

Assessing the Merits of Reallocation under Joint and Several Liability: Evidence from Asbestos Litigation

Anup Malani and Charles Mullin*

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Abstract

If two defendants share a joint and several liability and the first becomes insolvent, its unpaid liabilities are reallocated to the second. The upside is that the plaintiff is insured against the insolvency of the first defendant. The downside is that, if the second defendant's assets cannot cover the first defendant's liabilities, the second defendant may also go bankrupt. We quantify this insurance and externality in the context of asbestos-related torts. We choose this example because 61 companies with major asbestos liabilities have gone bankrupt since 1982. Using data from 10-K forms and asbestos trials, we estimate more than half of liability payments by currently solvent defendants can be attributed to the reallocation of liabilities owed by bankrupt defendants. Moreover, we estimate that each additional dollar of compensation that reallocation provides to plaintiffs costs 23 to 66 cents in bankruptcy-related expenses. We situate this finding in the broader debate over different policies designed to provide insurance against insolvency, including superpriority for tort claimants.

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According to the Restatement (3d) of Torts, "if the independent tortious conduct of two or more persons is a legal cause of an indivisible injury," a state may hold all responsible persons jointly and severally liable for the injury. A central implication of joint and several liability is that, if any responsible person becomes insolvent, his unpaid liabilities are reallocated to the remaining, solvent responsible persons. This reallocation of liability is thought to serve two purposes. It insures compensation to plaintiffs by shifting the risk of a given defendant's insolvency from the plaintiff to co-defendants. Moreover, it reduces the level of tortious activity by encouraging co-defendants to police one another.

The most important test case for reallocation is asbestos litigation. Liability for asbestos is joint and several in all but 14 states. It is estimated that 27 to 100 million American have been exposed to asbestos [28]. As a result, nearly 700,000 plaintiffs had sued a total of 8,000 companies for asbestos exposure by the end of 2003 [6, 38]. It is projected that 1.1 to 3 million people will ultimately file asbestos claims and that the total liability bill will range from \$200 to \$265 billion [38, p. 42]. (To put this in perspective, this is roughly equal to all medical malpractice liability costs for the last 25 years [33, Appendix 5].) This redistribution of funds from injurers to victims is far from orderly. As illustrated by the line-plot in Figure 1, the average payment by individual defendants to individual plaintiffs nearly tripled from 1990 - 2002. Moreover, a growing number of defendant companies are filing for bankruptcy. The bar-chart in Figure 1 shows 61 companies have filed since 1982 — 28 of them since 2000 [17, p. 52]. Because asbestos manufacturers such as the Johns-Manville Corporation have already declared bankruptcy, many of the companies now being sued, such as Pfizer and Viacom, have rather tenuous connections to asbestos victims.

These trends suggest that it would be useful to know the empirical validity of the rationale for reallocation of joint and several liabilities. In particular:

1. To what extent does reallocation improve recovery by plaintiffs?
2. Does reallocation promote the optimal deterrence of tortious activities?

In addition, it would be helpful to know of any harmful side-effects of reallocation of unpaid liabilities from one defendant to co-defendants. Specifically:

3. Does reallocation cause co-defendants to also file for bankruptcy?

This is an important negative externality because bankruptcy has both direct costs such as professional fees [26, 5, 39, 25] and indirect costs such as lost productivity in the period before and during reorganization [2]. A recent survey of the literature estimates that the costs of bankruptcy range from 12 to 20 percent of a firm's pre-distressed value [5].

This paper provides data on one of the two benefits of reallocation – higher victim compensation – and the negative externality reallocation has on co-defendants' solvency in the case of asbestos liabilities.¹ Specifically, we employ data from 10-K filings of asbestos defendants and data on the universe of judgments in asbestos trials to estimate the relative amount of liability that has been reassigned from insolvent defendants to solvent co-defendants. We find that asbestos claim values against individual defendant companies grew an additional 5 - 10 percent annually — or 56 to 157 percent total — during 1990 - 2002 due to the bankruptcy of jointly liable defendants. As a result, as much as 60 percent of current payments by companies can be attributed to reallocated liabilities from companies that went bankrupt during this period. The actual amount is even greater once the effect of bankruptcies prior to 1990 are taken into account.² These findings suggest that

¹We have little to say about the deterrence benefits of reallocation. There are reasons to suspect that reallocation did not deter very much asbestos production – especially early production. But there is little basis for generalizing the reasons to other joint and several torts. Therefore, we believe our only empirical contribution is to the discussion of the insurance benefits and costs of administering reallocation.

There are three reasons to suspect that reallocation did not deter much asbestos production. First, most asbestos liabilities were incurred four decades before liability was imposed. Second, tort law has become far more liberal in permitting recovery and this change may not have been anticipated. Third, a good share – perhaps one-half – of asbestos liabilities are covered by insurance policies that have been interpreted to cover far more than insurers anticipated. (Historically, insurers have been responsible for 61% of payments. [27]. Going forward, however, proposed legislation to establish a national trust fund to compensate asbestos victims – the FAIR Act – assigns \$45 billion of financing liability to insurers and \$90 billion to defendants.) Finally, The U.S. government, specifically the Navy, required the use of asbestos by manufacturers of its military hardware, making it hard for the latter to refuse to use asbestos.

²Identification of the bankruptcy-induced growth in claim values against individual companies relies on data from 10-K filings, which reveal average payments by individual defendants to plaintiffs. Growth in these payments is the product of "natural" growth in the value of tort claims and growth due to the reallocation of liabilities owed by bankrupt companies. (Natural growth is due, e.g., to changes in legal rules, discovery of new evidence, or growth in wages or savings of injured workers.) We derive the bankruptcy-induced growth rate by estimating the natural growth rate and dividing the total growth rate by the natural growth rate. We estimate the natural growth rate in two ways. One approach relies on the insight that, when a defendant goes bankrupt, joint and several liability increases the liability of each solvent co-defendant to a given plaintiff, but not total recovery to the plaintiff. Because the natural growth rate operates on the total recovery to the plaintiff, we can estimate it by examining the growth in the sum of payments across companies to a fixed set of plaintiffs. Our second approach takes advantage of a natural experiment from the mid-1990s during which companies held off filing for bankruptcy while the U.S. Supreme Court considered whether to authorize a consolidation of all asbestos litigation into a class action. During this period, total growth in average payments by defendants was equal to natural growth because there were no bankruptcies. Assuming that natural growth is constant over time, this experiment enables us to derive bankruptcy-induced growth during periods outside the experiment. We validate our estimates from 10-K data with data on judgments from asbestos trials. We do not rely primarily on the latter because judgments are a small, nonrandom subset of asbestos claims.

reallocation provides plaintiffs a significant amount of insurance against insolvency of defendants, at least when compared to the liabilities owed by solvent companies.

The amount of liability that is being reallocated, however, raises serious concerns that the bankruptcy of asbestos companies may have a domino effect and cause the bankruptcy of co-defendant companies. This concern is illustrated by the coincidence, in Figure 1, of growth in the average company's payment on individual claims and growth in the bankruptcies of companies with asbestos liabilities.³ This paper employs a reasonable hypothetical to estimate the costs – in terms of inefficiencies from domino bankruptcies – of the additional compensation reallocation provides to plaintiffs.⁴ We find that the cost is 23 - 66 cents per dollar of compensation, which leads us to conclude that reallocation is a rather costly mechanism for providing insurance.

Joint and several liability with reallocation is not the only tool for improving plaintiff recovery and for discouraging excessive tortious activity when defendants are at risk for insolvency. Alternatives include elimination of limited liability for torts [13], requiring defendants purchase insurance against default [8], and prohibiting the discharge of tort liabilities in bankruptcy [4]. The most popular reform proposal, however, is raising the priority of tort claimants in bankruptcy [31]. In its stronger form, this proposal calls for "super-priority" of tort claimants before even secured creditors [34, 30]. In order to situate the contribution of this paper in the larger debate over how best to insure victims against defendant insolvency, we also provide a quick comparison of the relative merits of reallocation and its leading competitor, super-priority. The take-away is that reallocation provides more resources to compensate victims – the assets of all co-defendants – but compulsory insurance and superpriority may offer better prospects for deterrence because insurance companies and the defendant's creditors are in a better position to discipline the defendant for undertaking tortious activity than are its co-defendant competitors.

This paper belongs most directly to the law and economics literature on joint and several liability. That literature focuses on the incentives that the doctrine provides for the ex ante tortious behavior [22, 37] and for the ex post litigation strategy of defendants [23, 21, 20, 29, 11, 14].⁵ Our

³Our findings also suggest that a significant portion of the growth in claim values against individual defendants depicted in Figure 1 is due to the reallocation of liabilities from bankrupt co-defendants. It is not all due to growth in the total recovery of individual plaintiffs.

⁴There were two waves of asbestos bankruptcy in the 1990s. We assume that the first wave caused the second. Our estimate of the amount of additional compensation provided to victims during the period after the first wave \$6.5 - 11 billion. The direct and indirect costs of the second wave bankruptcies is \$2.5 - 4.3 billion.

⁵Even the literature that examines the interaction of joint and several liability and insolvency focuses on ex post

contribution, however, is to provide data on the ex post insurance against defendant insolvency that the doctrine provides to plaintiffs and on the negative externality that insolvent defendants have on solvent co-defendants as a result of the doctrine. The paper also relates to the literature on the intersection of tort law and bankruptcy. That literature examines a number of different methods [31, 36, 4, 13, 8, 34, 30] of improving compensation for tort claimants when defendants are judgment proof. Omitted from this discussion, for the most part, is joint and several liability with reallocation. The reason is likely that joint and several liability does not apply to all torts and that reallocation is not the only effect of joint and several liability. Our contribution is to compare the merits of reforms proposed in this literature with the merits of joint and several liability.

Finally, this paper belongs to the public policy literature on the costs of asbestos litigation. The most closely related paper is Stiglitz et al. (2003), which attempts to quantify the direct and indirect costs associated with asbestos-related bankruptcies. Its analysis, however, is confined to the period after a company has gone bankrupt and to costs for the bankrupt company and its employees only. In contrast, we study the externality that one company's insolvency has on other solvent companies during the period before the latter themselves become insolvent. Although we are not the first paper to hypothesize that this externality may trigger financial distress at co-defendant companies [43, 19], we are the first to attempt to quantify the magnitude of this distress.

The remainder of this paper may be outlined as follows. Section 1 describes the doctrine of joint and several liability and its interaction with bankruptcy law. Section 2 describes the methodology employed to estimate the growth rate of tort recoveries due to joint and several liability. Section 3 presents our data, some technical details regarding our estimation strategy,⁶ and the results of our analysis. Section 4 examines the effect joint and several liability has on the solvency of co-defendants and bankruptcy costs. Section 5 compares the merits of reallocation to policy alternatives such as elimination of limited liability, compulsory insurance, and super-priority for tort claimants in bankruptcy. The conclusion discusses the extent to which one can generalize empirical findings from the asbestos context to other joint and several torts.

litigation strategy, in particular the incentive to settle [24, 37].

⁶The remaining details may be found in the appendix.

1 Legal implications of joint and several liability given insolvency

This section sets forth the basic doctrine of joint and several liability, indicates which states apply the doctrine to asbestos-related injuries, and describes the interaction between the doctrine and bankruptcy. Suppose that two defendants, D_1 and D_2 , engage in "independent tortious conduct that is a legal cause of an indivisible injury" to plaintiff P valued at L . Moreover, according to principles of comparative fault, D_1 is responsible for portion L_1 and D_2 for portion L_2 of the plaintiff's total loss.⁷ The Restatement (3d) of Torts §17 says that the defendants may be severally liable or jointly and severally liable for that loss, depending on the law of the applicable jurisdiction. If liability is merely several, to recover L_1 the plaintiff must sue D_1 . To recover L_2 she must sue D_2 . In contrast, if liability is joint and several, P may sue either D_1 or D_2 for the entire injury L .

Table 1 indicates whether defendants are currently liable severally or jointly and severally for asbestos poisoning in each of the 50 states and D.C. Among jurisdictions with joint and several liability, one can find four distinct flavors of this doctrine. One imposes joint and several liability so long as the plaintiff has no comparative responsibility for her injury. Otherwise the defendants are merely severally liable. A second imposes joint and several liability only on defendants with comparative responsibility greater than some threshold, typically 50 percent. A third imposes joint and several liability only for a certain type — economic or noneconomic — of damages or for damages below some ceiling. The final rule imposes joint and several liability without any conditions whatsoever. This last variant of the doctrine is labelled a pure joint and several rule. At opposite ends of the spectrum, one finds 14 states with several liability and 18 states with pure joint and several liability.

1.1 The case of solvent defendants

Suppose liability is joint and several and P sues D_1 for the entire loss and does not sue D_2 at all. It is then the responsibility of D_1 to seek compensation from D_2 . D_1 can do this in two ways.

⁷The sum of these portions and the portion L_P for which the plaintiff is herself responsible equals the total injury to the plaintiff: $L_1 + L_2 + L_P = L$.

First, when P sues D_1 , D_1 can compel D_2 to join the suit. Whether joinder is permitted depends on state procedural rules.⁸ If joinder is permitted, P may recover L_1 from D_1 and L_2 from D_2 all in one legal action. Second, if D_1 fails to join D_2 and P obtains a judgment for L against D_1 , D_1 can — again, state law permitting — file a separate suit for contribution from D_2 .⁹ The size of the contribution depends on whether state law permits D_1 to recover from D_2 a pro rata portion ($L/2$) of the total loss or the portion (L_2) dictated by comparative fault. Table 2 summarizes the interaction between contribution and settlement.

1.2 The case of insolvent defendants

Of greater relevance to this paper is what happens if liability is joint and several, reallocation to a co-defendant is permitted, and one of the defendants, say D_1 , has insufficient assets A_1 to cover his portion L_1 of the liability to P . D_1 may declare bankruptcy. (Of the 37 jurisdictions with some form of joint and several liability, 24 states and D.C. permit reallocation of asbestos liabilities to solvent defendants.¹⁰) If P has already obtained a judgment against D_1 , then she must file a claim against D_1 's estate. She has the same priority as an unsecured creditor. If P has been injured by D_1 and has filed suit but not obtained a judgment against D_1 , the bankruptcy court must estimate the size of D_1 's liability to P and permit a claim of that value against the bankruptcy estate with the same priority as a claim by an unsecured creditor.

If there is a class of plaintiffs that has been injured by D_1 but has not filed suit or a class that will be injured in the future by the products D_1 has already produced, then the court has two options. The court may refuse to discharge their claims.^[41] Alternatively, the court may estimate the size of D_1 's liabilities to future plaintiffs, create a trust to cover these liabilities,¹¹ and finance this trust with certain of D_1 's assets. The assets the court can allocate to the trust are those left over after first paying secured creditors the full value of their secured claims and then giving unsecured ordinary creditors a portion of the remaining assets equal to their share of the

⁸Restatement (3d) Torts [1, §17 cmt. a] provides a survey of state joinder rules. In federal court joinder is accomplished through an impleader action under Fed. R. Civ. Pro. 14(a), subject to limits under Rules 19 and 20.

⁹Failure to join the defendant from whom contribution is sought in the original action by the plaintiff is not generally a defense to a contribution action. There is a risk, however, that the contribution action will yield an inconsistent verdict on the same set of evidence [32, p. 951].

¹⁰See Table 1. It should be noted that this number has fallen in recent years because a number of states have only recently — in 1986-1987 or in the late 1990s — reformed their tort law to eliminate pure joint and several liability.

¹¹In asbestos cases, this power is explicitly provided by §524(g) of the U.S. Bankruptcy Act of 1978.

total claims by unsecured ordinary creditors and tort claimants against D_1 . That said, there are certain assets that are most valuable in the hands of the trust and therefore find their way there. These include insurance policies to cover D_1 's tort liabilities and contribution claims that D_1 may have against jointly liable defendants. Other generic assets — cash or equipment — also find their way into the trust. Because tort claimants have less priority than secured creditors, the trust is also likely to contain D_1 's equity. Hence the plaintiffs are likely to own the firm after bankruptcy, though they are permitted to sell their shares at any time.

What happens to the unpaid portion of D_1 's liability, $L_1 - A_1$? In a jurisdiction with several liability, the loss is borne by the plaintiff. D_2 can only be held responsible for L_2 . In joint and several jurisdictions, however, some of the loss may be reassigned to D_2 . The fraction of $L_1 - A_1$ for which D_2 can be held liable depends on whether the state in which P brings her suit has a pure joint and several rule or a reallocation statute. If the state has a pure joint and several rule, D_2 can be held liable for all of $L_1 - A_1$ [1, §10 cmt. b]. If the state has a reallocation rule that permits an insolvent defendant's liability to be assigned solely to solvent defendants, D_2 can again be held liable for all of $L_1 - A_1$. If the reallocation statute permits an insolvent defendant's liability to be assigned to both solvent defendants and the plaintiff, D_2 can only be held liable for a fraction of D_1 's unpaid liability. This fraction is $L_2 / (L_2 + L_P)$, which is equal to his comparative fault relative to that of the plaintiff. The plaintiff bears the remaining share of D_1 's unpaid liability [1, §17]. Table 2 summarizes reallocation rules and their interaction with settlement.¹²

To summarize, if one defendant has insufficient assets to cover his share of a joint and several

¹²As a technical matter, neither the pure joint and several rule nor reallocation statutes specify whether L_1 or $L_1 - A_1$ is to be reassigned to D_2 and, perhaps, P . In practice, however, it appears that L_1 is reassigned and D_2 and P are permitted to seek contribution out of A_1 from D_1 's estate. This assessment is based on cases, such as *Hosley v. Armstrong Cork Co.* (Minn. 1986) [40], which interpret reallocation statutes, and on trust distribution plans for defendants who file for bankruptcy due to asbestos liabilities. Reallocation statutes are silent with regard to the amount to be reallocated and the few courts that have addressed the issue reassign L_1 rather than $L_1 - A_1$. Moreover, trust distribution plans appear to contain provisions whereby defendants jointly liable with a bankrupt defendant may seek contribution from the latter's estate [10, 15, §5.6]. That said, we have spoken to trustees of tort victim trusts of such bankrupt entities as UNR and found that few if any contribution claims have been made, let alone paid out, by these trusts.

Suppose D_1 goes bankrupt because it has fewer assets than its share of liabilities, D_1 's liabilities are reallocated to D_2 , but D_2 does not have enough assets to cover its own liability plus D_1 's, i.e., $L_2 < A_2 < L_1 + L_2$. D_2 may also declare bankruptcy. A natural question is: can D_2 's estate, having perhaps established a trust with assets to cover not just L_2 but also some of L_1 , seek contribution against the estate of D_1 ? As far as we know, this question has not been answered by any court. (We see no reason, however, if D_2 's trust has assets greater than D_2 's equitable share of liability plus the unpaid portion of D_1 's liabilities, why D_2 should not be able to seek contribution from D_1 's estate.) Whatever the answer turns out to be, however, D_2 will still have been forced into bankruptcy and will not be able to obtain more than $A_1 < L_1$ in contribution. These rules concerning the interaction between reallocation, on the one hand, and contribution and insolvency, on the other, are reproduced in Table 2.

liability to a plaintiff, that defendant's liabilities may be reallocated to a jointly liable but solvent defendant. If the second defendant ends up paying more than his equitable share of the liability, he can seek contribution from the bankruptcy estate of the first defendant, though in practice such actions are rare. If, however, the second defendant does not have sufficient assets to cover both his own share of the joint liability and the reassigned portion of the first defendant's share of that liability, the second defendant may also end up bankrupt.

2 Empirical strategy for identifying reallocation

2.1 Empirical model

This section provides an overview of the empirical strategy employed to quantify the effect of the bankruptcy of one defendant on tort payments by solvent, jointly liable defendants. The strategy can be illustrated by means of a simple two period model. Suppose there are three defendants (D_1, D_2, D_3) and two plaintiffs (P_1, P_2). Each plaintiff has suffered the same injury, say mesothelioma from exposure to asbestos. All three defendants are jointly liable for the injury to each plaintiff. Moreover, for simplicity, assume each defendant's share of liability to P_1 is identical to that defendant's share of liability to P_2 . These shares are (S_1, S_2, S_3) . The only difference between the two plaintiffs is that P_1 sues in period t , and P_2 in period $t + 1$. The only change in the defendants across the two periods is that D_1 goes bankrupt between the two periods.

The total liability of the three defendants to P_1 is L_t , where the subscript indicates that P_1 sues on this liability in period t . The total liability to P_2 is L_{t+1} . Because both plaintiffs suffer the same injury, we define the natural growth rate of tort claim values to be $NG = L_{t+1}/L_t$. This growth may be due to discovery of new evidence that suggests the defendants are more culpable than previously thought, to changes in liability rules that makes it easier for a plaintiff to prove her case, to a change in damages rules that makes a greater share of a plaintiff's injury compensable by the defendants, to changes in litigation strategy by the plaintiff that exploits these rules, or to growth in the wages or savings of injured plaintiffs [16].

Assume that the parties are in a jurisdiction with joint and several liability for asbestos poisoning and with a reallocation rule that permits reassignment of all of an insolvent defendant's liabilities to solvent defendants (but not plaintiffs). Moreover, assume no contribution claims are possible

against bankrupt entities. The total liability of a solvent defendant, say D_2 , is $L_{2,t} = S_2 L_t$ in period t . His liability in period $t + 1$ is

$$L_{2,t+1} = \left\{ S_2 + \frac{S_2}{S_2 + S_3} S_1 \right\} L_{t+1} = S_2 \left\{ 1 + \frac{S_1}{S_2 + S_3} \right\} L_{t+1}. \quad (1)$$

The second term in each of the brackets reflects the fact that D_1 has gone bankrupt. Due to the reallocation rule, his share of the liability to P_2 is reassigned to D_2 in proportion to his share of liability to P_2 relative to other solvent defendants, here just D_3 . We will define the growth rate of tort claim liability of D_2 due to the bankruptcy of D_1 to be $BG = S_1 / (S_2 + S_3)$ because had D_1 not become insolvent, D_2 's liability would simply be $S_2 L_{t+1}$. (The bankruptcy-induced growth rate of tort claim values against D_3 is the same.)

Suppose that one only observes the tort payment history of solvent defendants, i.e., $\{L_{1,t}\}$, $\{L_{2,t}, L_{2,t+1}\}$ and $\{L_{3,t}, L_{3,t+1}\}$. This is due to the fact that there are far more plaintiffs than defendants. Through the end of 2003, there were 700,000 plaintiffs compared with 8,000 defendants [6, 38]. (Although judgments in court cases provide information on individual plaintiffs' overall recovery, they are a nonrandom subset of all asbestos claims.) As for insolvent defendants, they may enter bankruptcy when their expected liabilities exceed their expected ability to pay into the future. It may not be clear for some time, however, how large their actual unpaid liabilities are. In addition, for any plaintiff-insolvent defendant pair, it is unclear who exactly are the jointly liable but solvent defendants. This is not to say data on the tort payment history of solvent defendants is easy to obtain, an issue we will address below, but those data are easier to gather and more informative than other payment data.

The goal of our analysis is to estimate the bankruptcy-induced growth rate of tort claim values for solvent defendants given the tort payment histories of the solvent defendants. This is accomplished using only solvent defendant's tort payments data in two steps. First, we estimate the growth rate of any given solvent defendant's tort payments: $G_2 = L_{2,t+1} / L_{2,t}$. This growth rate can, as demonstrated in the following equation, be decomposed into the product of the natural growth rate of tort claims values and the growth rate of the value of tort claims against solvent

defendants due to the insolvency of jointly liable defendants:

$$G_2 = \frac{L_{2,t+1}}{L_{2,t}} = \frac{S_2 \left\{ 1 + \frac{S_1}{S_2+S_3} \right\} \frac{L_{t+1}}{L_t}}{S_2} = \{1 + BG\} \times NG \quad (2)$$

(The same is true of the growth rate of D_3 's tort payments.) Thus one can estimate the bankruptcy-induced growth rate of tort claims by $BG = (G_2/NG) - 1$, where NG is the natural growth rate of tort claims.

Second, we determine the natural growth rate in one of two ways. One takes advantage of a basic but important feature of joint and several liability. Although the doctrine may raise the tort liabilities of a solvent defendant once a jointly-liable defendant becomes insolvent, it theoretically does not raise the total tort recovery of any given plaintiff from all solvent defendants. Thus $L_{2,t+1} + L_{3,t+1} = L_{t+1}$. Therefore, we can estimate the natural growth rate with

$$NG = \frac{L_{t+1}}{L_t} = \frac{L_{2,t+1} + L_{3,t+1}}{L_{1,t} + L_{2,t} + L_{3,t}}. \quad (3)$$

Another way to estimate the natural growth rate is to find a period during which no firms are going bankrupt. During this period the natural growth rate is equal to the total growth rate G_2 because there is no bankrupt-induced growth. If the natural growth rate is constant over time, then our estimate of the natural growth rate is valid even for periods when firms are going bankrupt.

2.2 Complications

A number of issues may arise that complicate the calculations from the previous section. For example, what happens if one of the defendants, say D_2 , is in a joint and several jurisdiction but the other is in a several jurisdiction? Where one defendant, say D_2 , is in a several liability state, D_3 may be held solely liable for the insolvent defendant's share of the liability. The bankruptcy-induced growth rate in his claim values would be $BG_3 = S_1/S_3$. There would be no bankruptcy-induced growth in D_2 's claim values. Where we calculate the bankruptcy-induced growth rate separately for each solvent defendant, this is not a concern. Where we provide the average bankruptcy-induced growth rate across solvent defendants, however, there will be some error in our estimates. Nevertheless, the greater the number of claims subject to several liability, the lower will be our

estimate of this average growth rate. Moreover, any error should be slight because most asbestos injuries occurred before 1979, the year asbestos stopped being manufactured in the U.S., and only three states (Kansas, Vermont, and Wyoming) had deviated from the rule of pure joint and several liability by that point.¹³

A second complication is that some courts may interpret their state’s reallocation rule to only allow reassignment of unpaid (as opposed to all) liabilities of the insolvent defendant or may permit solvent defendants to seek contribution from an insolvent defendant’s estate — in the case of asbestos liabilities its §524(g) asbestos trust. In that case, the sum of tort payments by solvent defendants is less than the total receipts by the plaintiff: $L_{2,t+1} + L_{3,t+1} < L_{t+1} = A_1 + L_{2,t+1} + L_{3,t+1}$, where A_1 is the insolvent defendant’s assets available to P_2 . In order to estimate total receipts by the plaintiff, and thus the natural growth rate of tort claim values, one must include payments by insolvent defendants. This is made difficult by the fact that payments by insolvent defendants may be delayed by many years due to the automatic stay in bankruptcy and that it is difficult to match the date of a payment by solvent defendants with a date of payments by insolvent defendants to the same plaintiff. One factor that limits the impact of this shortcoming in our analysis is that we have found no evidence either of courts permitting only the reassignment of unpaid liabilities of insolvent defendants or of solvent defendants seeking contribution from insolvent defendants.¹⁴

A third complication is that there may be a mismatch between the number of claims filed against insolvent defendants and solvent defendant. One reason is that the cost of filing a compensation claim against an asbestos trust formed with an insolvent defendant’s assets are lower than the cost of filing a legal claim against a solvent defendant. This may raise the number of claims against an insolvent defendant relative to the number of claims against a jointly liable, solvent defendant. This is widely thought to be the reason, for example, that the Mansville Personal Injury Trust

¹³Two other issues are analogous in effect to the growth of several liability jurisdictions. First, some states do not authorize reallocation of an insolvent defendants liabilities to solvent defendants and, second, defendants who settle for less than their equitable share of liability after reallocation are protected in most states from contribution claims. The existence of joint and several states without reallocation is also subject to the caveat that most asbestos liabilities arising from exposure before 1979 and that most state tort reform statutes that abandon reallocation are adopted in 1986-1987 or the late 1990s. Ultimately, these two issues, like that in the previous paragraph, will appropriately be reflected in a lower estimate of the mean bankruptcy-induced growth rate of claim values.

¹⁴A related issue is that some states permit reallocation of an insolvent defendant’s liability to the plaintiff as well as solvent defendants. This limits the pressure that one defendant’s bankruptcy has on the financial status of other defendants. Therefore, it lowers the bankruptcy-induced growth rate of claim values: $BG = S_1 / (S_2 + S_3 + S_P)$, where S_P is the plaintiff’s share of liability. This reduction should be reflected in our estimates of this growth rate.

was forced to lower the amount it paid on each dollar of liabilities from, e.g., \$200,000 in 1988 to \$20,000 in 1995 on mesothelioma claims [3, 43, pp. 1323-1325]. A second reason for the mismatch is that, whereas §524(g) trusts may have high medical standards that must be met before any claim for compensation is paid, solvent defendants do not apply very high standards for certain types of claims filed against it. The explanation is that the cost to the defendant of enforcing these standards for certain — generally non-malignant — injuries is greater than the cost of settling the legal claims. This encourages the filing of questionable if not baseless suits against solvent defendants [43, pp. 1330-1332].¹⁵

We do not have the data to determine which effect dominates and therefore which type of defendant attracts more suits. Our concern, however, is the marginal effect that insolvency of one defendant has on the value of claims against remaining, solvent defendants. Therefore, the growth in the number of claims against asbestos trusts does not concern us. Moreover, baseless filings against a solvent defendant should be unaffected by the bankruptcy of a small number of jointly liable defendants. The cost of enforcing medical standards and product identification limits the gain from such filings. Therefore, baseless claims should experience substantially less bankruptcy-induced growth in claim values than well-substantiated claims. Thus, our estimate of average bankruptcy-induced growth should understate the true bankruptcy-induced growth experienced by well-substantiated claims, such as mesothelioma claims, and overstate the true bankruptcy-induced growth experienced by baseless claims.

A fourth complication is that courts may make errors in reallocation. For example, they may under- or overestimate the share of liability owed by insolvent defendants. This is not a serious problem because our goal is not to determine the pressure that joint and several liability

¹⁵The actuarial firm Tillinghast-Towers Perrin estimates that 94 percent of the 52,900 claims filed in 2000 were by nonmalignant claimants. Of the \$54 billion that RAND estimates has been spent on asbestos litigation through 2001, about 65 percent of the funds — after excluding transactions costs — went to nonmalignant claimants [38, p. vii].

Moreover, a number of studies have found that between two-thirds and 90 percent of claimants are unimpaired. For example, in 1991 a federal judge had medical evidence in 65 asbestos cases filed in the Southern District of Ohio validated by court-selected experts. He found that 64 percent of claimants were free from any actionable condition. Of the remaining claimants, 85 percent had pleural plaque rather than asbestosis [7, p. 39]. A separate study asked an independent panel of three radiologists to examine x-rays of 439 tire workers who had filed for compensation due to asbestos exposure. They found that only 11 to 16 x-rays — a mere 3.6 percent — suggested evidence consistent with exposure to asbestos [35]. Finally, a recent study asked six independent radiologists and pulmonologists to interpret 492 x-rays initially screened by plaintiff lawyers. Whereas the plaintiffs' experts had found that 95.9% of x-rays demonstrated exposure to asbestos, the independent experts found only 4.5% of cases were positive for exposure [18].

theoretically imposes upon a solvent defendant after a jointly-liable defendant goes bankrupt, but to determine the effect that it actually has. This effect includes court errors in reallocation.

3 Estimates of compensation benefit

This section describes our data, provides technical details on how we estimate the natural growth in claim values, and reports our estimates of the bankruptcy-induced growth rate. The two most important implications are, first, that, although our data are not sufficient to generate precise point-estimates of the natural growth rate, they are sufficient to place bounds on this rate. Second, these bounds imply that the bankruptcy-induced growth rate averaged between 5 and 10 percent per annum or between 56 and 157 percent during the 1990-2002 period.

3.1 Data

We utilize two primary data sources for our analysis — annual corporate 10-K filings and the RAND asbestos judgment database.¹⁶ 10-K filings of companies with substantial asbestos liability include their aggregate asbestos-related losses (typically indemnity and defense are reported as a single number) and the number of asbestos personal-injury claims they have resolved. Since companies only report this information once their asbestos liabilities have become sizeable, we only have these data for large and relatively mature asbestos defendants. Moreover, most of the companies in our 10-K data set were members of the Asbestos Claims Facility (ACF), which included most large, mature defendants while it was in operations from 1985-1988. The 17 companies on which we have 10-K data report about \$15 billion in asbestos-related payments covering more than 3.9 million claims between 1990 and 2002. We believe that, overall, these companies account for about 30-50 percent of the universe of solvent asbestos defendants by dollar of liabilities.

Our second data source is judgments awarded in 689 litigated asbestos personal-injury cases

¹⁶The analysis in this paper focuses on average claim values unconditional on the disease — mesothelioma, asbestosis, lung cancer or pleural plaque. First, although claim values vary substantially across these disease categories, Table 3 illustrates that the distribution of claims against solvent defendants in the Center for Claims Resolution (CCR) across the four major disease categories — mesothelioma, lung cancer, other cancer, and non-malignant — has remained stable between 1990 and 2000. Second, most of the defendants in our 10-K sample were members of the ACF, which was succeeded by the CCR. While CCR included some smaller members, there was significant overlap in membership for defendants that remained solvent. Finally, we believe that the bankruptcy-induced growth rate in claims values is independent of disease category. This is reasonable because, for example, the disease distribution of claims against the Manville Personal Injury Trust is not dissimilar to the disease distribution in Table 3 [3, p. 10].

between 1994 and 1998. RAND gathered these data and recorded the judgment date, jurisdiction filed, and the plaintiff’s disease. A problem with judgments is that they only reveal the value of a small, nonrandom subset of claims. The nature of case selection implies average judgment values overestimate the average value of all claims. Growth in judgments, however, may be a valid estimate of the total growth in claim values. Nevertheless, we only use these data to validate our estimates from 10-K data.

3.2 Estimators for the natural growth rate

The appendix provides a precise accounting of how we estimate the total growth rate in claim values. Here we provide technical detail on the two methods we employ to estimate the natural growth rate of claim values, which is defined as the total liability owed by all defendants to the average plaintiff in period $t + 1$ divided by the same value for period t : \bar{L}_{t+1}/\bar{L}_t . Note that, due to the limitations of our data, the two methods only permit estimation of bounds on the natural growth rate.

The first method employs as an estimator of \bar{L}_t proxies for the total payment received by an average asbestos plaintiff in year t . One proxy is the total amount a plaintiff received from all defendants in our 10-K sample, assuming that the plaintiff named each defendant in the sample and got the average per-claim payment from each defendant:

$$\hat{\bar{L}}_{10-K,t}^{(1a)} = \sum_{j-10-K} \frac{\hat{T}_{j,t}}{\hat{N}_{Pj,t}} \quad (4)$$

where $\hat{T}_{j,t}$ is the total payment by company j from the 10-K sample in year t and $\hat{N}_{Pj,t}$ is the number of different plaintiffs that settled claims against this company that year. The summation is over all companies in our 10-K sample that were solvent in year t . Because this estimator holds constant the number of companies named by the average plaintiff and as naming rises the number of plaintiffs that file claims against each company rises, the estimator underestimates the true growth in the natural growth rate.

An alternative proxy for total payment received by the average plaintiff in year t is the mean

payment by a defendant to a plaintiff:

$$\hat{\bar{L}}_{10-K,t}^{(1b)} = \frac{\sum_{j=10-K} \hat{T}_{j,t}}{\sum_{j=10-K} \hat{N}_{Pj,t}} \quad (5)$$

This differs from (4) in that it accounts for changes in patterns of naming within our sample of 10-K companies. Because it holds constant naming growth outside the 10-K sample, it will continue to underestimate the true natural growth rate.¹⁷ Therefore, we treat this estimator and the last as lower bounds on the natural growth rate and thus upper bounds on the bankruptcy-induced growth rate. Note that these estimators for \bar{L}_t permit us to calculate the average natural growth rate for the entire sample period.

Our second method for estimating the natural growth rate takes advantage of a “natural” experiment. Asbestos bankruptcies occurred in two waves in the 1990s. Seven asbestos defendants declared bankruptcy between 1990 and 1993 — which we label “bankruptcy wave I.”¹⁸ Another 28 asbestos defendants declared bankruptcy between 2000 and 2002 — “bankruptcy wave II.”¹⁹ Table 4 lists major asbestos defendants that declared bankruptcy during each of these waves. Between 1994 and 1997 no significant asbestos defendants declared bankruptcy. Only three asbestos defendants — Lykes Brothers Steamship, Rock Wool Manufacturing, and Rutland Fire Clay — declared bankruptcy between the two waves and they were minor players. All other things being equal (which we admit is questionable), the bankruptcy-induced growth rate during the period 1994 to 1997, which we define as the experiment period, should be zero. Therefore, an estimate

¹⁷Because the the number of defendants in our 10-K sample grows over time, however, (5) will yield a lower estimate of the growth than (4).

Although (5) resembles our estimate (10) for the average payment by a given plaintiff, it is different in one critical respect. Whereas (10) measures the *growth* in per plaintiff payments *for a given defendant j*, the ratio of (5) for two consecutive periods gives the *growth in the average* per plaintiff payment *across defendants*. When a jointly liable defendant files for bankruptcy, if the number of defendants named increases by the number who would have been named but file for bankruptcy, the average payment by a defendant to a plaintiff should not rise because the total amount paid by all defendants does not rise. Thus, if the number of defendants named is constant over time, growth estimates based on (5) should yield a result similar to growth estimates based (4). Even if the number of defendants is held constant, however, the reallocated liability may be redistributed among solvent defendants such that each defendant’s residual share rises. Equation (10) is formulated to calculate this growth for the individual defendant *j*.

¹⁸It should be noted that bankruptcy wave I is coincidental with the first awards of punitive damages against asbestos defendants. Companies started getting hit with punitives in 1988-1989; such awards were a well established phenomenon by 1992-1993. Punitive damages should not significantly bias our estimates of the natural growth rate by total growth rate in the experimental period because only a small handful of companies – frontline producers – were hit with punitives.

¹⁹We take the bankruptcy wave II to start in 2000 rather than in 1998 because few companies go bankrupt in 1998 and 1999. We do not, however, extend the natural experiment period to 2000 because there are still enough bankruptcies in 1998 and 1999 to elevate the total growth rate during those years above the natural growth rate.

of the overall growth in claim values during the experiment period provides an estimate of the natural growth rate during the entire 1990-2002 period, assuming this natural growth rate is the same during the experiment and non-experiment period.

There is one hitch in our analysis. Although there were no major asbestos bankruptcies, the *Georgine* class action case unfolded during the natural experiment period. The *Georgine* class action was certified in 1993 and dissolved in 1997 by *Amchem Products v. Windsor*. The uncertainty created by *Georgine* impacted all asbestos defendants. For example, the Center for Claims Resolution (CCR) settled about five times as many claims in both 1993 and 1998 than it settled in any year in between. More importantly, most asbestos defendants experienced a transitory spike in claim values after *Georgine* was dissolved. Because we define the natural experiment period to end by 1998, the spike in 1997 and 1998 claim values following the dissolution of *Georgine* inflates the growth in claim values during the experiment period. Therefore, the natural experiment estimator resembles an upper bound on the natural growth rate, which translates into a lower bound on the bankruptcy-induced growth rate.²⁰

We calculate the mean overall growth rate during the experimental period primarily using data from 10-K filings. We validate these estimates using data on median court judgments in asbestos cases from joint and several jurisdictions. Judgment data yield an appropriate estimate of the natural growth rate because defendants in court cases from joint and several liability jurisdictions are assigned the aggregate liability owed by all defendants to any plaintiff.²¹

3.3 Estimates of reallocation

Table 5 presents our estimates of the natural growth rate. The second column presents the growth rate in nominal dollars, while the third presents the growth rate in real dollars. The two proxies for the total payment received by the average plaintiff, which are lower bounds, suggest a natural growth rate of 2.9 and zero percent, respectively, in nominal terms. The natural experiment estimator, which provides an upper bound, suggests a natural growth rate of 8.5 percent in nominal terms. In

²⁰It is not precisely an upper bound because, although there may not have been any bankruptcy-induced growth in claim values during the natural experiment period, there was likely a reduction in claim values as the number of named defendants rose. This tends to depress overall growth and thus our estimates of natural growth. We believe, however, based on time-series of claim values, that the bias from including the *Georgine* class action during the natural experiment period dwarfs the effect from naming.

²¹In several liability jurisdictions, defendants are only assigned their proportionate share, which reflects the natural growth rate so long as defendants equitable shares or defendant composition does not change over time.

real terms, estimates of the natural growth rate fall between minus three percent and six percent.²²

The final three columns of Table 5 present the bankruptcy-induced growth rates from bankruptcy wave I, bankruptcy wave II, and the combined impact of both bankruptcy waves. These estimates employ a weighted average of the growth in payments by companies listed in Table 6 to individual plaintiffs, where the weights are the size of each company's mean payments and the payments are extracted from 10-Ks for each company.²³ Allowing for the highest estimated natural nominal growth rate of 8.5 percent annually, the two bankruptcy waves combined to increase claim values 56 percent. With zero real or zero nominal natural growth in claim values, the two bankruptcy waves combined to increase defendant-specific claim values by 157 percent or 200 percent, respectively. Based on these findings, we conclude that the true bankruptcy-induced growth rate is likely to lie between 56 and 157 percent.²⁴

4 Estimate of bankruptcy costs

Our findings suggest that a substantial amount of liabilities were transferred from bankrupt companies to solvent defendants from 1990 - 2002. As a result, bankruptcies increased the value of asbestos-related claims at least 56 to 157 percent, which translates to annual bankruptcy-induced growth of 5 to 10 percent.²⁵ To put it another way, if no companies had gone bankrupt in the 1990s due to asbestos-related liabilities, current defendants' liabilities would be at most two-fifths to two-thirds of their present size. We say "at most" for two reasons. First, plaintiffs named

²²Figure 2 illustrates why we estimate zero real growth from aggregate payments. Although total payments increased by 33 percent from 1991 to 2001, compound inflation was 30 percent over this period. Therefore, this measure of payments indicates positive nominal growth in plaintiff claim values, but close to zero real growth. Figure 3 illustrates why we estimate zero nominal growth from the estimator in (5). The average payment by each settling defendant ranges from \$3,000 to \$4,500 and has no pattern over time. Thus, although these companies are a select subset of asbestos defendants, the average nominal settlement value across these companies does not grow over time. Finally, on a company-by-company basis, average payment per settled claim rose 38 percent for companies in the 10-K data set during the experiment period. We get an identical estimate from our judgments data. This increase is equivalent to an average of 8.5 percent growth annually. Inflation over this period averaged 2.4 percent annually, resulting in 6.1 percent real growth.

²³Using a straight average across companies has no impact on the bankruptcy-induced growth rate during bankruptcy wave I, but increases the growth rate during wave II by about 30 percentage points.

²⁴We use 157 percent estimate from the aggregate payment estimator rather than 200 percent estimate from the average claim value estimator because both estimators purport to give us upper bounds on the natural growth rate and the aggregate payment estimator is the lower of the upper bounds.

²⁵Our estimates mask a large number of bankruptcies, specifically 7 in wave I and 28 in wave II. Simple division suggests that the mean effect of any given bankruptcy on the growth of claims against solvent companies is 3.7 to 8.8 percent in wave I and 0.6 to 1.6 percent in wave II. The reason for the reduction in the marginal impact of bankruptcies on growth in claim values is likely the fact that earlier bankruptcies involved larger defendants and that the number of companies named by plaintiffs rose over time.

an increasing number of defendants per complaint during the 1990s and, as we explain in the appendix following (11), this depresses the overall growth rate of per-claim payments by individual defendants once purged of the natural growth rate of the value of these claims. Second, there were a number of important defendants that went bankrupt before 1990. For example, Johns-Manville Corporation, which filed for Chapter 11 in 1982, alone had a products market share of 30 percent. Therefore, the numbers we started with already embed a certain amount of reallocated liability. Further, our analysis only identifies growth during two bankruptcy waves.

Because the bankruptcy of a defendant raises the liabilities, but not the assets, of jointly liable, solvent defendants, it increases the pressure on the latter to also file for bankruptcy. Of course the exact amount of pressure depends on two omitted variables: the amount of solvent defendants' assets and the number of claims filed. The former is difficult to estimate in the asbestos context, not just because it is difficult to get precise values for a corporation's unsecured assets, but because joint and several liability is piggy-backed on an underlying theory of liability that permits plaintiffs to attack any parties in the chain of distribution for asbestos. Therefore, it is very difficult to identify all possible defendants whose assets could be used to satisfy tort claims. (Indeed, given the widespread use of asbestos, the number of defendants may be quite large. Recall that over 8,000 different companies have already been sued.)

It is possible, however, to obtain data on the number of claims filed annually. For example, the average number of filings against the 17 companies we have 10-K data for has grown from 7,317 in 1990 to 34,026 in 2002, equivalent to a compound rate of 13.7 percent. Our estimate is consistent with those from other sources [38, p. 42]. Because the aggregate liability is the product of the number of claims filed and the value of claims filed, growth in liability is the product of the percentage growth in filings and claim values. (So, e.g., if filings double and claim values double, overall payments quadruple.)

The pressure that reallocation places on the solvency of co-defendants has important welfare implications. The reason is that there are significant direct and indirect cost of bankruptcies, especially in the case of asbestos. For example, Austern (2002) notes that, in 1988 dollars, the bankruptcy of Johns-Manville Co., which had a market cap of \$1.8 billion when it went bankrupt due to asbestos liabilities, generated \$100 million in transactions costs. Stiglitz et al. (2003) estimate that bankruptcies have also been responsible for the loss of 52,000 - 60,000 jobs; that each

of these workers lost on average \$25,000 - \$50,000 in wages as a result of these bankruptcies; and that each of these workers who were at firms with a 401(k) plan lost on average \$8,300 in pension benefits.

Bankruptcy costs are not a social loss in the case of firms that are distressed due to economic shocks because such firms would not be operationally profitable even in the absence of bankruptcy [42]. They are a social loss, however, when firms are in distress due to financial shocks because these firms would be operationally profitable in the absence of the distress.²⁶ Reallocated asbestos liabilities are examples of financial shocks because firms to which liabilities are transferred often have a very remote connection to the initial tortious behavior.

We propose a simple hypothetical in order to compare the compensation benefits of reallocation to its associated bankruptcy costs. Our hypothetical assumes that the reallocation after the first wave of asbestos bankruptcies in 1990 - 1993 caused the second wave of asbestos bankruptcies in 2000 - 2002.²⁷ The benefit of the reallocation of liabilities from wave I companies is the reallocated share of total payments made on asbestos claims from 1994 - 2002. The cost of this reallocation is the direct and indirect costs associated with the bankruptcy of wave II companies.

The total amount of payments made on asbestos claims during the period 1994 - 2002 is estimated by the actuarial firm Tillinghast-Towers Perrin to be \$53.3 billion [27].²⁸ In Section 3 we estimated that 36 - 61 percent of asbestos payments are reallocated liabilities. Moreover, RAND estimates that roughly 66 percent of payments are taken up by the legal expenses of plaintiffs and defendants combined [38]. This suggests that total additional compensation due to reallocation is \$6.5 - \$11 billion.

We assume, based upon a recent review of the bankruptcy costs literature [5], that the costs of wave II bankruptcies are 12 - 20 percent of the pre-distressed value of wave II companies. Pre-distressed value is taken to be enterprise value (stock plus debt) from the mid-1990s, before the

²⁶Estimates of costs in the case of firms in distress from financial shocks are similar to those for firms in distress due to economic shocks [12].

²⁷Of course we cannot be certain of this causation because we do not know for sure whether wave II companies would have become insolvent if wave I companies had not. But the assumption of causation is reasonable because the companies that went bankrupt in wave I are larger asbestos manufacturers than those in wave II. It would be odd to assume that wave II companies were less able to handle their asbestos liabilities outside of bankruptcy than wave I companies.

²⁸This is calculated by taking cumulative payments by U.S. insurers during this period (\$16 billion) and dividing by the share of all payments by U.S. insurers (30 percent). Tillinghast-Towers Perrin estimates non-U.S. insurers are responsible for 31 percent and defendants for 39 percent of all liability payments.

height of the 1990s stock market bubble. Because many of the wave II companies are private, we cannot rely on public reporting to calculate value. Rather we multiply any available sales or revenue from each wave II company with ratios of sales or revenues to enterprise value among other firms in the same industry as each wave II company. In the case of wave II companies for whom no data at all is available, we assign the average enterprise value among other wave II companies, in the same industry if possible. Our estimate of the aggregate enterprise value of wave II companies is \$21.5 billion,²⁹ which implies bankruptcy costs of \$2.6 - \$4.3 billion. In other words, each additional dollar of compensation due to reallocation costs between 23 and 66 cents in bankruptcy-related expenses.³⁰ We are led to the conclusion that reallocation is an unduly expensive form of insurance.

5 Comparing reallocation to alternatives

Reallocation is but one of a number of policies that provide victims insurance against defendant insolvency.³¹ Hansmann and Kraakman (1991) have called for elimination of corporate limited liability for tort claims, so that victims can recover directly from shareholders even if a defendant company becomes insolvent. Coffey (1994) has suggested requiring companies to purchase insurance to cover the risk of insolvency to tort claimants. Bibler (1987) has argued that bankruptcy courts do not have the authority to discharge tort liabilities. Although courts have ignored his argument, his analysis suggests an obvious reform: regardless of who ends up with the equity of a company after reorganization, the company still owes tort victims full compensation. The most commonly recommended reforms, however, seek to manipulate the priority assigned to tort claims. Currently, tort claimants have the same priority as unsecured creditors of a defendant. Painter (1984) has recommended that tort claimants be given the same priority as secured claimants and

²⁹ Computations available from authors.

³⁰ If one also takes into account the litigation costs (assumed to be proportional to the reallocated share of the \$53.3 billion in payments), the price of each dollar of compensation is between \$1.39 and \$3.96!

³¹ An antecedent question is whether greater insurance is even warranted. If some plaintiffs are presently over-compensated, whether because they are not injured or because they have judgments or settlements that overestimate the harms they have suffered due to asbestos, then the value of insuring them against defendant insolvency falls. (If there are sufficient victims who have not sued, the value to deterrence may not fall, i.e., there may be little risk of over-deterrence.) However, because there are many plaintiffs who are properly-compensated and because we seek to generalize our analysis to non-asbestos torts that may not have a high false-positiverate, we ignore the overcompensation problem in this section. In any case, the best approach to addressing the false-negative problem may be to modify the underlying liability rule, say by raising the applied standard of causation, rather than by eliminating reallocation. The reason is that false-positives are a problem whether or not a defendant goes bankrupt.

Price (1995), among others [30], has recommended they be given "super-priority" over all other creditors.³² In this section we compare reallocation to these policy alternatives.³³ Our goal is to situate the empirical contribution of the previous section in the larger debate about policy.

5.1 Reallocation

We begin by reciting how reallocation works, its benefits and costs. Reallocation compensates victims for an insolvent defendant's unpaid liability by transferring those liabilities to co-defendants. Depending on the substantive scope of joint and several liability and the nature of causation, co-defendants can be vertical, i.e., drawn from downstream industries, or horizontal, i.e., drawn from competitors of the defendant.

There are two benefits to providing compensation: deterrence of tortious activity and insurance against defendant insolvency. Deterrence depends on the ability of some third party to monitor and ex ante to discipline the defendant's tortious activity.³⁴ In the case of reallocation, the third party – co-defendants – have great ability to monitor the defendant because they are familiar with the defendant's industry. A co-defendant's ability to discipline, however, depends on whether it is a vertical or horizontal co-defendant. The vertical co-defendant can discipline the defendant by lowering the price it is willing to pay for the defendant's wares. The lower price will reflect the risk that the defendant will become insolvent and its unpaid tort liabilities will be transferred to the vertical co-defendant. The horizontal co-defendant cannot do the same because it does not contract with the defendant, but rather competes against it.

³²Price also recommends elimination of limited liability for companies without creditors capable of forcing them into bankruptcy.

³³When comparing reallocation to alternatives, one must be careful to specify exactly which policies are being compared. The reason is that joint and several with reallocation is a tort rule but alternatives, such as no limited liability or super-priority, for example, are corporate or bankruptcy rules, respectively. One implication is that reallocation and its alternatives may not be mutually exclusive. Our approach, therefore, is to compare reallocation to alternatives without reallocation, i.e., we compare joint and several with reallocation, on the one hand, to joint and several without reallocation, plus no limited liability or plus super-priority, on the other hand. (By joint and several without reallocation, we mean that, if a defendant – because of insolvency – cannot cover its share of liability under principles of comparative fault, the unpaid liability falls on the plaintiff, not on co-defendants. Joint and several would still have bite in states of the world where the defendant was solvent. There the plaintiff could still recover the defendant's share, plus the share of co-defendants, from the defendant alone.) Another implication of comparing joint and several tort rules to non-tort rules is that the latter may apply to tort liabilities that are not joint and several. Therefore, when we analyze alternative policies, we confine their application to joint and several liabilities. For example, we will compare reallocation of joint and several liabilities to super-priority for joint and several liabilities, not to super-priority for all tort liabilities.

³⁴Ex post discipline is generally meaningless because the insolvent defendant is either liquidated or its debts are discharged.

The value of the second benefit – insurance – is judged by the ability of the third party to bear the risk of the defendant’s insolvency and the amount of third party assets made available to victims. In the case of reallocation, the parties ultimately responsible for compensation are the shareholders of co-defendants. Because shareholders are generally assumed to hold a diversified portfolio of investment and because their liability is limited to the extent of their investments in co-defendants, we may assume that co-defendants can well bear the risk of defendant insolvency. The amount of assets made available to victims is bounded above by the going-concern value of all co-defendants. The actual assets available will depend on the competing liabilities of co-defendants, e.g., to their secured and unsecured creditors.

What remains is determining the costs of reallocation. Here lies the main contribution of this paper. The risk with reallocation is that it might drive otherwise viable co-defendants into bankruptcy. This paper demonstrates that the social cost of this externality is between \$0.23 - 0.66 for each additional dollar of compensation for victims. Table 7 summarizes our accounting of the benefits and costs of reallocation – and its alternatives. Our empirical contribution is shaded grey.

5.2 No limited liability

The first policy alternative we consider is eliminating limited liability. This would shift the burden of the defendant’s unpaid damages to the defendant’s shareholders. Shareholders may be in a good position to discipline defendants – by lowering the price they are willing to pay for its shares – but they may not be well-placed to monitor the defendant’s tortious activities. Indeed, one reason for the corporate form is to delegate monitoring to the board of directors. However, the recent history of oversight by boards – think Enron – is not stellar. It is true that shareholders could hire other parties, e.g., co-defendants or creditors, to monitor the defendant’s tortious activities. But a widely-cited obstacle is the collective action problem among shareholders.

The flipside of deterrence is bearing the risk of loss: if shareholders cannot stop tortious activity, are they well-positioned to bear the damages from that activity? On the one hand, diversification reduces the variance of a shareholder’s investment returns. On the other hand, limited liability places a lower bound on the distribution of a shareholder’s investment outcomes. In English: without limited liability, a shareholder stands to lose all her assets, including those from other

investments and those assets not invested at all. One solution is for the shareholder to further diversify. But that is increasingly costly because the returns to diversification are falling in the number of stocks in a portfolio.³⁵ Therefore, to the extent that the marginal utility of income falls with wealth, unlimited liability is more likely to drive shareholders into states where losses have higher utility costs.

There are two costs of unlimited liability. The first is that it may be costly to pursue the personal assets of shareholders. We do not have a sense of the magnitude of these costs. It would be instructive to examine the costs to plaintiffs of pursuing doctors' personal assets; no hard data are available but anecdotal evidence suggests they are high. Second, if shareholders cannot identify companies that engage in tortious activity, shareholders may reduce equity investment across the board. This would reduce the total supply of equity capital.

5.3 Compulsory insurance

Compulsory insurance would shift unpaid losses to insurance companies. Insurers are well positioned to contract for monitoring of defendants and they can make defendants internalize the risks of tortious activities and insolvency by raising insurance premiums. They are also quite capable of bearing the risks of insolvency, though the extent of additional compensation provided to victims will be determined by the amount of insolvency insurance required by law.

There are two costs of compulsory insurance. The first is administrative costs. Using data from A.M. Best on losses and expenses for products liability lines during 1995-2004, we estimate that every dollar of compensation costs \$0.22 to \$0.66 [9, p. 413]. Because these numbers are very similar – perhaps too similar – to bankruptcy costs, some explanation is required. These numbers are calculated by taking the ratio of expenses to losses incurred. The lower bound on costs includes commissions and brokerage fees and overhead (unrelated to claims adjustment) in numerator. The upper bound adds loss adjustment expenses to the numerator. The loss adjustment expenses include both claims adjustment costs and legal fees. The question we would like to answer is: how much would it cost to provide insurance against unpaid damages due to insolvency? If this insurance policy is merely an extension of an existing products liability policy covering the

³⁵This is a standard law of large numbers result. The variance of the estimate of a mean of n draws from an i.i.d. population is σ^2/n . The first derivative with respect to n is negative, but the second is positive.

defendant and the insurer does not contest the claims of non-tort claimants in bankruptcy, then the marginal costs are low. They may include only sales expenses and general overhead. If the insurance policy is new or the insurer enters the bankruptcy fray, then the costs may include claims adjustment and legal fees.

Another cost of compulsory insurance is that it may attract tort litigation. Industry participants, when asked why no companies have offered asbestos liability insurance since 1984, have suggested on more than one occasion that purchasing insurance might increase the number of suits in which a defendant is named and increase the settlement demands of plaintiffs. While we cannot verify these claims, we note that it is simply a variant of the adage that plaintiffs seek out deep pockets.

5.4 No discharge

A third alternative to reallocation is to bar the discharge of tort liabilities following a Chapter 11 bankruptcy. This would transfer unpaid damages to the shareholders of the reorganized defendant. Because these shareholders will likely be the defendant's creditors prior to bankruptcy, a no-discharge policy is similar to super-priority. The main difference is that, super-priority offers tort claimants some relief even in Chapter 7 liquidation cases, but a no-discharge policy does not. (A compromise policy may be no-discharge in Chapter 11 and super-priority in Chapter 7, but that adds complication without little additional benefit over super-priority in all bankruptcy cases.)

The benefits of a no-discharge policy are similar to those for super-priority and described in the next subsection, except that the benefits are confined to the Chapter 11 context. A cost of this limitation is that a defendant is more likely to be liquidated even if its value as a going concern exceeds its assets. The key insight here is that a no-discharge policy gives creditors relative priority if the defendant is liquidated and gives tort claimants relative priority if the defendant is reorganized. The reason is that, in the event of liquidation, no-discharge gives all assets to creditors and none to tort claimants. In the event of reorganization, however, creditors become equity-holders and are sent to the back of the priority queue, while tort claimants retain their priority. If the value of the defendant as a going concern does not exceed the liability owed to both creditors and tort claimants, the creditors have an incentive to force the defendant into Chapter 7. Whether they succeed depends on whether creditors or tort claimants are in a better position to dictate the

Chapter 7 or 11 choice. Even if tort claimants can control the choice between liquidation and reorganization, there may be collateral damage from a no-discharge policy. If creditors are unable to identify the amount of tortious activity by different defendants, they may raise interest rates for all companies.

5.5 Super-priority

Super-priority shifts the burden of unpaid damages to secured creditors. (Unsecured creditors already bear some of the burden under current bankruptcy priorities.) Secured creditors are well-placed to monitor the defendant because they supply it capital and therefore have private knowledge of its activity level. They can discipline the defendant by charging higher interest rates on loans. Creditors are also able to bear the risk of insolvency because they are likely to have a diversified portfolio of loans. The amount of additional compensation that super-priority affords tort claimants is the value of the defendant as a going-concern.

Because creditors are less likely than co-defendants to go bankrupt, the main cost of superpriority arises in the case where creditors are unable to identify the level of tortious activity by the defendant. In that case, a lemons problem arises, causing creditors to raise interest rates for all companies. This manifests as a contraction of the supply of non-equity capital.

5.6 Synopsis

So which policy is preferable?³⁶ In order to facilitate a comparison, Table 7 highlights with bold print the disadvantages of each policy relative to its competitors. It should be apparent that no policy stands above the crowd. There are, however, a few basic lessons. The main advantage of reallocation is the amount of assets it makes available to victims – the going concern of all co-defendants. The two closest competitors appear to be compulsory insurance and super-priority. Insurance companies are better able *ex ante* to discipline defendants, but may offer less compensation for victims or generate more tort litigation depending on the amount of insurance required by law. Super-priority also offers greater potential for discipline, but offers less compensation

³⁶We do not mean to suggest that one cannot use a combination of reallocation and its alternatives. It is unclear, however, that a mixed strategy is superior. While increasing the number of parties liable for unpaid damages increases the amount of assets available to victims, it will also increase the collective action problem with monitoring. Moreover, pricing will become more complicated unless co-defendants coordinate with, e.g., creditors and insurance companies. That may be a serious challenge.

for victims and may, if creditors suffer asymmetric information, contract the supply of non-equity capital.

Perhaps the main contribution of the discussion in this section is to highlight those questions most in need of empirical research. Primary attention should be given to quantifying the salient costs of the strongest competitors to reallocation. These costs include how much additional litigation is generated by insurance coverage for default and the extent to which superpriority would contract the supply of capital. Researchers could shed light on the first issue by examining the extent to which the amount of insurance a defendant holds predicts the number of asbestos suits it faces and the amount of its tort settlements. They could shed light on the second issue by examining the effect that the bankruptcy of a defendant has on the interest rate paid by co-defendants on their bonds and private loans.³⁷

6 Conclusion

An important question raised by the empirical analysis in this paper is: to what extent can it be generalized beyond the asbestos context? Before answering, we note that even if it could not be generalized, our calculation of the costs of reallocation of asbestos liabilities is important to the legal system. Asbestos is the single largest — in terms of filings or dollars — personal injury litigation in U.S. history. Its impact is not confined to a small set of traditional manufacturing industries. Due to reach of joint and several liability, asbestos litigation affects such unexpected companies as Viacom and Pfizer, which recently sent a subsidiary into bankruptcy due to asbestos liabilities. The asbestos crisis is so serious that Congress is considering special legislation to take asbestos litigation out of the court system. This legislation would establish a national trust, funded by defendants and their insurers, that would pay all presently unresolved and future asbestos claims.

In any case, our estimate of the bankruptcy costs of reallocation may have important appli-

³⁷There are two other issues that warrant empirical investigation. One is the extent to which competitors of the defendant, as opposed to downstream producers, end up as co-defendants in joint and several tort cases. This would determine the extent to which joint and several deters tortious activity. Competitors are more likely to end up as defendants if it is too difficult to determine which competitor's product was responsible for a given victim's injuries.

Moreover, it would be helpful to know whether secured creditors of joint and several defendants are financially stable. If not, super-priority may also generate serious bankruptcy costs. Because unsecured creditors obtain only a pro-rata share of their claims against defendants and are not obviously more sound than secured creditors and because we know of no major unsecured creditors that have been driven into bankruptcy by the bankruptcy of primary defendants, our prior is that secured creditors are unlikely to be driven into bankruptcy by superpriority.

cations outside asbestos. There are a number of new litigations that are following the path of asbestos. These include silica and mold/fungi. The former concerns a lung disease (silicosis) caused by occupational exposure to crystalline silica dust. The latter concerns various ailments associated with the growth of mold in home and building construction. Both are toxic torts subject to joint and several liability rules, with claim filings already in the tens of thousands. In addition, a number of more novel claims, if accepted, might follow in the path of asbestos. These include suits against gun manufacturers and distributors for gun-related injuries and against food manufacturers, distributors, and restaurants for obesity. All these claims involve an uncertain line of causation, justifying the use of joint and several liability rules, and a large number of claimants, creating the risk of bankruptcy and significant reallocation.

Appendix: Estimators for the total and bankruptcy-induced growth rates

Define S_j to be the equitable share of company j and L_i to be the claim value of plaintiff i . Total liability of defendant j to plaintiff i is

$$T_{ij} = \left[S_j + \frac{S_j}{\sum_{\text{named}} S_m} \left(\sum_{\text{bankrupt}} S_m + \sum_{\text{not-named}} S_m \right) \right] L_i \quad (6)$$

The first term on the right hand side captures equitable share. The second term is the the product of (a) the shares of bankrupt companies and companies who are not named in the plaintiff's complaint that are reallocated to solvent and named defendants, respectively, and (b) the share of reallocated liabilities that is assigned to defendant j in particular. The overall share in the square brackets, which we shall call the residual share, is multiplied by the total recovery owed to the plaintiff by all defendants.³⁸ Equation (6) is a more precise rendition of (1). The main difference is the inclusion of the reallocated shares of unnamed defendants. The goal of our analysis is to estimate the growth in $R_{\text{bank}} = \sum_{\text{bankrupt}} S_m / \sum_{\text{named}} S_m$, which is the amount reallocated from bankrupt to solvent

³⁸ Actually, payments also reflect the amount not covered by other defendants who settled and the amount below the residual share for which defendant j may settle. Because we will be summing across all relevant defendants, however, these terms should cancel.

We assume that shares are constant across plaintiffs. This is technically incorrect, but should not affect our results. If we indexed shares by i , we could use the trick $\sum_i x_i \sum_{ij} y_{ij} = \bar{y} \sum_i x_i$, where $\bar{y} = \sum_i x_i \sum_{ij} y_{ij} / \sum_i x_i$, and estimate the weighted mean of shares, where the weights were the liabilities owed to different plaintiffs.

defendants.

The average payment of defendant j to a single plaintiff is

$$T_{Pj} = \frac{1}{N_{Pj}} \sum_i T_{ij} \quad (7)$$

where N_{Pj} is the total number of plaintiffs who file an asbestos-related tort suit against defendant j . Plugging (6) into (7) yields

$$T_{Pj} = [1 + R_{\text{bank}} + R_{\text{named}}] S_j \frac{1}{N_{Pj}} \sum_i L_i \quad (8)$$

where $R_{\text{not-named}} = \sum_{\text{not-named}} S_m / \sum_{\text{named}} S_m$. Because we are interested in changes over time, we shall now index by t and take the ratio of (8) for two consecutive periods:

$$\frac{T_{Pj,t+1}}{T_{Pj,t}} = \frac{[1 + R_{\text{bank},t+1} + R_{\text{not-named},t+1}]}{[1 + R_{\text{bank},t} + R_{\text{not-named},t}]} \times \frac{\bar{L}_{t+1}}{\bar{L}_t} \quad (9)$$

where \bar{L}_t is the total liability owed by all defendants to the average plaintiff. This is independent of the identity of the defendant; variation across payments to a plaintiff by different defendants is fully captured in the share of that plaintiff's liability owed by different defendants. Note that the equitable share of defendant j cancels out because it is unchanged over time; most of these liabilities were generated 40 years before claims were filed [3, p. 3]. The left-hand side term in (9) is the overall growth rate of payments from defendant j to individual plaintiffs. The second term on the right-hand-side is the natural growth rate of tort claims. This equation is a more precise statement of (2).

We estimate the overall growth rate $T_{Pj,t+1}/T_{Pj,t}$ for any given company j on which we have 10-K data with

$$\frac{\widehat{T_{Pj,t+1}}}{\widehat{T_{Pj,t}}} = \frac{\hat{T}_{j,t+1}}{\hat{T}_{j,t}} \frac{\hat{N}_{Pj,t}}{\hat{N}_{Pj,t+1}} \quad (10)$$

where $\hat{N}_{Pj,t}$ is the total number of plaintiffs reported in the company j 's 10-K as having settled complaints against it in year t , and $\hat{T}_{j,t}$ is the total amount company j 's 10-K reported that the company paid in t to resolve asbestos claims.³⁹ The next subsection discusses precisely how we

³⁹We acknowledge that the companies with 10-K filings that provide overall payments to resolve asbestos liabilities are not representative of all companies with asbestos liabilities. In particular, the companies in our 10-k sample are

estimate the natural growth rate \bar{L}_{t+1}/\bar{L}_t . In particular, we offer two methods, which we argue give upper and lower bounds for the natural growth rate.

Dividing the over growth rate by the natural growth rate leaves us with an estimate of

$$\frac{[1 + R_{\text{bank},t+1} + R_{\text{not-named},t+1}]}{[1 + R_{\text{bank},t} + R_{\text{not-named},t}]} = 1 + G_{\text{bank},t+1} + G_{\text{not-named},t+1} \quad (11)$$

where

$$\begin{aligned} G_{\text{bank},t+1} &= \frac{(R_{\text{bank},t+1} - R_{\text{bank},t})}{[1 + R_{\text{bank},t} + R_{\text{not-named},t}]} \\ G_{\text{not-named},t+1} &= \frac{(R_{\text{not-named},t+1} - R_{\text{not-named},t})}{[1 + R_{\text{bank},t} + R_{\text{not-named},t}]} \end{aligned}$$

are the growth rates of the reallocated shares from bankrupt and unnamed defendants to solvent and named defendants, respectively. Because the number of named companies rises over time, we expect that $G_{\text{named},t+1}$ is negative. Therefore, if we estimate $G_{\text{bank},t+1}$ by simply subtracting one from the left-hand side of (11), we will underestimate the growth in liability shares reallocated from bankrupt to solvent, jointly-liable defendants.

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larger and more mature defendants. We have no reason to think, however, that the growth rate in their payments per plaintiff is higher or lower than the growth rate in such payments by smaller defendants. Moreover, because the larger, more mature asbestos defendants have more at risk, they are more vulnerable, all other things being equal, to bankruptcy. Therefore, the growth rate in their overall claims are more relevant to determining the domino bankruptcy effect of joint and several liability in the asbestos context.

A concern with estimating the overall growth rate of claims is that there may be growth in settlement values due to externalities from early settlement of joint and several liabilities. A defendant who settles early for less than his share will raise remaining defendants' liabilities were the matter litigated in court. Therefore, the subsequent defendants would have to pay more, even if they were to settle [24]. This settlement externality does not cause (10) to overestimate the overall growth rate for two reasons. The externality manifests itself as growing settlement values for the same plaintiff across different defendants over time. Our estimator, however, follows the same defendant across different plaintiffs over time. In addition, we do not believe that the defendants in our sample tend to become later settlers during the course of our sample period.

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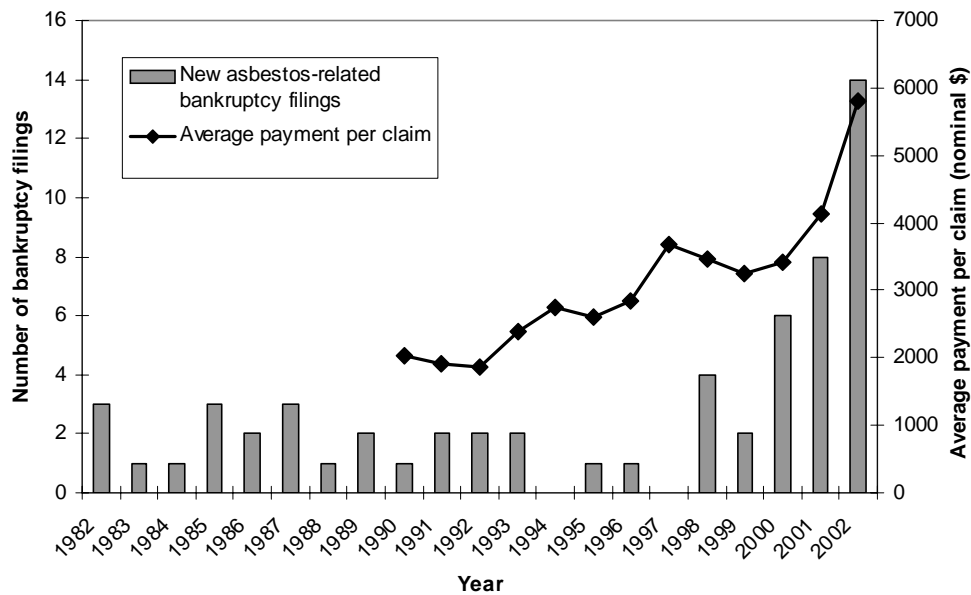


Figure 1: New asbestos-related bankruptcy filings per year and the average payment per tort claim by certain large asbestos defendant companies, 1982-2002. (Average payment is per company for seven large asbestos defendants who are in our 10-K data set and solvent for the entire period from 1990-2002.)

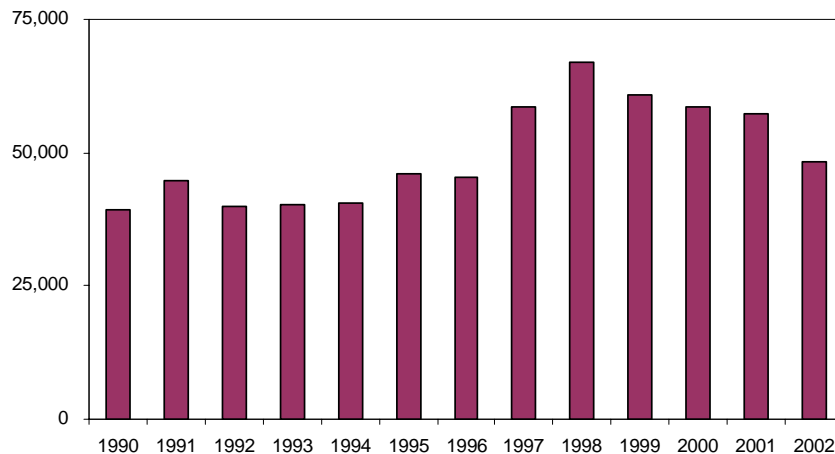


Figure 2: Total asbestos liability costs across all companies in 10-K data set, by year, 1990-2002.

Table 1: Liability for asbestos exposure in the 50 states and D.C.

State	Liability rule for asbestos claims (D is defendant, P is plaintiff)	To whom may insolvent's liability be reallocated?	State	Liability rule for asbestos claims	To whom may insolvent's liability be reallocated?
AK	Pure J&S	D	NH	Pure J&S or J&S if D's share > 50%	
AL	Pure J&S	D	NJ	J&S if D's share > 5% to 60%	
AR	J&S if P's share < D's share	D	NM	Several	
AZ	Several		NV	Pure J&S	D
CA	J&S for econ. damages		NY	Pure J&S	D
CO	Several		OH	J&S for econ. damages if D's share > 50%	
CT	J&S for econ. damages	D (econ. damages)	OK	J&S if P w/o fault	
DC	Pure J&S	D	OR	J&S for econ. damages if D's share > 15% and > P's share	D if share > 25% and > P's share
DE	Pure J&S	D	PA	Pure J&S	D
FL	J&S for econ. damages up to flexible cap		RI	Pure J&S	D
GA	J&S if P w/o fault		SC	Pure J&S	D
IA	J&S for econ. damages if D's share > 50%		SD	J&S (D liable only up to 2x its share)	D
ID	Several		TN	Several	
IL	J&S if D's share > 25%		TX	J&S if D's share > 15%	
IN	Several		UT	Several	D (if insolvent's share < 40%)
HI	Pure J&S	D	VA	Pure J&S	D
KS	Several		VT	Several	
KY	Several		WA	Pure J&S	D
LA	Several		WI	J&S if D's share > 51%	
MA	Pure J&S	D	WV	Pure J&S	D
MD	Pure J&S	D	WY	Several	
ME	Pure J&S	D			
MI	Several				
MN	J&S (but if D's share < 15%, liable only up to 4x D's share)	D, P			
MO	J&S if P w/o fault	D and (if P is at fault) P			
MS	Pure J&S				
MT	J&S if share > 50%	D if share > 50%			
NC	Pure J&S	D			
ND	Several				
NE	J&S for econ. damages				

Notes. Cites available from author. * - After 2007, a defendant is J&S liable for 50% of plaintiff's economic damages if defendant's share is greater than 30%.

Table 2: Contribution rules based nature and size of payments by defendants and by solvency of defendants.

		Judgment		Settlement		Insolvency	
		$J_2 < L_2$	$J_2 > L_2$	$S_2 < L_2$	$S_2 > L_2$	$A_2 < L_2$	$L_2 < A_2 < L$
Judgment	$J_1 < L_1$	No contribution.					
	$J_1 > L_1$	Contribution against D_2 (but $J_2 = 0$ maybe required).	Set-off rule should avoid this.				
Settlement	$S_1 < L_1$	No contribution.	No contribution.	No contribution.			
	$S_1 > L_1$	Contribution against D_2 (but $J_2 = 0$ maybe required).	Set-off rule should avoid this.	No contribution against D_2 unless P releases D_2 from liability.	Bad bargaining by defendants. No contribution.		
Insolvency	$A_1 < L_1$	No contribution against D_1 .	Possible only if reallocation. Contribution from D_1 estate permitted (but $J_2 = L$ maybe required).	No contribution.	Contribution from D_1 estate (but $S_2 = L$ maybe required).	No contribution.	
	$L_1 < A_1 < L$ (assume D_2 moves first)	Contribution against D_2 (but $J_2 = 0$ maybe required).	Not possible.	No contribution.	Not possible.	Uncertain.	No contribution.

Table 3: Distribution of claims across disease-types, by year of settlement, 1990-2000.

Year of settlement	Percent of claims by disease			
	Non-malignant	Other cancer	Lung cancer	Mesothelioma
1990	85.89%	2.01%	7.60%	4.51%
1991	88.30%	1.44%	6.59%	3.66%
1992	84.35%	3.26%	8.79%	3.60%
1993	88.87%	1.80%	6.57%	2.77%
1994	86.09%	2.56%	7.54%	3.81%
1995	85.42%	1.81%	7.41%	5.36%
1996	86.74%	2.00%	6.85%	4.41%
1997	83.66%	2.53%	7.83%	5.99%
1998	87.46%	1.92%	6.54%	4.07%
1999	91.02%	1.57%	4.73%	2.67%
2000	86.55%	2.37%	6.66%	4.43%

Table 4: Timing of major asbestos-related bankruptcies during 1990-2002.

Bankruptcy wave	Company	Year of bankruptcy
Wave I	Raybestos	1989
	Celotex (Carey Canada)	1990
	National Gypsum	1990
	Eagle Picher Industries	1991
	Keene Corporation	1993
Wave II	Armstrong World Industries	2000
	Babcock & Wilcox	2000
	GAF Corporation	2000
	Owens Corning/Fibreboard	2000
	Pittsburgh Corning	2000
	Federal Modul	2001
	USG	2001
	W.R. Grace	2001
	AC&S	2002
	Harbison Walker Refractory Company	2002
	Kaiser Aluminum and Chemical Company	2002
	North American Refractories	2002

Table 5: Estimates of the natural and bankruptcy-induced growth rate.

Technique	Annual natural growth rate		Cumulative bankruptcy-induced growth rate (nominal and real)		
	Nominal	Real	Wave 1	Wave 2	Com-bined
1a - aggregate payment	2.9%	0.2%	62%	59%	157%
1b - average payment	0.0%	-2.7%	75%	72%	200%
1994 to 1999 "natural" experiment	8.5%	6.1%	26%	24%	56%

Table 6: Company-specific growth in claim values.

Company	Ave. annual growth in nominal claim values		
	Wave 1	Interim	Wave 2
Grace	-10%	18%	17%
FWC	52%	-7%	32%
CCK	5%	4%	34%
Coltec	-2%	-7%	35%
GP	24%	17%	36%
B&W	33%	9%	0%
OI	38%	22%	-10%
ABB	n/a	-3%	10%
Kaiser	0%	3%	42%
HAL	-10%	-17%	37%
Weighted ave.	17%	9%	17%

Table 7: Comparison of the the merits of reallocation and alternative policies.

	J&S with reallocation	No limited liability	Mandatory insurance	No discharge	Super-priority (plus J&S w/o reallocation)
Party liable for defendant's unpaid damages	Co-defendants (vertical and horizontal)	Shareholders	Insurance company	Reorganized defendant	Unsecured creditors and (partly) secured creditors
Benefits					
Deterrence: ability to monitor tortious activity	Co-defendants have more knowledge of industry; but can contract out	SH not well informed about defendants activities; collective action problem limits hiring of external monitors	Can contract out	Defendant knows about its activity	Creditors have private info on activity levels; but can contract out
Deterrence: ability to discipline defendant	Vertical co-defendants can raise prices, but horizontal co-defendants cannot	Share price will fall	Cost of insurance will reflect insolvency risk	Defendant internalizes costs so long as chap. 11 bankruptcy	Creditors can charge higher interest rates to defendants
Insurance: ability to bear risk of defendant insolvency	Shareholders in public company defendant are diversified; defendant can buy insurance	Some shareholders may lose all their assets	Insurers well-diversified	So long as Chap. 11 case.	Creditors likely diversified; can require defendant to purchase insurance
Insurance: extent of compensation	Limited to value of all co-defendants as going concerns	Limited to value of all shareholder assets	Limited to amount of insurance dictated by law	Limited to value of defendant as going concern	Limited to value of defendant as going concern
Costs					
Transaction costs		Costly to pursue shareholders	Administrative costs are \$0.22-0.66 per \$1.00 of insurance		
Other costs	Bankruptcy costs: \$0.23-0.66 per \$1.00 of insurance	Collateral damage: equity investment may decline	Liability insurance may attract litigation	Some defendants will be liquidated even though they have greater value as going concerns	Collateral damage: non-equity capital may contract

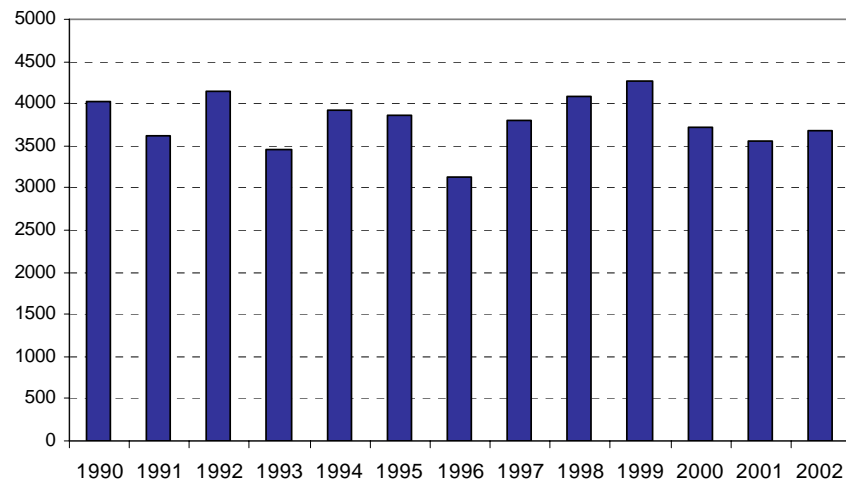


Figure 3: Average claim values of companies in 10-K data set (including defense costs and dismissals), by year, 1990-2002.