Beyond the Prisoners' Dilemma: Coordination, Equity, and Law

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BEYOND THE PRISONERS’ DILEMMA:
COORDINATION, EQUITY, AND LAW

Richard H. McAdams*

ABSTRACT: Legal scholars across all fields explore the game theoretic idea of cooperation as illustrated by the Prisoners’ Dilemma (“PD”) and its variants. By contrast, other games – especially those involving equity and coordination – have proved far less influential. Examples include the games known as Stag Hunt, Hawk-Dove, and Battle of the Sexes. After documenting a dramatic disparity in the legal literature favoring the PD game, this paper raises and rejects two possible justifications for the neglect of other games: (1) that the PD occurs more frequently than other situations; and (2) that other game situations are less important than the PD for modeling the social conflict law addresses. To the contrary, I demonstrate that coordination and equity problems are common and illuminate many issues relevant to law, including the function of constitutions, democracy, international law, expressive law, sex role conventions, and social movements. The final implication is the potential for greater intellectual exchange between Law & Economics and Law & Society.

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INTRODUCTION

The problem of cooperation exemplified by the Prisoners’ Dilemma is one of the most interesting and dominant paradigms of recent theoretical work in economics, politics, and law. As Robert Axelrod puts it: “The two-person iterated Prisoner’s Dilemma is the E. coli of the social sciences.”¹ Legal scholars make great use of the concept, having mentioned it in over 2800 law review publications² to explore topics ranging from contracts³ and property,⁴ to international law,⁵ race discrimination,⁶ feminism,⁷ social norms,⁸ the federal judiciary,⁹ and, indeed, actual prisoners.¹⁰ Legal theorists use the Prisoners’ Dilemma to

² See results of Westlaw search, infra text accompanying note 42.
¹⁰ See, e.g., Russell Dean Covey, Beating the Prisoner at Prisoner’s Dilemma: The Evidentiary Value of a Witness’s Refusal to Testify, 47 Am. U. L. Rev. 105 (1997).
explain other major concepts in law—e.g., the tragedy of the commons,\textsuperscript{11} the public goods problem,\textsuperscript{12} and trust,\textsuperscript{13} all which are themselves relevant to many areas of law.

In this article, I claim that legal scholars overuse the cooperation concept. As real and important as cooperation problems are, the proportion of legal scholarship devoted to them—particularly the Prisoners’ Dilemma—vastly exceeds their real world significance and causes a relative neglect of other equally important strategic situations or “games.” The world often presents social problems of equity and coordination that are not reducible to cooperation problems.

By equity, I refer to distributional issues that arise in games where some outcomes favor one party and other outcomes favor the other party or are equal. As explained below, examples include the games known as “Rambo” and “Hawk-Dove.” Coordination problems arise where there is more than one plausible outcome, and the players share some common interest in reaching or avoiding certain outcomes. Examples include the games known as “Stag Hunt” and “Battle of the Sexes.” My central examples are games that present both equity and coordination issues, such as Battle of the Sexes and the game known as “Hawk-Dove.”

\textsuperscript{11} See, Hanoch Dagan & Michael A. Heller, \textit{The Liberal Commons}, 110 YALE L.J. 549, 555 (2001)(“Most lawyers, economists, and other social scientists learn of the ‘tragedy of the commons’ in the first weeks of school, and all are taught that commons property is the axiomatic example of a prisoner’s dilemma.”).

\textsuperscript{12} See, e.g., Richard A. Epstein, \textit{A Farewell to Pragmatism}, 71 U. CHI. L. REV. 675, 677 (2004) (referring to “the creation of public goods” as occurring “when state power blocks the degenerative outcomes of the standard prisoner’s dilemma game.”); Sean J. Griffith, \textit{Spinning and Underpricing: Legal and Economic Analysis of the Preferential Allocation of Shares in Initial Public Offerings}, 69 BROOK. L. REV. 583, 610 n.91 (2004) (“The most familiar of these [social dilemmas] is the ‘prisoner’s dilemma,’ but other terms are commonly applied to the same general problem, including ‘social traps,’ the ‘tragedy of the commons,’ and ‘public goods/free riding problems.’”).

I present many examples. As three quick illustrations, coordination and equity problems arise (1) when the government in a multi-lingual city selects a language to use on its street signs, (2) when industries set technical standards for products made by one firm that interact with products made by other firms, and (3) when criminal defendants in a conspiracy select a joint defense for use at trial. None of these is a Prisoners’ Dilemma; there is no incentive to defect from what others do. If other drivers conform to an English language “one way” sign on a street, then everyone else, including non-English speakers, will also wish to conform (although they may fail to, given the language barrier). Once an industry or government sets a technical standard, manufacturers who believe everyone else is conforming want to conform themselves; otherwise, no one will buy their products. Even prisoners in a conspiracy will not wish to defect if their best outcome occurs when they present a united front at trial, as by presenting a consistent alibi or self-defense claim.

Thus, one problem in each of these cases is a need for coordination – street signs to direct traffic in a coherent way, technical standards to allow market goods to interact, co-defendants’ statements that present a united defense. As is common, coordination is paired in each case here with equity: non-English speakers will prefer signs in another language, manufacturers prefer standards consistent with their current production, and some criminal defenses may benefit one co-defendant more than the other.\textsuperscript{14} This article will canvass a wide array of situations relevant to law that raise coordination and equity.

\textsuperscript{14} Sometimes different co-defendants prefer different defenses. For example, one defendant may a long-shot defense that offers a chance at complete exoneration and the other may prefer a more believable defense that only mitigates the charge to a lesser crime.
Yet, I contend, legal scholars using game theory tend to ignore equity and coordination problems, while celebrating the Prisoners’ Dilemma. One might therefore expect me to say that the Prisoners’ Dilemma needs no introduction. Yet to appreciate fully how narrow are the circumstances that present a Prisoners’ Dilemma (as well as how scholars sometime use the game incorrectly to describe situations to which it does not apply), I must begin by describing it. The payoffs of Figure 1 present a PD based on the narrative from which the game gets its name. A prosecutor suspects two prisoners of a felony, but can currently prove their involvement only in a misdemeanor. The prosecutor offers each prisoner the same inducement to confess to the felony: “If you are the only one to confess, I will reward you with zero years in prison (represented by 0 in Figure 1); if you are the only one not to confess, I will convict you of the felony and you will get the maximum five years in prison (represented by -5); if neither of you confesses, you each get one year for the misdemeanor (-1); if both confess, you each get three years (-3).” Now the prisoners decide simultaneously. In this context, to select the strategy of not confessing is to “cooperate” and to select the strategy of confessing is to “defect.”

<table>
<thead>
<tr>
<th></th>
<th>Cooperate</th>
<th>Defect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Defect</td>
<td>-5</td>
<td>-3</td>
</tr>
</tbody>
</table>

Figure 1: The Classic Prisoners’ Dilemma

With these payoffs, if Prisoner 2 cooperates, Player 1 is better off defecting (and receiving a payoff of 0) than cooperating (for a payoff of -
If Player 2 defects, Player 1 is better off defecting (-3) than cooperating (-5). Therefore, Player 1 has a “dominant” strategy of defecting; it is her best move regardless of what Player 2 does. Because the payoffs shown are symmetric, Player 2 has the same dominant strategy. Thus, the only equilibrium is Defect/Defect. In Figure 1, and subsequent matrices, I indicate an equilibrium by underlining the payoffs. The game is termed a “dilemma” because this inevitable outcome is worse for each prisoner than the outcome Cooperate/Cooperate.

My main complaint is that legal scholars tend to use game theory only when the problem they face has this very particular structure, even though the neglected game theory of coordination and equity is as analytically rich. As a symptom of this larger problem, scholars sometimes mischaracterize coordination and equity problems as Prisoners’ Dilemmas, attempting to shoehorn a phenomenon into the model they find so alluring. A simple example is a “run on a bank.” Quite a few articles claim that “[b]ank runs represent a classic prisoner’s dilemma.”

Notice that in Figure 1 as in every matrix the payoffs for Player 1 are in the lower left corner of each cell and the payoffs for Player 2 are in the upper right corner of each cell.

By the term “equilibrium,” I refer to a “Nash equilibrium,” which is the central solution concept in game theory. It is based on the principle that the combination of strategies that players are likely to choose is one in which no player could do better by choosing a different strategy given the ones the others choose. A pair of strategies will form a Nash equilibrium if each strategy is one that cannot be improved upon given the other strategy. We establish whether a particular strategy combination forms a Nash equilibrium by asking if either player has an incentive to deviate from it.


On this view, “[d]epositors will be better off individually if they could beat their fellow depositors to the bank and reclaim their deposits whenever there is the slightest bit of uncertainty about the value of a bank’s assets.”¹⁸

Yet a Prisoners’ Dilemma is surely a poor model of a bank run. A better model would include both the equilibrium outcome where the bank is stable – as banks usually are – and also the equilibrium where there is a run. The Prisoners’ Dilemma game can – at best – apply only after some uncertainty arises about the bank. By contrast, the game of Assurance, discussed below,¹⁹ describes both the efficient “deposit” equilibrium and the inefficient “run” equilibrium and the way that uncertainty or a lack of “assurance” tips the situation from the former to the latter.

The Prisoners’ Dilemma game is also a poor model of a bank run because, even after “the slightest bit of uncertainty” arises in a bank, it is not necessarily the best strategy for each depositor to “reclaim” her deposit. Depositors incur costs in removing deposits. If some uncertainty arises about person X’s bank, and yet others do not reclaim their deposits, then X may have no interest in incurring the costs of reclaiming hers. It is only when she expects others to withdraw their deposits that she wants to withdraw hers. The difference between wanting to take some action no matter what the others do and wanting to take some action only if others also do the same may seem small, but the Prisoners’ Dilemma is strictly limited to the former case. Yet this distinction is often overlooked. Indeed, when describing the original Prisoners’ Dilemma scenario, quite a few scholars posit payoffs that do not produce a Prisoners’ Dilemma because the best

¹⁹ See infra text accompanying notes 62-69.
outcome occurs when neither party confesses.\textsuperscript{20} If so, then each prisoner wants to confess only if the other confesses. As we shall see, this situation describes what I call a Prisoners’ Assurance game.\textsuperscript{21}

\textsuperscript{20} Some very smart scholars have made this error. Consider Robert Birmingham’s observation that Judge Easterbrook misdescribes a Prisoners’ Dilemma in Page v. United States, 884 F.2d 300, 301 (7th Cir. 1989)(emphasis added), when he states:

Students of strategy and bargaining cut their teeth on the game of Prisoners’ Dilemma. Two prisoners, unable to confer with one another, must decide whether to take the prosecutor’s offer: confess, inculpate the other, and serve a year in jail, or keep silent and serve five years. If the prisoners could make a (binding) bargain with each other, they would keep silent and both would go free. But they can’t communicate, and each fears that the other will talk. So both confess.

But if mutual silence means that both go free, while a sole confessor serves one year (and a sole non-confessor gets five years), then the best response to silence is silence (producing zero years instead of one). If so, we cannot say that confessing (or “defecting”) is the best strategy no matter what the other player does. To create the actual “Dilemma,” the prosecutor must ensure that either can “go free” only by being the sole confessor. So if both are silent, they must both serve some time, as for a minor crime the prosecutor can already prove. See Robert Birmingham, \textit{Telling Alternative Stories: Heterodox Versions of the Prisoner’s Dilemma, the Coase Theorem, and Supply-Demand Equilibrium}, 29 CONN. L. REV. 827, 842-45 (1997)(first making this criticism). Lee Fennell catches the same error in her review of ROBIN PAUL MALLOY, LAW IN A MARKET CONTEXT: AN INTRODUCTION TO MARKET CONCEPTS IN LEGAL REASONING (2004). See Lee Anne Fennell, \textit{Book Note}, 55 J. LEGAL ED. 295, 300-01 (2005).

I have found five other examples just in the past three years: David McGowan, \textit{Politics, Office Politics, and Legal Ethics: A Case Study in the Strategy of Judgment}, 20 GEO. J. LEGAL ETHICS 1057, 1072 (2007)(“If they cooperate with one another by remaining silent, each receives no penalty (or a relatively light one.”); Jonathan T. Schmidt, \textit{Note}, \textit{Keeping U.S. Courts Open to Foreign Antitrust Plaintiffs: A Hybrid Approach to the Effective Deterrence of International Cartels}, 31 YALE J. INT’L L. 211, 234 (2006)(showing chart with outcome for mutual silence being no penalty, while the sole confessor gets a “light penalty” of “one year”); Glenn Harrison & Matthew Bell, \textit{Recent Enhancements in Antitrust Criminal Enforcement: Bigger Sticks and Sweeter Carrots}, 6 HOUS. BUS. & TAX L. J. 207, 216 (2006) (“If neither prisoner confesses, both go free”); Geoffrey P. Miller, \textit{The Legal Function of Ritual}, 80 CHI.-KENT L. REV. 1181, 1185 (2005)(“If neither confesses, both will go free,” while if only one confesses, the confessor “will serve only a short sentence (say, one year)”); Pamela H. Bucy, \textit{Game Theory and the Civil False Claims Act: Iterated Games and Close-Knit Groups}, 35 LOY. U. CHI. L.J. 1021, 1028 n.46 (2004)(“If both prisoners refuse to confess, they both go free. Otherwise, the prisoner who confesses first gets a short prison sentence . . . “).

\textsuperscript{21} See infra text accompanying notes 62-69.
The bank run example is not unique, but to repeat – the problem of misdescribing other games as Prisoners’ Dilemmas is merely a symptom of the much larger problem, which is to ignore entirely other situations or to analyze them without the benefit of game theory. Part I offers the evidence that the other games are neglected. The theorists I criticize might then justify their focus – I am tempted to call it an obsession – on the Prisoners’ Dilemma in one of two ways, each of which I consider and reject. First, they might say that cooperation problems like the Prisoners’ Dilemma are vastly more common than other situations. Second, they might claim that, however common, these problems are more relevant to law – that law is either more capable of solving or more commonly used to solve such problems. As I demonstrate in Parts II and III, neither claim is plausible. Nor is it plausible to explain the focus on cooperation as a failure of game theory. As plenty of economists, philosophers, and political scientists have shown, the theory shines light on much more than the Prisoners’ Dilemma, including the problems of equity and coordination.

I focus on this neglected aspect of game theory,

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22 Bankruptcy provides a similar example. When uncertainty arises, creditors can make a “run” on their debtor just as depositors make a run on a bank. Thomas Jackson describes this situation as a Prisoners’ Dilemma, see Thomas H. Jackson, Bankruptcy, Non-Bankruptcy Entitlements, and the Creditors’ Bargain, 91 YALE L.J. 857 (1982), but the same problems arise. First, the game describes only the situation that exists after the perception of insolvency arises, where games like Assurance also capture the original situation of perceived solvency. Second, given costs to calling in a loan, creditor X may not want to bear this cost if none of the other creditors call in their loan.


illustrating how useful the theory is to illuminating the vast array of problems the law addresses other than cooperation problems.

The change in focus I advocate – where legal scholarship explores games to a degree proportionate to the empirical reality they represent – has significant implications for legal theory. As I describe, economists, political scientists, and philosophers, along with just a few legal academics, have already drawn significant lessons from these alternative games for diverse topics such as the nature of constitutions and social movements; the stability of democracy, sex roles, and discrimination; the function of international law; and the expressive power of law. The theoretical insights already made, however, no doubt only scratch the surface for what is possible if legal scholars were to engage these alternative games as intensely as they have explored the Prisoners’ Dilemma.

Indeed, before concluding, I speculate in Part IV about how equity and coordination games may provide a basis for intellectual exchange between two rival schools of thought that largely ignore each other: Law & Economics and Law & Society. Though the latter group mostly shuns game theory, it turns out that the social problems Law & Society scholars explore are overwhelming captured by equity and coordination games. Each group might understand better the contributions of the other if legal scholars using game theory were to focus more attention on these alternative games.

To be clear, I have no quarrel with the remarkable power of cooperation analysis: such problems are also prevalent, their solution frequently offers an uncontroversial way to improve social welfare, and

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legal sanctions are often necessary and sufficient to solve such problems.\(^{24}\)
I only mean to correct the tendency to over-describe legal problems in those terms and to understate the importance and pervasiveness of the alternative problems of equity and coordination. I should also be clear that I focus squarely on other games as simple as the Prisoners’ Dilemma. Modern game theory is vastly more complex than these simple games,\(^{25}\) but I believe that informal game theory generates great insight and that these simple coordination and equity games I discuss have as much analytic value as the Prisoners’ Dilemma.\(^{26}\)

This article proceeds as follows. Part I quantifies the disproportionate attention legal scholarship gives to the Prisoners’ Dilemma in comparison to problems involving equity and coordination. In Part II, I consider and reject one possible justification for this disparity: that cooperation situations occur more frequently than other problems. To the contrary, the Prisoners’ Dilemma is the more exotic creature. Part III considers and rejects the other possible justification: that cooperation games are more relevant to law. Here, I review the relevant literature from other fields that shows how these alternative games successfully model a wide array of important legal. Part IV explores the idea that equity and coordination games provide a possible basis for theoretical exchange and

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\(^{24}\) In addition, some subgroups in society will create negative externalities by solving their own cooperation problems, so society has an interest in blocking the solution to these cooperation problems. See, e.g., Christopher R. Leslie, Trust, Distrust, and Antitrust, 82 Tex. L. Rev. 515, 524-28 (2004) (discussing cartels as Prisoner’s Dilemmas); Richard H. McAdams, Cooperation and Conflict: The Economics of Group Status Production and Race Discrimination, 108 Harv. L. Rev. 1003 (1995) (discussing race discrimination as occurring when racial groups overcome a Prisoners’ Dilemma problem).

\(^{25}\) A particularly mathematical innovation is evolutionary game theory. See, e.g., H. Peyton Young, Strategic Learning and Its Limits (2004); Drew Fudenberg & David K. Levine, The Theory of Learning in Games (1998); Axelrod, supra note 1.

\(^{26}\) At the same time, there are clear limits to simple models, situations where omitting certain complexities to the game – such as a sequential structure, imperfect information, or continuous strategy choice – leads to the wrong conclusions. See, e.g., Baird, Gertner & Picker, supra note 16, at 188-218 (chapter on “Collective Action and the Limits of Simple Models”).
I. A DISPROPORTIONATE FOCUS ON COOPERATION PROBLEMS IN LEGAL SCHOLARSHIP, OR, “I CAN’T GET THAT PRISONERS’ DILEMMA TUNE OUT OF MY HEAD”

My claim is that legal scholarship gives too much attention to the Prisoners' Dilemma (hereinafter, “PD”) game when compared to the scant attention given to equity games posing distributional problems and games with multiple equilibria posing coordination problems, and particularly games involving both equity and multiple equilibria. My claim is primarily about the legal literature that uses game theory informally. Those who use formal game theory are, for the most part, well aware of the criticism I am making. But I think that the widespread use of informal game theory is vitally important, as it offers concepts that allow legal scholars to clarify the complex interactions underlying social conflict. The appropriate game can reveal otherwise neglected aspects of a legal problem, at best, the underlying social dynamic without which the problem cannot be understood or resolved.

The PD is a simple game: there are only two players, each choosing between two "moves" made simultaneously, and each with perfect information. To make a fair comparison, I focus on equally simple alternative games. Although I mention some other possibilities, I emphasize games with two-players, two strategies, and perfect information. Game theory has of course evolved far beyond these simple games. Indeed, formal theorists don't use games with "names," but

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27 See, e.g., BAIRD, GERTNER & PICKER, supra note 16; Randal C. Picker, Simple Games in a Complex World: A Generative Approach to the Adoption of Norms, 64 U. Chi. L. Rev. 1225 (1997). There is some tension between these scholarly groups – some thinking that the main value of game theory derives from its formal, mathematically-informed models and others thinking that its main value derives from its informal, intuitive ideas. My article assumes there is value in informal game theory.
construct the game that best fits the situation they are studying. Nonetheless, I direct my criticism primarily at the informal use of game theory, so I want to show that there are neglected games that are as easy to understand and exploit as the PD.\footnote{Put differently, the accessibility of the PD game does not explain why scholars overuse it. Other games are as easy to grasp. By contrast, if one is interested in more advanced theory, everything I have to say about simple games follows through for sequential games, games with imperfect info, games with n-players and n-strategies, dynamic games, etc.}

I begin not by describing specific games, which I do below, but by observing the disparity in the scholarly attention paid to different games types. Figure 1 helps to clarify my thesis. Here, I divide games by two characteristics: (1) whether they have a single equilibrium or multiple equilibria and (2) whether they have distributional conflict.

An equilibrium is a central concept in game theory. It refers to an outcome in which each individual is playing their “best response” to the strategies selected by the other players; given an equilibrium outcome, therefore, no individual can improve her situation by unilaterally switching strategies.\footnote{Technically, it is merely a “weak” Nash equilibrium if no individual can improve her outcome by unilaterally switching strategies because that condition leaves open the possibility a player could be indifferent about switching strategies (if doing so would make him no better but also no worse off). By contrast, a strong or strict Nash equilibrium exists if each player would be worse off if he unilaterally switched strategies. In general, see the explanation supra note 16. For my purposes, these distinctions will not be important.} The upper left cell of Figure 2 represents games with a single equilibrium and no distributional conflict, such as the Prisoners’ Dilemma. The cell below it represents games with multiple equilibria but no distributional conflict, such as the infinitely or indefinitely \textit{iterated} Prisoners’ Dilemma. As is well known, when the PD is repeated, the original all defect outcome remains an equilibrium but also, under the right conditions (a sufficient concern for the future), there is an
equilibrium of mutual cooperation.\textsuperscript{30} Yet because mutual cooperation makes everyone better off (as in the one-shot version), there is no distributional conflict. Although there are ways in which coordination matters to the iterated PD game,\textsuperscript{31} they are almost entirely neglected by the literature, which instead emphasizes a single story: cooperation is impossible in the one-shot PD, but possible in the iterated PD. One chooses to model a legal problem as a series of PDs precisely to emphasize the problem of cooperation over everything else.

<table>
<thead>
<tr>
<th>Distributional Conflict</th>
<th>No Distributional Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Equilibrium</td>
<td>PD</td>
</tr>
<tr>
<td></td>
<td>Ultimatum</td>
</tr>
<tr>
<td></td>
<td>Rambo</td>
</tr>
<tr>
<td>Multiple Equilibria</td>
<td>Iterated PD</td>
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<tr>
<td></td>
<td>Hawk/Dove</td>
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<tr>
<td></td>
<td>Battle of Sexes</td>
</tr>
</tbody>
</table>

\textbf{Figure 2: A Game Typology}

In the upper right cell are single equilibrium games with a distributional conflict. One game in this category has received significant attention – the Ultimatum game\textsuperscript{32} – but still vastly less attention than the

\textsuperscript{30} See BAIRD, GERTNER & PICKER, supra note 16, at 307-08 (explaining the Folk Theorem that constitutes the above claim).

\textsuperscript{31} See Geoffrey Garrett & Barry R. Weingast, Ideas, Interests, and Institutions: Constructing the European Community’s Internal Market, in IDEAS AND FOREIGN POLICY: BELIEFS, INSTITUTIONS, AND POLITICAL CHANGE (J. Goldstein & R.O. Keohane, eds. 1993), who discuss how solving a PD game often involves not only the difficulty of generating cooperation, but also coordinating among different means of cooperating. There is also an equity problem if, as they claim is common, some parties prefer one way of cooperating and other parties prefer another way.

\textsuperscript{32} In this game, one player is told to propose a division of a certain sum of money, such as $10, between herself and a second player. The second player can then accept or reject this division. Acceptance means each player takes the share determined by the first player’s proposed division; rejection means both players receive nothing. If the players are selfish and rational, the sole equilibrium is that player 1 proposes the smallest possible positive amount (e.g., one cent) for player 2 and the rest for herself. The game is interesting because experiments reveal that people do not play the sole equilibrium. See
PD game. Finally, in the lower right cell we have the games that legal scholarship treats as most exotic: those involving both distributional conflict and multiple equilibria, such as Battle of the Sexes and Hawk-Dove. Existing legal scholarship unjustifiably treats the PD game as the central paradigm, as if the only interesting example of multiple equilibria is that arising in the iterated PD game and as if distributional conflict were of only peripheral concern.

I suspect that most scholars will readily agree with the descriptive part of my claim: that the legal literature using game theory does give far more attention to cooperation than to coordination among multiple equilibria or equity and far more attention to the PD than other games. To give some quantitative content to the claim, in November of 2007, I conducted a series of Westlaw searches in the JLR database, which includes all the law reviews and legal journals that Westlaw archives. [NOTE TO EDITORS: I will update this search before publication.] An initial search for various spellings of “Prisoners’ Dilemma,”33 unrestricted by date, yields a remarkable 2809 law review articles (or other included documents).34


There is a related “dictator” “game” where player 1’s selects a division of the money and that division is then implemented (as by the experimenter) without any “move” by player 2. The standard economic prediction is that player 1 will allocate everything to himself, but frequently such individuals share a non-trivial amount with player 2 (even though these players are anonymous to each other). See Alvin Roth, supra; Camerer & Thaler, supra; Ernst Fehr & Urs Fischbacher, *Third-Party Punishment & Social Norms*, 25 EVOLUTION & HUM. BEHAV. 63 (2004). Because there is in this case no strategic interaction between player 1 and player 2 – the latter being entirely passive – this is not formally a “game” and I do not discuss it further.

33 I searched for “prisoner’s dilemma” and “prisoners dilemma.” “Prisoners’ dilemma” is not a valid search term because of the way Westlaw reads an apostrophe at the end of a word, but the search I ran picks up this usage anyway.

34 If we add to the search the Prisoners’ Dilemma’s multi-party cousin the “social dilemma,” also unrestricted by date, the yield is 3106 documents, 927 of which are after
How do other games compare? As we move away from the PD game, the scholarly interest drops off dramatically. In the same cell of Figure 1 as the Iterated PD game are the related games known as Stag Hunt and Assurance, yet the search for these non-PD games yielded only 106 documents, or 4% of the PD total. In the upper right cell, there has been a recent surge of interest in the Ultimatum game, but the date unrestricted search yielded only 186 documents mentioning the game or 7% of the PD total. When we move to the lower right cell that is most unlike the PD game, the results are predictably meager: the Battle of the Sexes game yields only 69 hits and the game alternatively called Hawk-Dove or Chicken gains only 93, which respectively constitute only 2% and 3% of the PD total.

To those familiar with game theory, these disparities are dismaying. As I show below, the strategic situations these games represent are likely to be as common as the PD game and as important to law. Eleven years ago, Baird, Gertner and Picker lamented that legal scholars too quickly invoke the Prisoner’s Dilemma to represent any collective action problem. In response to their counsel, one might hope that the situation has more recently improved. In one respect it has. In the nearly five years since the end of 2002, the PD game has been discussed in 828 articles, compared to 99 for the Ultimatum game, now 11% of the PD total. Yet in the same time period there are only 36 for the Staghunt or Assurance games, 42 articles discussing the Hawk-Dove or Chicken game, and 23 for the Battle of the Sexes Game. These latter three numbers

2002, although some of these use the term in a non-strategic sense (as a synonym for the term “social problem”).

35 My search terms were: “stag hunt” or “assurance game.”
36 My search term was: “ultimatum game.”
37 My search terms were: (battle /s sexes /s game).
38 My search terms were: “chicken game” or (hawk /s dove /s game).
correspond to 4%, 5%, and 3%, respectively, of the PD total. Table 1 summarizes.

Table 1

<table>
<thead>
<tr>
<th>Frequency in Westlaw JLR Articles Referencing Four Key “Games”</th>
<th>Raw Total</th>
<th>% of PD</th>
<th>Raw Total</th>
<th>% of PD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD</td>
<td>2851</td>
<td>-----</td>
<td>867</td>
<td>-----</td>
</tr>
<tr>
<td>Staghunt/Assurance</td>
<td>106</td>
<td>4%</td>
<td>36</td>
<td>4%</td>
</tr>
<tr>
<td>Ultimatum</td>
<td>186</td>
<td>7%</td>
<td>99</td>
<td>11%</td>
</tr>
<tr>
<td>BOS</td>
<td>69</td>
<td>2%</td>
<td>25</td>
<td>3%</td>
</tr>
<tr>
<td>HD/Chicken</td>
<td>93</td>
<td>3%</td>
<td>42</td>
<td>5%</td>
</tr>
<tr>
<td>Any of the above 4</td>
<td>390</td>
<td>14%</td>
<td>174</td>
<td>20%</td>
</tr>
</tbody>
</table>

Note that if we search for articles mentioning any of these alternative games in the recent time period, the result – 174 – is still only 20% of the PD total. That is certainly better than the 14% for a date-unrestricted search, but still utterly disproportionate to the relative importance of the different games. A skeptic might wonder if I have stacked the deck by selecting these four particular games. As we will see, this objection is beside the point because I will show that the specific disparity regarding these games is itself the problem. But consider nonetheless the results of a broader search. I searched for fourteen names of multiple equilibrium games (about a dozen games because some games

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40 I conducted the search on November 11, 2007. The search for “Any of the above 4” yields fewer documents than adding the four individual game totals because some documents mention more than one of the games.
have multiple names), not including the iterated PD game, and found that only 526 articles used any of these terms, of which 217 documents came after 2002. These results represent merely 19% and 26%, respectively, of the number of PD “hits.” There is some small movement towards discussing the other games, but even in the last (almost) five years, the focus on the PD game is four times greater than that of a dozen alternative games.

In sum, legal scholarship exhibits far greater interest in the PD and the problem of cooperation than in other games involving issues of equity or coordination (among multiple equilibria). As I said, most scholars will probably concede the disparity, but see nothing wrong with it. I imagine two possible justifications for the disparity. The first is that PDs occur significantly more often than equity or coordination games. The second is that cooperation games are significantly more important than equity

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41 To make certain I didn’t leave out any significant multiple equilibrium game, I included all such games from the glossary of Baird, Gertner & Picker, supra note 16. The search was: “stag hunt” “assurance game” “chicken game” (hawk /s dove /s game) “volunteers dilemma” “volunteer’s dilemma” (battle /s sexes /s game) (“weakest link” /s game) (“best shot” /s game) “Nash bargaining” “Rubinstein bargaining” “pirate game” “el farol bar” “minority game” “coordination game.” Considering the two spellings of the “volunteer’s dilemma” as one term, there are 14 search terms.

42 In response to this analysis, one might claim that the conceptual insight of multiple equilibria games have had great influence even if the names of multiple equilibrium games are not often used. It is certainly true that legal scholars greatly discuss “path dependence” and “network effects,” which derive from coordination games. My Westlaw search revealed 2042 documents using one or both of those terms. But one could do a similar analysis of the broader influence of the PD game. It is hard to be fair in deciding what concepts to search for or what terms to use for the PD game, but it seems to me that one could include ideas like opportunism, defecting, free-riding, and tragedy of the commons. My Westlaw search of these terms ((opportunism /p game strategy) ((defection defecting) /p game strategy) ((free-ride free-riding) /s game strategy) (tragedy /3 commons)) yielded 3055 documents. If one adds to this list “public goods,” the result is 7998 documents. “Public goods” can be modeled with multiple equilibrium games, but when I searched for uses of the specific “public goods” games that involve multiple equilibria or in tandem with the concept of coordination, (i.e., “public goods” and (“multiple equilibria” “multiple equilibrium” “best shot” “weakest link”)), the result of 131 is a trivial amount of the whole. So even if we look for conceptual influences of game theory, the PD game has disproportionate influence.
coordination games, in the sense of describing situations more relevant to law.

The next two parts argue against these justifications. Part II provides an abstract discussion of game types, which shows every reason to believe that the games the literature neglects occur more frequently than those it emphasizes. I then turn to a more concrete discussion in Part III, where I illustrate the real world significance of equity and coordination games. These games model common social problems that law is called upon to address.

II. NOT BECAUSE OF FREQUENCY: EQUITY AND COORDINATION PROBLEMS ARE MORE COMMON THAN COOPERATION PROBLEMS

There is no reason to think that the PD game or its variants occur more frequently than equity or coordination games. Strategic situations vary across many dimensions, but for ease of comparison, let us focus on the simple setting in which the PD arises: a game involving two players who each choose simultaneously between two discrete strategies (the “two-by-two” setting). Even within these relative simple games, the PD turns out to be more esoteric than other games.

To begin, consider again the PD game, as illustrated by Figure 1. What generates its interesting outcome is the abstract structure of the payoffs. Each player ranks the outcomes as follows: best is to play defect against cooperate; second best is to play cooperate against cooperate; third best is defect against defect; worst is cooperate against defect. If you change any of those rankings, the PD game disappears. Another way to make the point is to replace particular payoff values with variables, and to replace the strategy labels with generic labels, as in Figure 3, which represents a large variety of simultaneous and symmetric games with two players and two strategies.
The PD arises here because, for each player, \( b > a > d > c \). Because \( b > a \), each player wants to respond to cooperation (Strategy A) with defection (Strategy B). Because \( d > c \), each player wants to respond to defection with defection. Because \( a > d \), each player regards the outcome Defect/Defect as worse than the outcome Cooperate/Cooperate.

### A. The Frequency of the Prisoners' Dilemma

Now we reach the frequency question. One way to justify the hugely disproportionate attention to the PD game in the legal literature is to claim that these conditions \( (b > a > d > c) \) are common and, specifically, more common than the conditions of the relatively neglected games. Is there some reason to believe this? Not at all. To begin with, note how many different types of games are possible in this simple two-by-two setting. Assume the players only make ordinal (not cardinal) rankings of the outcomes and that they are never indifferent between different outcomes. Under these restrictive circumstances, there are 576 different possible combinations of payoffs.44 Political scientist Katherina Holzinger

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43 If the game is repeated, another standard condition is that \( b + c < 2a \). Otherwise, the expected value of taking turns playing defect against cooperate (alternating each round) would exceed the expected value of mutually cooperating each round.

has examined the combinations and found that most are “strategically equivalent,” leaving only 78 “strategically distinct games.” Of these 78 possibilities, only one is the PD game and only three more are a variant she calls the “Asymmetric Dilemma.”

Twenty-two of the 78 possibilities are Harmony games where there is no collective action problem, leaving 56 troublesome games. Thus, the “defection” problem exemplified by the PD game constitutes only 4 of 78 – 5% – of the strategically distinct two-by-two games (assuming strict ordinal rankings) and only 4 of 56 – 7% – of the games that present some sort of collective action problem.

explains, each player can ordinally rank the four outcomes in the two-by-two setting in 24 ways, which means the two players can rank the outcomes in $24 \times 24 = 576$ ways. If one instead introduces the possibility that a player may be indifferent between some outcomes or strategies, which is not true in the PD game, then “the number of strategically different games rises to 732.” Id. at 6.

Id. at 6. Holzinger explains: “The game matrices are strategically equivalent whenever only the rows, the columns, both rows and columns, or, in symmetric games, the players are interchanged.” For example, if two players assigned all four outcomes the same rank, mutually preferring the outcome where both play “Strategy X,” then the game where “Strategy X” is placed in the first row and first column is strategically equivalent to the game where “Strategy X” is placed in the second row and second column.

Anatol Rapoport and Melvin Guyer were the first to note that there are 78 strategically distinct two-by-two games (assuming strict ordinal rankings) of the 576 possible payoff combinations. See Anatol Rapoport & Melvin Guyer, A Taxonomy of 2 X 2 Games, 11 GENERAL SYSTEMS: YEARBOOK OF THE SOC’Y FOR ADVANCEMENT OF GEN. SYSTEMS THEORY 203, 204 (1966). See also Anatol Rapoport, Melvin J. Guyer & David G. Gordon, The 2X2 Game 17 (1976). Given developments in game theory terminology, however, I find Holzinger’s classifications more useful for the discussion that follows.

Id. at 9, 14. The Asymmetric Dilemma differs from the PD in that only one of the two players has a dominant strategy to defect, while the other player’s best move is to match whatever the first player does. But the result is still a Dilemma because, knowing that the first player will defect, the second player will also defect.

Id. at 9, 13. Harmony games have a unique Pareto-optimal equilibrium with equal payoffs between the players. The inevitable result therefore is efficient and fair. One would not expect the legal literature to have any concern for such situations.
It is certainly possible that Dilemma games nonetheless represent more (or less) than 5% or 7% of discrete two-by-two interactions in the real world. Despite the abstract probabilities, nature might disproportionately create situations where the payoffs, for each player, take the form (from Figure 3) $b > a > d > c$. But there is no particular reason to think so and I have found no theorist making such a claim.\textsuperscript{48} A standard assumption would be that nature presents payoffs that vary continuously across the possibilities. One might therefore expect that the payoff structure producing the four Prisoners’ and Asymmetric Dilemmas are no more common than any other four possible games, i.e., 7% of the problematic cases. But even if one credits the idea that Dilemma games occur more frequently than their proportion of the strategic possibilities, which is possible (as is the opposite), it is extremely doubtful that this explains the huge disparity observed in the legal literature. Recall that Dilemma games references outnumber four other game references by a ratio of 5 to 1. Absent some theoretical insight, it is outlandish to assume that situations representing only 7% of the troublesome two-by-two games represents such a large majority of the empirical reality.\textsuperscript{49}

\textbf{B. The Comparative Frequency of Equity Problems}

The frequency claim is even more difficult to sustain when we look closely at some of the other problematic games. Subtracting the Dilemma games and the Harmony games that present no collective action problem, there are 52 remaining games. Holzinger labels the largest category –

\textsuperscript{48} See id. at 16 (“As of yet, not much can be said about the empirical frequency of the collective action problems.”).

\textsuperscript{49} Holzinger makes the same point about political science scholarship: The fact . . . that the prisoners’ dilemma has received a great deal of attention in social science literature, while Rambo games [discussed in the next paragraph above] have not, does not make it possible to draw conclusions about the empirical relevance of the two games. This fact is probably a mere result of researchers’ perceptions and interests, and of the greater logical or normative attractiveness of the prisoners’ dilemma. Id. at 16.
representing 29 games or 56% of troublesome games – as “mere distribution.” Here, there is a unique equilibrium with unequal payoffs but also an efficient non-equilibrium outcome. Holzinger provides an example of such a game – labeled “Rambo” in Figure 4.

<table>
<thead>
<tr>
<th>Player 1: Strategy</th>
<th>Player 2: Strategy A</th>
<th>Player 2: Strategy B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy A</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Strategy B</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 4: A “Rambo” Game**

Here, Player 1 has no dominant strategy. If Player 2 selects Strategy A, then Player 1 is better off playing Strategy B (receiving 4 instead of 2). But if Player 2 selects Strategy B, then Player 1 is better off playing Strategy A (receiving 3 instead of 1). By contrast, Player 2 does have a dominant strategy: if Player 1 selects Strategy A, then Player 2 prefers Strategy A (receiving 4 instead of 3); if Player 2 selects Strategy B, then Player 2 still prefers Strategy A (receiving 2 instead of 1). Player 2 will therefore select A and the only equilibrium is where Player 1 anticipates this move and selects B, i.e., the outcome B/A. Note that this equilibrium is unequal – producing the payoffs (4, 2). The “problem” here is that Player 2 may regard the equilibrium outcome as unfair. Not only is there an inequality, the inequality is also not necessary to achieve efficiency. The

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50 Id. at 9, 13.
51 For the label, she cites Michael Zurn, Interessen und Institutionen in der internationalen Politik. Grundlegung und anwendungen des situationsstrukturellen Ansatzes. Opladen: Leske+Budrich (1992). A Westlaw search (Aug. 26, 2007) found no references to “Rambo game,” but I am unaware of any alternative name for this simultaneous game. Note, however, that the Ultimatum game might be thought of as a sequential (and continuous) version of the Rambo game (or the Rambo as a simultaneous and dichotomous version of Ultimatum).
non-equilibrium outcome A/B (where Player 1 selects A and Player 2 selects B) produces equal payoffs (3, 3) with the same joint returns (6) as outcome B/A. Player 2 may therefore seek some mechanism, such as law, to force the outcome A/B. Or, if the game is repeated, Player 2 “go Rambo” by selecting Strategy B, which produces the worst possible outcome (B/B = 1, 1), but may also give Player 1 an incentive to switch in future rounds to Strategy A, thereby producing the equal outcome.

The Rambo game illustrates the problem of distribution or equity, which arises far more frequently (29 of 56) in the two-by-two setting than the problem of cooperation (4 of 56). As discussed in the next part, the point is not just that equity games are common but that they also describe situations the law frequently addresses.\(^{52}\)

**C. The Comparative Frequency of Coordination Problems**

\(^{52}\) As an example, imagine the Prisoners’ Rambo Game. Two criminals, A and B, commit a crime together and later B is arrested for the crime, but A is not caught and the prosecutor does not know that anyone other than B was involved. B must decide whether to implicate A, where successfully implicating A requires that B “confess” to participating in the crime herself. A must decide whether to “help” B in some costly way, such as to pay for a top flight lawyer to represent B or to swear to a false alibi for B. Because the prosecutor’s case is not overwhelming and B has a chance of an acquittal, B is better off not confessing and not implicating A no matter what A does. Knowing this, A’s best response is not to contribute to B’s defense. B regards the outcome as unfair, as the resulting payoffs are unequal. For this reason, B has some incentive to “go Rambo” and confess to hurt A and to achieve equal payoffs. If A and B committed multiple crimes together, so that the game is repeated for each crime, B might confess to one crime to convey the threat of confessing to the other crimes, thereby inducing A into contributing to his defense on those other crimes.

Another example is abortion. Imagine that B is an unmarried pregnant woman who chooses whether to abort or give birth. A is the father who decides whether to provide help or not (with either the abortion or the birth). Suppose that A prefers that B abort, feels no obligation to help B pay for or recover from the abortion, yet would feel (at least legally) obligated to provide financial support for his child, if born. Suppose B prefers to abort whether or not A provides assistance, though she prefers to have assistance. Given these preferences, A will anticipate that B will abort and choose to provide no assistance, producing the single, unfair equilibrium.
What about the problem of coordination? The “pure” coordination game is by now familiar, if distracting. Legal scholars know the example of individuals choosing between driving on the left or right side of the road. In that case, there are two pure strategy equilibria: RR, where both players drive on the right, and LL, where both drive on the left. The game is purely one of coordination because both players care solely about a common objective: avoiding the non-equilibrium outcomes where one drives on the left side of the road and the other on the right. The problem, however, is that even given identical preferences as to what are the best and worst outcomes, there is a danger that individuals will fail to coordinate their strategies.

The pure coordination game is distracting, however, because it seems to be rare and therefore makes the issue of coordination seem rare. In Holzinger’s count, the Pure Coordination game constitutes only one of the 78 strategically distinct two-by-two games, even less than the four Dilemma games. For that reason, many theorists seem to view coordination as trivial. Although I will not explore the pure coordination game, it is worth noting that the situation arises in the two-by-two setting 25% as often as the Dilemma, but is mentioned only 2.1% as often in the legal literature in recent years.

In any event, the real problem of coordination occurs in impure cases, which are far more common. In Holzinger’s count of two-by-two cases, which are far more common. In Holzinger’s count of two-by-two

53 Recall that an equilibrium exists where, as here, neither player can unilaterally improve her situation by switching strategies.

54 As another example, we might imagine the Prisoners’ Pure Coordination game. Two guilty prisoners seek to give a common exculpatory alibi during separate interrogations, but failed to agree in advance on the false alibi. If they both give the same alibi (e.g., watching television at the first prisoner’s apartment), the prosecution will not be able to convict them, but if they give no alibis or conflicting alibis, he will.

55 Holzinger, supra note 44, at 9, 14.

56 A separate Westlaw search for (“pure coordination” /2 game) yields 43 documents, of which 17 come after 2002. These amounts constitute 1.5% of the number of references to the PD game without a date restriction (2809) and 2.1% of the PD references since 2002 (828).
games, there are five distinct cases represented by the Stag Hunt or Assurance game or variations she calls “degenerate coordination,” one case of the Chicken or Hawk-Dove game, and five distinct cases represented by the Battle of the Sexes game. I describe these games below and explain how each has an element of coordination (and often an element of equity). If we add in the one case of the pure coordination game, there are twelve games involving coordination (of the possible 78) compared to four Dilemma games. Yet even though these coordination games arise in Holzinger’s count of the two-by-two setting three times as often as a Dilemma, the legal literature has discussed the former games in recent years less than 12% as often as the latter.

D. Examples: The Frequency of Assurance and Hawk-Dove Games

To illustrate, consider two of the relatively neglected games – Assurance and Hawk-Dove, which in subsequent discussions I will show are relevant to law (I defer discussing a third key game, Battle of the Sexes, until the next Part).

1. The Assurance or Stag Hunt Game

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57 In these games, there is a significant role of indifference between certain outcomes; there are still multiple equilibria, where some favor one or the other player, but the efficient equilibrium has equal payoffs. Thus, the games should be easy to solve, but still require some assurance of how one is going to play.

58 Id. at 9, 14-15.

59 Note: this is a different claim that the one presented in Table 1 because we are not here counting the Ultimatum game, which has only one equilibrium. Instead, a separate Westlaw journal search for “stag hunt” or “assurance game” or (battle /s sexes /s game) or “chicken game” or (hawk /s dove /s game) or “pure coordination” yielded 260 documents, which is 9% of the 2851 date-unrestricted PD references. The same search restricted to articles since 2002 yielded 103 hits or 12% of the 867 PD references since 2002.
Figure 5 depicts what is known as a Stag Hunt or Assurance game. Here, if Player 2 selects Strategy A, then Player 1 is better off selecting Strategy A. If Player 2 selects Strategy B, however, then Player A is better off selecting Strategy B. Because the payoffs are symmetric, Player 2 has the same preferences. Thus, the game has two equilibria: A/A and B/B.

![Figure 5: An Assurance or Stag Hunt Game](image)

The players have the same preferences, each strongly preferring A/A to B/B. This common interest might make it trivially easy to reach the mutually desired outcome. But the problem here is the riskiness of Strategy A. Selecting Strategy B guarantees a return of 3, while Strategy A will earn either 4 or 0. For this reason, both Players might select the less risky Strategy B and wind up in equilibrium B/B despite the fact that each regards B/B as worse than A/A. The players thus face a problem of coordination. The game draws one of its names – Assurance – from the fact that each needs to assure the other that she is going to play the riskier strategy – A – so the other should as well. The name “Stag Hunt” comes

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60 For technical differences in the two games, which need not concern us here, see Baird, Gertner & Picker, supra note 16, at 301, 315.

from Rousseau’s illustration of the choice between hunting stag and hunting hare, where one succeeds in hunting stag only if the other hunter also hunts stag, where sharing a stag with the other hunter is the best outcome, but where hunting hare is safer because one can succeed on one’s own.

As another means of judging the relative frequency of the PD game, consider how easily small changes in the payoffs of one game can produce the other. Start with Figure 5 and note what happens if we were to change slightly just two of the eight payoffs, specifically, if we raise the payoff from playing Strategy B against Strategy A from 3 to 5. With that change, we arrive at the payoffs in Figure 6. A quick inspection will show that this game is a PD because for each player the dominant strategy is B, which produces a single inefficient equilibrium B/B. Of course, if we had started with Figure 6, the change in the payoffs from 5 back to 3 would cause the PD game to flip into the Stag Hunt game of Figure 5.

![Figure 6: Another Prisoners' Dilemma](image)

To make the point more generally, recall the generic symmetric two-by-two game of Figure 3. The PD arises because, for each player, the payoff values take the form \( b > a > d > c \). The Assurance game arises because the payoffs take the form \( a > b > d > c \). The difference is trivial; all

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that is required is a change in the relative positions of payoffs $a$ and $b$. If $b$

is slightly greater than $a$, we have a PD; if $a$ is slightly greater than $b$, we

have Assurance. In sum, if the PD is a pervasive feature of social life, then

there is good reason to think that the Assurance game is a pervasive

feature of social life, given how little the payoffs have to change to flip one

game into the other. If cooperation is a common problem, so is

coordination.

One illustration of the game is the “bank run” discussed in the

introduction. The Assurance game shows the efficient equilibrium where

depositors gain the advantage of pooling their resources in a bank (where

there is no bank run), as well as the inefficient equilibrium where

everyone seeks to withdraw their deposits and go it alone. The game

captures the fact that, in times of uncertainty, the depositors need to 

assure

each other than they will not panic and the fact that, if no one else

withdraws their deposit in fear, there is no reason for you to do so.

As a second example, consider again the familiar setting where

prosecutors bargain with prisoners. Suppose a situation similar to the PD,

except that the prosecutor cannot convict either prisoner of any crime if

neither confesses. Christopher Leslie claims, for example, that this result is

common in anti-trust conspiracies: if the prosecutor can’t prove the

conspiracy, she can’t prove any offense. If so, then the best outcome for

each is when neither confesses and both go free. (Oddly, sometimes the

PD game has been erroneously described as occurring in this very case).

Figure 7 illustrates.

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63 See text accompanying notes 17-21.

64 See Christopher R. Leslie, Antitrust Amnesty, Game Theory, and Cartel Stability, 31 J.

CORP. LAW 453, 457-61 (2006) (noting that the resulting game is one of “coordination”);


(“Yet in most criminal antitrust prosecutions, the authorities do not have solid evidence

of a minor crime. . . . Without sufficient evidence of a minor crime, antitrust authorities

need some leverage to convince cartelists to confess. Otherwise, there is no Prisoner’s

Dilemma.”).

65 See supra note 20.
If only one prisoner confesses, both prisoners are convicted, but the confessor gets a lenient sentence (e.g., one year) while the non-confessor gets the maximum (e.g., 15 years). If both confess, both are convicted and receive an intermediate sentence (e.g., 7 years). Under these circumstances, if Player 2 remains silent, Player 1 is best off being remaining silent. If Player 2 confesses, Player 1 wishes to confess. Player 2 has parallel incentives so there are two (pure strategy) equilibria: both are silent and both confess. Though mutual silence is best for each prisoner, silence is risky because it might produce the worst outcome. So each prisoner needs to assure the other to play the risky strategy of silence. Thus, a small change in the PD narrative produces the “Prisoners’ Assurance Game.”

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66 A pure strategy is one that, in given circumstances, selects a certain “move” or behavior with certainty. By contrast, a “mixed strategy” involves (in a given circumstance) selecting among at least two moves with some probabilities that sum to one. Concordantly, a pure strategy equilibrium, “each player adopts a particular strategy with certainty,” whereas in a mixed strategy equilibrium “one or more of the players adopts a strategy that randomizes among a number of pure strategies.” BAIRD, GERTNER & PICKER, supra note 16, at 313. In the present context, a pure strategy equilibrium involves each player being silent or confessing with certainty.

67 Given that the only difference is that, in the PD, the prosecutor can convict each prisoner of something even with no confession, whereas in Prisoners’ Assurance, she can convict the defendants of nothing without a confession, there is no reason to think the PD is more common. One may challenge the example by saying that a prosecutor would
2. The Hawk-Dove or Chicken Game

The Assurance or Stag Hunt game does not represent the problem of equity because, in its two equilibria, the payoffs are equal. By contrast, the Rambo game discussed above illustrates equity without any element of coordination. But the Hawk-Dove (“HD”) game (also known as Chicken) poses both coordination and equity problems (as does the Battle of Sexes game discussed in the next Part). As we will see, HD also arises from a small change in the PD payoffs. Figure 8 illustrates.

<table>
<thead>
<tr>
<th></th>
<th>Player 1: Hawk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dove</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

2: Player

<table>
<thead>
<tr>
<th></th>
<th>Player 2: Dove</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawk</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Dove</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
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</table>

Figure 8: A Hawk-Dove Game

always choose to make the game a PD by offering zero years if a defendant is the only one who confesses (instead of 1 in Figure 7). In that case, it seems to be weakly dominant to confess, which is better for the prosecutor.

Yet the reality is that most defendants will never regard an outcome of confessing and avoiding criminal sanctions as being as good as not confessing and avoiding criminal sanctions. First, confessing may force the confessor to stop engaging in profitable illegal activities, such as an ongoing price-fixing scheme. Second, there is a reputational cost to being a snitch. Third, the defendant may have some small altruism towards her criminal confederates. However small these effects are, the best outcome in this situation (where the prosecutor can’t convict either without a confession) will remain Be Silent/Be Silent, in which case the result is an Assurance Game and not a PD.

Because Rambo is asymmetric, there are significant differences in the Rambo game and Prisoners’ Dilemma, so it requires more than trivial change to flip one situation into the other.
Given these payoffs, if Player 2 selects the strategy Dove, then Player 1’s best response is Hawk. If Player 2 selects Hawk, then Player 1’s best response is Dove. Because the payoffs are symmetric, the converse is true for Player 2, which means there are two (pure strategy) equilibria: Dove/Hawk and Hawk/Dove. Most obviously, there is an equity problem here because each equilibrium has dramatically unequal payoffs, one favoring Player 1 and the other favoring Player 2. But there is also a problem of coordination because the players have a common interest in avoiding what each regards as the worst possible outcome – Hawk/Hawk. Even though that outcome is not a Nash equilibrium (because at that point a player would prefer to unilaterally switch strategies), if both players “aim for” their preferred outcome by playing Hawk, that is exactly the outcome that results. Indeed, in the alternative name “Chicken” comes from a fictional game between teenagers who drive their cars directly at each other, where the one who swerves first loses face, but the failure of either to swerve is catastrophic.69

To generalize, recall the generic symmetric two-by-two game of Figure 3. The PD arises because, for each player, the payoff values take the form $b > a > d > c$. The HD Game arises because the payoffs take the form $b > a > c > d$. Again, the difference is trivial; all that is required to flip from one game to the other is a change in the relative positions of payoff $c$ and payoff $d$. If $d$ is slightly greater than $c$, we have a PD; if $c$ is slightly greater than $d$, we have HD. If the PD is a pervasive feature of social life, then there is good reason to think that the HD game is a pervasive feature of social life, given how little the payoffs have to change to flip one game into the other.

Again, I defer until the next part the main illustrations of the legal significance of HD, but as an example, consider again the setting of prosecutorial bargaining. The Prisoners’ Assurance game discussed above arises because the prosecutor has so little evidence that she cannot convict

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69 See Rebel Without a Cause (Warner Brothers 1955).
either prisoner of any crime without a confession. Suppose instead that
the prosecutor has so much evidence that she can convict both prisoners of
a serious offense without a confession. But imagine that either prisoner
can, by “snitching,” reveal evidence that the true perpetrator is a
previously unsuspected person $X$, thereby exonerating both prisoners.
The problem is that the prisoners each prefer that the other snitch because
each worries that a snitch may suffer retaliation by $X$ or other criminals. Finally, suppose each considers the worst outcome to be where neither
snitches and both are imprisoned for a crime they did not commit. As
illustrated by Figure 9, the result is a HD game with the (pure strategy)
equilibria Snitch/Be Silent and Be Silent/Snitch. As with the more abstract
story above, small variations in PD circumstances can produce an entirely
different game.

\[
\begin{array}{c|cc}
\text{Player } & \text{Be Silent} \\
\hline
\text{Snitch} & -1 & 0 \\
\text{Be Silent} & -2 & 0 \\
\end{array}
\]

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70 This possibility also arises if the existing evidence makes the crime looks more serious
than it actually was, and to appear to have been committed jointly by the prisoners, when
a confessor could plausibly claim to have committed it alone. The problem here is that an
explanation refuting the serious crime involves admitting to the commission of some
lesser crime, as by admitting to a criminally negligent killing to defend against a charge
of intentional killing or giving an alibi to a serious crime that reveals one’s being in a
place to commit a minor crime (e.g., a house of prostitution). In any such case, suppose
that the prisoner’s only chance of making her explanation credible is to implicate herself
in the minor crime, which has the effect of exculpating both prisoners for the more serious
crime and also the other prisoner for the minor crime. Each prisoner then wants the other
to confess, but considers the worst outcome where neither confesses.

71 This kind of Chicken or Hawk/Dove game is sometimes called the “Volunteers’
Dilemma,” but it is not a PD (because it is not a dominant strategy to avoid volunteering).
See William Poundstone: Prisoner’s Dilemma: John von Neumann, Game Theory,
Be Silent

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Figure 9: The Prisoners’ Chicken Game

In sum, one cannot possibly explain or justify the disparate attention given to the PD based on the rarity of other games. Equity and coordination problems are likely to be more pervasive than Dilemmas. I next consider the possibility that equity and coordination problems, though common, are not important to the study of law.

III. NOT BECAUSE OF RELEVANCE: THE IMPORTANCE OF EQUITY AND COORDINATION TO LAW, LEGAL INSTITUTIONS, AND LEGAL CHANGE

However unlikely it is that one could justify the scholarly emphasis on PDs by the game’s relative frequency, it is even more implausible to think that situations involving coordination or equity are neglected because they are not relevant to law. Coordination and equity are involved in much of the social conflict law that law is called upon to resolve. As should go without saying, much of law is concerned with distribution. As a positive matter, people often judge law by its “fairness,” which they relate in part to its distributional consequences.\(^\text{72}\) In turn, people often seek legal change as a means to change distribution.\(^\text{73}\) As a normative matter, under a variety of perspectives – corrective justice, distributive justice, and many non-utilitarian social welfare functions –

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distribution is a central concern.\textsuperscript{74} Even if one accepts the standard economic recommendation that income redistribution be achieved solely through the income tax system,\textsuperscript{75} there remains the fact that tax law should on this view redistribute and that other legal rules may justifiably addresses forms of inequality other than income, e.g., laws aimed at eliminating discrimination.

Though less obvious, coordination issues are just as important to law, legal institutions and legal change. There are so many ways in which coordination matters that a mere article cannot review them all. In the remainder of this Part, I make my case for the importance of coordination by offering only a sample of such problems, often in situations that also raise concerns of equity. Coordination games help to explain bargaining and constitutional theory, international law, the expressive function of law, social roles and discrimination, and social movements and legal change.

\textit{A. Bargaining and Constitutional Theory}

Any theory of constitutional interpretation must make descriptive claims about what a constitution is and how it functions. What the constitution \textit{means} is affected by the functions it serves. In this section, I explain how game theory illuminates these matters.

\textit{1. Background on Bargaining as Coordination}

As both a prelude to the constitutional discussion and as a subject of independent importance, coordination is central to bargaining. Admittedly, when negotiations conclude, there may be a PD regarding

\textsuperscript{74} See, e.g., \textsc{John Rawls}, \textit{Justice as Fairness: A Restatement} (2001); \textsc{Martha C. Nussbaum}, \textit{Women and Human Development: The Capabilities Approach} (2000).

\textsuperscript{75} See \textsc{Louis Kaplow} \& \textsc{Steven Shavell}, \textit{Why the Legal System Is Less Efficient than the Income Tax in Redistributing Income}, 23 \textit{J. Legal Stud.} 667, 667-68 (1994).
compliance. If enforcement is insufficient, then each might have a dominant strategy not to uphold her end of the bargain. But in many situations, formal or informal sanctions ensure contractual compliance. In this common context, the important issue is whether and how the parties reach agreement. Given enforcement, whatever problem bargaining is, it is not a PD. A bargain is possible only because two or more parties can mutually gain by some agreement. Where being the only one to defect in a PD is the best outcome, being the only one to withhold agreement in a bargaining situation is not the best outcome because it prevents the gain of the bargain. Instead, the problem is one of coordination and equity: coordination because there is more than one way to conclude agreement and each party shares the desire to avoid an impasse; equity because there are different ways to allocate the gains from agreement.

Any two-by-two game will miss much of the problem of bargaining. First, such a simple game narrows the number of possible “moves” to two, where there are often an enormous number of ways one could reach agreement. Second, a simultaneous game ignores the back and forth nature of bargaining, as well as uncertainty about how many sequences the game will have. Finally, these simple games imply perfect information, where bargaining usually occurs in the presence of asymmetric information. For this reason, game theorists have explored several different highly complex models of bargaining.\footnote{One of the basic (non-cooperative) bargaining approaches is the Rubenstein alternating offers model, first set forth in Ariel Rubinstein, \textit{Perfect Equilibrium in a Bargaining Model}, 50 ECONOMETRICA 1151 (1982). For discussions, see MARTIN OSBORNE \& ARIEL RUBINSTEIN, BARGAINING AND MARKETS (1990); BAIRD, GERTNER \& PICKER, supra note 16, at 219-41; ERIC RASMUSEN, GAMES AND INFORMATION 299-303 (3d ed. 2001). An entirely different (and cooperative) approach derives from the axiomatic bargaining approach of John Nash, \textit{The Bargaining Problem}, 18 ECONOMETRICA 155 (1950). For discussions, see AVINASH DIXIT \& SUSAN SKEATH, GAMES OF STRATEGY 521-49 (1999); RASMUSEN, supra, at 296-99.}

Nonetheless, if one seeks some insight from simple models, one may reasonably ask what two-by-two game best models bargaining. The
most common answer is the Battle of the Sexes (“BOS”) game. In the prior section, I noted that BOS occurred in five distinct cases of Holzinger’s count of two-by-two interactions, but I have not yet explained the game. In BOS, the players choose between Strategies A and B, where the worst outcome for each is the failure to match strategies, but where one player prefers matching at Strategy A and the other prefers matching at Strategy B. In Figure 10, if Player 2 selects strategy A, Player 1 is better off selecting Strategy A (receiving 3 instead of 0). If Player 2 selects Strategy B, Player 1 is better off selecting Strategy B (receiving 1 instead of 0). Player 2’s preferences are parallel, so there are two equilibria: A/A and B/B. Player 1 prefers A/A and Player 2 prefers B/B, but the players agree on the need to avoid B/A and A/B, each of which is worse for both players than either equilibrium.

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<tr>
<th>Player</th>
<th>Player 1: 1</th>
<th>Strategy B</th>
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<td>Strategy A</td>
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<td>Strategy B</td>
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Figure 10: A Battle of the Sexes Game

The BOS game usefully models bargaining in the three coordination examples from the introduction. Most obviously, it models standard setting, as where different firms or industries need to agree to certain technical standards to allow their products to interact. Both sides strongly prefer to “match” standards, but each side prefers a different one, such as the specifications of their current product. Similarly, criminal

77 See supra text accompanying note 14.
78 Of course, there are dynamic aspects to the situation that the simple two-by-two model omits. See BAIRD, GERTNER & PICKER, supra note 16, at 208-13.
defendants being jointly tried may each benefit from presenting a unified defense, as where their alibis match. But the defendants may disagree on which defense is best.\textsuperscript{79} These groups of individuals need to negotiate to an agreement and BOS nicely presents the basic structure of their bargaining problem (at least in such cases where there is no practical 50/50 split of the available surplus). Although it leaves many aspects of bargaining out, we might think of BOS as capturing what both sides know is the last round of bargaining, where each side will make its final offer. If the two offers match, there is a contract. If there is no match, the bargaining ends without an agreement. More complex games are more realistic, but (given enforcement) they will not be PDs. Any model of bargaining with involve coordination about outcomes with different distributional consequences.

2. The Bargaining Problems Constitutions Solve

Russell Hardin initiated an interesting political science literature by claiming that constitutions arise out of, not the PD game, but a BOS game.\textsuperscript{80} Hardin imagines the constitution is the result of a bargain between powerful interest groups who wish to form a state. The situation is a multi-player BOS game because the players are always better off “matching” their strategies, by agreeing to the same structure of

\textsuperscript{79} Similarly, when the government in a multi-lingual city selects a language to use on its street signs, each side may prefer that their language be made most prominent and, in cases where practical constraints permit the use of only one language, each side prefers their own. Nonetheless, if the government builds new roads or implements new one-way requirements, each side prefers that there be some new signage to direct traffic and avoid accidents, especially if most individuals on each side can read simple words in the other’s language.

government, than they are if they fail to agree. Any one of the governmental structures being discussed may be better for all players than the absence of a governmental structure. But at the same time the situation is obviously not a pure coordination game because different players – states or individuals – will prefer different structures.

According to Hardin, constitutions are self-enforcing conventions in which one wants to conform once everyone else is conforming. A convention is a type of solution to an iterated coordination game. An obvious example is the convention of driving on the right side of the road; once everyone else does that, no individual wants to deviate. This is true in the BOS game because, once there is a “match” at some equilibrium, one is worse off by deviating. If the players agree to A/A, even though this is worse for Player 1 than B/B, Player 1 will prefer playing strategy A and receiving a payoff of 1 to playing Strategy B and receiving a payoff of 0. Similarly, if new entrants are permitted to join the constitution, they will be better off conforming to the existing arrangement than to create a “mismatch” that lowers everyone’s payoffs including their own. For example, a populous state might have preferred that seats in the Senate were, like the House, allocated by population. But such a state may strongly prefer entering the existing arrangement to starting from scratch with a new constitutional convention (or staying on its own).

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81 See Hardin, *Why a Constitution*, supra note 80, at 105, Game 3. Note that instead of giving payoff numbers that represent utilities, where higher numbers are better, Hardin gives payoff ranks, where lower numbers mean higher ranks. Thus, Game 3 is BOS with the two equilibria being the payoff ranks (2,1) and (1,2), representing matches at I/I and II/II.

82 Id. at 109, 113-14.

In a similar vein, imagines the constitution as an agreement that arises between the most powerful political parties in the state. Political parties expect to alternate control of government and thus find themselves in an iterated PD game where each party will benefit if both parties adhere to certain restraints of power when in office. Conditional cooperation is possible because defection today is deterred by the threat of retaliatory defection tomorrow. Because Elster uses the PD game, the idea is in one respect the very thing object of my criticism in this article. Yet Elster’s discussion makes clear the important coordination element embedded in the iterated PD game. There are obviously many ways to define governmental powers; many ways of defining the restraint required of each branch. To permit cooperation in the iterated PD game, the parties must agree on what the boundaries of governmental powers. Only then will they commonly understand what constitutes “cooperation” and “defection.” If the political parties do not share expectations, then they cannot expect to maintain cooperation over time by the threat to defect only in retaliation for the other side’s defection.

Where Hardin and Elster focus on the bargaining between interest groups that occur for any constitution, some political scientists have focused on democratic constitutions and the implicit bargain struck by citizens with each other. As Barry Weingast observes, the stability of democracy depends on “the people” being willing to challenge official action that transgresses democratic principles, as by purporting to stay in office after being defeated in a lawful election. The problem is how to create “the rule of law.” He models the problem as a complex game

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85 Without a common understanding of required political restraint, each side will constantly believe that the other side has defected, thus justifying retaliatory defection. Because unjustified retaliation is itself defection, the failure to coordinate on a particular understanding ensures mutual recriminations and the unraveling of cooperation.
involving (in part) an Assurance game, where citizen groups can maintain
democratic rule only by jointly challenging the official and thereby
removing her from power.\footnote{See id. at 248 (figure 2) and 250 (figure 4), where the top node in each figure is, on inspection, a Stag Hunt game for citizen groups A and B. For example, in the top node of Figure 2, there two equilibria are Acquiesce/Acquiesce and Challenge/Challenge. Mutual Challenge is best for A and B (payoff of 7), but riskier because their worst outcome comes from playing Challenge against Acquiesce (payoff of 1). Of course, in both cases the Stag Hunt is embedded in a larger game, but Weingast’s point is to show how that game requires coordination.} Each group prefers to challenge the official if
the other group does the same, but would rather acquiesce if the other
group acquiesces, because unilateral action is ineffective and costly. The
problem, however, is that different citizen groups have very different
views about the appropriate limits to state power. If each group seeks to
oust government officials only when (and whenever) that group views the
official as having overstepped her authority, the citizen response will
never be sufficiently united to threaten authoritarian officials (but yet may
cause constant turmoil).\footnote{Id. at 246, 251-52.}

What is essential, then, is that the citizen groups coordinate their
efforts to challenge government officials around a “social consensus”
about what state actions are legitimate. Especially in a large diverse
society, that consensus is unlikely to arise in a decentralized fashion. Some
centralized mechanism is needed and that is what a constitution provides.
“Policing the sovereign requires that citizens coordinate their reactions,
which requires constructing a coordination device,” such as a written
constitution.\footnote{Id. at 251. Other political scientists, such as Peter Ordeshook, have explored the prescriptive implications of this theory for the creation of stable constitutions. See Peter C. Ordeshook, \textit{Are 'Western' Constitutions Relevant to Anything Other than the Countries they Serve?}, 13 CONST'L POL. ECON. 3 (2002); Peter C. Ordeshock, \textit{Constitutional Stability}, 3 CONST'L POL. ECON. 137 (1992).}

In sum, the constitution is a bargain struck between individuals
who face some need to coordinate their expectations.
3. How Constitutions Coordinate: Law as Constructed Focal Point

Even if the problem to be solved is one of coordination, the question remains how a constitution can coordinate. For much of the law, it is tempting just to view legal enforcement as exogenous – people obey the stated rule because they fear enforcement. But for the constitution (or the rule of law), one requires a deeper explanation. There is no external enforcer of the constitution. How does the simple act of agreeing to the constitution cause the parties to the agreement to enforce it? As a subset of this question, what enforces the judiciary’s interpretation of the constitution? Why do the legislative and executive branches pay any attention to the judiciary?

As background, we must begin with the role of “focal points” in solving coordination problems. Decades ago, Nobel Laureate Thomas Schelling first observed that, in situations requiring coordination, anything that makes salient one behavioral means of coordinating tends to produce self-fulfilling expectations that this equilibrium will occur.\textsuperscript{90} Schelling noted how, in many real world settings, something in the situation not captured by the formal mathematic structure draws the mutual attention of the individuals who need to coordinate.

The simplest examples involve pure coordination games. For example, when Schelling asked people at what time of day they would go to meet another person if they had planned a day and place but had failed to pick a particular time, he found a strong tendency to pick noon.\textsuperscript{91} When he showed individuals a map and asked where they would go to meet another individual who had the same map and sought to meet them, the individuals tended to point to a topographically unique place, such as the

\textsuperscript{90} SCHELLING, supra note 23, at 54-67.
\textsuperscript{91} Id. at 55-56.
only bridge.\textsuperscript{92} In each case, there are a great many ways to coordinate – a multitude of equilibria – but the players manage to solve their problem by gravitating towards the prominent or conspicuous one, which Schelling called the “focal point.”\textsuperscript{93} Later research finds that individuals do not just thoughtlessly choose the salient solution, but reason about what is likely to be mutually understood as salient.\textsuperscript{94}

What makes a particular outcome focal? Although many things can matter, we can focus on just two. One factor Schelling identified is past practice or “precedent,”\textsuperscript{95} which I discuss below. A second is communication; even non-binding “cheap talk” can make the discussed solution salient.\textsuperscript{96} Sometime this communication occurs between the parties in the coordination game. Perhaps Schelling’s most interesting insight, however, is the idea that a third-party – someone not in the coordination game – can use expression to construct a focal point.\textsuperscript{97} The third party can recommend that the individuals coordinate in a particular way, and thereby create self-fulfilling expectations that the recommended behavior will occur. This is easy to imagine in a pure coordination game. If the government in a new society announces that drivers will drive on the right side of the road, the salience of that solution is likely to cause that result, regardless of whether the government will use sanctions to enforce

\textsuperscript{92} Id.
\textsuperscript{93} Id. at 57 (“Most situations . . . provide some clue for coordinating behavior, some focal point for each person’s expectation of what the other expects him to expect to be expected to do.”).
\textsuperscript{95} SCHELLING, supra note 23, at 57.
\textsuperscript{97} See id. at 66 (department store sign for where lost parties should re-unite creates a focal point solution to their coordination problem).
the equilibrium (or whether the citizens feel a moral obligation to obey the law).

Of greatest significance to law, however, Schelling proposed that third-parties can create focal points in the more common mixed motive games that involve both coordination and conflict. Suppose, Schelling asks, that the traffic light fails at some busy intersection and a bystander – not a police officer – steps in to direct traffic.98 As two drivers approach from different streets, each prefers to proceed ahead of the other, although each regards the worst outcome as a collision. Thus, the situation is like a HD or BOS game. Schelling conjectured that the bystander’s hand signals would influence the drivers’ behavior. If the drivers can both see (and see that the other sees, and see that the other sees that the other sees; in short, have “common knowledge”99 that) the bystander motioning one driver to stop and the other to proceed, then the driver told to stop will now have stronger reason to expect that the other driver will proceed. Given that expectation, her best response is to stop, which is to comply with the third party’s expression. By creating a focal point, the third party yields a purely expressive influence on behavior.100

Several theorists have noted that law can work in this manner, as legal rules are a form of third-party expression (of legislators, judges, or

98 Id. at 144.
99 See BAIRD, GERTNER & PICKER, supra note 16, at 304 (“Something is common knowledge if it is known to each player, and, in addition, each player knows that the other player has this knowledge; know that the other player know the player know it; and so forth.”).
100 Nothing in the example requires that the bystander threaten non-compliance drivers with sanctions or possess what drivers consider to be legitimate authority. “[H]is directions have only the power of suggestion, but coordination requires the common acceptance of some source of suggestion.” SCHELLING, supra note 23, at 144. Schelling discussed focal points in the context of bargaining based on the idea that a bargainer will try to identify or create focal points that draws her counterpart toward the bargaining outcome she seeks. That idea has generally been ignored in the bargaining literature, but see Maarten C.W. Janssen, On the Strategic Use of Focal Points in Bargaining Situations, forthcoming J. ECON. PSYCH. 2008.
executive branch officials) making focal the form of behavior the law demands. As a first example, the idea that written constitutions are focal points is implicit in Hardin’s claim that they solve coordination problems. Writing down the allocation of power in a particular structure of government makes that allocation salient and creates self-fulfilling expectations that the various players will demand at least as much power as granted in the writing, forcing other players to cede that much power. Other theorists have made the point explicit. Indeed, one of the few law professors to write on the coordinating function of constitutions – David Strauss – described this focal effect as justifying a particular interpretive stance toward constitutional text:

On the conventionalist account, the Constitution is a focal point . . . : our culture has given it a salience that makes it the natural choice when cooperation is valuable. But its salience and general acceptability, rather than its authority or optimality, are the most important reasons for accepting it.

Conventionalism, understood in this way – as an allegiance to the text of the Constitution, justified as a way of avoiding costly and risky disputes and of expressing respect for fellow citizens – helps explain the deference given to the text more fully than traditionalism standing alone. We do not

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“overrule” the text because any such overruling would jeopardize the ability of the text to serve as a generally accepted focal point. . . .

At the same time, the conventionalist account has much to say about the constitutional importance of settled practices that are not written into the formal constitution. Recall that Schelling said an outcome may be focal because of past precedent. If two people have solved particular coordination problem in the past by engaging in a certain behavior, then that behavior will usually be focal. Along these lines, Jon Elster catalogues sixty-eight instances of unwritten but self-enforcing constitutional customs or conventions found in six nations – Great Britain, Australia, Canada, the United States, France, and Norway. In the United States, for example, he identifies a dozen such conventions, including that “members of a state delegation to the Electoral College vote for the candidate who received most votes in their state” and that, despite the fact that “the Constitution authorizes Congress to limit the jurisdiction of the Supreme Court, it does not use that power.” There was until 1940 an unwritten constitutional convention that the President could not be elected for a third term.

Some unwritten constitutional conventions arose at a particular moment, as George Washington’s refusal to stand for a third term set a

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103 Id. at 911.
104 SCHELLING, supra note 23, at 57.
105 If the first time the parties were lost in a department store, they accidentally reunited in the sporting goods section, then that is a likely place they will try the next time they are lost.
106 Elster, supra note 84.
107 Id. at 16. I explain how these conventions are “self-enforcing” in the next paragraph, but Elster notes that many state laws also forbid violation of this convention, although no one has ever been punished under those laws.
108 Id.
109 Id. at 15.
precedent against doing so,\textsuperscript{110} while others emerged gradually, such as the fact that Congress does not use its power to limit the Supreme Court’s jurisdiction. In each case, the expectations of individuals settled around a historic practice, which made its continuation the focal outcome. Elster imagines the political parties cannot sustain cooperation over time unless they can coordinate on a particular understanding of what constitutes “defection” when in power. His point is that this understanding can arise outside of the written constitution, but that the resulting convention can nonetheless be understood as a constitutional supplement.\textsuperscript{111} Indeed, the example of Great Britain proves the force of the point because its entire constitution is just this sort of unwritten convention.\textsuperscript{112}

By contrast, a conventionalist account of the constitution has negative implications for the interpretive theory of originalism. Where a constitutional issue arises for the first time and the text gives no definitive answer, conventionalism is certainly consistent with consulting “original understandings” or expectations, to the extent that they supply a definitive answer. But if the primary purpose of the constitution is to settle expectations, in order to render the constitution self-enforcing, then one should be wary of claims for judicial reconsideration of old issues. The conventionalist’s skepticism may give way to strong policy reasons for change, as based on the claim that the prior rule, however functional when created, is no longer functional. But the conventionalist will reject demands to change the settled interpretation not supported by policy considerations, but only by the claim that, far in the past, the court erred in judging the original understanding.

\textsuperscript{110} Id. at 32. Elster notes, however, that the convention may have been weak until after Jefferson and Jackson refused to run for a third term.

\textsuperscript{111} The idea obviously resonates with Bruce Ackerman’s idea that certain “constitutional moments” can informally change the meaning of the constitution. See BRUCE ACKERMAN, WE THE PEOPLE, VOL. 1, FOUNDATIONS (1993); Bruce Ackerman, Oliver Wendell Holmes Lectures: The Living Constitution, 120 HARV. L. REV. 1737 (2007).

\textsuperscript{112} Elster, supra note 84, at 9-13 (discussing Great Britain’s constitution).
In sum, a coordination game provides one starting point for thinking about what a constitution is – for the ends it serves and the means by which it serves them – both of which affect how best to interpret a constitution.

B. International Law

Because there is no overarching sovereign among nations, international relations are understood as a form of anarchy, a state of nature. Political scientists have then made the same points about international treaties that the last section covered regarding constitutions: First, the interaction of states frequently presents a game involving coordination (and equity). Second, a written arrangement or adjudication between states may influence their behavior by virtue of creating a focal point in a coordination game (and thereby creating self-fulfilling expectations of how to behave). I divide the discussion by starting with prospective international law – treaties and customs – and then considering adjudication.

1. Prospective Law: Treaties and Customs

There is a large political science literature that uses coordination games to explore international relations and international law. As one example, consider the model of political scientists Geoffrey Garrett and

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Barry Weingast. They view international law as arising in an iterated PD game, a paradigm that I believe is overused. But they make the same move as Elster does with constitutional law, emphasizing an element of coordination within the PD game because there is more than one way to cooperate. Essentially, they embed a BOS game into the iterated PD game on the grounds that different ways of cooperating are preferred by different states, but that cooperation is sustainable only if all states agree to a single understanding of cooperation and that all states are better off when everyone complies with one form of cooperation than when all states defect or cooperate in different ways. Thus, they view a treaty as a potentially self-enforcing agreement that specifies what form their cooperation will take.

Two nations, for example, may agree to limit their tariffs and sustain cooperation by threatening to breach if the other breaches. But the parties require an agreement to define precisely what trading behavior constitutes “cooperation” for purposes of their conditionally cooperative strategies. Garrett and Weingast then propose that the treaty (and any subsequent judicial interpretations of it) makes focal one solution to the BOS game (embedded in the PD), so each nation thereafter uses the agreed upon definitions to judge whether the other nation cooperated or defected in the prior round. With such a mutual understanding, the nations may then sustain cooperation (by threatening to respond to defection with future defection).

115 James Fearon makes what I regard as the same point by separating the issue of bargaining and enforcement. See James Fearon, Bargaining, Enforcement, and International Cooperation, 52 INT’L ORG. 269 (1998). He says that after two states conclude an agreement, there is frequently an enforcement problem that takes the form of an iterated PD (because each side finds it cheaper in the short run not to comply regardless of what the other side does). But the initial stage of creating an agreement involves coordination. Garrett & Weingast make the same point by creating a more complex game that involves both coordination and cooperation.
My own work with Tom Ginsburg uses a different coordination game to model other types of international interactions, including territorial disputes.\textsuperscript{116} Here, we followed Robert Sugden’s idea that property disputes in a state of nature often take the form of a Hawk-Dove game.\textsuperscript{117} Recall that in such a game the worst outcome occurs when both sides play the aggressive “Hawk” strategy. Sugden imagines that in a state of nature, a dispute over a resource frequently has this structure because the Hawk/Hawk represents a violent struggle that may cause a serious wound or death, thus dwarfing the potential gain.\textsuperscript{118} Sugden’s point is that, in such a situation, a custom or convention may arise in which everyone expects one and only one individual in certain situations to play Hawk and the other individual to play Dove. For example, under the convention of first possession, everyone expects the first possessor of the resource to play Hawk. If so, then the convention is self-enforcing. No one wants to play Hawk when everyone expects the other player to play Hawk because to do so guarantees the worst outcome.

Ginsburg and I apply this logic to territorial disputes between nations, at least where the value of the territory at issue is too small to be worth an actual war.\textsuperscript{119} In these cases too, we may understand the first possessor custom or convention as self-enforcing. We similarly imagine how a territorial treaty works: once the parties have agreed to a territorial resolution, such as a boundary, then there is far more reason to expect that


\textsuperscript{118} Each individual ranks the outcomes as follows: (1) best is to play Hawk to the other player’s Dove, thereby getting the resource without a fight; (2) second best is to play Dove against Dove, which results in splitting the resource or allocating it randomly; (3) third best is to play Dove against Hawk, giving up the resource without a fight; and (4) the worst is Hawk/Hawk.

\textsuperscript{119} See Ginsburg & McAdams, supra note 116.
either side will fight rather than relinquish what the treaty recognizes as its own territory.

As a third example, consider how the harmonization of law across nations is a type of standard setting. In the introduction, I mentioned standard setting as an example of a coordination game. Industries set technical standards for products made by one firm that interact with products made by other firms. Once everyone else starts to use a given technical standard, there is no incentive to “defect” but every incentive to conform. Most likely, there is some conflict because one firm will gain an advantage if all adopt a technical standard based on that firms’ product, but other firms will prefer the specification of their own product. For this reason, the BOS game is the accepted model for standard setting, because all parties wish to reach some standard, but disagree as to what standard is best.

The international context has its obvious examples of standard setting, such as treaties and customs concerning standardized weights and measures, communications protocols for air traffic control, the right of way among vessels in international waters, the international exchange of mailed and telephonic communications, and the exchange of fingerprints by police departments. In each case, the central issue is coordination; despite disagreement as to what standard is best, there is a strong

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120 See supra text accompanying notes 14.

121 For coordinating air traffic control, the relevant treaty is the Convention on International Civil Aviation, Dec. 7, 1944, art. 37, 61 Stat. 1180, 1190, 15U.N.T.S.295, 320. For an explanation, see Michael Gerard Green, Control of Air Pollutant Emissions from Aircraft Engines: Local Impacts of National Concern, 5 ENVTL. LAW. 513 (1999) (authorizing the “governing body of the ICAO . . . to adopt international standards and practices” concerning “communications systems; airport characteristics; air traffic control practices; personnel licensing; aircraft airworthiness; aircraft registration; and other matters dealing with the ‘safety, regularity and efficiency of air navigation.’”). See also Convention for the Establishment of an International Bureau of Weights and Measures, May 20, 1875, 20 Stat. 709; Convention on the International Regulations for Preventing Collisions at Sea, Oct. 20, 1972, 28 U.S.T. 3459, 1050 U.N.T.S. 16.
incentive to “match” standards and no incentive to deviate from the standard everyone else adopts.

But standard setting is far more common and central to international law than these obvious examples suggest. Regarding private international law, such as contracts, securities regulation, or arbitration, states are frequently interested in “harmonization” or, as a lesser but even more common step, the convergence of different domestic legal regimes. The advantage of policy convergence and legal harmonization is that they save transaction costs when private firms seek to do business internationally. The greater the disparity in the laws of, say, contracts, securities, or antitrust, the more difficult it is to transact across national borders. In other words, legal rules themselves are “standards” and there are costs savings to minimizing the differences between the standards. At the same time, a state incurs costs in switching from one legal standard to another. When two or more nations would benefit from policy convergence or harmonization, but each would prefer that other nations

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123 See DANIEL W. DREZNER, ALL POLITICS IS GLOBAL: EXPLAINING INTERNATIONAL REGULATORY REGIMES (2007). Drezner distinguishes three related types or levels of coordination that occurs at the international level: “Regulatory coordination” is “the codified adjustment of national standards in order to recognize or accommodate regulatory frameworks from other countries.” Id. at 11. “[P]olicy convergence” is “the narrowing of gaps in national standards over time.” Id. “Harmonization” is “policy convergence to a single regulatory standard.” Id.

124 The international point is just a larger version of the same concern in a federalist system such as the United States, where business interests often push for uniform state laws to save transaction costs when transacting across state lines. See, e.g., James J. Brudney, The Uniform State Law Process: Will the UMA and RUAA be Adopted by the States? 8 DISP. RESOL. MAG. 3 (Summer 2002). Each state might prefer that all the others adopt its law, but each state might regard non-uniformity as worse than changing its law to some uniform standard.
shift to their legal standard, the result is a BOS game.\textsuperscript{125} It is not a PD because one want to match the behavior of the other nation. And once the change is made, there is no incentive to defect. Thus, in many international contexts, coordination is vitally important to the way that treaties and customary law works.

2. Retrospective Law: International (and Constitutional) Adjudication

As described so far, international treaties and recognized customary law work to create focal points \textit{prospectively}. In other work, I have contended that, even after a dispute arises, the retrospective judgments of judges or arbitrators can similarly influence the behavior of the disputing parties.\textsuperscript{126} The expressive power of adjudication depends in significant part on the adjudicator’s ability to manipulate the expectations of the parties in a coordination game. Recall Schelling’s example of the bystander-in-the-intersection who influences drivers merely by signaling one to proceed and the other to stop.\textsuperscript{127} Similarly, disputants are often in a HD game where the worst outcome for both is for the conflict to remain unresolved, leading to some higher level of destructive conflict such as violence. Merely by announcing that one party is “in the right,” an adjudicator creates that expectation that this party will never defer, which

\textsuperscript{125} Drezner provides a slightly more complex “standards game” for just this situation. See Drezner, supra note xx, at 51-55. His game uses variables that allow for the possibility that both parties are better off retaining their own national standard because the gains to either party from coordination are smaller than the costs of switching legal standards. But where the costs of coordinating are high enough, the result is a BOS game. See also Anu Bradford, \textit{International Antitrust Negotiations and the False Hope of the WTO}, 48 Harv. Int’l L.J.383 (2007)(using Drezner’s approach to model international antitrust harmonization).

\textsuperscript{126} See Richard H. McAdams, \textit{The Expressive Power of Adjudication}, 2005 Ill. Law Rev. 1043. See also Ginsburg & McAdams, supra note 116, where we identify and explain compliance with judgments of the International Court of Justice.

\textsuperscript{127} Schelling, supra note 23, at 144.
gives the losing party an incentive to defer to avoid the destructive outcome.\textsuperscript{128}

Garrett and Weingast were apparently the first to borrow Schelling’s focal point idea to explain adjudication.\textsuperscript{129} They claim that the power to construct focal points gives international courts the ability to resolve disputes without wielding the power of sanction. Disputes arise between parties to a treaty, on their view, because treaties are inevitably incomplete. Unforeseen contingencies always reveal gaps and ambiguities that create situations where the states disagree on what behavior is required to cooperate. The parties may be drawn to preexisting focal solutions but, in the absence of natural focal points, “an institution” such as a court “can construct one by devising the required set of specifications (as to the nature of the agreement, and hence as to what constitutes cooperation and defection) and by making them known to the community.”\textsuperscript{130} Similarly, Tom Ginsburg and I found evidence that the International Court of Justice generates high compliance with its decisions in part by its ability to make focal the outcomes it endorses.\textsuperscript{131}

The same, by the way, is true of constitutional disputes that arise between the branches of government. Here, it is clear that the \textit{ultimate} reason the executive and legislative branches defer to the judiciary is not that the judiciary will bring legal sanctions to bear, given that the judiciary depends on other branches of government for those sanctions. As Matthew Stephenson asks, why do the parts of government with “the money and guns” listen to the part with neither?\textsuperscript{132} Stephenson proposes a complex game with multiple equilibria in which different political parties

\textsuperscript{128} For experimental evidence supporting this claim, see McAdams & Nadler, supra note 101; Tyran & Feld, supra note 101.

\textsuperscript{129} See Garrett & Weingast, supra note 114, at 183.

\textsuperscript{130} Id.

\textsuperscript{131} See Ginsburg & McAdams, supra note 116.

that expect to be in and out of power agree to give up implementing their most extreme policy preferences when they are in power in exchange for the other party giving up its most extreme (opposite) policy positions when it is in power. The agreement is embodied in the constitution, certain statutes, and custom. But, like treaties, these sources still leave open gaps and ambiguities, which produce disputes. Unresolved disputes can produce a constitutional crisis and governmental chaos, the expected value of which is negative to both parties. Thus, courts have some ability to resolve these disputes expressively. Their judgments are followed merely because, like a driver in traffic, the losing party expects the winning party to insist and views deferring as the only way to avoid the worst outcome.133

C. The Expressive Power of Law

Outside of international and constitutional law, it might appear that there is no room for law’s focal effect. Even if governments frequently cannot credibly threaten to sanction one another for failing to comply with international law, and even if the judiciary cannot credibly threaten to sanction the legislative and executive branch for violating the constitution, governments can and do credibly threaten their citizens with sanctions for failing to comply with domestic law. In addition, democratic governments usually enjoy sufficient legitimacy that they may generate compliance out of a felt obligation to defer to legitimate authority. With a functioning government enforcing its law, there may seem to be no room for an effect as subtle as focal point construction. Nonetheless, I explain here how the

133 See also Tom Ginsburg, Judicial Review in New Democracies: Constitutional Courts in Asian Cases (2003). The same theory helps to explain how domestic courts or private arbiters wield influence in settings where there is no executive to enforce judicial rulings. See, e.g., Andrea McDowell, Real Property, Spontaneous Order, and Norms in the Gold Mines, 29 Law & Social Inq. 771 (2004)(finding that the focal point theory of adjudication explains third party resolution of frontier mining disputes); Richard H. McAdams, The Expressive Power of Adjudication, 2005 Ill. Law Rev. 1043, 1101-03 (using the focal point theory to explain the effectiveness of courts in medieval Iceland, where no executive existed).
focal point effect offers a theory of the *expressive* power of law.\textsuperscript{134} I present the general theory and then illustrate its relevance to examples involving traffic, smoking, and property.

In general, for law to have a focal effect on behavior, the law must address a coordination situation, it must be sufficiently clear and public, and there must be no stronger competing focal points. Obviously, the necessary conditions do not always hold: Law may address situations of pure conflict, where there is no element of coordination. Or, if there is an element of coordination, the publicity of the law depends largely on media coverage, which does not always exist. Law cannot create a focal point if the content of the law is generally unknown. Even if publicized, the content of the law is often unclear, especially to non-lawyers. Law cannot align expectations unless it is sufficiently clear that most individuals have the same interpretation of it. Finally, even if the law enjoys clarity, it may face strong competition from other factors that make a particular outcome salient. Most commonly, the law might attempt to change an existing norm that, as precedent for past behavior, continues to make salient the behavior that adheres to the norm.

Nevertheless, the necessary conditions sometimes do hold. Indeed, we might see law as being the form of third party expression for which these conditions are most likely to hold. Taking the conditions in reverse order, note first that law often avoids having to compete with other stronger focal points, as where social expectations are not fully settled. Second, though many laws are opaque, some are fairly simple, e.g., no smoking in restaurants, the right-of-way goes to the driver with the green light, the landowner owns the branches of trees hanging over her property, even if she doesn’t own the tree. Third, there is often great publicity to legal rules either from media coverage of the enactment of a new statute or from direct government advertising of a new rule (by public service announcements or the posting of signs).

\textsuperscript{134} See sources cited supra at note 101.
Most importantly, law often addresses situations that contain an element of coordination. The legal example most directly suggested by the applied game theory literature is traffic regulation. The topic is important because automobile accidents kill about 43,000 annually in the United States\textsuperscript{135} and over a million worldwide.\textsuperscript{136} Traffic is quintessentially a matter of coordination. Two drivers approach an intersection on perpendicular streets where each wishes to proceed first through the intersection; or two drivers moving in opposite directions on the same road approach a one-lane bridge that each wishes to use first; or two drivers in adjoining lanes merge into a single lane where each wishes to get ahead of the other. In each case, there is conflict because each wants to proceed ahead of the other. But there is also a common interest in coordinating to avoid a collision, which each regards as the worst possible outcome.\textsuperscript{137}

There is every reason to think that the government exploits the focal point effect for its traffic rules because (1) those rules are relatively clear and (2) the government publicizes them by requiring driver’s tests and by the posting of traffic signs. Without denying the effect of sanctions and legitimacy, the focal effect is probably a significant cause of compliance with traffic laws, which is substantial despite obvious examples of violations (such as speeding). When a driver approaching a busy intersection observes a sign or traffic light indicating “stop” or


\textsuperscript{137} It is likely that the two drivers also have a common interest in avoiding the outcome where both wait for the other to proceed. Not only does that waste time for both, but after each realizes that the other is waiting, they must face the same situation again – deciding whether to proceed first or wait – which means they again risk the possibility of a collision.
“yield,” she has a strong reason to comply independent of sanctions and legitimacy. Even if she has no fear of or respect for law, she fears an accident. Knowing that others expect her to comply, and that miscoordination entails a serious risk of collision, her best choice is to comply. The effect is not likely to disappear merely because an individual does fear sanctions and respect law because we know that both incentives are highly imperfect.\textsuperscript{138}

Many disputes have a structure like traffic, that is, like a Hawk-Dove game. Take property disputes. Two neighbors may disagree where the boundary of their property is or whether one has a right to walk or drive over her neighbor’s property if it is the only way for her to access a public road. Two neighbors may disagree over whether one can take fruit from branches that overhang one’s property even though the tree grows out of land owned by a neighbor, whether there is any limit to how much water the upstream property owner can take from the stream before it flows into her downstream neighbor’s land, or whether one has an obligation to prevent silt from running off her land onto her neighbor’s or not to block light by erecting a structure on one’s land.

In each case, each party clearly prefers to insist on their position while the other defers, thus getting their way at minimal cost. To be Hawk-Dove, each party has to also rank as the worst outcome the situation of unresolved conflict that occurs when both insist. That is a

\textsuperscript{138} The focal effect might not matter if traffic laws were perfectly enforced, but of course they are not. Note also that the focal effect may combine with imperfect sanctions and legitimacy. Consider a one-way street. Suppose that, if sanctions and legitimacy were totally lacking, and setting aside any focal effect, there were would be 50 violations (driving in the wrong direction) per month. With so many violations, drivers who go in the lawful direction might drive slowly and take great care to look out for those going in the wrong direction. Now suppose that sanctions and legitimacy are sufficient by themselves to deter 45 violations per month, leaving 5. Given so much compliance, drivers going in the lawful direction might drive more quickly with little thought to drivers going in the wrong direction. As a result, the focal effect is stronger – that is, the probability of an accident from violating the one-way requirement is higher. As a result, the focal effect of the law might lower violations to zero.
function of how much each party values the resource in dispute relative to unresolved conflict, which depends on what unresolved conflict means. One possibility is largely emotional – that the parties wind up in a heated shouting match, which is itself embarrassing and may end any social relationship the two parties previously enjoyed. Another possibility is more dire: violence. Not only do mature legal systems not deter all violence, but much of the violence that remains occurs because individuals in a dispute engage in a “self-help” remedy to enforce their perceived rights. Thus, for many disputing parties, the insist/insist outcome is worse than giving in because the stakes at issue are low compared to (a) the embarrassment of a shouting match, (b) the loss of the social relationship with the other party, or (c) violence. In these cases, the resulting game is Hawk-Dove (or a close analogue).

If so, then there is room for a focal effect. Suppose that in any such dispute the law clearly says that landowner A wins and neighbor B loses. Even if the expected civil or criminal sanctions are inadequate to deter B from continuing to insist on getting her way and even if B is uninfluenced by the law’s legitimacy (because he doesn’t perceive the law as legitimate or doesn’t care about legitimacy), the law’s announcement that A wins may influence B’s behavior. The law’s expression works like the hand signals of the bystander directing traffic in an intersection: it makes salient the outcome where A insists and B defers, which tends to create expectations that the outcome will occur. A is less likely to defer once the law points to her as the one to insist. Knowing this, it is in B’s rational self-interest to defer, to avoid the worst outcome where both insist. Thus, the law can influence behavior in disputes by creating self-fulfilling expectations of how the dispute will be resolved.

There is nothing in this logic peculiar to disputes about property. For example, when government bans smoking in public places like restaurants, smokers may stop smoking there in part because they now expect non-smokers, influenced by the focal point, to insist on non-smoking and therefore view compliance as necessary to avoid the unpleasant conflict – a shouting match – that will otherwise result. What matters is that the parties to the dispute interact in a way that the failure to agree can cause an outcome each regards as the worst. Here, the law may work expressively.

D. Social Roles and Discrimination

The HD and BOS games are also useful for modeling inequality, especially that arising from social roles associated with immutable characteristics like race and gender. These and other similar games explain the difficulty individuals have avoiding their social roles. Once a social role convention arises, it is costly for any one individual to deviate. To make these points, I introduce some evolutionary game theory. I introduce that theory in a discussion of the origin of property, and then use elements of that theory to explain inequality and social roles.

1. Evolutionary Game Theory and the Origin of Property

In the social contract tradition, some theorists interpret Thomas Hobbes\textsuperscript{140} as justifying government to overcome a multi-party PD.\textsuperscript{141} By contrast, in recent years, several theorists have been using games of coordination to explore the origin and justification of the state. The economist Robert Sugden\textsuperscript{142} and the philosopher Brian Skyrms,\textsuperscript{143} for

\textsuperscript{140} THOMAS HOBBS, LEVIATHAN (1668) (Richard Tuck translation 1991).
\textsuperscript{141} See, e.g., DAVID GAUTHIER, MORALS BY AGREEMENT (1986).
\textsuperscript{142} SUGDEN, supra note 117.
example, draw more from Hume\textsuperscript{144} and Rousseau\textsuperscript{145} than from Hobbes. Both use coordination games to imagine how spontaneous order can arise slowly in a decentralized fashion. Their theory is independently interesting,\textsuperscript{146} but I will discuss one subset of it entirely to develop insights useful for exploring inequality and social roles.

The insight I want to use is the subtle distinction Sugden and Skyrms develop between “symmetric” and “asymmetric” games.\textsuperscript{147}

\begin{itemize}
\item \textsuperscript{144} See David Hume, A Treatise of Human Nature (L.A. Selby-Bigge ed., 2d ed. 1978) (1740, Book 3, Part 2, Section 2) (property “arises gradually and acquires force by a slow progression, and by our repeated experience of the inconvenience of transgressing it”); see also Peter Vanderschraaf, The Informal Game Theory in Hume’s Account of Convention, 14 Econ. & Phil. 215 (1998).
\item \textsuperscript{145} See Rousseau, supra note 62.
\item \textsuperscript{146} Using various iterated games involving coordination – Hawk-Dove, Attrition, and Nash Bargaining, Sugden, supra note 117, shows how, even without a centralized authority, there can emerge conventions of property, mutual aid, and voluntary provision of public goods. Brian Skyrms pursues a similar theme, first showing how a norm of “fair” behavior can emerge, without a centralized authority, in iterations of the Nash Bargaining game. See Skyrms, Social Contract, supra note 143; see also Brian Skyrms, Sex and Justice, 91 J. Phil. 305 (1994). More recently, in Skyrms, Stag Hunt, supra note 143, Skyrms models the state of nature as a series of Stag Hunt games between pairs or small groups of individuals. Skyrms’ extensive computer simulations explore the robust conditions – involving neighborhood interactions, signaling, and reinforcement – under which stag playing is likely to emerge as players interact over time. Id.31-44 (neighborhood interactions increase Stag-playing); 65-73 (cheap talks increase Stag-playing); 87-103 (choosing partners increases Stag-playing). He contrasts this optimistic prediction from the more dismal prospects for achieving order out of similar iterations of the PD. Id. at 108-09.
\item \textsuperscript{147} The principle is related to the idea of correlated equilibrium first developed by the Nobel Laureate Robert Aumann. See Robert J. Aumann, Correlated Equilibrium as an Expression of Bayesian Rationality, 55 Econometrica 1 (1987); Robert J. Aumann, Subjectivity and Correlation in Randomized Strategies, 1 J. Math. Econ. 67 (1974). Aumann proved that in certain games additional equilibria become possible if the parties can, prior to their action, mutually observe a random event. Sugden’s point is similar. He shows how a non-random characteristic of the situation, what might be called a deterministic public signal that occurs prior to the moves in the game, can affect how the game is played.
\end{itemize}
Sugden’s insight comes from his model of the convention of property. He starts by proposing that disputes over resources can be seen as an iterated HD game between pairs of disputants. In this setting, “Hawk” is the strategy of insisting on the resource and “Dove” is the strategy of deferring to the other claimant. In the state of nature, the Hawk/Hawk result is a physical fight that could fatally injure either of the players. Each player would most prefer to insist on the firewood while the other defers, but each regards the worst outcome as Hawk/Hawk because the expected benefit of fighting – a chance to gain or keep the resource – is outweighed by the expected cost of fighting – a chance of suffering a crippling injury or death.

Sugden asks what would happen if individuals play an indefinite number of iterations of the game, in each case against one other randomly selected individual. Note that in this initial set-up, the game is symmetric in the sense that there is no distinction between the players. Thus, the only strategies available to a player in a given round are to play Hawk with a certain probability and Dove with a certain probability (where the two probabilities sum to one). Game theory describes various “mixed strategy” equilibria that can emerge, where a certain number of individuals always play Hawk and a certain number always play Dove or, more likely, each individual plays each strategy with certain probabilities.

Sugden’s point, however, is to show how a more interesting “convention” or pure strategy equilibrium can arise, where all individuals play strategies that select actions with certainty rather than

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148 See SUGDEN, supra note 117, at 55-103. See also HIRSHLEIFER, supra note 117, at 223–34; Yee, supra note 117.
149 We can express all the possible strategies in the iterated game merely by selecting a given probability for each action. Thus, a player selects a value for $p$ where Hawk is played with probability $p$ and Dove with probability $(1 - p)$. There are only two pure strategies: (1) Play Hawk with certainty ($p = 1$); and (2) Play Dove with certainty ($p = 0$). In equilibrium, each player will select some value $p$.
150 See supra note 66.
151 See, e.g., McAdams, supra note 83.
mixed probabilities. What is necessary is for individuals to observe certain asymmetries in their situations, as where they occupy different roles. The creation of roles or labels for the individuals in the game allows them to play entirely new strategies based on those roles. The asymmetries could be anything, but suppose, for example, that whenever the property dispute arises, one and only one of the individuals is physically holding the resource (e.g., firewood) or has placed it in a space he is understood to “possess.” This apparently trivial observation has profound effects because one can now play entirely new strategies that correlate with one’s role of “possessor” or “non-possessor.” Now possible are role-based strategies such as: “when possessor, play Hawk, and when non-possessor, play Dove.” Hirshleifer labels this particular possibility the “bourgeois” strategy.

The new role-based strategies create new role-based equilibria, such as where all players adopt the bourgeois strategy. When everyone else plays Hawk when they are the possessor, your best reply is to play Dove when you are the non-possessor. If everyone else plays Dove when they are the non-possessor, your best reply is to play Hawk when you are the possessor. If everyone plays the bourgeois strategy, the result is the convention of property.

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152 Thus, in addition to the two pure strategies noted supra note 149, which result when one is limited to playing Hawk with probability \( p \) and Dove with probability \( 1 - p \), each player can now also choose from a new set of asymmetric strategies defined by \( q \) and \( r \), as follows: When possessor, play Hawk with probability \( q \) and Dove with probability \( 1 - q \), and when non-possessor, play Hawk with probability \( r \) and Dove with probability \( 1 - r \). As a result, there are two new pure strategies: (3) Play Hawk with certainty when possessor and Dove with certainty when non-possessor \( (q = 1 \text{ and } r = 0) \); and (4) Play Dove with certainty when possessor and Hawk with certainty when non-possessor \( (q = 0 \text{ and } r = 1) \).

153 See HIRSHLEIFER, supra note 117.

According to this logic, the opposite convention – where possessors play Dove and non-possessors play Hawk – is also an equilibrium. Note that the property convention and also this “anti-property” convention have a certain efficiency – they both avoid Hawk/Hawk outcomes. At least where there is no ambiguity about who occupies the role of possessor, they will be no ambiguity about which player will play Hawk, meaning that the other will play Dove and the worst outcome for each never occurs. This efficiency is related to the reason that one of these conventions is likely to arise. As between the two, Sugden plausibly argues that the payoffs asymmetries are likely to favor possessors playing Hawk.155

So, as Hume first suggested,156 the convention of property may slowly emerge from an iterated process that creates a pattern of expectations of how people will behave in resource disputes. Property is interesting in itself, but is merely an example of how spontaneous order emerges.

2. From Property Roles to Social Roles

Conventions need not cause inequality. When iterated iteration in a HD game produces a traffic convention (e.g., the driver on the right has priority), there is no overall inequality because the drivers’ “roles” of being on the left or right are transitory and each individual can expect to

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155 See SUGDEN, supra note 117, at 89–91. The argument is that, on average, those who have put forth the effort to possess the property will value it more than those who do not possess it. As a result, possessors have more at stake and are therefore more likely to play Hawk, leading to the property convention. Hirshleifer makes the claim regarding land, that territoriality is likely to be adaptive given that possessors tend to know better and be better matched with land than nonpossessors. See Jack Hirshleifer, Privacy: Its Origin, Function, and Future, 9 J. LEGAL STUD. 649, 657–58 (1980). More recently, Gintis claims that the cognitive bias known as the “endowment” effect may tilt humans in favor of defending what they possess, leading to the convention of property. See Herbert Gintis, The Evolution of Private Property, 64 J. ECON. BEHAV. & ORG. 1 (2007).

156 See HUME, supra note 144.
occupy one role as much as the other. By contrast, when individuals vary by the amount of property they possess, they will not equally occupy the roles of possessor and non-possessor. But the possibility remains that the roles will be significantly reciprocal, that everyone will get some opportunities to enjoy the privileged role associated with Hawk, which receives the highest payoff.

Yet when we extend the idea of “roles” to include more permanent distinctions among individuals, we may see conventions arise in which some people always enjoy the more privileged role in the relevant interaction and others always endure the lower payoffs of the subordinate role. All that is necessary is that the players can easily observe distinctions between each other. Obvious examples are the differences we associate with race and gender.

In HD game, assume that at individuals observe not only the possession/non-possession distinction, but also a male/female or own race/other race distinction. As before, additional roles create new strategies and new strategies may create new equilibria. For example, given an observed male/female distinction, one can now play strategies like: “If the other player is female, play Hawk; if the other player is male, play Dove.” New strategies give rise to new equilibria. One such equilibrium is this Sexist Property Convention:

All males play:

“If the other player is female, play Hawk; if the other player is male, play Hawk if possessor and Dove if non-possessor,”

and all females play:

“If the other player is male, play Dove; if the other player is female, play Hawk if possessor and Dove if non-possessor.”

I discuss the argument that follows in more detail in McAdams, supra note 154.
Whether you are a male or female, if all other players play the strategy specified for their sex, your best response is to play the strategy specified for your sex.\textsuperscript{158} The result is a convention in which all property winds up in the hands of men. The only way for women to enjoy property will be to use the property of a male relative or mate.

As with all conventions, once it arises, it will not pay for an individual to deviate. If a woman tries to play Hawk against men, who expect women to play Dove, she will simply endure the worst outcome (as do the men with whom she interacts). The same point can be made by using race roles instead of or in addition to sex roles, or any other immediately observable distinguishing traits. On the other hand, because it is difficult for strangers to play strategies based on the characteristics of others that are not reliably observable, the theory predicts that physically observable characteristics (including immutable physical features and mutable features such as clothing and hair length) will matter much more to emergent conventions than will other characteristics.

The point is general to games of multiple equilibria. To illustrate, consider Skryms’ optimistic analysis of the Nash Bargaining game.\textsuperscript{159} In this game, two players divide some resource. Each must decide simultaneously with the other how much of the resource to claim, where they will receive exactly what they claim (neither receives any unclaimed amount) unless the two claims total more than 100\%, in which case each receives nothing. In experimental bargaining games of this sort,

\textsuperscript{158} If you are female and you play against a male, he will play Hawk regardless of who is the possessor and your best reply is Dove. If you are female and you play against a female, she will play Hawk if possessor and Dove if non-possessor, and so your best reply is Dove if non-possessor and Hawk if possessor. If you are male and you play against a male, he will play Hawk if possessor and Dove if non-possessor, so your best reply is Dove if non-possessor and Hawk if possessor. Finally, if you are male and play against a female, she will play Dove and your best reply is Hawk. Thus, whatever your sex, your best reply is to play the same strategy that everyone else of your sex is playing.

\textsuperscript{159} Skyrms, Social Contract, supra note 143, at 1-21.
individuals tend to claim exactly one-half. Skyrms offers an evolutionary account of this “fair” behavior by using an iterated version of the Bargaining game. For simplicity, he compares just three strategies: “Greedy,” which claims 2/3 of the resource; “Fairminded,” which claims 1/2; and “Modest,” which claims 1/3. Using replicator dynamics, he ran various computer simulations to see how the strategies would do, given a variety of randomly selected starting points. Skyrms found that the Fairminded strategy “took over” the population in 62% of the simulation runs, but the remaining runs produced a polymorphic equilibrium of Greedy and Modest strategies, such as half of the population playing each strategy. Yet if Fairminded players have some small ability to increase their interactions with other Fairminded players, as might occur from people choosing their neighbors, then Fairminded always takes over the population.

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160 Id.

161 Skyrms’ model assumes that the payoff to a given strategy received in round $n$ positively influences the number of players using that strategy in round $n + 1$. Id. In general, replicator dynamics do not assume that individuals are perfectly rational and select strategies that are the “best reply” to the overall distribution of strategies in the previous period. Instead, replicator dynamics assume that individuals “have limited and localized knowledge concerning the system as a whole” and select a strategy that did well in that “neighborhood” in the prior round. See HERBERT GINTIS, GAME THEORY EVOLVING 191 (2000). The transmission of successful strategies might occur in a variety of ways, including the intuitive possibility that individuals with imperfect reasoning abilities learn by copying the strategies of nearby individuals who, in the prior round, had higher payoffs. Replicator dynamics thus offer a way of comparing the strength of different Nash equilibria: given random starting points – where all individuals in a population begin with randomly selected strategies – some equilibria are more likely to emerge than others.

162 In the computer simulations, there are a large number of individual “agents” who select strategies each round based on an algorithm that looks at the success enjoyed by their immediate neighbors in the prior round. At the beginning of each simulation, each agent is randomly assigned an initial strategy. Then Skyrms has the agents interact for a large number of iterations and observes what strategies are being played in what proportion at the end.

163 Id.
Skyrms’ analysis omits a less optimistic possibility, however, which is that individuals play strategies based on their observable characteristics. In his Bargaining game, nothing distinguishes the roles of the players. In the bargaining context, there is no distinction available like being the property “possessor” or the driver “on the right.” But observable personal traits like race and sex could “break symmetry.” Players could choose from a set of symmetric strategies defined not only by the amount of the surplus one will claim (1/3, 1/2, or 2/3), but also by the other player’s group membership. These additional roles create additional strategies and equilibria. For example, one new equilibrium would be this *Sexist Bargaining Convention*:

*All males play:*

“If the other player is female, claim 2/3; if the other player is male, claim 1/2,”

*and all females play:*

“If the other player is female, claim 1/2; if the other player is male, claim 1/3.”

Whether you are male or female, if all the players but you play this strategy, your best response is to play this strategy too. The result is a convention in which contracts between men and women always favor the male. This Sexist Bargaining Convention might govern all bargaining between men and women or some subset of bargaining situations, as in the division of domestic labor between spouses.

Similarly, it is an equilibrium for members of race $A$ to play Fair-minded against other race $A$ members and Greedy against race $B$.

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164 If you are female and you play against a male, he will claim 2/3 so your best reply is to claim 1/3. If you are female and you play against a female, she will claim 1/2 and your best reply is to claim 1/2. If you are male and you play against a male, he will claim 1/2 and your best reply is to claim 1/2. Finally, if you are a male and you play against a female, she will claim 1/3 and your best reply is to claim 2/3. Thus, whatever your sex, your best reply is to play the same strategy that everyone else of your sex is playing.
members, while race B members play Fair-minded against other race B members and Modest against race A members. In either case, women or members of race B are systematically disadvantaged in bargaining with men or members of race A, respectively; over time, they will wind up with less wealth.

The convention is disturbingly stable. No one individual in the disfavored group can benefit by deviating from the convention. When women deviate, they receive 0 instead of 1/3. Moreover, note that the source of the strength that Skryms found in the Fairminded equilibrium is also a strength of the Sexist Bargaining Convention. The Fairminded equilibrium gains stability from the fact that it avoids waste: when each player claims 1/2, nothing is left behind. By contrast, in a polymorphic equilibrium, sometimes two Greedy players meet and their mutual claims for 2/3 ensures that they each receive nothing. Sometimes two players Modest players meet, and while each receives the 1/3 they claim, they leave unclaimed the final third. But the introduction of sex roles allows Greedy strategies to avoid waste via the Sexist Bargaining Convention. When two men or two women meet, they both play 1/2. When a man and woman meet, the man plays 2/3 and the woman plays 1/3. There is never a case where 2/3 is played against 2/3 (or 1/2) nor where 1/3 is played against 1/3 (or 1/2). Thus, against Skyrms’ optimism for fair behavior, there is reason to expect persistent unfair behavior tied to observable social roles.  

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165 Similarly, in the Battle of the Sexes Game, it is an equilibrium for males to correlate their strategy with some random event when paired against other males, and for females to do the same when paired against other females, but for males to always play the strategy associated with their preferred equilibrium when paired against females, who in turn always play the strategy associated with their less preferred equilibrium when paired against males. (The opposite is also an equilibrium.) The result is another sexist convention. Again, the same point can be made in the context of racial distinctions.
Along these lines, a recent experiment had groups of individuals play a BOS game against other individuals in the group. The subjects were made aware of the sex of the subject against whom they were matched. When matched against a woman, the subjects was significantly more likely to play the strategy associated with his or her preferred equilibrium than when matched against a man. In this way, gender facilitated coordination and mixed sex groups therefore earned more on average than unisex groups. Yet men also earned more than women.

Despite the inequality and unfairness of these conventions, they are stable. Each individual is playing his or her best strategy given what the others are doing. That the equilibrium disadvantages, say, women does not give an individual woman any incentive to deviate. Women can collectively gain only if they act collectively to change the expectations underlying the convention. If all or most women at the same time (say, as part of a social movement) start to play Hawk whenever pitted in some situation against a man, this change would produce a lot of painful Hawk/Hawk outcomes but eventually men would no longer expect them to play Dove in that situation. Although men would, as a group, wish to resist the change, they might eventually begin to play Dove. But short of this sort of risky collective action, no individual woman gains by playing

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166 See Hakan J. Holm, Gender-Based Focal Points, 32 Games & Econ. Behav. (2000). Two experiments were conducted in Sweden (306 subjects) and one in the United States (164 subjects).

167 In the first Swedish experiment, subjects selected the more aggressive strategy 68% of the time when matched against a woman, but only 48% of the time when matched against a man. Id. at 299. For the Swedish replication, the numbers were 67% and 48%. Id. at 302. For the American study, the numbers were 50% and 38%. Id. at 304-05.

168 In the first Swedish experiment, men earned 27% more than the women. In the Swedish replication, they earned 63% more. Id. at 303. In the American study, male subjects earned 28% more than female subjects. Id. at 305.

the unexpected strategy, even though the expected strategy is inegalitarian.  

Other theorists have used coordination games to explore how particular sex role norms arise and persist. In separate papers explaining different customs, the economist Gillian Hadfield and the political scientist Gerry Mackie both point to the coordination that occurs within marriage. Hadfield explores why it is that, “[r]egardless of the level of economic development, it appears that almost all tasks in a society tend to be gendered, that is, to be easily identifiable as either women’s work or man’s work.” Biological explanations founder because “the majority of tasks divided along sex lines are not allocated uniformly to one sex worldwide.” Instead, it is common that a task gendered male in one society is gendered female in another. Hadfield points to the need for individuals to coordinate their acquisition of human capital before marriage so as to bring to a marriage the skills that best compliments a 

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170 The requirements of the theory presented are so minimal that it is consistent with many other theories of racial and sexual differences. Common knowledge that players notice certain differences among themselves – skin color, the shape of the eyes and lips, genitalia, etc. – is alone sufficient to produce conventions based on the personal physical traits of the person one is playing against. It isn’t initially necessary to assume any differences in preferences, abilities, or opportunities. Nor is it necessary to assume any difference in beliefs, except that, at some point, the players believe there is a statistical correlation between the race or sex of an individual and the way s/he plays the game.

Nonetheless, the personal-trait-as-asymmetry theory is ultimately partial and benefits greatly from connections to other theories. First, an asymmetry will not influence the learning of parties unless it is salient. Second, even when some asymmetry is mutually salient, the personal-trait-as-asymmetry theory is neutral about which of the multiple equilibria will emerge. Additional theory is necessary to explain why physical traits are salient and why they have come to play the particular role they have in observed societies. But the personal-trait-as-asymmetry theory is a useful starting point for understanding the ubiquity and stability of conventions that incorporate sex and race.

171 Gillian K. Hadfield, A Coordination Model of the Sexual Division of Labor, 40 J. ECON. BEHAV. & ORG. 125, 125 (1999).

172 Id. at 130.

173 In one large study of 50 economic activities in 185 pre-industrial societies, the manufacturing of leather products, for example, was an exclusively male occupation in 35 societies and an exclusively female occupation in 29, while basket-making was exclusively male in 37 societies and exclusively female in 51. Id. at 127-28 (Table 1).
future spouse’s skill. In a pre-industrial society, for example, if most men (women) know how to make leather products, but not baskets, then they will seek wives (husbands) who have the skill they lack – basketmaking. Once most men (women) in society do a certain kind of work, a woman (man) who has the same skill will be unattractive as a spouse. As with all conventions, the individual who deviates pays a cost.

Mackie addresses the customs of female footbinding and genital cutting. He notes the important aspect of coordination in explaining their stability. If the parents of girls in a village bind their daughters’ feet and the parents of boys permit marriage only to females whose feet were bound, then individual deviations are costly. There is the risk that girls whose feet are not bound will be unmarriageable. Mackie notes that the astonishingly quick demise of the custom of footbinding took account of this coordination dynamic. What worked were agreements between parents within villages that those who had girls would not bind their feet and that those who had boys would not allow them to marry

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174 Id. at 130 (“the coordination model provides a basis for understanding how economic conditions can give rise to norms, culture, ideology and so on which independently keep the sexual division of labor alive long after economic conditions have changed”). See also 143-48.

175 Id. at 143 (“Trying to break out of these gendered categories . . . puts an individual at great risk of not finding a partner with whom he or she can combine skills so as to have bread to consume.”).


177 See id. at 1005-07 (explaining how conventions are solutions to iterated coordination games).

178 See id. at 1008 (“However the custom originated, as soon as women believed that men would not marry an unmutilated woman, and men believed that an unmutilated woman would not be a faithful partner in marriage, and so forth, expectations were mutually concordant and self-enforcing convention was locked in.”). Mackie speculates that the practices first arose when wealthy men had multiples wives or consorts and sought to ensure paternity by making it harder for women to enjoy sex or to travel to meet men.
girls with bound feet.\textsuperscript{179} Once enough parents expressed a willingness to follow this new behavior, everyone else wanted to follow it as well. Where individual deviation is costly, this collective action worked to unravel the norm.

In sum, it is games other than the PD that give insight to sex roles and discrimination.

\textit{E. Social Movements and Legal Change}

Mackie’s observation about collective action is general. When conventions arise because people coordinate their behavior in particular ways, collective action is the only plausible mechanism for change. Equity games often explain the motive of individuals to want social change. Coordination games help explain the success and failure of movements for social change.

Imagine a social group seeks significant social change, that is, to produce a fundamentally new law or norm. In the Jim Crow era of the American South, for example, blacks sought to topple segregation norms.\textsuperscript{180} In many parts of the world, women seek to earn the right to be educated, to hold jobs, and to avoid various forms of oppressive treatment.\textsuperscript{181} On a much smaller scale, in many communities today, non-smokers seek to ban public smoking.\textsuperscript{182} In each case, for the group seeking social change, that change is a public good because the enjoyment of the new rights by some individuals does not diminish the “consumption” of

\begin{footnotesize}
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\item[179] Id. at 1011.
\item[180] See, e.g., KLARMAN, supra note 73; MORRIS, supra note 73.
\item[181] See, e.g., NUSSBAUM, supra note 73; MARTHA C. NUSSBAUM, WOMEN AND HUMAN DEVELOPMENT (2001); LISA BALDEZ, WHY WOMEN PROTEST: WOMEN’S MOVEMENTS IN CHILE (2002).
\end{enumerate}
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those rights by others and the group cannot exclude the benefits from those who did not contribute to creating them. Given that it is costly to participate in a social movement, it might appear that the problem is essentially one of cooperation. The correct model might be a Social Dilemma, where the dominant strategy for everyone is not to participate.

Of course, this is not quite right. Because of the non-linear nature of the public good involved in a social movement, the situation described has two equilibria. The success of a social movement is likely to be “all-or-nothing” or “lumpy” because low levels of participation (protest, boycotts, norm enforcement, monetary contributions, etc.) produce zero returns for the group up to some threshold where participation produces significant returns. Suppose that $k$ represents the number of individuals who must participate in the social movement for it to succeed. To say that there is a public goods problem assumes that an individual’s cost of participation is less than her benefits from having the social movement succeed. If so, then there is an equilibrium in which exactly $k$ individuals participate. At that level, no individual will want to change strategies unilaterally. Those bearing the costs of participation will want to continue because, if any one stops, the movement will fail. Those not participating will want to continue free-riding because they will enjoy the ultimate benefits without bearing any costs.

Given this model, however, it is very difficult to explain how any social movement occurs. By definition, one starts at an equilibrium in which there is no “movement” and the participation level is zero. Deciding to participate in this context is similar to the “paradox of voting,” where the odds that one’s vote will affect the outcome are infinitesimally small. That one will turn out to be the $k$th participant (not

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183 See, e.g., Richard L. Hasen, *Voting without Law?* 144 U. PA. L. REV. 2135, 2136-37 (1996)(the paradox of voting arises because “the infinitesimal chance that one's own vote could affect the outcome of most elections or the stability of the electoral system” makes it appear “rational to abstain from voting.”). As Hasen explains, id. at 2136 n.6, the
\( k - 1 \) or \( k + 1 \) is similar to the possibility that one will turn out to cast the tie-breaking vote in a large election. If that is the only reason to participate (or vote), then it seems unlikely anyone would bother. Moreover, when a social movement leader tried to rally people to some cause, everyone would hope that \( k \) individuals were persuaded ("suckered") to participate, but would have an incentive to commit themselves to not participating, so others would have to do so instead.

In award-winning work,\(^{184}\) political scientist Dennis Chong offers a more sensible way of modeling social movements using game theory. Focusing on the civil rights movement of the 1950s and 60s, Chong suggests that there were strong social incentives at work that would reward participation if the movement event succeeded but not otherwise. After a successful event – a boycott, march, registration drive, etc. – the group venerated those who helped it to succeed and sometimes shamed those who refused to participate. A failed movement event, by contrast, did not produce any or nearly as much social distinction between participators and non-participators. Considering these additional social incentives, the payoff from participating when enough others participated to make the movement successful was plausibly higher than the payoff from not participating in the same circumstances. Yet because the social rewards of participating in an unsuccessful movement even were far less, the payoffs from participating in a failed effort remained lower than not participating. The result, Chong observes, is a Stag Hunt or Assurance game, where individuals prefer contributing if enough others contribute, but prefer not contributing when enough others do not contribute.\(^ {185}\)

\(^{184}\) Dennis Chong, Collective Action and the Civil Rights Movement (1991) won the William Riker Prize given every two years by the Political Economy Section of the American Political Science Association.

\(^{185}\) Id. at 103-40. See also Will H. Moore, Rational Rebels: Overcoming the Free-Rider Problem, 48 Pol. Research Quart. 417 (1995).
Chong’s point generalizes. In many public good situations, where scholars believe the only rational strategy is not to contribute no matter what the other do (because the odds of exactly \( k - 1 \) contributors is so small), it is likely that real world individuals prefer to contribute if enough others also contribute (while still preferring not to contribute if too few others do so). Put differently, the Stag Hunt or Assurance game is common because people frequently wish to reciprocate what others or most others do. There are two reasons. First, extensive experimental research provides powerful evidence that many people value reciprocation intrinsically. 186 “Homo reciprocans” may gain utility from reciprocating cooperation or lose utility from the guilt of exploiting another player by failing to reciprocate their cooperation. 187 The game for such individuals may be Assurance because they will get extra utility from participating when others participate and extra disutility from shirking when others participate. One of the reasons it is so common to observe some cooperation in experimental PD games, even when they are played anonymously and without repetition, 188 may be that some subjects do not experience the game as a PD, given the value they place on reciprocation.

A second motive leading to the same result is the desire for esteem. Several theorists claim that esteem judgments provide a pervasive social incentive to engage in behavior that others approve or to avoid behavior

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188 See sources cited supra note 186.
that others disapprove.\textsuperscript{189} Even if people are not intrinsically motivated to reciprocate behavior, esteem-seeking generates an external incentive for the same behavior. If others contribute, and the individuals bring about the desired collective action, then there is likely to be strong disapproval for those who failed to contribute. Yet people are not as likely to approve those who contribute to causes that everyone regards as “lost.” Whether this esteem differential is larger enough to offset the costs of contributing depends on several factors, including how much an individual values the esteem from the group the public good would benefit. But where the group is “close-knit”\textsuperscript{190} the esteem may be very valuable. As a result, the general social incentive of esteem may frequently work contingently in the way Chong describes: when enough others contribute, the fear of disapproval can make contributing more beneficial than not contributing.

With either an internal or external motivation for reciprocity, situations that appear to be Social Dilemmas, or public goods games with a highly improbable efficient equilibrium, are actually Assurance Games.\textsuperscript{191} The two equilibria are Participate/Participate or Withhold/Withhold. The former equilibrium is mutually better, but the riskiness of participating may cause the players to prefer to withhold. Note that even if \(k\) participants are sufficient to produce the all-or-nothing public good, we no longer have the odd equilibrium where exactly \(k\) individuals participate. Instead, if \(k\) individuals participate and the

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\item[191] I am here ignoring another side of the public goods problem. In the above discussion, the public good is “lumpy” and collective action is required to create any of it. In other cases, the good is lumpy but any one individual can supply all of it. In that case, the game is Chicken or Hawk-Dove, where each hopes the other will alone bear the cost of contributing, but the worst outcome for each is where none contributes. See Michael Taylor & Hugh Ward, Chickens, Whales, and Lumpy Goods: Alternative Models of Public-Goods Provision, 30 POL. STUDIES 350 (1982). The situation is related to the anti-commons, which Lee Fennell models as a Chicken game. See Fennell, supra note 22.
\end{itemize}
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movement succeeds, then everyone will want to participate. Now we can more easily explain how social movements occur. By failing to participate, one does not merely risk the remote possibility that, because exactly $k - 1$ others participate, one’s failure to participate causes the movement to fail. One also risks the outcome where $k$ or more others participate, in which case one is worse off for having failed to participate.

As Chong observes, the Assurance Games captures an important dynamic of social movements like the civil right movement – the need for leaders to convince potential participants that there will be enough participation to succeed. Given a baseline of non-participation in the absence of a social movement, charismatic leaders must communicate optimism. Such leaders must convince others of the inevitability of success (e.g., “We Shall Overcome” or “The arc of the moral universe is long, but it bends towards justice.”). To do so, they will need to select small easy steps to build up a track record of success, to publicize even small successes, perhaps to exaggerate them as groups often exaggerate the number of protesters who participate in their events. And the leaders must coordinate the particular form of action – protest, boycott, etc. – the movement will take.

Of course, what Chong says about social movements can also be said about opposition to social change. Here too, the problem is often one of coordination. The resisting group may succeed in blocking change only if a sufficient number of people participate and also if they coordinate the manner of their participation. Richard Brooks documents an interesting

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192 See CHONG, supra note 184, at 73-90.
194 Martin Luther King, Jr., Where Do We Go From Here?, Speech before the Southern Christian Leadership Conference, Atlanta, GA (August 16, 1967).
195 Id. See also JACK KNIGHT, INSTITUTIONS AND SOCIAL CONFLICT 201 (1992)(describing union organization as an Assurance Game).
example – the resistance of white homeowners in Chicago to racial integration in the early and mid-20th century.\textsuperscript{196} At one time, that resistance included legally enforceable restrictive covenants that forbade homeowners from selling their land to non-whites. Brooks observes, however, that even these legal sanctions did not prove universally successful because many whites decided that it was cheaper to move to all-white suburbs where blacks were not trying to live than to enforce legal rights.\textsuperscript{197} Indeed, consider that when there was a meritorious lawsuit to bring, the multiple neighbors who had standing to enforce the covenant faced a Hawk-Dove game. Each would prefer that some other bear the expense of litigation, though each considered the worst outcome to be where no one sued to enforce the covenant.\textsuperscript{198}

\textit{Shelley v. Kraemer}\textsuperscript{199} ruled these restrictive covenants unenforceable. Brooks suggests that, at this point, white segregationist homeowners faced an Assurance game.\textsuperscript{200} Here, the whites each wanted to sell to blacks if their neighbors did, but to “stay put” if their neighbors did. In other words, they want to match the strategy of the others. The mutually best outcome was for all to stay put, but staying put was risky because if the white homeowner’s white neighbor sold to blacks, the property values would fall before the white homeowner could sell. Brooks goes on to explain how racially restrictive covenants, even though unenforceable after \textit{Shelley}, continued to support and stabilize segregation.\textsuperscript{201} His empirical analysis shows that these legally void covenants continued to work as a focal point, signaling the nature of the neighborhood and

\textsuperscript{196} Richard R.W. Brooks, Covenants & Conventions, unpublished manuscript (July 2005).
\textsuperscript{197} Id. at 17.
\textsuperscript{198} This is the situation identified in supra note 191.
\textsuperscript{199} 334 U.S. 1 (1948).
\textsuperscript{200} See Brooks, supra note xx, at 18. He does not call the game Stag Hunt or Assurance, but an inspection of the matrix shows that it is, as the text above explains.
\textsuperscript{201} Id. at 18-19.
coordinating actions of white homeowners, purchasers, real estate agents, and government agencies at preserving its exclusivity.\textsuperscript{202}

Finally, note what happens when we combine the discussion of social role conventions from the last section with this section’s discussion of social movements and counter-movements. \textit{We can now model much social conflict as a combination of two games:} HD and Stag Hunt. First, the HD Game models the interaction between two individuals from the two different groups. E.g., the conflict between a smoker and a non-smoker; in the era of Jim Crow segregation, the conflict between a black and white southerner; in many places and times, the conflict between a male and female over sex-role conventions. There emerges from this interaction one of the possible equilibria, which becomes a social convention, e.g., non-smokers defer to smokers; blacks defer to whites; women defer to men.

Second, the Assurance Game models the interaction among individual members \textit{within} the same group. The group disadvantaged by the prevailing norm seeks to change it. If enough individuals switch strategies, they can change the convention, but because there is uncertainty whether enough individuals will act, it remains risky to switch strategies. E.g., if enough non-smokers aggressively confront smokers in public places for enough iterations of the HD game, then smokers may switch from playing Hawk in those interactions to playing Dove. That would produce a public good for non-smokers. Individual non-smokers might face a Social Dilemma in which everyone prefers not to bear the costs of participating to change the norm. But, as argued above, I claim a frequent situation (especially among successful movements) is Stag Hunt, where most want to participate in successful movements, but not unsuccessful ones.

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\textsuperscript{202} Id. at 20-35.
To recap, The BOS game is useful for understanding bargaining, constitutions, the stability of democracy, and conventions enforcing social roles and discrimination. The HD game is useful for understanding the origin of property, the expressive power of law and adjudication, and, again, conventions enforcing race- and sex-based social roles. The Assurance game is useful for understanding the success of social movements and counter-movements. These are merely some of the possible examples.\textsuperscript{203} In the end, there is no justification for the disproportionate focus of legal scholarship on the PD by the unimportance of other games to legal theory.

\textbf{IV. One Road Not Taken: \textsuperscript{204} Intellectual Exchange between Law-and-Society and Law-and-Economics Scholarship}

\textsuperscript{203} There are many more examples that space limitations prevent my exploring. The philosopher David Lewis wrote a seminal book on conventions to explain how language is a conventional solution to a coordination game, See Lewis, supra note 23. See also Skyrms, \textit{Stag Hunt}, supra note 143, at 49-81 (on the evolution of signaling systems and inference); Skyrms, \textit{Social Contract}, supra note 143, at 80-104 (on the evolution of meaning). The political scientist Michael Chwe has written a book explaining the function of social rituals as solutions to coordination problems. Michael Suk-Yong Chwe, \textit{Rational Ritual: Culture, Coordination, and Common Knowledge} (2001). Economists and psychologists view “culture,” including “corporate culture,” to refer to the conceptual tools, including language and ritual, that social groups have used to solve past coordination games and are therefore likely to use in attempting to solve future coordination games. See Avner Greif, \textit{Cultural Beliefs and the Organization of Society: A Historical and Theoretical Reflection on Collectivist and Individualist Societies}, 102 J. POL. ECON. 912 (1994); Benjamin E. Herma~lin, \textit{Economics and Corporate Culture} in THE INTERNATIONAL HANDBOOK OF ORGANIZATIONAL CULTURE AND CLIMATE (S. Cartwright et al., eds., 2001); David M. Kreps, \textit{Corporate Culture and Economic Theory}, in PERSPECTIVES ON POSITIVE POLITICAL ECONOMY (Alt & Shepsle, eds., 1990); Roberto A. Weber & Colin F. Camerer, \textit{Cultural Conflict and Merger Failure: An Experimental Approach}, 49 Management Sci. 400 (2003). The function of language, ritual, and culture are obviously important in a variety of ways to law.

\textsuperscript{204} I borrow here from John Donohue’s title, whose 20-year old article remains one the few addressing the lost opportunities for exchange between Law-and-Economics and Law-and-Society. See John J. Donohue III, \textit{Law and Economics: The Road Not Taken}, 22 LAW & SOC’Y REV. 903 (1988). Donohue does not explore, as I do, how one would apply game theory to the field of Law & Society or use that field’s findings to enlighten game theory.
The legal scholarship using informal game theory is unjustifiably obsessed with the PD. If game theory is useful, its use extends far beyond that game. The world presents problems of coordination and equity more often than the cooperation problem embodied in a PD game. Law is frequently called upon to resolve problems of coordination and equity. Thus, legal scholarship ignores these strategic situations or games to its detriment, failing to explore the theoretical insights economists, political scientists, and philosophers have made using these alternative games.

That is my main thesis. But I conclude by stepping back from particular games and legal applications to make a broader point. The failure to study and elaborate the problems of coordination and equity contributes to unnecessary divisions between legal scholars. I refer to the divide between the two primary social science schools of legal thought: Law & Economics and Law & Society. These scholarly camps are represented by the American Law and Economics Association and the Law and Society Association. Each group of scholars has their own peer-review journals, such as the Journal of Law and Economics, started in 1958, and the Law and Society Review, dating to 1966. Where some law faculties are heavily identified with law and economics, e.g., Chicago and George Mason, others are heavily represented by Law & Society scholars, e.g., Berkeley and Wisconsin.

Like most scholarly divides, neither group seems particularly impressed with the other. Yet given how both groups use a social science approach to law, it is still remarkable how little either engages the theory.

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207 As one of the few who regularly attends the annual meetings of both organizations, it is clear that the annual meetings of the Law & Society have greater attendance, though it is not clear which has more attendance by law professors. Law & Society draws many members from sociology, political science, psychology, history, and other fields, as well as law professors. Law professors dominate ALEA, which otherwise has members in economics departments and business schools.
or empiricism of the other. Here, I will briefly explain how a focus on the PD game obscures possible connections between Law & Economics and Law & Society.

One of the rare occasions when a Law & Economics scholar addressed Law & Society came when Robert Ellickson wrote about the two schools in *Order Without Law*.

Ellickson characterized Law & Economics scholars as “legal centralists” because they viewed law as the central mechanism of social control. Their scholarship commonly assumed that people know the law, that legal sanctions work effectively, and that people therefore act in accordance with law. By contrast, Ellickson described Law & Society scholars as “legal peripheralists” because they are skeptical regarding the claim that law influences behavior and demand empirical evidence. Much of their scholarship finds a serious gap between “law-in-the-books” and “law-in-action.”

In addition to Ellickson’s observation, note two more distinctions between these schools of thought: One is that Law & Economics

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209 Id. at 147.

210 Id. at 148.

211 See, e.g., Kristin Bumiller, *The Civil Rights Society: The Social Construction of Victims* (1988); William K. Muir, Jr., *Prayer in the Public Schools: Law and Attitude Change* (1967); Gerald N. Rosenberg, *The Hollow Hope: Can Courts Bring About Social Change?* (1991). Indeed, Ellickson’s *Order Without Law*, supra, is a classic example of a “gap study” because he found that Shasta County ranchers did not know the property law governing their disputes with neighbors and that such disputes were instead resolved by local social norms.
emphasizes efficiency, exchange, and mutual advantage while Law & Society emphasizes distribution, stratification, and social conflict. Law & Economics theorists look for means to avoid the waste of resources, where, by definition, waste benefits no one. Law & Society scholars look at struggles over resources (often including intangibles like social status), where one person’s gain is another person’s loss.

The final differences are methodological. These differences are complex, but for my purposes, it is enough to note just one contrast: Law & Economics makes extensive use of game theory, while Law & Society, for the most part, shuns it. Law & Society methods vary because the group includes several social science disciplines, but it tends strongly to favor thick description of human actors over the reductive descriptions necessary for game theory.

Now consider the relationship between these three differences: (1) reductive game theory description vs. thick description; (2) legal centralism vs. legal peripheralism; and (3) efficiency vs. distribution. Obviously, social science disciplines are separated by method. Perhaps ideological differences underlie the methodological ones, but a common view is that the method, in turn, is what drives social science disciplines apart. Thus, a standard view is that Law & Economics differs from Law & Society not because of what it studies (law, legal institutions, legal change) but how it studies. On this account, the connection between the three differences is that (1) the reductive tools of economics, including a reliance on game theory, lead the economic theorist toward (2) legal centralism and (3) a focus on efficiency.

Yet we can now see why this is not the case. Game theory is far too rich to lead legal scholars to care only about efficiency or to assume the

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centrality of law. What does lead to these tendencies (or at least what permits them to persist) is an excessive focus on the PD. The PD is obviously the wrong model for most of what Law & Society scholars study, so a focus on the PD makes game theory seem less relevant to their work than it actually is.

First, in the PD game, there is no distributional issue. To “solve” the PD and move from the outcome of mutual defection to the outcome of mutual cooperation benefits all the players in the game. Being about making everyone better off, the game involves no problem of equity or distribution. As if the PD game were not already designed to focus attention away from distributional issues, note the strong tendency in almost all descriptions of the game to describe the payoffs as equal in both the inefficient equilibrium of mutual defection and the efficient outcome of mutual cooperation. The PD game does not formally require equality in these payoffs,²¹³ but their common use further obscures the possibility of a distributional concern.

Second, a focus on the PD will make law and legal sanctions seem quite central. If the current payoffs permit only one equilibrium, then the only way to solve the game is to change the payoffs. If there are multiple equilibria because the game is repeated, but the players are hopelessly stuck in the inefficient “all defect” equilibrium, then changing the payoffs may be the only way to solve the game. In these settings, the law’s apparent ability to manipulate payoffs via sanctions make it at least appear necessary and sufficient for solving the problem. Moreover, given the absence of conflict, there is no reason for political opposition to solving a PD and every reason for unanimous support.²¹⁴ So in this case there

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²¹³ Indeed, recall that Holzinger, supra note 44, found three strategically distinct versions of the Asymmetric Dilemma, but only one of the actual PD.
²¹⁴ Of course, public choice theory has a lot to say about how inefficient law gets enacted, at least by legislatures. See, e.g., DANIEL A. FARBER & PHILIP P. FRICKEY, LAW AND PUBLIC CHOICE: A CRITICAL INTRODUCTION (1991); DENNIS C. MUELLER, PUBLIC CHOICE III (2003). But the influence of public choice has not popularized in the legal literature the
should be no gap between the law-on-the-books and the law-in-action. One simply uses law to change the payoffs sufficiently so that, as a result, the only equilibrium now is what the law requires: mutual cooperation. Law is central.

Now notice what happens when we turn instead to the alternative games explored here. First, these games highlight distributional issues. In HD and the BOS game, the two equilibria involve no issue of efficiency – the sum of the payoffs is the same – but solely a distributional choice. In the Rambo game that Holzinger found so common in the two-by-two setting, there was only one unequal equilibrium even though there was another equally efficient outcome where the players have equal payoffs. When one of these games is repeated, there is the possibility that a convention will emerge in which individuals in one social role – women, non-smokers, property non-possessors – will systematically receive less than those in another social role, which may lead to demands to change the distribution through law.

Second, if the correct model is a game of equity, then one side will favor change and the other will necessarily oppose it. Those disfavored by the status quo seek to use law merely as one means (along with politics) to achieve what they perceive as justice. The social movement is met, however, by resistance from those who would lose from a new equilibrium. If those who benefit from the current distribution were, in the past, able to preserve the existing arrangement, they are likely to possess similar power today. Sometimes they will block any change. But even when resistors lack the ability to block all change, they may be able to minimize it in familiar ways: to narrow the new law’s scope, to create procedural hurdles, to limit remedies, to influence the enforcement authorities, to outspend plaintiffs in litigation, etc.

part of game theory that that models distributive choices. To the contrary, this literature is generally critical of law that does something other than solve a Prisoners’ Dilemma.

See Holzinger, supra note 44.
After legal reform, there may *remain* multiple equilibria, one being the status quo distribution – where potential defendants insist and potential plaintiffs defer – and the other being the new distribution that is the goal of the law – where potential plaintiffs insist on their new “rights” and potential defendants defer. When the law fails to make compliance the only equilibrium, as it often does, then focal points and *not payoffs* will determine the actual outcome. Thus, if the game is not PD, but BOS or Hawk-Dove, then we may follow Law & Society scholars in studying law and legal change in the much broader context of social movements and counter-movements and we may readily predict a gap between the law-in-action and law-on-the-books.

At the same time, the alternative games reveal a more subtle expressive role for law that renders it less central and more like other competing social influences. Here, I refer to the theory describe above where law constructs a focal point around which individuals coordinate in situations of multiple equilibria. There were, however, several conditions I identified for the expressive function to work.\(^{216}\) Whether they exist in a particular case is entirely an empirical question.

In particular, note that one of the conditions for expressive law is the absence of a more powerful competing focal point. Legal expression is only one way in which particular behavioral outcome becomes salient. Schelling mentions “precedent” as another obvious mechanism – also focal is the solution everyone knows was used in the past.\(^{217}\) If the context is a place and time in which non-smokers have always in the past deferred to smokers, that will like remain salient. Sometimes the precedent is only analogous – if drivers slow down and defer to the car on the right, then perhaps that will be the focal solution when the drivers of two boats or airplanes find themselves on a collision course; if women initially defer to

\(^{216}\) See supra text accompanying note 134.

\(^{217}\) See SCHELLING, supra note 23, at 57.
men in one context, then perhaps their deferring will, by analogy, be focal in another context. Put differently, if the issue is the law’s focal effect, we cannot merely assume its effectiveness because the law’s influence will depend on competing social precedent, whether direct or analogous, which is to say, law’s effect depends on history and culture. The strength of the legal focal point will depend on whether it seeks to reinforce or change the precedent. If current behavior and patterns of thought are sufficiently focal, individuals will entirely ignore a new law that tries to change existing practice.218

Now it should be clear why a focus on equity and coordination games would lessen the differences between Law & Economics and Law & Society and provide some basis for intellectual exchange. Most obviously, equity games direct attention away from efficiency, exchange, and mutual advantage that Law & Economics now emphasizes and towards the Law & Society concern with distribution, stratification, and social conflict. They emphasize why law is not always central to behavior – because the aim is often redistribution, opposition to change makes it likely that legal remedies do not match legal rights, that the law will usually make only marginal and incremental moves towards social change.219 The excessive attention to the PD makes these conclusions seem

218 Factors that seem irrelevant to conventional economic analysis can then come into play. As Law & Society scholars say, law will have a greater effect if it changes the “frame” or “schema” individuals use for understanding the conflict. But law is merely one means of trying to change how people understand their situation. See Robert D. Benford & David A. Snow, Framing Processes and Social Movements: An Overview and Assessment, 26 ANN. REV. SOC. 611 (2000). The rhetoric of social movement leaders is another. One of the most common rhetorical moves, made powerful by existing legal focal points, is to claim some outcome as a “right.” In a coordination game, even a purely symbolic legal recognition of rights may influence how people expect others to behave, and therefore how they behave themselves. We can see then another reason why legal symbolism is so fraught with politics and emotion: because in the middle of a struggle, when there is uncertainty about how to behave, even symbolic law can change behavior.

219 At the same time, because the focal point effect exists only in games of multiple equilibria, the law may on occasion have discontinuous rather than marginal effects, where the behavior shifts from one equilibrium to another. The result is highly
foreign to game theory, when they are really well modeled if one starts with the right games.

CONCLUSION

Legal scholars have learned the lessons of the Prisoners' Dilemma too well, to the point where they allow it to obscure other insights of game theory. To some degree, legal scholars mischaracterize other situations as a PD game. To a greater extent, they merely ignore the insights of game theory for situations that are not PDs.

They do so I believe because of certain attractive features of the Prisoners' Dilemma game. First, when these games are played once, they have a single Nash equilibrium, which provides a tidy and definitive prediction of the behavioral outcome. One can therefore ignore messy concepts like culture and history because, once factored into the payoffs, their influence is fully exhausted. Second, such models are normatively simple. The Prisoners' Dilemma provides a simple Pareto-justification for legal intervention: where the problem is cooperation, *everyone* can be made better off by the right kind of external incentives that "solve" the Dilemma. There is no issue of distribution, so there is no need for a complex normative theory to justify redistribution.

By contrast, games modeling equity and coordination problems lack the normative and descriptive simplicity of cooperation games. By definition, when there is more than one possible equilibrium, the payoffs alone do not determine the behavioral outcome. The game theorist readily concedes that other messy factors influence behavior. The standard way to express this point is to say that the parties will gravitate toward the outcome that is "focal," but that terminology just means that factors outside of game theory, such as history and culture, affect behavior.

contingent. When legal sanctions are weak, a dramatic behavioral shift is more likely to occur when the law is able to work *with* rather than merely *against* other focal points.
Second, equity games present no opportunity for a Pareto-superior move making everyone better off. Instead, the “solution” to such problems more commonly requires a choice between the conflicting preferences of different individuals, which requires a contestable normative theory, such as a non-utilitarian social welfare function or a notion of corrective or distributive justice.

In short, there is a strong temptation to describe a situation as a Prisoners’ Dilemma because it renders the problem amenable to an uncontroversial legal solution. This article, however, describes the benefits of resisting this temptation, of opening one’s eyes to the game theory of multiple equilibria and distributional conflict. I have ventured to prove that coordination and equity problems are common and that there is much to be learned from using even very simple games to analyze them. Although many non-legal scholars and a few of us legal scholars have made some progress in understanding the importance of coordination and equity to law and legal change, the main purpose of this article is to encourage more work of this sort by legal scholars, to exploit the potential of this sort of game theory, and correct the imbalance currently overemphasizes the Prisoners’ Dilemma.

\(^{220}\) For a description, see LEWIS KAPLOW & STEVEN SHAVELL, FAIRNESS VS. WELFARE 15-37 (2002).

\(^{221}\) See, e.g., RAWLS, supra note 74; NUSSBAUM, supra note 74; ERNEST J. WEINRAB, THE IDEA OF PRIVATE LAW (1995).