma}, D)$, with respect to $\sigma$ at any $\hat{\sigma} \in [\hat{\sigma}_1, \hat{\sigma}_2)$:

\(^39\) By assumption, $D > v - \frac{1}{2}(C - c)$. Hence, $\hat{\sigma}_1 > 0$.

\(^40\) This range disappears if $D \leq C$ such that $\hat{\sigma}_2 \leq 0$. 
The positive derivative means that any homogeneous population with a fairness concern \( \sigma \in [\hat{\sigma}, \hat{\sigma}_2) \) can be successfully invaded by a mutant with a slightly greater fairness concern.

We have thus far shown that any fairness concern other than \( \hat{\sigma}_2 \) is unstable. To prove that a population with \( \hat{\sigma}_2 \) is stable, we verify that no mutant can outperform this population. The analysis of ranges 1 and 3 implies that no mutant with \( \sigma < \hat{\sigma}_2 \) can invade the \( \hat{\sigma}_2 \) population. It remains to prove that no mutant with \( \sigma > \hat{\sigma}_2 \) can invade the \( \hat{\sigma}_2 \) population. Mutants with \( \sigma > \hat{\sigma}_2 \) lose from inefficient breaches, and thus face a significant disadvantage compared to the \( \hat{\sigma}_2 \) population. These mutants, however, enjoy more favorable stage 1 prices:

\[
\frac{\partial f}{\partial \sigma}(\sigma = \hat{\sigma}; \hat{\sigma}, D) = \frac{1}{2} \left[ \frac{\partial}{\partial \sigma} p(\sigma = \hat{\sigma}, \hat{\sigma}_2) - p(\hat{\sigma}, \sigma = \hat{\sigma}_2) \right] + q \frac{\partial}{\partial \sigma} \left( \Delta p(\sigma = \hat{\sigma}, \sigma, D) - \Delta p(\hat{\sigma}, \sigma = \hat{\sigma}_2, D) \right) =
\]

\[
= \frac{1}{2} \left[ \frac{v - c}{2 \cdot (1 + \hat{\sigma}_2)} + q \cdot \frac{1}{2 \cdot (1 + \hat{\sigma}_2)} \left[ \left( \frac{1}{2} (C - c) - (C - D) \right) - \frac{1}{2 \cdot (1 + \hat{\sigma}_2)} \right] (v - c) \right] 
\]

\[
= \frac{1}{4 \cdot (1 + \hat{\sigma}_2)^2} \left[ \left( 1 + \frac{\hat{\sigma}_2}{21 + \hat{\sigma}_2} \right) (v - c) + q \left( \frac{1}{2} (C - c) - (C - D) \right) \right] > 0
\]

Thus, a mutant with a sufficiently large fairness concern will do better than the population, especially when \( q \) is small. In particular, \( \exists \sigma > \hat{\sigma}_2 \) such that mutants with \( \sigma > \sigma \) can invade the \( \hat{\sigma}_2 \) population. We limit the analysis to \( \sigma < \sigma \). Otherwise, the result is that a stable homogenous population does not exist.

(iii) The common fairness concern at the unique evolutionary stable population is

\[
\hat{\sigma}(D) = \frac{v - C}{\frac{1}{2} (C - c) - (v - D)} \quad \text{(see part (ii) of the proposition). And, } \frac{\partial \hat{\sigma}(D)}{\partial D} < 0.
\]

QED