

The Deadliest of Games: The Institution of Dueling

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Abstract

Recent historical research indicates that ritualistic dueling had a rational basis. Basically, under certain social and economic conditions, individuals must fight in order to maintain their personal credit and social standing. We use a repeated two-player sequential game with random matching to show how the institution of dueling could have functioned as a costly but incentive-compatible means by which individuals could demonstrate their good faith dealings by defending their “honor”.

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1 Introduction

“Pistols at ten paces” and other forms of dueling were once commonplace in Europe and the early United States (Holland 1997). Alexander Hamilton, who graces \$10 Federal Reserve notes, died in a duel in 1804; Andrew Jackson, whose portrait appears on the \$20, was seriously wounded in two duels. Except for some politically-motivated dueling (Freeman 2001), the institution faded in the North in the early nineteenth century but at the same time waxed strong in the U.S. South (Seitz 1929) and West (Steward 2000). By the twentieth century, the code duello had largely disappeared from the U.S. (Wallace 1991) and Europe. To this day, however, dueling persists in rural areas in some developing nations, including Paraguay (Gunson 1998) and the Philippines (de Leon 2002).

Most analysts have treated duels as irrational affairs, a belief that has deep roots. Victorian-era Virginian Robert Reid Howison, for instance, considered dueling a form of private war that “originated in the wicked vindictive passions and propensities of fallen human nature.” Only when the “Kingdom of Christ shall be established in all hearts,” he opined, will dueling cease (Howison 1924). Many others also considered dueling a barbaric activity (Morgan 1995:228). The fact that most duels seemed to be fought over trivial matters, “the drop of a hat” in the words of one writer, further suggests that dueling was essentially an irrational activity.

By contrast, we contend that dueling contains a rational core that can be modeled. After all, dueling has ended in many places though human nature remains unchanged (Wright 2002a). Moreover, even wicked people like Adolf Hitler have opposed dueling (Combs 1997). Both facts suggest that something other than innate human depravity drives dueling behavior. Yet, while a number of models of optimal firing strategies under various circumstances have been proffered (see, for instance, Blackwell 1948, Restrepo 1957, Kursin 1983, Radzik 1988), there has been less attention to why the combatants might have rationally agreed to duel in the first place.

Careful review of the historical literature suggests that most duels were born of conflicts over resources, sometimes tangible resources like land, lucrative government offices, market share, or women (Morgan 1995:535-536), but usually intangible ones. In the best recent treatments of dueling, Greenberg (1990) and Morgan (1995) argue persuasively that duelists sought to defend their “honour.” Other scholars (Schwartz, Baxter and Ryan 1984; Billacois 1990; Keiser 1990; Weber 1999) and contemporaries (Anon. 1830) make similar claims. Importantly, they contend that “honor” was not a meaningless term or catchall but rather a reference to reputation for fair dealing, for honoring contracts, for paying debts. Financial responsibility, in other words, if not quite synonymous with honor was at least an important component of the concept. Gentlemen did not shoot each other over trivial matters but rather over accusations that they had lied. Seemingly bizarre behavior, like gently tugging on

rival's nose, was a major offense because it symbolized the unmasking of a liar. The credit implications of such an accusation were certainly negative. Seen in this light, duels take on a more rational cast.

In fact, dueling thrived when and where credit markets were opaque and highly personal in nature, as in early modern Europe, colonial America, the antebellum South, late nineteenth-century Mexico, and rural Paraguay today. Where credit markets are more impersonal and formal, like the antebellum North (Wright 2001, 2002b), Nazi Germany, and much of the globe today, "honor" loses its strength as a credit signal and dueling fades. Economies of scale and relatively low transaction costs allow modern lenders to carefully screen applicants through the use of credit histories, revenue statements, and balance sheets. Personal credit markets, however, rely more upon outward appearances than financial facts; holistic impressions of the borrower's "character" reign supreme.

Southern planters often relied on personal credit markets and just as often they were highly leveraged, even technically bankrupt. Thomas Jefferson, for example, was a lifelong bankrupt who stayed one step ahead of the jailer by borrowing from Peter to pay Paul (Sloan 1995). Like Jefferson, most Southern planters owned tremendous assets but also owed tremendous liabilities (Breen 1987). Further complicating their financial affairs, many of their liabilities were essentially callable. Most of their debt took the form of callable open book accounts or relatively short term (1 to 5 years) bonds and mortgages that had matured but remained "at interest" at the mutual consent of both lender and borrower (Kilbourne 1995). At the same time, many of their assets were highly illiquid, like real estate, or mission-critical, like slaves (Mann 2003). Similar to a bank short of cash reserves, planters could not suffer any attack on their credit standing lest they be run upon and ruined.

Unlike the formal lending sector, the personal credit market would make loans to men like Jefferson so long as they remained honorable men of character. A man who lost his honor, however, was no longer worthy of credit. His fortune was jeopardized as he might be forced to sell assets at unpropitious times in order to meet the demands of liability holders. Unable to obtain new loans to pay pressing demands, he stared bankruptcy and destitution in the face. An attack upon a man's honor, therefore, was not a trivial affair but rather a dire threat to his business and to his family's well-being. To those accustomed to obtaining bank loans, risking life and limb to reestablish one's credit seems absurd. To those accustomed to private credit markets, not defending one's honor was the absurdity (Wright 2002a).

The customs of the code duello also point to the basic rationality of the institution. Duels were not barroom brawls or spontaneous gunfights but rather carefully planned events. In a typical scenario, one man would insult another by tugging on his nose or accusing him of being a liar, thief, or some other term that threatened to sour the personal credit market's assessment of his creditworthiness. If the accused

thought the accusation potentially damaging, which he was likely to do if the accuser was of a similar social rank and hence presumably qualified to make the accusation, “negotiations” commenced. Working through an agent called a “second,” the accused sought to persuade the accuser to withdraw, modify, or explain away the damaging comment or action. If the accuser refused, the accused had to decide whether the potential damage was sufficient to warrant challenging him to a duel. If a challenge was issued, the accuser now faced a decision: risk his life or admit that he had lied. Unsurprisingly, the public scorned men who refused to accept a challenge; its credit rating implications were also negative (Morgan 1995).

The challenged chose the weapons, time, and place of the encounter. Other rules, like distance between the shooters, number of shots allowed, and other details were also agreed to. If last minute attempts at reconciliation failed, the men fought it out, with their seconds nearby to ensure that this deadliest of games was fairly played. Dueling was illegal in most jurisdictions so duels were usually conducted in secret. Data is therefore sparse. Our best guess, however, is that the chance of surviving a duel was roughly 50 percent. Legal sanctions were extremely rare because juries sympathetically entertained claims of “self-defense” and surviving witnesses, usually just one of the principals and the two seconds, often swore that the shooting had been an “accident” (Piccato 1999).

The honor and creditworthiness of the winning duelist was upheld and even enhanced. Accusations against his character were erased; the winner had signaled the credit market that he was a manly, courageous leader capable of defending his property and his interests. The loser lost his life, but that outcome many thought preferable to living life dishonored. Once accused, it was often better to have dueled and lost than not to have dueled at all (Holland 1997; Piccato 1999).

Personal creditors did not punish duelists by restricting future loans the way that banks appear to have done. The reason is that personal creditors “won” whether their debtor survived a duel or not. If the borrower lived, his credit remained high and a damaging run on his assets was avoided. (A run could injure all creditors by forcing the debtor to sell assets for prices far below fair value. Or, a run could help some creditors at the expense of others if the debtor showed favoritism by immediately liquidating some claims in full.) If the borrower died, his estate went into a slow, managed liquidation. Assuming the executor was an honorable man, creditors of the estate could look forward to receiving their fair share of the estate’s assets, with legal interest if the debtor died while financially solvent. Because probate proceedings were better conceived than most early bankruptcy laws in the U.S. (the best of which were short-lived and applied only to those in the commercial or financial sectors), the death of one’s debtor was often preferable to his forced insolvency or involuntary bankruptcy (Mann 2003).

As joint-stock corporations, banks, insurance companies, and other institutional

lenders were not so patient. Moreover, they enjoyed superior methods for screening credit risks and hence did not need to rely on such gross proxies as “character.” Perhaps most importantly, they preferred that their clients lived to borrow again. Realizing that long-term relationships reduced information asymmetry and increased profits, they actively cultivated long-term relationships (Bodenhorn 2000, 2002; Wright 2001, 2002b).

Consistent with the evidence, our story predicts that economies devoid of extensive financial intermediation should experience more duel-like behavior than economies with high levels of per capita intermediation facilities. It also predicts that where the institution of dueling is present, short-term interest rates and the incidence of dueling should be positively correlated because as interest rates increase personal creditors will be more likely to call the debts of dishonored borrowers. Unfortunately, we are unable to test these hypotheses rigorously due to the dearth of data on dueling. We show below, however, that it is possible to model the motivations of duelists in a way that illuminates many otherwise puzzling aspects of the historical record.

The only previous paper to have explicitly modeled the dueler’s rational motivation for dueling is Allen and Reed (2006). In their model, dueling serves as a screening device used to filter out individuals with low levels of social capital for appointments to public office in a patronage-based political system. In their (one-period) model, the king first chooses a reservation level of social capital and the probability of dying in a duel. Potential political appointees then have the option of dueling, but individuals with social capital below the reservation level will refuse to duel, because their low level of social capital means that they would have less to gain from membership in the political ruling class (and by the same token, once in public office, they could not be trusted by other members of the ruling class: social capital serves as a bond for good behavior).

There are a number of difficulties with this interpretation. First, it implies that dueling should be restricted to those seeking public office; and that all those seeking public office should first duel. Neither of these predictions matches the historical facts well. Furthermore, they argue that social capital “comes from attending the same schools, social events, clubs, and churches,” and is also “acquired through education, marriage, business connections, and family history.” Many of these attributes are, however, observable, or at least learnable (perhaps at some cost). Their key assumption that social capital is unobservable is therefore largely unsupported.¹

¹Another somewhat related paper, but with important differences from ours, is Volckart’s (2004) study of feuding in late Medieval Germany. Unlike duels, the feuds Volckart studies involved efforts by feudal noblemen to redress grievances by harassing, raiding and looting their opponent’s lands and dependent peasants, sometimes for years. Crucially, those waging the feud expected to gain from it directly through plunder, whereas in our approach no player expects to benefit directly from the duel itself (though as we will show, they may benefit indirectly, by defending their honor).

In our approach, a player’s “honor” is not an unobservable endowment, but an outcome of the player’s strategic actions in a repeated game in which players are randomly matched from time to time to carry out credit transactions. An “honorable” man is one who can be trusted - in this case, to repay a loan. In the equilibrium we describe, a “dishonorable” man, having no reputation to protect, is effectively excluded from borrowing, based on a credible expectation that he would not repay loans; and from lending, since he cannot issue challenges, and so has no way to credibly enforce repayment. Honor - a trustworthy reputation - is therefore a valuable asset, and well worth defending if necessary.

Kandori (1992) shows that cooperation can be sustained in a repeated random-matching game if players can observe a reputational “label” which indicates whether their current trading partner has ever cheated in the past. Other papers study historical cases in which such reputational information was shared via merchant’s correspondence (Greif 1993) or by judges (Milgrom, North and Weingast 1990). All of these models assume, however, that cheating is observable by third parties to the transaction, such as the other merchants in the community, or the judge (Law Merchant) in Milgrom et al.’s paper. Otherwise, the reputation mechanism cannot work.

The institution of dueling - defending one’s honor - can be understood in this light. In our model, “cheating” can sometimes occur involuntarily, and only the debtor himself can observe whether his failure to repay a loan is a result of deliberate malfeasance or simply bad luck. In this scenario, we show how the institution of dueling can provide an incentive-compatible mechanism which enables an individual whose reputation has come into question to credibly demonstrate his good faith and recover his honor. Essentially, dueling must be costly enough that the possibility of a duel is daunting enough to induce borrowers to make a good faith effort to repay loans *ex ante*; but not so costly that someone who is involuntarily forced to default through bad luck would be unwilling to face a duel *ex post*, to credibly demonstrate his good faith, recover his honor, and retain access to the credit market.

2 Model: Dueling in defense of “honor”

For concreteness, we model the institution of dueling by focusing on the use of “honor” to enforce a credit transaction between two players, a lender and borrower. A simple credit transaction is depicted in Figure 2. First, the lender chooses whether to lend to the borrower an amount x ; next, the borrower chooses whether to repay with interest, or to default. If the borrower repays the loan, both players benefit (here, they receive a net payoff normalized to 1). However, the borrower, having received the loan, can do even better (a payoff of $2 + x$) by renegeing on repayment. For simplicity, we will assume throughout the paper that there is no formal enforcement mechanism in place:

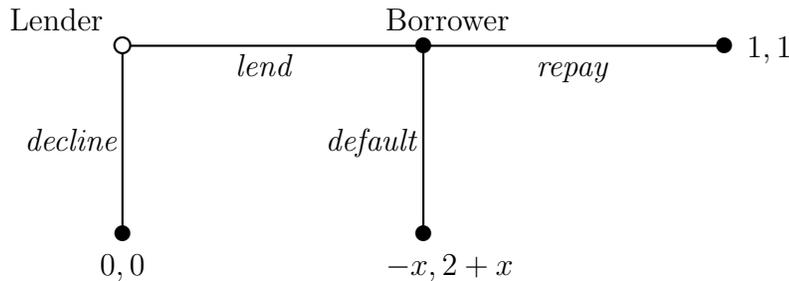


Figure 1: A simple credit transaction

the lender has no way to enforce repayment if the borrower chooses not to repay.

Thus, there is a “fundamental problem of exchange” (Greif 2000): unless the borrower can commit to repay the lender, the lender will not lend, and the opportunity for beneficial exchange is lost (both players receive a net payoff of 0). The unique subgame-perfect equilibrium is $(\textit{decline}, \textit{default})$. As Greif argues, a similar fundamental problem of exchange - or commitment problem - arises in many important economic and political transactions, and a key role of many institutions is to overcome such commitment problems.

To capture the role of dueling, we modify the basic credit transaction as follows (Figure 2). First, as before, the lender chooses whether to make a loan to the borrower. If the loan is made, then Nature moves: with probability ε , the project fails as a result of bad luck. If the project succeeds, then the borrower chooses whether to repay the loan (leading to a payoff of 1 for each player), or to deliberately default. Only the borrower observes Nature’s move, so in the event of a failure to repay the loan, the lender cannot discern whether the default has occurred as a result of bad luck or deliberate default. If the borrower fails to repay the loan, the lender then chooses whether to challenge the borrower to a duel (C) or not (N).² If a challenge is made, the borrower can accept (A) or reject (R) the challenge. If the Borrower chooses A, then a duel occurs, and each player suffers an expected cost c (reflecting the possibility of injury or death). Note that the duel has no other effect on payoffs - it is purely destructive. In particular, who wins the duel has no effect on financial

²An alternative formulation, more in line with historical observation, would be to allow the lender to accuse the borrower of cheating; then the borrower could issue a challenge; and the lender would then have to decide whether to withdraw the accusation or accept the challenge. Our formulation here is simpler, but still captures the strategic essence of the situation, since if an accusation is expected to lead to a challenge, then the lender would not make an accusation unless he were willing to accept the ensuing challenge and fight a duel.

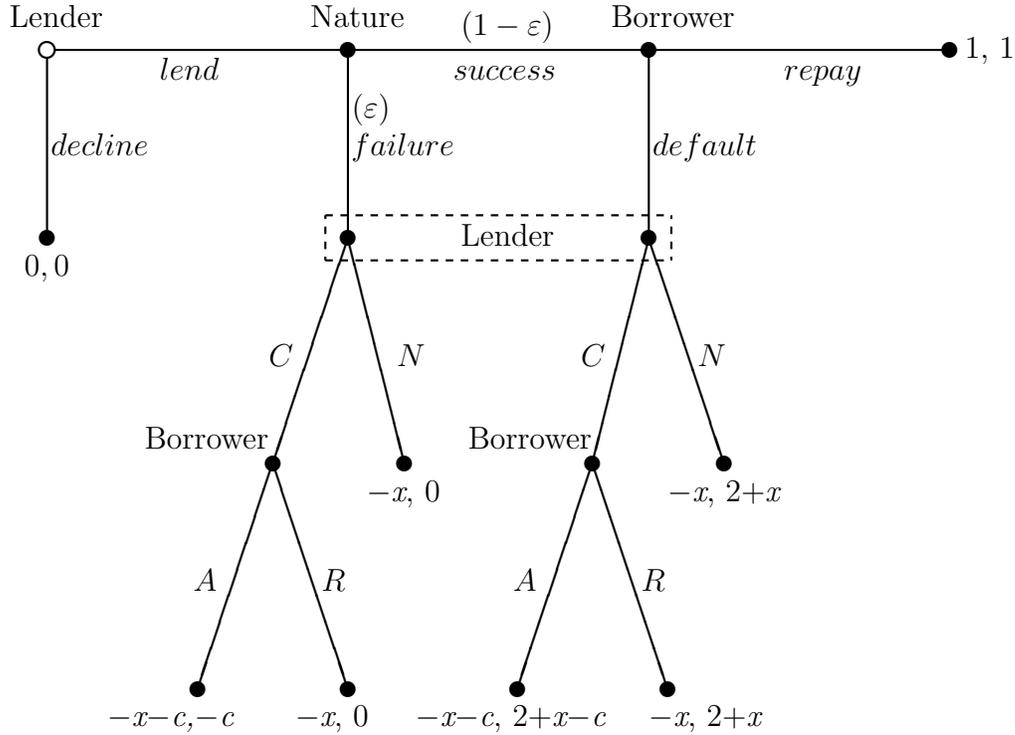


Figure 2: The credit transaction, with potential for dueling

outcomes - shooting the borrower, for example, does not enable the lender to recover his money; and since the lender is assumed to have no way to enforce repayment, it is not necessary for the borrower to shoot the lender in order to get out of repaying the loan.

The one-shot game is easily solved: the borrower prefers to reject a challenge; the lender is therefore indifferent about whether to challenge a borrower who defaults; borrowers will always default rather than repay the loan; and the lender will therefore never lend to begin with. Dueling is meaningless, and the fundamental problem of exchange remains.

Suppose, however, that the game is repeated. Specifically, consider an infinitely large population of players who engage in credit transactions.³ All players

³The assumption of an infinitely large population is convenient for technical reasons; specifically,

are infinitely-lived and have a common discount rate, δ . At the start of each period, each player is randomly matched with another, and within each pairing, one player is randomly assigned the role of borrower, and the other player is assigned the role of lender. Each lender-borrower pair then play the game depicted in Figure 2. The probability of involuntary default is ε , which is independent across periods for each individual.

Assume in addition that each player’s history of play is publicly observable (all players can observe whether loans are repaid, and all duels are public), with the exception that no player except the defaulting borrower can observe whether a failure to repay a loan was a result of bad luck or deliberate malfeasance (that is, only the borrower observes Nature’s move).

To capture the role of honor, suppose that at any moment in time, each player in this society may be viewed by the others as being in one of two states: honorable (H) or dishonorable (D). All players are regarded as honorable unless, at some time in the past, they have either (i) as a lender, failed to challenge an honorable borrower who did not repay a loan, or (ii) as a borrower, refused a challenge from an honorable lender. Such men, having failed to defend their honor, are forever (and irreversibly) branded as dishonorable (cowards). This binary label (honor/dishonor) has no direct physical consequences; its consequences, and its significance, derive entirely from the beliefs and expectations of the players, and how those beliefs and expectations shape their interpretation of events and their subsequent behavior. In particular, suppose the players adopt the following strategy, which we will refer to as the “Code of Honor”:

- For Honorable Lenders:
 - Lend to honorable men, and only to honorable men
 - Challenge borrowers who fail to repay loans
- For Dishonorable Lenders:
 - Never make loans
 - Never issue challenges
- For Honorable Borrowers:
 - Whenever possible, repay loans from honorable lenders
 - Do not repay loans from dishonorable lenders.

it avoids having to deal with incentive compatibility in subgames off the path of play, in which many players have cheated in the past, so the value of maintaining a reputation is lower. See Kandori (1992) for a discussion.

- Accept all challenges from honorable men, and only from honorable men
- For Dishonorable Borrowers:
 - Never repay loans
 - Reject all challenges

We will show that for suitable parameter values, the Code of Honor, if adopted by all players, gives rise to a self-enforcing set of social “rules” in which borrowers will always repay loans if possible, but in which dueling will nevertheless rationally occur on the path of play. In this equilibrium, the value of a player’s honorable reputation is that it provides access to the credit market, so honor is well worth defending, even at great cost.

Under the Code of Honor, an individual who loses his honor cannot borrow in the future, since (as he has no honor to defend) he cannot be meaningfully challenged in the future (it is costless for him to refuse a challenge), and he therefore has no incentive to repay a loan. Knowing this, no lender will lend to him; and if one were foolish enough to do so, he would rationally default, as he expects no future loans whether he repays or not. Similarly, since he has no honor to defend, a dishonorable lender cannot meaningfully challenge a borrower who fails to repay a loan, so he can be cheated with impunity (even if he issues a challenge, the borrower can refuse the challenge without any loss of honor). Lacking the ability to make meaningful challenges, a dishonorable individual cannot expect any loans they make to be repaid, and will therefore miss out on potentially profitable lending opportunities.

Therefore under the Code of Honor (and under suitable parametric conditions to be derived below), all individuals have an incentive to maintain their honor. Even if a default were unintentional, a borrower has an incentive to duel in order to maintain his honor and his access to future credit. Similarly, a lender must duel to maintain, and demonstrate a willingness to defend, his honor. Both parties enter into credit transactions aware that, despite their best intentions, they might ultimately have to face each other in a duel; and at the moment when they duel, they do so despite “knowing” that (on the path of play) neither of them has in fact attempted to deliberately cheat the other. Nevertheless, the incentives created by the institution of dueling leave them little alternative but to fight.

Proposition 1. *If*

$$c > 1 + x \tag{1}$$

$$c < \frac{1}{\varepsilon} - (1 + x) \tag{2}$$

$$\text{and } c < \frac{\delta[1 - \varepsilon - \frac{\varepsilon x}{2}]}{1 - \delta + \delta\varepsilon} \tag{3}$$

then the Code of Honor, if adopted by all players, constitutes a subgame-perfect equilibrium of the repeated credit game with dueling and random matching.

Proof. First, note that the case of interest is the one in which ε is sufficiently small that the net expected return from an investment is positive; that is, $\varepsilon x < 2(1 - \varepsilon)$. However, this is implied by (1) and (2), so we do not need to assume it explicitly.⁴

Let V_H be the expected value of the stream of future payoffs for a player whose status at the end of the period is H (“Honorable”), and let V_D be the expected value of future payoffs for a D (“Dishonorable”) player. To verify that the Code of Honor gives rise to a subgame-perfect equilibrium, we need to check that no player has an incentive to deviate from the strategies specified as long as all other players are also expected to conform to those strategies.

First, note that under the Code of Honor, no D player expects to receive a loan in the future, or that any loan he makes in the future will be repaid; and given these expectations, he has no incentive to make loans, repay loans, or fight duels. Therefore, his expected payoff in each future period is 0, so $V_D = 0$.

Assuming all players follow the Code of Honor, an H player who is matched with another H player as a lender has an expected payoff in that period of

$$\begin{aligned}\pi_{Lender}(H, H) &= \varepsilon(-x - c) + (1 - \varepsilon)(1) \\ &= 1 - \varepsilon(1 + x + c)\end{aligned}$$

whereas an H player who is matched with another H player as a borrower has an expected payoff in that period of

$$\begin{aligned}\pi_{Borrower}(H, H) &= \varepsilon(-c) + (1 - \varepsilon)(1) \\ &= 1 - \varepsilon(1 + c)\end{aligned}$$

Therefore, at the end of the period, an H player who expects to meet only H players in the future has an expected stream of future payoffs of value

$$V_H = \frac{\delta}{1 - \delta} \left[1 - \varepsilon(1 + c) - \frac{\varepsilon x}{2} \right]$$

For Honorable players (borrowers or lenders), issuing or accepting a challenge to another Honorable player is incentive compatible as long as the value of preserving one’s honor (to retain future access to the credit market) exceeds the cost. Under the Code of Honor, this is so if

$$V_H > c$$

which (solving for c) can be rewritten as (3).

⁴ $\varepsilon c < 1 - \varepsilon - \varepsilon x$, so $\varepsilon(1 + x) < 1 - \varepsilon - \varepsilon x$, so $\varepsilon x < 2\varepsilon x < 1 - 2\varepsilon < 2(1 - \varepsilon)$.

Given the expectation that default will lead to a duel, honorable borrowers will repay honorable lenders if

$$2 + x - c + V_H < 1 + V_H$$

which reduces to (1) (this is the borrower's incentive compatibility constraint). If they expect borrowers to repay whenever possible (and duel otherwise), honorable lenders will make loans as long as

$$(1 - \varepsilon)1 + \varepsilon(-x - c) + V_H > 0 + V_H$$

which reduces to (2) (this is the lender's participation constraint). If equations (1), (2), and (3) are satisfied, then the strategy with dueling gives rise to a subgame perfect equilibrium. \square

As the proof of Proposition 1 shows, for the Code of Honor to be an equilibrium, dueling must be sufficiently costly that *ex ante*, borrowers prefer to make a good faith effort to repay loans whenever possible rather than fight duels (equation (1)), but the cost of dueling is also bounded above by the requirement that *ex post*, if an unavoidable default occurs, it must be worthwhile to duel to retain future access to credit (equation (3)). In addition, the probability of unavoidable default (ε) cannot be too high, or the high probability of dueling on the path of play will make lenders unwilling to lend money to begin with (equation (2)). By inspection of equations (1)-(3), it is clear that the range of possible values of c for which the Code of Honor is sustainable as an equilibrium expands when players are more patient (higher δ), involuntary default is less likely (lower ε), and for lower values of x (implying a higher percentage return on loans, and a lower temptation for the borrower to default).

How restrictive are conditions (1)-(3)? This is, of course, somewhat sensitive to the exact setup of our model. However, one approach to answering this question is to make a guess at plausible numerical values for the parameters. For example, if $\delta = 0.95$, $x = 4$, and $\varepsilon = 0.05$, then the Code of Honor is sustainable for values of c between 5 and 8.28. If δ falls to 0.9, however, then the range of possible values of c tightens to [5, 5.27]. If instead x increases to 6, then the range of c shrinks to [7, 7.79]. Alternatively, if ε increases to 0.08, then the range of c shrinks to [5, 5.73]; but if ε increases to 0.1 (with $\delta = 0.95$ and $x = 4$), then the Code of Honor would no longer be sustainable for any value of c .

An alternative approach is to treat c as endogenous: one can imagine the institution of dueling evolving over time, with the set of dueling rules or customs (affecting the probability of injury) gradually adjusting so as to maintain a value of c which would make the Code of Honor strategy, with dueling on the path of play, a possible equilibrium. Thus, for example, taking $\delta = 0.9$ and $x = 5$ as a given, the Code of

Honor is sustainable as an equilibrium for values of ε up to 0.035. But if $\delta = 0.95$ and $x = 5$ then it is sustainable for $\varepsilon \leq 0.072$.

More generally, Proposition 2 shows that, if involuntary default is very rare ($\varepsilon \rightarrow 0$), these conditions approximate the standard repeated-game condition that the discounted value of the stream of gains from honest play must exceed the one-shot gains from cheating ($1 + x$).

Proposition 2. *For any given values of x and δ , if*

$$\frac{\delta}{1 - \delta} > 1 + x$$

then a value of c exists such that the Code of Honor is a subgame-perfect equilibrium for sufficiently low values of ε .

Proof. As $\varepsilon \rightarrow 0$, (3) becomes $\frac{\delta}{1 - \delta} > c$, so a value of c can be found satisfying (1) and (3). Moreover, as $\varepsilon \rightarrow 0$, $\frac{1}{\varepsilon} \rightarrow \infty$, so (2) is satisfied. \square

Note that the role of dueling here is not to signal one’s hidden “type”; all players are identical, and none is inherently more trustworthy or more courageous than another. Rather, the point of dueling is to control moral hazard: being honorable is a property of one’s past actions rather than one’s inherent characteristics; and the presence of a norm of dueling ensures that honorable men will not deliberately default on loans, even if no-one else would ever know that a default were deliberate: an observation which accords well with traditional interpretations of the notion of honor. One could, however, extend our model to situations in which borrowers differed in their costs of dueling, the riskiness of their projects, or some other parameter. For example, if borrowers had private information about their projects’ probability of failure (ε), then a norm of dueling could also serve as a screening device, filtering out borrowers whose projects involve a high risk of default. Given the expectation that failure to repay a loan will require a borrower to fight a duel or face dishonor, an honorable borrower who anticipated a high probability of exogenous default (ε) in a given period would be dissuaded from seeking a loan in that period and thereby putting his honor (and future access to the credit market) in jeopardy.

The grim trigger strategy used in the model is, of course, an extreme case; in reality one might imagine more forgiving punishments. In particular, one can readily imagine situations in which those who had lost their honor (or had none to begin with) might have opportunities to build, or re-build their reputation. Some duels might then be fought, or provoked, deliberately to raise the status of the duelist. This function of dueling is somewhat reminiscent of Carmichael and MacLeod (1997)’s “gift-giving” theory. In that paper, players can give wasteful gifts (“burn money”) at the start of a long-term relationship to establish their mutual good faith; the gift-giving convention,

though wasteful, can survive because it enables players to credibly demonstrate their good faith and conduct mutually beneficial trade.⁵ Dueling, in our model, acts rather like a wasteful, public “gift”, one which is only worth making if one subsequently plans to act “honorably” (i.e., not to cheat one’s trading partners) and which therefore can act as a credible demonstration of one’s intended good faith. Thus, the motivations of duelists deliberately provoking duels (and risking their lives) in order to establish an honorable reputation are effectively similar to those of a borrower and lender who must duel to preserve their good names, even following a default that (on the path of play) they both “know” to have been involuntary.

Finally, note that we have treated c as symmetric across individuals. One potentially interesting extension would be to consider a world where individuals could develop a reputation for dueling skill (such as fencing skill). The choice of whether to duel then becomes trickier, as it will depend both on the other person’s dueling prowess and one’s own. But this in turn would affect one’s incentives to develop a reputation for dueling prowess in complex ways: too good a reputation for dueling might effectively exclude you from the credit market (by reducing c); but a reputation as a lousy shot would also reduce the credibility of any threat to defend one’s honor (by raising c), so everyone would want to borrow from and cheat you. Thus, asymmetric values of c ought to tend to undermine the institution of dueling. It is not surprising that, as Allen and Reed (2006) emphasize, many of the rules which governed the practice of dueling (the code duello) appear to have been designed precisely to increase the randomness of the outcome.

3 Concluding Remarks

Heretofore, game theorists have been primarily interested in the mechanics of dueling, i.e. strategies about when to shoot. Here, we model the pre-engagement decisions leading up to the actual combat, revealing that the classic gentlemen’s duel was a very rational affair, not a spontaneous outburst of violent emotion. Although some duels were fought over tangible resources, like beautiful women and lucrative offices, most duels centered around “honour,” a cultural code word for creditworthiness. Our model describes how dueling to defend one’s honor was a rational choice aimed at retaining access to credit markets (and possibly other social and economic interactions) under a prevailing norm which linked dueling to honor, and shunned those who had been dishonored. The model therefore helps to explain why dueling was common where credit markets were personal, and hence more oriented on outwards appearances and less oriented on the examination of audit financial statements, the

⁵Theirs is an evolutionary model; in the presence of the gift-giving convention, players who give gifts and then cheat and move on do worse than gift-givers who subsequently act honestly.

monitoring of restrictive covenants, and other modern techniques for limiting information asymmetry.

Our model suggests that dueling might be more likely to emerge when formal institutions for financial intermediation were absent, the probability of default for unobserved reasons was low (or monitoring costs would have been high), players had relatively long time horizons, and when interest rates were not too high. When these conditions cease to hold, and as transactions become increasingly complex and impersonal (making it harder to discover whether one's potential trading partner is "honorable"), the institution of dueling should break down.

We would emphasize that despite its apparent irrationality, dueling need not necessarily be regarded as a wasteful and socially inefficient means of achieving incentive compatibility. In the presence of asymmetric information, any governance mechanism which enables exchange inevitably entails some costs. For example, in a modern legal system it is necessary to pay policemen, lawyers and judges. In other cases, enforcement may require the transacting parties to incur the costs of sharing reputational information, as in Greif's (1993) study of a medieval trading community, or Milgrom et al.'s (1990) model of the medieval Law Merchant. Other institutions involve monitoring costs, such as the costs of monitoring workers in a firm, as in Bowles and Gintis (1992), or of monitoring other members of a team, as in Arce and Gunn (2005). From this perspective, the occasional injuries and deaths caused by dueling may have been a worthwhile price to pay to promote exchange in the societies in which it occurred, and perhaps less costly overall than feasible institutional alternatives.

Of course, the concept of "honor" has broader connotations than creditworthiness. While we have focused on the credit market transaction because of its historical significance to dueling, a similar logic can be extended to any situation in which an offended party was unable to discern whether an offense was due to an intentional act of opportunism or to an unintentional affront, or when monitoring costs (the cost of discovering the true cause of an offense) were high. If an injury, whether intentional or not, were expected to lead to a duel, our model shows that individuals would have an incentive to try to avoid injuring others, but that if, through bad luck, an injury nevertheless occurred, the parties might find it necessary to "satisfy" honor to leave their mutual good faith in no doubt and to restore the mutual expectation of good conduct in the future.

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