ARTICLES

BEYOND THE PRISONERS' DILEMMA: COORDINATION, GAME THEORY, AND LAW

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I. INTRODUCTION

In reviewing a game theory text almost twenty years ago, Ian Ayres complained that "countless" law review articles "rearticulate the Prisoner's Dilemma, but few even proceed" to the simplest of other games.[1] Several years later, in what is still the most significant book treatment of game theory for law, Douglas Baird, Robert Gertner, and Randal Picker began by lamenting how legal scholars had neglected game theory up to that point "other than to invoke a simple game such as the prisoner's dilemma as a metaphor for a collective action problem."[2] All of these scholars asserted the great value of game theory to legal analysis and the hope that it would transform legal theory as it has transformed economic theory.

That transformation has not occurred, at least not in the law review literature. To the contrary, the diagnosis of Ayres, Baird, Gertner, and Picker remains true today: legal scholars are nearly obsessed with the Prisoners' Dilemma, mentioning the game in a staggering number of law

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    1. Ian Ayres, *Playing Games with the Law*, 42 STAN. L. REV. 1291, 1294–95 (1990) (book review) (footnote omitted) ("Law review articles continue to be mindlessly mired in the game theory 'technology' of the fifties.").

    2. DOUGLAS G. BAIRD, ROBERT H. GERTNER & RANDAL C. PICKER, GAME THEORY AND THE LAW 1 (1994).

review articles (over three thousand), while virtually ignoring other equally simple games offering equally sharp insights into legal problems. One has to guess that the former obsession contributes to the latter neglect. Having learned one tool very well, legal scholars either shoehorn situations that are not Prisoners' Dilemmas into that framework or, recognizing that the problem is not a Prisoners' Dilemma, give up on game theory. For certain, this diagnosis does not apply to the formal modelers, many with Ph.D.s in economics, who publish predominantly in peer-reviewed law and economics journals. But, as this Article shows below, the far more typical story for legal scholars is to use game theory only by using the Prisoners' Dilemma. And this outcome is like only using mathematics when the problem involves odd numbers between twelve and two hundred.

Game theory contains many tools and insights beyond the Prisoners' Dilemma, too many to discuss in a single article. No doubt the formal modelers would point out the greater realism of using games with continuous rather than discrete strategies,[3] sequential rather than simultaneous moves,[4] and asymmetric rather than complete information,[5] as well as models of evolutionary emergence of equilibrium.[6] Most contemporary game theory is not about games with preexisting names like the Prisoners' Dilemma or the alternatives discussed below, but rather concerns games the modeler constructs to fit the situation being studied. Yet this is the kind of complaint that Baird, Gertner, and Picker raised previously. This Article seeks to take a different, more practical path in criticizing the law professor's use of game theory, one that borrows from another applied field: political science. That work demonstrates that in situations just as basic as the Prisoners' Dilemma—with two players, two discrete strategies, complete information, and simultaneous moves—there is a world of value in games *other than* the Prisoners' Dilemma.[7] This Article focuses on three such games, all involving problems of coordination[8] that do not arise in the Prisoners' Dilemma, and all having

        3.   *See, e.g.*, ERIC RASMUSEN, GAMES AND INFORMATION 87–94 (4th ed. 2007).
        4.   *See, e.g.*, DREW FUDENBERG & JEAN TIROLE, GAME THEORY 68–200 (1991).
        5.   *See, e.g.*, *id.* at 209–428; RASMUSEN, *supra* note 3, at 179–348.
        6.   *See, e.g.*, DREW FUDENBERG & DAVID K. LEVINE, THE THEORY OF LEARNING IN GAMES 7–8 (1998); H. PEYTON YOUNG, STRATEGIC LEARNING AND ITS LIMITS 29–42 (2004).
        7.   At the same time, one must be aware of the limits of simple models, such as situations in which omitting certain complexities to the game leads to the wrong conclusions. *See, e.g.*, BAIRD ET AL., *supra* note 2, at 188–218 (chapter on "Collective Action, Embedded Games, and the Limits of Simple Models").
        8.   Some essential works on coordination are DAVID K. LEWIS, CONVENTION: A PHILOSOPHICAL STUDY 5–51 (1969); THOMAS C. SCHELLING, THE STRATEGY OF CONFLICT 89–99 (1963); BRIAN SKYRMS, THE STAG HUNT AND THE EVOLUTION OF SOCIAL STRUCTURE 31–44 (2004); ROBERT

great value for legal theory.

Why would legal scholars focus on the Prisoners' Dilemma to the point where it obscures other insights of game theory? What is the game's allure? Two features that narrow the game's application also make it tempting to a legal scholar. When played just once, the Prisoners' Dilemma is one of the few games with a single equilibrium. An equilibrium is central to game theory; it is an outcome where each individual is playing her best response to what everyone else is doing. At such a point, no one wants to switch strategies.[9] Single equilibrium games provide a tidy and definitive prediction of the behavioral outcome. One can therefore ignore culture and history because, once factored into the payoffs, their influence is fully exhausted.[10] A second temptation of the Prisoners' Dilemma is a unique normative feature: *everyone* can be made better off by legal sanctions that "solve" the game; so if the problem is a Prisoners' Dilemma, the case for a legal solution is unusually strong.

By contrast, coordination games have *multiple* equilibria and therefore lack these allures. The existence of more than one equilibrium means that the payoffs alone do not determine the behavioral outcome. In such cases, the economist concedes that history and culture (or other factors) may affect behavior independent of—and in addition to—their effect on payoffs.[11] Prediction is messy. Additionally, games other than the Prisoners' Dilemma frequently present no opportunity for a solution making everyone better off. Instead, coordination games often present a distributional choice between conflicting preferences of different individuals, which must be made on the basis of some complex and

SUGDEN, THE ECONOMICS OF RIGHTS, CO-OPERATION AND WELFARE 36–91 (Palgrave Macmillan 2d ed. 2004); EDNA ULLMANN-MARGALIT, THE EMERGENCE OF NORMS 74–133 (1977).

   9.   More precisely, an equilibrium refers to a "Nash equilibrium," which is

   [t]he 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.

BAIRD ET AL., *supra* note 2, at 310 (emphasis omitted).

   10.   For example, if an individual gains some extra benefit from an outcome because of an emotional attachment to a particular cultural identity, the game theorist will accordingly raise the payoffs to that individual for that outcome. If there remains only one equilibrium, then the effect of culture is entirely limited to the way it affects payoffs.

   11.   In contrast to the prior footnote, if the payoffs permit multiple equilibria, culture may not only affect the payoffs, but may also affect the choice between the multiple equilibria. For example, if the payoffs do not determine a unique equilibrium, individuals with the same payoffs but different cultural identities may play the game differently. *See infra* Parts IV.B.2–3 (discussing culture and focal points).

contestable normative theory.[12]

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 describes the benefits of resisting this temptation, of opening one's eyes to more game theory than that one trick, however clever. Coordination problems are common and important to law, and there is much to be learned from using simple games to analyze them. Unlike the Prisoners' Dilemma, coordination games describe situations that involve inequality, reveal how culture and history powerfully affect behavior, and demonstrate how law works expressively. These games provide unique insights into bargaining, constitutional law, democratic stability, international law, standard setting, traffic regulation, property norms, gender roles, and social movements. Political scientists, economists, philosophers, and just a few legal scholars have begun exploring these matters. 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. The main purpose of this Article is to encourage legal scholars to exploit the potential of this sort of game theory and to correct the imbalance that currently overemphasizes the Prisoners' Dilemma.

I also explain how coordination games provide a bridge 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 overwhelmingly coordination problems, not Prisoners' Dilemmas. Each group might better understand the contributions of the other if legal scholars using game theory were to focus more attention on these alternative games.

Part II introduces the Prisoners' Dilemma and gives some measure of its enormous influence over legal scholarship. Part III introduces three simple games—Assurance, Battle of the Sexes, and Hawk-Dove—that are at least as common as the Prisoners' Dilemma, but that are relatively neglected by legal scholarship. In Part IV, I describe some of the many ways these games illuminate legal problems, showing them to be at least as important to law as the Prisoners' Dilemma. Part V discusses opportunities for intellectual exchange between scholars in Law & Economics and those in Law & Society. Part VI concludes.

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12. *See, e.g.*, LOUIS KAPLOW & STEVEN SHAVELL, FAIRNESS VERSUS WELFARE 15–38 (2002); JOHN RAWLS, JUSTICE AS FAIRNESS: A RESTATEMENT 39–40, 150–52 (2001).

II. ALL THE PRISONERS' DILEMMA, ALL THE TIME

The problem of cooperation exemplified by the Prisoners' Dilemma ("PD") is one of the most dominant paradigms of recent theoretical work in economics, politics, and law. As political scientist Robert Axelrod phrases it, "The two-person iterated Prisoner's Dilemma is the *E. coli* of the social sciences . . . ."[13] Legal scholars make great use of the concept, having mentioned it in an astonishing number of law review publications—over three thousand according to my Westlaw search[14]—to explore topics ranging from contracts[15] and property,[16] to international law,[17] race discrimination,[18] feminism,[19] social norms,[20] the federal judiciary,[21] and, indeed, actual prisoners.[22] Legal theorists use the PD to explain other major concepts in law—for example, the tragedy of the commons,[23] the public

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13.   ROBERT AXELROD, THE COMPLEXITY OF COOPERATION, at xi (1997) (emphasis omitted).

14.   A search conducted on January 3, 2009, in the JLR database for "prisoner's dilemma" or "prisoners dilemma" resulted in 3119 documents. "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 picks up this usage anyway. If we add to the search the Prisoners' Dilemma's multiparty cousin, the "Social Dilemma," the yield is 3452 documents, although some of these use the term in a nonstrategic sense (as a synonym for the term "social problem").

15.   *See, e.g.*, Robert L. Birmingham, *The Duty to Disclose and the Prisoner's Dilemma:* Laidlaw v. Organ, 29 WM. & MARY L. REV. 249, 275–82 (1988); Wayne Eastman, *How Coasean Bargaining Entails a Prisoners' Dilemma*, 72 NOTRE DAME L. REV. 89, 97–100 (1996); Robert E. Scott, *Conflict and Cooperation in Long-Term Contracts*, 75 CAL. L. REV. 2005 (1987).

16.   *See, e.g.*, ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION 23–38 (1990) (explaining that people who share common resources face a form of the prisoner's dilemma); Wendy J. Gordon, *Asymmetric Market Failure and Prisoner's Dilemma in Intellectual Property*, 17 U. DAYTON L. REV. 853 (1992).

17.   *See, e.g.*, George Norman & Joel P. Trachtman, *The Customary International Law Game*, 99 AM. J. INT'L L. 541, 548–53 (2005); John K. Setear, *Responses to Breach of a Treaty and Rationalist International Relations Theory: The Rules of Release and Remediation in the Law of Treaties and the Law of State Responsibility*, 83 VA. L. REV. 1, 27–32 (1997).

18.   *See, e.g.*, Richard H. McAdams, *Cooperation and Conflict: The Economics of Group Status Production and Race Discrimination*, 108 HARV. L. REV. 1003, 1018–32 (1995).

19.   *See, e.g.*, H.E. Baber, *Tomboys, Femmes and Prisoner's Dilemmas*, 9 J. CONTEMP. LEGAL ISSUES 37, 41–54 (1998); Carol M. Rose, *Women and Property: Gaining and Losing Ground*, 78 VA. L. REV. 421, 424–28 (1992).

20.   *See, e.g.*, ROBERT AXELROD, THE EVOLUTION OF COOPERATION 27–54, 75–77, 92, 109–23 (1984); ERIC A. POSNER, LAW AND SOCIAL NORMS 12–15, 172–74 (2000); Paul G. Mahoney & Chris W. Sanchirico, *Competing Norms and Social Evolution: Is the Fittest Norm Efficient?*, 149 U. PA. L. REV. 2027, 2031–41, 2052–56, 2061–62 (2001).

21.   *See, e.g.*, David S. Law, *Appointing Federal Judges: The President, the Senate, and the Prisoner's Dilemma*, 26 CARDOZO L. REV. 479, 502–04 (2005); Thomas W. Merrill, *Pluralism, the Prisoner's Dilemma, and the Behavior of the Independent Judiciary*, 88 NW. U. L. REV. 396, 401–09 (1993).

22.   *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, 149–50 (1997).

23.   *See, e.g.*, Hanoch Dagan & Michael A. Heller, *The Liberal Commons*, 110 YALE L.J. 549,

goods problem,[24] and trust[25]—all of which are themselves relevant to many areas of law.

Given my thesis, the PD needs almost no introduction, yet it will help greatly to review the iconic 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, summarized below in Figure 1: "If you are the only one to confess, I will reward you by dropping all charges," which is represented in Figure 1 by the payoff of 0. "If you are the only one *not* to confess, I will use your confederate's testimony to convict you of the felony and obtain for you the maximum five years in prison (-5); if neither of you confesses, you each get one year for the misdemeanor (-1); if both confess, I will convict you both of the felony, but give you an intermediate sentence of three years (-3)." In this context, to select the strategy of not confessing is to "cooperate" and to select the strategy of confessing is to "defect." Altruism can of course change the game, but the standard assumption is that each prisoner cares only about his or her own punishment.

FIGURE 1. The Classic Prisoners' Dilemma.

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	-1, -1	-5, 0
	Defect	0, -5	<u>-3</u>, <u>-3</u>

With these payoffs, if Player 2 cooperates, Player 1 is better off

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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." (footnote omitted)).

    24.   *See, e.g.*, Richard A. Epstein, *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, *Spinning and Underpricing: A 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.'").

    25.   *See, e.g.*, Karen Eggleston, Eric A. Posner & Richard Zeckhauser, *The Design and Interpretation of Contracts: Why Complexity Matters*, 95 NW. U. L. REV. 91, 115 (2000) ("One useful model of trust treats it as an attribute of relationships in which two parties in a repeated prisoner's dilemma cooperate rather than risk retaliation.").

defecting (receiving a payoff of 0) than cooperating (-1).[26] 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, an equilibrium is indicated by underlining the payoffs. The game is termed a "dilemma" because this theoretically inevitable outcome is worse *for each prisoner* than another possible outcome, Cooperate/Cooperate.

A simple Westlaw search reveals a staggering three-thousand-plus articles referring to the PD,[27] which contrasts with only trivial attention given to coordination games of equal legal significance (as demonstrated below). One indication that legal scholars give excessive attention to the PD is how scholars misdescribe and misapply the game. First, scholars sometimes attempt to shoehorn a non-PD situation into the PD 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."[28] 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."[29] Yet the PD 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 PD game can—at best—apply only *after* some uncertainty arises about the bank. By contrast, the simple game of Assurance, discussed below,[30] 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

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26.   Notice that in Figure 1, as in every matrix in this Article, the payoffs for Player 1 are on the left in each cell and the payoffs for Player 2 are on the right.

27.   *See supra* note 14 and accompanying text.

28.   Mark E. Van Der Weide & Satish M. Kini, *Subordinated Debt: A Capital Markets Approach to Bank Regulation*, 41 B.C. L. REV. 195, 201 (2000). *Accord* Daniel R. Fischel, Andrew M. Rosenfield & Robert S. Stillman, *The Regulation of Banks and Bank Holding Companies*, 73 VA. L. REV. 301, 307–10 (1987); Jonathan R. Macey, *The Business of Banking: Before and After Gramm-Leach-Bliley*, 25 J. CORP. L. 691, 696–97 (2000); R. Nicholas Rodelli, Note, *The New Operating Standards for Section 20 Subsidiaries: The Federal Reserve Board's Prudent March Toward Financial Services Modernization*, 2 N.C. BANKING INST. 311, 314–15 (1998). On January 3, 2009, my Westlaw search in the JLR database for "(run /3 bank) /p (prisoner /2 dilemma)" yielded ten documents. By contrast, a parallel search for articles involving the most apt coordination game ("stag hunt" or "assurance," explained *infra* Part III.A) to describe a bank run yielded zero documents. I thank Keith Hylton for suggesting this example.

29.   Macey, *supra* note 28, at 696.

30.   *See infra* Part III.A.

the former to the latter.

The PD 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 *A*'s bank, and yet others will not reclaim their deposits, then *A* will have no interest in incurring the costs of reclaiming hers. It is only when *A* expects others to withdraw their deposits that *A* also 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 PD is strictly limited to the former case. As we shall see, the latter situation is about *coordinating* one's behavior with that of others.

Yet the distinction is often overlooked. Even when describing the original PD scenario, quite a few scholars posit payoffs where the best outcome for a player—freedom from prison—*occurs when neither party confesses*.[31] This is an error. By positing that mutual silence allows both

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31.   Some smart scholars make this error. Robert Birmingham observes that Judge Easterbrook misdescribes a PD in *Page v. United States*, 884 F.2d 300, 301 (7th Cir. 1989) (emphasis added), when he says:

> 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 equals mutual freedom, while a sole confessor serves one year (and a sole nonconfessor gets five), then the best response to silence is silence. To create a PD, the prosecutor must instead ensure that either prisoner can obtain her best outcome—no prison—only if she is the sole confessor. So if both are silent, they must both serve some time, such as for a minor crime the prosecutor can already prove. *See* Robert Birmingham, Remark, 29 CONN. L. REV. 827, 842–45 (1997) (remark to Wayne Eastman, *Telling Alternative Stories: Heterodox Versions of the Prisoner's Dilemma, the Coase Theorem, and Supply-Demand Equilibrium*, 29 CONN. L. REV. 727 (1997)).

Lee Fennell catches the same error in her review of ROBIN PAUL MALLOY, LAW IN A MARKET CONTEXT (2004). *See* Lee Anne Fennell, Book Review, 55 J. LEGAL EDUC. 295, 300–01 (2005). This author has found five other examples just in the past four years: Pamela H. Bucy, *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 . . . ." (citation omitted)); Glenn Harrison & Matthew Bell, *Recent Enhancements in Antitrust Criminal Enforcement: Bigger Sticks and Sweeter Carrots*, 6 HOUS. BUS. & TAX L.J. 206, 215 (2006) ("If neither prisoner confesses, both go free . . . ." (emphasis omitted)); David McGowan, *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)."); Geoffrey P. Miller, *The Legal Function of Ritual*, 80 CHI.-KENT L. REV. 1181, 1185 (2005) (positing that "[i]f neither confesses, both will go free," while if only one confesses, the confessor "will serve only a short sentence (say, one year)"); Jonathan T. Schmidt, Note, *Keeping U.S. Courts Open to Foreign Antitrust Plaintiffs: A Hybrid Approach to the*

prisoners to avoid any penalty, these scholars create a situation where each prisoner wants to confess *only if* the other confesses; each wants to remain silent if the other remains silent. As a result, there are two equilibria (Confess/Confess and Silence/Silence) and the situation is not a PD, but one of the coordination games discussed below. I suspect these scholars make this error despite knowing the game theory because, in trying quickly to recall the PD scenario from memory, they imagine a prosecutor/prisoner bargaining situation *that seems realistic and typical*, which is where mutual silence is best. It just turns out—surprise!—that many realistic and typical legal situations are not PDs. Below we see how a different game— Assurance—helps to understand these interactions.

In any event, these examples are not alone.[32] Legal scholars seem to wear PD-colored lenses that trick them into seeing something that is not there. Let us now consider what they are failing to see.

III. WHAT THE PRISONERS' DILEMMA OBSCURES: THREE SIMPLE GAMES OF COORDINATION

The PD game is a brilliant way of illustrating the problem of cooperation. Where selfish pursuits lead individuals to outcomes that are worse for each than some other achievable outcome, they need to find how to cooperate to reach the better outcome. To be clear, I have no quarrel with the power of this analysis: PD problems are prevalent, their solution frequently offers an uncontroversial way to improve social welfare, and legal sanctions are often necessary and sufficient to solve such problems. But cooperation failures are not the only obstacles individuals face in achieving their ends. Game theory identifies another pervasive problem: the need to *coordinate*. Using games as simple as the PD, the theory demonstrates why society needs mechanisms for coordination as much as it needs mechanisms for cooperation. As we shall see, law serves the former function as much as the latter.

To illustrate a coordination problem, consider a simple variation on

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Effective Deterrence of International Cartels, 31 YALE J. INT'L L. 211, 234 chart 1 (2006) (showing the outcome for mutual silence being no penalty, while the sole confessor gets a "light penalty" of one year).

32.   Bankruptcy is similar. 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 PD in Thomas H. Jackson, *Bankruptcy, Non-Bankruptcy Entitlements, and the Creditors' Bargain*, 91 YALE L.J. 857, 862–65 (1982), but the same problems arise. First, the game describes the situation that exists only *after* the perception of insolvency arises, where a game discussed below (Assurance) also captures the original situation of perceived solvency. Second, because calling in a loan is costly, creditor *A* may not want to bear this cost if none of the other creditors call in their loans.

the canonical narrative of the PD. The prosecutor places in different interrogation rooms two prisoners who jointly committed some crime. Suppose, however, that the prosecutor's case is so weak that the prisoners could defeat the prosecutor and free themselves if, but only if, they can give a *consistent* alibi for their whereabouts at the time of the crime. It will not work for the prisoners to say they were each alone at the time; they each need someone to confirm their alibi and, because they are guilty, each knows that she can rely on no one except the other prisoner. But they did not agree on an alibi in advance. Each prisoner thinks of various possibilities: they were at one of their homes or the other, at the movies, out hunting, etc. The problem is that neither knows what alibi the other will choose. Let us call the example the "Prisoners' (Pure) Coordination" game.[33]

More generally, the problem of coordination arises where two or more individuals can reach some mutually desired outcome—or avoid some mutually undesired outcome—only by combining their actions in a certain way, but where more than one possible combination will suffice. The presence of multiple ways to combine actions requires that individuals coordinate on *the same* combination. Coordination is a pervasive concern of law. There are many coordination games, but this Article limits the discussion to three classics: (1) the Assurance or Stag Hunt game, (2) the Battle of the Sexes game, and (3) the Hawk/Dove or Chicken game. Unlike the PD, these games require an introduction because they are routinely ignored by the legal scholarship. In contrast to 3119 results for the PD,[34] a Westlaw search reveals 123 references to the Assurance or Stag Hunt game,[35] 76 references to the Battle of the Sexes game,[36] and 102 references to the Hawk/Dove or Chicken game.[37] In other words, these other games are mentioned, respectively, 3.9 percent, 2.4 percent, and 3.3 percent as often as the PD game. The number of articles mentioning *any* of these three games is 246, or 7.9 percent of the PD total.[38] So let us meet these

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33.   The game is a "pure" coordination game because there is no element of conflict—each player is indifferent among the equilibria and cares only about coordinating. The classic example is the choice of driving on the left or the right side of the road.

34.   *See supra* note 14 and accompanying text.

35.   My search terms were as follows: "stag hunt" or "assurance game." All the searches reported here were conducted on January 3, 2009, in the JLR database.

36.   My search terms were as follows: (battle /s sexes /s game).

37.   My search terms wereas follows: "chicken game" or (hawk /s dove /s game).

38.   My search combined the above three searches, disjunctively. The combined search result of 246 yields fewer documents than adding the three individual game totals because some documents mention more than one of the games. Yet these games are the most likely coordination games to be mentioned. Indeed, my search for the generic term "coordination game" yielded only 243 documents.

neglected tools of legal analysis.

A. THE ASSURANCE OR STAG HUNT GAME

Figure 2 depicts what is known as the Assurance or Stag Hunt game.[39] Here, if Player 2 selects Strategy A, then Player 1 is better off selecting Strategy A and receiving 4 than selecting Strategy B and receiving 3. If Player 2 selects Strategy B, however, then Player A is better off selecting Strategy B (receiving 3 instead of 0). Because the payoffs are symmetric, Player 2 has the same preferences. Thus, the players want to match strategies and the game has two (pure strategy)[40] equilibria: A/A and B/B.

FIGURE 2. An Assurance or Stag Hunt Game.

		Player 2	
		Strategy A	Strategy B
Player 1	Strategy A	4, 4	0, 3
	Strategy B	3, 0	3, 3

The players have the same preferences, each 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.

There is, however, some slight movement in the right direction. Limiting the prior searches to publications since 2002, I found 1115 articles referencing the PD and 107 referencing any one of the three coordination games, which is approximately 10 percent of the PD total.

    39.   *See, e.g.*, DENNIS CHONG, COLLECTIVE ACTION AND THE CIVIL RIGHTS MOVEMENT 103–07 (1991); SKYRMS, *supra* note 8, at 1–4; Gary Bornstein & Zohar Gilula, *Between-Group Communication and Conflict Resolution in Assurance and Chicken Games*, 47 J. CONFLICT RESOL. 326, 327–31 (2003); Amartya K. Sen, *Isolation, Assurance and the Social Rate of Discount*, 81 Q.J. ECON. 112, 112–15 (1967). For technical differences between Assurance and Stag Hunt, which need not concern us here, see BAIRD ET AL., *supra* note 2, at 301, 315.

    40.   A "pure strategy" is one that selects (in a given circumstance) a certain "move" or behavior with certainty. This approach is contrasted with a "mixed strategy," which involves (in a given circumstance) selecting among at least two moves with probabilities that sum to one. Concordantly, in 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 ET AL., *supra* note 2, at 313 (emphasis omitted). To keep things simple, this Article focuses on pure strategy equilibria.

The game draws one of its names—Assurance—from the fact that each needs to *assure* the other that he or she is going to play the riskier strategy—A—so the other should as well.[41] The name "Stag Hunt" comes 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, and where sharing a stag with the other hunter is the best outcome, but hunting hare is safer because one can succeed on one's own.[42]

One illustration of the game is the bank run discussed above, although that obviously involves more than two players.[43] Everyone wants to keep their money in the bank if everyone else does, but wants to remove their money if enough others are going to remove theirs. The efficient equilibrium is where depositors gain the advantage of pooling their resources, but the inefficient equilibrium results when everyone seeks to avoid the risk of pooling and goes it alone. The game captures the fact that, in times of uncertainty, the depositors need to *assure* each other that they will not panic. Unlike the PD, if no one else will withdraw their deposit in fear, there is no reason for you to do so.

As another example of Assurance, consider again a prosecutor bargaining with prisoners. Suppose that, unlike the PD, the prosecutor has so little evidence that she cannot convict either prisoner of any crime if neither confesses. Unlike the above example, they need not even give an alibi to avoid punishment; they need merely to remain silent for both to walk free. Against this best outcome, the prosecutor offers a prison term of seven years each if both confess, one year for being the sole confessor, and twelve years for being the sole nonconfessor. If so, then each prisoner wants to assure the other that she will remain silent; neither wants to confess if they expect that the other will not confess.[44] The "Prisoners' Assurance" game must be highly plausible because it is the set of facts by

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41.   *See, e.g.*, CHONG, *supra* note 39, at 103–04; Sen, *supra* note 39, at 112–15.

42.   JEAN-JACQUES ROUSSEAU, A DISCOURSE ON INEQUALITY 111 (Maurice Cranston trans., 1984) (1755).

43.   *See supra* text accompanying notes 28–30.

44.   One might challenge the example by saying that a prosecutor would always choose to make the game a PD by offering zero years (instead of one year) if a defendant is the only one who confesses. 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 toward her criminal confederates. However small these effects are, the best outcome when the prosecutor cannot convict either without a confession is mutual silence, in which case the game is Assurance and not PD.

which some scholars misdescribe the PD.[45] Indeed, Christopher Leslie confirms that this result is common in antitrust conspiracies: if the prosecutor cannot prove the conspiracy, she cannot prove any offense.[46]

B. THE BATTLE OF THE SEXES GAME

Figure 3 illustrates the Battle of the Sexes ("BOS") game, where the worst outcome for each player is the failure to match strategies, and where one player prefers matching at Strategy A and the other prefers matching at Strategy B.[47] Specifically, 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 (pure strategy) equilibria: A/A and B/B. Unlike Assurance, there is conflict here because Player 1 prefers A/A and Player 2 prefers B/B. Like Assurance, the players agree on the need to avoid certain outcomes, B/A and A/B, each of which is worse for both players than either equilibrium.

FIGURE 3. A Battle of the Sexes Game.

		Player 2	
		Strategy A	Strategy B
Player 1	Strategy A	3, 1	0, 0
	Strategy B	0, 0	1, 3

Although any game this simple will miss much nuance, the BOS is a useful model of bargaining. The game also models standard setting, as where different firms or industries need to agree to certain technical standards to allow their products to interact. I explore these examples below.[48]

We can also return to prosecutorial bargaining with prisoners. Suppose the prosecutor has enough information to charge both prisoners with a substantive offense *and* with a conspiracy to commit that offense. In

45.   *See supra* note 31 and accompanying text.

46.   Christopher R. Leslie, *Trust, Distrust, and Antitrust*, 82 TEX. L. REV. 515, 638–39 (2004) ("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.").

47.   *See, e.g.*, Russell Cooper et al., *Forward Induction in the Battle-of-the-Sexes Games*, 83 AM. ECON. REV. 1303, 1303–04 (1993).

48.   *See infra* Part IV.C.1.

response, A and B could each assert that a particular one of them committed the offense *alone*. If so, then neither prisoner can be convicted of the crime of conspiracy; the confessor will be convicted only of the substantive offense and the other prisoner will go free. The strategy obviously requires coordination because they will fail to be credible and fail to defeat the conspiracy charge if they each point the finger at the other, or each point the finger at themselves. Being a BOS, each prefers a different equilibrium—the one where the *other* prisoner takes responsibility. Instead of a PD, we have the "Prisoners' BOS" game.

C. THE HAWK-DOVE OR CHICKEN GAME

The Hawk-Dove ("HD") or Chicken game poses a coordination problem but one with even greater conflict than the BOS.[49] Figure 4 illustrates this problem. Given the payoffs, if Player 2 selects the strategy Dove, then Player 1's best response is Hawk (receiving 4 instead of 2 from playing Dove). If Player 2 selects Hawk, then Player 1's best response is Dove (receiving 0 instead of -1 from playing Hawk). 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.

FIGURE 4. A Hawk-Dove Game.

		Player 2	
		Dove	Hawk
Player 1	Dove	2, 2	0, 4
	Hawk	4, 0	-1, -1

Most obviously, there is conflict 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 an equilibrium (because at that point a player would prefer to unilaterally switch strategies), if both players aim for their preferred outcome by

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49. *See, e.g.*, SUGDEN, *supra* note 8, at 61–65 (describing the HD game); Gary Bornstein, David Budescu & Shmuel Zamir, *Cooperation in Intergroup,* N*-Person, and Two-Person Games of Chicken*, 41 J. CONFLICT RESOL. 384, 384–91 (1997); Hugh Ward, *The Risks of a Reputation for Toughness: Strategy in Public Goods Provision Problems Modelled by Chicken Supergames*, 17 BRIT. J. POL. SCI. 23, 27–28 (1987).

simultaneously playing Hawk, that is exactly what results.[50] Indeed, 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.[51]

In the next part, I claim that disputes often have the structure of an HD game.[52] For now, consider again the setting of prosecutorial bargaining. Suppose 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 *C*, thereby exonerating both prisoners. The problem is that the prisoners each prefer that the other one act as a snitch, because each knows that a snitch may suffer retaliation by *C* or other criminals. Each prisoner therefore regards the best outcome to be to remain silent while the other snitches, but the worst outcome to be where neither snitches and both are imprisoned for a crime neither committed.[53] The only two (pure strategy) equilibria involve exactly one snitcher: Snitch/Be Silent and Be Silent/Snitch.[54] Instead of the PD, this is the "Prisoners' HD" game.

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In the PD, a prisoner always does better by confessing and does best by being the only one to confess. But in four other equally plausible cases of prosecutorial bargaining, that is not the case. In the Prisoners' (Pure) Coordination game, one does best by matching whatever alibi the other prisoner gives. In the Prisoners' Assurance game, each prisoner wants to reciprocate the other prisoner's decision, and both do best by mutual silence. In the Prisoners' BOS game, one wants to cast all blame on whichever prisoner the other prisoner blames; one does best where there is mutual blaming of the other prisoner. In the Prisoners' HD game, one wants to be silent if the other prisoner snitches on the third party who committed the crime, but wants to snitch if the other prisoner is silent; thus, one does best by having the other prisoner snitch.

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50.   The other nonequilibrium outcome is Dove/Dove. In Figure 4, the joint payoffs at this outcome (2 + 2 = 4) are the same as the joint outcome at the two equilibria (4 + 0 = 4). This is not necessary. The joint Dove/Dove payoffs could be less or more than the joint equilibria payoffs. If they are more, then we also have a cooperation problem in reaching this efficient outcome.

51.   *See, e.g.*, REBEL WITHOUT A CAUSE (Warner Bros. Pictures 1955).

52.   *See infra* Part IV.C.2.b.

53.   Each would also prefer that both snitch over being the only snitch, because there is some safety in numbers.

54.   This kind of HD or Chicken game is sometimes called the Volunteer's Dilemma, but it is not a PD (because it is *not* a dominant strategy to avoid volunteering). *See* WILLIAM POUNDSTONE, PRISONER'S DILEMMA 201–04 (1992).

This Article is not just about prosecutorial bargaining, but taking seriously the iconic scenario of the PD tells us something of the excessive influence of that game. Because the legal/game theory literature discusses prisoner/prosecutor bargaining nearly only in terms of the PD, one might think that the PD is the standard situation that actual conspirators face, that is, that prosecutors always create a dilemma for them. But the conditions allowing the PD are specific and narrow. Collectively, the other four situations seem at least equally plausible, and probably more so.[55] No doubt, legal scholars recognize this empirical fact, but fail to imagine that game theory also nicely captures the situations that are not PDs. In the next part, we see how the problem generalizes.

IV. WHAT LEGAL SCHOLARSHIP NEGLECTS: THE IMPORTANCE OF COORDINATION PROBLEMS TO LAW

There is nothing exotic about the three coordination games introduced in the last part—Assurance, BOS, and HD. They were identified and named decades ago, have been the subject of enormous theoretical and empirical work, and are thought by game theorists to typify many situations of social interaction. Indeed, I have chosen them because, among the games as simple as the PD, these three have the most obvious usefulness for law. Yet the degree to which legal scholarship uses these games is utterly trivial when compared to the attention (obsession?) given to the PD. Not one of these games is mentioned in more than 4 percent of the number of articles that cite the PD game; collectively they receive 8 percent of the references as the PD receives.[56]

I can only imagine two possible justifications for this disparity: that one believes that the PD game is far more common than these three coordination games or that one believes that the PD game is far more relevant to the situations law addresses. As I show in this part, neither is true. Section A looks at the issue abstractly, identifying several reasons to believe that coordination problems are at least as pervasive as PDs. Section B explains three ways that coordination problems matter generally for law. Finally, Section C considers individually each of the three games (Assurance, BOS, and HD) and reviews some literature, published almost entirely outside of law reviews, that uses them to illuminate legal issues. The point here is not to be exhaustive—an impossible task in a single article—but to show something of the untapped potential for games other

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55.   *See infra* Parts IV.A, IV.C.
56.   *See supra* text accompanying notes 35–38.

than the PD.

A. THE FREQUENCY OF COORDINATION GAMES

In the real world, coordination games occur no less frequently than PD games. In later sections, I argue for this proposition with concrete examples. Initially, however, consider three abstract observations. First, the PD represents only a small fraction of the possible games that arise in the simple two-by-two setting.[57] Second, the payoff structure that gives rise to the PD game is trivially different from the structure that produces the HD and Assurance games, thus making it likely that all three games are equally common. Third, even within the iterated PD, there is frequently a strong element of coordination.

In its simple form, the PD game has two players, each of whom have two discrete actions they can potentially take, and where the decisions are made simultaneously. Long ago, game theorists mapped out all the possible games that have this two-by-two structure. If the players only make ordinal rankings and are never indifferent between outcomes, there are seventy-eight "strategically distinct games."[58] The PD game represents *one* of these possibilities.[59] According to political scientist Katherina Holzinger, three more cases are close variants on the PD.[60] By contrast to these four games, Holzinger counts five distinct cases of the Assurance (or Stag Hunt) game or variations she calls "degenerate coordination,"[61] one case of the HD (or

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57. *See* Katharina Holzinger, *The Problems of Collective Action: A New Approach* 5–6 (Max-Planck-Projektgruppe Recht der Gemeinschaftsgüter: Recht, Politik und Ökonomie, Preprint No. 2003/2, 2003), *available at* http://www.coll.mpg.de/pdf_dat/2003_2.pdf.

58. 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 GEN. SYS: Y.B. SOC'Y FOR ADVANCEMENT GEN. SYS. THEORY 203, 203–04 (1966). *See also* ANATOL RAPOPORT, MELVIN J. GUYER & DAVID G. GORDON, THE 2 X 2 GAME 17 (1976) (summarizing and interpreting the experiments done on two-by-two games). Each player can ordinally rank the 4 outcomes in the two-by-two setting in 24 ways, which means the two players can rank the outcomes in 24 x 24 = 576 ways. But "[t]he game matrices are strategically equivalent whenever only the rows, the columns, both rows and columns, or, in symmetric games, the players are interchanged." *See* Holzinger, *supra* note 57, at 5–6. For example, if two players mutually prefer 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.

59. Holzinger, *supra* note 57, at 9 tbl.1.

60. *Id.* at 9 tbl.1, 14. These asymmetric dilemmas differ 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.

61. *Id.* at 9 tbl.1. In these games, there are 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

Chicken) game, and five distinct cases of the BOS game.[62] There is, therefore, nothing in the abstract nature of the PD game that makes it more likely to occur than these three coordination games. We do not know that nature produces payoffs randomly, but if it did, we would actually expect these three coordination games to occur almost three times as frequently as the PD game (given eleven occurrences of the coordination game variants, compared to four occurrences of the PD game variants).

Furthermore, minor changes in the payoffs of a PD game can produce two of our coordination games: Assurance and HD. To illustrate, Figure 5 represents a generic two-by-two game, where specific payoffs are replaced by the variables a, b, c, and d. The particular game that exists in Figure 5 depends on the relationship between those variables. The PD arises if, for both players, $b > a > d > c$.[63] If $b > a$, each player wants to respond to Strategy A (which we can here call "Cooperation") with Strategy B ("Defection"). Because $d > c$, each player wants to respond to Defection with Defection. So each player will choose Defection, the sole equilibrium is Defect/Defect, and each player receives a payoff of d. Yet because $a > d$, each player regards this outcome as worse than the outcome Cooperate/Cooperate. That is what makes the game a dilemma.

FIGURE 5. A Generic Symmetric 2x2 Game.

Player 2

		Strategy A	Strategy B
Player 1	Strategy A	a, a	c, b
	Strategy B	b, c	d, d

PD: $b > a > d > c$
Assurance: $a > b > d > c$
HD: $b > a > c > d$

Yet Figure 5 also represents the Assurance game if the payoffs take the form $a > b > d > c$. If $a > b$, then each player wants to respond to Strategy A with Strategy A. If $d > c$, then each player wants to respond to Strategy B with Strategy B. As a result, there are two equilibria: A/A and B/B, where both players prefer A/A (because $a > d$), but each regards

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require some assurance of how the other player is going to proceed. *Id.* at 14.

    62.   *Id.* at 9 tbl.1, 14–15.

    63.   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.

Strategy B as safer (it necessarily avoids the worst outcome *c*). This is Assurance. Yet the difference from the PD is trivial; all that differs is 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.

Similarly, the HD game arises if the payoffs take the form $b > a > c > d$. If $b > a$, then each player wants to respond to Strategy A with Strategy B. If $c > d$, then each player wants to respond to Strategy B with Strategy A. The two equilibria are A/B and B/A; each player most prefers to play Strategy B against Strategy A (because *b* is the highest payoff), but if both play B they get the worst possible outcome (*d* is the lowest). This is HD. Again, the difference is trivial; all that is required to flip the PD game to HD 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.

Thus, if one takes the PD to be a pervasive feature of social life, then there is good reason to think that the Assurance and HD games are also 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.

Coordination is pervasive for a final reason: the problem frequently arises *within* an iterated PD. In the real world, the iterated PD is usually complicated by the fact that there is more than one plausible way for the parties to go about cooperating. If the parties attempt to cooperate using different understandings of cooperation, then it is likely that at some point a party will engage in behavior that that party believes is cooperative, but that the other side views as noncooperative. One side punishes what it views as defection, while the other side views the punishment as unjustified defection requiring retaliatory defection. The resulting recriminations end cooperation. Thus, one step to solving the iterated PD game, almost always neglected by existing legal literature, is *coordinating* on one particular means of cooperation.

The resulting game is now, I admit, slightly more complex than a two-by-two game. Instead of each player choosing one of two actions, there are three choices: Defect, Cooperate According to Plan A, or Cooperate According to Plan B. The result is a three-by-three game, as in Figure 6, adapted from Geoffrey Garrett and Barry R. Weingast, the political scientists who first noted the legal significance of coordination within an

iterated PD.[64]

FIGURE 6. PD with Embedded BOS Game.

		Player 2		
		Cooperate A	Cooperate B	Defect
	Cooperate A	<u>3</u>, <u>2</u>*	1, 1	0, 4
Player 1	Cooperate B	1, 1	<u>2</u>, <u>3</u>*	0, 4
	Defect	4, 0	4, 0	<u>1</u>, <u>1</u>

* Equilibrium possible only with iteration

Figure 6 is a PD.[65] If the game is repeated, the folk theorem says that it is possible to sustain cooperation; each party may cooperate to avoid the other side's future defection.[66] But in Figure 6, there is no gain over mutual defection and no chance of sustaining cooperation unless the two players use the same *form* of cooperation, A or B. The need to match cooperative form is a matter of coordination. The type of coordination can vary, but the coordination problem *embedded* in Figure 6 (in the four upper left cells showing the interaction of the two cooperative strategies) is a BOS game. If iteration makes cooperation possible, then there are two cooperative equilibria: A/A and B/B. Each player prefers either equilibria to mutual defection, but Player 1 prefers cooperating at A/A, while Player 2 prefers B/B (each receives a payoff of 3 at her own preferred equilibrium and 2 at the other's preferred equilibrium).

Garrett and Weingast use the embedded BOS game to model treaties.[67] Two nations, for example, may agree to limit their tariffs (against domestic interest groups that push for them) and sustain this agreement by threatening to breach if the other breaches. But the parties must define precisely what trading behavior constitutes cooperation for purposes of their conditionally cooperative strategies. If one nation eliminates its tariffs but enacts health or labor legislation that impedes imports from the other nation, is that defection? More precisely, under what circumstances is

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64.   *See* Geoffrey Garrett & Barry R. Weingast, *Ideas, Interests, and Institutions: Constructing the European Community's Internal Market*, *in* IDEAS AND FOREIGN POLICY 173, 178–81 (Judith Goldstein & Robert O. Keohane eds., 1993).

65.   Each player's dominant strategy is Defect. If Player 2 cooperates in either way, A or B, Player 1 gains more by defecting (4) than by either form of cooperation (3 or 1). If Player 2 defects, then Player 1 gains more by defecting (1) than either form of cooperating (0). Player 2 faces the same incentives so, in the one-shot game, the only equilibrium is Defect/Defect.

66.   BAIRD ET AL., *supra* note 2, at 172–73.

67.   *See* Garrett & Weingast, *supra* note 64, at 178–81.

nontariff legislation that impedes trade consistent with cooperation? Perhaps there is a single answer to this question, but if there are two or more ways to define acceptable nontariff legislation and each nation prefers a different standard, they face a situation like Figure 6. Unless they first solve their BOS game by agreeing on Standard A or Standard B, they will eventually be in a position where one nation's effort to cooperate under Standard A is perceived by the other nation as a defection under Standard B. The latter nation retaliates by defecting and cooperation unravels.

The example generalizes because cooperation is rarely self-defining. Two neighboring farmer/ranchers may face a variety of cooperation problems, for example, the need for joint repair of border fences or conservation of a shared water source. But assume one neighbor wants to repair border fences annually and base water conservation measures on an assumption of average annual rainfall, while the other neighbor wants to repair fences every three months and save water for possible drought years. Unless they first coordinate on these matters, they will never sustain cooperation. Those using the PD usually simplify the scenario by ignoring these embedded coordination problems, but they may constitute the biggest obstacle to long-term cooperation.

In sum, there is no reason to think that the PD is more common a problem than coordination.

B. THREE REASONS WHY COORDINATION MATTERS TO LAW

Coordination problems are not only pervasive, but they are also important to the social conflict law addresses. I consider specific games in the next section, but there are three general features of these games that I explain first. Unlike the PD game, coordination games model situations of inequality, make history and culture relevant, and explain one way that law works expressively, independent of sanctions.

1. Inequality

Everyone gains from solving a PD. Yet it is obvious that law frequently deals with social conflict in which one person or group gains only because another person or group loses. The concepts of social roles based on race, gender, or other factors usually arise in the context of social norms that impose unequal burdens on different groups. Correcting injustice usually means raising the wealth (or other privileges) of the victim by compensation that lowers the wealth of the wrongdoer. But the PD game does not capture these issues of distribution. If the problem is a PD, the

solution makes everyone better off. There is no normative complexity and no controversy.

By contrast, coordination games frequently capture distributional conflict. Not always though: there need be no inequality in the Assurance game. The two equilibria may involve equal payoffs between the two players. Yet the BOS and HD games do reflect distributional struggle. The two equilibria outcomes in each game necessarily have unequal payoffs where one player prefers one equilibrium and the other player prefers the other equilibrium. When discussing these games below, I point out some literature that uses the BOS game to model certain sexist norms in different parts of the world, such as those that require female footbinding and genital cutting.[68] I have used the BOS and HD games to model discriminatory norms,[69] in ways I discuss below.[70]

2. The Influence of History and Culture on Behavior

A second implication of coordination games is the importance of history and culture. In a single equilibrium game, an economic model can claim to account for the influence of history and culture by making adjustments to the payoffs, which then uniquely determine how individuals will behave. But the surprising result of a coordination game, or any game with multiple equilibria, is that the payoffs, whatever they include, do *not* uniquely determine the behavior. Something else besides payoffs can and does influence how people act.

The game theory term for those other influences is "focal point."[71] 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.[72] Schelling notes 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.[73]

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68.   *See infra* text accompanying notes 127–37.

69.   *See* Richard H. McAdams, *Conformity to Inegalitarian Conventions and Norms: The Contribution of Coordination and Esteem*, 88 MONIST 238, 239–50 (2005).

70.   *See infra* Parts IV.C.1–2.

71.   *See, e.g.*, Maarten C.W. Janssen, *Focal Points*, *in* 2 THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW 150, 150 (Peter Newman ed., 1998); Maarten C.W. Janssen, *Rationalizing Focal Points*, 50 THEORY & DECISION 119, 119–22 (2001); Robert Sugden, *A Theory of Focal Points*, 105 ECON. J. 533, 533 (1995).

72.   *See* SCHELLING, *supra* note 8, at 54–67.

73.   *Id.*

The simplest examples involve pure coordination games. For example, Schelling asked people to name a place and time of day they would go to meet another person in New York City if they had planned a day to meet but had failed to pick a particular place or time.[74] There are a very large number of choices; random selection should produce almost zero matches. But Schelling found that a majority identified Grand Central Station and almost everyone selected noon.[75] When he asked individuals to name a positive number named by another person who wanted to match the number they named, despite the infinity of equilibria, 40 percent named the number one.[76] When he modified the problem to ask individuals to match a number on the hypothetical assumption that they would receive the number of dollars equal to the number on which they matched, 29 percent selected not one but one million.[77] In each case, the players solve a difficult coordination problem by gravitating toward the prominent or conspicuous outcome. Schelling called the salient solution the focal point.[78] Later research finds that individuals do not just thoughtlessly choose the salient solution, but actually reason about what is likely to be mutually salient.[79]

What makes a particular outcome focal? Among other things, Schelling mentions precedent, analogy, and "who the parties are and what they know about each other."[80] Precedent refers to history. What is focal depends on what the individuals in the situation believe about how they or others they know have solved the same or analogous situations in the past. If the youngest or the oldest present always bore some burden in the past, everyone is likely to expect that solution in the present. It is critical "who the parties are and what they know about each other,"[81] not only because different pairs of individuals share different experiences, but also because they may share different frames by which they judge past events as analogous. Thus, focal points reflect culture. The only reason Schelling's respondents identified Grand Central Station as a meeting spot is that they lived in New Haven, Connecticut, and such people frequently arrive in New York City at that location. That his respondents named one million as

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74.   *Id.* at 56.

75.   *Id.* at 55 n.1.

76.   *Id.* at 55 n.1, 56.

77.   *Id.*

78.   *Id.* at 57.

79.   *See* Judith Mehta, Chris Starmer & Robert Sugden, *Focal Points in Pure Coordination Games: An Experimental Investigation*, 36 THEORY & DECISION 163, 182–83 (1994); Judith Mehta, Chris Starmer & Robert Sugden, *The Nature of Salience: An Experimental Investigation of Pure Coordination Games*, 84 AM. ECON. REV. 658, 672 (1994).

80.   SCHELLING, *supra* note 8, at 57.

81.   *Id.*

a quantity of money was entirely contingent on the salience of that quantity in American culture.

Economists thus discuss culture, especially corporate culture, as the conceptual tools—common language, beliefs, and frames—that social groups have used to solve past coordination games and therefore are likely to use in attempting to solve future coordination games.[82] The political scientist Michael Chwe explains the function of social rituals as creating focal point solutions to coordination problems.[83] Indeed, one of the path-breaking early works on coordination was the philosopher David Lewis's effort to explain language as a conventional solution to a recurrent coordination game.[84] None of this is possible with the PD, where history and culture affect behavior only to the degree they affect payoffs.

3. The Focal Point Power of Legal Expression

Besides precedent and analogy, Schelling also identified communication as a means of creating a focal point.[85] Even nonbinding "cheap talk" can make the discussed solution salient.[86] Such communication may occur between the parties in the coordination game, but Schelling observed how a *third party*—someone not in the coordination game—can use expression to construct a focal point.[87] The third party can recommend that the individuals coordinate in a particular way, and thereby create self-fulfilling expectations that the recommended behavior will

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82.   *See* AVNER GREIF, INSTITUTIONS AND THE PATH TO THE MODERN ECONOMY 58–157 (2006); Avner Greif, *Cultural Beliefs and the Organization of Society: A Historical and Theoretical Reflection on Collectivist and Individualist Societies*, 102 J. POL. ECON. 912, 915–17 (1994); Benjamin E. Hermalin, *Economics and Corporate Culture*, *in* THE INTERNATIONAL HANDBOOK OF ORGANIZATIONAL CULTURE AND CLIMATE 217 (Cary L. Cooper et al. eds., 2001); David M. Kreps, *Corporate Culture and Economic Theory*, *in* PERSPECTIVES ON POSITIVE POLITICAL ECONOMY 90, 124–31 (James E. Alt & Kenneth A. Shepsle eds., 1990); Roberto A. Weber & Colin F. Camerer, *Cultural Conflict and Merger Failure: An Experimental Approach*, 49 MGMT. SCI. 400, 412 (2003).

83.   *See* MICHAEL SUK-YOUNG CHWE, RATIONAL RITUAL: CULTURE, COORDINATION, AND COMMON KNOWLEDGE 3–11 (2001).

84.   *See* LEWIS, *supra* note 8. *See also* SKYRMS, *supra* note 8, at 49 (discussing the concept of "cheap talk" and the evolution of signaling and inference); BRIAN SKYRMS, EVOLUTION OF THE SOCIAL CONTRACT 80–104 (1996) (discussing the evolution of meaning and its effect on signaling and sender-receiver games).

85.   *See* SCHELLING, *supra* note 8, at 57.

86.   Cheap talk refers to statements that are "costless" to make, "nonbinding, and nonverifiable." BAIRD ET AL., *supra* note 2, at 303. For the theory of how cheap talk can nonetheless influence behavior, see Joseph Farrell & Matthew Rabin, *Cheap Talk*, J. ECON. PERSP., Summer 1996, at 103. For a review of the experimental literature on behavior in communication games, see Vincent Crawford, *A Survey of Experiments on Communication Via Cheap Talk*, 78 J. ECON. THEORY 286 (1998).

87.   *See* SCHELLING, *supra* note 8, at 66 (noting that a department store sign for where lost parties should reunite creates a focal point solution to their coordination problem).

occur. If the government in a new society (without a prior custom) 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 the announcement or whether the citizens feel a moral obligation to obey the law.

Of greatest significance to law, 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.[88] 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 an HD or BOS game. Schelling conjectured that the bystander's hand signals would influence the drivers' behavior. If hand signals are in full view of both drivers, then the driver motioned to stop will now have stronger reason to expect that the other driver will proceed (and vice versa). Given that expectation, the best response for the driver told to stop is to stop, that is, to comply with the third-party's expression. By creating a focal point, the third party wields a purely expressive influence on behavior.[89]

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 executive branch officials) making focal the form of behavior the law demands.[90] Like the bystander in the intersection, legal actors can influence behavior merely by creating self-fulfilling expectations that the legally obligatory behavior will occur. A number of experiments prove the point.[91] For example, psychologist Janice Nadler and I show that mere expression,

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88.   *Id.* at 144.

89.   Nothing in the example requires that the bystander threaten noncompliant 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." *Id.*

90.   *See* Robert B. Ahdieh, *Law's Signal: A Cueing Theory of Law in Market Transition*, 77 S. CAL. L. REV. 215, 233–38 (2004); Robert Cooter, *Expressive Law and Economics*, 27 J. LEGAL STUD. 585, 586 (1998); Richard H. McAdams, *The Expressive Power of Adjudication*, 2005 U. ILL. L. REV. 1043, 1060–64 [hereinafter McAdams, *Expressive Adjudication*]; Richard H. McAdams, *A Focal Point Theory of Expressive Law*, 86 VA. L. REV. 1649, 1663–68 (2000); Roger B. Myerson, *Justice, Institutions, and Multiple Equilibria*, 5 CHI. J. INT'L L. 91, 91–94 (2004).

91.   *See, e.g.*, Roberto Galbiati & Pietro Vertova, *Obligations and Cooperative Behaviour in Public Good Games*, 64 GAMES & ECON. BEHAV. 146, 160 (2008); Richard H. McAdams & Janice Nadler, *Coordinating in the Shadow of the Law: Two Contextualized Tests of the Focal Point Theory of Legal Compliance*, 42 LAW & SOC'Y REV. 865, 883–84, 890 (2008); Jean-Robert Tyran & Lars P. Feld, *Achieving Compliance when Legal Sanctions Are Non-Deterrent*, 108 SCANDINAVIAN J. ECON. 135, 153 (2006).

even when selected randomly by a mechanical device, affects behavior in an HD game.[92]

For a real world example of law's focal point power, it helps to look to history, where some legal institutions lacked the power of sanctions. Consider medieval Iceland, which for several centuries had a robust legal culture, elaborate legal codes, and courts that generated substantial compliance,[93] all despite "the absence of any coercive state institutions."[94] There was "no state apparatus to pretend to monopolize the legitimate use of force," and "no sheriff to issue a summons to a hostile party, to keep the peace in the court, or to execute the judgment."[95] Instead, "[i]t was up to the litigants to serve process on their opponents, maintain order in court, and enforce court judgments in their favor. Ultimately, the sanction behind legal judgment and arbitrated settlement was self-help, most often appearing in the guise of the bloodfeud."[96]

How did the law work without state enforcement? By making focal the outcome the court's judgment declared. Individual litigants could enforce or resist a judgment only by gathering the support of their kin. "[Power] meant having others *think* one had the ability to muster bodies to assist in the various procedures that made up a legal action."[97] The situation was not a PD, but a coordination game like HD, in which neither wanted to back down but neither wanted the dispute to continue to the death. In this setting, it is easy to believe that a court could influence the behavior of the parties by providing a focal point. Once the court announced a winner, it appeared that the winner would fight, and this expectation made it more difficult for the loser to gather or retain kin to fight on his behalf.[98]

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92.   *See* Richard H. McAdams & Janice Nadler, *Testing the Focal Point Theory of Legal Compliance: The Effect of Third-Party Expression in an Experimental Hawk/Dove Game*, 2 J. EMPIRICAL LEGAL STUD. 87 (2005).

93.   *See* WILLIAM IAN MILLER, BLOODTAKING AND PEACEMAKING: FEUD, LAW, AND SOCIETY IN SAGA ICELAND 222–57 (1990).

94.   *Id.* at 224.

95.   *Id.* at 232.

96.   *Id.* at 20–21.

97.   *Id.* at 245 (emphasis added).

98.   *See* McAdams, *Expressive Adjudication*, *supra* note 90, at 1101–03. For another historic example, see Andrea McDowell, *Real Property, Spontaneous Order, and Norms in the Gold Mines*, 29 LAW & SOC. INQUIRY 771, 798–803 (2004) (finding that the focal point theory of adjudication explains third-party resolution of frontier mining disputes).

C. Legal Applications of the Three Coordination Games

Now let us turn to our three coordination games and consider how each of them bears on various legal issues. The ultimate point is to ask whether the legal literature is justified in giving more than twenty times the attention to the PD than to any one of these games.

1. Battle of the Sexes

The BOS game is useful for understanding bargaining, the creation of constitutions and treaties, standard setting, the harmonization of law, and gender roles.

a. Bargaining

Coordination is central to bargaining. Admittedly, when negotiations conclude, there may be a PD regarding compliance. If enforcement is insufficient, each party might have a dominant strategy to not uphold his or her end of the bargain. But in many situations, formal or informal sanctions make contractual compliance likely. If so, the important issue is whether the parties reach agreement. Given enforcement, whatever problem bargaining is, it is *not* a PD.[99] A bargain is possible only because two or more parties can mutually gain by some agreement. Though 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 because there is more than one way to conclude agreement and each party shares the desire to avoid an impasse that may result when each party presses for its preferred distribution.[100]

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99. Political scientist James D. Fearon, *Bargaining, Enforcement, and International Cooperation*, 52 INT'L ORG. 269, 276–77 (1998), makes this point in the context of treaty negotiations. Fearon states 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. *Id.*

100. Schelling discussed focal points in the context of bargaining based on the idea that bargainers will try to identify or create focal points that draw their counterparts toward the bargaining outcome they seek. *See* SCHELLING, *supra* note 8, at 60. That idea has generally been neglected in the bargaining literature. *But see* Maarten C.W. Janssen, *On the Strategic Use of Focal Points in Bargaining Situations*, 27 J. ECON. PSYCHOL. 622 (2006). In the legal literature, a few scholars have used focal points to explain the effect of nonbinding rules or precedent on bargaining. *See* Robert B. Ahdieh, *The Strategy of Boilerplate*, 104 MICH. L. REV. 1033, 1053–55 (2006) (using focal points to explain how boilerplate terms in contract forms influence bargaining); Russell Korobkin, *Inertia and Preference in Contract Negotiation: The Psychological Power of Default Rules and Form Terms*, 51 VAND. L. REV. 1583, 1587, 1593–97 (1998) (exploring similar effects for default contract rules). *See also* McAdams & Nadler, *supra* note 91, at 885–90 (finding that contract default rules affect decisions in a BOS game).

Any two-by-two game will miss much of the problem of bargaining, which is why formal modelers use more complex games.[101] Nonetheless, because there is insight in simple models, one may reasonably ask which two-by-two game best models bargaining. The answer is the BOS game. BOS captures what both sides know is the last round of bargaining, in which each side will make its final offer and there are just two unequal ways for the offers to match. If the two offers match, there is a contract and both parties gain. If there is no match, the bargaining ends without an agreement and both parties lose. But each prefers to match terms in a different way.

b. International Law

A large political science literature uses coordination games to explore international relations and international law.[102] As noted above, Garrett and Weingast view international law as arising in an iterated PD game, but they make the "embedded coordination" point discussed above.[103] Because the nations must solve a BOS game in order to solve their PD, the nations must bargain. Cooperation is sustainable only if the states agree to a single understanding of cooperation.[104] Garrett and Weingast propose that the treaty and subsequent judicial interpretations of it make focal one solution to the embedded BOS game, so each nation thereafter uses the agreed upon definitions to judge whether the other nation cooperated or defected in the prior round.[105] With such a mutual understanding, the nations may then sustain cooperation (by threatening to respond to defection with future

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101. First, such a simple game narrows the number of possible moves to two, where there are usually many ways one could reach agreement. Second, a simultaneous game ignores the back and forth nature of bargaining. Finally, simple games assume complete information, where bargaining usually occurs in the presence of asymmetric information. For this reason, game theorists have explored various complex models of bargaining. One approach is the Rubinstein alternating offers model. *See, e.g.*, MARTIN J. OSBORNE & ARIEL RUBINSTEIN, BARGAINING AND MARKETS 29 (1990); Ariel Rubinstein, *Perfect Equilibrium in a Bargaining Model*, 50 ECONOMETRICA 97, 98–101 (1982). For discussions of Rubenstein's model, see BAIRD ET AL., *supra* note 2, at 219–41; RASMUSEN, *supra* note 3, at 361–65. Another approach is the axiomatic bargaining model. *See* John F. Nash, Jr., *The Bargaining Problem*, 18 ECONOMETRICA 155 (1950). For discussions of the axiomatic bargaining model, see AVINASH DIXIT & SUSAN SKEATH, GAMES OF STRATEGY 521–47 (1999); RASMUSEN, *supra* note 3, at 359–61.

102. *See, e.g.*, Judith Goldstein & Robert O. Keohane, *Ideas and Foreign Policy: An Analytical Framework, in* IDEAS AND FOREIGN POLICY, *supra* note 64, at 3, 17–20; James D. Morrow, *Modeling the Forms of International Cooperation: Distribution Versus Information*, 48 INT'L ORG. 387, 387–93 (1994); Duncan Snidal, *Coordination Versus Prisoners' Dilemma: Implications for International Cooperation and Regimes*, 79 AM. POL. SCI. REV. 923, 923–25 (1985); Arthur A. Stein, *Coordination and Collaboration: Regimes in an Anarchic World*, 36 INT'L ORG. 299, 301–08, 324 (1982).

103. *See* Garrett & Weingast, *supra* note 64.

104. *See id.* at 183–84.

105. *See id.*

defection).[106] Jack Goldsmith and Eric Posner were the first law professors to exploit this point and the general power of coordination games to explain customary international law and treaties.[107]

c. Standard Setting and Uniform Laws

When different firms or industries need to agree to certain technical standards to allow their products to interact (for example, automotive parts, computers and add-ons, DVDs and DVD players), they engage in standard setting. The BOS game models standard setting because all parties wish to reach some standard, but disagree as to which standard is best. Each firm prefers the standard closest to the specifications of its current product, but everyone still wants their product to "match" everyone else's product. Unlike the PD, once everyone else starts to use a given technical standard, there is no incentive to defect, but every incentive to conform.

There are some obvious legal examples of standard setting, such as treaties establishing standardized weights and measures, communications protocols for air traffic control, the international exchange of mailed and telephonic communications, and the exchange of fingerprints by police departments.[108] In each case, the central issue is coordination; despite disagreement as to which standard is best, there is a strong 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 law than these examples suggest. Regarding private law, such as contracts, securities regulation, or arbitration, nation-states are frequently interested in

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106. *See id.* at 184.

107. *See* Jack L. Goldsmith & Eric A. Posner, *A Theory of Customary International Law*, 66 U. CHI. L. REV. 1113, 1127–28 (1999) (identifying the role of coordination in creating international customs). *See generally* JACK L. GOLDSMITH & ERIC A. POSNER, THE LIMITS OF INTERNATIONAL LAW (2005) (explaining "how international law works by integrating the study of international law with the realities of international politics"). In this manner, Eric Posner applies to international customs the game theory he first used to model social norms as costly signals that arise in a complex game of coordination. *See* ERIC A. POSNER, LAW AND SOCIAL NORMS (2000).

108. *See, e.g.*, Laurence R. Helfer, *Exiting Treaties*, 91 VA. L. REV. 1579, 1633–36 (2005) (using the BOS game to explore the issue of treaty exit). For coordinating air traffic control, the relevant treaty is the Convention on International Civil Aviation art. 37, Dec. 7, 1944, 61 Stat. 1180, 1190–91, 15 U.N.T.S. 295, 321–22. For an explanation, see Michael Gerard Green, *Control of Air Pollutant Emissions from Aircraft Engines: Local Impacts of National Concern*, 5 ENVTL. LAW. 513, 531 (1999) (noting that the treaty authorized the "governing body of the [International Civil Aviation Organization] . . . 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 art. 6, May 20, 1875, 20 Stat. 709, 713.

"harmonization"[109] or, as a lesser but even more common step, the convergence of different domestic legal regimes.[110] Within a federated nation-state, the same desire exists for the unification of laws across jurisdictions, such as the adoption of the Uniform Commercial Code across American states.[111] The advantage of policy convergence and legal harmonization is that they save transaction costs when private firms seek to do business across borders. The greater the disparity in the laws of, say, contracts, securities, or antitrust, the more difficult it is to transact across borders. In other words, *legal rules themselves are standards*, and there are cost savings to minimizing the differences between the standards. At the same time, because a state incurs costs in switching from one legal standard to another, it prefers that the *other* nations shift to its legal standard. The result is a BOS game.[112]

d. Constitutions

Political scientists have applied the above analysis of international law to constitutional law. First, the interaction of parties to a constitution frequently presents a game involving coordination. Second, a written arrangement or adjudication between those parties 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). Russell Hardin initiated this literature by claiming that constitutions arise out of, not the PD, but a BOS game.[113] Hardin imagines the constitution is the

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109.   *See, e.g.*, Francesco Parisi, *The Harmonization of Legal Warranties in European Sales Law: An Economic Analysis*, 52 AM. J. COMP. L. 403, 415–16 (2004); Beth A. Simmons, *The International Politics of Harmonization: The Case of Capital Market Regulation*, 55 INT'L ORG. 589, 591–94 (2001). The International Institute for the Unification of Private Law ("UNIDROIT") works toward harmonization of private law. *See, e.g.*, Klaus Peter Berger, *International Arbitral Practice and the UNIDROIT Principles of International Commercial Contracts*, 46 AM. J. COMP. L. 129, 129–30 (1998).

110.   *See* DANIEL W. DREZNER, ALL POLITICS IS GLOBAL: EXPLAINING INTERNATIONAL REGULATORY REGIMES 11 (2007) (distinguishing three nested levels of international coordination: "[r]egulatory coordination," the "codified adjustment of national standards in order to recognize or accommodate regulatory frameworks from other countries"; "policy convergence, . . . the narrowing of gaps in national standards over time"; and "harmonization, which implies policy convergence to a single regulatory standard").

111.   *See, e.g.*, James J. Brudney, *The Uniform State Law Process: Will the UMA and RUAA Be Adopted by the States?*, DISP. RESOL. MAG., Summer 2002, at 3.

112.   Drezner provides a slightly more complex "standards game" for just this situation. *See* DREZNER, *supra* note 110, 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 benefits of coordinating are high enough, the result is a BOS game. *See also* Anu Bradford, *International Antitrust Negotiations and the False Hope of the WTO*, 48 HARV. INT'L L.J. 383, 383, 399 (2007) (using Drezner's approach to model international antitrust harmonization).

113.   *See* Russell Hardin, *Why a Constitution?*, *in* THE FEDERALIST PAPERS AND THE NEW

result of a bargain between powerful interest groups who are better off matching strategies by agreeing to the same structure of government than they are if they fail to agree and have no government.[114] But at the same time, the situation is obviously not a pure coordination game, because interest groups prefer different structures. Jon Elster, by contrast, views the constitution as solving an iterated PD game between political parties, but (as Garrett and Weingast claim for international law) he describes a coordination problem embedded in the PD.[115]

Creating a constitution constructs a focal point. 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. David Strauss, one of the few constitutional scholars to examine the focal point theory, explains that it suggests giving great interpretive weight to constitutional textualism.[116] Eric Posner has more generally modeled constitutions as solving different types of coordination problems, where the constitution influences behavior by being a focal point.[117] That focal points can alternatively be based on precedent (rather than communication) also explains the power of unwritten constitutional law on customs that create strong expectations

INSTITUTIONALISM 100, 101, 105 (Bernard Grofman & Donald Wittman eds., 1989) (arguing that constitutions arise out of compromises between interest groups). *See also* Russell Hardin, *Constitutionalism*, *in* THE OXFORD HANDBOOK OF POLITICAL ECONOMY 289, 291 (Barry R. Weingast & Donald A. Wittman eds., 2006) (noting that while contracts have the structure of a PD, constitutions have the structure of coordination games). 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, *Are "Western" Constitutions Relevant to Anything Other than the Countries They Serve?*, 13 CONST. POL. ECON. 3, 3–11 (2002); Peter C. Ordeshook, *Constitutional Stability*, 3 CONST. POL. ECON. 137, 148–51 (1992).

114.   *See* Hardin, *Why a Constitution?*, *supra* note 113, at 104–05 (displaying the adoption of the Constitution as a BOS in Game 3). Note that instead of giving payoff numbers that represent utilities, in which higher numbers are better, Hardin gives payoff ranks, where lower numbers mean higher ranks. Thus, Game 3 is a BOS with the two equilibria being the payoff ranks (2, 1) and (1, 2), representing matches at I/I and II/II.

115.   *See* Jon Elster, Unwritten Constitutional Norms 39–40 (unpublished manuscript, on file with author). 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. But there are many ways to define governmental powers and many ways of defining the restraint required of each branch. To achieve cooperation in the iterated PD game, the parties must agree on the boundaries of governmental powers.

116.   *See* David A. Strauss, *Common Law Constitutional Interpretation*, 63 U. CHI. L. REV. 877, 910–19 (1996).

117.   *See* Eric A. Posner & Adrian Vermeule, *Constitutional Showdowns*, 156 U. PA. L. REV. 991 (2008); Eric A. Posner, *Strategies of Constitutional Scholarship*, 26 LAW & SOC. INQUIRY 529, 542 (2001) (book review).

about how parties will coordinate.[118]

The focal point power also explains the judiciary's influence over the other branches of government in matters of constitutional conflict. The ultimate reason the executive and legislative branches defer to the judiciary cannot be that the judiciary will bring legal sanctions to bear, given that the judiciary depends on other branches of government for those sanctions. But the court may wield expressive influences by virtue of its power to make a particular resolution focal. The key is that the political branches or parties wish to coordinate to avoid a constitutional crisis or breakdown.[119] But the constitutional text and tradition leave open gaps and ambiguities, which allow disruptive disputes. Judicial 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. A few law professors recently have begun to explore this insight.[120]

e. Gender Roles and Inequality

Other theorists use coordination games to explore how sex-role norms arise and persist. In separate papers, the economist Gillian Hadfield and the political scientist Gerry Mackie 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 men's work."[121] Biological explanations founder because "the majority of tasks divided along sex lines are not allocated uniformly to one sex worldwide."[122] Instead, it is common that a task gendered male in one society is gendered female in another.[123] Hadfield points to the need for

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118.   *See, e.g.*, Ernest A. Young, *The Constitution Outside the Constitution*, 117 YALE L.J. 408 (2007); Elster, *supra* note 115, at 18–19.

119.   *Cf.* Matthew C. Stephenson, *"When the Devil Turns . . .": The Political Foundations of Independent Judicial Review*, 32 J. LEGAL STUD. 59, 85 (2003) (explaining that "judicial review serves a valuable insurance function for competitors in a stable democracy").

120.   *See* TOM GINSBURG, JUDICIAL REVIEW IN NEW DEMOCRACIES: CONSTITUTIONAL COURTS IN ASIAN CASES 22–27 (2003); Tom Ginsburg, *Beyond Judicial Review: Ancillary Powers of Constitutional Courts*, *in* INSTITUTIONS & PUBLIC LAW: COMPARATIVE APPROACHES 225–44 (Tom Ginsburg & Robert Kagan eds., 2005); Posner & Vermeule, *supra* note 117; Stephenson, *supra* note 119.

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

122.   *Id.* at 130.

123.   *Id.* at 127–28 tbl.1 (citing George P. Murdock & Caterina Provst, *Factors in the Division of Labor by Sex: A Cross-Cultural Analysis*, 12 ETHNOLOGY 203 (1973)). For example, in one large study of 50 technological activities in 185 preindustrial societies, the manufacturing of leather products was an exclusively male occupation in 35 societies and an exclusively female occupation in 29, while basketmaking was exclusively male in 37 societies and exclusively female in 51. *Id.*

individuals to coordinate their acquisition of human capital before marriage so as to bring to a marriage the skills that best complement a future spouse's skills.[124] In a preindustrial 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.[125] As with most conventions, the individual who deviates pays a cost.[126]

Mackie identifies the same coordination dynamic in customs of female footbinding and genital cutting.[127] If the parents of girls in a village bind their daughters' feet, and the parents of boys permit marriage only to girls whose feet are bound, then individual deviations are costly. There is the risk that girls whose feet are not bound will be unmarriageable.[128] Mackie notes that the astonishingly quick demise of the custom of footbinding in China early in the twentieth century took account of this coordination dynamic.[129] The demise of footbinding was largely the result of collective 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 girls with bound feet.[130] Once enough parents expressed a willingness to follow this new behavior, everyone else wanted to follow it as well.[131] Where individual deviation is costly, this collective action works to unravel the norm.[132]

Finally, inequality may arise because history and culture make the gender or race of individuals the focal point for coordination. If everyone

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124.   *Id.* at 130 ("[T]he 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 id.* at 143–48 (discussing the persistence of the sexual division of labor in the modern economy).

125.   *See id.* at 143.

126.   *Id.* ("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.").

127.   *See* Gerry Mackie, *Ending Footbinding and Infibulation: A Convention Account*, 61 AM. SOC. REV. 999 (1996).

128.   *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 a self-enforcing convention was locked in."). Mackie speculates that the practices first arose when wealthy men had multiple wives or consorts and sought to ensure paternity by making it harder for women to enjoy sex or to travel to meet men. *Id.* at 1001–02, 1007.

129.   *See id.* at 1015.

130.   *Id.* at 1011.

131.   *Id.* at 1011–12.

132.   *See id.* at 1015.

expects women or a racial minority to "settle for less" in a bargaining situation, then women or minority members will find that refusing to settle for less will, by preventing agreement, leave them worse off. In BOS situations between a man and woman, if the man expects the woman to settle for her less favored outcome, then the man will play the strategy associated with his most preferred outcome. If the woman, counter to expectations, also attempts to claim the larger share, they will fail to coordinate and she will be worse off than if she did what was expected. A recent experiment is instructive.[133] The subjects were made aware of the sex of the subject against whom they were matched in an abstract BOS game with real monetary payoffs.[134] When matched against a woman, the subjects were significantly more likely to play the strategy associated with his or her preferred equilibrium than when matched against a man.[135] Thus, gender facilitated coordination and mixed-sex groups therefore earned more on average than unisex groups.[136] Yet, predictably, men earned more than women.[137]

2. Hawk/Dove

The HD game is useful for understanding traffic regulation, low stakes disputes, the origin of property, and, again, conventions enforcing race- and sex-based social roles.

a. Traffic Regulation

Traffic regulation is mundane, but important—automobile accidents kill about forty-three thousand annually in the United States[138] and over one million worldwide.[139] Traffic is quintessentially a matter of

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133.   *See* Håkan J. Holm, *Gender-Based Focal Points*, 32 GAMES & ECON. BEHAV. 292 (2000). Two experiments were conducted in Sweden (306 subjects) and one in the United States (164 subjects). *Id.*

134.   *Id.* at 297–98.

135.   In the first Swedish experiment, subjects selected the more aggressive strategy 67.6% of the time when matched against a woman, but only 47.9% of the time when matched against a man. *Id.* at 299. For the Swedish replication, the numbers were 67.4% and 48%. *Id.* at 302. For the American study, the numbers were 50% and 37.5%. *Id.* at 304–05.

136.   *See id.* at 306.

137.   In the first Swedish experiment, men earned 27% more than the women. In the Swedish replication, they earned 62.8% more. *Id.* at 303. In the American study, male subjects earned 28% more than female subjects. *Id.* at 305.

138.   *See* NAT'L CTR. FOR STATISTICS & ANALYSIS, NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., 2006 TRAFFIC SAFETY ANNUAL ASSESSMENT—A PREVIEW (2006), http://www-nrd.nhtsa.dot.gov/Pubs/810791.PDF (calculating 43,510 killed in 2005 and 42,642 killed in 2006).

139.   *See* WORLD HEALTH ORG., WORLD REPORT ON ROAD TRAFFIC INJURY PREVENTION—MAIN MESSAGES (2004), http://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/main_messages_en.pdf (finding 1.2 million people killed per year).

coordination. Two drivers approach an intersection on perpendicular streets where each wishes to proceed first through the intersection; or two drivers in adjoining lanes merge into a single lane where each wishes to merge first; or two drivers stop to make left turns across each other's path and each wishes to turn first. 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. The situation is certainly not a PD, but the HD game serves as an appropriate model.[140]

Given a strong element of coordination, there is every reason to think that the government exploits the focal point effect for its traffic rules. Those rules are relatively clear and the government publicizes them by requiring driving tests and by posting 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). A driver approaching a busy intersection who observes a yield sign or stoplight has a strong reason to comply, independent of sanctions and legitimacy. Even absent fear of or respect for the law, the driver fears an accident. Knowing that others expect one to comply and that miscoordination entails a serious risk of collision, the best choice is to comply. The effect is not likely to disappear merely because an individual fears sanctions and respects the law, because both incentives are highly imperfect.

b. Disputes

Many disputes have a structure like traffic, that is, like an HD game. Take property disputes, for example. Two neighbors may disagree as to the boundary of their property, whether one has a right to drive over a neighbor's property to access a public road, or whether there is any limit to how much water an upstream property owner can take from the stream before it flows into the downstream neighbor's land. In these disputes, each party clearly prefers to *insist* on his or her position while the other *defers*, thus getting his or her way at minimal cost. To be HD, each party has to also rank as the worst outcome the situation of unresolved conflict that occurs when both insist. This is a function of how much each party values the resource in dispute relative to the costs of unresolved conflict, which depends on what unresolved conflict entails.

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140.   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 face the same situation again—deciding whether to proceed first or to wait.

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 violence. Even mature legal systems fail to deter all violence; much of the violence that remains occurs because individuals in a dispute engage in a "self-help" remedy to enforce their perceived rights.[141] 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 HD (or a close analogue).

If so, then there is room for a focal effect. If a well-publicized legal rule clearly identifies one neighbor as the property owner, then (like the bystander in the intersection) the rule creates expectations that this neighbor will insist (play Hawk) on the property claim. If so, then the other neighbor wants to defer (play Dove) to avoid the shouting match or violence that would otherwise result.

c. Property Norms

Economist Robert Sugden uses coordination games to imagine how the institution of property could arise from a state of nature, without any centralized enforcer like a state.[142] As with traffic interactions, resource disputes can be seen as an iterated HD game between randomly matched pairs of disputants.[143] In this setting, "Hawk" is the strategy of insisting on the disputed 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 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

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141.   *See, e.g.*, SALLY ENGLE MERRY, URBAN DANGER 175–86 (1981); RICHARD E. NISBETT & DOV COHEN, CULTURE OF HONOR, at xv–xvi, 25–39 (1996); Donald Black, *Crime As Social Control*, 48 AM. SOC. REV. 34 (1983). "Self-help" is in quotation marks to indicate references to violence that falls outside of the legal entitlement to use force to defend one's rights. *Cf.* Richard A. Epstein, *The Theory and Practice of Self-Help*, 1 J.L. ECON. & POL'Y 1, 2 (2005) (defining self-help as those legally sanctioned remedies).

142.   *See* SUGDEN, *supra* note 8, at 58–91. *See also* JACK HIRSHLEIFER, ECONOMIC BEHAVIOUR IN ADVERSITY 223–34 (1987) (using HD to find that an evolutionary equilibrium exists whereby nonpossessors of a resource defer to possessors of the resource); Kenton K. Yee, *Ownership and Trade from Evolutionary Games*, 23 INT'L REV. L. & ECON. 183, 187–94 (2003) (discussing game theory in the context of property ownership without any external enforcer).

143.   But the game does not have to be HD. If the value of the disputed resource were high enough relative to the costs of disputing, then the worst outcome is to defer when the other insists, and the game is PD. But frequently the resource is not worth winning at all costs.

chance of suffering a crippling injury or death.

Now suppose that the two individuals in a resource dispute observe which of them *possesses* the disputed resource. Because I am focusing on the simplest uses of game theory, I will not explore the evolutionary theory by which Sugden and others derive a particular equilibrium based on this observation. I merely note how a certain set of expectations could logically sustain a behavioral pattern that looks like the institution of property. Assume you expect *everyone else* to play the following strategy:

> *When I am the possessor, play Hawk, and when I am the nonpossessor, play Dove.*

What is your best response? If everyone else plays Hawk when they are the possessor, your best reply is to play Dove when you are the nonpossessor. If everyone else plays Dove when they are the nonpossessor, your best reply is to play Hawk when you are the possessor. Thus, when all others play the above strategy, your best response is to do the same. Thus, there is an equilibrium where everyone plays this possession-based strategy. The result is the convention of property.[144] Sugden argues that the convention is not only possible, but likely.[145]

So, as David Hume first suggested,[146] conventions of property may slowly emerge from an iterated process that creates a pattern of expectations of how people will behave in resource disputes. Note also that the theory helps to explain the emergence of informal property rights not enforced by the state, such as the claim to return to parking spaces from which one has shoveled out snow.[147] Similarly, Tom Ginsburg and I extended this analysis to territorial disputes between nations.[148] Sometimes

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144.   For a more complete summary, see McAdams, *supra* note 69, at 242–43.

145.   *See* SUGDEN, *supra* note 8, at 94–95. His 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. *Id. Accord* Herbert Gintis, *The Evolution of Private Property*, 64 J. ECON. BEHAV. & ORG. 1 (2007); Jack Hirshleifer, *Privacy: Its Origin, Function, and Future*, 9 J. LEGAL STUD. 649, 657–58 (1980).

146.   DAVID HUME, A TREATISE OF HUMAN NATURE 490 (L.A. Selby-Bigge ed., 2d ed., Oxford Univ. Press 1978) (1739) ("[T]he rule concerning the stability of possession . . . arises gradually, and acquires force by a slow progression, and by our repeated experience of the inconveniences of transgressing it."). *See also* Peter Vanderschraaf, *The Informal Game Theory in Hume's Account of Convention*, 14 ECON. & PHIL. 215, 240–45 (1998) (noting that Hume claimed that individuals slowly learn to follow conventions after frequent unsuccessful coordination).

147.   *See* Richard A. Epstein, *The Allocation of the Commons: Parking on Public Roads*, 31 J. LEGAL STUD. 515, 528–29 (2002).

148.   Tom Ginsburg & Richard H. McAdams, *Adjudicating in Anarchy: An Expressive Theory of International Dispute Resolution*, 45 WM. & MARY L. REV. 1229 (2004).

those disputes involve territory that is so valuable to at least one side that it will try to "win at all costs." But frequently, two nations dispute territory that is not worth the price of war.[149] If so, they face an HD game where each would like the other to back down, but each regards the worst outcome as the case where neither backs down.[150] Given this problem, territorial treaties work by making one outcome focal.[151] Once the parties have agreed to a territorial boundary, there is far more reason to expect that either side will fight rather than relinquish what the treaty recognizes as its own territory.[152] Ginsburg and I also found evidence that the International Court of Justice generates high compliance in territorial disputes, which we attribute to the court's ability to make focal the outcomes it endorses.[153]

d. Gender Roles and Inequality

The same logic underlying Sugden's property analysis applies to other settings, as players select strategies based on observed facts other than possession. Again, I will not explain how particular strategies evolve, but merely illustrate a possible equilibrium. Assume that individuals contesting over resources in an iterated HD game observe not only the possession/nonpossession distinction, but also a male/female distinction. Assume you expect all males to play this strategy:

> *if the other player is female, play Hawk; if the other player is male, play Hawk if possessor and Dove if nonpossessor*;

and all females to play this strategy:

> *if the other player is male, play Dove; if the other player is female, play Hawk if possessor and Dove if nonpossessor.*

What is your best response? 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. 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 will the men with whom she interacts). The result is a convention in which all property winds up in the hands of men. 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.

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149.   *See id.* at 1235–36.
150.   *Id.*
151.   *See id.* at 1261–66.
152.   *See id.* at 1235–36, 1255–56.
153.   *Id.* at 1308–22, 1327–30.

3. Assurance

Previously, I explained how the Assurance game models a bank run better than PD. Now consider how the game also models democracy and social movements and countermovements.

a. Democracy

Where Hardin and Elster focus on the bargaining between interest groups that produces *any* constitution, some political scientists have focused on *democratic* constitutions and the implicit bargain struck by citizens with each other. As Weingast observes, the stability of democracy depends on "the people" being willing to challenge official action that transgresses democratic principles—for example, purporting to stay in office after being defeated in a lawful election.[154] He models the problem as a complex game 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.[155] 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.[156] The problem, therefore, is coordination. Different citizen groups have very different views about the appropriate limits to state power.[157] If each group seeks to oust government officials only when (and whenever) that group views the official as having overstepped its authority, the citizen response will never be sufficiently united to threaten authoritarian officials (but yet may cause constant turmoil).[158]

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.[159] 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,

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154. Barry R. Weingast, *The Political Foundations of Democracy and the Rule of Law*, 91 AM. POL. SCI. REV. 245, 245–46 (1997).

155. *See id.* at 248–51 & figs.2 & 4. Inspection of Figures 2 and 4 reveal that the top node in each figure is an Assurance game for citizen groups A and B. For example, in the top node of Figure 2, the two equilibria are Acquiesce/Acquiesce and Challenge/Challenge. *Id.* at 248 fig.2. Mutual Challenge is best for A and B (payoff of 7), but riskier because their worst outcome results from playing Challenge against Acquiesce (payoff of 1). *Id.* Of course, in both cases, Assurance is embedded in a larger game, but Weingast's point is to show how that game requires coordination. *See id.* at 248–51.

156. *Id.* at 248.

157. *Id.* at 250–57.

158. *Id.* at 246, 251–52.

159. *Id.* at 251.

which requires constructing a coordination device," such as a written constitution.[160]

b. Social Movements

Imagine a group seeks significant social and legal change. In the Jim Crow era of the American South, for example, blacks sought to topple segregation norms and to enact laws prohibiting private discrimination.[161] 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.[162] On a much smaller scale, in many communities today, nonsmokers seek to ban public smoking.[163] In each case, for the group seeking social or legal change, reform is a public good because the enjoyment of the new rights by some individuals does not diminish the consumption of 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 multiparty PD, where the dominant strategy for everyone is not to participate.[164]

Political scientist Dennis Chong offers a more sensible way of modeling social movements.[165] Focusing on the civil rights movement of

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160.   *Id.*

161.   *See, e.g.*, MICHAEL J. KLARMAN, FROM JIM CROW TO CIVIL RIGHTS *passim* (2004); ALDON D. MORRIS, THE ORIGINS OF THE CIVIL RIGHTS MOVEMENT, at ix–xi (1984).

162.   *See, e.g.*, LISA BALDEZ, WHY WOMEN PROTEST 146–51 (2002); MARTHA C. NUSSBAUM, WOMEN AND HUMAN DEVELOPMENT 1–31 (2000).

163.   *See, e.g.*, Thaddeus Mason Pope, *Balancing Public Health Against Individual Liberty: The Ethics of Smoking Regulations*, 61 U. PITT. L. REV. 419 (2000) (discussing ethical justifications to limiting the liberty of smokers); Jessica Niezgoda, Note, *Kicking Ash(trays): Smoking Bans in Public Workplaces, Bars, and Restaurants—Current Laws, Constitutional Challenges, and Proposed Federal Regulation*, 33 J. LEGIS. 99 (2006) (arguing that smoking bans are a correct use of the government's police power).

164.   Another possibility trivially involves coordination. Suppose that a social movement is unsuccessful because low levels of participation (in marches, boycotts, monetary contributions, etc.) produce zero returns up to some threshold where participation produces the desired change. Take k to be the number of individuals who must participate for the social movement to succeed. If the benefits an individual receives from the movement's success exceed her own costs in participating, there is an equilibrium in which exactly k individuals participate. At that level, no participants withdraw because that would cause the movement to fail, but no one else participates because nonparticipants can free ride on the movement's success. But, just as with the PD, it is difficult to see how social movements ever succeed with this model. One starts at an equilibrium where the participation level is zero. My decision to participate at this point makes sense only if I believe that, suddenly, exactly $k - 1$ other individuals will participate.

165.   *See* CHONG, *supra* note 39. Chong won the William H. Riker Award for the best book on political economy from the Political Economy section of the American Political Science Association. Political Economy Section Winners, http://www.apsanet.org/imgtest/Org%20Section%2025%20-%20 Political%20Economy.pdf (last visited Jan. 4, 2009).

the 1950s and 1960s, Chong suggests that there were strong social incentives at work that would reward participation *if the movement event succeeded*, but not otherwise.[166] 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.[167] A failed movement event, by contrast, did not produce social distinction between participators and nonparticipators. 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 were far less, the payoffs from participating in a failed effort remained lower than not participating.[168] The result, Chong observes, is an Assurance game, where individuals prefer contributing if enough others contribute, but prefer not contributing when enough others do not contribute.[169]

Chong's point generalizes. Several theorists claim that the desire for esteem provides a pervasive social incentive to engage in behavior that others approve or to avoid behavior that others disapprove.[170] 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 failed causes. As a result, the 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.[171]

A second possibility is internal. Extensive experimental research provides powerful evidence that many people value reciprocation intrinsically.[172] "*Homo reciprocans*"[173] may gain utility from reciprocating

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166.   *Id.* at 112–40. *See also* JACK KNIGHT, INSTITUTIONS AND SOCIAL CONFLICT 201 (1992) (describing union organization as an Assurance Game).

167.   CHONG, *supra* note 39, at 31–65.

168.   *Id.* at 112–40.

169.   *Id. See also* Will H. Moore, *Rational Rebels: Overcoming the Free-Rider Problem*, 48 POL. RES. Q. 417, 437–39 (1995) (discussing Chong's claim that political activists face an Assurance game).

170.   *See, e.g.*, GEOFFREY BRENNAN & PHILIP PETTIT, THE ECONOMY OF ESTEEM 2–4, 15–16, 68–77 (2004); Tyler Cowen, *The Esteem Theory of Norms*, 113 PUB. CHOICE 211, 221–22 (2002); Richard H. McAdams, *The Origin, Development, and Regulation of Norms*, 96 MICH. L. REV. 338, 355–57 (1997).

171.   CHONG, *supra* note 39, at 120–21.

172.   *See, e.g.*, Samuel Bowles & Herbert Gintis, *Homo Reciprocans*, NATURE, Jan. 10, 2002, at 125, 125–28; Ernst Fehr & Simon Gächter, *Fairness and Retaliation: The Economics of Reciprocity*, 14 J. ECON. PERSPS. 159, 162–63 (2000); Ernst Fehr, Urs Fischbacher & Simon Gächter, *Strong*

cooperation or lose utility from the guilt of exploiting another player by failing to reciprocate that player's cooperation.[174] The game for such individuals may be Assurance, because they will get extra utility from participating when others participate and/or extra disutility from shirking when others participate.

With an internal or external motivation for reciprocity, situations that appear to be multiparty PDs[175] are actually multiparty Assurance games.[176] 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.[177] As Chong explains, the Assurance Game captures an important dynamic of social movements like the civil rights movement—the need for leaders to assure potential participants that there will be enough participation to succeed.[178] Given a baseline of nonparticipation in the absence of a social movement, charismatic leaders must communicate optimism. Such leaders must convince others of the inevitability of success (for example, "We Shall Overcome"[179]). They will select small easy steps to build up a track record of success, publicize even small successes, and perhaps exaggerate them as groups often exaggerate the number of protesters who participate in their events.[180] Thus, coordination games help us to better understand the

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Reciprocity, Human Cooperation, and the Enforcement of Social Norms, 13 HUM. NATURE 1 (2002); Joseph Henrich et al., *In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies*, 91 AM. ECON. REV. (PAPERS & PROC.) 73 (2001); James K. Rilling et al., *A Neural Basis for Social Cooperation*, 35 NEURON 395 (2002); Thomas Dohmen et al., *Homo Reciprocans: Survey Evidence on Prevalence, Behavior and Success* (Inst. for the Study of Labor, Discussion Paper No. 2205, 2006).

173.   Bowles & Gintis, *supra* note 172, at 127.

174.   *See generally* Dan M. Kahan, *The Logic of Reciprocity: Trust, Collective Action, and Law*, 102 MICH. L. REV. 71 (2003) (discussing behavioral dynamics pertinent to societal collective action problems).

175.   Or public-goods games with a highly improbable efficient equilibrium, where exactly k individuals contribute. *See supra* note 164.

176.   CHONG, *supra* note 39, at 103–07.

177.   In contrast to the analysis at *supra* note 164, with this new model, if k social movement participants are sufficient to produce the lumpy public good, we no longer have the odd equilibrium where exactly k individuals participate. Instead, if k individuals participate, the movement will succeed, so everyone with an internal or external incentive to reciprocate will want to participate. 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 and the movement succeeds, in which case one is worse off for having failed to participate.

178.   *See* CHONG, *supra* note 39, at 112–25.

179.   *See, e.g.*, GUY CARAWAN & CANDIE CARAWAN, STUDENT NON-VIOLENT COORDINATING COMM., WE SHALL OVERCOME!: SONGS OF THE SOUTHERN FREEDOM MOVEMENT 11 (1963).

180.   *See* CHONG, *supra* note 39, at 175–78.

process of social and legal change.

c. Social Countermovements

What Chong says about social movements can also be said about *opposition* to social and legal change. Here too, the problem is 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.

Economist Richard Brooks documents an interesting example—the resistance of white homeowners in Chicago to racial integration in the early- and mid-twentieth century.[181] At one time, that resistance included legally enforceable restrictive covenants that forbade homeowners from selling their land to nonwhites.[182] *Shelley v. Kraemer* ruled these restrictive covenants unenforceable.[183] Brooks suggests that, at this point, white segregationist homeowners faced an Assurance game.[184] Here, the whites each wanted to sell to blacks if their neighbors did, but to "stay put" if their neighbors did. 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 *Shelley*, continued to support and stabilize segregation.[185] His empirical analysis shows that these legally void covenants continued to work as a focal point, coordinating the actions of white homeowners, purchasers, real estate agents, and government agencies that preserved racial exclusivity.[186]

d. Social Conflict

Finally, note what happens when we combine the prior discussions of

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181.   Richard R.W. Brooks, *Covenants & Conventions* (Northwestern Univ. Sch. of Law Law & Econ. Research Paper Series, Paper No. 02-8, 2002), *available at* http://www.law.berkeley.edu/institutes/csls/covenant.pdf.

182.   *Id.* at 11–13. Brooks observes 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 their restrictive covenants. *Id.* at 20–22. Indeed, the multiple neighbors who had standing to enforce the covenant faced an HD game. Each preferred that another bear the expense of litigation, though each considered the worst outcome to be where no one sued to enforce the covenant. *See id.* at 12 n.41.

183.   Shelley v. Kraemer, 334 U.S. 1, 23 (1948). Brooks discusses the impacts of this holding in his piece. Brooks, *supra* note 181, at 12–13, 33–34.

184.   *See* Brooks, *supra* note 181, at 13–18. He does not call the game Stag Hunt or Assurance, but an inspection of the matrix shows that it is.

185.   *Id.* at 18–19.

186.   *Id.* at 23–37.

disputes and inequality (in the HD game) with the prior discussions of social movements and countermovements (in the Assurance game). *We can now model much social conflict as a combination of two games:* HD and Assurance. First, the HD Game models the interaction *between* two individuals from the two different groups: for example, the conflict between a smoker and a nonsmoker; 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: for example, nonsmokers defer to smokers; blacks defer to whites; women defer to men.

Second, the Assurance game models the interaction among individual members *within* the same group. The group disadvantaged by the prevailing norm seeks to change it. If enough such individuals switch their strategies in the HD game against the other group members—playing Hawk instead of Dove—the resulting Hawk/Hawk conflict will be costly, but it may compel the other group's members to back down and start playing Dove. For individuals seeking social change, there is uncertainty whether enough of one's fellow group members will stand up and play Hawk long enough to make the other group's members back down. This makes joint action risky, even though it potentially produces the best outcome. The game between group members might be PD, if an individual prefers to free ride even when other group members succeed in creating a new norm. But where Chong's analysis applies, individuals prefer to contribute *if* the movement is successful. In this case, the game is Assurance. Given sufficient social identity or solidarity, women or racial minorities are willing to sacrifice for social change when enough others will do the same, and therefore seek to coordinate their actions with others. Those resisting change may have similar motives so that their interaction is also an Assurance game.

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Again, these are merely examples, not an exhaustive list. The world presents problems of coordination at least as often as the cooperation problem embodied in a PD game. And law is frequently called upon to resolve coordination problems. In the end, there is no justification for the disproportionate focus of legal scholarship on the PD compared to other equally simple, and arguably more applicable, games.

V. INTELLECTUAL EXCHANGE BETWEEN LAW & SOCIETY AND LAW & ECONOMICS SCHOLARSHIP

The neglect of coordination contributes to unnecessary intellectual divisions. I refer to the divide between the two primary social science schools of legal thought in the United States: Law & Economics and Law & Society. These scholarly camps are represented by the American Law and Economics Association[187] and the Law and Society Association.[188] Each group has its own peer-reviewed 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 & Economics, others are heavily represented by Law & Society scholars.[189] 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 remarkable how little either engages the theory or empiricism of the other. Here, I briefly explain how a focus on the PD game magnifies the differences between Law & Economics and Law & Society.

On one of the rare occasions when a Law & Economics scholar addressed Law & Society, Robert Ellickson distinguished the "legal centralism" of Law & Economics from the "legal peripheralism" of Law & Society.[190] By the former, he meant that Law & Economics viewed law as the central mechanism of social control.[191] Its scholarship commonly assumed that people know the law and that legal sanctions work.[192] By contrast, Law & Society scholars are skeptical regarding the claim that law

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187.   The association began in 1991; its website is http://www.amlecon.org.

188.   The association began in 1964; its website is http://www.lawandsociety.org.

189.   As one of the few individuals who regularly attends the annual meetings of both organizations, I can report that the annual meetings of 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 Law & Economics, which otherwise has members in economics departments and business schools.

190.   *See* ROBERT C. ELLICKSON, ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES 4–6, 147–48 (1991). The only other examples I know of are Kenneth G. Dau-Schmidt, *Economics and Sociology: The Prospects for an Interdisciplinary Discourse on Law*, 1997 WIS. L. REV. 389 (1997), and John J. Donohue III, *Law and Economics: The Road Not Taken*, 22 LAW & SOC'Y REV. 903 (1988). Law & Society scholars have addressed Law & Economics more frequently. *See, e.g.*, Lauren B. Edelman, *Rivers of Law and Contested Terrain: A Law and Society Approach to Economic Rationality*, 38 LAW & SOC'Y REV. 181 (2004); Carol A. Heimer & Arthur L. Stinchcombe, *Elements of the Cooperative Solution: Law, Economics, and the Other Social Sciences*, 1997 WIS. L. REV. 421 (1997). For a comment on Edelman, *supra*, see Richard H. McAdams, *Cultural Contingency and Economic Function: Bridge-Building from the Law & Economics Side*, 38 LAW & SOC'Y REV. 221 (2004).

191.   ELLICKSON, *supra* note 190, at 137–40.

192.   *Id.*

influences behavior and demand empirical evidence.[193] Much of their scholarship finds serious gaps between "law-in-the-books" and "law-in-action."[194]

Today we must modify Ellickson's observation. Because he was so successful at persuading legal economists to incorporate social norms into their analyses, Law & Economics scholars are no longer legal centralists, even if they have greater faith in law than Law & Society scholars do. But I think it fair to say that Law & Economics scholars remain "*sanctions* centralists" in that the key lesson they take from the power of social norms is that they must account for informal as well as formal sanctions. Informal sanctions are important because they also facilitate cooperation, "solving" the PD.

To this point, I want to add two more distinctions. First, where Law & Economics emphasizes efficiency, exchange, and mutual advantage, Law & Society emphasizes distribution, inequality, and social conflict. Law & Economics theorists look for means to avoid the waste of resources, that is, "dead weight" losses. Law & Society scholars look at struggles over resources and status, where one person's gain is often another's loss. Second, among other methodological differences,[195] 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 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 versus thick description; (2) sanctions centralism versus legal peripheralism; and (3) efficiency versus distribution. The conventional account of the distinctions emphasizes method; that Law & Economics diverges from Law & Society not because of *what* it studies (law, legal institutions, legal change) but *how* it studies. On this view, the three distinctions are causally connected as follows: (1)

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193. *Id*. at 148–49.

194. The idea originates in the legal realism of the early twentieth century. *See* Roscoe Pound, *Law in Books and Law in Action*, 44 AM. L. REV. 12, 15 (1910). For contemporary gap studies, see, for example, KRISTIN BUMILLER, THE CIVIL RIGHTS SOCIETY (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). ELLICKSON, *supra* note 190, at 3–4, is also a gap study because he found that Shasta County ranchers did not know the property law governing their disputes with neighbors; such disputes were instead resolved by local social norms.

195. *See, e.g.*, Howard Erlanger et al., *Is It Time for a New Legal Realism?*, 2005 WIS. L. REV. 335, 336 (noting "important differences in epistemology, methods, operating assumptions and overall goals" among the social sciences).

the reductive tools of economics, including game theory, drive the economic theorist to embrace (2) sanctions centralism and (3) a focus on efficiency.

Yet we can now see why this is *not* the case. Although the methods differ, these two schools differ more profoundly because they study different kinds of situations. The law review Law & Economics literature focuses on the PD game. Although Law & Society scholars do not use game theory, their work focuses on coordination games involving distributional issues. The PD is the wrong model for most of what Law & Society scholars study, so an emphasis on the PD makes game theory seem less relevant to their work than it actually is.

Although it is reductive, game theory need not lead legal scholars to care only about efficiency or to assume the centrality of sanctions. What produces these tendencies is the PD focus. First, the PD diverts attention from distributional issues because solving the game benefits *all* the players in the game. There is no problem of equity or distribution. Second, the PD focus makes sanctions central. If current payoffs permit only one equilibrium, then the only way to solve the game is to change the payoffs, as by sanctions. Or, if the game is repeated but the players are stuck in the inefficient "all defect" equilibrium—their informal sanctions fail them— then formal sanctions for defection may be the only way to achieve cooperation. In these settings, the law's apparent ability to manipulate payoffs via sanctions makes it appear both necessary and sufficient for solving the problem. And given the absence of conflict, there is no reason for political opposition to solving a PD and every reason for unanimous support. So *in this case* there should be no gap between the law-on-the-books and the law-in-action. One uses law to change the payoffs so that the only equilibrium now is what the law requires: mutual cooperation. Law *is* central.

Coordination games, by contrast, lead to the Law & Society view. 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. When one of these games is repeated, there is the possibility that a convention will emerge in which individuals in one social role—women, nonsmokers, property nonpossessors—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 oppose it. Those disfavored by the status

quo seek to use law to achieve what they perceive as justice. The social movement is met, however, by resistance. 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.

Legal reform often fails to make compliance the only equilibrium. Instead, there *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. Where this is true, then focal points, *not payoffs*, determine the actual outcome. If the issue is the law's focal effect, we cannot merely assume its effectiveness (legal centralism) 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. If current behavior and patterns of thought are sufficiently focal, individuals will entirely ignore a new law that tries to change existing practice.[196]

Thus, if the game is not PD, but BOS or HD, then we may follow Law & Society scholars in studying law and legal change in the much broader context of social movements and countermovements, and we may readily predict a gap between the law-in-action and law-on-the-books. A focus on coordination games lessens the differences between Law & Economics and Law & Society and provides some basis for intellectual exchange. Most obviously, coordination games direct attention away from the Law & Economics concerns of efficiency, exchange, and mutual advantage and toward the Law & Society issues of distribution, inequality, and social conflict. The excessive attention to the PD makes these conclusions seem foreign to game theory, when they are really well modeled if one starts with the right games.

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196. 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. *See* Robert D. Benford & David A. Snow, *Framing Processes and Social Movements: An Overview and Assessment*, 26 ANN. REV. SOC. 611, 614–18 (2000) (discussing the importance of competing mental frames to social movements). 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.

VI. CONCLUSION

Legal scholars have learned the lessons of the Prisoners' Dilemma too well, to the point where they obscure other insights of game theory. Because a Prisoners' Dilemma framing renders a problem amenable to an uncontroversial legal solution, there is a strong temptation to overdescribe problems as Prisoners' Dilemmas and to value game theory only for this one insight. This Article, however, describes the benefits of resisting this temptation. Coordination problems are common and important to law. Unlike the Prisoners' Dilemma, they describe situations involving inequality, where culture and history affect behavior (independent of payoffs), and where law can work expressively.

Game theory includes many complex tools not discussed here, including techniques for constructing new games without preexisting names that best fit the situation being studied. While some game theorists understandably push for greater use of these advanced tools, I have taken a different tack, criticizing the existing legal literature by focusing on two-by-two games as simple and rudimentary as the Prisoners' Dilemma. There is much to be learned from elemental coordination games, such as Battle of the Sexes, Hawk-Dove, and Assurance, which collectively model bargaining, constitutional law, democratic stability, international law, standard setting, low-stakes disputes, traffic, property, gender roles, social movements, and even the interaction of prosecutors and their prisoners. Anyone who thinks there is value in using the Prisoners' Dilemma game to understand legal problems should want to explore the usefulness of these three coordination games. Although many nonlegal scholars and a few legal scholars have made some progress in understanding the importance of coordination to legal issues, the main purpose of this Article is to encourage more work of this sort by legal scholars, to exploit the full potential of game theory, and to correct the imbalance that unjustifiably elevates cooperation problems over coordination problems.