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Robert D. Cooter and Ariel Porat

Abstract

According to legal principles, a driver who negligently breaks a pedestrian's leg should pay the same damages as a doctor who negligently breaks a patient's leg. According to economic principles, however, the driver should pay more than the doctor. Non-negligent drivers impose risk on others without being liable for it. When liability externalities are mainly negative as with driving, liability should increase beyond full compensation to discourage the activity. Unlike pedestrians, patients contract with doctors for treatment and willingly submit to the risk of harm. Imperfections in medical markets cause some kinds of doctors to convey more positive than negative externalities on their patients. Increasing liability for these doctors would discourage an activity that needs encouragement. The argument for decreasing doctors' liability is especially strong when doctors must choose among risky procedures, such as cesarean or vaginal delivery of a baby, which we call a "mandatory choice". Given equal benefits, the doctor ought to choose the least risky alternative. If the doctor negligently chooses a more risky alternative and harm materializes, courts award damages equal to the harm suffered by the patient. Even without the doctor's faulty choice, however, the patient would have been exposed to the least risky alternative. Economic efficiency requires reducing the doctor's liability below the victim's actual harm, which current legal rules usually prohibit. We propose that legislatures give courts the choice of lowering tort damages for doctors in well defined circumstances, and for their mandatory choices in particular, and we suggest some principles for doing so.

INTRODUCTION

This paper concerns the novel application of some familiar concepts to tort law, as illustrated by three examples:

> *Example 1: Liability externality.* A doctor makes a mistake and negligently breaks his patient's leg. In a separate accident, a driver negligently collides with a pedestrian and breaks her leg. The doctor and driver are both liable for the harm caused by their negligence. The seriousness of injury, pain, treatment, and course of recovery are identical for both victims. According to legal principles, the doctor should pay the same damages as the driver. Should the damages be the same according to economic principles?

Economic principles imply that the driver should pay more than the doctor. *Non*-negligent drivers impose risk on pedestrians without being liable for it, which we call a *liability externality*. Law should discourage activities with negative liability externalities. A tax on these activities will discourage them. Many jurisdictions tax driving, but we know of no jurisdiction that calibrates the tax according to the risk that drivers impose on others.[1] In the absence of a tax on risk, law should increase liability beyond full compensation in order to discourage driving. In general, liability law should adjust damages in light of the externalities that it creates.

Unlike pedestrians and drivers, patients contract with doctors for treatment and willingly submit to the risk of harm. If medical markets worked perfectly, contracts would internalize all marginal costs and benefits, so liability law would not need to encourage or discourage doctoring. In reality, medical markets are imperfect and externalities occur. Imperfections cause some kinds of doctors to convey more positive than negative externalities on their patients. Law should encourage activities with positive externalities. A subsidy on these activities will encourage them. In fact most such activities are not subsidized. Increasing liability for doctors would discourage activities that need encouragement.

Liability law does not need to discourage the activity of doctoring, and it needs to encourage some medical specialties. The following example, however, illustrates that when medical malpractice is proved, the damages often exceed the harm caused by doctors, which discourages doctoring.

> *Example 2: Least Risky Alternative.* An obstetrician must decide whether to deliver a baby by vaginal or cesarean birth. In this difficult case, vaginal birth imposes the unavoidable risk of harm to baby and mother of 200 with

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[1] The actual amount of the tax is typically too low for internalizing risk. *See* Edlin & Karaca-Mandic, *infra* note 3.

probability .10 (expected harm of 20), whereas cesarean birth imposes the unavoidable risk of different harm of 300 with probability .10 (expected harm of 30). The obstetrician mistakenly chooses cesarean birth and the harm materialized. A court applies a negligence rule to these facts and finds the obstetrician liable. Should damages equal 300 or 100?

Economic efficiency requires that the obstetrician should be liable for the harm caused by his negligence. Having a baby by vaginal birth risks losing 200 with probability of .10. The obstetrician negligently chose cesarean delivery, which caused risk of losing an additional 100 with probability .10. Legal liability of 100 would make the obstetrician internalize the additional expected loss of 10. Starting with the patient's actual harm of 300, deducing the harm of 200 from vaginal birth yields legal liability of 100.

In general, doctors often choose among risky procedures. The doctor should choose the procedure with largest expected net benefits. When benefits and costs of executing the procedures are similar, the doctor should choose the *least risky alternative*. If the doctor negligently chooses a more risky alternative, his faulty choice causes incremental risk. The practice of the courts, however, is to award damages equal to the harm actually suffered by the patient in most cases. That makes the doctor' expected liability exceed the expected harm caused by the faulty choice. Later we explain why legal rules produce this wrong result in many cases.

Medical professionals allege that high damages for tort liability in the U.S. cause too few doctors to specialize in obstetrics.[2] This allegation implies that

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[2] Pamela Robinson et al., *The Impact of Medical Legal Risk on Obstetrician Gynecologist Supply*, 105 OBSTETRICS & GYNECOLOGY 1296 (2005); Michelle M. Mello & Carly N. Kelly, *Effects of a Professional Liability Crisis on Residents' Practice Decisions*, 105 OBSTETRICS & GYNECOLOGY 1287 (2005). Some allege that high damages affect not only obstetrics, but also other high-risk specialties as well as the general supply of physicians. *See*, *e.g.*, Fred J. Hellinger & William E. Encinosa, U.S. Dep't of Health & Human Servs., *The Impact of State Laws Limiting Malpractice Awards on the Geographic Distribution of Physicians* (2003), *available at* http://www.ahrq.gov/research/tortcaps/tortcaps.pdf; Daniel P. Kessler et al., *Impact of Malpractice Reforms on the Supply of Physician Services*, 293 JAMA 2618 (2005). Another recent research claims that caps on damages increase the supply of rural specialist physicians, but do not affect other populations. *See* David A. Matsa, *Does Malpractice Liability Keep the Doctor Away? Evidence from Tort Reform Damage Caps* (2006), *available at* http://ssrn.com/abstract=920846. *See also* U.S. DEP'T OF HEALTH & HUMAN SERVS., ADDRESSING THE NEW HEALTH CARE CRISIS: REFORMING THE MEDICAL LITIGATION SYSTEM TO IMPROVE THE QUALITY OF HEALTH CARE (2003), *available at* http://aspe.hhs.gov/daltcp/reports/medliab.pdf. For an opposite view, questioning the connection between high damages and supply of physicians, see TOM BAKER, THE MEDICAL MALPRACTICE MYTH 140-56 (2005); Patricia M. Danzon et al., *The Effects of Malpractice Litigation on Physicians' Fees and Incomes*, 80 AM. ECON. REV. Papers & Proc. 122 (1990).

doctors cannot fully recoup liability through higher fees. Applying this assumption to Example 2, damages of 300 make the obstetrician's practice relatively unprofitable, which would discourage medical students from specializing in obstetrics.

Now we turn from the underlying activity of practicing obstetrics to the choice of procedures. The court in Example 2 can verify whether or not the obstetrician chose the right method of delivery and the court can impose liability for making the wrong choice. In a more common situation described in Example 3, the court cannot verify the right method of delivery in the circumstances. Instead, the court can assess whether the *chosen* method of delivery, right or wrong, was executed negligently or non-negligently. Even the court's assessment of fault in executing the delivery is imperfect and might contain systematic errors, as the next example describes.

> *Example 3: Negligent Execution of a Mandatory Choice.* An obstetrician must decide whether to deliver a baby by vaginal or cesarean birth. The obstetrician's fees and profits are the same. In vaginal delivery the obstetrician makes a mistake with probability .10 that causes harm of 200, and the probability of liability is 1. In cesarean delivery the obstetrician makes a mistake with probability .10 that causes harm of 300, and the probability of liability is .5 According to economic principles, what damages should courts award when harm materializes from negligent cesarean or vaginal delivery?

In Example 3, the court's 50% error in finding liability for negligent cesarean deliveries results in too many of them. To correct this problem, the obstetrician *could* be held liable for 200% of the victim's harm. Instead of liability for more than the victim's harm, a lower damage measure can still cause obstetricians to choose the right method of delivery. To achieve this result, we can equalize the external harm caused by each of the mandatory alternatives. In particular a court can award damages for negligent cesarean delivery at 300 or 100% of victim's harm and for negligent vaginal delivery at 50 or 25% of victim harm. Compared to internalizing the externality, equalizing the externality provides the same incentive to make the efficient mandatory choice and more incentive to engage in the underlying activity.

Examples 1, 2, and 3 illustrate concepts developed in this paper. Part I of this paper develops the general theory of liability externalities as illustrated in Example 1. Part II discusses mandatory choices as illustrated in Examples 2 and 3, including the least harmful alternative and equalizing the externality. Part II also introduces a novel measure of damages for mandatory choices. Part III compares these concepts under uncertainty and identifies some suitable

circumstances for applying them. When externalities are positive, liability should decrease below the harm caused by the doctor's negligence in order to encourage the underlying activity. We propose that legislatures give courts the choice of lowering tort damages for doctors in well defined circumstances, and for their mandatory choices in particular, and we suggest some principles for doing so. Part IV concludes and briefly discusses other mechanisms to control liability externalities.

I. LIABILITY EXTERNALITIES

According to the standard economic analysis of law, a rule of strict liability with perfect compensation causes injurers to internalize the risk that they impose on others. The precaution and activity levels of injurers, consequently, are efficient. The conclusion is different, however, for a negligence rule. A negligence rule gives actors an incentive to escape liability by satisfying the legal standard of care. Having escaped liability, careful actors engage in too many harmful activities, and they engage in too few beneficial activities.
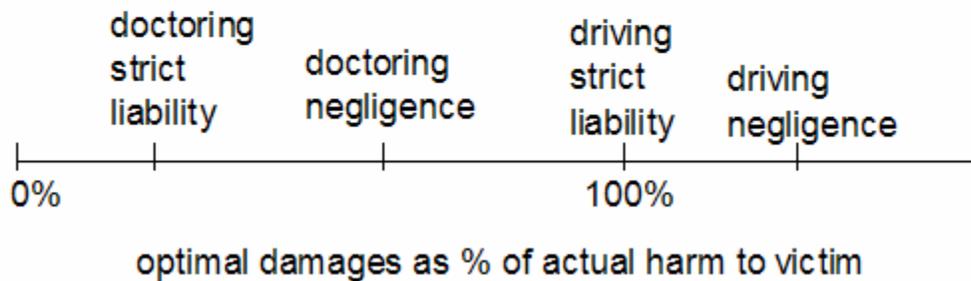
For drivers, the legal standard concerns how carefully people drive, not how much they drive. Since careful drivers escape liability most of the time, they externalize part of the risk of harming others, which makes them drive too much.[3] For doctors, the legal standard concerns their choice of treatment and their skill in carrying it out. Like drivers, careful doctors satisfy the legal standard and escape liability most of the time. Unlike drivers, escaping liability does not cause careful physicians to doctor too much. Unlike drivers and accident victims, doctors and patients have a contractual relationship and patients agree to submit to the risk that their doctor will accidentally harm them. If the contractual relationships approached the economic ideal of perfect competition, prices would capture all of the benefits and costs. Instead of perfect competition, medical markets have administered prices and quantities. Doctors often create benefits for patients that exceed their fees in total and at the margin.[4]

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[3] Also negligent drivers drive too much for the same reason, but they pay a higher fraction of the harm they cause relatively to careful driver. Even if drivers create some positive externalities, the negative externalities they create are much greater. A careful empirical study concludes that a tax on driving to cover the negative externalities from risk of accident would exceed $2,000 per car in regions with high traffic density. In California the total tax revenue would exceed the sum of the current corporate and personal income tax. *See* Aaron S. Edlin & Pinar Karaca-Mandic, *The Accident Externality from Driving*, 114 J. POL. ECON. 931 (2006).

[4] *See* David S. Bloch & William R. Nelson Jr., *Defining 'Health': Three Visions and their Ramifications*, 1 DEPAUL J. HEALTH CARE L. 723, 731 (1997) ("Commentators who consider health a non-marketable good contend that there are elements of health which, though valuable, are unquantifiable, such as hope, compassion, and the extension and preservation of life … Health's social benefits are not fully realized by the market price it commands"); T.R Marmor et al., *Medical Care and Procompetitive Reform*, 34 VAND. L. REV. 1003, 1009 (1981) ("Improved

A negligence rule, however, does not allow careful drivers or doctors to escape liability in all circumstances. Courts sometimes make mistakes in applying the duty of care and hold careful actors liable. Like courts, normally careful actors occasionally make mistakes and harm others. Whether from court or personal error, even normally careful actors bear some of the risk associated with their activity. Higher damages, consequently, reduce the incentive of careful actors to engage in the activity. In the case of drivers, higher damages will increase auto insurance premiums and drivers will respond by driving less and buying fewer cars. In the case of doctors, higher damages will cause them to perform fewer treatments that risk liability and discourage them from specializing in fields with high risk of liability. Lowering damages will decrease these undesirable effects and benefit patients.[5]

Figure 1: Optimal Damages for Drivers and Doctors

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        doctoring              driving
        strict      doctoring  strict    driving
        liability   negligence liability negligence
    ├────────┼──────────┼─────────┼────────┼────────┤
    0%                            100%
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optimal damages as % of actual harm to victim

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health, the anticipated outcome of medical care, has positive externalities. This makes medical care a merit good, and, unlike many other economic goods, one that should not be allocated solely on the basis of ability to pay"); Stuart Rome, *Medicine and Public Policy: Let Us Look Before We Leap Again*, 41 MD. L. REV. 46, 48 (1981). *See also* Maja Campbell-Eaton, *Antitrust and Certificate of Need: A Doubtful Prognosis*, 69 IOWA L. REV. 1451, 1459 (1984). ("Moreover, health care usually is viewed as a "merit good", with benefits extending beyond its economic value. This view is reinforced by the ethical mandates of the health professions and by a widespread belief that "more is better" in the provision of medical services").

[5] Tom Baker argues that doctors, health care providers, and medical malpractice insurers pay much less than necessary to cover the true social costs of doctors' wrongdoing. *See* BAKER, *supra* note 2. *See also infra* note 22. If the external costs discussed by Baker exceed the external benefits of doctoring, then incentives exist for too many people to become doctors. Our article does not compare the negative and positive liability externalities of doctors in general. Rather, we assume that there are several fields in medicine where the positive externalities exceed the negative externalities. For example, much research supports the argument that positive externalities exceed negative externalities in obstetrics. *See supra* note 2. Liability law biases doctors against specializing in these fields.

Figure 1 depicts these facts about driving and doctoring. The line in Figure 1 represents optimal damages as a percentage of full compensation. For activities like driving, incentives are optimal under a rule of strict liability when damages equal 100% of the victim's harm. For a negligence rule, however, incentives for drivers' activity are optimal when damages exceed 100% of the victim's actual harm. For activities with positive externalities like some medical specialties, incentives are optimal when damages are less than 100% of the victim's actual harm. For these activities, optimal damages fall as the rule of liability shifts from negligence to strict liability.

Empirical studies show that courts tend to award higher damages in medical malpractice cases than in road accident cases. When researchers controlled for injury severity, amount of reported economic damages, and other factors, malpractice awards remained approximately three times larger than those in automobile cases.[6] Furthermore, in cases of wrongful death, the median award in malpractice trials was $876,000, while the median award in automobile trials was $318,000.[7] This data, however, requires cautious interpretation.[8] Turning from econometrics to raw statistics, plaintiffs have lower success rates[9] and higher

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[6] AUDREY CHIN & MARK A. PETERSON, DEEP POCKETS, EMPTY POCKETS: WHO WINS IN COOK COUNTY JURY TRIALS 36 (1985) (The median award was $201,000 and the mean was $1,057,000. When outlier awards were excluded, the mean was $432,000. Fully 15% of malpractice awards exceeded $1 million).

[7] Thomas H. Cohen & Steven K. Smith, *Civil Trial Cases and Verdicts in Large Counties, 2001*, BUREAU JUST. STAT. BULL., Apr. 2004, at 1, *available at* http://www.ojp.usdoj.gov/bjs/pub/pdf/ctcvlc01.pdf.

[8] The discrepancy between tort awards overall and malpractice awards is likely due, in large part, to differences in how malpractice cases are selected for trial. *See* Neil Vidmar, *Pap and Circumstance: What Jury Verdict Statistics Can Tell Us About Jury Behavior and the Tort System*, 28 SUFFOLK U. L. REV. 1205, 1212-22 (1994). Other differences could also explain the discrepancy: Automobile cases often involve multiple plaintiffs, the driver and passengers of the second car, but usually a single defendant, the allegedly negligent driver of the first car. Malpractice cases, however, typically involve a single plaintiff, the injured patient, and multiple defendants. Automobile cases may involve contributory negligence, which is not claimed as often in malpractice cases. Medical malpractice lawyers tend to be specialists who carefully screen cases and invest heavily in experts, whereas generalist lawyers who often call few or no experts to litigate automobile cases. *See* FRANK M. MCCLELLAN, MEDICAL MALPRACTICE: LAW TACTICS AND EVIDENCE 45-62 (1993); PAUL C. WEILER, MEDICAL MALPRACTICE ON TRIAL 19-26 (1991). The crux of the matter is that "juries hear very different cases in medical and automobile negligence trials and decide them under different legal standards." Vidmar, *supra*, at 1222.

[9] The overall win rate for medical malpractice plaintiffs (27%) was about half of that found among plaintiffs in all tort trials (52%). *See* Thomas H. Cohen, *Medical Malpractice Trials and Verdicts in Large Counties, 2001*, BUREAU OF JUSTICE STATISTICS CIV. JUST. DATA BRIEF., Apr. 2004, *available at* http://www.ojp.usdoj.gov/bjs/pub/pdf/mmtvlc01.pdf; Cohen & Smith, *supra* note 7, at 1. *See also* NEIL VIDMAR, MEDICAL MALPRACTICE AND THE AMERICAN JURY: CONFRONTING THE MYTHS ABOUT JURY INCOMPETENCE, DEEP POCKETS AND OUTRAGEOUS

awards in medical malpractice cases, compared to automobile cases or tort cases in general.[10]

"Externality" usually means costs and benefits conveyed to others that market prices do not capture. When markets fail, liability law often improves the situation by making injurers compensate victims. Sometimes, however, liability law leaves significant costs externalized. We adopt the phrase "liability externality" to mean costs and benefits conveyed to others that market prices do not capture and liability law does not correct. Given liability externalities, adjusting damages can improve incentives. When liability externalities are negative as with driving, increasing damages above full compensation improves incentives for the activity. Conversely, when liability externalities are positive as with doctoring in certain fields, decreasing damages below full compensation improves incentives for the activity.

While decreasing damages improves incentives for the activity, it could distort the incentives for precaution. Thus, if doctors pay, say, 50% of harm, they might take less precaution than required by efficiency. Later we show that medicine involve mandatory choices, and liability lower than 100% will provide efficient incentives for precaution in these cases. In other cases, a tradeoff exists between precautions and activity level, and so improving incentives for activity necessarily worsens incentives for precaution.

DAMAGE AWARDS 39 (1995). For comparison, in automobile negligence trials, plaintiffs prevailed in 61.2% of the trials. Cohen & Smith, *supra.*

[10] In general tort cases, the median verdict, including punitive damages was $51,000. Brian J. Ostrom et al., *A Step above Anecdote: A Profile of the Civil Jury in the 1990's*, 79 JUDICATURE 233, 238 (1996). The mean award was much higher $408,000. The discrepancy between median and mean was produced by some very large awards. When the top and bottom 5% of these outlier awards were excluded, the mean was $ 160,000. Medical malpractice cases, however, had substantially higher awards. *Id. See also* Cohen, *Medical Malpractice Trials*, *supra* note 10 (showing that the median award of $425,000 in medical malpractice trials was nearly 16 times greater than the overall median award in all tort trials ($27,000)). The RAND corporation studies indicated that even when juries considered injury severity, medical malpractice plaintiffs and products liability plaintiffs received awards several times greater than those received by automobile injury plaintiffs. CHIN & PETERSON, *supra* note 6. Randall Bovbjerg and his colleagues found that the expected awards for automobile cases are only two thirds those for malpractice cases (0.66 as compared to 1.00), or, conversely, malpractice scores half again higher. Randall R. Bovbjerg et al., *Juries and Justice: Are Malpractice and Other Personal Injuries Created Equal?*, 54 LAW & CONTEMP. PROBS. 5, 25 (1991). Almost one out of every four medical malpractice awards exceeded $1 million. In contrast, automobile and premises liability cases had much lower mean and median awards. *See* Neil Vidmar, *The Performance of the American Civil Jury: an Empirical Perspective*, 40 ARIZ. L. REV. 849, 876 (1998). However, punitive damages remain rare in medical malpractice jury trials. From 1992 to 2001, 1% to 4% of plaintiff winners in medical malpractice jury trials received punitive damages. *See* Cohen, *Medical Malpractice Trials, supra* note 10; *see also* Marc Galanter, *Real World Torts: An Antidote to Anecdote*, 55 MD. L. REV. 1093, 1134, 1138 (1996).

To increase precision, we express the preceding arguments in notation. Consider an activity that benefits other people, and also imposes risks on them. The activity creates benefits of b for other people and imposes risk of harm h on them with probability p. Thus the marginal net benefit to others is b-ph. Because of a market transaction, the actor receives the market price m. Liability law requires the actor to pay damages d with probability q. Thus the actor's expected net benefit equals m-qd. These variables - b, q, d, p, and h - may be interpreted as marginal values.[11] To internalize marginal net benefits, the actor's expected net payoff must equal the net social benefit of the activity to others at the margin:

$$m - qd = b - ph \tag{1}.$$

Solving for d yields the level of damages d* that internalizes social costs:

$$d^* \quad = \quad (1/q) \quad\quad [ph \quad - \quad (b-m)] \tag{2}.$$

| | reciprocal of enforcement error | expected harm | price externality |

For an application of equation 2, consider defective consumer products. Strict liability implies that most injuries are compensated: q≈p. When consumer products are sold in competitive markets and consumers discount risks due to ignorance, consumers buy the good until the marginal benefit from consumption equals the price: b=m. Thus equation 2 reduces to the proposition that social harms are internalized when manufacturer's liability equals 100% of the actual harm to a consumer: d*=h. This is the standard conclusion of the economic argument for strict liability for defective consumer products.

Now consider automobile accidents. The injurer and victim are usually strangers, so, before the accident, they do not negotiate a price for driving: 0=m. Drivers do not convey benefits to their potential victims: 0=b. Equation (2) reduces to d*=(p/q)h. q represents the probability that a driver involved in an accident is held liable. If drivers were always held liable for involvement in an accident, then q would equal the accident probability p, and optimal damages d* would equal actual harm h. This outcome might occur if drivers were strictly liable for harm to others. Instead of strict liability, drivers face a negligence rule and they expect to escape liability part of the time: q<p. To offset the fall in

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[11] Thus *p* denotes the change in the probability of an accident from a marginal increase in the activity. For drivers, p is the increase in the probability of an accident from a small increase in driving. For doctors, p is the increase in the probability of an accident from treating another patient.

probability of liability, damages must increase above full compensation. Specifically, damages internalize the externality when d=(p/q)h. To illustrate, if drivers expect to be liable 33% of the time, then damages must equal 300% of the actual harm in order to internalize the risk of harm to others.[12]

Unlike drivers, doctors usually have a contractual relationship with an injured patient. The contract may include a price m that encompasses some, but not all, of the benefits to the patient, in which case we have m<b. The unpriced benefit given by b-m is a price externality. According to Equation 2, the price externality causes optimal damages d* to decrease below 100% of the actual harm h. With a negligence rule, doctors are liable for some, but not all, accidents: q<p. This fact, according to Equation 2, causes damages d* to increase above 100% of the actual harm h. The external benefit causes optimal liability to fall, and the external harm causes optimal liability to rise.

To be concrete, assume that the probability p that the treatment harms the patient is .10, and the resulting harm h is 100. Assume that the doctor is found liable in half of the cases where the patient suffers harm, so the doctor's probability of liability q equals .05. Finally, assume that the patient's benefit b exceeds the doctor's fee m by 8. Under these assumptions, equation 2 implies that the doctor's optimal liability d* equals 40% of the actual harm of 100. [13]

II. Mandatory Choices

Providers of services are usually free to choose whether or not to serve a particular client.[14] Once the actor commits to providing the service, however, he subsequently faces mandatory choices in fulfilling his commitment. Mandatory

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[12] Less care by the injurer increases the probability of an accident. Assume that less care also increases the probability that the victim can prove negligence and recover damages. These assumptions imply Craswell's Paradox: With the multiplier, the optimal sanction is less when wrongdoing is worse. By definition the multiplier equals the reciprocal of the enforcement error, and, by assumption, worse wrongdoing is more likely to be detected, so worse wrongdoing must result in a lower sanction. Richard Craswell, *Deterrence and Damages: The Multiplier Principle and its Alternatives*, 97 MICH. L. REV. 2185 (1999).

[13] By assumption, H=100, p=.10, q=.05, and a-m=8. Thus equation 2 reduces to:

$$d* = \frac{1}{q}(ph - b + m) = \frac{1}{.05}(.10 \times 100 - 8) = 40.$$

[14] Law sometimes requires a professional to provide a service. For example, according to the Emergency Medical Treatment and Active Labor Act, 42 U.S.C. 13955dd (1998), hospitals have an obligation to provide for examination and treatment for emergency medical conditions. For a claim that common law should recognize a duty of 'medical rescue' of doctors and other health care professionals see Kevin Williams, *Medical Samaritans: Is There a Duty to Treat?*, 21 OXFORD J. LEGAL STUD. 393 (2001).

choices often arise from a relationship created by contract. For some mandatory choices, each of the alternatives imposes risks on others.[15] We focus on medical services where a doctor must choose among treatments and each one risks harming the patient, such as a choice of how to deliver a baby, whether or not to operate, or whether or not to administer a particular drug. The same problem of mandatory choice with unavoidable risks arises in a fiduciary relationship between, say, a client and his bank, an investor and the firm's board of directors, or a client and his attorney.

Our discussion of Example 2 explained how liability affects the obstetrician's choice between vaginal and cesarean delivery. Figure 2 imbeds this mandatory choice in some decisions that precede and follow it. Before choosing, the obstetrician must prepare to make the choice, which involves examining the patient and ordering tests. Much earlier in the sequence, the medical student must decide whether or not to specialize in obstetrics. Finally, after making the mandatory choice, the obstetrician must carry it out, either carefully or negligently. We will analyze the connection between each of these decisions and liability in tort law.

Figure 2: Acts Preceding and Following a Mandatory Choice

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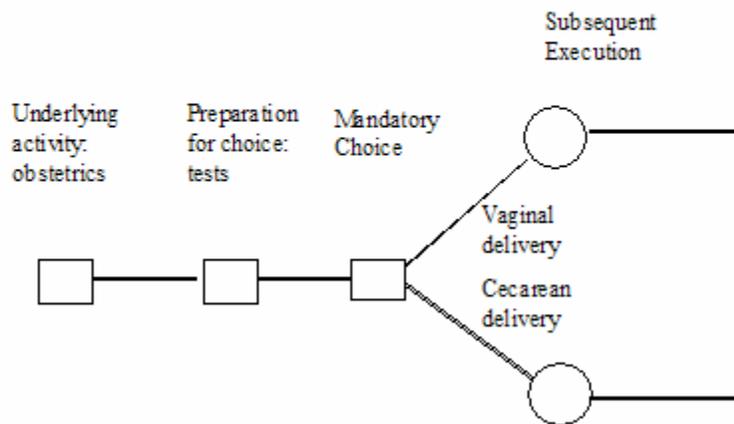
[15] Ariel Porat, *The Many Faces of Negligence*, 4 THEORETICAL INQ. L. 105, 121-4 (2003).

A. *The Least Harmful Alternative*

A general principle of tort law holds a person liable for damages equal to the harm caused by his negligence. For mandatory choices, courts apply this principle inconsistently, as we will demonstrate. In Example 2, the actor did not cause the mandatory choice that he must make on behalf of the patient. Given the mandatory choice, risk of harm at the level caused by the least harmful alternative was unavoidable. The actor's faulty choice caused additional risk of harm, which equals the patients' actual risk minus the risk from the least harmful alternative. In Example 2, the additional risk is 30-20=10. In Example 2, the risk associated with the actor's choice materialized and actual harm equaled 300. In setting damages, the court might want to subtract the unavoidable risk from the actual harm, resulting in damages of 280.[16] Or the court might want to subtract the harm of 200 that might have been realized by the non-negligent choice, resulting in damages of 100.

The principles of positive law, however, do not allow the court to subtract anything as long as the risks of the faulty choice and the risks of the least harmful choice do not overlap. To illustrate non-overlapping risks, vaginal delivery is more likely to cause uterine prolepses, whereas cesarean birth carries risks associated with surgery. If the obstetrician wrongfully chooses cesarean delivery and the mother suffers harm in surgery, the principles of positive law do not allow a deduction for avoiding the risk of uterine prolepses.

The principles of economics favor a different conclusion from positive law. The obstetrician's faulty choice increased one risk by 30 and reduced another risk by 20, thus causing additional risk of 10. This is true even though the risks do not overlap. In order to make the doctor internalize the social costs of his wrong choice, he could be held liable for imposing risk of 10, regardless of whether or not the risk materialized. Tort law, however, imposes liability for materialized harm, not for exposure to risk. Harm materializes with probability .10. Liability of 100 for materialized harm has the same incentive effects as liability of 10 for exposure to risk.[17] The socially efficient level of damages for materialized harm equals 100 in this example.

Notice that our rule differs from a rule of probabilistic recovery. A probabilistic recovery principle mandates imposing liability on a defendant for the harm suffered by the plaintiff multiplied by the probability that the harm was

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[16] An award of 280 is analogical to probabilistic recovery awarded by some courts for lost chances of recovery. *See* ARIEL PORAT & ALEX STEIN, TORT LIABILITY UNDER UNCERTAINTY 73-76, 101-29 (Oxford, 2001).

[17] For simplicity, we also assume that actors are risk-neutral.

caused by the defendant's wrongdoing.[18] Some courts apply the principle in medical malpractice cases where the doctor's negligence diminished the plaintiff's chances of recovery. Consider the patient who arrives at the hospital with 30% odds of recovery, but because his disease is not diagnosed by the doctor in time, his chances drop to zero. The patient brings a tort action against the doctor. The patient would lose if the preponderance of evidence standard were applied, because the probability that the doctor caused the harm is lower than 50%. The court might apply a probabilistic recovery rule, which would result in the doctor bearing liability for 30% of the patient's harm. [19]

Under a probabilistic recovery rule damages in Example 2 should be 280. The reason is simple: The patient suffered harm of 300. "But for" the doctor's negligence the patient would have suffered either no harm or harm of 200. The probability of the latter is.1. Therefore. 200 x .1 should be deducted from the actual harm of 300 suffered by the patient. Conversely, under our rule, liability should be for 100. Liability for 100—not for 280—will make the doctor internalize the true risk he created by his negligence.

In fact our suggestion is motivated not by the uncertainty of the case (which is the motivation for a probabilistic recovery rule), but by the presence of positive externalities. In Example 2 the doctor's negligent choice caused both negative and positive effects: He increased one risk by 30 (negative externaliy) and he also decreased another risk by 20 (positive externality). Prevailing tort law internalizes the negative effects by imposing liability on the doctor when harm materializes, but the positive effects remains externalized by him. As a result, the doctor bears more than the net risk created by his negligence. We suggest correcting this distortion by crediting the doctor with the positive externalities he created by his negligence and reducing his liability accordingly.

To formalize this argument, let A denote the reasonable choice that risks harm h_a with probability p_a. Let B denote the unreasonable choice that risks harm h_b with probability p_b. The expected harm from the least harmful alternative equals $p_a h_a$, and the expected harm from the chosen alternative equals $p_b h_b$. Deducting the former from the latter yields $p_b h_b - p_a h_a$, which indicates the additional risk from choosing the wrong alternative. Instead of liability for risk, the court imposes liability for realized harm. To find the level of liability for realized harm

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[18] PORAT & STEIN, *supra* note 16, at 116-29.

[19] In this context, the principle is known as the "lost chances of recovery principle." *See*, *e.g.*, Herskovits v. Group Health Coop. of Puget Sound, 664 P.2d 474 (Wash. 1983); Perez v. Las Vegas Med. Ctr., 805 P.2d 589, 592 (Nev. 1991). *See also* DAN B. DOBBS, LAW OF REMEDIES 238 (2d ed., 1993). For support for the principle, see J.H. King, *Causation, Valuation, and Chance in Personal Injury Torts Involving Pre-existing Conditions and Future Consequences*, 90 Yale L.J. 1353 (1981). The market share liability doctrine is another application of a probabilistic recovery rule. PORAT & STEIN, *supra* note 16.

that is equivalent to liability for additional risk, multiply the preceding difference by $1/p_b$, which yields $h_b - p_a h_a/p_b$.

We have explained that when the risks from a mandatory choice do not overlap, legal principles would not allow subtracting from the victim's actual harm a fraction that reflects the *risk* of the least harmful alternative. When the mandatory choice imposes unavoidable *harm* rather than risk, however, the court has no difficulty subtracting the least harmful alternative when computing damages. To illustrate, modify Example 2 and assume that vaginal delivery causes harm of 200 to mother with certainty, and cesarean delivery causes different harm of 300 to mother with certainty. Courts would note that, but for the actor's negligence, harm would have been 200 rather than 300, so the negligent choice caused harm of 100. When a mandatory choice results in certain harm, the "but for" test of causation requires subtracting the least harmful alternative for victim from victim's actual harm.

The same conclusion applies in another set of circumstances as illustrated by a hypothetical inspired by Example 2. Assume that two alternatives procedures, A or B, benefit the patient equally and cost the doctor the same. Also, procedure A or procedure B risk harm of 200 with probability .1 to patient's *left* leg. Since the risk to the left leg is the same for both procedures, we call it *overlapping*. In addition, procedure B risks harm of 100 with probability .1 to patient's *right* leg. Since the risk to the right leg only occurs with procedure B, we call it *non-overlapping*.

The doctor negligently chooses procedure B and the patient suffers total harm of 300—200 to his left leg and 100 to his right leg. The doctor's negligent choice did not change the overlapping risk to the left leg. The doctor's wrong choice, however, increased the risk to the right leg. Under appropriate application of causation law,[20] liability for making the wrong choice will be imposed on the doctor only for the harm to the right leg. This is true even though the doctor's wrong choice is also a "but for" cause of the harm to the left leg (since but for the doctor's wrong choice the probability of inflicting harm on the patient's left leg was only .1). By this reasoning, doctor's liability equals 100, not 300.

Another variation concerns non-overlapping harm to different people. In Example 2 assume that the additional risk created by cesarean delivery falls on the baby, not the mother, while the risk to mother is identical under both procedures and relates to the same harm. By assumption, the risks to mother by both methods of delivery overlap, while the risks to baby are separate. If the obstetrician delivers by cesarean and harm materializes, mother suffers loss of

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[20] Guido Calabresi, *Concerning Cause and the Law of Torts: An Essay for Harry Kalven, Jr.*, 43 U. Chi. L. Rev. 69 (1975).

200 and baby suffers loss of 100. Baby is entitled to damages of 100 while mother is entitled to no damages.[21]

We have explained that computing damages for a negligent mandatory choice requires subtracting from actual harm a fraction that reflects the risk of the least harmful alternative. Legal principles of causation, however, require courts to subtract damages only where harm is certain or overlapping, but not when harm is probabilistic and not overlapping.[22]

Failing to reduce damages has three negative consequences as represented from left to right in Figure 2.

First, it discourages medical students from specializing in obstetrics. Even though in theory doctors could shift the additional liability to their patients, in fact doctors cannot fully recoup liability through higher fees.[23]

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[21] If vaginal delivery risks harm of 200 with probability .1 to mother, and cesarean delivery risks harm of 300 with probability .1 to baby, and doctor wrongfully choose cesarean and harm materialized, the risks do not overlap and doctor will pay damages of 300, not 100. But this should not come as a surprise to tort law scholars who know that positive externalities to one person (e.g. the mother) do not affect the victim's right to compensation (e.g. the baby). Efficiency would mandate liability of 100 in all such cases.

[22] Arlen and MacLeod argued that doctors' liability should equal the difference between the patient's expected benefits from optimal treatment and the patient's actual benefit from the erroneous treatment that he received. Assuming under-enforcement, that difference should be divided by the probability that the doctor is found liable when negligent. *See* Jennifer Arlen & W. Bentley MacLeod, *Malpractice Liability for Physicians and Managed Care Organizations*, 78 N.Y.U. L. Rev. 1929, 1984-5 (2003). Those authors, however, did not distinguish between certain harms and uncertain risks, overlapping and non-overlapping risk, and risks to same patient or different patients.

The idea developed here with respect to mandatory choices has a wider scope. In general, when a wrongful act creates risks but at the same time reduced other risks, either to the victim or to third parties, liability should be reduced, reflecting the net, rather the gross risks, which the wrongful behavior created. Especially when applied to risks reduced to third parties, the argument invites a strong opposition from corrective justice scholars. *See* Porat, *The Many Faces of Negligence*, *supra* note 15; Ariel Porat, *Offsetting Risks* (on file with authors).

[23] Mello & Kelly, *supra* note 2. Of the inability of doctors to pass higher insurance costs along to patients, see Peter Eisler et al., *Hype Outraces Facts in Malpractice Debate*, USA TODAY, Mar. 5, 2003, *available at* http://www.usatoday.com/news/nation/2003-03-04-malpractice-cover_x.htm (claiming that the cause of this inability is the limitations on reimbursements made by managed care insurers, Medicare and Medicaid). BAKER, *supra* note 2, at 64-65. (admitting that "physicians have little or no ability to raise prices in response to increased costs. When a malpractice insurance crisis hits, the burden falls disproportionately on physicians in high-risk specialties and locations, who cannot raise their prices in response"). It is worth mentioning that medical practice has negative externalities as well due to the fact that many of patients who sustained injury as a result of negligence do not sue. *See id.*; A.R. Localio et al., *Relations Between Malpractice Claims and Adverse Events Due to Negligence: Results of the Harvard Medical Practice Study III*, 325 NEW ENG. J. MED. 245 (1991); David M Studdert et al., *Negligence Care and Malpractice Claiming Behavior in Utah and Colorado*, 38 MED. CARE 250 (2000). Another research by Studdert points to the costly litigation in these cases which might discourage patients from suing. *See* David M.

Second, it causes too many tests in preparing to choose a procedure. To illustrate by Example 2, when negligent obstetricians are liable for 300, obstetricians order more tests than if they were liable for 100.[24] In principle, courts could solve the problem by imposing strict liability on obstetricians for the full harm that resulted from either choice. Strict liability would discourage obstetrics by making obstetricians pay much more than the social costs of their activities. Indeed, non-negligent obstetricians would have to pay for the risks caused by the pregnancy of their patients.

Third, it causes obstetricians who face mandatory choices to choose the alternative that reduces the risk of liability and not the risk of harm. This fact might explain the high number of cesarean deliveries compared to vaginal deliveries. In general, when liability for negligence is larger, the incentives of doctors to escape the risk of liability by practicing defensive medicine are stronger.[25]

Studdert et al., *Claims, Errors, and Compensation Payments in Medical Malpractice Litigation*, 354 New Eng. J. Med. 2024 (2006). *But see supra* note 6.

[24] The reason for that is the possibility of courts' and doctors' errors in determining whether the doctor satisfied the standard of care.

[25] Lowering the cesarean rate in the United States has been a goal for the past 25 years. *See* U.S. Dep't of Health & Human Servs., NIH Pub. No. 82-2067, Cesarean Childbirth: Report of a consensus development conference (1981). It is still highly relevant today, while the total cesarean section rate is 27.5 per 100 births. Actually, cesarean delivery rates in the United States rose from 4.5 per 100 births in 1965 to 24.1 per 100 in 1986. A.R. Localio et al., *Relationship between malpractice claims and cesarean delivery*, 269 JAMA.366 (1993). In response to the growing concerns in the 1980s about the rising cesarean rate, the U.S. Department of Health and Human Services established decreasing the cesarean rate as one of the *Healthy People 2000* objectives. U.S. Dep't of Health & Human Servs., Healthy People 2000: National health promotion and disease prevention objectives (1990). National efforts to decrease the cesarean rate now focus on low-risk women as defined in the *Healthy People 2010* objectives, while the objective is for a cesarean rate of no more than 15 per 100 births. 2 U.S. Dep't of Health & Human Servs., Healthy People 2010 §16-9 (2d ed., 2000), *available at* http://www.healthypeople.gov/Document/pdf/Volume2/16MICH.pdf.

A reason for these high rates may be found in the malpractice crisis. Obstetrics experience growing claims rates and now fields more malpractice claims than any other specialty. Roger A. Rosenblatt et al., *Why do Physicians Stop Practicing Obstetrics? The Impact of Malpractice Claims,* 76 Obstetrics & Gynecology 245, 249 (1990). The frequency of claims has increased such that, in 1999, 76.5% of obstetrician-gynecologists surveyed by the American College for Obstetricians and Gynecologists reported being sued at least once. Sarah Domin, *Where Have All the Baby-Doctors Gone? Women's Access to Healthcare in Jeopardy: Obstetrics and the Medical Malpractice Insurance Crisis*, 53 Cath. U. L. Rev. 499, 504 (2004).

Fear of being sued if complications arise in a vaginal delivery has contributed to the rising number of cesarean sections. *See* Elizabeth Swire Falker, *The Medical Malpractice Crisis in Obstetrics: A Gestalt Approach to Reform*, 4 Cardozo Women's L.J. 1, 15 (1997). Studies examined the impact of malpractice risk on cesarean deliveries and found that a systematic relationship between the rate of cesarean surgical procedures and malpractice claim frequency exists. Michael Daly, *Attacking Defensive Medicine Through The Utilization of Practice*

The preceding analysis assumed a mandatory choice between two alternatives, but the results change only modestly when there is a mandatory choice among continuous alternatives. Assume that the mandatory choice involves alternatives that run continuously from the least risky alternative to the more risky alternatives. Somewhere along this continuum is the boundary between negligent and non-negligent behavior. As the injurer's behavior approaches this boundary, the risk of injury increases continuously, whereas the expected liability jumps discontinuously at the boundary. The jump occurs so long as the court awards compensation for the victim's actual harm without subtracting damages which reflect the least harmful alternative. This discontinuity in costs has important behavioral consequences described in an earlier literature without the concept of mandatory choices or recognition of non-overlapping risks.[26]

B. *Disgorgement*

Faced with a mandatory choice, a self-interested injurer will choose the alternative whose net benefit is higher for him, even if his choice increases the risks to the victim by more than its net benefit. If injurer must disgorge his savings each time he chooses the more risky alternative, he will have an incentive to choose the less risky alternative. To illustrate, assume that the obstetrician's fee in Example 2 is the same for cesarean and vaginal delivery, but vaginal delivery costs the doctor 1 more than cesarean delivery. The obstetrician thus gains 1 each time he negligently chooses cesarean delivery. If the obstetrician were required to disgorge his gain every time he negligently chooses cesarean delivery, then he

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Parameters, 16 J. LEGAL MED. 101, 105 (1995). *See also* Antonella Vimercati et al., *Choice of Cesarean Section and Perception of Legal Pressure*, 28 J. PERINATAL MED. 111 (2000) (stating that the perception of legal pressure was directly related to the rate of cesarean section). For an argument that reducing damages could have opposite effects, because when liability is lower doctors tend to perform more unnecessary procedures which are more profitable to them, see Janet Currie & Bentley Macleod, *First Do Not Harm? Reform and Birth Outcomes* (NBER Working Paper Series, Working Paper No. 12478, 2006), *available at* http://papers.ssrn.com/sol3/abstract=926057.

[26] The discontinuity and its behavioral consequences were originally explained in Robert D. Cooter, *Economic Analysis of Punitive Damages*, 56 S. CAL. L. REV. 79 (1982). Cooter later explained that the discontinuity is due to incomplete information by the courts. *See* Robert D. Cooter, *Punitive Damages for Deterrence: When and How Much?*, 40 ALA. L. REV. 1143 (1989). Grady argued against Cooter that courts would not actually hold injurers liable for more harm than they actually caused by negligently untaken precautions. *See* Mark F. Grady, *A New Positive Economic Theory of Negligence*, 92 YALE L.J. 799 (1983). *See also* Marcel Kahan, *On Causation and Incentives to Take Care under the Negligence Rule*, 18 J. LEGAL STUD. 427 (1989); Richard Craswell & John E. Calfee, *Deterrence and Uncertain Legal Standards*, 2 J.L. ECON. & ORG. 279, 295-7 (1986) (advocating liability for incremental damages which is the difference between the social losses inflicted by injurers' activity and the social losses that would have been inflicted had they complied with the legal standard).

would have efficient incentives. If, however, the disgorgement takes place only when the obstetrician negligently chooses cesarean delivery and harm materializes, then deterring wrongdoing requires increasing damages to reflect the obstetrician's gain in the cases where he negligently chooses cesarean delivery and harm did not materialize. In our example, the obstetrician expects to pay damages when harm materializes, which occurs in 10% of cesarean deliveries. Damages of 10 for materialized harm will cause the obstetrician's expected liability to equal his expected gain from negligence, so he expects to disgorge his gain from wrongdoing.

Alternatively, the injurer can cut costs by reducing efforts to verify which alternative is the least risky alternative. Spending less on preparing to choose increases the probability of making the wrong choice. To illustrate, assume that the obstetrician saves 1 by refraining from making costly tests to decide how to deliver the baby, and a lack of test causes the obstetrician to choose the more risky alternative.

We coin the phrase "Disgorgement Damages for Risk of Accidents" ("DDA") to refer to damages that makes the negligent injurer's expected liability equal to his expected gains from negligence. For mandatory choices these gains include the difference between the injurer's costs of executing the two alternative procedures. These gains also include the untaken precautions that should have been taken to prepare to choose. The *DDA* generally equals or exceeds the actual gain in the case where the harm materializes. In the preceding examples, DDA equals the gain multiplied by the reciprocal of the probability of liability.

We will derive this result for a case where the alternative procedures have different costs for the injurer. Let a_A and a_B represent the cost of alternative acts to the actor. Assume that act a_B involves more costs than act a_A. As before, m is the price paid to the actor, q is the probability of liability, and d is damages. Disgorgement damages $d_A{}^*$ equalize the net costs of each act to the actor:

$$[\, m_B - a_B - q_B d_B \,] \; = \; [m_A - a_A - q_A d^*{}_A].$$

Rearranging terms yields a formula for disgorgement damages:

$$d^*{}_A \;\; = \;\; \frac{1}{q_A}\, q_B d_B \;\;\; + \;\;\; \frac{1}{q_A}[(m_A - m_B) + (a_B - a_A)].$$

Under the simplifying assumptions that $d_B=0$ and $m_A=m_B$, the preceding equation reduces to the proposition that damages equal the reciprocal of the probability of harm multiplied by the gain from negligence:

$$d *_A = \frac{1}{q_A}(a_B - a_A).$$

gain from

negligence

Since DDA exactly offsets the expected gain from making the wrong choice, DDA is the lowest level of damages that cause self-interested actors to behave non-negligently. Moving from left to right in Figure 2 reveals an advantage and a disadvantage of DDA. For activities with positive externalities, DDA has the advantage of encouraging more of the underlying activity than any alternative damage measure that deters negligence. DDA, however, is likely to give the injurer deficient incentives to prepare for the mandatory choice. The reparations are often non-verifiable, so the gains included in the DDA exclude them. Applied to Example 2, DDA gives the obstetrician the required incentive to choose vaginal delivery, and DDA encourages medical students to become obstetricians, but DDA is likely to give insufficient incentives for testing before deciding on the method of delivery. To illustrate the latter effect by Example 2, under DDA the doctor is likely not to take tests that cost him more than 1, even though the expected harm from making the wrong choice is 10.

Another problem with DDA arises in cases where an ordinarily carefully actor's attention lapses and he causes harm. Under prevailing law a lapse of attention that causes harm is considered negligence and triggers liability. Typically, the injurer gains nothing from lapsing, which implies that DDA equals zero. To avoid DDA of zero, the court would have to find someone liable who saved costs from the doctor's untaken precaution. Thus over-work or inferior working conditions could cause an obstetrician to lapse. Perhaps the doctor's employer overworked the doctor and caused the lapse, or perhaps the doctor's employer provided inferior working conditions that caused the lapse. Courts could apply DDA to the employer's gains from over-working the doctor or providing inferior working conditions.[27]

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[27] Saul Levmore raised the possibility of using a multiplier in restitution cases but rejected it as impractical. Even though Levmore has not explicitly discussed accidental cases, his analysis can be applied to them. Saul Levmore, *Probabilistic Recoveries, Restitution, and Recurring Wrongs*, 19 J. LEGAL STUD. 691, 713. For a discussion of the possibility of awarding damages at the amount of the injurer's gain, but without suggesting a DDA, see A. Mitchell Polinsky & Stephen Shavell, *Should Liability be Based on the Harm to the Victim or the Gain to the Injurer*, 10 J.L. Econ. & Org. 427 (1994). Laycock posed the question of whether restitution law should be applied to saving of precaution in product liability cases and if yes, in what manner. *See* DOUGLAS LAYCOCK, MODERN AMERICAN REMEDIES: CASES AND MATERIALS 598-600 (3d ed., 2002).

C. *Equalizing Externalities*

Think of liability as having two components: The baseline of liability for harm resulting from the right choice, plus the increase in liability for making the wrong choice. The increase in liability for making the wrong choice is the difference in liability. The difference in liability can be used to control the mandatory choice, and the baseline of liability can be used to control other behaviors: engaging in the underlying activity, preparing to choose and executing the choice. In section A we assumed the baseline to be zero. Now we explore under what circumstance it should be positive.

As we have shown, disgorgement damages (DDA) provide the lowest liability for a mandatory choice that still gives an incentive to make the right choice. As long as the difference in liability for each of the choices equals or exceeds DDA, the actor has incentives to make the right choice. The line labeled "mandatory choice" in Figure 3 depicts the fact that liability at least as large as DDA provides efficient incentives for the mandatory choice.

Figure 3: Damages and Optimal Incentives for Different Choices

0	DDA	equalization	internalization
(activity level)	(mandatory choice)	(preparing to choose)	(execution of choice)
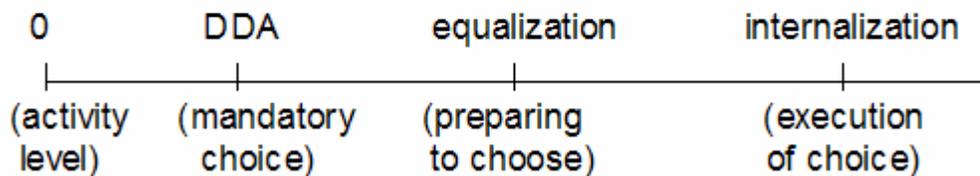
A mechanical application of the DDA could end up with liability which is higher than liability for the entire harm. That could create a moral hazard. Suppose gains from untaken precautions are 1, probability of harm is .1, and harm, if materialized, is 5 in half of the cases, and 25 in the rest of the cases. Mechanical application of the DDA would impose liability on the injurer for 10, regardless of whether the materialized harm is 25 or 5. That could provide incentives for victims to bring upon themselves harm of 5, and get compensation of 10. *See* Levmore, *supra*. To avoid moral hazard we suggest applying the DDA in a different way: Impose liability according to the ratio between gains and expected harm. In the latter example the ratio between gains and expected harm is 1/3. Therefore, if harm of 5 materializes liability will be for 1.66, and if harm of 25 materializes liability will be for 8.33. The expected liability of the injurer in this example will be exactly 1 and the moral hazard problem completely avoided.

Now consider how the baseline of liability affects the first choice depicted in Figure 2 - engaging in the underlying activity. The incentive to engage in the underlying activity depends on the resulting level of liability. A higher baseline discourages engaging in the activity, and a lower baseline encourages it. The lowest baseline for damages provides the strongest incentives to engage in the activity. If the activity has more positive than negative externalities, as with specializing in obstetrics, then the most efficient incentives to engage in the underlying activity require the lowest baseline for damages,[28] which is zero.[29] Figure 3 depicts this fact by placing "activity level" at zero on the damages line.

Now consider how liability for the wrong mandatory choice affects the choice that immediately precedes it in Figure 2, which is preparing to choose. The difference in liability determines how much the actor stands to lose from making the wrong choice. When the actor stands to lose more from the wrong choice, he has a stronger incentive to prepare to choose. Damages exceeding DDA are required for efficient incentives to prepare to choose. Specifically, incentives to prepare are efficient when the difference in liability equals the difference in social costs between the alternatives.[30] Figure 3 depicts this fact by placing "equalization" to the right of DDA on the damages line.

We apply these principles to Example 2, where vaginal birth risks harm of 200 with probability .10 (expected harm of 20), and cesarean birth risks harm of 300 with probability .10 (expected harm of 30). For efficient incentives to prepare to choose and to make the right choice, the difference in expected liability must equal the difference in expected harm, which is 10. If liability is imposed for materialized harm and not exposure to risk, the difference in liability must be 100. Assume the *difference* in liability for materialized harm equals 100 – making the wrong choice increases liability by 100 as compared to making the right choice. Now consider the *baseline*, which refers to liability for harm when making the right choice. The baseline could be 200, which implies damages of 200 and 300 for harm from vaginal and cesarean birth, respectively. Or the baseline could be 50, which implies damages of 50 and 150, respectively. Or the baseline could be 0, which implies damages of 0 and 100, respectively. Since the underlying activity in Example 2 has beneficial externalities, damages for making the wrong mandatory choice should be computed by starting with a baseline of 0 and adding the difference in harm to the victim, so liability for materialized harm in cesarean birth should equal 100. This is equivalent to starting with the actual harm of the victim (300) and subtracting the least harmful alternative (200).

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[28] Note that setting the liability difference and baseline in a discrete choice corresponds to setting the marginal and average liability in a continuous choice.

[29] We assume that the baseline cannot be negative.

[30] *But see* text before the paragrapg which follows note 27, *supra*.

We summarize these results in a general principle. The *Equalization Principle* is the principle that the difference in expected social harm between mandatory alternatives should equal the difference in the actor's liability. The Equalization Principle provides socially efficient incentives to prepare to choose and to make the right choice. Since the Equalization Principle concerns the difference in liability and not the baseline, the latter can be adjusted for the best incentives to engage in the underlying activity.

We formalize the Equalization Principle by using the same notation as before, where the mandatory choice is between A and B. The following expressions give the externalities for the two acts:

FOR ACT A : $q_A d_A \;-\; p_A h_A \quad + \quad b_A - m_A$

FOR ACT B : $q_B d_B \;-\; p_B h_B \quad + \quad b_B - m_B.$

$$\begin{matrix} liability & price \\ externality & externality \end{matrix}$$

The Equalization Principle requires equating the externality for the two acts:

$$(q_A d_A - p_A h_A) + (b_A - m_A) = (q_B d_B - p_B h_B) + (b_B - m_B) \tag{3}.$$

For an application of equation 3, assume the consumer pays for the benefit he receives, or $b_A = m_A$ and $b_B = m_B$. Equation 3 reduces to:

$$(q_A d_A - p_A h_A) \quad = \quad (q_B d_B - p_B h_B) \tag{3`}.$$

Equation 3` says that the difference between expected liability and social harm for act A equals the difference between expected liability and social harm for act B.

Now we turn to the fourth choice in Figure 2 - execution of a mandatory choice. Expected liability must equal the expected harm of faulty execution in order to provide perfectly efficient incentives for proper execution of the procedure.[31] Figure 3 depicts this fact by placing "execution of choice" at the "internalization" point on the damages line.

To illustrate by Example 3, the obstetrician makes a mistake in executing vaginal delivery with probability .10 that causes harm of 200, and the probability of liability is 1. In cesarean delivery the obstetrician makes a mistake with probability .10 that causes harm of 300, and the probability of liability is .5.

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[31] Note, however, that this problem could be avoided if execution of the chosen procedure involves a series of mandatory choices. For subsequent mandatory choices, less than 100% liability would suffice for the same reason that it suffices in making the original mandatory choice – the liability difference control, not the baseline.

Since the probability of liability is .5 for the harm caused by faulty cesarean delivery, the harm is externalized half of the time. To overcome this distortion, set liability equal to 200% of the harm from faulty cesarean delivery. Now the obstetrician is liable for 100% of the expected harm from faulty vaginal or cesarean delivery, as required to internalize the social costs of negligent execution.

Figure 3 summarizes the tradeoffs in incentives for the four choices when setting liability. Incentives for the activity level are best when liability equals zero. We are assuming that the activity has more positive than negative externalities. To provide efficient incentives for making the right mandatory choice, damages must increase at least to the disgorgement level (DDA). Increasing damages to the equalization level will provide efficient incentives for preparing to make the mandatory choice and to make it. To provide incentives for executing the mandatory choice, damages must increase to the internalization level.

III. UNCERTAINTY ABOUT THE RIGHT CHOICE AND APPLICATION

Thus far we have assumed that courts have accurate information about the private and social costs of the relevant acts.[32] In fact courts seldom possess complete information about the alternatives faced by the actors. Even so, courts can often conclude that negligence caused harm. For those cases we propose that in certain areas where positive externalities are high or when mandatory choices are common, legislatures give courts several options for setting damages. Legislatures might authorize courts to award in such areas damages of 25%, 50%, 75%, 100%, 125% or 150% of the plaintiff's harm.

For freely chosen activities, legislatures could allow courts to award damages as guided by the underlying externalities. For driving, liability might equal, say 150%. When two automobiles collide, part of the damages ideally would be paid to the state.[33] For immunization from diseases, liability might equal, say, 75%.[34]

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[32] When we applied the Least Harmful Alternative Principle to Example 2, we assumed that courts could verify that the unavoidable risks of vaginal delivery were 20 while the risks of cesarean were 30. When we discussed disgorgement damages for accidents (DDA), we assumed that courts could verify the gains to the doctor from choosing cesarean and the probability of the resulting harm. Similarly, when we applied the Equalization Principle to Example 3 we assumed that courts can verify the risks of negligent execution of each alternative, as well as the level of externality associated with each of the underlying activities.

[33] If a car strikes a pedestrian, damages of, say, 150% will discourage driving and hence correct for the negative externality. This is true regardless of whether or not the pedestrian gets all of the damages. If one car strikes another car, damages of 150% paid to the victim will redistribute money from negligent to non-negligent driver. It will discourage negligent driving and encourage non-negligent driving. The state should take, say, half of the damages in order to discourage non-negligent driving.

For mandatory choices with positive externalities in the underlying activity like obstetrics, courts should be allowed to choose damages below 100%. The exact choice should depend on the court's information, and the incentive effects explained in this article. If the actor saved money by untaken precautions, the court might want to give damages that approximate disgorgement for accidents. Application of DDA requires information about the gain of the injurer from untaken precautions and information about the probability of the injurer's liability. In Example 2, DDA requires information on both the doctor's gain from his negligence (which is 1) and the probability of holding him liable when he behaves negligently (which is .10). Disgorgement damages should be low as a percentage of victim's harm, say 25%. Disgorgement damages are especially attractive if the court has little concern with incentives to prepare for the mandatory choice or to execute it.

Alternatively, the court might want to set damages by deducting a fraction that reflects the risk of the least harmful alternative. This approach requires verifying the harm, the risk of the chosen alternative and the risk of the least harmful alternative. When the court cannot verify these two latter values precisely, it might roughly estimate the magnitudes. To illustrate, suppose the court in Example 2 finds out that the risk from cesarean was between 30 and 40, whereas the risk from vaginal delivery was between 10 and 20. The court should reduce damages at least by 25%.[35]

Finally, if the court can verify the extent of the external harm from two alternatives in a mandatory choice, it may want to set damages in order to equalize the externalities. When the court cannot determine the exact expected harm of each alternative, it could use rough estimations. Assume that the court in Example 3 can verify the range of risks associated with cesarean delivery. Instead of exact expected harm of 20, the court verifies that the expected harm is at least 20 and no more than 30. If the rate of externalization of cesarean accidental harms is 50%, courts could safely assume that expected harm of at least 10 was externalized when the doctor chose cesarean. Therefore courts could award damages for the full harm when the doctor chose cesarean, and reduce damages when the doctor chose vaginal delivery. The rate of the reduction should reflect the minimum expected harm that cesarean externalizes. Thus, in our case, if courts could assume that the expected harm of vaginal delivery is, say, also 20 to

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[34] Since immunization creates benefits also to people who do not take the vaccine, which constitute positive externalities. *See* Steve P. Calandrillo, *Vanishing Vaccinations: Why Are So Many Americans Opting Out of Vaccinating their Children?*, 37 U. MICH. J.L. REFORM 353, 419-20 (2004); Amy B. Monahan, *The Promise and Peril of Ownership Society Health Care Policy*, 80 TUL. L. REV. 777, 833-34 (2006).

[35] The most favorable assumption for the defendant is that the risks associated with cesarean was 40 and for vaginal delivery was 10, thus liability should be for (40-10)/40xH.

30, they could safely reduce liability for accidental harm caused during vaginal delivery by 33%. That would result in reduction of expected liability for vaginal delivery by no more than 10. Of course, also here the court can reduce damages even further depending on the level of the positive externality of the underlying activity and the risk of eroding incentives to execute the alternative chosen by the doctor.

By using numbers, the preceding discussion suggests a level of precision that courts can seldom achieve. In fact we favor simple rules with modest information requirements that respond to the contours set out in the principles in this paper. As long as the simple rules respond to liability externalities and mandatory choices, many doctors will pay less.

CONCLUSION

Liability externality has various possible remedies. Since Pigou, the standard prescription taxes negative externalities and subsidizes positive externalities.[36] In principle taxes and subsidies are the best solution to externalities whenever private bargains cannot solve the problem. In practice, however, the scope and direction of taxes and subsidies has more to do with interest group politics than with economic efficiency. Given practical limits on controlling externalities by taxes and subsidies, liability law might be adjusted for better results. This is especially true for those externalities that courts can better understand because they arise from the liability system itself, such as the activity level problem.

Several dimensions of liability law could be adjusted in principle: the rule of liability (strict liability versus negligence), the standard of care, the standard and burden of proof, and the level of damages. Recently Jeong-Yoo Kim argued that negligence is generally a better rule than strict liability when the activity involves positive externalities unrelated to the accident. Kim observes that a negligence rule places a smaller burden of liability on the activity, which is desirable when it has positive externalities.[37] Similarly, Keith Hylton argued that a strict liability rule is suitable only when the external costs of the activity exceed the external benefits by a substantial amount, whereas a negligence rule is better when the external costs and external benefits are roughly the same,[38]

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[36] ARTHUR C. PIGOU, THE ECONOMICS OF WELFARE (London, 1932).

[37] Jeong-Yoo Kim, *Strict Liability Versus Negligence when the Injurer's Activity Involves Positive Externalities*, 22 EUR. J.L. & ECON. 95 (2006). *See also* Mark Geistfeld, *Should Enterprise Liability Replace the Rule of Strict Liability for Abnormally Dangerous Activities?*, 45 UCLA L. REV. 611, 653 (1998) (arguing that with positive externalities strict liability is undesirable as a means of reducing risks relative to negligence).

[38] Keith N. Hylton, *A Missing Markets Theory of Tort Law*, 90 NW. U. L. REV. 977, 984 (1996). Keith N. Hylton, *Duty in Tort Law: An Economic Approach*, (Boston Univ. Sch. of Law, Working Paper Series, Law & Economics, Working Paper No. 06-04, 2006) *available at*

Another possibility is adjusting the legal standard of care under a liability rule. A lower standard of care for activities with positive externalities reduces expected liability and thus increases incentives to engage in the activity, whereas a higher standard of care has the opposite effect. Similarly, increasing the standard of proof reduces the injurer's expected liability and thus increases incentives to engage in the activity, while shifting the burden of proof to the defendant has the opposite effect.

Instead of these possibilities, we focus on adjusting damages to remedy liability externalities. Adjusting damages could be regarded as a supplement or an alternative to the other possibilities. Compared to the alternatives, adjusting damages has distinct advantages. We believe that a full exploration of all the alternatives would conclude that the principles developed in this paper are easier for courts to understand and to apply accurately than the alternatives.

Our suggestions in this Article could be criticized as undermining one of the major goals of tort law, which is compensation. We mention briefly how to defend our focus on incentives rather than compensation. As we demonstrated through the paper, full compensation through tort law is detrimental to potential victims when they benefit from the underlying activity. When excessive liability for child birth discourages doctors from specializing in obstetrics and encourage them engage in defensive medicine, patients ultimately pay much of the price. Given these facts, the potential victims may prefer to provide for compensation by other means than tort law, such as social or private insurance.

http://www.bu.edu/law/faculty/scholarship/workingpapers/abstracts/2006/pdf_files/HyltonK022706.pdf.