An Efficiency Analysis of Vicarious Liability Under the Law of Agency

Under the law of agency, business principals often are held liable for the torts of their agents. If the victim of an agent's tortious conduct can recover full compensation directly from the agent, however, the victim ordinarily has no reason to seek compensation from the agent's principal. The law of vicarious liability, therefore, exists primarily as a way to cope with the problem of judgment-proof agents.

An important basis for the imposition of vicarious liability on a business principal is the existence of "control" or a right of "control" by the principal over the physical conduct of his agent. If a tort is committed within the scope of the agent's employment, the existence of control is a sufficient but not a necessary condition for the imposition of vicarious liability. The principal also incurs vicarious liability if his agent, in the performance of his duties, commits a tort during the course of an "inherently dangerous activity."

Although these liability rules are widely in force, the theories advanced to explain them are at best incomplete. As a step toward a rigorous theoretical basis for explanation and reform of the law, this Note develops a formal economic model of the principal-agent relationship to identify the circumstances under which vicarious liability is and is not an efficient liability rule.

2. The term "agent" is used in this Note to refer to all parties in the employ of business principals. It encompasses independent contractors who may or may not be agents in the legal sense of the term. Cf. RESTATEMENT (SECOND) OF AGENCY §§ 1-2 (1958) (defining "agent," "master," "servant," "independent contractor").
3. Of course, the victim may have other motives for suing the principal—for example, to defeat diversity jurisdiction.
4. This proposition is supported by the fact that principals generally have a common-law right of indemnity against their agents. M. FRANKLIN, TORT LAW AND ALTERNATIVES 390 (2d ed. 1979). Unless the principal's right to indemnity is contractually abrogated, vicarious liability does not relieve agents of liability up to the limit of their assets, but merely allows victims to reach principals' assets when agents' assets are insufficient.
5. W. SELL, AGENCY 84 (1975).
6. See W. PROSSER, supra note 1, at 461-66 (discussion of scope of employment limitation on vicarious liability); W. SELL, supra note 5, at 88-93 (same).
7. See W. PROSSER, supra note 1, at 458-75 (discussing possible bases for vicarious liability).
8. See id. at 472.
10. Efficiency in this context refers to the attainment of a social wealth maximum; liability rule A is more efficient than liability rule B if and only if A generates greater aggregate social wealth than B. Because aggregate social wealth is the criterion of efficiency, A may be more efficient than B even though some individuals are disadvantaged by A—this possibility distinguishes the social wealth max-
Two factors are of critical importance in this efficiency analysis. One factor is the extent to which financial incentives affect the level of precautionary behavior. If precautionary behavior is unaffected by the financial incentives created by alternative liability rules, then vicarious liability is generally an efficient rule. When financial incentives significantly affect the level of precautionary behavior, however, another factor is relevant—the ability of the principal to monitor the agent’s precautionary behavior. If the principal can monitor the adequacy of the agent’s precautions, then vicarious liability again is generally an efficient rule. If the principal is unable to monitor the agent’s precautionary behavior, however, vicarious liability may or may not be an efficient rule.

The existing law of agency differs significantly from the normative implications of the proposed economic model. For example, the law largely ignores the question of whether financial incentives affect precautionary behavior. Moreover, although the principal’s ability to “control” the agent is a basis for the imposition of vicarious liability, the practical indicia of control employed by the courts are only tangentially related to the ability of the principal to monitor the agent’s precautionary behavior. Despite these problems, however, the legal treatment of inherently dangerous activities is remarkably consistent with the normative implications of the model.

I. The Law of Vicarious Liability and Its Historical Basis in Policy

The law of vicarious liability centers around the control test and its exceptions. Many policy arguments have been advanced in support of the law, but none of them provide adequate explanation or justification for the law as it stands.

A. The Control Test and the Inherently Dangerous Activity Exception

Under agency law, an “agent” is a party who is hired by a business entity to perform a task connected with the business, and a principal is a party who employs an agent. Courts applying the control test distinguish between two types of agents: servants and independent contractors. A servant is an agent who is employed by a principal to perform services, and whose physical conduct in the performance of those services is controlled or is subject to a right of control by the principal. A principal...
who employs a servant is termed a master. Under the doctrine of respondeat superior, masters are liable for the torts of their servants if the torts are committed within the scope of the servants’ employment. In contrast, an independent contractor is an agent who is under contract to perform services for a principal, but whose physical conduct is neither controlled nor subject to a right of control by the principal. In general, an employer is not liable for the torts of an independent contractor.

Because the control test is applied in diverse situations, it is impossible to provide a comprehensive listing of the factors that courts consider in determining whether control exists. Among those factors, however, are the extent of supervision upon which the parties agree, whether the agent is engaged in an occupation or business independent or distinct from that of the principal, trade practices regarding the degree of supervision that an employer normally exercises, the agent’s skill level, whether the employer supplies tools and the place of work, the employer’s power to terminate the agency, the method of payment (by the hour or by the

AGENCY 99 (1979); W. SELL, supra note 5, at 84.

15. W. PROSSER, supra note 1, at 460; RESTATEMENT (SECOND) OF AGENCY § 219 (1958).
16. W. PROSSER, supra note 1, at 468; H. REUSCHELIN & W. GREGORY, supra note 13, at 100; W. SELL, supra note 5, at 95.
17. W. PROSSER, supra note 1, at 468; H. REUSCHELIN & W. GREGORY, supra note 13, at 100; W. SELL, supra note 5, at 95; RESTATEMENT (SECOND) OF TORTS § 409 (1965). Exceptions to the independent contractor rule include vicarious liability for non-delegable duties of the principal, W. PROSSER, supra note 1, at 470; RESTATEMENT (SECOND) OF TORTS §§ 417-22, 424-25, 428 (1965), liability when the agent acts under the apparent authority of the principal, RESTATEMENT (SECOND) OF TORTS § 429 (1965), liability of the principal for his own negligence, id. §§ 410-15 (1965); W. PROSSER, supra note 1, at 469, and liability for the results of inherently dangerous activities, W. PROSSER, supra note 1, at 472; RESTATEMENT (SECOND) OF TORTS §§ 416, 423, 427 (1965).
18. Cf. W. PROSSER, supra note 1, at 460 (control test reduces to question of whether, “in the eyes of the community, the person employed would be regarded as part of the employer’s own working staff”).
19. See W. PROSSER, supra note 1, at 460; W. SELL, supra note 5, at 86; RESTATEMENT (SECOND) OF AGENCY § 220 (1958).
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whether the agent's work is part of the employer's regular business, and whether the parties believe they are creating a master-servant relation.

If the court determines that control is absent, then the principal is not liable for the agent's tort unless the tort arises out of an activity that falls under one or more of the exceptions to the independent contractor rule. One such exception includes torts that an agent commits during the course of an inherently dangerous activity. Many cases that fall under this exception arise when the tortfeasor creates an unusual risk that is recognizable in advance, and that requires special precautions to guard against an undue risk of harm. Other cases that fall under this exception involve "ultrahazardous" activities, which are considered inherently dangerous regardless of the precautions taken.

B. The Rationale for Vicarious Liability

Many theories have been advanced to support or explain the law of vicarious liability. Although they all contain a kernel of truth, none of the theories provides an adequate policy basis for the law. Three of the more prominent theories are examined below.

1. The Principal's Benefit Theory

According to one proposed justification for vicarious liability, the principal should bear the costs of the agent's endeavors because he reaps the

27. See, e.g., Sam Horne Motor and Implement Co. v. Gregg, 279 S.W.2d 755, 757 (Ky. 1955); RESTATEMENT (SECOND) OF AGENCY § 220(2)(h) (1958).
29. Exceptions outside the scope of the model in this Note include the negligence of the employer exception, see W. PROSSER, supra note 1, at 469, and the apparent authority exception, see M. FRANKLIN, supra note 4, at 368. An exception at least partially within the scope of the model, though not discussed in the text, is the non-delegable duty exception. See W. PROSSER, supra note 1, at 470.
30. See W. PROSSER, supra note 1, at 472.
31. Id.
32. Ultrahazardous activities include the construction of reservoirs, see Rylands v. Fletcher, L.R. 3 E. & L. App. 330 (1868); the keeping of vicious animals, see Yazoo & M.V.R. Co. v. Gordon, 184 Miss. 885, 186 So. 631 (1939); the exhibition of fireworks, see Blue Grass Fair Ass'n v. Bunnell, 206 Ky. 462, 267 S.W. 237 (1924); blasting activities, see Gien v. Williams, 215 Ark. 705, 222 S.W.2d 800 (1949); and crop dusting, see Pendergrass v. Lovelace, 57 N.M. 661, 262 P.2d 231 (1953).
33. See T. BATY, VICARIOUS LIABILITY 148 (1916) (considering nine theories of vicarious liability and rejecting all as inadequate). See also P. ATIYAH, VICARIOUS LIABILITY IN THE LAW OF TORTS 15-28 (1967) (reassessing Baty's nine theories, and concluding that true basis for vicarious liability may lie in some unspecified combination of those theories and modern theory of loss distribution).
benefits of those endeavors. Stated this simply, however, the principal's benefit theory does not explain any of the limitations on vicarious liability that are discussed above. Benefits accrue to the principal in any agency relationship regardless of the degree of control. Thus, as stated, the principal's benefit theory fails to provide a cogent basis for the law.

2. Loss-Spreading and Deep-Pocket Theories

Another proposed justification for vicarious liability is that it spreads the costs of torts to principals with "deeper pockets" than their agents and to society as a whole through higher prices for the principals' goods and services. The loss-spreading and deep-pocket arguments do not define appropriate limits to the scope of vicarious liability, however, because broadening the scope of vicarious liability could spread losses even further. Moreover, loss-spreading arguments do not suggest a reason for treating control as a crucial variable in vicarious liability cases. To the contrary, they suggest that the law should look to the relative affluence of the parties to the action. Hence, loss spreading and the search for a deep pocket cannot be the sole basis for the law of vicarious liability.

3. The Cost Internalization Theory

The third commonly proposed justification for vicarious liability is that it forces internalization of social accident costs—that is, it guarantees that no agency activity is undertaken unless the principal and the agent together are willing to bear the tort costs of the activity. Such a policy, it is argued, promotes an efficient allocation of resources.

The cost internalization theory, however, does not adequately explain why principals should internalize the tort costs of servants but not the tort costs of independent contractors. Especially when the independent contractor is judgment proof, as is commonly the case when the vicarious liability issue is actively litigated, the only party capable of internalizing tort costs (other than the victim) is the principal. Moreover, the cost internalization argument neglects the incentive effects of alternative liability rules. Specifically, it neglects the problem of "moral hazard"—the danger that if the risks of tort liability are shifted from the agent to the principal

34. See P. ATIYAH, supra note 33, at 17; T. BATY, supra note 33, at 148.
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through vicarious liability, the agent's incentives to exercise care may be reduced.38

II. A Formal Model of Agency Under Alternative Liability Rules

When a principal and an agent create an enterprise, their first task is to negotiate an agency agreement. The agreement must identify the various duties of the parties in the conduct of the enterprise, and must specify how the returns from the enterprise are to be split between the parties. In addition, if the possibility of tort liability is foreseen and is sufficiently significant to warrant attention, the agreement must allocate the risks of tort liability.

During negotiations, each party seeks a contract that maximizes his own welfare. The goals of the principal and the agent come into conflict as each party endeavors to increase his share of the returns to the enterprise at the expense of the other party. Both parties must also cooperate, however, as they perceive the need to achieve agreement lest the mutual benefits of the enterprise be lost. The ultimate outcome of this give-and-take process depends upon factors such as the degree of market power that each party possesses, and the ability of each party to bargain skillfully.

Although the outcome of bargaining is impossible to predict with certainty, the presence of indeterminacy is not fatal to a meaningful economic analysis of the negotiation process.39 Crucial policy implications for the law of vicarious liability can be derived from the simple assumption that bargaining leads to a "Pareto optimal" agency contract—a contract that could not be modified so as to make both parties better off.40

The implications of the Pareto optimality assumption for the law of vicarious liability depend, in part, upon the nature of the activity that creates the risk of a tort. For purposes of efficiency analysis, enterprise activities that create a risk of tort liability can be divided roughly into three categories, based upon the extent to which the precautionary behavior41 of the enterprise is affected by financial incentives, and the extent to which the principal can monitor the precautionary behavior of the agent.

The model developed below analyzes enterprise behavior for each type of activity—first under a legal regime without vicarious liability, and then under a legal regime with vicarious liability. By comparing enterprise be-

38. See pp. 186-87 infra; app. VI infra.
39. See app. I infra (discussing why collective action and market forces fail to produce efficiency irrespective of liability rule).
40. Although the Pareto optimality assumption is intuitively appealing, it does rule out the use of destructive bargaining tactics that would destroy the Pareto optimality of the bargaining outcome, and it presumes that the bargaining process proceeds until a Pareto optimal contract is identified.
41. In general, precautionary behavior includes any action designed to reduce the likelihood or magnitude of tort liability.
behavior under the two regimes, the analysis generates a set of conclusions as to the efficient liability rule for each type of activity.

A. Financial Incentives, Monitoring, and Precautionary Behavior

In the model below, potentially tortious activities are divided into three categories: incentive-independent activities, principal-monitored activities, and agent-monitored activities. Concededly, real enterprise activities rarely fall neatly into one category or another, and the problem of generalizing the analysis to encompass "intermediate activities" is considered after the development of the model.42

Incentive-Independent Activities. In activities that belong to this category, the extent to which the agent takes precautions to reduce the risk of torts is not influenced by the financial incentives generated by the tort system. As a result, whether or not the principal is vicariously liable for the agent's torts, the probability and potential magnitude of tort liability remain the same.

Three groups of activities fall under this category. The first group consists of activities in which, regardless of the liability rule, the costs of available precautions either always exceed their benefits, or never exceed their benefits.43 A second and far more important group of incentive-independent activities consists of activities in which the level of care is determined without conscious regard for the danger of tort liability, and the potential tortfeasor's decisionmaking suffers from "bounded rationality."44 In such activities, the risk of tort liability is attributable primarily to momentary carelessness rather than to a calculated decision to disregard prudent standards of care.45 That is, the decisionmaker does not choose the level of care by weighing the relevant costs and benefits, including those created by the tort system, but instead acts without serious attention to the relevant costs and benefits. The third group of incentive-independent activities consists of activities that create a de minimis risk of tort liability. In these activities, the parties do not balance the costs and benefits of precautions because the costs of assessing the relevant costs and benefits exceed the potential benefits of doing so—it is irrational to choose precau-

42. See pp. 189-90 infra.
43. Relatively few activities fit this description, but examples may be found in the legal category of ultrahazardous activities. See M. FRANKLIN, supra note 4, at 392-420, p. 55 infra (discussing similarity between incentive-independent activities and ultrahazardous activities).
44. The term "bounded rationality" is used extensively in the economics literature to refer to a wide variety of human cognitive shortcomings. See, e.g., Simon, Rationality and Administrative Decisionmaking, in MODELS OF MAN 196 (1957); Simon, Theories of Bounded Rationality, in DECISION AND ORGANIZATION 161 (C. McGuire & R. Radner eds. 1972).
45. For example, many motor vehicle torts may result primarily from lapses of attention and periods of fatigue rather than from conscious decisions to drive imprudently.
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tionary behavior carefully because the danger of a tort is so small.

**Principal-Monitored Activities.** In activities that belong to this category, principals' and agents' decisions about precautionary behavior depend upon financial incentives to exercise care, and the principal can contractually specify and easily monitor the level of care to be exercised by the agent. Thus, in contrast to decisionmaking in incentive-independent activities, both the principal and the agent choose their precautionary behavior with reference to all of the relevant costs and benefits, and the danger of tort liability is not so minimal that it is irrational to examine the financial incentives created by the tort system.46

**Agent-Monitored Activities.** In activities that belong to this category, decisions about precautionary behavior are influenced by financial incentives to exercise care, but the level of care is under the exclusive control of the agent due to the principal's inability to monitor the agent's precautionary efforts. The agent, however, does consider the relevant costs and benefits in choosing the level of care. The risk of tort liability is not de minimis, and the agent's decisionmaking takes into account the financial incentives created by the tort system.

In typical agent-monitored activities, it is infeasible or prohibitively costly for the principal to observe the behavior of the agent. As a consequence, contractual requirements pertaining to the agent's precautionary behavior are unenforceable, and the agent chooses the level of precautionary behavior solely on the basis of his own financial incentives.47

**Intermediate Activities.** The three categories of activities defined above are not meant to be exhaustive of all possible principal-agent activities. Although incentive-independent activities are a distinct class, principal-monitored and agent-monitored activities are two ends of a continuum. At

46. As an example of a principal-monitored activity, consider a construction project in which the only risk of a tort is the possibility that an unwitting individual may wander onto the site and be injured. The enterprise, comprised of a developer (principal) and a builder (agent), faces the decision of what type of fence, if any, to build around the construction project. Because the parties realize that construction sites are dangerous and accidents frequently occur, they consciously contemplate the costs and benefits of alternative safety precautions. Assuming that the risk of tort liability is not de minimis, then the financial incentives that confront the parties, including those created by the tort system, have an impact on the choice of precautionary behavior. Finally, because the existence of a fence is easily verifiable, the principal can (almost) costlessly monitor the implementation of a contractual requirement that the agent erect a particular type of fence.

47. As an example of an agent-monitored activity, suppose that the operator (agent) of a service station affiliated with a major oil company (principal) is responsible for keeping the station free of safety hazards, such as patches of grease in the service area. Clean-up personnel are costly, and the agent is influenced by financial incentives in choosing the amount of clean-up services to purchase. Moreover, because the risk of tort liability is not de minimis, the financial incentives created by the tort system are among the factors influencing the agent's decision. The principal has only infrequent contact with the agent, however, and hence the principal has no effective way of verifying that the agent keeps the premises consistently free of hazards. The principal cannot monitor the level of care, and the agent can select the level of precautionary behavior with reference only to his own financial incentives.
one end, monitoring is essentially costless, and at the other end, monitoring is infeasible or prohibitively costly. Between these endpoints lie many agency activities in which monitoring is feasible at a significant positive cost that is not always prohibitive. For purposes of the formal model below, however, the abstraction afforded by considering only the endpoints of the continuum is an essential simplification. Once the analysis of the formal model is complete, the results will be generalized to encompass the intermediate cases.

B. Optimal Agency Contracts in the Absence of Vicarious Liability

In the model below, a principal and an agent join to create an enterprise. The components of enterprise profit, exclusive of tort liability, are assumed to be known with certainty at the time the enterprise is formed, and are denoted by \( \pi \). The parties perceive tort liability as a random variable, which is beyond their control in incentive-independent activities, but which can be influenced by expenditures on precautionary behavior in principal-monitored and agent-monitored activities.

In general, the exposure of an enterprise to tort liability depends upon what torts are committed, the damages that they cause, whether injured persons seek recovery, and ultimately, the amount of damages that a court awards. In the analysis that follows, all of these factors are collapsed into a single random variable, \( X \), which represents tort damages payable by the enterprise.\(^{48}\)

In this model, there are two states of nature: a no-accident state in which damages payable, \( X \), are equal to zero, and an accident state in which damages payable are equal to a fixed amount \( x \).\(^{49}\) It is assumed that the principal and the agent seek to maximize their expected utility, which is a function of wealth. The utility functions of the principal and the agent are given by \( V(w) \) and \( U(w) \), respectively, where \( w \) denotes wealth.\(^{50}\) If the negotiated contract is Pareto optimal, as assumed above,

\(^{48}\) \( X \) also includes any litigation or settlement costs.

\(^{49}\) It is important to note several limitations of the model. First, the model implicitly assumes that the enterprise cannot insure against the risk of tort liability. Although the availability of liability insurance may affect the optimal agency contract, a formal extension of the model to allow for insurance would complicate the analysis unnecessarily, and would lead to substantially the same conclusions with regard to the efficient liability rule.

In addition, the model covers only one time period, and it therefore neglects the effects of future opportunities on current behavior (and vice-versa). The model also suppresses some interesting aspects of corporate law and bankruptcy law, such as the ability of the enterprise to limit tort liability through incorporation, and the ability of insolvent individuals to retain a portion of their assets in bankruptcy. While both of these limitations raise interesting economic issues, they do not significantly affect the qualitative results.

\(^{50}\) \( V(w) \) and \( U(w) \) are Von Neumann-Morgenstern utility functions, and their existence requires that the preferences of the principal and the agent satisfy certain axioms. See J. Von Neumann & O. Morgenstern, Theory of Games and Economic Behavior 15-29 (1944) (original exposition of
then no alternative contract can improve the expected utility of both parties.\textsuperscript{51}

Before proceeding, it is necessary to introduce the following additional notation. Let

\[ m_0, y_0 = \text{the initial wealth levels of the principal and agent, respectively;} \]
\[ m_n, y_n = \text{the amount of enterprise income allocated to the principal and agent, respectively, in the no-accident state; and let} \]
\[ m_a, y_a = \text{the amount of enterprise income allocated to the principal and agent, respectively, in the accident state.} \]

The principal and the agent must negotiate a contract under which enterprise income is allocated between the two of them. Because they know that two states of nature can occur, their allocation scheme must provide for a division of enterprise income contingent upon each state of nature. Their negotiations, therefore, produce a set of values for \( m_n, m_a, y_n \) and \( y_a \). In addition, in principal-monitored and agent-monitored activities, the negotiations will determine the level of precautionary behavior. Whatever the outcome of the negotiations, the payoffs to each party must be large enough for that party to find participation in the enterprise worthwhile—each party must find the enterprise at least as attractive as his best alternative.

The allotments of enterprise income to the principal, \( m_n \) and \( m_a \), and to the agent, \( y_n \) and \( y_a \), depend upon their relative bargaining strength. Bargaining strength, however, is not directly relevant to the model or to its policy implications.\textsuperscript{52}

Under the law of fraudulent conveyance, transfers of wealth from the agent to the principal are legally invalid if they render the agent unable to pay damages.\textsuperscript{53} Thus, in the accident state of nature, the agent’s initial wealth, \( y_0 \), cannot be transferred legally to the principal if such a transfer would leave the agent with an amount less than the amount of tort liability, \( x \). If \( x \) is less than \( y_0 \), therefore, the agency contract cannot legally render the agent judgment proof. If \( x \) is greater than \( y_0 \), however, the agent is potentially judgment proof to the extent of \( x-y_0 \), the difference between his tort liability and his initial wealth.

Because the law of vicarious liability raises interesting economic issues

\textsuperscript{51} The Pareto optimality assumption is quite weak in that it implies little more than the collective rationality of the bargaining process. \textit{But see note 40 supra.}

\textsuperscript{52} \textit{See p. 173 supra.}

\textsuperscript{53} \textit{See S. WILLISTON, CONTRACTS § 2013 (3d ed. 1978).}
only if the agent is judgment proof, it is assumed throughout the model that tort liability, \( x \), exceeds the agent's initial wealth, \( y_0 \). Thus, under the law of fraudulent conveyance, no portion of the agent’s initial wealth, \( y_0 \), can be transferred legally to the principal in the accident state, and the agent’s allotment of enterprise income in the accident state, \( y_a \), cannot be negative.  

1. *Optimal Agency Contracts for Enterprises Conducting Incentive-Independent Activities*

Because financial incentives do not affect the level of precautionary behavior in incentive-independent activities, the principal and the agent do not choose the level of precautionary behavior when they negotiate the agency contract. In the negotiation process, the probability of a tort resulting in damages, \( p \), and the magnitude of the damages, \( x \), are treated as constants.  

The expected utility that the principal derives from any agency contract is equal to the probability-weighted average of the utility that he would derive from his wealth if no tort were to occur and the utility that he would derive from his wealth if a tort were to occur. Symbolically, his expected utility is represented by  

\[
E[V(w)] = (1-p)V(y_0 + m_n) + pV(y_0 + m_a)
\]

The expected utility that the agent derives from an agency contract is conceptually similar: a probability-weighted average of the utility of his wealth in each state of nature. Because the agent may be insolvent in the accident state of nature, however, the symbolic representation of the agent’s expected utility is more complex. Specifically, if tort damages, \( x \), exceed the sum of the agent’s initial wealth, \( y_0 \), and the agent’s allocation of income in the accident state, \( y_a \), the agent’s wealth in the accident state is zero. If the reverse relationship holds, then the agent’s wealth in the accident state is positive, equal to \( y_0 + y_a - x \).

Symbolically, the agent’s expected utility is represented by  

\[
E[U(w)] = (1-p)U(y_0 + y_n) + pU(y_0 + y_a - x)
\]

if \( y_0 + y_a \geq x \), or

54. If the agent is not judgment proof, then any Pareto optimal agency agreement in the absence of vicarious liability can be contractually recreated after the imposition of vicarious liability. Thus, vicarious liability has no effect on enterprises that are not judgment proof in the absence of vicarious liability. See p. 185 infra; app. IV infra.

55. Under these circumstances, the agent legally may become partially judgment proof under the agency contract if \( y_a \) is sufficiently small.

56. That is, Prob\((X=x) = p\), and Prob\((X=0) = (1-p)\).
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\[ E[U(w)] = (1-p)U(y_0 + y_n) + pU(0) \]
\[ \text{if } y_0 + y_a < x \]

A Pareto optimal contract requires that each party's expected utility be at a maximum given the level of the other party's expected utility. Thus, given a level of utility for the principal, denoted by \( V^* \) in the model below, a Pareto optimal contract can be found by maximizing the agent's expected utility subject to the constraint that the principal attain the utility level \( V^* \). By varying the choice of \( V^* \), other Pareto optimal contracts can be found, although for purposes of analysis it is sufficient to treat \( V^* \) as an arbitrary parameter.

In addition to the constraint incorporating \( V^* \), there are other constraints on the maximization problem that reflect logically necessary relationships between the choice variables, and there is a constraint that reflects the law of fraudulent conveyance.

Formally, the problem is to:

maximize \( E[U(w)] \) over all possible values of \( m_n, m_a, y_n, y_a \),

subject to the following constraints:

1. \( E[V(w)] \geq V^* \)
2. \( m_a + y_a \leq \pi, m_n + y_n \leq \pi \),
3. \( m_n \leq y_0 + \pi, m_a \leq y_0 + \pi, y_n \leq m_0 + \pi, y_a \leq m_0 + \pi \), and
4. \( y_a \geq 0 \),

where \( V^* \) is the principal's expected utility under the contract, and \( \pi \) is enterprise income.\(^{57} \)

Constraint (1) says that the principal's level of utility must at least equal \( V^* \). Constraints (2) ensure that the contractual allocation of enterprise income in each state of nature does not exceed total enterprise income.\(^{58} \) Constraints (3) ensure that the contractual allocation of enterprise wealth to each party in each state of nature does not exceed the sum of enterprise income and the other party's initial wealth.\(^{59} \) Constraint (4) ensures that the contract does not violate the law of fraudulent conveyance.

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57. In obtaining the solution to this problem, it is assumed that \( U(w) \) and \( V(w) \) are both strictly increasing (the marginal utility of wealth is always positive) and concave (the marginal utility of wealth decreases or remains constant as wealth increases). These assumptions imply that both the principal and the agent are either risk averse or risk neutral. See H. Varian, Microeconomic Analysis 108 (1978).

58. A positive marginal utility of wealth ensures that all enterprise wealth will be allocated to one party or the other, and hence constraints (2) hold with equality at the optimum.

59. It is assumed that the bargaining process renders three of these constraints non-binding. In particular, it is assumed that, at the optimum, \( y_n < m_0 + \pi, y_a < m_0 + \pi, \) and \( m_n < y_0 + \pi . \) In addition, the fraudulent conveyance constraint insures that \( m_a < y_0 + \pi \) at the optimum. Thus, for practical purposes, constraints (3) have no impact on the solution to the problem.

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The solution to this maximization problem is obtained in three stages. First, the optimal solvency contract is derived: the optimal solvency contract is the best contract that the principal and the agent can devise that leaves the agent solvent in the accident state. Second, the optimal judgment-proof contract is derived: the optimal judgment-proof contract is the best contract that the principal and the agent can devise that leaves the agent insolvent in the accident state. Finally, the Pareto optimal contract is found by comparing the optimal solvency contract with the optimal judgment-proof contract. Because the principal receives an expected utility of $V^*$ under both contracts, the contract that provides the agent with the greatest expected utility is the Pareto optimal contract.

The Optimal Solvency Contract. For the agent to be solvent in the accident state, his initial wealth plus his allotment of enterprise income must be sufficient to pay tort damages in full. That is, $y_0 + y_a \geq x$. This fact, coupled with previous assumptions, greatly simplifies the original statement of the optimization problem. Specifically, the optimal solvency contract represents the solution to the following problem:

\[
\text{maximize } E[U(w)] \text{ over all possible values of } y_n, y_a,
\]

subject to the constraints:

\[
E[V(w)] = (1-p)V(m_0 + \pi - y_n) + pV(m_0 + \pi - y_a) \geq V^*
\]

\[
y_0 + y_a \geq x.
\]

If the optimal solvency contract is to be a viable candidate for the Pareto optimal contract, the marginal rate of substitution between

60. See pp. 177-78.
61. The three stage procedure is not merely a matter of expositional convenience. Because the agent's expected utility function is not differentiable at the point $y_0 + y_a = x$, it is mathematically essential to optimize separately over the two subintervals $y_0 + y_a > x$ and $y_0 + y_a < x$, and then to compare the two resultant optima to determine the overall optimum.
62. See notes 58-59 supra, and recall the prior assumption that $x > y_0$. See pp. 177-78 supra.
63. Using Lagrange multipliers $\lambda$ and $\eta$ for the constraint on the principal's utility and the constraint on the agent's allotment of enterprise income in the accident state, respectively, the following conditions characterize the optimal solvency contract:

\[
\begin{align*}
(\text{a}) \quad & (1-p)U'(y_0 + y_n) - \lambda (1-p)V'(m_0 + \pi - y_n) = 0 \\
(\text{b}) \quad & pU'(y_0 + y_a - x) - \lambda pV'(m_0 + \pi - y_a) + \eta = 0 \\
(\text{c}) \quad & y_a \geq x - y_0; \quad \eta (y_0 + y_a - x) = 0 \\
(\text{d}) \quad & (1-p)V(m_0 + \pi - y_n) + pV(m_0 + \pi - y_a) = V^*
\end{align*}
\]

Because the objective function is concave in $y_n$ and $y_a$, and the constraints are convex in $y_n$ and $y_a$, conditions (a)-(d) are necessary and sufficient for a global optimum to the problem of computing the optimal solvency contract. See H. VARIAN, supra note 57, at 258-67. Condition (d) holds with strict equality because the marginal utility of wealth is assumed to be positive. See note 57 supra.
64. The solution to this problem may entail setting $y_a = x - y_0$, but such a solution can never be Pareto optimal because a decrease in $y_a$ below that point would increase the principal's utility without reducing the agent's utility. That is, when $y_a = x - y_0$, a decrease in $y_a$ is, in effect, a transfer from
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wealth in each state of nature must be the same for both parties. That is,

\[
\frac{U'(y_0+y_n)}{U'(y_0+y_a-x)} = \frac{V'(m_0+\pi-y_n)}{V'(m_0+\pi-y_a)}
\]

If this condition is violated, one party can trade income in the no-accident state to the other party in return for income in the accident state, thereby rendering one or both parties better off. This is a classic condition for optimal risk sharing first analyzed in the economic theory of optimal insurance contracts. In this model, as in the theory of optimal insurance contracts, the above condition determines how the risk of tort liability is allocated between the principal and the agent under the optimal solvency contract.

The Optimal Judgment-Proof Contract. In a judgment proof enterprise, all of the agent's wealth is paid to the tort victim as compensation in the accident state of nature. The optimal judgment-proof contract will minimize the agent's gross wealth (exclusive of tort liability) in the accident state, therefore, subject to the law of fraudulent conveyance. Hence, the agent's allotment of enterprise income in the accident state, \(y_a\), will be set as low as possible, thereby maximizing the principal's wealth in the accident state, and minimizing the amount of compensation paid to the tort victim. The agent's income in the no-accident state compensates him for participating in such an arrangement.

Because the law of fraudulent conveyance does not allow the agent to transfer wealth to the principal in the accident state of nature, the agent's allotment of enterprise income in the accident state, \(y_a\), is set equal to zero, and the tort victim receives partial compensation equal to the agent's initial wealth of \(y_0\). The tort victim has a legal entitlement to full compensation of \(x\), however, and hence the optimal judgment-proof con-
tract effectively transfers to the enterprise part of the tort victim’s entitlement.

To complete the characterization of the optimal judgment proof contract, note that once the principal’s utility level $V^*$ is determined, and $y_a$ is set equal to zero in the expression for the principal’s expected utility, that expression becomes a single equation in a single unknown, $y_n$. One can then calculate the agent’s allotment of enterprise income in the no-accident state. That is, $y_n$ satisfies

$$(1-p)V(m_0 + \pi - y_n) + pV(m_0 + \pi) = V^*.$$

The Pareto Optimal Contract. Because the principal receives the same expected utility, $V^*$, under both the optimal solvency contract and the optimal judgment-proof contract, the Pareto optimal contract is the contract that gives the agent the greatest expected utility. Depending upon whether the optimal solvency contract or the optimal judgment-proof contract is chosen, a tort victim will either be fully compensated or partially compensated for his losses. The economic effects of vicarious liability, therefore, depend largely on which of the two contracts is chosen.


In principal-monitored activities, decisions about precautionary behavior depend upon financial incentives, and the parties to the enterprise jointly choose an optimal level of precautionary behavior that the princ-

69. Three factors are especially important to the choice between the optimal solvency contract and the optimal judgment-proof contract.

(i) If both the principal and the agent are risk neutral—that is, if both are concerned exclusively with the expected value of their wealth—then the optimal judgment-proof contract is Pareto optimal because it maximizes the expected net income of the enterprise. This follows from the fact that the optimal judgment-proof contract minimizes the expected value of tort compensation paid by the enterprise, subject to the fraudulent conveyance constraint.

If the agent is risk averse, however, he is willing to accept a reduction in expected wealth to insure against insolvency. If the agent is sufficiently risk averse, therefore, he will prefer the optimal solvency contract to the optimal judgment-proof contract, even though his expected wealth is greater under the latter contract.

(ii) As the loss $x$ increases with the probability of liability fixed at $p$, the expected profit of the enterprise decreases under the optimal solvency contract. To keep the principal at the expected utility level $V^*$, therefore, the agent must give up more and more income under that contract in one or both states of nature. Thus, the larger the potential loss $x$ for a given value of $V^*$, the more likely it is that the parties will prefer the optimal judgment-proof contract to the optimal solvency contract.

(iii) As the agent’s initial wealth $y_0$ increases, holding $x$ constant, the payment to the tort victim under the optimal judgment-proof contract also increases. Thus, as $y_0$ increases, the optimal judgment-proof contract becomes increasingly ineffective as a way for the enterprise to evade tort liability. If the agent is risk averse, the risk-sharing advantages of the optimal solvency contract eventually will dominate. Hence, the larger the value of $y_0$ relative to the potential liability $x$, the more likely it is that the parties will prefer the optimal solvency contract to the optimal judgment-proof contract.

70. See pp. 185-87 infra.
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can enforce upon the agent. In contrast to incentive-independent activities, the parties must decide not only on the allocation of risks in the two states of nature, but also on the magnitude of those risks.

Optimal agency contracts for principal-monitored activities can be determined the same way as optimal agency contracts for incentive-independent activities. In selecting a Pareto optimal contract, the principal and the agent compare the optimal solvency contract, which protects the agent against insolvency in the event of a tort, with the optimal judgment-proof contract, which places the entire risk of tort liability on the agent but compensates him for bearing the attendant risk of insolvency with additional income in the no-accident state of nature.

In both the optimal solvency contract and the optimal judgment-proof contract, the principal and the agent must select the desired level of precautionary behavior. These selections depend upon a comparison between the marginal costs and marginal benefits of precautions under each contract. Once the parties agree upon a level of precautionary behavior, the principal can supervise the agent sufficiently well to insure his adherence to the contract's provisions regarding the appropriate level of care.

3. Optimal Agency Relationships for Enterprises Conducting Agent-Monitored Activities

In agent-monitored activities, financial incentives affect the level of precautionary expenditures, but the principal cannot monitor the agent. Hence, a jointly determined level of precautionary behavior is unenforceable, and the agent will choose the level of precautionary behavior so as to maximize his own utility without taking into account favorable or adverse effects on the principal's utility. For this reason, the Pareto optimal agency contract attainable for principal-monitored activities is generally, though not always, unattainable for agent-monitored activities.

The agency problem in an agent-monitored activity is analogous to the problem faced by insurance companies in the presence of "moral hazard," and it can be treated analytically as a moral hazard problem.

71. See app. II infra (developing agency model for principal-monitored activities).
72. See app. II infra.
74. In the insurance context, the moral hazard problem arises when an insured party takes advantage of an insurance policy by reducing his efforts to avoid the occurrence of events covered by the insurance policy. An extreme example is an act of arson committed for the purpose of collecting on an insurance policy. A less extreme example is a degree of laxity in fire safety precautions attributable to the insured's knowledge that the risk of fire is borne by the insurance company.
75. See, e.g., Holmstrom, Moral Hazard and Observability, 10 BELL J. ECON. 74 (1979); Shavell, Risk Sharing and Incentives in the Principal and Agent Relationship, 10 BELL J. ECON. 55 (1979).
Omitting the formal analysis of optimal agency contracts under moral hazard, the central feature of the problem is that the agent selects the level of precautionary behavior, in a self-serving fashion, after the allocation of enterprise income in the two states of nature has been negotiated. The principal is not blind to the agent's self-serving behavior, however, and the negotiated payoffs to the agent are chosen to motivate him to behave, as much as possible, in accordance with the interests of the principal. Nonetheless, once the agent's payoffs are determined he is free to select precautionary expenditures so that, from his perspective, the marginal benefits of the precautions are commensurate with their marginal costs.

As with incentive-independent and principal-monitored activities, the optimal contract for agent-monitored activities may or may not leave the agent insolvent in the accident state. Thus, in the absence of vicarious liability, the tort victim may or may not receive full compensation.

4. Summary

Whatever the enterprise activity, the absence of vicarious liability affords the principal and the agent an opportunity to execute an optimal judgment-proof contract, which leaves the agent insolvent in the accident state of nature, and which partially evades the tort victim's right to compensation. In return for bearing the entire risk of tort liability under such a contract, the principal compensates the agent with additional income in the no-accident state of nature.

The parties may choose an alternative contract, however, in which the risk of tort liability is distributed between the principal and the agent in accordance with their attitudes toward risk bearing. Such optimal solvency contracts resemble insurance agreements. The principal, in effect, provides the agent with full or partial insurance against the risk of tort liability.

Absent additional assumptions about the preferences and financial positions of the principal and the agent, it is impossible to predict which type of contract they will choose. The optimal judgment-proof contract af-


77. See app. III infra (discussing choice of precautionary behavior by agent in agent-monitored activity).

78. See app. III infra (interpreting conditions that determine agent's choice of precautionary behavior).

79. See note 69 supra (discussing choice between optimal solvency contract and optimal judgment-proof contract in incentive-independent activities).
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...fords to the parties the advantage of partial liability avoidance, but it places the agent in a highly "risky" position that he may be hesitant to accept. The optimal solvency contract, in contrast, spreads the risk between the parties in accordance with their willingness to bear risk, but sacrifices the benefits of liability avoidance.

In addition to this choice between risk distribution and liability avoidance, parties to principal-monitored and agent-monitored activities must select a level of precautionary behavior. In principal-monitored activities, the determination of precautionary behavior is based on the costs and benefits to the principal as well as the costs and benefits to the agent. In agent-monitored activities, however, only the agent's costs and benefits are taken into account. This distinction has important implications for the effects of vicarious liability on the principal-agent relationship, and for the efficiency of vicarious liability as a liability rule.

C. Optimal Agency Contracts Under Vicarious Liability

Under vicarious liability, the principal and the agent are jointly liable for damages, and the optimal judgment-proof contract is unavailable to the enterprise. If the enterprise's total assets are sufficient to cover its potential tort liability, tort victims will be fully compensated. For simplicity, the discussion below assumes that vicarious liability results in full compensation to the tort victim.

For enterprises that choose the optimal solvency contract in the absence of vicarious liability, the imposition of vicarious liability has no effect on the expected utility of the parties or on the level of precautionary behavior that they select. Their preferred contract—the optimal solvency contract—remains available to them, and hence they continue to operate under that contract.

In contrast, the imposition of vicarious liability on enterprises that would otherwise select the optimal judgment-proof contract forces the enterprise to shift to an optimal solvency contract. After the imposition of vicarious liability, the principal is liable for damages equal to the difference between the tort judgment and the amount of damages that the agent can pay. Thus, the principal and the agent must select a new contract from the set of solvency contracts that are available in the absence of...
vicarious liability.

1. The Effects of Vicarious Liability on the Undertaking of Enterprise Activities

For enterprises that would select the optimal judgment-proof contract in the absence of vicarious liability, the imposition of vicarious liability may deter the formation of the enterprise, and thereby eliminate the risk of tort created by enterprise activity. Under a rule of vicarious liability, the tort victim is fully compensated in the accident state of nature. Hence, the expected profitability of the enterprise declines relative to its profitability under the optimal judgment-proof contract. The fact that the parties would have preferred the optimal judgment-proof contract implies that the potential risk-sharing benefits of the new solvency contract are insufficient to compensate the parties for this loss of profitability. Thus, the new contract necessarily yields lower expected utility to either the principal or the agent, or both. Depending upon their opportunity costs, therefore, one or both of the parties may find that the enterprise is no longer worthwhile. If so, the enterprise will not be formed and the attendant risk of tort is avoided.

2. The Effects of Vicarious Liability on Precautionary Behavior

If the enterprise is involved in a principal-monitored or agent-monitored activity, the imposition of vicarious liability can also affect the amount that the enterprise spends on precautionary behavior, but only if the enterprise would select the optimal judgment-proof contract in the absence of vicarious liability.\(^8\) In a principal-monitored activity, the effect of vicarious liability on the level of precautionary behavior is generally indeterminate. If potential tort liability, \(x\), is large relative to the agent’s initial wealth, \(y_0\), however, the enterprise has substantially more wealth at risk under vicarious liability—when the entire tort judgment must be paid—than in the absence of vicarious liability—when only the agent’s initial wealth is available to satisfy the tort judgment. Hence, when \(x\) is large relative to \(y_0\), vicarious liability tends to make precautions more worthwhile to the enterprise\(^8\), and the level of precautionary behavior tends to increase.

In agent-monitored activities, the imposition of vicarious liability gener-

\(^8\) In incentive-independent activities, precautionary behavior is unaffected by financial incentives and the imposition of vicarious liability cannot affect the level of precautions. See p. 174 supra.

\(^8\) See app. V infra (analyzing effect of vicarious liability on precautionary behavior in principal-monitored activity).
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ally reduces the level of precautionary behavior.\textsuperscript{84} Because the principal must pay out a portion of his own wealth in the accident state, vicarious liability tends to reduce the agent's allotment of enterprise income in the no-accident state. In addition, if the parties conclude a risk-sharing agreement that protects the agent from insolvency in the accident state, the agent's incentive to prevent torts is further diminished. Because the agent cannot be monitored in his choice of precautions, the level of precautionary expenditures will fall.

D. Policy Implications

The preceding behavioral analysis of principal-agent relationships under alternative liability rules, when integrated with principles of economic efficiency, has a number of normative implications for the law of vicarious liability. Economic efficiency (social wealth maximization)\textsuperscript{85} requires that if an activity is to be undertaken, the difference between the social benefits and the social costs of the activity must be positive and at a maximum. In other words, an activity is efficient if no alternative use of the productive resources consumed by the activity can produce a greater excess of social benefits over social costs. This criterion has several consequences for the law of vicarious liability.\textsuperscript{86}

1. The Importance of Bargaining Over Risk Allocation

In the models developed above, the principal and the agent bargain over the allocation of tort risks. If bargaining or the opportunity to bargain is absent, however, vicarious liability does not in general promote efficiency. If bargaining is absent because tort risks are not foreseen by the parties, vicarious liability clearly has no effect on the incentives for efficient behavior. But if bargaining is absent because its cost is wholly disproportionate to the value of the enterprise to the parties,\textsuperscript{87} vicarious liability may or may not be efficient. For example, the imposition of vicarious liability may deter the formation of an enterprise if the principal is unwilling to bear a risk about which he has little information, and if neither party is willing to pay the cost of determining and allocating the risk. Such a process of risk allocation is unnecessary in the absence of vicarious liability.

84. See app. VI infra (showing that precautionary behavior declines or remains unchanged when vicarious liability is imposed on agent-monitored activity).
85. See note 10 supra.
86. The discussion ignores the theory of the second best, which applies when other imperfections are present in the economy. See Lipsey & Lancaster, The General Theory of the Second Best, 24 REV. ECON. STUD. 11 (1956).
87. Concededly, the imposition of vicarious liability may make bargaining worthwhile even though it is not worthwhile in the absence of vicarious liability.
Hence, if the enterprise is socially worthwhile, vicarious liability may undermine efficiency. On the other hand, vicarious liability may deter the formation of inefficient enterprises, and all that can be said a priori is that in the absence of bargaining, vicarious liability does not in general promote efficiency. 88

2. Vicarious Liability in the Presence of Bargaining

If the parties have an opportunity to bargain over risk allocation, the efficiency implications of vicarious liability can be analyzed according to the three types of activities considered in the model. Further implications can be deduced concerning activities that lie somewhere in between principal-monitored and agent-monitored activities, along the continuum of costly monitoring. 89

If the opportunity to bargain exists, vicarious liability deters the formation of enterprises in which social costs exceed social benefits, irrespective of the type of activity involved. In the absence of vicarious liability, enterprises may be designed to be judgment-proof. Such enterprises operate without paying the full social costs of enterprise activities, which include the costs of torts caused by the enterprise. 90 By foreclosing the use of judgment-proof contracts, vicarious liability forces enterprises to treat these social costs as costs of doing business, and thereby deters the formation of enterprises in which social costs exceed social benefits.

Thus, for incentive-independent activities, vicarious liability is an efficient rule. Precautionary behavior in such activities is not affected by the liability rule, and hence the only efficiency issue is whether or not the activity should be undertaken. By deterring the undertaking of inefficient activities, vicarious liability unambiguously serves the efficiency goal.

Vicarious liability also promotes efficiency in enterprises that are engaged in principal-monitored activities. It not only deters the formation of such enterprises if their social costs exceed their social benefits, but it also forces the parties to take account of the social costs of torts when choosing the level of precautionary behavior. This ensures that the perceived marginal costs and benefits of precautionary expenditures fully reflect their social costs and benefits. 91

88. The mere presence of bargaining costs does not necessarily inject indeterminacy into the analysis. As long as the bargaining costs are sufficiently low for the parties to ascertain the nature of tort risks and reach agreement on an allocation of those risks, bargaining costs can be largely ignored for purposes of analysis.
89. See pp. 175-76 supra.
90. One can view tort costs as costs of the victims' activities, but the analysis in the text assumes that the tort system optimally allocates losses between tortfeasors and tort victims.
91. As noted earlier, see p. 186 supra, vicarious liability may decrease or increase the level of precautionary expenditures in principal-monitored activities, with an increase especially likely when
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In contrast, it is impossible to say a priori whether vicarious liability promotes efficiency in enterprises that are engaged in agent-monitored activities, despite the fact that it deters the formation of such enterprises if their social costs exceed their social benefits. This ambiguity arises because of the negative effect of vicarious liability on precautionary expenditures in enterprises in which social benefits exceed social costs. For example, if the level of precautionary behavior taken by a judgment-proof enterprise falls short of the social optimum, vicarious liability will usually aggravate the problem by further reducing the agent's incentive to make precautionary expenditures.\(^9\) Of course, if tort damages fully compensate tort victims for their losses, victims will generally prefer vicarious liability to its absence. Because vicarious liability tends to increase the number of torts, however, inefficiency may result from the attendant increase in the social costs of torts, though concededly those costs are borne by tortfeasors rather than by tort victims. Furthermore, because the tort system does not always provide full compensation to victims, victims may collectively prefer to trade compensation under vicarious liability for a lower accident probability. Thus, vicarious liability may even be undesirable from the victim's perspective.

3. Extensions of the Analysis to Intermediate Activities

Because principal-monitored activities and agent-monitored activities represent two endpoints on a continuum,\(^9\) it is important to examine the efficiency implications of vicarious liability for activities in which monitoring is neither trivially costly nor prohibitively costly. These implications may be derived from modest extensions of the arguments developed above. Recall that the efficiency criterion has ambiguous implications for the imposition of vicarious liability in agent-monitored activities because of the presence of moral hazard—the ability of the agent to choose precautionary behavior to maximize his own expected utility without taking into account possible adverse effects on the principal's expected utility. Assume for the moment that moral hazard can be eliminated by the principal at some non-prohibitive positive cost. If the imposition of vicarious liability leads the principal to incur such a cost, then vicarious liability is efficient just as if the activity in question were a principal-monitored activity. Socially inefficient enterprises will not be formed, and precautionary ex-

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the agent's initial wealth, \(y_0\), is small relative to the potential tort liability, \(x\). See note 69 supra; app. V infra. Regardless of whether precautionary expenditures increase or decrease as a result of vicarious liability, however, the change is efficient because vicarious liability eliminates the disparity between private costs and benefits and social costs and benefits.

\(^9\) See pp. 186-87 supra; app. VI infra.

\(^{92}\) See pp. 175-76 supra.
penditures will be chosen with reference to their full social costs and benefits. On the other hand, if the cost of eliminating moral hazard is excessive, it will not be incurred, moral hazard will persist, and the imposition of vicarious liability may not promote efficiency. Hence, the issue is whether vicarious liability will lead the principal to incur the cost necessary to eliminate moral hazard. That cost will be incurred if, from the principal’s perspective, it is sufficiently smaller than the cost of allowing moral hazard to persist. Thus, if the elimination of moral hazard is “cost-effective” for the principal, vicarious liability should be imposed because the activity in question is “reasonably close” to a principal-monitored activity.

Assume now that moral hazard cannot be completely eliminated, but that the principal can nonetheless reduce moral hazard at some positive cost. If the principal incurs such a cost and reduces moral hazard, the difference between the actual precautionary behavior of the enterprise and the precautionary behavior of the enterprise in the absence of moral hazard will be reduced. Concomitantly, the likelihood that vicarious liability will lead to significant inefficiencies is reduced. If moral hazard can be significantly reduced at a reasonably low cost, therefore, vicarious liability again should be imposed because the activity is “reasonably close” to a principal-monitored activity.

4. Implications for the Law of Vicarious Liability

The efficiency analysis above suggests guidelines for the law of vicarious liability. Because efficiency is the sole basis for these guidelines, however, they are subject to the caveat that equity and distributive justice may sometimes support alternative liability rules.

When a tort occurs, efficiency requires that the court first consider whether the principal and the agent had the opportunity to ascertain the nature of tort risks, and to allocate those risks. If such an opportunity was absent, efficiency may or may not result from the imposition of vicarious liability.

If an opportunity for risk allocation between the parties was present, the next task is to classify the activity that generated the tort as incentive-independent, principal-monitored, agent-monitored, or “reasonably close” to principal-monitored or agent-monitored. To this end, the first question is whether or not financial incentives were important to the choice of precautionary behavior. If not, then the activity was incentive-independent,

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94. “Surprise” inspections, for example, may increase the agent’s level of care, but not to the level it would attain if the principal could supervise the agent at all times.

95. Cf. Holmstrom, supra note 75 (analyzing relation between quality of monitoring and extent of parties’ failure to attain “first-best” Pareto optimality); Shavell, supra note 75 (same).
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and the efficiency criterion supports the imposition of vicarious liability.

If financial incentives were important to the choice of precautionary behavior, the next question concerns the ability of the principal to monitor the agent's precautionary behavior. This requires an identification of the cause of the tort, and the precaution or precautions that could have prevented the tort. By examining the relevant precautions, it is possible to ascertain the cost of requiring the agent to undertake such precautions, and thereby to assess the principal's monitoring capability. Of course, innumerable factual considerations may serve as indicia of monitoring capability in this context.⁹⁶

If the principal had the ability to monitor the agent's choice of precautions at little or no cost, or to monitor the agent's precautions at a reasonably low cost, then the activity was principal-monitored or reasonably close to principal-monitored. Once again, efficiency supports the imposition of vicarious liability. In contrast, if the principal lacked the ability to monitor the agent's precautionary behavior at all, or without incurring unreasonably high costs, then the activity was agent-monitored or reasonably close to agent-monitored. Because vicarious liability may undermine efficiency in such activities, the efficient legal rule is unclear. Thus, there is some justification for declining to hold the principal liable for the agent's torts.

III. Implications of the Model: The Concept of Control

Under current law, the primary criterion for the imposition of vicarious liability is the "control test." According to the efficiency analysis above, however, control is a compelling basis for vicarious liability only in certain activities and only if control is interpreted as the ability of the principal to monitor the precautionary behavior of the agent. The existing control test is not in accord with these conclusions, although to some extent the weaknesses in the test have been circumvented by the creation of an exception for inherently dangerous activities.

⁹⁶. To give a few examples, if the precaution is a one-time act—such as the construction of a fence—then the principal needs only a single act of observation to verify the use of the precaution. Typically, the cost of a single observation of the agent's behavior is low, so the classification of the associated activity as principal-monitored is often appropriate. Alternatively, if the precaution requires a continuous pattern of careful behavior—such as the careful wiring of each electrical connection in a large building—then monitoring requires continuous observation. Such a pattern of observation may be quite costly, and classification of the associated activity as agent-monitored is often appropriate unless the principal is normally in such close proximity to the agent that continuous observation is reasonably inexpensive, or unless a reasonably inexpensive and effective "spot-inspection" system is available.

Of course, some precautions may involve the use of highly technical skills or devices that are beyond the understanding of the principal. Activities requiring such precautions are likely to be agent-monitored activities regardless of whether monitoring requires a single or a continuous observation of the agent's behavior.
A. The Control Test

The factors that are taken into account by the control test often do not capture the presence or absence of monitoring capability. Indeed, many of the factors examined by the courts have nothing whatsoever to do with monitoring. To the extent that the factors considered by the courts may sometimes bear on monitoring capability, they nonetheless should not be considered unless the nature of the relevant precautions suggests their relevance. Even when courts examine potentially relevant factors, they do not consistently discriminate between principal-monitored and agent-monitored activities.

Moreover, efficiency analysis suggests that the principal’s ability to monitor the agent’s precautionary behavior is irrelevant if financial incentives do not affect the level of precautions—that is, if the agent conducts an incentive-independent activity. Regardless of the degree of monitoring capability, vicarious liability should always be imposed in such activities; the use of the control test can only lead to inefficient denials of vicarious liability.

Finally, the control test is applied whether or not the principal and the agent have a reasonable opportunity consciously to allocate the risk of torts. If the absence of conscious risk allocation is due to the unforeseeability of the risk, vicarious liability neither promotes nor undermines efficiency; if the absence of conscious risk allocation is due to the high costs of investigating and negotiating over the risk, vicarious liability may or may not undermine efficiency. In either case, the control test is inappro-

97. See Sam Horne Motor & Implement Co. v. Gregg, 279 S.W.2d 755 (Ky. 1955) (auto dealer held liable for negligent driving of auto salesman partly because dealer owned automobile). But see Throop v. F.E. Young & Co., 94 Ariz. 146, 382 P.2d 560 (1963) (defendant corporation held not liable for salesman’s motor vehicle tort because defendant could not exercise control over salesman’s method of driving).

98. See note 96 supra.

99. See p. 188 supra.

100. See, e.g., Throop v. F.E. Young & Co., 94 Ariz. 146, 382 P.2d 560 (1963); Sam Horne Motor & Implement Co. v. Gregg, 279 S.W.2d 755 (Ky. 1955); Glynn v. M.F.A. Mut. Ins. Co., 363 Mo. 896, 254 S.W.2d 623 (1953). All of these cases involved motor vehicle accidents caused by the negligence of someone within the defendant principal’s employ. Liability or non-liability in each case was predicated on the court’s application of the control test, but an issue of great importance in each case should have been whether the activity of driving was an incentive-independent activity. Many auto accidents probably involve momentary carelessness rather than conscious decisions not to exercise due care. In such cases, the financial incentives created by the liability rule will not have a significant effect on the precautions taken to prevent accidents. Monitoring capability is therefore immaterial to the efficient liability rule for such cases, see p. 188 supra, and vicarious liability should be imposed as long as the parties have had a reasonable opportunity to foresee and allocate the risks of auto accident liability. See pp. 187-88 supra.

101. Conceivably, vicarious liability may promote efficiency in these cases by creating incentives for the conscious allocation of risk, but this possibility is speculative and does not provide a clear justification for vicarious liability when risk allocation costs are inordinately high.

102. See pp. 187-88 supra.
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appropriate, and its legal implications bear no predictable relationship to economic efficiency.

Concededly, the problems with the control test do not always lead to outcomes that differ from the outcomes that would be achieved if the principles in this Note were followed. Nonetheless, because the concept of control is ill-defined and often inappropriately applied, the control test frequently generates objectionable results.

Service Station Tort Cases and the Control Test. The problems with the control test are illustrated by the case law concerning the liability of parent oil companies for the torts of service station operators and their employees. When a service station operator or one of his employees commits a tort, the victim frequently seeks recovery from the station operator's principal—the parent oil company. The oil companies often contest their liability in these cases, and the outcome usually turns upon the courts' application of the control test.

Frequently, the courts find that the oil company has insufficient control over the station operator to justify the imposition of vicarious liability. Among the factors that the courts cite as indicative of a lack of control are the operator's control over the hours of operation, the hiring and firing of employees, and the prices charged for products. Courts that find control on the part of the oil companies cite such factors as exclusive sales agreements, clean restroom clauses in the franchise agreements, and opportunities for the oil companies to suggest retail prices. None of the factors noted above, however, relate closely or consistently to the ability of oil companies to monitor the precautionary behavior of service station op-

103. See Sam Homr Motor & Implement Co. v. Gregg, 279 S.W.2d 755 (Ky. 1955). Vicarious liability was imposed in this case based upon a concept of control that was inconsistent with the concept of control developed in this Note. See note 100 supra. The decision to impose vicarious liability may have been warranted under the principles in this Note, however, if the activity of driving was an incentive-independent activity.

104. Cf. Davis, Service Station Torts: Time for the Oil Companies to Assume Their Share of the Responsibility, 10 CAL. W. L. REV. 382 (1975) (survey of service station cases including discussion of control test); Toner, Liability of Oil Companies for the Torts of Service Station Operators, 7 LAND & WATER L. REV. 263, 264 (1972) (same).

105. In one annotation, about two-thirds of approximately sixty cases held that, as a matter of law, the service station operator was an independent contractor. Most of the remaining cases held that a jury question existed as to the status of the operator as servant or independent contractor. Annot., 83 A.L.R.2d 1282 (1962).


operators. Whether the tort is caused by a patch of grease,\textsuperscript{112} exploding gasoline,\textsuperscript{113} faulty repairs,\textsuperscript{114} or some other condition attributable to the operator's negligence,\textsuperscript{115} the ability of the oil company to control factors such as hours of operation, prices and restroom cleanliness has minimal bearing on its ability to monitor behavior that would reduce the risk of tort liability. Even a factor such as the ability to hire and fire employees, which may be relevant to monitoring capability, should not be considered by a court unless the nature of the relevant precautions suggests its importance.

Moreover, another important question—whether financial incentives have an effect on the level of precautionary behavior—is not addressed in any of the service station cases. Thus, the law that courts apply in these cases is inconsistent with the efficiency analysis in this Note, and the results in the cases bear little relationship to the decision criteria suggested above.\textsuperscript{116}


\textsuperscript{113} E.g., BP Oil Co. v. Mabe, 279 Md. 632, 370 A.2d 554 (1976); Elkins v. Husky Oil Co., 153 Mont. 159, 455 P.2d 239 (1969).

\textsuperscript{114} E.g., Levine v. Standard Oil Co., 249 Miss. 651, 163 So.2d 750 (1964); Coe v. Esau & Continental Oil Co., 377 P.2d 815 (Okla. 1963).


\textsuperscript{116} Consider the case of Hoover v. Sun Oil Co., 58 Del. 553, 212 A.2d 214 (1965), in which the operator was found to be an independent contractor. In Hoover, the plaintiff's car caught fire while being fueled by the defendant's service station attendant. The court held that the oil company lacked control over the operator because of the operator's control over the hours of the station's operation and the pay scales of the employees, and because of the lack of a contractual obligation on the part of the operator to follow the business advice of an oil company sales representative.

Had the court focused directly on the ability of Sun Oil to monitor the fueling of each automobile that visited the station, it undoubtedly would have concluded that such an ability was absent. Monitoring ability may have been irrelevant, however, because the activity of dispensing gasoline may have been an incentive-independent activity—financial incentives may have had no bearing on the attendant's level of care prior to the fire. If so, then the denial of vicarious liability was unambiguously inefficient in \textit{Hoover} despite the absence of monitoring ability.

In contrast to \textit{Hoover}, consider Humble Oil & Refining Co. v. Martin, 148 Tex. 175, 222 S.W.2d 995 (1949), which arose from the following sequence of events. A customer drove into the defendant's station and parked her car for repairs. Before the station attendants had an opportunity to begin repairs on the vehicle, it rolled down a hill and struck a pedestrian. The jury found that the station attendants were negligent for failing to inspect the emergency brake and for leaving the car unattended. The jury then applied the control test and found the station operator to be a servant of Humble. On appeal, the court held that because Humble furnished the station with certain equipment, conducted widespread advertising on behalf of its stations, supplied a portion of the station's operating costs, and required the operator to perform miscellaneous duties, there was sufficient evidence of control to support the jury verdict.

None of these factors, cited by the court as evidence of control, demonstrates Humble's ability to monitor effectively the use of precautions that would have avoided the tort. It is virtually inconceivable that a parent oil company could effectively require its agent, the station operator, to inspect promptly the parking brake on every vehicle brought in for service.

The accident that gave rise to the \textit{Martin} litigation, however, probably was not attributable to calculated imprudence on the part of the operator. If so, the activity that gave rise to the tort was an incentive-independent activity, and the court's decision to impose vicarious liability was an unambiguously efficient outcome in the case despite the fact that Humble could not monitor the station operator.
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B. The Inherently Dangerous Activity Exception to the Independent Contractor Rule

Generally, employers are not liable for the torts of their independent contractors, but several exceptions to this rule have developed, including an exception for torts that are committed during the course of an inherently dangerous activity. Inherently dangerous activity cases may be divided roughly into two categories.

The first category consists of cases in which the activity of the defendant's independent contractor creates an unusual risk, recognizable in advance, for which special precautions are required to prevent an undue risk of harm. In many of these cases, special precautions are needed prior to the time the risky activity is undertaken.

In cases that belong to this first category, the principal can exert considerable control over the use of precautions without incurring substantial costs. If the risks of torts are recognizable in advance, and special precautions are available to mitigate those risks, then appropriate precautions can be contractually required by the principal. Most importantly, if the agent must undertake specific, one-time precautions prior to or during the course of the activity, the principal typically has an opportunity costlessly or inexpensively to verify the agent's use of precautions. This group of inherently dangerous activities, therefore, corresponds closely to principal-monitored activities, and the imposition of vicarious liability is consistent with the efficiency analysis developed above.

The second category of inherently dangerous activity cases are those involving ultrahazardous activities. Activities falling into this category are considered dangerous regardless of the precautions taken. Individuals

117. See note 17 supra.
118. See W. PROSSER, supra note 1, at 472.
119. The inherently dangerous activity exception arose from the English case of Bower v. Peate, 1 Q.B.D. 321 (1876), cited in W. PROSSER, supra note 1, at 472, in which a principal was held liable when his independent contractor negligently undermined the foundation of an adjacent building during the course of an excavation. Following Bower, the Restatement of Torts provides an exception to the independent contractor rule for activities that are likely to be dangerous unless special precautions are taken. RESTATEMENT (SECOND) OF TORTS § 416 (1965).
120. W. PROSSER, supra note 1, at 472.
121. Construction or repair work on buildings adjacent to a public highway is inherently dangerous. See, e.g., Whalen v. Shivek, 326 Mass. 142, 93 N.E.2d 393 (1950); Rohls v. Weil, 271 N.Y. 444, 3 N.E.2d 588 (1936). Before such work begins, precautions are required to redirect endangered traffic, and to protect passing pedestrians.
122. The demolition of a highway or brick wall is regarded as inherently dangerous. See, e.g., Bonczkiewicz v. Merberg Wrecking Corp., 148 Conn. 573, 172 A.2d 917 (1961); Hevel v. Stangier, 238 Ore. 44, 393 P.2d 201 (1964). Before demolition begins, the area should be roped or fenced off, and signs should be posted, to prevent individuals from accidentally wandering into danger. Such precautions are easily verifiable by a principal, who therefore has considerable control over their utilization.
123. See note 32 supra.
who conduct such activities are normally subject to strict liability.\textsuperscript{124}

These cases also are consistent with the efficiency analysis developed above, perhaps not because of the principal's ability to monitor precautionary activity, but because precautionary behavior cannot eliminate the serious risks of harm in such activities. Hence, to the extent that activities in this group do not resemble principal-monitored activities, they have the characteristics of incentive independent activities,\textsuperscript{125} and vicarious liability is the efficient liability rule.

Conclusion

The efficiency analysis in this Note provides a normative framework within which to administer the law of vicarious liability, subject of course to any countervailing equitable considerations. Concededly, the framework admits to some indeterminacy, but it identifies the crucial factors: the existence of an opportunity for conscious allocation of tort risks between the principal and the agent, the effects of financial incentives on precautionary behavior, and the ability of the principal to monitor the precautionary behavior of the agent.

In analyzing the issues in a particular case, a court should first ask whether the principal and the agent knew or should have known of the risks inherent in the activity that caused the tort, and whether they had a reasonable opportunity to allocate those risks. If the answer to either question is negative, efficiency analysis provides little or no guidance to the court, and equitable considerations alone should dictate the outcome.

If the answers to both questions are affirmative, however, the court should ask next whether the level of precautionary behavior was sensitive to the financial incentives facing the enterprise. If not, then vicarious liability is clearly the efficient liability rule.

If the court finds that financial incentives were important to the choice of precautionary behavior, the next question is whether the principal had the ability to monitor the agent's precautionary behavior. If the principal was able to monitor the agent reasonably well, then vicarious liability is the efficient rule. If the principal lacked a reasonable monitoring capabil-

\textsuperscript{124} W. PROSSER, \textit{supra} note 1, at 472.

\textsuperscript{125} To be sure, the risks of ultrahazardous activities may be reduced by precautions, but substantial risks remain. If, because of the high degree of danger, the available precautions in these activities are taken regardless of the liability rule (that is, the liability rule does not affect the marginal incentives for precautions), then ultrahazardous activities are incentive-independent under the definition given above, \textit{see} p. 174 \textit{supra}, and vicarious liability is the appropriate liability rule. If the available precautions are sensitive to financial incentives, however, they probably involve single observable acts at particular points in time. If so, the principal can exercise control over the precautions, and the activity is most likely a principal-monitored activity. Again, vicarious liability is the appropriate liability rule.
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ity, however, vicarious liability may be inefficient. It deters the formation of enterprises in which social costs exceed social benefits, but it also tends to increase the number of torts, perhaps to the detriment of efficiency, by diluting the agent’s incentives for precautionary behavior. A decision not to impose vicarious liability in these circumstances is not irrational under the efficiency criterion.

The existing law of vicarious liability departs significantly from this framework. Courts have not employed the control test in a way that consistently captures the principal’s ability to monitor the agent’s precautionary behavior. Moreover, they apply the control test when the issue of monitoring capability is, from the standpoint of efficiency, immaterial to the issue of whether to impose vicarious liability. To some extent, however, the law has circumvented these characteristics of the existing control test by creating the inherently dangerous activities exception, which is generally consistent with the normative principles in this Note.

Appendix I. The Importance of Liability Rules

Liability rules are important for two reasons. First, they represent an assignment of entitlements; if individual A is liable to individual B in tort, B has, in effect, an entitlement to the status quo upset by the tort. See Calabresi and Melamed, Property Rules, Liability Rules and Inalienability: One View of the Cathedral, 85 Harv. L. Rev. 1089, 1093 (1972). As entitlements, liability rules have significant distributional consequences.

Liability rules are also important because, in the presence of market failure, they may affect economic efficiency by creating incentives for efficient or inefficient behavior. See G. Calabresi, The Costs of Accidents (1970). If society can act collectively in a costless fashion, however, or if the market can replicate the results of collective action, economic efficiency will be achieved regardless of the choice of a liability rule. See Coase, The Problem of Social Cost, 3 J. L. Econ. 1 (1960) (original statement of “Coase theorem”). Accordingly, the efficiency analysis of alternative liability rules in this Note presumes both a failure of collective action and a failure of the market to replicate collective action.

A. Failure of Collective Action

Suppose, for purposes of illustration, that a totally judgment-proof agent who is employed by a wealthy principal contemplates an activity that, with certainty, will impose a cost of $x on society. Suppose further that both the principal and the agent are interested solely in maximizing the expected profits of the enterprise, which will be split between them in some predetermined way.

Under a rule of vicarious liability, the principal is liable to society for the entire $x in damages, and the enterprise will undertake the activity only if its gross contribution to profit exceeds $x. In the absence of monopoly power, externalities, or other market imperfections, economic efficiency is achieved because the activity will be undertaken only if its social benefit exceeds its social cost of $x.

In the absence of vicarious liability, but with costless collective action, society will recognize that the agent is unable to pay damages, and therefore will offer the enterprise a "bribe" of up to $x not to engage in the activity. Once again, the enterprise will undertake the activity only if its gross contribution to profit exceeds $x, and economic efficiency is achieved. Thus, with costless collective action, either liability rule is consistent with efficiency.

Contrary to the basic assumption of the analysis above, however, collective action of the sort necessary to generate the "bribe" is obviously quite costly, especially when the number of potential tort victims is large. Consequently, collective bribes will rarely be offered, and in the absence of vicarious liability, the enterprise will undertake the activity if its gross profits exceed the amount of the agent's assets available for the satisfaction of a tort judgment. Hence, the enterprise may undertake the activity even if it is socially inefficient.

B. Failure of the Market to Replicate Collective Action

Despite the failure of collective action, a market solution to the efficiency problem may emerge. Suppose that torts occur only during or after some voluntary transaction in which an enterprise sells goods or services to a tort victim—for example, a tort caused by the failure of an auto mechanic to bolt on a customer's wheels. Assume that all enterprises are run by judgment-proof agents, and that there is no vicarious liability. If the market conveys perfect information about the propensity of each enterprise to commit torts, then relatively "safe" enterprises are able to charge higher prices than relatively "unsafe" enterprises, the difference reflecting the lower expected cost to customers of a transaction with the "safe" enterprise. Thus, appropriate incentives for safety are created, because each enterprise realizes that unsafe behavior is penalized in the form of lost profits equal to the expected social cost of such behavior. In essence, the market replicates the results of collective action by offering the enterprise a "bribe" to behave safely, and economic efficiency is attained even though judgment-proof enterprises are unable to pay tort damages.

Like the collective action solution, however, this type of market solution to the problem of judgment-proof agents is beset with difficulties that suggest the importance of the proper liability rule. First, this solution cannot work in the absence of a voluntary market transaction between the enterprise and the tort victim. Hence, for example, it does not provide incentives for judgment-proof contractors to avoid injuries to children playing near a construction site. Second, it assumes a quality and quantity of information in the market that is rarely present. Cf. Akerlof, The Market for Lemons: Qualitative Uncertainty and the Market Mechanism, 84 Q.J. ECON. 488 (1970) (discussing effects of poor information on operation of markets).

In summary, the efficiency problems created by judgment-proof enterprises are unlikely to be solved by the market. Liability rules can be used to promote efficiency, therefore, as well as to promote an equitable distribution of wealth.
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Appendix II. Optimal Agency Contracts for Principal-Monitored Activities

For simplicity, assume that precautionary behavior takes the form of dollar expenditures on precautions, denoted by \( e \). There is no loss of generality in assuming that the agent incurs all precautionary expenditures, because the agent's share of enterprise income in each state of nature can be adjusted to compensate. In addition, assume that precautionary expenditures affect the probability of the tort but not the magnitude of damages. Then, let \( p(e) \) be the probability of the accident. The remainder of the notation is consistent with the model of agency contracts for incentive-independent activities. See pp. 176-82 supra.

The final assumption concerns the shape of \( p(e) \). It is realistic and mathematically useful to assume that precautionary expenditures reduce the probability of the tort at a decreasing rate. That is, \( p(e) \) reflects diminishing returns to precautionary expenditures. This assumption implies that \( p(e) \) is decreasing and convex (\( p''(e) < 0 \) and \( p''(e) > 0 \)).

Under these assumptions, the expected utility of the principal is given by

\[
E[V(w)] = [1-p(e)]V(m_0 + m_n) + p(e)V(m_0 + m_a)
\]

The expected utility of the agent is given by

\[
E[U(w)] = [1-p(e)]U(y_0 + y_n - e) + p(e)U(y_0 + y_a - e)
\]

for values of \( y_a \) and \( e \) such that \( y_a - e \geq x - y_0 \), and

\[
E[U(w)] = [1-p(e)]U(y_0 + y_n - e) + p(e)U(0)
\]

for values of \( y_a \) and \( e \) such that \( y_a - e < x - y_0 \).

The Pareto optimal contract is found as the solution to the following problem:

maximize \( E[U(w)] \) over all \( m_n, m_a, y_n, y_a, e \)

subject to the constraints:

(A1) \( E[V(w)] \geq V^* \),

(A2) \( m_a + y_a = \pi; m_n + y_n = \pi \),

(A3) \( y_n = m_0 + \pi; y_a = m_0 + \pi; m_n = y_0 + \pi - e; m_a = y_0 + \pi - e \), and

(A4) \( y_a \geq 0 \).

which have the same interpretation as those for incentive-independent activities. See pp. 179-80 supra.

Utilizing the assumptions employed above, see notes 58-59 supra, constraints (A2) always hold with equality (\( m_n = \pi - y_n \) and \( m_a = \pi - y_a \)), and constraints (A3) never hold with equality. As shown below, the fraudulent conveyance constraint may or may not hold with equality.

A. The Optimal Solvency Contract

If the agent is to be solvent in the accident state, then \( y_a > 0 \) (assuming \( x > y_0 \)). Thus, aside from the constraint on the principal's utility level, the only constraint on the optimization problem is the solvency constraint given by \( y_0 + y_a - x - e \geq 0 \).
The problem of finding the optimal solvency contract now can be stated as:

$$\text{maximize } E[U(w)] \text{ over all } y_n, y_a, e,$$

subject to

$$E[V(w)] \geq V^*$$

$$y_0 + y_a - x - e \geq 0$$

Using Lagrange multipliers $\lambda$ and $\eta$ for the constraint on the principal's utility and the solvency constraint, respectively, the following five conditions are necessary for an optimum:

1. $$[1-p(e)]U'(y_0 + y_n - e) - \lambda [1-p(e)]V'(m_0 + \pi - y_n) = 0$$
2. $$p(e)U'(y_0 + y_a - x - e) - \lambda p(e)V'(m_0 + \pi - y_a) + \eta = 0$$
3. $$p'(e)[U(y_0 + y_n - e) - U(y_0 + y_n - e)]$$
   $$+ \lambda p'(e)[V(m_0 + \pi - y_n) - V(m_0 + \pi - y_n)] \leq$$
   $$[1-p(e)]U'(y_0 + y_n - e) + p(e)U'(y_0 + y_a - x - e) + \eta$$

Condition (3) holds with equality if $e > 0$ at the optimum.

4. $$y_0 + y_a - x - e \geq 0; \eta (y_0 + y_a - x - e) = 0$$

Finally, because the marginal utility of wealth is positive for both parties, $\lambda > 0$, and hence

5. $$[1-p(e)]V(m_0 + \pi - y_n) + p(e)V(m_0 + \pi - y_a) = V^*$$

Conditions (1), (2), (4) and (5) are conceptually equivalent to conditions (a)-(d), see note 63 supra, and they have the same basic implications for optimal risk sharing between the principal and the agent. See note 67 supra.

The crucial difference between this problem and the parallel problem for incentive-independent activities lies in condition (3), which determines the optimal choice of $e$ given $y_n$ and $y_a$. The left hand side of (3) represents the marginal benefit of precautionary expenditures—the marginal gain in the expected utility to both parties from a marginal expenditure on precautions. The right hand side represents the marginal cost of precautionary expenditures—the marginal decrease in the agent's expected utility from a marginal dollar spent on precautions. Thus, condition (3) states that, at the optimum, the marginal benefit of precautionary expenditures is no greater than the marginal cost, and is equal to the marginal cost if precautionary expenditures are positive.

**B. The Optimal Judgment Proof Contract**

The optimal judgment-proof contract requires that $y_a$ be as small as possible given the fraudulent conveyance constraint and the level of precautionary behavior. This fact implies that $y_a = 0$ if $e \leq y_0$ at the optimum, or $y_a = e - y_0$ if $e > y_0$ at the optimum. Larger values of $y_a$ would decrease the principal's utility without increasing the agent's utility because the increment in $y_a$ would be paid
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entirely to the tort victim as compensation.

The determination of the optimal judgment-proof contract is more complex than in the case of incentive-independent activities, however, because the parties must choose the optimal value of \( e \). It is necessary, therefore, to solve the following problem:

\[
\max \mathbb{E}[U(w)] = [1-p(e)]U(y_0 + y_n - e) + p(e)U(0) \text{ over all } y_n, e,
\]

subject to \( \mathbb{E}[V(w)] \geq V^* \).

The necessary conditions are:

\[
(6) \quad [1-p(e)]U'(y_0 + y_n - e) - \lambda [1-p(e)]V'(m_0 + \pi - y_n) = 0
\]

\[
(7) \quad p'(e)[U(0) - U(y_0 + y_n - e)] + \lambda p'(e)[V(m_0 + \pi) - V(m_0 + \pi - y_n)] \leq [1-p(e)]U'(y_0 + y_n - e)
\]

if \( e \leq y_0 \) at the optimum, or

\[
(7)' \quad p'(e)[U(0) - U(y_0 + y_n - e)] + \lambda p'(e)[V(m_0 + \pi - y_0) - V(m_0 + \pi - y_n)] \leq [1-p(e)]U'(y_0 + y_n - e) + \lambda p(e)V'(m_0 + \pi - e + y_0)
\]

if \( e > y_0 \) at the optimum, and

\[
(8) \quad [1-p(e)]V(m_0 + \pi - y_n) + p(e)V(m_0 + \pi - y_a) = V^*
\]

where \( y_a = 0 \) if \( e \leq y_0 \) at the optimum, and \( y_a = e - y_0 \) if \( e > y_0 \) at the optimum.

Condition (7) holds with equality if the optimal value of \( e \) lies between 0 and \( y_0 \), and condition (7)' holds with equality if the optimal value of \( e \) is greater than \( y_0 \).

Conditions (7) and (7)' have essentially the same interpretation as condition (3). They state that if the optimum falls interior to the relevant interval \([0 < e < y_0\) in the case of (7), \( e > y_0 \) in the case of (7)']\), then the marginal cost of precautionary expenditures is equal to their marginal benefit. If the optimal value of \( e \) falls at the lower boundary of the relevant interval \([e = 0\) in the case of (7), \( e = y_0 \) in the case of (7)']\), then marginal benefit must be less than or equal to marginal cost at that point.

C. The Pareto Optimal Contract

The principal and the agent compare the optimal solvency contract to the optimal judgment-proof contract, and select the one that maximizes the agent’s utility given the value of \( V^* \). Again, one cannot say a priori which one the parties will prefer. Their choice has important implications, however, for the level of precautionary behavior. Moreover, the effects of vicarious liability on the level of precautionary behavior depend critically upon which of the two contracts is preferred in the absence of vicarious liability. See app. IV \textit{infra}; app. V \textit{infra}.

The factors relevant to the choice between the optimal solvency contract and the optimal judgment-proof contract are essentially the same as those relevant in the case of incentive-independent activities. See note 69 \textit{supra}. Specifically, the more risk averse the agent, the more likely it is that the optimal solvency contract
will be chosen. If both parties are risk neutral (expected profit maximizing), then the optimal judgment-proof contract is chosen because it maximizes the expected value of total enterprise wealth.

In addition, the larger the value of $x$ (other things equal), the greater is the incentive to choose a judgment-proof contract and thereby to avoid a substantial portion of tort liability. Concomitantly, the smaller the value of $y_0$, the lower is the utility to the agent of the optimal solvency contract, and the more likely it is that the parties will choose the judgment-proof contract.

Appendix III. The Determination of Precautionary Behavior in Agent-Monitored Activities

Absent supervision by the principal, the agent chooses the level of precautionary expenditure, $e$, to maximize his expected utility, contingent on the values of $y_n$ and $y_a$ established in the agency contract. Suppose that $y_n$ and $y_a$ are the agent’s payoffs under a particular contract. Then, the agent chooses $e$ to

$$\maximize \ E[U(w)]$$

subject to $y_n = y_n; y_a = y_a$.

There are two possible solutions to this problem:

i. At the optimum, the agent’s wealth in the accident state is positive. If the agent has positive wealth in the accident state, then $y_0 + \hat{y}_a - x - e > 0$. Thus, $e$ must have been chosen so that this inequality holds. The necessary condition corresponding to such a choice of $e$ is given by:

$$-p'(e)U(y_0 + \hat{y}_n - e) \leq [1 - p(e)]U'(y_0 + \hat{y}_n - e)$$

$$+ p(e)U'(y_0 + \hat{y}_a - x - e) - p'(e)U(y_0 + \hat{y}_a - x - e)$$

Condition (9) holds with equality when $0 < e < y_0 + \hat{y}_a - x$.

ii. At the optimum, the agent’s wealth in the accident state is zero. Insolvency in the accident state implies that $y_0 + \hat{y}_a - x - e \leq 0$. The necessary condition for optimality under these circumstances is given by:

$$-p'(e)U(y_0 + \hat{y}_n - e) \leq [1 - p(e)]U'(y_0 + \hat{y}_n - e) - p'(e)U(0)$$

Condition (10) holds with equality when $e > \max(0, y_0 + \hat{y}_a - x)$.

The interpretation of conditions (9) and (10) is completely analogous to the interpretation of condition (3) in Appendix II. Each left-hand side represents the marginal benefit of precautions, and each right-hand side represents the marginal cost of precautions.

Appendix IV. The Effects of Vicarious Liability on Enterprises That Prefer the Optimal Solvency Contract in the Absence of Vicarious Liability

This appendix proves that if an enterprise prefers the optimal solvency contract in the absence of vicarious liability, the imposition of vicarious liability will have no effect on the optimal contract. See p. 185 supra. In the interest of brevity, the
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analysis is limited to incentive-independent activities, but it can be extended to cover all of the activities discussed in the text.

After the imposition of vicarious liability, let the agent’s payoffs in the accident and no-accident states be denoted as $\hat{y}_a$ and $\hat{y}_n$, respectively. Net enterprise income is $\pi$ in the no-accident state and $\pi-x$ in the accident state. The Pareto optimal contract represents the solution to the following problem:

$$\begin{align*}
\text{maximize } & \mathbb{E}[U(w)] = (1-p)U(y_0 + \hat{y}_n) + pU(y_0 + \hat{y}_a), \\
\text{subject to:} & \mathbb{E}[V(w)] = (1-p)V(m_0 + \pi - \hat{y}_n) + pV(m_0 + \pi - x - \hat{y}_a) \geq V^* \\
\hat{y}_a & \geq -y_0
\end{align*}$$

and subject to other constraints that are assumed to be non-binding. See note 59 supra. Of course, under vicarious liability, the fraudulent conveyance constraint does not restrict the choice of $\hat{y}_a$.

Let $\lambda$ be the multiplier for the constraint on the principal’s utility, and let $\eta$ be the multiplier for the constraint on $\hat{y}_a$. Under prior assumptions, see note 63 supra, the following conditions are necessary and sufficient for a global optimum:

$$\begin{align*}
(a)'' & (1-p)U'(y_0 + \hat{y}_n) - \lambda (1-p)V'(m_0 + \pi - \hat{y}_n) = 0 \\
(b)'' & pU'(y_0 + \hat{y}_a) - \lambda pV'(m_0 + \pi - x - \hat{y}_a) + \eta = 0 \\
(c)'' & \hat{y}_a \geq -y_0 ; \eta (y_0 + \hat{y}_a) = 0 \\
(d)'' & (1-p)V(m_0 + \pi - \hat{y}_n) + pV(m_0 + \pi - x - \hat{y}_a) = V^*
\end{align*}$$

Note the implicit assumption that $m_0 + \pi - x - \hat{y}_a$ is strictly positive at the optimum because of the constraint on the principal’s utility.

Compare conditions (a)'' - (d)'' with conditions (a) - (d) in note 63 supra. Let $y^*_n$, $y^*_a$ be the solution to conditions (a) - (d), and let $\hat{y}^*_n$, $\hat{y}^*_a$ be the solution to conditions (a)'' - (d)''. If $V^*$ in condition (d) equals $V^*$ in condition (d)'', then $\hat{y}^*_n = y^*_n$ and $\hat{y}^*_a = y^*_a - x$. In other words, if the bargaining parameter $V^*$ is unaffected by the imposition of vicarious liability—as is quite probable, see note 80 supra—then the Pareto optimal contract under vicarious liability is identical to the optimal solvency contract in the absence of vicarious liability.

Appendix V. The Effects of Vicarious Liability on Precautionary Behavior in a Principal-Monitored Activity

Assume that the principal and the agent in a principal-monitored activity prefer the optimal judgment-proof contract in the absence of vicarious liability. Their level of precautionary expenditure is determined by conditions (6)-(8), app. II supra. The imposition of vicarious liability, however, forces the enterprise to adopt an optimal solvency contract, see pp. 185-86 supra, which is characterized by conditions (1)-(5), app. II supra.

Because of the complexity of these conditions, and the indeterminacy of $V^*$ in the model, however, it is difficult to use the general formulation of the model to assess the effects of vicarious liability on precautionary behavior. Fortunately, most of the important effects appear in the following, highly tractable special case of the model.
Assume that the principal and the agent both are risk neutral. Then, their utility functions may be written as

\[ U(w) = V(w) = w. \]

Therefore, condition (3), app. II supra, becomes

\[ (3)' -p'(e) x \leq 1, \]

and condition (7), app. I supra, becomes

\[ (7)' -p'(e) (y_0 - e) \leq 1 - p(e) \]

In this special case, (7)" and (9)" alone suffice to determine the optimal values of e under the optimal solvency contract and the optimal judgment-proof contract.

Both conditions have a simple interpretation. Because the parties' utility depends exclusively on their expected wealth, the Pareto optimal contract requires that expected enterprise profits be at a maximum. In an enterprise that operates under the optimal solvency contract, or under vicarious liability, the amount of wealth at risk is x, and hence \(-p'(e)x\) in condition (3) is the addition to expected profits from a marginal expenditure on precautions. The marginal cost of a dollar spent on precautions is 1, and so (3)" states the familiar requirement that the marginal benefit of precautionary expenditures be no greater than the marginal cost, and equal to marginal cost if \(e > 0\).

A similar interpretation holds for condition (7)". In an enterprise operating under the optimal judgment-proof contract, the amount of wealth at risk is \((y_0 - e)\), and hence the marginal benefit of a dollar expenditure on precautions is \(-p'(e)(y_0 - e)\). The marginal cost of a dollar spent on precautions is only \(1 - p(e)\) because a dollar saved out of \(y_0\) is paid to the tort victim with probability \(p(e)\).

For arbitrary choices of \(p(e), y_0,\) and \(x > y_0\), it is unclear whether the value of \(e\) that satisfies (3)" is greater or less than the value of \(e\) that satisfies (7)". Intuitively, the marginal benefit of precautions is lower under the optimal judgment-proof contract, but the marginal cost of precautions is also lower, so that the optimal value of \(e\) may be higher or lower. Hence, the effects of vicarious liability on the level of precautionary behavior are indeterminate.

Conditions (3)" and (7)" yield conclusive results, however, about the effects of \(y_0\) and \(x\) on the optimal value of \(e\). Differentiating (3)" with respect to \(x\) and (7)" with respect to \(y_0\) yields

\[
\frac{\partial e}{\partial x} = -\frac{p'(e)}{p''(e) x} > 0
\]

\[
\frac{\partial e}{\partial y_0} = -\frac{p'(e)}{p''(e) + 2 p'(e)} > 0
\]

Hence, an increase in the potential loss, \(x\), causes an enterprise operating under the optimal solvency contract to increase precautions, and an increase in the agent's wealth at risk, \(y_0\), causes an enterprise operating under the optimal judgment-proof contract to increase precautions. This result suggests that if \(x\) is suffi-
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ciently large or sufficiently small, precautionary expenditures tend to be greater under vicarious liability than in the absence of vicarious liability.

Appendix VI. The Effects of Vicarious Liability on Precautionary Behavior in an Agent-Monitored Activity

In an agent-monitored activity operating under the optimal judgment-proof contract, the level of precautionary behavior is determined by condition (10), app. III supra. In an agent-monitored activity operating under the optimal solvency contract, or under vicarious liability, the level of precautionary behavior is determined by condition (9), app. III supra (if the agent's wealth is positive in the accident state at the optimum), or condition (10), app. III supra (if the agent's wealth is zero in the accident state at the optimum). These optimality conditions yield conclusive results about the effects of vicarious liability on precautionary behavior.

Assume that the parties prefer the optimal judgment-proof contract in the absence of vicarious liability. Let the agent's allotment of enterprise income in the no-accident state be denoted by \( y_J \). The agent's wealth in the accident state, of course, is zero.

Consider the effects of imposing vicarious liability on the enterprise. The principal's wealth in the accident state must decline because the agent's wealth in the accident state is already at a minimum. By hypothesis, the parties prefer the optimal judgment-proof contract; hence, vicarious liability inevitably reduces the expected utility of one or both parties. Thus, it is compelling to assume that in the bargaining process, no party obtains greater expected utility in the presence of vicarious liability than in the absence of vicarious liability. Under this assumption, the agent's wealth in the no-accident state, denoted by \( y_n^a \), and if the agent's expected utility is strictly lower under vicarious liability, then \( y_n^v < y_n^a \). Consider two possible conditions.

(i) Under vicarious liability, the agent's wealth in the accident state is zero.

If this condition prevails, which corresponds to a full indemnity agreement, then the level of precautionary expenditure, with and without vicarious liability, is determined by condition (10), app. III supra. Let \( e^j \) denote the level of precautionary expenditures in the absence of vicarious liability. Then, the choice of \( e^j \) must satisfy condition (10), which may be written

\[
(10)^j -p'(e^j)U(y_0 + y_n^a - e^j) \leq [1-p(e^j)]U'(y_0 + y_n^a - e^j) - p'(e^j)U(0)
\]

or, in terms of marginal costs (MC) and marginal benefits (MB),

\[
(10)^j \text{ MB}^j \leq \text{ MC}^j
\]

Similarly, let \( e^v \) denote the level of expenditure under vicarious liability. The choice of \( e^v \) must satisfy condition (10), which may be written

\[
(10)^v -p'(e^v)U(y_0 + y_n^v - e^v) \leq [1-p(e^v)]U'(y_0 + y_n^v - e^v) - p'(e^v)U(0)
\]

or, alternatively,
(10)\(v^*\) \(MB_v \leq MC_v\)

Recall that \(y^*_v \leq y^*_p\), and that \(U(w)\) is an increasing, concave function. Now suppose that \(e^j = e^v\). Based on a term by term comparison, it follows that \(MB^j \geq MB^v\), and \(MC^j \leq MC^v\). The marginal benefit “curves,” \(MB^v\) and \(MB^j\), are downward sloping, however, and the marginal cost “curves,” \(MC^v\) and \(MC^j\), are upward sloping. It follows that if \(e^v^*\) is the optimal level of precautionary expenditure under vicarious liability and \(e^j^*\) is the optimal level of expenditure in the absence of vicarious liability, \(e^j^* \geq e^v^*\).

(ii) Under vicarious liability, the agent’s wealth in the accident state is positive.

If this condition prevails, then the level of precautionary behavior in the absence of vicarious liability again is determined by (10)\(j\), but the level of precautionary behavior under vicarious liability is now determined by condition (9), app. III supra, which may be written

\[
(9)^v -p'(e^v)U(y_0 + y^*_v - e^v) \leq [1-p(e^v)]U'(y_0 + y^*_v - e^v) + p(e^v)U'(y_0 + y^*_v - e^v - x) - p'(e^v)U(y_0 + y^*_v - e^v - x)
\]

or, alternatively,

\[
(9)^v MB^v \leq MC^v
\]

where \(y^*_v\) is the agent’s allotment of enterprise income in the accident state. Now suppose that \(e^j = e^v\). Based on a term by term comparison, it follows that \(MB^j \geq MB^v\) and \(MC^j \leq MC^v\). As above, the marginal benefit “curves,” \(MB^j\) and \(MB^v\), are both downward sloping, as is the marginal cost “curve,” \(MC^j\). In general, however, \(MC^v\) is not everywhere downward sloping, but \(MC^v\) lies nowhere below \(MC^j\). Hence, it again follows that \(e^j^* \geq e^v^*\).

In general, therefore, under the compelling assumption that vicarious liability does not increase the expected utility of either party, the level of precautionary behavior in enterprises conducting agent-monitored activities declines or remains unchanged after the imposition of vicarious liability. An actual decline in the level of precautionary expenditure is likely because it requires only that vicarious liability reduce the expected utility of the agent, or that the principal and the agent enter a risk-sharing agreement that provides the agent with positive wealth in the accident state.