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Economic Models of Law

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by

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Abstract: This essay discusses the use of economic models for understanding law. It begins by describing the nature of economic models in general, and then turns to the specific application of economic models to law. The discussion distinguishes between “economic analysis of law”—which concerns the use of economic theory for describing the incentive effects of legal rules (positive analysis) and for prescribing better rules (normative analysis); and “law and economics”—which concerns the relationship between law and markets as alternative institutions for organizing economic activity. The essay concludes with some comments on the actual process of building economic models of law.

Key words: Economic models, economic analysis of law, law and economics

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1. Introduction

Physicists have long pondered the epistemological question of why mathematics appears to be so effective in describing the natural world. Einstein, for example, once asked, “How is it possible that mathematics, a product of human thought that is independent of experience, fits so excellently the objects of physical reality?” (Livio, 2009: 1). The remarkable power of mathematics has even prompted some philosophers to wonder whether mathematical truths are invented or discovered by humans. Social scientists were somewhat later in recognizing the usefulness of mathematics, but they have also successfully employed mathematical models to describe human behavior. The application of economic models to law is an even more recent development, reflecting the general expansion of economic reasoning to behaviors outside of the traditional market setting. This trend represents a recognition that economics is defined not by the subject matter that it studies (markets), but by the methodology that it brings to bear in describing rational decision-making in whatever context it occurs.¹

Law is an ideal subject matter in this respect because, like economics, it is largely concerned with incentives. According to the axiom of rationality, which is the foundation of economic decision-making, individuals act to maximize their well-being (however that is measured), subject to the various constraints that they face. In a market setting, these constraints consist of income and prices; in law they consist of legal sanctions. The application of economic analysis to law specifically presumes that individuals view the threat of sanctions—whether in the form of fines, damages, or imprisonment—as implicit prices that can be set to guide behavior in certain socially desirable directions. In this view, notions of “legality” and “illegality” are

¹ This expansion, however, has not been without its critics. See, for example, Coase (1978).

stripped of their moral or ethical connotations and instead are interpreted according to a functionalist view of law.

The great American legal scholar and jurist Oliver Wendell Holmes, Jr. anticipated this approach when, in his classic article “The Path of the Law,” he described his so-called “prediction theory” of law (Holmes, 1897). The key figure in this theory is the “bad man,” who represents the classic rational maximizer from economic theory. The bad man is not an immoral agent, but rather is amoral in the sense that he will break the law when the gains from doing so exceed the costs. Thus, “[i]f you want to know the law and nothing else, you must look at it as a bad man, who cares only for material consequences which such knowledge enables him to predict” (Holmes, 1897: 459). This view of law may strike many as crass, especially those who obey the law out of a sense of moral obligation rather than a fear of punishment, but to examine the incentive effects of law, it is necessary to focus on those individuals for whom it is a binding constraint. That is what economic models of law seek to do.

The remainder of this essay examines the use of economic models for understanding law as a social institution. It begins by describing the nature of economic models in general, and then turns to the specific application of economic models to legal relationships. It concludes with some practical comments on building economic models of law.

2. The Nature of Economic Models

As a social science, economics relies heavily on models, mostly mathematical, as a way of simplifying the world. Without the use of models, it would be impossible to disentangle the myriad causal relationships that characterize the operation of a complex social system like the marketplace or the legal system. To be sure, there is a necessary sacrifice in reality when using a

model to isolate a particular phenomenon, but the hope is that the factors that are excluded from the model are extraneous to the particular question of interest and so can be safely ignored, at least as a first approximation. The extent to which a model succeeds in isolating the essential features of an issue is an indication of its “goodness.” Economists use two basic approaches to evaluate the goodness of their models:² the first is to evaluate the quality of the assumptions, and the second is to use empirical evidence to test whether the model accurately predicts behavior.

The assumptions of an economic model define the specific relationships that will be studied and the factors that will be excluded from analysis—in other words, what variables are endogenous and what variables are exogenous. In this sense, they are the counterpart to controls in a laboratory experiment. The validity, or quality, of the assumptions determines how believable the conclusions of the model are, because once the assumptions are in place, the results follow logically from the structure of the model. Most debates over economic models therefore focus on the assumptions: in particular, has the essence of the issue been captured, and are only inessential factors excluded? In many cases these are subjective questions, and so the skillful choice of assumptions is often characterized as an “art.”³

The second test of a model is whether it can predict or explain the real world.⁴ This is where theory meets empiricism; that is, where data or other forms of empirical analysis, like case studies, are used to test the predictions of a model. As in physics, economists tend to specialize in either theoretical or empirical analysis, but even those scholars who are exclusively interested in theory need to develop their models with an eye toward making testable predictions, for

² Much of the discussion in this section is based on Nicholson and Snyder (2012: 3-9).

³ See, for example, the essay by Landes (1998).

⁴ Some would argue that empirical verification of a model’s ability to predict actual behavior in the real world is the only relevant test of a model’s quality. See, for example, the classic articulation of this view by Friedman (1953).

according to the scientific method, a model that fails the empirical test, no matter how elegant, should either be discarded or revised.

Although economic models can vary widely in their specific techniques and methodologies, they usually share certain characteristics. First, they nearly always start by positing rationality on the part of the relevant decision-makers, at least some of the time.⁵ Second, the setting in which agents act is limited by the assumptions of the model, which, as discussed above, allows the researcher to focus on the particular question(s) of interest. Finally, economic models distinguish between positive and normative analysis; that is, between analysis that is meant to describe or predict behavior in a particular institutional setting, and analysis that is meant to prescribe a better outcome or policy based on some articulated social norm such as efficiency. Economic models of law come in both varieties, depending on whether the goal is to understand the origin or describe the impact of a particular legal rule, or to propose a better one. I will provide examples of both types of analysis below.

3. Economic Models of Law

The application of economic analysis to law has a long history, dating back at least to the criminal law theories of Beccaria (1986 [1764]) and Bentham (1969 [1789]). Surprisingly, however, the idea that laws could be interpreted as creating incentives for behavior did not seem to resurface again until the 1960s with the work of Coase (1960) on externalities, Calabresi (1961) on accident law, and Becker (1968) on criminal law. Since then, of course, the application of law to economics has blossomed into a major field in both law and economics.⁶

⁵ The relatively new field of behavioral economics examines the implications of relaxing the strict assumption of rationality that underlies Neo-classical economic models. See, for example, Sunstein (2000).

⁶ See Posner (2005) and Pearson (1997) for discussions of the early history of the law and economics movement, and Mercurio and Medema (1997) for an overview of recent developments and perspectives.

Most critics of the economic approach to law argue that it is inappropriate to evaluate the law based on the norm of efficiency. The goal of the law should instead be to pursue justice or fairness, however those objectives are defined. Richard Posner, one of the founding fathers of law and economics, has responded to this criticism in two ways. First, he argues that justice in the sense of distributional equity is a value that most economists also recognize, along with efficiency, as relevant in judging the performance of the market or the legal system. And although economists have no special insight into what degree of distributional equity is desirable, they have a lot to say about the feasibility of attaining different outcomes and the amount of sacrifice of overall wealth that would be necessary to achieve a particular distributional goal. Second, he argues that one meaning of “justice” may in fact be efficiency because “in a world of scarce resources waste should be regarded as immoral” (Posner, 2003: 27).

Kaplow and Shavell (2002) have argued that social welfare, which they define as the aggregation of some index of the well-being of all members of society, should be the sole basis for evaluating legal policy. According to this view, fairness matters for legal rulemaking, but only insofar as it affects people’s well-being (that is, to the extent that they care about fairness). At the same time, narrow concepts of efficiency like pure wealth maximization (or Kaldor-Hicks efficiency) are inappropriate because they exclude factors (like fairness) that people value. It is nevertheless the case that most law and economic analysis focuses on wealth maximization as the objective. Although changes in legal rules will often affect the distribution of income, it will usually be quite difficult to ascertain these effects, and in any case, tinkering with legal rules will not generally be the best means of achieving a more equitable distribution of wealth, or will entail a trade-off between fairness and efficiency. For example, the assignment of liability for product-related damages will likely affect both the distribution of wealth between businesses and

consumers, and their incentives to avoid accidents. The fact that there exist alternative mechanisms for redistributing wealth that have no relation to products liability (such as the income tax and welfare systems) suggests that the liability system should be used solely for creating incentives to minimize accident costs.⁷ Thus, the mainstream approach to law and economics, most often associated with the “Chicago School,” has for the most part employed the wealth-maximization approach to the development of economic models of law.

The following two sections provide specific examples of the use of economic models for understanding law. I divide the discussion into two sections based on what I perceive to be two distinct approaches to modeling law. The first, which I call “economic analysis of law,” uses economic models to describe the structure and function of law; and the second, which I call “law and economics,” examines the relationship between law and markets as alternative social institutions for organizing economic activity.

4. Economic Analysis of Law

By economic analysis of law I mean the use of economic models to evaluate legal rules. The positive version of this approach uses economic methods to examine the law as it is. It thus addresses questions about how the law affects behavior, but often goes further to argue that the various doctrines of the common law reflect an underlying economic logic. This view, first put forward by Richard Posner, maintains that the goal of efficiency has somehow become embedded in the law. Normative analysis, in contrast, asks how the law can be improved to better achieve the goal of efficiency, though as noted, other norms can be incorporated into the analysis. Mainstream economic analysis of law encompasses both positive and normative analysis. I first illustrate positive analysis as it has been applied to the analysis of tort law, but

⁷ See the discussion in Shavell (2004: Chapter 28). For a contrary view, see Sanchiricio (2000).

then extend the logic derived from study of that area to other areas of law. I then turn to the economic model of criminal law, as first formalized by Becker (1968), to illustrate normative analysis.

4.1. *The economic model of tort law*

The use of tort liability to internalize harmful externalities is a straightforward extension of the theory of Pigovian taxation. The main difference is that tort law is administered privately through the judicial system rather than publicly by a regulatory authority. In the context of a simple externality model, however, there is no difference (at least in terms of deterrence) between a tax and an equivalent imposition of liability. The real insights, I contend, emerge from the application of the model to negligence law.

Ironically, the first use of an explicitly mathematical model of negligence was by a judge in the famous case of *U.S. v. Carroll Towing Co.*⁸ In that case, Judge Learned Hand proposed his eponymous test for determining negligence, which says that an injurer who fails to take care should be found negligent if $B < PL$, where B is the cost (or burden) of care, P is the probability that an accident will occur, and L is the damage, or loss, in the event of an accident. As Posner (1972) argued, this standard, when properly interpreted in its marginal form, creates exactly the right incentives for injurers to invest in efficient accident avoidance. In particular, the PL must be interpreted as the expected *marginal* reduction in accident costs, and B must be interpreted as the *marginal* cost of care.

To see how the Hand test creates incentives for efficient behavior in this setting, suppose that taking care is efficient in the above sense, or that $B < PL$. A court will therefore find an injurer negligent if he failed to take care and an accident occurs. Thus, the injurer knows that by spending the B on accident prevention, he or she can avoid a larger expected cost of PL . A

⁸ 159 F.2d 169 (2d. Cir. 1947).

rational person will therefore take care. In contrast, if care is not efficient, or $B > PL$, the court will *not* find the injurer negligent if he or she failed to take care and an accident occurs. The injurer therefore has no incentive to invest in care because there is no benefit from doing so. In both cases, the injurer makes the efficient choice.

The key point is that a negligence rule creates efficient incentives for potential injurers regarding accident prevention because it creates a *threshold of behavior*—the so-called “due care” standard—that shields them from liability if they meet that standard. Injurers thus have a strong incentive to do so. Strict liability also induces injurers to invest in efficient accident prevention by imposing full liability on them for any accident losses that they cause. Injurers therefore cannot escape liability by taking efficient (due) care, but they still have an incentive to be careful so as to minimize their overall exposure to accident costs (prevention plus liability). The importance of this distinction in the way negligence and strict liability work becomes apparent when the simple accident model is extended to allow victims as well as injurers to take precaution—that is, by making it a “bilateral” rather than “unilateral” care model.

In bilateral care contexts, imposing strict liability on injurers is not generally efficient because, although it induces efficient injurer care, victims have little or no incentive to be careful due to the moral hazard problem. In contrast, the negligence rule potentially creates incentives for *both* injurers and victims to invest in efficient accident prevention. The intuitive reason for this striking result can be illustrated as follows. As demonstrated above, the due care standard creates a strong incentive for injurers to meet the standard in order to avoid liability, which implies that any accident losses will remain on the victim. And since victims rationally anticipate this outcome, they too have an incentive to invest in efficient accident prevention so as to minimize their expected losses. The negligence rule thus induces efficient prevention by both

injurers and victims because it combines the two methods for creating efficient incentives. Specifically, it sets a threshold level of care so that the injurer can avoid liability by meeting the threshold (as described above), and it simultaneously imposes full damages on the victim, thus eliminating the moral hazard problem.⁹

The preceding argument illustrates the superiority of negligence over strict liability in bilateral accident settings, but the logic of the argument has implications beyond tort law. In particular, it reveals the general usefulness of “threshold rules” for creating bilateral incentives. As noted, the problem with a rule of strict liability was that the awarding of compensation to victims eliminates any incentives for them to avoid the accident because they (theoretically) expect to be made whole.¹⁰ This problem is a consequence of the dual function of liability to *deter* dangerous activities and to *compensate* victims of those activities. Deterrence and compensation are perfectly compatible when only injurers can take precaution (as in the unilateral care model), but when victims can also take precaution, the compensatory and incentive functions come into conflict, a situation that Cooter (1985) refers to as the “paradox of compensation.” The problem is the requirement that any money that the injurer is required to pay in liability must be passed on to the victim as compensation, thus precluding so-called “decoupling” of liability and compensation.¹¹ The brilliance of the negligence rule is that it resolves this paradox by establishing a standard of behavior that the injurer can meet to *avoid*

⁹ Negligence law often supplements the due standard for injurers with a corresponding standard for victims, referred to as contributory negligence. (See *Davies v. Mann*, 11 East 60 (K.B. 1809). Under contributory negligence, failure of victims to meet the due standard of care prevents them from recovering damages regardless of the injurer’s care level. The logic of this rule is the same as that for the Hand test, and it similarly creates a powerful incentive for victims to invest in efficient accident prevention. In terms of efficiency, however, creation of a due standard for victims seems redundant since, as we have just seen, the “simple” negligence rule which only establishes a due standard for injurers is adequate to create efficient bilateral incentives. But see Landes and Posner (1987: 76), who offer an efficiency argument for contributory negligence.

¹⁰ A symmetric argument applies to a rule of “no liability,” which creates incentives for victims to take care but not injurers. The bilateral care model thus reveals the symmetry between strict and no liability, as epitomized by the “least cost avoider” approach to liability, as well as the superiority of negligence.

¹¹ See, for example, Polinsky and Che (1991).

liability, thereby giving the victim an incentive to invest in precaution so as to minimize her own damages.¹² Beginning with Brown (1973),¹³ economists have formally shown that this approach works perfectly to create efficient bilateral incentives if the due care standard is set at the injurer's cost-minimizing level of care, as described in the example above.

Grady (1988: 16) identifies the key feature of negligence law that allows it to coordinate the behavior of injurers and victims in this way: "if each party is placed in a position where its conduct is judged on the assumption that the other side has taken appropriate precautions, then it would act in the socially appropriate manner." Game theory is the perfect methodology for formalizing this idea because it shows that efficient care by both injurers and victims, acting in ignorance of the other's behavior, is the Nash equilibrium of a non-cooperative game under a properly designed negligence rule. Specifically, efficient care is the "best response" of each party under the presumption that the other party is also taking efficient care. What's more, the law of negligence actually requires parties who find themselves in risky situations to hold such presumptions; that is, to assume that other parties with whom they may come in contact are taking ordinary care (Keeton, et al., 1984: 240). In this way the law facilitates the attainment of the efficient equilibrium by compelling parties to hold Nash conjectures about what others are doing.¹⁴

4.2. *Extending the logic: The model of precaution*

Cooter (1985) revealed the power of economic models to provide a unifying framework for law when he used Brown's accident model—what he called the "model of precaution"—to

¹² A rule of strict liability coupled with a contributory negligence defense maintains bilateral incentives but also results in compensation of victims, which shows that deterrence and compensation are not necessarily incompatible.

¹³ Also see Landes and Posner (1987) and Shavell (1987).

¹⁴ Grady (1988) goes on to discuss what happens when parties can observe what others are doing before choosing their own actions. In the case of these "sequential accidents," strategic behavior becomes possible (Shavell, 1983; Wittman, 1981). Still, Grady argues that the law has developed fairly sophisticated methods for dealing with this problem.

demonstrate an underlying unity in torts, contracts, and property law. The key insight was Cooter's recognition that most legal conflicts, regardless of the subject matter, can be conceptualized as "bilateral care" problems in the sense that they involve a dispute between two parties (a plaintiff and defendant), each possessing the ability to take some action to avoid or mitigate the resulting "damages." Cooter illustrated this approach by showing that the basic accident model that Brown had used to evaluate the efficiency of various liability rules in tort law can also be used to examine certain rules in both contract and property law.

In contract law, for example, Cooter interpreted the breach of a contractual promise as an "accident," where the "injurer" is the breaching party (the promisor), and the "victim" is the party to whom the promise was made (the promisee). (The fact that the breach is often a deliberate act rather than an "accident" does not alter the mathematical logic of the model.) The promisor's "care" in this setting is the decision of whether (or when) to breach the contract, and the promisee's "care" is how much to invest in reliance on performance, which determines the amount of loss in the event of breach. In this context, one can show that awarding victims full damages for breach (the "expectation damage" measure) is like strict liability in torts because it creates efficient incentives for promisors to avoid breach, but inadequate incentives for promisees to mitigate damages. (Specifically, they overrely on performance.) Cooter showed, however, that a rule that limits damages to the amount that promisors could have *reasonably foreseen* will, like negligence, create efficient incentives for both parties. Note that such a rule essentially establishes a threshold for the promisor by limiting the promisor's liability to the level

of damages that would result from efficient promisee reliance.¹⁵ In this sense, it creates the same efficient bilateral incentives as a negligence rule.

Cooter's application of the model of precaution to property law concerns government takings of private property under eminent domain. In this context, the injurer's care corresponds to the government's taking decision, while the victim's care represents the landowner's initial investment in improvements to the land, which determines the value of the lost property in the event of a taking. Miceli and Segerson (1994, 1996) apply this model to the law of regulatory takings and show that efficient decisions by both regulators and landowners can be achieved by a conditional (threshold) compensation rule that requires the government to pay compensation only when it inefficiently regulates a piece of land. They go on to interpret the extensive case law in this area in light of the model, an exercise in positive analysis.

The preceding examples illustrate the usefulness of economic models for unifying disparate areas of law. In each of the examples, the problem was to design a rule for coordinating the behavior of parties engaged in an activity that would potentially involve them in a legal dispute. Although the actual rules that have arisen in these different areas vary in their outward form, Cooter's analysis shows that they often embody the same inherent mathematical structure. In this sense, the law has converged on similar solutions (though often in different forms) to a common set of economic problems.¹⁶ The value of economic models is that they reveal this common structure by isolating the essential elements of the problem.

¹⁵ The case of *Hadley v. Baxendale* 9 Ex. 341, 156 Eng. Rep. 145 (1854) established the reasonable foresight doctrine for breach of contract. Interestingly, Sykes (1990) interprets the doctrine of commercial impracticability as a literal threshold rule for breach of contract.

¹⁶ In addition to Cooter (1985), see Posner (2003), Shavell (2004), Miceli (2009), and Cooter and Ulen (2012) for textbook treatments of law and economics that emphasize these unifying principles. Interestingly, there is a corresponding concept in evolutionary biology, referred to as "convergent evolution," which describes the independent emergence of certain adaptive forms or traits. See, for example, Gould (1985: 411-412).

This conclusion naturally raises the question of where this underlying unity in the law came from. This is a central question in the positive economic theory of law, which asserts that the common law displays an inherent economic logic. Originally, Posner attributed this underlying logic to the decision-making of judges, who he claimed actively promote efficiency because they “cannot do much ... to alter the slices of the pie that various groups in society receive, [so] they might as well concentrate on increasing its size” (Posner, 2003, p. 252). Other scholars, however, have attempted to show that efficiency can emerge without the conscious help of judges based on the argument that the common law, like the competitive market, is driven by invisible-hand type forces that propel it in the direction of efficiency. A large literature has arisen to evaluate the merits of this argument.¹⁷

4.3. *Normative analysis: The economics of crime*

I conclude the current discussion by offering an illustration of normative analysis based on the economic theory of law enforcement as first formalized by Becker (1968) and elaborated on by Polinsky and Shavell (2000, 2007), among others. Although many of the prescriptions of the Becker-Polinsky-Shavell (BPS) model of criminal law are in fact compatible with actual law enforcement practices (representing further examples of positive analysis), I will highlight here a couple of divergences as a way of showing how economic theory can prescribe more efficient (though not necessarily more desirable) policies.

The economic approach to crime control is based on the assumption that rational offenders decide whether or not to commit an illegal act by comparing the dollar value of the gains from the act to the expected cost, which is equal to the magnitude of the sanction multiplied by the probability of apprehension and conviction. Given the goal of deterrence, the

¹⁷ This literature began with the seminal papers by Rubin (1977) and Priest (1977). See also Gennaioli and Shleifer (2007), and Miceli (2011).

optimal law enforcement policy prescribed by the BPS model involves choosing the probability of apprehension, the type of criminal sanction (a fine and/or prison), and its magnitude, to minimize the overall cost of crime.

The standard BPS model asserts that efficiency is the (primary) norm for deriving the optimal enforcement policy. Although minimizing the cost of operating the system is surely an important goal, actual policies often diverge from the prescriptions of the BPS model, suggesting that other goals are also relevant. I will give two examples. First, the BPS model says that the optimal sanction, whether a fine or imprisonment, should be maximal. The reason this is true for a fine is clear: offenders only care about the *expected* sanction, pf , and since it is costly to raise the probability of apprehension, p , but not the fine, f , it is cost-minimizing to raise the fine as much as possible (up to the offender's wealth) before raising the probability. Less obviously, when the sanction is prison only, the optimal prison term should also be maximal. Intuitively, expected costs can be lowered by increasing the prison term and lowering the probability of apprehension proportionally (thereby holding deterrence fixed) because the punishment, although costly, is imposed less often. In terms of actual punishment policy, however, it is clear that fines and prison terms are not set at their maximal levels for most crimes. In this sense, the model is not descriptive of actual legal practice.

Second, the BPS model predicts that imprisonment should only be used after fines have been used up to the maximum extent possible (for example, up to the offender's wealth), and only then if additional deterrence is cost-justified. Again, the logic is clear: fines are costless to increase while prison is costly, so it is optimal to exhaust the costless form of punishment first. Actual punishment policies also fail to implement this prescription as offenders are often

sentenced to prison when they could have afforded a substantially higher fine. (Think of white collar criminals.)

The reason for both of these divergences of practice from theory is almost certainly due to the importance of norms besides efficiency, such as fairness or equal treatment, that society deems relevant for the determination of optimal criminal punishment.¹⁸ For example, the idea of sentencing poor defendants to lengthier prison terms than wealthy defendants for the same crime would strike many as unacceptable (if not unconstitutional) because it would appear that the wealthy were being allowed to buy their way out of prison (Lott, 1987). Society therefore apparently tolerates a costlier punishment policy for the sake of more equal treatment of offenders.

5. Law and Economics

The preceding section focused on economic models in which law was the subject matter to be explained. This section turns to a somewhat different approach to modeling law in which economic theory is used to understand how law and markets interact as alternative social institutions for coordinating human behavior. Economists for the most part take for granted the role of the law in creating a stable background for markets in the same way that they take preferences and technology as given. But law and economics scholars have shown that important insights can be gained about the operation of markets by explicitly recognizing the interrelationship between markets and law. The starting point for such an examination is the Coase Theorem (Coase, 1960).

5.1. The Coase Theorem

¹⁸ See, for example, Miceli (1991) and Polinsky and Shavell (2000).

Coase's original motivation in writing his seminal paper on externalities was to offer a critique of the Pigovian view, which asserted that some form of government intervention (taxes, fines, or liability) was required to internalize external harm, such as that caused by straying cattle or railroad sparks. Absent such intervention, the Pigovian view maintained, the "cause" of the harm (the rancher or the railroad) would over-engage in the harmful activity. Coase challenged this view by first noting that causation is reciprocal in the sense that both the injurer and victim must be present for an accident to occur. The designation of one party as the "injurer" is therefore arbitrary and in fact represents an implicit awarding of the right to be free from harm to the other party (the "victim"). Thus, for example, under the traditional Pigovian view, the farmer has the right to be free from crop damage—whether from straying cattle or spewing sparks—and so the rancher or the railroad should be compelled to pay the farmer's cost. But suppose the farmer-victim is in a better position to avoid the harm, say by moving his crops or not locating near the railroad or ranch in the first place. In that case, the designation of the rancher/railroad as the injurer may actually preclude the identification of more efficient ways of avoiding the harm.

Coase's point in raising the causation issue was to evaluate the conditions under which court-imposed liability is needed to internalize the external harm. Suppose, for example, that in the rancher-farmer dispute the court does not intervene to assign liability to the rancher. Does that necessarily mean that the rancher's herd will expand inefficiently? The answer, of course, is no, provided that the parties can bargain, because if bargaining is possible, the farmer would be able to bribe the rancher to reduce the herd to the point where the marginal benefit from the last cow equals the marginal cost. In this case, property rights in straying cattle effectively belong to the rancher, and the farmer has to "purchase" them, which he will do up to the point where the two parties value the last cow equally. Note that this is the reverse of what happens under the

Pigovian solution, where the farmer is (implicitly) awarded rights to the straying cattle and the *rancher* has to purchase them by paying the court-imposed damages. In both cases, however, the outcome will be efficient. This conclusion—that the initial assignment of property rights does not affect the final distribution of resources, which is efficient—is the Coase Theorem.

The importance of the Coase Theorem, however, lies not its practical relevance, but in its highlighting of the role of bargaining costs. When the conditions for the Coase Theorem are satisfied—that is, when bargaining is possible—the assignment of liability for external harms does not affect efficiency because the parties will re-arrange any initial assignment of rights to the point where the gains from trade are exhausted. In this sense, the law does not matter for efficiency (though it does affect the distribution of wealth).¹⁹ When bargaining is not possible, in contrast, the law does matter because the parties will not be able to re-arrange inefficient assignments of rights. As a result, the law must be designed with the explicit goal of efficiency in mind. In this way, the Coase Theorem defines the efficient scope for legal intervention (Demsetz, 1972). The next section elaborates on this idea in the context of the choice between property rules and liability rules.

5.2. *Property rules versus liability rules*

The classic paper by Calabresi and Melamed (1972) addresses the manner in which rights or entitlements, once assigned, are legally protected and transferred. They distinguished between *property rules*, under which an entitlement can only be transferred if the holder of the entitlement consents; and *liability rules*, under which a party seeking to acquire an entitlement can do so without the holder's consent provided that he or she is willing to pay compensation for the

¹⁹ The conclusion that the efficient allocation of resources will be achieved regardless of the initial assignment of legal rights mirrors the First Fundamental Theorem of Welfare Economics, which says that market exchange will be efficient regardless of how property rights are initially assigned. The Coase Theorem thus shows that externalities need not preclude this outcome as long as bargaining costs are low.

holder's loss.²⁰ Property rules therefore form the basis for market (voluntary) exchange, while liability rules form the basis for legal (forced) exchange. Because market exchange is consensual, it ensures a mutual benefit, or the existence of gains from trade. The role of the law in such transactions is limited to the enforcement of property rights and contractual exchange of entitlements. In other words, law is *complementary* to markets in promoting the efficient allocation of resources. In the case of liability rules, on the other hand, the law takes the primary role of forcing an exchange of the entitlement on terms dictated by the court. Here, the law is a *substitute* for market exchange in organizing the transfer of entitlements because bargaining costs preclude voluntary transfers.

The choice between market and legal exchange depends on the trade-off between the transaction costs associated with bargaining over the price, and errors by the court in setting the price. To use one of Coase's examples, suppose that farmers situated along a railroad track have the legal right to be free from crop damages caused by sparks, and that right is protected by a property rule. The railroad would then have to secure the agreement of all farmers in order to run trains along a given route, a prospect that would likely prevent any trains from ever running due to high bargaining costs. If the farmers' rights were instead protected by a liability rule that only required the railroad to compensate farmers for any damages but did not allow the farmers to prevent trains from running, the railroad would internalize the harm through the assessment of liability for damages, and it would run the efficient number of trains. This arrangement, however, places a heavy burden on the court to measure the damages suffered by victims

²⁰ Calabresi and Melamed also discuss a third rule, called an *inalienability rule*, which prohibits the exchange of an entitlement under any circumstances, including consensual exchange. Examples include constitutional protections of certain fundamental rights, like speech and religion, as well as laws prohibiting the sale of organs, children, and cultural artifacts.

accurately. If it under-estimates the damages, the railroad will run too many trains, and if it over-estimates damages, the railroad will run too few.

5.3. *The General Transaction Structure*

The choice between property rules and liability rules as just described delineates the scope of markets versus law in achieving an efficient allocation of resources. The resulting framework has been characterized as the General Transaction Structure (GTS) for organizing exchange.²¹ Figure 1, which is adapted from Coleman (1988: 31), summarizes the framework in the context of the rancher-farmer dispute. The rows represent the party to whom the entitlement is initially assigned (the “winner” of the legal dispute), and the columns represent the rule used to protect that assignment. Cells I and II represent cases won by the farmer, and cells III and IV represent cases won by the rancher. In the cases won by the farmer, protection by a property rule (cell I) means that the rancher can only infringe on the farmer’s right to be free from straying cattle by bargaining. The farmer can therefore prevent any infringements by obtaining an injunction against trespass. In contrast, when the farmer’s right is protected by a liability rule (cell II), the farmer cannot prevent straying cattle but can only seek compensation for the resulting damages. Note that this latter outcome coincides with the Pigovian view of externalities first critiqued by Coase. As the GTS reveals, however, this is only one out of four possible resolutions of the dispute, and it is only desirable when transaction costs preclude bargaining between the rancher and the farmer.

[Figure 1 here]

In cases won by the rancher, protection by a property rule (cell III) means that the rancher is free to let his cattle stray without penalty. As the above discussion revealed, however, this does not necessarily imply that there will be too much crop damage because, as Coase

²¹ See, for example, Klevorick (1985) and Coleman (1988: Chapter 2).

recognized, if the value of lost crops to the farmer exceeds the value of additional cows to the rancher, the farmer can bribe the rancher to reduce his herd, provided that transaction costs are low enough. When the rancher's right is protected by a liability rule, in contrast (cell IV), the farmer can go to court to obtain a reduction in straying cattle, but he must be willing to pay the resulting loss in profits to the rancher.²² As with cell II, no bargaining between the parties is required here, but the court must calculate the value of additional cows to the rancher.

Notice that the four possible outcomes in Figure 1 provide courts with discretion over both the distributional effects of legal rules, and the manner in which they can be transferred. The choice of which party receives the initial right (the winner) has distributional implications because it determines the assignment of a valuable entitlement. As to the enforcement rule, that has efficiency implications because it determines the manner in which any transfers away from the initial assignment can occur, whether by market exchange if transaction costs are low, or by legal exchange if they are high. In other words, the enforcement rule determines whether entitlements can be exchanged by markets or legal transfers.

5.4. *Criminal law again*

I conclude the discussion of the GTS by suggesting how it can be extended to incorporate criminal law. Although the economic analysis of crime has long been a sub-field of law and economics, an interesting question in the positive theory of law is why a separate category of "crimes" is needed.²³ After all, both criminal and tort law are concerned with internalizing unwanted harms, so one might ask why tort law alone is not sufficient. It is not an adequate answer to simply say that crimes are intentional and torts are accidental because the economic

²² The court's ruling in *Spur Industries, Inc. v. Del E Webb Development Co.*, 494 P.2d 701 (Ariz. 1972), exemplifies this outcome.

²³ See, for example, Friedman (2000: Chapter 18) and Posner (1983).

model of tort law as outlined above can easily accommodate intent (see, for example, Landes and Posner, 1987: Chapter 6). Economists thus seek a deeper reason.

One interesting perspective suggested by Calabresi and Melamed (1972) is that criminal law is needed to enforce the GTS.²⁴ Consider, for example, a thief who steals someone else's property—that is, an entitlement protected by a property rule. When the thief is caught, why not simply make him pay the victim the value of the stolen property? If the thief values the property more than the owner, this “transaction” would produce an “efficient theft,” which seems no different than a court's imposition of liability on spark-spewing railroads or other injurers. In other words, once we accept the validity of coercive exchanges as efficient in those contexts, why should we not be prepared to accept them in all such cases of forced exchange? What makes the act that we call “theft” different from the other involuntary transfers of entitlements that are allowed within the GTS? The question turns out to be a difficult one that is sidestepped by the BPS model of crime, which simply takes the existence of the criminal category as given and proceeds to derive the optimal enforcement policy.

One answer to this paradox is to recall the reason why liability rules are not universally allowed as the basis for exchange under the GTS. Liability rules require courts to estimate the value of the entitlement to the owner after the fact, which means that there is no guarantee that the resulting exchange is efficient. In contrast, property rules ensure that only efficient exchanges occur because the owner has the right to refuse the transaction. This is why property rules are preferred when transaction costs are low. But what happens if a thief violates an owner's property rule by stealing the protected item? If the legal remedy is simply to require the thief to pay compensation, then he has succeeded in *transforming the property rule into a liability rule*. To prevent this, some further sanction (or “kicker”) is needed to discourage the

²⁴ Also see Klevorick (1985), and Coleman (1988: Chapter 6).

thief from violating the GTS in the first place; that is, from bypassing the market. This enhanced sanction represents the criminal penalty.

If the logic of this argument makes sense in the context of property transfers, it becomes even more compelling when applied to bodily harm or other violent acts, where court efforts to estimate the dollar cost to victims are bound to be inadequate (or impossible). In these cases, criminal sanctions are meant to discourage exchanges that should never happen at all—those that are protected by “inalienability rules.” The specific form of the criminal sanction, whether a fine, imprisonment, or some combination, is not important. What is important is that the sanction in question is intended as a *punishment* for an illegitimate transaction, as opposed to *compensation* for a legitimate transaction (Cooter, 1984). It is this punitive aspect of criminal law that distinguishes it from tort law and thereby offers a resolution of the paradox of “efficient theft.”²⁵

6. Some Thoughts on Model Building

I conclude this essay with some practical comments on the process of building economic models of law. The comments are based on Varian (1998) as well as my own experience, as an economist with no formal legal training, in building economic models of law over the past twenty-five years.

Above all, the process of building good economic models, in law or any field, involves asking interesting questions and using the right methods to answer them. The first problem is therefore to find a good question. The law is an ideal subject area for finding interesting economic questions for several reasons: first, both law and economics presume rational decision

²⁵ Punitive damages in tort law therefore reside at the boundary between torts and crimes, and indeed, in many cases where punitive damages are awarded, the injurer is also susceptible to criminal prosecution.

makers; second, both areas involve the use of incentives; and third, both are concerned with trade-offs. Still, some legal issues are more interesting and relevant than others, and good scholars are more adept at finding the interesting ones. The best questions are those that generalize to circumstances beyond the particular case at hand, or even the particular area of law. (The model of precaution is a good example.) The good news for young scholars is that formal legal training is not generally necessary to find good questions because most areas of law concern issues and disputes that arise in ordinary experience. Indeed, interesting questions can often be found by simply reading newspapers or paying attention to current events. Although detailed legal knowledge will eventually be necessary for purposes of interpreting the result of one's model in light of the law—either to describe existing rules or to propose better ones—it is usually not difficult to learn the relevant law in an ad hoc manner.

As emphasized above, the use of economic models to understand the law requires acceptance of rationality on the part of the key decision-makers, which is the basis of most economic analysis. Even if one eschews efficiency as the sole objective of the law, rationality of agents is necessary if one wants to employ standard optimization models. The next decision involves the choice of the assumptions, which, as discussed above, serve to limit the scope of the inquiry at hand. Although the ultimate goal is to derive general conclusions, it is best to start out with the simplest setting that captures the essence of the problem of interest. This allows one to isolate the key elements of the model and to understand what drives it. It is a common mistake of young scholars to generalize a model too soon under the belief that the simple version lacks realism or relevance, but this approach quickly leads to an overly complex model that is either intractable or yields no clear results. Only after understanding a simple version of the model

(probably too simple), does it make sense to generalize it by relaxing some of the assumptions and adding additional elements.

An important consideration in developing economic models of law is to identify the role that the “legal rule” plays in creating incentives for decision makers to act in a certain way. Most legal problems involve some kind of externality or market failure that the law is designed to correct. It is therefore important to identify what that market failure is and how the legal rule addresses it. The accident model is again a good illustration: as discussed above, the market failure there is the external harm created by a risky activity, and the question of interest is how different liability rules internalize the harm. A typical approach is to assess the relative efficiency of different rules (positive analysis) and/or to propose more efficient ones (normative analysis).

It is advisable in the early stages of model building to refrain from delving too deeply into the existing literature. Begin instead with a few stylized facts about the question of interest, possibly suggested by reading some cases or other legal materials. This allows one to formulate original ideas without undue influence from previous scholars. Although it is unlikely that no one has thought about a particular problem before, knowing too much at the early stages may hinder one from developing an innovative approach that improves upon or extends existing work. One should not work in a total vacuum, however. In the process of building a model, it will often prove useful to think about whether the problem at hand resembles any models that the researcher may have previously studied in other contexts. Reasoning by analogy is important in law and can also be helpful in scholarly work. Recognizing the applicability of previous models suggests that the question at hand is interesting and may have more general relevance. It can also help in working out the kinks or overcoming impediments in one’s own modeling efforts.

Eventually, though, a thorough literature review is necessary to properly position one's work in the field. Unfortunately, in some cases this will reveal that the question of interest has already been adequately addressed. When this happens, it is important for the researcher to remember that the time spent on the project has not been wasted—he or she has gained some valuable modeling experience and can take heart in having independently identified and solved a problem that was interesting enough to be published.

Once the researcher feels confident that he or she has developed an innovative model of some interesting legal question, the final step is to share it with colleagues by circulating early drafts of the paper and/or presenting it in seminars and at professional meetings. Be prepared to describe the model verbally or in writing in a way that does not depend on its mathematical components. This is especially important in the field of law and economics, where at least some of the potential audience will not have formal economic training. But beyond that, it is often the case that the process of writing down a model and presenting it to others reveals weaknesses and inconsistencies that the researcher had not fully resolved in the formal analysis. In most cases, these problems involve the nature of the model's assumptions rather than the details of the proofs. Presentation of a model to other scholars provides an invaluable check on the assumptions and can reveal difficulties that will have to be addressed in preparing a final version of the paper for submission to a journal. Although the author may be an expert on the details of his or her model, it is easy to get lost in those details. Other scholars will bring fresh eyes to the issue that can yield valuable insights and possibly suggest improvements and further avenues of research. Above all, remember that the goal of model building, in law or any field, is to enhance one's understanding of the way the world works, and that this is ultimately a collaborative effort of the community of scholars.

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Figure 1. The General Transaction Structure

		Enforcement Rule:	
		Property Rule	Liability Rule
Protected Party:	Farmer	I. Farmer can enjoin ranching	II. Farmer can seek compensation for damaged crops
	Rancher	III. Rancher is free to impose damage	IV. Rancher can seek compensation for abating damage