

Who Should Pay for Bankruptcy Costs?

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ABSTRACT

The fees of professionals (financial advisors, lawyers, accountants) are a substantial fraction of bankruptcy costs. Scholars have considered how best to reduce these costs but have not considered how they should be allocated among creditors. Creditors can spend redistributively (to violate or uphold absolute priority) or productively (to increase the value of the bankrupt firm). An efficient bankruptcy cost allocation scheme should discourage redistributive and encourage productive creditor spending. We consider the desirability of various allocation schemes in a model in which senior and junior creditors can engage in both types of spending. We show that (1) the current U.S. cost allocation system is unsatisfactory because the scheme partially reimburses junior expenses for professionals but does not reimburse senior expenses and (2) a cost allocation scheme that approaches the first-best solution and is implementable would delegate the issue of professionals' cost reimbursement to the debtor in possession.

1. INTRODUCTION

The fees of professionals—lawyers, accountants, investment bankers, financial advisors, and turnaround specialists—drain substantial re-

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sources from the estates of large bankrupts.¹ The scholarly literature considers how total bankruptcy costs are best reduced but devotes little attention to how the costs of professionals should be allocated. There are three candidates for bearing these costs: the creditors, the bankrupt estate, or the government. The U.S. Bankruptcy Code implicitly rules out the government but then is almost completely unilluminating with respect to the optimal allocation of costs between the parties and the estate. Instead, the code confers a large discretion on the bankruptcy courts.²

In this paper, we open the subject of how professional costs should be allocated. Creditors³ spend on professionals for two reasons: junior creditors (or juniors) spend to capture a larger part of the estate than the absolute priority rule (APR) would otherwise grant to them, and senior creditors (or seniors) spend to fend off the redistributive efforts of others and to increase the value of the estate. The cost allocation problem would be trivial if value-increasing and redistributive efforts

1. The magnitude of direct professional expenses in bankruptcy can be significant. Warner (1977) finds that the direct costs of bankruptcy—compensation provided to lawyers, accountants, consultants, and expert witnesses—are about 4 percent of the market value of the firm 1 year prior to the default. Altman (1984) calculates these costs to be about 7.5 percent of firm value using a broader sample of 19 bankrupt companies from 1974 to 1978. In a sample of 22 firms from 1994, Lubben (2000) calculates the cost of legal counsel in Chapter 11 bankruptcy to represent 1.8 percent of the distressed firm's total assets, with percentages above 5 in some cases. In the average case, the debtor spends \$500,000 on lawyers, and creditors spend \$230,000. LoPucki and Doherty (2004) study a sample of 48 cases from 1998 to 2002, mostly from Delaware and New York cases, and report that professional fees were 1.4 percent of the debtor's total assets at the beginning of the bankruptcy case. Evidence from administrative fees from 105 Chapter 11 cases from the Western District of Oklahoma in Ang, Chua, and McConnell (1982) suggests that administrative fees are about 7.5 percent of the total liquidating value of the bankrupt corporation's assets. Weiss (1990) and Betker (1997) have similar estimates. Fees can be large in absolute terms for large, complex bankruptcies. Advisors (whom we call experts) to MCI, the former WorldCom, Inc., have applied to collect about \$600 million in fees, and Enron's Chapter 11 plan estimates that fees to bankruptcy advisors' will ultimately reach \$995 million (Pacelle 2004).

2. Subsection 330(a)(1) of the U.S. Bankruptcy Code authorizes the bankruptcy court to compensate professionals by awarding "reasonable compensation for actual, necessary services." The court, in making its award, is to consider "the nature, the extent and the value of such services taking into account all relevant factors." These factors include time spent, rates charged, comparable fees for nonbankruptcy cases, and "whether the services were necessary to the administration of, or beneficial . . . toward the completion of, a case." The Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 makes no material changes in any of the code sections cited in this paper.

3. The equity interest has the same incentives as do junior creditors. Hence, we refer only to juniors and seniors for convenience.

were separate and courts could distinguish between them: courts then would reimburse only productive creditor efforts. We make the realistic assumption that courts cannot draw this distinction for two reasons. First, the same actions can have both productive and redistributive effects. For example, business continuation may increase firm value but also can redistribute wealth in favor of the juniors and against the seniors. Continuation increases the value of the juniors' call option on the firm, while liquidation may fully pay off the seniors' claims. Also, efforts by juniors to establish the firm's value can be productive, because an accurate valuation is necessary to create a viable business plan, but the juniors have an incentive to inflate value to increase their payout. Second, courts usually cannot observe the parties' production functions for effort and therefore cannot assess the optimality of the parties' actions. For these reasons, when bankruptcy courts cannot tell the difference, the public policy problem is to allocate the costs of professionals in such fashion as to reward productive and to dampen redistributive creditor efforts. This turns out to be a difficult problem, and our early effort here tries to isolate the relevant considerations.

The incentive problem that bankruptcy law has to solve is created by the parties' priority rankings. The seniors have too little incentive to spend on productive activities because, at the inception of a bankruptcy, their claim is partly or totally in the money. The seniors' primary motive to spend thus is defensive—to fend off the redistributive efforts of the juniors. The juniors, in contrast, have an incentive to spend too much on professionals. Because the juniors are the residual claimants, they have an incentive to spend optimally on value-increasing activities, but because junior efforts also decrease the probability that the APR will be followed (as we assume), the juniors have an additional incentive to spend redistributively. The policy task thus is to allocate the costs of professionals such that the seniors spend more, some of which would be productive, and the juniors spend less to curb their socially inefficient rent seeking.

We show that the three corner solutions are not optimal:

1. It is inefficient for the government to pay for all professional expenses because that would subsidize spending on both value-increasing activities and redistributive activities. This would increase firm value but reduce social welfare, because subsidies induce excessive professional representation.
2. It is inefficient for the firm to pay for all professional expenses

because that would permit the seniors to spend the juniors' money to prevent redistributive efforts by juniors. This is socially wasteful. On the other hand, some subsidized senior spending would likely preserve absolute priority, thereby making the juniors purely residual claimants. Under APR, juniors then invest optimally in value-increasing activities.

3. It is inefficient for creditors to pay their own professional expenses. The seniors' claim would be partly or totally in the money, so they would spend primarily to fend off the redistributive efforts of the juniors but not enough to increase value. The juniors, on the other hand, would spend both to increase value and to undermine absolute priority. Thus, the seniors would spend too little and the juniors would spend too much.

The failure of the three corner solutions to achieve efficiency suggests that partial-reimbursement schemes are best. Any such scheme should partially reimburse only the seniors. This would increase their incentive to invest in value-increasing activities. Also, because increased senior spending increases the probability that the APR will be followed, subsidizing the seniors would discourage junior redistributive efforts. Regrettably, the precise partial percentage for a senior subsidy to achieve efficiency is parameter specific, and the parameters likely would be difficult for an administrator, such as a bankruptcy judge, to recover. Thus, the policy problem is to choose among second-best schemes.

The current U.S. Bankruptcy Code is unsatisfactory because, with one exception, it does not expressly reimburse senior spending but expressly reimburses an important category of junior spending, that incurred by creditor committees.⁴ The exception is section 506(b), which provides that "there shall be allowed to the holder" of a secured claim that is in the money "any reasonable fees, costs or charges provided for under the agreement under which such claim arose." Section 506(b) clearly authorizes the reimbursement of a secured creditor's attorney fee expenses that are incurred in connection with repossessing or otherwise

4. A Chapter 11 creditors' committee is composed of creditors "that hold the seven largest claims against the debtor of the kinds represented on such committee" (11 U.S.C. sec. 1102[b][1]). A creditors' committee "with the court's approval . . . may select and authorize the employment of one or more accountants, attorneys or other agents, to represent or perform services for such committee." These services may include the investigation of "the acts, conduct, assets, liabilities and financial condition of the debtor, the operation of the debtor's business, and the desirability of such business, and any other matter relevant to the case or formulation of a plan" (secs. 1103[b] and 1103[c]). The court is authorized to award "reasonable compensation for actual, necessary services rendered by [a] . . . professional person" who has been employed under section 1103.

protecting the collateral, but otherwise the scope of the section is unclear.⁵ A bankruptcy court may use its inherent powers, and some courts do, to reimburse other senior expert expenses that are incurred during the course of a Chapter 11, but the extent and scale of this practice are unknown. As a legal matter, then, the Bankruptcy Code encourages junior spending, which we claim is bad, and provides little encouragement for senior spending. The code thus responds inadequately to the agency problems this paper uncovers.

Our paper suggests a partial-reimbursement scheme that is plainly better. Under our scheme, the debtor in possession is given discretion to reimburse creditor spending on professionals. To the extent that the debtor in possession can be given incentives to maximize the value of the firm, the management would have no incentive to subsidize junior redistributive spending. Any dollar spent by managers on reimbursing creditors' professionals would provide a greater increase in value if given to the seniors instead. As a consequence, our scheme does much better than current law at reducing strategic spending by the juniors. But managers will purchase (subsidize) productive senior professional spending to the extent that it enhances firm value. Thus, our scheme also does better than current law at enlisting the seniors in the task of value maximization.

Our scheme will not produce a first-best solution for three reasons. First, the managers of a debtor may attempt to maximize private benefits rather than firm value. Fortunately, bad managers are often replaced in bankruptcy, and compensation contracts can create incentives for man-

5. The contract that section 506(b) contemplates is a Uniform Commercial Code (U.C.C.) security agreement. Section 9-615(a)(1) of the U.C.C. permits the secured party to recover out of "the cash proceeds of disposition under sec. 9-610 . . . the reasonable expenses of retaking, holding, preparing for disposition, processing and disposing, and to the extent provided for by agreement and not prohibited by law, reasonable attorney's fees and legal expenses incurred by the secured party." There is a general rule that bankruptcy takes state law rights as it finds them unless there is a federal reason not to follow state law. Under this rule, section 506(b) would permit a secured party to recover only legal fees incurred in connection with liquidating the collateral. There would be no right to recover any expert expenses incurred in a Chapter 11 because no collateral is liquidated then. Two recent cases (*In re Kord Enterprises II*, 139 F.3d 684 [9th Cir. 1998]; *In re Schriock Const., Inc.*, 104 F.3d 200 [8th Cir. 1997]), however, held that the meaning of the word "agreement" in section 506(b) is a federal law question and permitted the secured creditor to recover attorney's fees provided for in the parties' contract, although state law prohibited their recovery. Whether these cases would be applied to the type of attorney's fees considered here or to the fees of other experts is unclear, especially as the cases did not specify a federal reason for overriding the U.C.C. and as the Supreme Court has frequently affirmed the general rule.

agers to lead firms out of Chapter 11 (Skeel 2003). Second, other asymmetric-information and agency problems may prevent the firm managers from making first-best contracts to secure professional services. Third, the juniors may spend their own money on redistributive efforts, which the managers cannot prevent.

Nevertheless, our scheme responds directly to the actual incentive problems that professional spending in bankruptcy poses and thus should materially improve efficiency. Also, although our proposal is radical in one way (taking professional reimbursement decisions largely out of the hands of bankruptcy judges), it is traditional in another. The debtor in possession today already has discretion to make many business decisions. We add to this discretion only the ability to take charge of the creditors' professional reimbursement process, which will result in choices that enlist professionals more efficiently in the task of value maximization.

Our paper proceeds as follows: Section 2 provides a numerical example of our results. Section 3 sets out the model. Section 4 derives the first-best solution, and Section 5 introduces the influence component. Sections 6 and 7 analyze the three corner solutions and the current U.S. system. Section 8 works out our proposed solution. Section 9 considers a utopian omniscient-government-financed partial-reimbursement scheme, and Section 10 concludes.

2. NUMERICAL ILLUSTRATION

Suppose the value of a firm is \$100 without professional effort. The firm has two creditors: a senior creditor who is owed \$40 and a junior creditor who is owed \$80. Each creditor can spend a maximum of 20 hours on professionals. Professionals play two roles: they may tilt the court's final decision on how to split the \$100 in their favor, and they may potentially increase the value of the firm.

The professionals' efforts sway the court in a particular way: if the senior creditor expends enough professional time, the APR is upheld;⁶ if the senior creditor spends nothing on professionals, then the parties are paid pro rata; and if both parties spend moderately on professionals, the allocation will be between these two choices. The extent to which the APR is upheld is represented by the parameter θ .

6. The basis for this assumption is that the U.S. Bankruptcy Code requires the court to follow the absolute priority rule (APR), so calling the court's attention to its legal duty is likely to be effective.

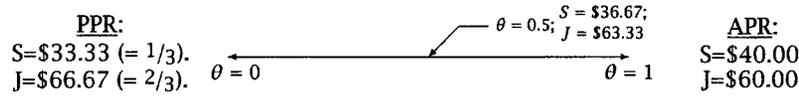


Figure 1. The absolute priority rule ($\theta = 1$) and the pro rata priority rule ($\theta = 0$)

Naturally, the senior prefers the APR ($\theta = 1$), while the junior prefers a pro rata priority rule (PPR) ($\theta = 0$).⁷ In this example, the courts' choice of θ is a specific function of the number of professional hours hired by each creditor:

$$\theta(s, j) = 1 - \left(\frac{j}{20}\right) \left[1 - \left(\frac{s}{20}\right)\right], \tag{1}$$

where 20 is the maximum number of hours for which a creditor can hire a professional. This function states that if the senior hires professionals for 20 hours, then APR obtains ($\theta = 1$) regardless of what the junior does. If the senior hires professionals for fewer than 20 hours, then the junior's professionals can influence the court. For example, if the senior hires professionals for 0 hours and the junior hires professionals for 20 hours, a PPR obtains ($\theta = 0$). If the senior hires professionals for 10 hours and the junior hires professionals for 20 hours, an outcome halfway between a PPR and the APR comes about: the senior receives \$36.67, and the junior receives the remaining \$63.33, as indicated by the middle arrow in Figure 1.

Professionals also can increase the value of the estate. Our professionals increase the value of the firm by $2\sqrt{x}$ dollars if they spend x hours at work.⁸ Professionals are expensive and charge \$.50 per hour. We can now consider the costs and benefits of different professional hiring schemes, summarized in Table 1.

In the social first-best outcome, it would not be optimal for a creditor to hire 20 hours of professional work, because this costs $20 \times \$.50 = \10.00 . This outweighs the benefit of $2\sqrt{20} = \$8.94$. Instead, society would want each creditor to hire 4 hours worth of professionals. Each

7. Although we constrain θ to be between zero and one (for the functional specification to make sense over the entire domain), the solutions are interior. Therefore, if we permitted payouts in which the senior were to receive more than S or the junior were to receive better than the pro rata amount, the same optimal solutions would still emerge.

8. We assume that it is more efficient for creditors to spend individually than it is for them to pool their resources and spend jointly, at least on the types of expenses that we are considering. We motivate our assumption in more detail below.

Table 1. Costs and Benefits of Various Professional Hiring Schemes

	Senior			Junior			APR Allocation (%)	Senior Payoff (\$)	Junior Payoff (\$)	Net Welfare (\$)	Ongoing Firm Value (\$)
	Hours	Cost (\$)	Benefit (\$)	Hours	Cost (\$)	Benefit (\$)					
Benchmark: first-best solution	4.00	2.00	4.00	4.00	2.00	4.00	+4.00	104.00
Government pays all professionals	20.00	10.00	8.94	20.00	10.00	8.94	100.0	40.00	77.88	-2.11	117.89
Firm reimburses all professionals	20.00	10.00	8.94	4.00	2.00	4.00	100.0	40.00	60.94	+94	100.94
Creditors pay own professionals	.14	.07	.75	9.11	4.56	6.04	54.8	37.94	64.23	+2.16	106.78
Firm reimburses only junior creditor (current U.S. system)	2.22	1.11	2.98	20.00	10.00	8.94	11.1	33.53	67.28	+82	101.92
Firm reimburses only senior creditor (outcome like "firm pays all")	20.00	10.00	8.94	4.00	2.00	4.00	100.0	40.00	60.94	+94	102.94
Partial-reimbursement system:											
Ex ante: firm reimburses senior to maximize welfare, 84.6% of senior's expenses	4.54	2.27	4.26	7.09	3.55	5.33	72.6	38.52	65.25	+3.77	107.67
Ex post: firm reimburses senior to maximize firm value, 81.5% of senior's expenses	3.16	1.58	3.56	7.46	3.73	5.46	68.6	38.42	65.28	+3.71	107.73
Optimal scheme: government carries 81.0% of senior's expenses	4.60	2.30	4.29	6.39	3.19	5.06	75.4	38.69	67.02	+3.85	109.35

Note. The per-hour cost of professional advice is \$.50. Each creditor can accumulate no more than 20 hours of such advice. Firm value improvement due to professionals is $\$2\sqrt{s} + \$2\sqrt{j}$, where s and j are the number of professionals' hours (units) hired by senior (S) or junior (J) creditors. Given this value-improvement function, for a given number of hours, benefits are highest if they are split equally between creditors. Courts are swayed by professionals in a way that depends on senior and junior expenses, $\theta(s, j) = 1 - (j/20)[(1 - s)/20]$, where $\theta = 1$ implies absolute priority allocation and $\theta = 0$ implies face-value pro rata allocation. APR = absolute priority rule.

creditor increases the firm value by $\$4(\$2\sqrt{4})$ at a cost of \$2, for a net benefit of \$2 per creditor.

1. If the government reimburses professionals, but they are hired by the creditors, each creditor would spend a maximum of 20 hours at a cost of \$10. This would improve firm value by \$8.94. Hence, a government full-reimbursement scheme would induce creditors to spend too much. Government reimbursement of professionals would reduce social welfare by \$2.12.

2. If the firm reimburses professionals, the senior will spend 20 hours, because this ensures that the court will uphold the APR and her claim will be fully satisfied. The junior then becomes the residual claimant and fully internalizes both costs and benefits of any professionals he hires. Thus, he will spend the optimal 4 hours of his professionals' time. The total value of the professionals will be $\$2\sqrt{4} + \$2\sqrt{20} = \$12.94$, but at a cost of $4 \times \$.50 + 20 \times \$.50 = \$12$. The professionals' total social contribution is a positive \$.94—which is not as high as the social optimum but higher than if the government reimburses professionals.

3. If creditors pay for their own professionals, the junior will overspend on professionals in order to sway the courts away from the APR, thus attacking the senior's claim. Some professional benefits would accrue to the senior because, in equilibrium (see below), the court's allocation ends up between the APR and a PPR. In addition to this participation in the social gain, the senior expenses help defend her claim against the junior's professionals. The senior's objective function is

$$\theta(s, j) \times \$40 + [1 - \theta(s, j)] \times \left[\frac{1}{3}(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) \right] - s \times \$.50.$$

The junior receives relatively more of the residual claim than the senior. Also, each dollar of expense on professionals shifts the court more in his favor. This means that the junior is more eager to hire professionals than is the senior. The junior's objective function is

$$\begin{aligned} & \theta(s, j) \times [(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - \$40] \\ & + [1 - \theta(s, j)] \times \left[\frac{2}{3}(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) \right] - j \times \$.50. \end{aligned}$$

In the unique Nash equilibrium, the senior thus hires .14 hours of advice; the junior hires 9.11 hours of advice. As a consequence, the court chooses 54.8 percent APR and 45.2 percent PPR; the senior receives \$37.94, and the junior receives \$64.23. The net social professional con-

tribution is therefore \$2.16. This is the highest that can be achieved in a non-partial-reimbursement system. Still, the problem remains that senior creditors underspend, while junior creditors overspend.

4. In the current U.S. system, the court primarily reimburses juniors.⁹ A naive and incorrect intuition is that this case is similar to the previous case because the junior is the residual claimant (so firm reimbursement or self-reimbursement is the same for the junior) and the senior pays for her own expenses. This is incorrect because when the junior spends a lot on professional advice (and in equilibrium, he does) and the senior does not spend a lot on professional advice (and in equilibrium, she does not), then the court leans away from the APR. Thus, under the current U.S. system, junior creditors “morph” from being residual claimants into becoming more pro rata claimants.¹⁰

In this equilibrium, the junior spends up to the limit, 20 hours, because his own professional expenses are fully reimbursed by the firm. The junior’s objective function is

$$\theta(s, j) \times [(\$100 + \$2\sqrt{s} + \$2\sqrt{j} - j \times \$.50) - \$40] \\ + [1 - \theta(s, j)] \times \left\{ \frac{2}{3} (\$100 + \$2\sqrt{s} + \$2\sqrt{j} - j \times \$.50) \right\}.$$

The senior maximizes her payoff with respect to the amount of spending on professionals she chooses to purchase, holding fixed the level of junior spending. Because the subsidized junior spends the maximum 20 hours, the senior’s objective function becomes

$$\theta(s, j) \times \$40 + [1 - \theta(s, j)] \\ \times \left\{ \frac{1}{3} [(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - j \times \$.50] \right\} - s \times \$.50.$$

The senior thus spends only 2.22 hours (at a cost of \$1.11) on professionals, which increases only slightly the probability that the APR will be followed.

In equilibrium, the court chooses 11.1 percent APR and 88.9 percent PPR; the senior receives \$33.53, and the junior receives \$67.28. The

9. In the United States, juniors first request reimbursement, which the court may or may not grant. LoPucki and Doherty (2004) find that, on average, courts reimburse 97.91 percent of the fees and professional expenses sought by creditors.

10. If the junior can commit himself ex ante not to seek court reimbursement in exchange for better loan terms, the U.S. case becomes like the previous case, in which creditors pay for their own professionals. Table 1 shows that this is an improvement, but not a major one.

social net professional benefit from professionals is +\$.82. This allocation system is worse than when creditors self-pay, because it is counterproductive to subsidize the junior's professionals.

There are three potential improvements to the U.S. system.

1. The simplest improvement to the U.S. system would be to reverse the U.S. system, that is, to have the court reimburse the seniors instead of the juniors. In our model, from the senior's perspective, this is equivalent to having the firm pay all: a senior is the full first claimant in equilibrium (spending 20 hours). The junior remains the residual claimant and spends efficiently.¹¹ The net social professional benefit is \$.94.

2. In our first improved partial-reimbursement scheme, the firm can commit in its lending agreement to reimburse the creditors in a manner that maximizes professional benefits. In our model, managers are assumed to want to maximize firm value but are not interested in how much or little creditors spend. They will want to calibrate their reimbursement policy to subsidize the senior, but not excessively so. They want the senior to hire more professional hours than when the senior has to pay herself (in which case the senior does not contribute enough, only .14 hours) and fewer professional hours than when the firm gives the senior a blank check (in which case the senior overcontributes, the full 20 hours). In our example, the firm is best off if it reimburses 84.6 percent of the senior's professionals. In equilibrium, the senior then spends 4.54 hours on professionals. Her objective function is

$$\begin{aligned} & \theta \times \$40 \\ & + (1 - \theta) \times \left\{ \frac{1}{3} [(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - .846(s \times \$.50)] \right\} \\ & \quad - .154(s \times \$.50). \end{aligned}$$

The junior spends 7.09 hours. His objective function is

$$\begin{aligned} & \theta \times \left\{ [(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - .846(s \times \$.50)] - \$40 \right\} \\ & + (1 - \theta) \times \frac{2}{3} [(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - .846(s \times \$.50)] \\ & \quad - j \times \$.50. \end{aligned}$$

Both professionals overspend, a direct consequence of the firm's intent to maximize its value ex ante with its reimbursement policy.

11. This result follows from our assumption that the APR is protected with certainty when the senior spends, and it may not hold under more general assumptions. The more general insight is that senior creditors would overspend in this regime.

It would not be optimal for the firm to reduce the senior reimbursement proportion. Doing so would encourage the senior to reduce her professional hours toward her socially optimal professional choice of 4 hours. But it would also induce the junior to spend more than 7.09 hours on professionals. (In equilibrium, junior and senior professional engagements are substitutes.) In equilibrium, the senior creditor does not enjoy the full APR, but she receives a higher share of the firm than when she has to pay for her own expenses. In this equilibrium, professionals contribute a social gain of \$3.77.

This scheme relies on *ex ante* professional reimbursement contracts. However, first, the firm may not know the appropriate model parameter values at the time that it borrows money. Second, *ex ante* contracts that constrain the power of the bankruptcy court to manage the process are seldom legally enforceable. And third, the firm will not have social maximization as its objective after bankruptcy has occurred. Instead, the firm will want to maximize its value at the time of bankruptcy regardless of any precommitment it may have made. (Naturally, it will still not take into account any professional expenses not charged to the firm.) This leads to the following suggested scheme:

3. In our second improved partial-reimbursement scheme, the firm itself makes compensation decisions, subject to the approval of the court, *ex post*. Compared to the previous case, the firm is a bit more reluctant to reimburse the senior creditor. Thus, if the firm reimburses 81.5 percent of the senior's expenses (rather than 84.6 percent), the senior will choose to reduce her professionals' value enhancement to the firm somewhat. Although this slight reduction is socially undesirable from the managers' perspective, it is offset by the lower sum the firm now pays out in total expenses. Managers do not mind junior professional spending: even if these professionals' cost is socially excessive, management welcomes any professional contributions because they increase firm value. After all, the firm does not reimburse the junior creditor.

In equilibrium, the senior hires 3.16 hours of professional advice, which is below the social optimum of 4 hours. Her objective function is

$$\begin{aligned} & \theta \times \$40 \\ & + (1 - \theta) \times \left[\frac{1}{3} (\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - .815(s \times \$.50) \right] \\ & \quad - .185(s \times \$.50). \end{aligned}$$

Induced by the senior's smaller professional retention, the junior now spends 7.46 hours. His objective function is

$$\begin{aligned} & \theta \times \{ [(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - .815(s \times \$.50)] - \$40 \} \\ & + (1 - \theta) \times \frac{2}{3} [(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - .815(s \times \$.50)] \\ & \quad - j \times \$.50. \end{aligned}$$

Compared to the case in which the firm can commit itself to the socially optimal reimbursement, the professionals' contribution to social welfare at \$3.71 is lower than the earlier \$3.77, because the managers cannot precommit to a higher reimbursement rate. And the improvement in social value is not as great as in the social optimum, because this scheme suffers from the same difficulties as the ex ante scheme: the firm also does not have the socially correct incentives but wants to maximize its own value. On the other hand, although the firm may be unable to observe all of the economic parameters ex post, these parameters are more likely to be observable after insolvency. In our model, the firm makes one upfront hiring/reimbursement choice. In real life, management can continuously evaluate creditor professionals for their contributions to firm value and terminate professionals when they cease their usefulness. Thus, our reform proposal may work better in practice than the model implies.

Both of our partial-reimbursement schemes ignore that management has just run the firm into bankruptcy and therefore may be either incapable or too conflicted to make good choices. However, old management is often replaced with new management in Chapter 11. Our solutions also ignore that management may prefer to continue firm operation, even if liquidation is optimal. (We ignore this by assuming that management wants to maximize firm value, regardless of continuation or termination.) In a more general model, this would lead management not to adequately reimburse senior creditors for professionals, which might establish socially optimal termination. (Recall that senior creditors will almost invariably argue in favor of termination!) However, the current U.S. system suffers from the same problem: senior creditor expenses to convince the court that termination is optimal must already be borne by senior creditors themselves. Appendix A completes our numerical examples by illustrating a utopian second-best scheme, in which an omniscient government can fine-tune reimbursement.

Table 2. Variables and Conditions

Variable	Condition
\mathcal{S}	Face value of claim of senior creditor; exogenous
\mathcal{J}	Face value of claim of junior creditor; exogenous
V	Value of the firm before professional activity; exogenous
P_s	Payoff to senior claimant; exogenous
P_j	Payoff to junior claimant; exogenous
s	Units of professional representation purchased by senior creditor; endogenous
j	Units of professional representation purchased by junior creditor; endogenous
b	Per-unit firm value enhancement; exogenous
c	Parameterization of cost of professional representation; exogenous
$\theta \equiv \theta(s, j)$	Adherence of the court to the absolute priority rule, specified in equation (6): $\theta(j, s) = 1 - j \times (1 - s)$; exogenous
W	Social welfare (value enhancement net of professional expenses) $W \equiv b \times (s + j) + c \times (s^2 + j^2)$; derived
Policy choices (model with optimal reimbursement [Sec. 9]):	
$1 - \gamma_s$	Fraction of senior's costs paid by government to senior creditor
$1 - \gamma_j$	Fraction of junior's costs paid by government to junior creditor
δ_s	Postgovernment γ_s : fraction of remaining costs paid by senior creditor herself
δ_j	Postgovernment γ_j : fraction of remaining costs paid by junior creditor himself
*	Designates a best policy
Imposed conditions:	
$\mathcal{S} + \mathcal{J} \equiv 1$	Normalization
\mathcal{S} and $\mathcal{J} < V < \mathcal{S} + \mathcal{J}$	Creditors in the money; financial distress
$0 \leq s$ and $j \leq 1$	Limited professional expense
$V + 2b < 1$	Firm still in distress after maximum value enhancement
$V - 2c > 0$	Firm still worth something after maximum professional expense
$V + 2b - 2c > \mathcal{S}$	Secured creditors' claim is satisfied even after maximum professional expenditures

3. THE FIRM AND PROFESSIONALS

3.1. The Firm

The firm is financed with equity and debt. Debt claims can be either senior (for example, secured) or junior (unsecured) and have a face value of \mathcal{S} and \mathcal{J} , respectively. (All variables are summarized in Table 2.) The securities are issued to finance a risky project. If the project succeeds,

all creditors are fully repaid without financial distress and without any professional representation. Our model is concerned with the state in which the project fails and the total debt cannot be paid off, that is, $V < \mathcal{S} + \mathcal{J}$, and we normalize the claims to add up to 100 percent ($\mathcal{S} + \mathcal{J} \equiv 1$). We assume that project proceeds are sufficient to repay either the senior creditors ($V > \mathcal{S}$) or the junior creditors ($V > \mathcal{J}$).¹²

3.2. Professionals' Contributions to Firm Value

Senior creditors and junior creditors engage s and j units¹³ of professional representation, respectively. We assume $0 \leq s \leq \bar{s}$ and $0 \leq j \leq \bar{j}$, where $\bar{s} \equiv \bar{j} \equiv 1$. Creditors' professionals increase the value of the firm in a linear fashion. The expected value of the firm after enhancement but before professional payout (if applicable) is $V(s, j) \equiv V + b\sqrt{s} + b\sqrt{j}$, where $b > 0$. Thus, b is a parameter measuring professional effectiveness.

The cost of professional representation is parameterized by c ($c > 0$). Senior and junior creditors pay cs and cj for professionals, respectively. We work exclusively with the monotonic transformation $s \equiv \sqrt{s}$ and $j \equiv \sqrt{j}$, so the value function is $V(s, j) \equiv V + bs + bj$ and professional costs are cs^2 and cj^2 for senior and junior creditors, respectively. That is, our model with its linear improvements and quadratic costs is identical to a model with square-root improvements and linear costs.

Our specification deliberately assumes that it is not optimal for creditors to pool resources and hire all professional advice jointly:

$$b \times (s + j) - c \times (s + j)^2 < bs + bj - cs^2 - cj^2. \quad (2)$$

This is largely a domain assumption. Conflict among creditors, the possible possession by creditors of different private information about the effect of creditor efforts on the firm's prospects, and different types of creditor expertise will make creditor specialization efficient some of the time. When specialization would be inefficient, the firm, representing all creditor classes, can hire its own professionals (as firms sometimes do).

12. A senior creditor would wear two hats if, say, she expected the Chapter 11 plan to give her a lien for part of the value of the senior claim and equity for the remainder. It would be interesting to extend our model to this case. Our introductory analysis here focuses on the basic case, but we note that bank creditors are prohibited from holding equity and that firms usually emerge from Chapter 11 with as much debt as before or more. As a consequence, the practical significance of this possible extension is unclear.

13. These units are measured in terms of time in our model, but they also could be measured in terms of quality. For example, they could equally well represent hiring a better and more expensive professional.

In sum, we assume that there are reasons for having professionals on both sides instead of a single dedicated professional team working jointly on behalf of the creditors. (If this were not so, the current U.S. system would be utterly nonsensical.)

We make four assumptions regarding the costs and benefits of hiring professionals:

Assumption 1: $V + 2b - 2c > \mathcal{S}$. This ensures that, if the APR is satisfied, senior creditors always fully recover their claim \mathcal{S} . In other words, if both groups of creditors spend $s = j = 1$ on professionals and the firm reimburses their expenses, the value of the firm is sufficient to pay the senior creditors' claim \mathcal{S} .

We motivate this assumption as follows: if the senior claim is substantially out of the money, junior claims will obviously be worthless. In such cases, the senior will be allowed to take her collateral, and the firm will be liquidated in Chapter 7. Our paper focuses on Chapter 11 reorganizations, in which both types of creditors can engage in the value-increasing and redistributive activities we model.

Assumption 2: $V + 3b < \mathcal{S} + \mathcal{J} \equiv 1$. This restriction states that even with exceptional professional contributions, the firm remains in bankruptcy. This includes the less restrictive condition that the firm remain in default even with maximal professional participation, $V + 2b < \mathcal{S} + \mathcal{J} = 1$.¹⁴

Assumption 3: $b < 2c$. There is an unconstrained optimum for creditors' professional expenses.

Assumption 4: $V - 2c > 0$. Creditor expenses can be reimbursed out of the firm's assets.

4. SOCIALLY OPTIMAL PROFESSIONAL EXPENSES

The socially optimal spending on professionals trades off gains in firm value against the costs of professional representation without regard to redistributive properties. This is the solution to

$$\max_{s,j} W \equiv b \times (s + j) - c \times (s^2 + j^2). \quad (3)$$

14. Although we assume that professionals of both groups of creditors are equally efficient, we have solved the case in which professionals are differentially efficient. The results are qualitatively the same.

Proposition 1. The first-order conditions show that it is socially optimal for both senior and junior creditors to hire professional advice of

$$s^* = \frac{b}{2c} \quad \text{and} \quad j^* = \frac{b}{2c}. \quad (4)$$

The resulting welfare W is

$$W^* = \frac{b^2}{2c}. \quad (5)$$

We use an asterisk throughout the paper to denote solutions under the socially first-best case. Our model specification was chosen to produce these closed-form interior solutions. The optimal expenses are such that, for every creditor, the marginal revenue of using professionals b equals its marginal costs $2cj$ and $2cs$.

If such first-best equilibrium behavior could be forced upon the two creditors, we can determine how their behavior changes with the two key parameters, the professionals' costs c and the professionals' benefits b . The optimal choice of professionals increases with benefit and decreases with cost, in terms of both units (quantity or quality) and expense, as Figure 2 shows.

Although this is only a hypothetical benchmark, in the numerical illustration earlier and the model later we posit a function for how senior and junior professionals sway the equilibrium between two extremes: a pro rata allocation ($\theta = 0$) and an absolute priority allocation ($\theta = 1$). In this benchmark, the in-equilibrium APR violation probabilities are highest for intermediate values of professional costs: with very low costs, senior creditors fully defend their claim. With very high costs, junior creditors "attack" less. Figure 3 shows the APR violation in equilibrium as a function of expert parameters, c and b .

The creditors' relative payoffs are determined by both the cost-benefit contribution of professionals and the implicit APR violation. Senior creditors end up being better off with less professional participation, junior creditors with more. Thus, Figure 4 shows that senior creditors are better off and junior creditors worse off in equilibria with high professional costs and low professional benefits.

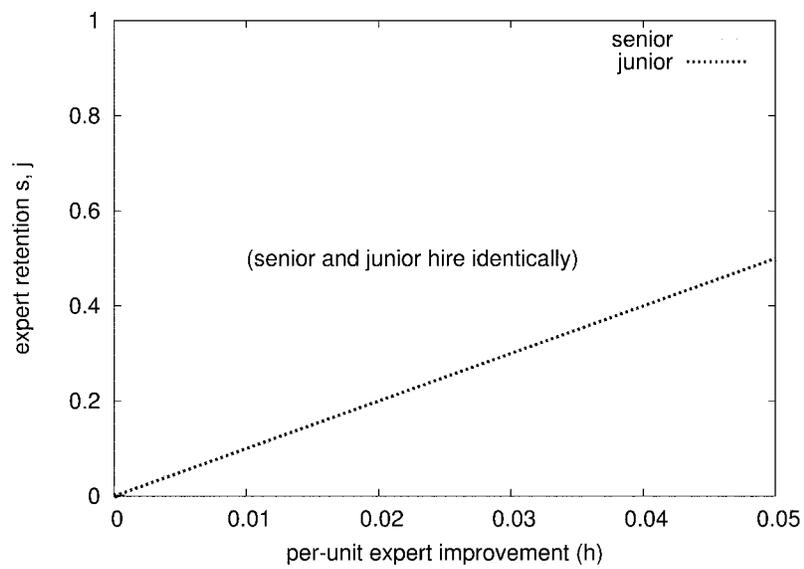
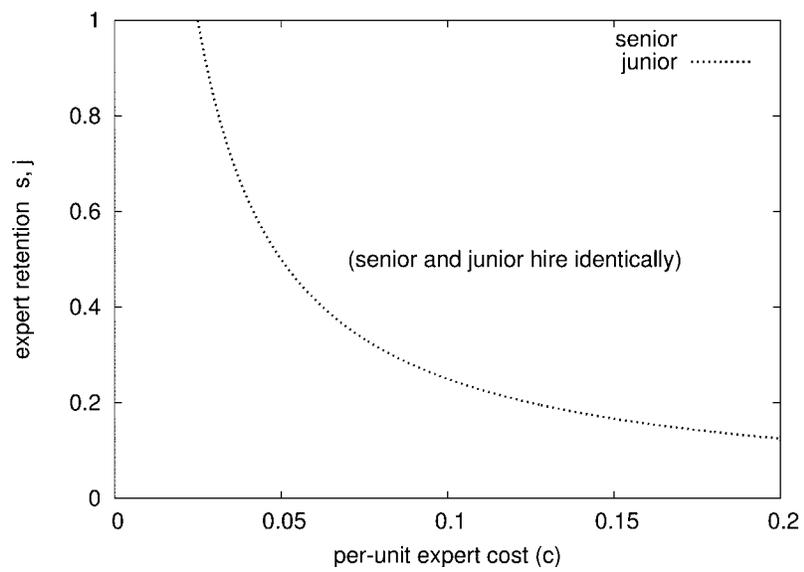


Figure 2. In-equilibrium expert costs and benefits

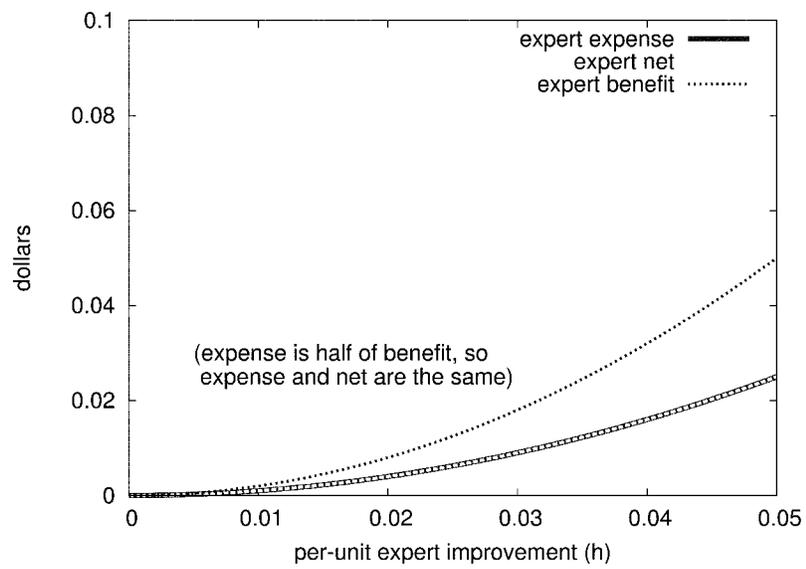
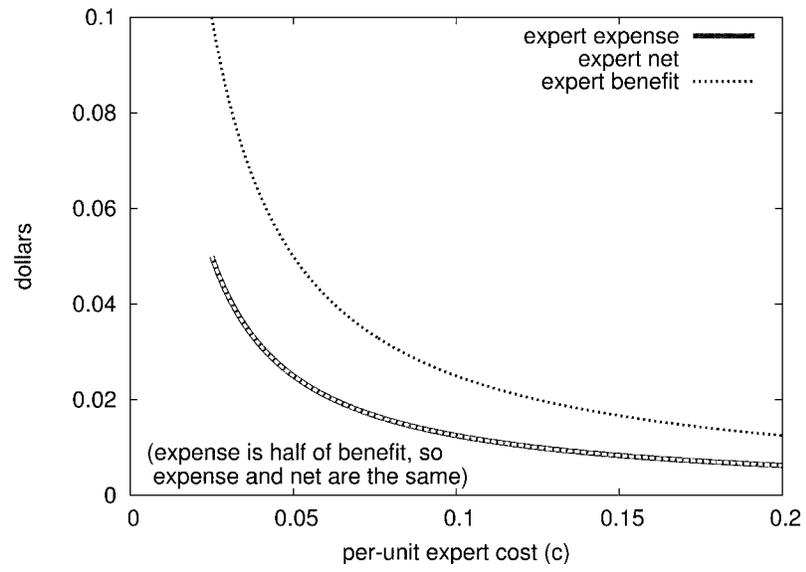


Figure 2. continued

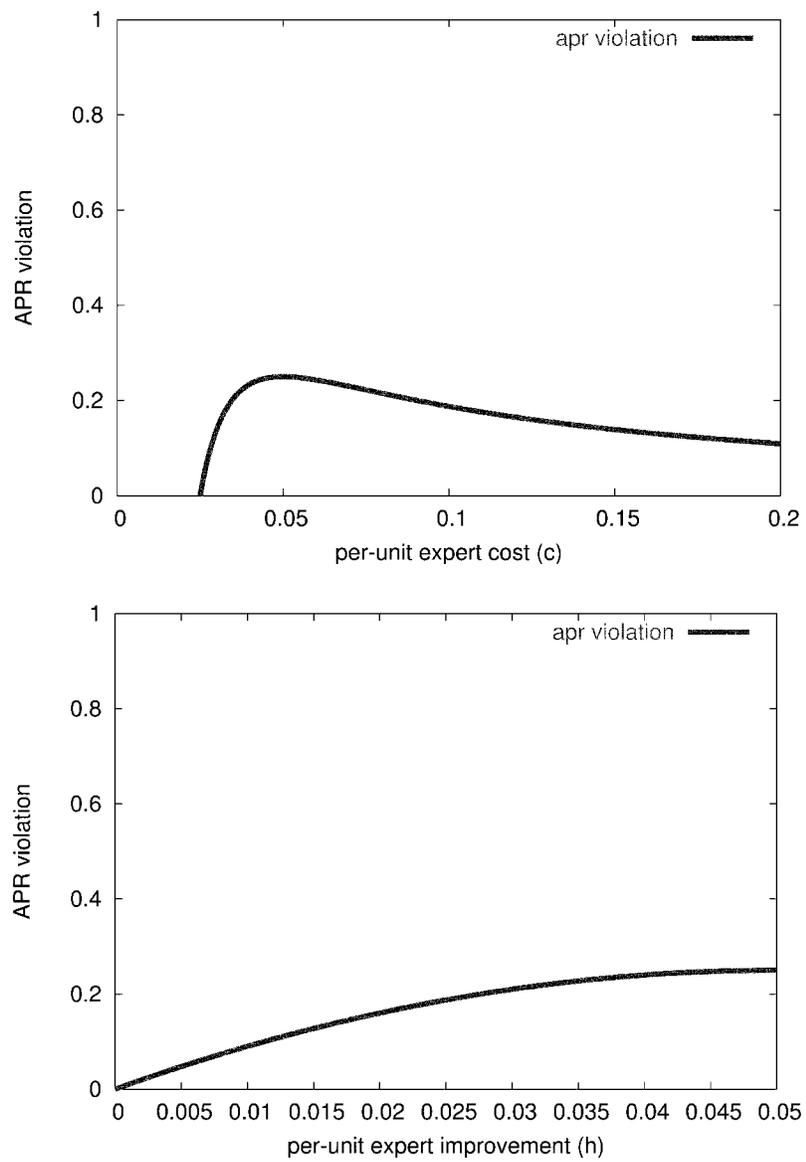


Figure 3. In-equilibrium absolute priority rule violation

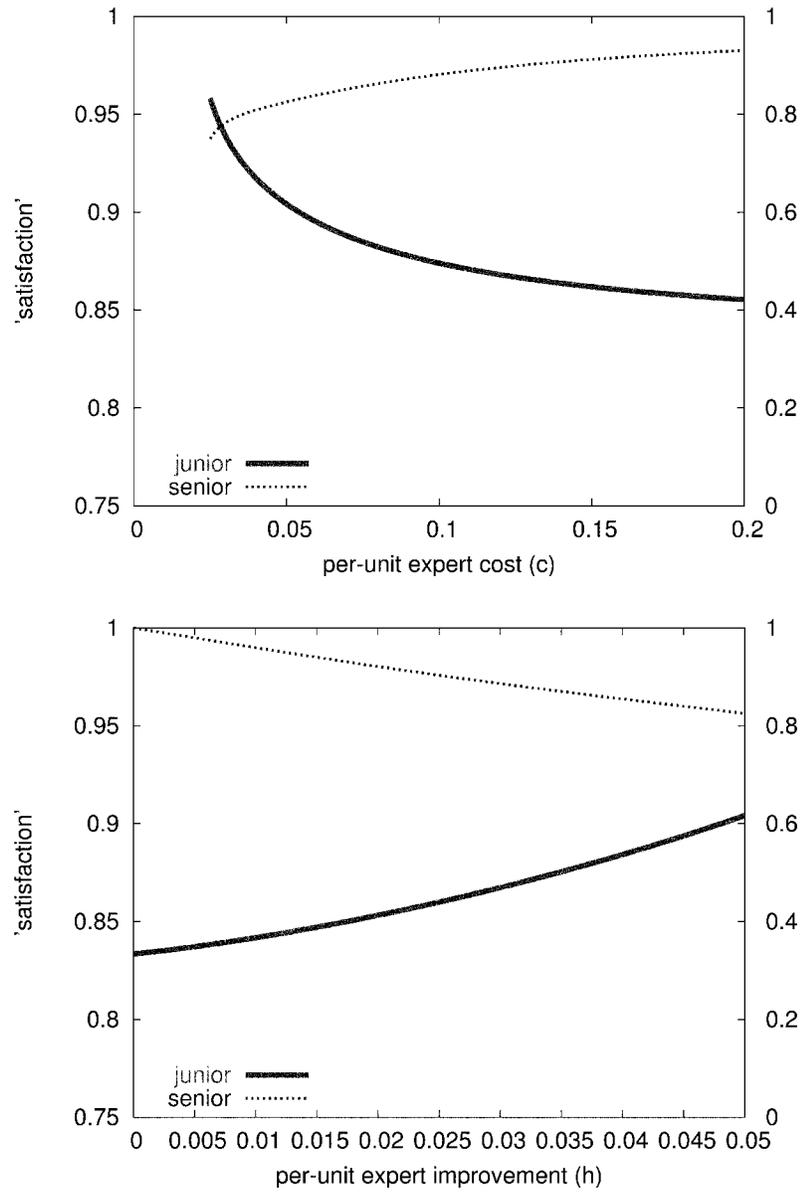


Figure 4. In-equilibrium claim satisfaction

5. THE INFLUENCE COMPONENT

The current U.S. Bankruptcy Code suffers from a confusion. Its intent is appropriate enough, as in section 330(a)4A: “The court shall not allow compensation for . . . [services] that were not reasonably likely to benefit the debtor’s estate.” Unfortunately, it defines an admissible reimbursable value enhancement to be any professional activity that enhances the unsecured creditor’s estate. But the junior estate could increase not only if the total estate increases but also if the junior can redistribute wealth from the senior. This creates an incentive for the junior to engage in redistributive activities, such as discovering minor flaws in senior liens. The statute thus should define benefit to the estate as actual increases in the value of the insolvent firm. This naturally brings us to the core of our paper: the redistributive nature of some professional activities.

Professionals not only enhance firm value but also try to convince the court to take a more favorable view toward their clients. A professional hired by the junior creditor thus may advocate that the firm has a higher value than previously thought, so junior creditors deserve a larger fraction of the recapitalized claims. Professionals hired by the senior creditor will respond by advocating that the firm has a lower value. If the court overestimates firm value, then it in effect violates the APR in favor of junior creditors.

In our model, courts allocate the residual value of the firm in a fashion that is influenced by professional activities. To be precise, courts allocate either according to the APR, or pro rata, or somewhere in between. If the court is “APR oriented,” the proceeds fully satisfy the senior creditors first and then repay the junior creditors with the remainder. The payoffs to senior creditors are $P_s = \mathcal{S}$; the payoffs to junior creditors are $P_j = V - \mathcal{S}$, where P_s and P_j denote the allocation to senior and junior creditors, respectively. If the court is “anti-APR oriented,” the firm’s cash flows are distributed proportionally; that is, $P_s = [S/(S + \mathcal{J})]V = \mathcal{S}V$ and $P_j = [J/(S + \mathcal{J})]V = \mathcal{J}V = (1 - \mathcal{S})V$.

The parameter $\theta \in [0, 1]$ determines the extent to which one or the other of these allocation schemes is followed. Thus, θ can be interpreted as the probability that the court upholds the APR, or as a compromise fractional allocation between the APR and non-APR, or both. Both senior and junior creditors’ professionals influence the reorganization parameter θ . We specify the outcome of the senior-junior conflict as

$$\theta(j, s) = 1 - j \times (1 - s). \quad (6)$$

This functional form implies that

1. If the junior creditors do not spend money on professionals, the court is APR oriented irrespective of the senior creditors' behavior ($j = 0 \Rightarrow \theta = 1$). This assumption is consistent with the law and practice in the United States.

2. The more resources that junior creditors spend on professionals, the less APR oriented the court is: $\partial\theta/\partial j = -(1-s) \leq 0$.

3. Senior creditors can mitigate ($\partial\theta/\partial s = j \geq 0$) or even completely undo the juniors' efforts by spending on professionals ($s = 1 \Rightarrow \theta = 1$).

6. FULL-PAYMENT SYSTEMS

Before we proceed to systems in which professional costs are shared by participants, it is instructive to compare schemes in which all professional fees are paid for by one party. This highlights the incentive issues that arise later. The next sections consider partial-reimbursement regimes.

6.1. Government Pays Professionals

If the government fully pays for all professionals retained by creditors (GP), the senior and junior creditors would solve, respectively,

$$\max_s P_s \equiv \theta(s, j)\mathcal{S} + [1 - \theta(s, j)]\left(\frac{\mathcal{S}}{\mathcal{S} + \mathcal{J}}\right)V(s, j) \quad (7)$$

and

$$\max_j P_j \equiv \theta(s, j)[V(s, j) - \mathcal{S}] + [1 - \theta(s, j)]V(s, j)\left(\frac{\mathcal{J}}{\mathcal{S} + \mathcal{J}}\right). \quad (8)$$

Because we have exogenously imposed a limit on expenditures in our model,

$$s^{\text{GP}} = \bar{s} \equiv 1 \quad \text{and} \quad j^{\text{GP}} = \bar{j} \equiv 1. \quad (9)$$

Relative to the first-best solution (5), both creditors overspend on representation. The court is APR oriented, so $P_s = \mathcal{S}$ and $P_j = V + 2b - \mathcal{S}$. Social welfare is a low $2b - 2c < 0$. Fortunately, although it may be realistic to presume that the government carries some expenses caused by professionals (for example, in maintaining a court system), it is neither realistic nor desirable to have the government pay for all creditor professionals.

6.2. Firm Pays Professionals

If professionals' fees are reimbursed at the court's discretion out of firm value, senior creditors solve

$$\begin{aligned} \max_s P_s \equiv & \theta(s, j) \min[\mathcal{S}, V(s, j) - cs^2 - cj^2] \\ & + [1 - \theta(s, j)][V(s, j) - cs^2 - cj^2] \left(\frac{\mathcal{S}}{\mathcal{S} + \mathcal{J}} \right). \end{aligned} \quad (10)$$

This equation assumes that even if the maximum amount is spent on professionals ($s = \bar{s}$, $j = \bar{j}$), creditors still receive some value. Similarly,

$$\begin{aligned} \max_j P_j \equiv & \theta(s, j) \max[V(s, j) - cs^2 - cj^2 - \mathcal{S}, 0] \\ & + [1 - \theta(s, j)][V(s, j) - cs^2 - cj^2] \left(\frac{\mathcal{J}}{\mathcal{J} + \mathcal{S}} \right). \end{aligned} \quad (11)$$

Proposition 2. If the firm fully pays for creditors' expenses (FP), senior creditors overspend on representation, and junior creditors spend optimally:

$$s^{\text{FP}} = \bar{s} \quad \text{and} \quad j^{\text{FP}} = j^*, \quad (12)$$

where \bar{s} is the maximum expense possible. Further, $W^{\text{FP}} > W^{\text{GP}}$.

Proof. See Appendix B.

Because the senior spends a lot, the APR is followed, so the junior becomes a pure residual claimant.

6.3. Creditors Pay Professionals

If each creditor pays for his own professionals, senior creditors solve

$$\max_s P_s \equiv \theta(s, j) \mathcal{S} + [1 - \theta(s, j)] \left(\frac{\mathcal{S}}{\mathcal{S} + \mathcal{J}} \right) V(s, j) - cs^2. \quad (13)$$

and junior creditors solve

$$\max_j P_j \equiv \theta(s, j)[V(s, j) - \mathcal{S}] + [1 - \theta(s, j)] \left(\frac{\mathcal{J}}{\mathcal{S} + \mathcal{J}} \right) V(s, j) - cj^2. \quad (14)$$

Proposition 3. If creditors pay for their own expenses (CP), junior creditors overspend on representation,

$$j^{\text{CP}} > j^*. \quad (15)$$

Senior creditors underspend on professional advice

$$s^{\text{CP}} < s^* \quad \text{if } \mathcal{S} < \mathcal{S}^{\text{M}}, \quad (16)$$

where $\mathcal{S}^{\text{M}} \equiv 2c/[1 - V + b - (3b^2)/2c]$. This is a (mild) sufficient but not necessary condition. Further, $W^{\text{CP}} > W^{\text{FP}}$.

Proof. See Appendix B.

When the APR is violated, senior creditors share in the residual claim. Hence, they are better off when firm value increases and will contribute some improvement, although too little from a social perspective. Among all full-pay schemes, this regime, in which creditors pay for their own expenses, is best. Unlike the earlier schemes, it does not induce either creditor to spend the maximum amount.

7. ASYMMETRIC FULL-PAYMENT SYSTEMS

7.1. The Current U.S. System: Full Junior Creditor Reimbursement

The U.S. Bankruptcy Code fails expressly to reimburse most senior expert expenses and does expressly reimburse substantial junior expert expenses. We continue to analyze this system here under the convenient, and largely on the mark, assumption that the seniors are not recompensed while the juniors are. Our results are similar to those of Welch (1997). When the junior claim is out of the money, junior creditors are indifferent between bearing costs themselves or being reimbursed by the court. However, if spending on professionals tilts the court against the APR, senior creditors ultimately bear part of the juniors' professional expenses. The next proposition shows that junior creditors overspend with respect to the case in which costs are paid for by the creditors. In addition, senior creditors will overspend in order to overcome the juniors' efforts.

Proposition 4. Under the U.S. system, both creditors spend more than when neither is reimbursed. In addition, the senior underspends and the junior overspends relative to the social optimum.

$$s^{\text{CP}} < s^{\text{US}} < s^* \quad \text{and} \quad j^* < j^{\text{CP}} < j^{\text{US}}. \quad (17)$$

Social welfare in this case is not higher than when creditors pay themselves ($W^{\text{US}} \leq W^{\text{CP}}$).

Proof. See Appendix B.

The intuition is that the junior creditor attempts to cause APR violations, knowing that the senior creditor will typically not find it in her interest to hire enough professionals to fully defend the APR. Still, unlike in the self-financing expenses case, senior creditors spend more in this system than when creditors self-reimburse. This is because when the junior is subsidized, he will overspend, thereby increasing the likelihood that the senior will be partly a residual claimant. The senior creditor then becomes more concerned about junior expenses that reduce the value of the firm and her own claim. Her optimal response is to increase spending.

7.2. Another Poor Alternative: Full Senior Creditor Reimbursement

As our numerical illustration showed, reversing the current U.S. reimbursement system (so that senior creditors rather than junior creditors are reimbursed) is not a panacea. Indeed, because the APR is fully upheld, the solution is the same as when the firm fully reimburses professionals from both parties. In our model, we can show

$$W^{US} < W^{\text{reverse US}} = W^{FP} < W^{CP}. \quad (18)$$

This system can be better than the current U.S. system because it at least attempts to correct reimbursement in the right direction. However, beyond the context of our model, it will depend on how bad excessive senior spending in such a system would be relatively to how bad excessive junior spending is in the current U.S. system.

8. SYSTEMS WITH PARTIAL REIMBURSEMENT BY FIRMS

Unlike earlier schemes, we now allow society to set more flexible rules for who pays for professional expenses. These schemes may permit firm managers the discretion to decide how creditors are reimbursed for their professionals' contributions. Any unreimbursed expenses must be carried by the creditors themselves.

We consider two schemes. In the first, the firm can set reimbursement rules at the time of loan origination. In the second, the firm can set reimbursement rules only at the time of bankruptcy. In both cases, the debtor's managers are presumed to maximize the value of the firm.

8.1. Socially Optimal Partial Reimbursement by the Firm

Proposition 5. Managers that can commit to reimburse creditors' expenses will contract for a scheme that maximizes firm value ex ante

(at loan origination). In this scheme, the firm agrees partially to reimburse senior creditors but will not reimburse junior creditors.

Both creditors overspend in equilibrium:

$$s^{\text{FRA}} > s^* \quad \text{and} \quad j^{\text{FRA}} > j^*, \quad (19)$$

where FRA indicates that the firm agrees ex ante to reimburse. Social welfare in this case is higher than when creditors pay for their own expenses ($W^{\text{FRA}} > W^{\text{CP}}$).

Proof. See Appendix B.

When the firm borrows, it will fully internalize the costs and benefits of any allocation scheme. As we have seen, it is optimal for the firm to reimburse some senior expenses but no junior expenses. Maximizing managers will offer creditors the optimal contract because this minimizes the cost of capital.

In numerical experiments, this scheme yields solutions that are usually close to the first-best situation when compared with the current U.S. bankruptcy regime. To see why, recall that the social problem in bankruptcy is that senior creditors contribute too little because most residual benefits accrue to the junior. The junior creditors spend too much because they not only internalize most of the professional's residual value enhancement but also receive the additional redistributive part of the pie from the senior creditors' claims. The social goal is thus to subsidize the senior creditors in order to enhance their incentives to hire professionals while dampening junior spending. The trick is to avoid subsidizing the senior too much, that is, not to reimburse all senior expenses. If the firm reimburses senior creditors, it will find it in its interest to suitably constrain the senior's reimbursement. In equilibrium, the junior creditor still chooses to hire too much representation because the senior creditor does not spend enough to defend the APR fully. The junior creditor thus should not be subsidized by the estate.

Although this system is better than all single-payor systems and the current U.S. bankruptcy system, it still fails to reach the first-best solution. The problem is that firms can only subsidize and not tax professionals' participation. In our model, in equilibrium, senior and junior professionals are substitutes: more spending by one leads to less spending by the other. Because the junior cannot be further restrained from seeking redistribution, the best reimbursement system induces the senior creditor to overspend a little on professional representation, in order to reign in the junior creditor's rent seeking.

8.2. Self-Seeking Partial Reimbursement by Firm

We have explained the difficulties that plague any compensation scheme. Therefore, we consider an alternative scheme in which managers not only are free to contract ex ante for reimbursement schemes but may choose a reimbursement scheme in bankruptcy that maximizes firm value. Such an ex post firm-value-maximizing system is time consistent, relatively simple to implement, and robust with respect to different parameter values.¹⁵ Although this scheme is inferior to an ex ante contracted-for firm-value-maximizing system, the difference is often surprisingly small, for example, as in our numerical illustration.

Proposition 6. Managers who are permitted to reimburse creditors' expenses ex post will not maximize benefits because managers fail to internalize enough of the senior professional costs. Their objective leads them to partially reimburse senior creditors (less than in the FRA case) but not to reimburse junior creditors.

In this scheme, both creditors overspend in equilibrium. Compared to the professional-benefit-maximizing choices (case FRA), senior creditors receive less reimbursement and thus hire less professional advice, and junior creditors spend more, taking advantage of less senior resistance:

$$s^{\text{FRP}} < s^* < s^{\text{FRA}} \quad \text{and} \quad j^{\text{FRP}} > j^{\text{FRA}} > j^*, \quad (20)$$

where FRP indicates that the firm agrees ex post to reimburse. Social welfare is lower when the firm maximizes ex post than when it can maximize ex ante, $W^{\text{FRP}} < W^{\text{FRA}}$.

Proof. See Appendix B.

8.3. Discussion

Because our results suggest that it is appealing to allow the managers of insolvent firms to choose how to compensate creditors in bankruptcy—for such reasons as simplicity, decentralized decision making, and relative social outcome—our paper suggests closer consideration of such a scheme.

Figure 5 plots the contribution of professionals to the social good and to the value of the firm as a proportion of senior expenses that are

15. Because the economic intuition is solid, this system is also robust with respect to many other functional specifications.

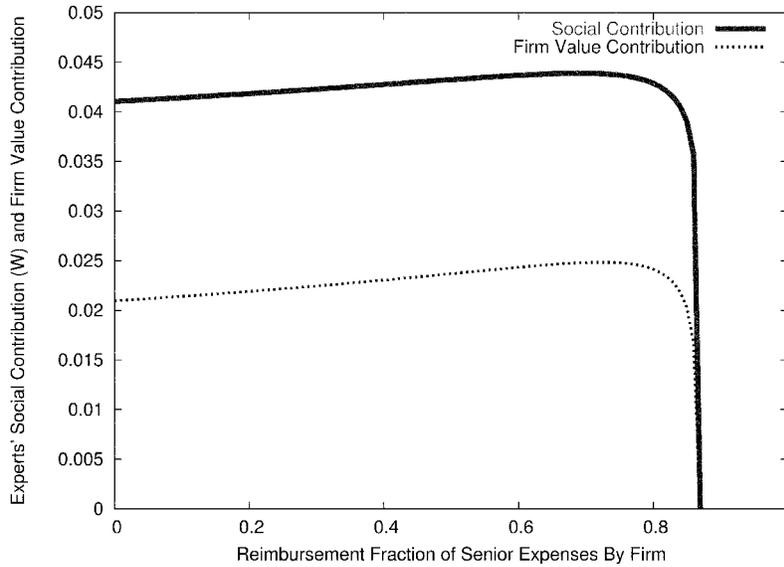


Figure 5. Professionals' contribution to social good and firm value

reimbursed by the firm. The figure shows that there is a modest but steady improvement in professionals' contribution, both to firm value and to social value, over a wide range of reimbursement fractions. As our propositions and figure show, the social gain is strictly higher when firms are permitted discretion in reimbursement than when one party fully pays for the expenses. If reimbursement is 0 percent, this case reverts to one in which creditors self-pay—a modestly bad scheme. If reimbursement is 100 percent, this case reverts to one in which the firm fully reimburses creditors, in which case senior creditors overspend dramatically—a very bad scheme.

Figure 5 also shows that there is little difference in the optimal choice of reimbursement between the case in which reimbursement rates are set by the firm at the time the contract is written or at the time of bankruptcy. When the firm “shaves” the reimbursement proportion, it has to pay a little less to the senior creditor, but it also gains less from the senior creditor's value improvement. Because all of the value improvement provided by senior creditors is internalized in the firm manager's objective function, the difference between the optimal reimbursement fractions when set ex ante (72 percent) and ex post (69 percent) is small.

The remaining figures consider the comparative statics of the model when managers choose the optimal reimbursement for senior creditors at the time of bankruptcy (see also Appendix C).¹⁶ Figure 6 shows that our scheme has the desirable characteristic that professional retention in equilibrium decreases with cost c and increases with value effectiveness b . For low enough professional costs, senior professionals should be 100 percent reimbursed. (Junior creditors will similarly hire 100 percent professionals for very low c .)

Figure 7 shows how social benefits decrease with c and increase with b . There is a kink in professional expenses because for low enough costs c , senior creditors are 100 percent reimbursed and thus max out on professional advice. Any increase in costs just increases the total cost. Beyond such very small values of c , professional retention decreases in c , and with it total professional expenses in equilibrium. However, the professionals' net contribution to both social and firm value always declines with higher costs. Figure 8 shows that when senior creditors do not max out on their professionals (the optimal reimbursement fraction is below 100 percent), the APR is violated in equilibrium with positive probability.

Putting together professional expenses and APR violations in equilibrium, we can compute the relative satisfaction of senior and junior claims. Figure 9 shows that for very low costs c and very high value improvement b , the professionals provide sufficiently valuable improvements in equilibrium to keep both creditors' recovery rates relatively high. For medium costs c and medium value improvement b , junior creditors succeed in capturing some value from senior creditors. Still, both creditors are worse off. If costs are very high and improvement very low, junior creditors find it less worthwhile to influence the court. They are thus worse off. Senior creditors, however, benefit from the reduced aggressive behavior of junior creditors and are thus better off.

Our analysis suggests that it is desirable to allow value-maximizing managers to set creditor reimbursement fractions. The debtor in possession today incurs the bulk of expert expenses, so our recommendation expands the scope of the debtor's discretion: it would continue to be able to use its own experts but also would be able to enlist creditors in the value-maximization task. Senior creditors sometimes may have more

16. The figures are practically identical if the consideration for senior professionals is decided ex ante (at the time of loan initiation). When plotting as a function of c , we hold V equal to .9, b equal to .05, and S equal to .4. When plotting as a function of b , we hold V equal to .9, c equal to .05, and S equal to .4.

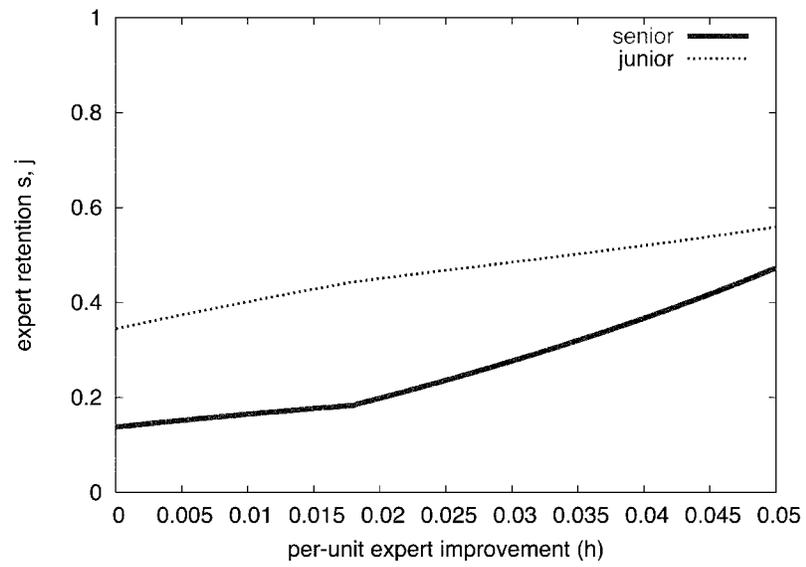
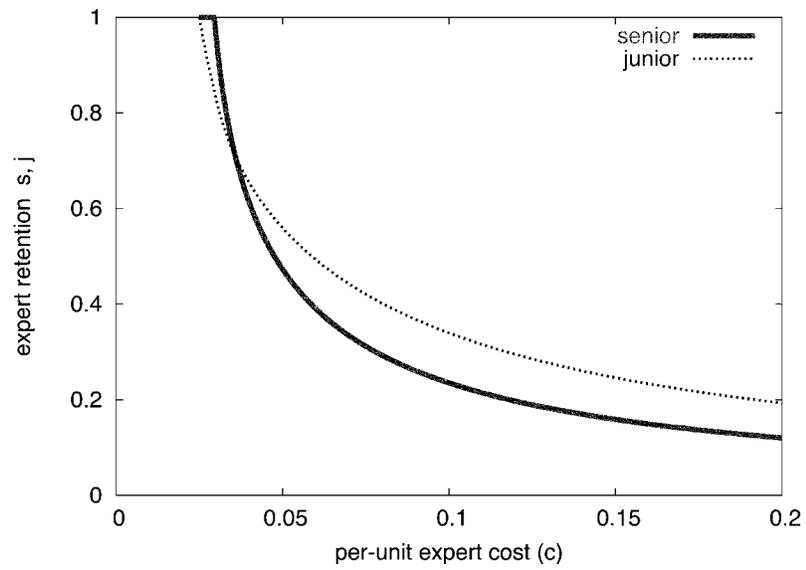


Figure 6. In-equilibrium expert retention

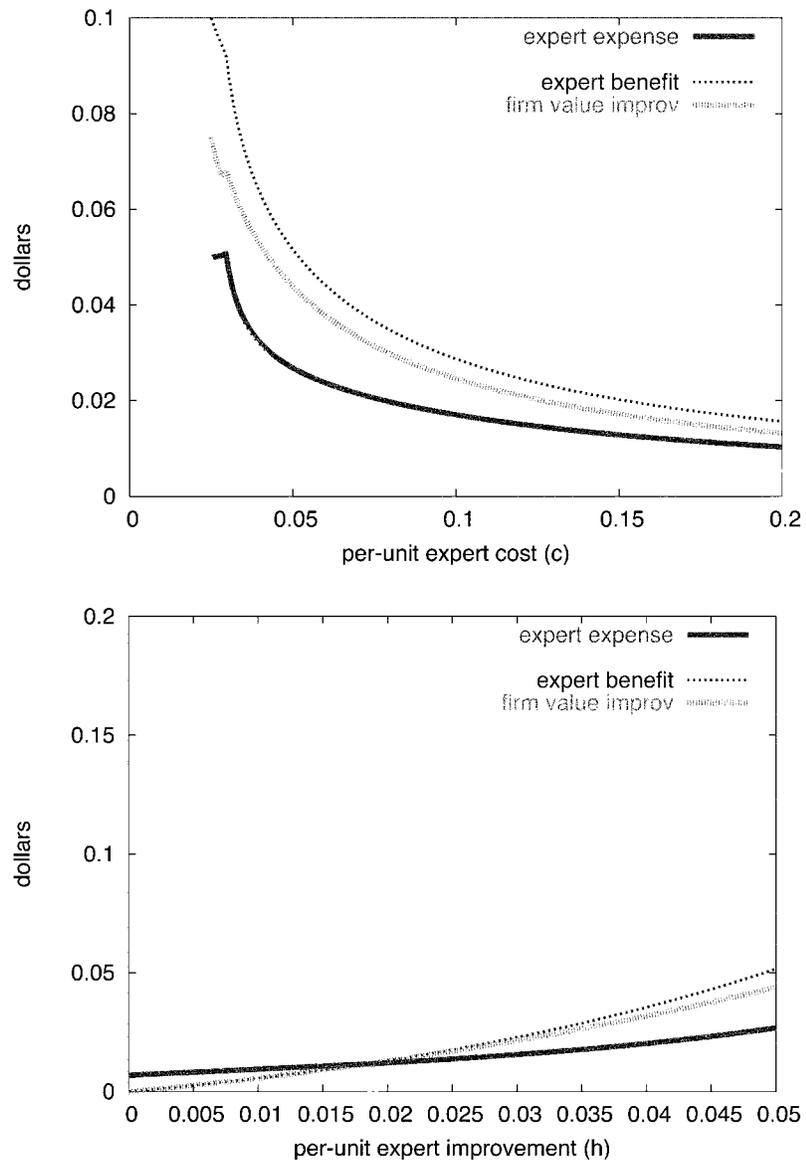


Figure 7. In-equilibrium costs and benefits

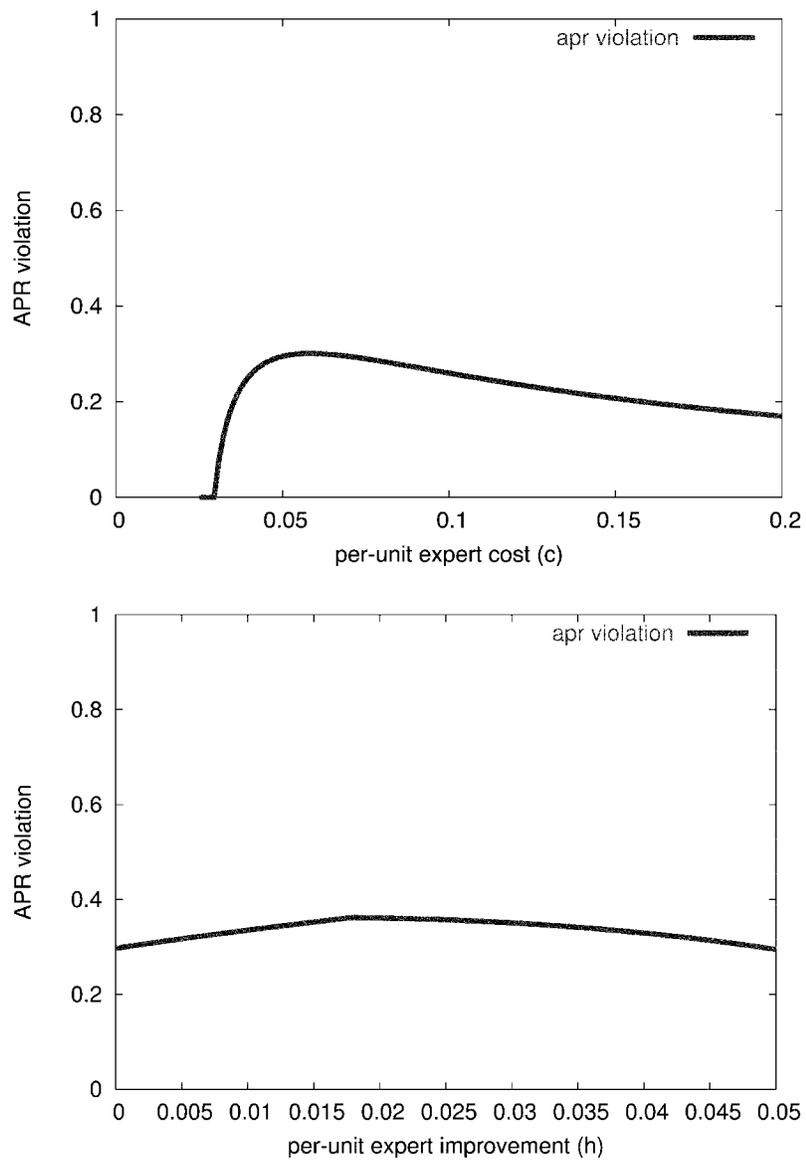


Figure 8. In-equilibrium absolute priority rule violation

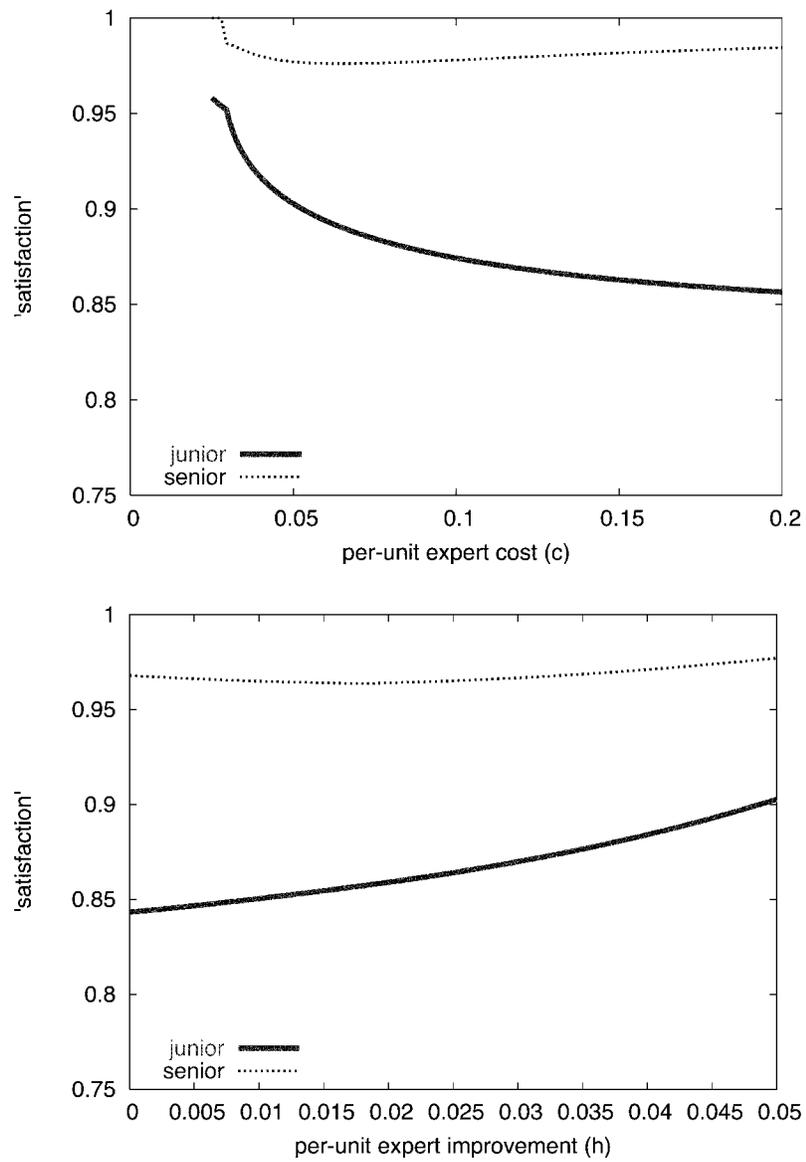


Figure 9. In-equilibrium claims satisfaction

expertise than the debtor when the relevant issues involve valuation, restructuring, or asset disposition. Seniors may share this expertise with the debtor, and this sometimes happens, but perfect cooperation in bankruptcy contexts is not always to be expected, and the seniors may want to perform a supervisory role regarding expert performance. To be sure, our assumptions that managers are competent and objective value maximizers with knowledge of the parameters may not always be satisfied. It seems reasonable to presume that even if managers do not have full knowledge of professionals' effectiveness, their knowledge of the effects of professional advice on firm value (the parameters) is likely to be better than that of a court or the government. Further, in this solution, in contrast to a theoretically better system in which a court or government maximizes social value (see below), the firm needs to judge only how reimbursement influences its own value. The firm is buying a service and does not have to know creditor costs in order to make its reimbursement decision.

A more serious concern relates to our assumption that the managers of a debtor in possession want to maximize the value of the insolvent firm. Managers sometimes have a continuation bias. This bias could yield two types of bad behavior. First, the firm could choose professionals who are good at delay or who will help to propose overly optimistic reorganization plans. Second, if matters look bleak, the managers could enlist professionals in a collusive scheme with junior claimants to cause the firm to overinvest. We nevertheless prefer the firm over the court as principal decision maker. Bankruptcy courts also have a continuation bias, so letting the firm decide is unlikely to make matters worse. Of greater importance, that the managers who brought the firm into bankruptcy sometimes have poor incentives now is widely recognized. Creditors who are residual claimants thus have an incentive, more frequently acted on than heretofore, to replace the old managers with new ones, whose compensation and reputations are tied to success at reorganization. These new managers should act to promote efficient and to dampen bad creditor spending.

9. SYSTEMS PERMITTING PARTIAL REIMBURSEMENT BY THE GOVERNMENT

We still have one degree of freedom that we have not exploited: what if the government is also allowed to pay a part of professionals' costs? Suppose that both the government and the firm can reimburse different

proportions of senior and junior creditors' claims. The remainder, unreimbursed by government and firm, is carried by creditors themselves. Further, we assume that not only the firm, but also the government, has zero administrative cost, is benevolent, and is omniscient about the model parameters. Call this case GR.

Proposition 7. If both the government and the firm can reimburse creditors, the optimal solution is for the government to reimburse a part of the senior creditor's expense and nothing of the junior creditor's expense. The firm should not reimburse either creditor. The remainder of the expenses should be borne by the creditors themselves.

Even in this scheme, both creditors overspend on professional representation,

$$s^{\text{GR}} > s^* \quad \text{and} \quad j^{\text{GR}} > j^*. \quad (21)$$

The professionals' welfare contribution is higher in this scheme than in schemes considered earlier, inferior only to the first-best solution.

Proof. See Appendix B.

Senior creditors need to be encouraged. Either the firm or government reimbursement schemes can be tuned to achieve an almost socially optimal first-best senior professional participation. The remaining problem is how to limit junior creditors from overretaining professionals. The problem when the firm reimburses is that the junior creditors' residual claim becomes smaller, inducing them to become more aggressive in seeking the larger senior share.

Naturally, with the extra degrees of freedom, this scheme can approach the social optimum better than previous schemes. However, even four degrees of freedom are not enough to fine-tune the choices so that junior creditors do not overspend. First-best could be achieved only if one could "tax" the junior creditors' professional expenses.¹⁷

We consider such optimal government reimbursement schemes to be academic. It is doubtful that governments can fine-tune their reimbursements appropriately to attain this second-best solution.¹⁸ The optimal reimbursement fraction depends on the professionals' production function (c and h), which is not only model specific but unlikely to be ac-

17. Note that this would need to be a tax on junior creditors' expenses, which is different from forcing junior creditors to subsidize senior creditors' expenses.

18. In the real world, the government subsidizes the court system, so we have something of a partial-reimbursement system now.

cessible to either legislators or courts.¹⁹ Otherwise, a simpler system that achieves the first-best solution would be one in which the court (or the government) fully reimburses creditors' expenses when they spend exactly the social optimum and zero otherwise. Thus, we are reluctant to advocate such government involvement in the bankruptcy reimbursement system.

10. CONCLUSION

Our model describes the trade-offs faced in designing an optimal professional reimbursement process in bankruptcy: good solutions must balance the value-increasing benefits of professionals against the value-decreasing distortions caused by creditors' rent-seeking activities. When the government fully reimburses creditors' professional expenses, both types of creditor spend too much money (in rent seeking) from a social perspective. When the firm fully reimburses both creditors' expenses, senior creditors' expenses are effectively subsidized by junior creditors (the residual claimants), and both parties end up spending excessively on professionals. When creditors fully pay for their own professionals' expenses, senior creditors fail to provide a sufficient contribution to the corporate value-enhancement process.

Partial-reimbursement systems work better. A robust characterization is that some, but not all, possible senior creditors' expenses should be reimbursed, while junior creditors should not receive any subsidy. We close our paper with our judgment on which solutions can reasonably be implemented.

1. The first-best solution can be obtained only if redistributive activities of all production function parameters are observable by the parties and the court. However, if redistributive activities can remain hidden, or production functions remain unobservable, the first-best solution is not attainable. A second-best solution, in which the government pays part of the senior creditors' professional expenses, and does so without introducing other distortionary incentives into the process, similarly suffers from an inability to observe the relevant parameters.

2. A third-best solution, often nearly as good as the first-best solution, can be obtained if managers are permitted to reimburse creditors, either *ex ante* or *ex post*. Firm-value-maximizing managers would choose

19. Simple comparative statics, which can be derived, are not sufficient for guidance.

to partially reimburse senior creditors but not junior creditors. This scheme can be implemented by a simple amendment to the bankruptcy code. The amendment would provide that creditors do not apply to the court for reimbursement but instead apply to the firm. The court then would review firm decisions only to ensure that they are not made in an arbitrary fashion. This scheme not only increases the amount of productive professional spending but, by substantially dampening redistributive spending, will also reduce the total amount of spending on professionals. Our two proposed schemes strike us as feasible and efficient bankruptcy reimbursement systems.

3. The current U.S. practice, in which junior creditors are reimbursed from the estate and senior creditors are not, is counterproductive. Junior creditors end up seeking redistributive rents (a bigger share of the estate), and senior creditors end up not spending enough on professional advice. (Also, within the current U.S. system, it would make sense to change the definition of redistributive activities to encompass the entire estate, not just the junior lien.)

We conclude by noting three promising areas for future research. First, the functional form we use for relating expenses to the probability that the court will follow the APR is deterministic: hours spent on professionals affect the probability in a predefined, quantified way. Creditors, however, may be able to direct spending relatively more toward productive or rent-seeking activities. This could in turn endogenize our θ function. Second, although creditor committees coalesce multiple junior creditors into one party, it would be interesting to allow for more creditors (Bris and Welch, forthcoming) and allow creditors to form coalitions. Third, our proposed reform should dampen creditor rent seeking, and this will increase the likelihood that courts will follow the APR. A bankruptcy procedure that awards the equity nothing, however, may worsen prebankruptcy investment incentives (Povel 1999). Thus, a more complete treatment should ask whether the reform we advocate would be an improvement, all things considered.²⁰

20. Schwartz (forthcoming) analyzes the trade-offs between the ex ante efficiency effects of following the APR strictly and the possible ex post inefficiency effects of discouraging use of the bankruptcy process.

APPENDIX A: NUMERICAL EXAMPLE CONTINUATION

For completeness, we now extend the numerical illustration of Section 2 to an even better partial (senior) reimbursement scheme, in which a benevolent omniscient government maximizes social welfare. We do not suggest this to be a feasible improvement.

In this scheme, the government would reimburse the senior for 81.0 percent of the senior's expense and none of the junior's expense. The firm would reimburse nothing, and a creditor who would want to spend more on professionals would have to fund such professional hours herself.

This case has an interesting intuition. Recall the case in which the firm's intention was to maximize professional contribution (case A). If the senior creditor had been reimbursed for 83.6 percent of her expenses, she would have spent the social optimum of 4 hours, but the junior would have hired about 7.23 hours. Increasing the senior reimbursement from 83.6 percent to 84.6 percent meant that she would hire a little bit more than the optimal 4 hours, but at a social cost of second-order importance (guaranteed by the envelope theorem). Because the junior and senior expenses are substitutes in equilibrium, this reduces the junior's professionals from 7.5 to 7.09 hours, which raises welfare.

Still, the problem in equilibrium remains that both creditors overspend. But reducing the firm reimbursement to senior creditors increases the junior's incentive to rent seek. The reason is of course that when the firm reimburses some senior expenses, the pro rata payoffs become worse for the junior creditors, and rent seeking becomes relatively more attractive. If the government instead of the firm reimburses the senior creditor, the junior is less eager to assail the senior claim and will spend less (socially inefficiently) on professionals. Thus, a better equilibrium can be achieved when the government reimburses creditors than when the firm reimburses creditors.

The optimal government reimbursement proportion for seniors is 81.0 percent, which is similar to the proportions when the firm reimburses creditors. The senior spends 4.6 hours. Her objective function is

$$\theta \times \$40 + (1 - \theta) \times \left[\frac{1}{3}(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) \right] - .207(s \times \$50).$$

The junior still finds it optimal to attack the senior claim and spends 6.39 hours. His objective function is

$$\begin{aligned} & \theta \times [(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) - \$40] \\ & + (1 - \theta) \times \left[\frac{2}{3}(\$100 + \$2\sqrt{s} + \$2\sqrt{j}) \right] - j \times \$50. \end{aligned}$$

Thus, both creditors overspend on representation. In this system, the court chooses 75.4 percent APR and 24.6 percent PPR; the senior receives \$38.69, and the junior receives \$67.02.

Therefore, in the case, the social net professional benefit is \$3.85. Unfortunately, although this is the best partial-reimbursement system, an optimal government reimbursement is probably not feasible. It relies on governmental knowledge of parameters and unbiased, uninfluenceable decisions—abilities and tendencies that we are not willing to attribute to courts.

APPENDIX B: PROOFS

Proof of Proposition 2. If senior creditors do not pay for their professionals, they maximize their profits by spending $s = 1$ because in that case the APR is upheld for sure and they receive \mathcal{S} . Consequently, junior creditors maximize

$$\max_j P_j \equiv V + (s + j)h - cs^2 - cj^2 - \mathcal{S}, \quad (\text{B1})$$

which is maximized when $j > h/2c$. Finally, because $s^{\text{GP}} = j^{\text{GP}} = 1$, then $W^{\text{GP}} = \arg \min_{s,j} W$. Hence, $W^{\text{GP}} < W^{\text{FP}}$. Q.E.D.

Proof of Proposition 3. Differentiating equation (14) with respect to j yields

$$\frac{\partial P_j}{\partial j} = \mathcal{S}(1-s)[1 - V - sb - 2hq] + h - 2cj. \quad (\text{B2})$$

The first term in (B2) is positive if $V + 3h < 1$. Hence, it must be that $h - 2cj^* < 0$ for $\partial P_j/\partial j = 0$. Therefore, $j > h/2c$. Solving for s in the partial derivative $\partial P_j/\partial s = 0$ yields

$$s = \frac{j\mathcal{S}[1 - V + h \times (1 - j)]}{2j\mathcal{S}h + 2c}. \quad (\text{B3})$$

Note that this expression is decreasing in j . Therefore, because $j > h/2c$,

$$s = \frac{j\mathcal{S}[1 - V + h \times (1 - j)]}{2j\mathcal{S}h + 2c} < \left(\frac{h}{2c}\right) \left(\frac{\mathcal{S}[1 - V + h \times (1 - j)]}{(\mathcal{S}h^2)/c + 2c}\right) < \left(\frac{h}{2c}\right) \quad (\text{B4})$$

when $\mathcal{S}[1 - V + h(1 - j)]/[(\mathcal{S}h^2/c) + 2c] < 1$. Because $j > h/2c$, the condition is equivalent to $\mathcal{S} < 2c/[1 - V + h - (3h^2/2c)]$. To prove that $W^{\text{CP}} > W^{\text{FP}}$, note that $\partial s^{\text{CP}}/\partial j > 0$ and $\partial j^{\text{CP}}/\partial s < 0$. Therefore, using the envelope theorem, $\partial W^{\text{CP}}/\partial s < 0$ for all j^{CP} and $s > h/2c$, and $\partial W^{\text{CP}}/\partial j < 0$ for all s^{CP} and $j > h/2c$. Hence, because $j^{\text{FP}} = h/2c$ and $s^{\text{FP}} = 1$, it follows that $W^{\text{FP}} < W^{\text{CP}}$. Q.E.D.

Proof of Proposition 4. In proposition 3, $\partial j^{\text{CP}}/\partial s < 0$ because $\partial^2 P_j/\partial j \partial s = 2\mathcal{S}hs - \mathcal{S}h + \mathcal{S}V + 2j\mathcal{S}h - \mathcal{S} < 0$. In addition, $\partial s^{\text{CP}}/\partial j > 0$ because $\partial^2 P_j/\partial s \partial j = \mathcal{S} - \mathcal{S}[V + (s + j)h] - j\mathcal{S}h + (1 - s)\mathcal{S}h > 0$. Under a system in which

the firm reimburses junior creditors only and senior creditors pay for their own expenses,

$$P_s = \theta(s, j)\mathcal{S} + [1 - \theta(s, j)]\mathcal{S}[V(s, j) - cj^2] - cs^2 \quad (\text{B5})$$

and

$$P_j = \theta(s, j)[V(s, j) - cj^2 - \mathcal{S}] + [1 - \theta(s, j)](1 - \mathcal{S})[V(s, j) - cj^2], \quad (\text{B6})$$

which implies $s^{\text{US}} = j^{\text{US}}\mathcal{S}[1 - V + b(1 - j) + cj^2]/(2j\mathcal{S}b + 2c)$.

From proposition 3, $s^{\text{CP}} = j^{\text{CP}}\mathcal{S}[1 - V + b(1 - j)]/(2j\mathcal{S}b + 2c)$. Therefore, $s^{\text{US}} > s^{\text{CP}}$ for a given j . Suppose now that s is given. In equation (B6), it means that $j^{\text{US}} > j^{\text{CP}}$ for given s . This is so because q increases as more j is financed by the firm. Therefore, because $\partial j^{\text{CP}}/\partial s < 0$ and $\partial s^{\text{CP}}/\partial j > 0$, and because $s^{\text{US}} > s^{\text{CP}}$ for a given j and $j^{\text{US}} > j^{\text{CP}}$ for a given s , it must be that $s^{\text{US}} > s^{\text{CP}}$. Moreover, differentiating (B6),

$$\begin{aligned} \frac{\partial P_j}{\partial j} &= (b - 2cj)\{1 - \mathcal{S}[1 - \theta(s, j)]\} \\ &+ (1 - s)(1 - \mathcal{S})[V(s, j) - cj^2 - \mathcal{S}] = 0, \end{aligned} \quad (\text{B7})$$

which implies that $j > b/2c$ because the second term in (B7) is positive and $\mathcal{S}[1 - \theta(s, j)] < 1$. To prove that $W^{\text{US}} \leq W^{\text{CR}}$, and using propositions 3 and 2, $\partial s^{\text{CP}}/\partial j > 0$ and $\partial j^{\text{CP}}/\partial s < 0$. Therefore, $\partial W^{\text{CP}}/\partial s > 0$ for all j^{CP} and $s > b/2c$. Similarly, $\partial W^{\text{CP}}/\partial s < 0$ for all s^{CP} and $j > b/2c$. Hence, because $j^{\text{US}} > b/2c$ and $s^{\text{US}} \leq 1$, then $W^{\text{US}} \leq W^{\text{CP}}$. Q.E.D.

Proof of Proposition 5. Let δ_s and δ_j be the percentage of creditors' expenses that are paid by themselves; the rest are paid by the company. From propositions 3 and 2, $j^{\text{CP}} > b/2c$ and $j^{\text{FP}} = b/2c$. Therefore, j is increasing in δ_s . From the proof of proposition 7, j is also increasing in δ_j . Therefore, the optimal constrained reimbursement policy is $0 < \delta_s < 1$ and $\delta_j = 1$.

From the proof of proposition 7, it must be that $\gamma_s(1 - \delta_s) = 0$ for $s^* = b/2c$. If the government cannot subsidize creditors, then $\gamma_s = 1$; hence, it must be that $\delta_s = \delta_j = 1$ for j^* to be minimum. However, for $\delta_s = \delta_j = 1$, $s^* = 1$ and $j^* = b/2c$, which can never be optimal. Therefore, it cannot be that $\delta_s = 1$ when $\gamma_s = 1$. Therefore, $\delta_s < 1$. However, this implies that $s^* > b/2c$ because s is decreasing in δ_s . Finally, for $0 < \delta_s < 1$ and $\delta_j = 1$, $j^* > b/2c$ from propositions 4 and 7. Finally, to prove that $W^{\text{FRA}} > W^{\text{CP}}$, note that the FRA policy is the optimal reimbursement policy among those in which the firm reimburses creditors, including the one in which the firm reimburses nothing (the CP policy). Q.E.D.

Proof of Proposition 6. If the firm reimburses a percentage γ of the senior expenses, then the firm's objective function is

$$F = b \times (s + j) - c\gamma s^2. \quad (\text{B8})$$

Similarly, senior and junior creditors maximize, respectively,

$$P_s = \theta \mathcal{S} + (1 - \theta) \mathcal{S} [V + b \times (s + j) - c\gamma s^2] - c(1 - \gamma)s^2 \tag{B9}$$

and

$$P_j = \theta [V + b \times (s + j) - c\gamma s^2 - \mathcal{S}] + (1 - \theta)(1 - \mathcal{S}) [V + b \times (s + j) - c\gamma s^2] - cj^2. \tag{B10}$$

The first-order conditions are

$$\begin{aligned} \frac{\partial F}{\partial \gamma} &= (b - 2c\gamma^{\text{FRP}} s^{\text{FRP}}) \frac{\partial s}{\partial \gamma} - cs^{\text{FRP}2} + b \frac{\partial j}{\partial \gamma} = 0, \\ \frac{\partial P_s}{\partial s} &= j^{\text{FRP}} \mathcal{S} - j^{\text{FRP}} \mathcal{S} \Theta + j^{\text{FRP}} (1 - s^{\text{FRP}}) \\ &\quad \times \mathcal{S} (b - 2c\gamma^{\text{FRP}} s^{\text{FRP}}) - 2c(1 - \gamma^{\text{FRP}}) s^{\text{FRP}} = 0, \\ \frac{\partial P_j}{\partial j} &= \mathcal{S} (1 - s^{\text{FRP}}) (1 - \Theta) + [1 - j^{\text{FRP}} \mathcal{S} (1 - s^{\text{FRP}})] b - 2cj^{\text{FRP}} = 0, \end{aligned} \tag{B11}$$

where $\Theta = V + b(s^{\text{FRP}} + j^{\text{FRP}}) - c\gamma^{\text{FRP}} s^{\text{FRP}2}$. From (B11), it cannot be that $b - 2c\gamma^{\text{FRP}} s^{\text{FRP}} < 0$ because, using the envelope theorem, and because $\partial j/\partial s < 0$ from the second condition in (B11), F always increases by reducing s , so $b - 2c\gamma^{\text{FRP}} s^{\text{FRP}} > 0$.

Therefore,

$$\begin{aligned} &\begin{bmatrix} \frac{\partial^2 P_s}{\partial s^2} & \mathcal{S}(1 - \Theta) - j^{\text{FRP}} \mathcal{S} b \\ & + (1 - s^{\text{FRP}}) \mathcal{S} (b - 2c\gamma^{\text{FRP}} s^{\text{FRP}}) \\ -(1 - \Theta) - \mathcal{S}(1 - s^{\text{FRP}}) & \frac{\partial^2 J}{\partial j^2} \\ (b - 2c\gamma^{\text{FRP}} s^{\text{FRP}}) + j^{\text{FRP}} \mathcal{S} b & \end{bmatrix} \begin{bmatrix} \frac{\partial s}{\partial \gamma} \\ \frac{\partial s}{\partial \gamma} \\ \frac{\partial s}{\partial \gamma} \end{bmatrix} \\ &= - \begin{bmatrix} \mathcal{S} c j^{\text{FRP}} s^{\text{FRP}2} - 2c s^{\text{FRP}} j^{\text{FRP}} (1 - s^{\text{FRP}}) \mathcal{S} + 2c s^{\text{FRP}} \\ \mathcal{S} (1 - s^{\text{FRP}}) c s^{\text{FRP}2} \end{bmatrix}. \end{aligned} \tag{B12}$$

Note that it must be that $\partial^2 \mathcal{S} / \partial s^2 < 0$ to satisfy the second-order conditions. Moreover, $\mathcal{S} c j^{\text{FRP}} s^{\text{FRP}2} - 2c s^{\text{FRP}} j^{\text{FRP}} (1 - s^{\text{FRP}}) \mathcal{S} + 2c s^{\text{FRP}} > 0$. Since $b - 2c\gamma^{\text{FRP}} s^{\text{FRP}} > 0$, then $\mathcal{S}(1 - \Theta) - j^{\text{FRP}} \mathcal{S} b + (1 - s^{\text{FRP}}) \mathcal{S} (b - 2c\gamma^{\text{FRP}} s^{\text{FRP}})$, and using (B11), it must be that $\partial s/\partial \gamma > 0 \Rightarrow \partial j/\partial \gamma < 0$.

Finally, from (B8) it must be that $\gamma^{\text{FRP}} < \gamma^{\text{FRA}}$, and using the previous result, this implies that $\mathcal{S}^{\text{FRP}} < \mathcal{S}^{\text{FRA}}$ and $j^{\text{FRP}} > j^{\text{FRA}}$. Moreover, because the FRA policy maximizes social welfare for all policies in which the firm reimburses creditors, then $W^{\text{FRP}} < W^{\text{FRA}}$.

To show that $s^{\text{FRP}} < b/2c$, we can rewrite the firm's objective function as follows:

$$F = h(s + j) - c\gamma s^2 = W + cj^2 + c(1 - \gamma)s^2. \quad (\text{B13})$$

Because W is maximized for $s = b/2c$, then differentiating F around $s = b/2c$ and using the envelope theorem,

$$\begin{aligned} \frac{\partial F}{\partial \gamma} \Big|_s &= \left(\frac{b}{2c}\right) = \frac{\partial [c(1 - \gamma)s^2]}{\partial s} + 2cj \frac{\partial j}{\partial \gamma} \Big|_s = \left(\frac{b}{2c}\right) \\ &= 2sc(1 - \gamma) \frac{\partial s}{\partial \gamma} \Big|_s = \left(\frac{b}{2c}\right) - cs^2 + 2cj \frac{\partial j}{\partial \gamma} \Big|_s = \left(\frac{b}{2c}\right). \end{aligned} \quad (\text{B14})$$

Suppose that $s^{\text{FRP}} \geq b/2c$. Then it must be that $(\partial F/\partial \gamma)|_s = b/2c > 0$, which implies, from (B14), that $(\partial s/\partial \gamma)|_s = b/2c \geq s/[2(1 - \gamma)]$ because $\partial j/\partial \gamma < 0$. Now, differentiating F with respect to s around $s = b/2c$, from (B13), yields

$$\frac{\partial F}{\partial \gamma} \Big|_s = \left(\frac{b}{2c}\right) (b - 2c\gamma s) \frac{\partial s}{\partial \gamma} \Big|_s = \left(\frac{b}{2c}\right) + b \frac{\partial j}{\partial \gamma} \Big|_s = \left(\frac{b}{2c}\right) - cs^2 = 0 \quad (\text{B15})$$

for $s = b/2c$, which is greater than or equal to zero for $s^{\text{FRP}} \geq b/2c$. Finally, using the condition that $(\partial s/\partial \gamma)|_s = b/2c \geq (sc)/[2(1 - \gamma)]$ results in

$$(b - 2c\gamma s) \frac{s}{2(1 - \gamma)} + b \frac{\partial j}{\partial \gamma} \Big|_s = \left(\frac{b}{2c}\right) - cs^2 > 0, \quad (\text{B16})$$

which implies that

$$(b - 2c\gamma s) \frac{s}{2(1 - \gamma)} - cs^2 > 0 \quad (\text{B17})$$

because $(\partial j/\partial \gamma)|_s = b/2c < 0$. This is equivalent to $s < b/2c$, which contradicts the initial assumption. Therefore, it must be that $s^{\text{FRP}} < b/2c$. Q.E.D.

Proof of Proposition 7. Let $1 - \gamma_s$ and $1 - \gamma_j$ be the percentage of creditors' expenses that are paid by the government; the rest are paid by either the creditors or the company. Similarly, let δ_s and δ_j be the percentage of the remaining expenses that are paid by the creditors themselves.

The maximization program for this problem is

$$\max_{\gamma, \delta} G \equiv h(s^* + j^*) - c(s^{*2} + j^{*2}), \quad (\text{B18})$$

where

$$\begin{aligned} s^* \in \arg \max_{s, j} P_s(s) &\equiv \theta S + (1 - \theta)S[V + sb + j^*b \\ &\quad - c\gamma_s(1 - \delta_s)s^2 - c\gamma_j(1 - \delta_j)j^{*2}] - \gamma_s \delta_s cs^2 \end{aligned} \quad (\text{B19})$$

and

$$j^* \in \arg \max_j P_j(j) \equiv \theta \times [V + s^*b + jb - c\gamma_s(1 - \delta_s)s^{*2} - c\gamma_j(1 - \delta_j)j^2 - \mathcal{S}] + (1 - \theta)(1 - \mathcal{S})[V + s^*b + jb - c\gamma_s(1 - \delta_s)s^{*2} - c\gamma_j(1 - \delta_j)j^{*2}] - \gamma_j\delta_jcj^2. \quad (B20)$$

First, note that $j^* = b/2c$ only when $s^* = 1$. From propositions 3 and 2, $j > b/2c$ for any γ_s, δ_s , and $s^* \neq 1$, and it is closest to $b/2c$ when $\gamma_j^* = \delta_j^* = 1$. To see that j is minimized for $\gamma_j^* = \delta_j^* = 1$, note that j^* is decreasing in γ_j^* , so it must be that $\gamma_j^* = 1$. Let P_j^c be the value of the junior creditors' claim when professional fees are paid for by the creditors. Similarly, P_j^f is the value of the junior debt when professional fees are financed by the firm. It is straightforward to show that $\partial^2 P_j^f / \partial j \partial s < 0$ and $\partial^2 P_j^c / \partial j \partial s < 0$. Besides, P_j^f and P_j^c satisfy

$$\frac{\partial P_j^f}{\partial j} = \frac{\partial P_j^c}{\partial j} + c(1 - s)(1 - \mathcal{S})(s^2 + 3j^2) \quad (B21)$$

for all s and j . Suppose that $s^f = s^c$. Then, because $c(1 - s)(1 - \mathcal{S})(s^2 + 3j^2) > 0$ and $\partial P_j^c / \partial j = 0$ for $j = j^c, s = s^c = s^f$, it must be that $j^f < j^c$. Because $s^f > s^c$, it is still true that $j^f < j^c$ because j^c is decreasing in s^c . Therefore, it must be that $\delta_j^* = 1$.

Substituting these values in the first-order condition for the junior creditors yields

$$\frac{\partial P_j}{\partial j} = (1 - s^{\text{GR}})\mathcal{S}(1 - \Lambda) + b[1 - j^{\text{GR}}(1 - s)\mathcal{S}] - 2cj^{\text{GR}} = 0, \quad (B22)$$

where $\Lambda = V + sb + jb - c\gamma_s(1 - \delta_s)s^2$ and GR is the scheme in which the government partially reimburses the creditors.

Because Λ is decreasing in $\gamma_s(1 - \delta_s)$, then, using the second-order conditions, it must be that $\partial j / \partial [\gamma_s(1 - \delta_s)] > 0$. Given s^{GR} , G is maximized with the lowest j , so it must be that $\gamma_s(1 - \delta_s) = 0$, which implies either $\delta_s = 1$ or $\gamma_s = 0$.

1. If $\delta_s^{\text{GR}} = 1$, then j^{GR} and γ_s^{GR} solve

$$\begin{aligned} \frac{\partial P_s}{\partial s} &= j^{\text{GR}}\mathcal{S} - j^{\text{GR}}\mathcal{S}[V + 2cs^{*2} + j^{\text{GR}}b] \\ &+ j^{\text{GR}}(1 - s^{\text{GR}})\mathcal{S}b - 2cs^{\text{GR}}\gamma_s^{\text{GR}} = 0 \end{aligned} \quad (B23)$$

and

$$\frac{\partial P_j}{\partial j} = (1 - s^{\text{GR}})\mathcal{S}[1 - (V + 2cs^{*2} + 2j^{\text{GR}}b)] + b - 2cj^{\text{GR}} = 0. \quad (B24)$$

Note that $j^{GR} > b/2c$ because the first term in the previous expression is positive. Then, from (B23),

$$\gamma_s^{GR} = \frac{j^{GR}\mathcal{S} - j^{GR}\mathcal{S}[V + 2cs^{*2} + j^{GR}b] + j^{GR}(1 - s^{GR})\mathcal{S}b}{2cs}. \quad (B25)$$

2. If $\gamma_s^{GR} = 0$, then $\partial P_s/\partial s = 0$ and $\partial P_j/\partial j = 0$ define a system of equations where only j is unknown and therefore lead to an absurd conclusion. Therefore, G is maximum where $\delta_s^{GR} = \gamma_j^* = \delta_j^{GR} = 1$ and $\gamma_s^{GR} > 0$.

3. To prove that $s^{GR} > b/2c$, let us assume that $s^* = b/2c$. Using the envelope theorem, an infinitesimal decrease ε in s^{GR} increases j^{GR} because, from proposition 4, $\partial j^*/\partial s < 0$. Therefore, $G \equiv b(s^{GR} + j^{GR}) - c(s^{*2} + j^{*2})$ decreases. However, for an infinitesimal increase ε in s^{GR} , j^{GR} increases, and therefore G increases. Therefore, the optimal $\gamma_s^{GR} > 0$ must be such that $s^{GR} > b/2c$ and $j^{GR} > 2/2c$.

APPENDIX C: NUMERICAL BACKGROUND FOR FIGURES

This appendix computes the base values for the figures in the text. The base parameters are

- value of the firm before enhancement: $V = .9$,
- senior creditor claim: $\mathcal{S} = .4$,
- junior creditor claim: $\mathcal{J} = .6$,
- per-unit professional value enhancement: $b = .05$, and
- cost of professionals: $c = .05$.

Because the professional fees are subtracted from the firm value, $V + 2b - 2c = .9 < 1$. If the APR were to hold (when $s = 1, j = 0$, for instance), firm value would be $V + b - c = .9$, and junior creditors would receive only $(.9 - .5)/(1 - .4) = 66.66$ percent of their claim. If instead the APR is completely violated, junior creditors could be able to recover $.6(.9/.6) = 90$ percent of their claim. Both junior and senior creditors can improve firm value up to $.9 + .05 + .05 = 1$. Note that this is possible only if $s = j = 1$, in which case the probability of an APR violation is $j \times (1 - s) = 0$, senior creditors receive $.4$ (100 percent of their claim), and junior creditors receive $1 - .4 = .6$ (100 percent of their claim).

With these parameters, we have the following:

Socially Optimal. The optimal first-best solution entails that $s^* = j^* = .5$ and total welfare $W^* = .025$; the APR is violated with a probability of 25 percent.

Government Pays. If the government assumes all the professional expenses, $s = j = 1$, and social welfare is zero, $W = 0$ because too much is spent in professionals; the APR is always upheld.

Creditors Pay. If creditors finance their own expenses, then $s = .23$, $j = .59$, and social welfare is $W = .021$; the probability of violating the APR is 45 percent.

Firm Pays. If the firm finances creditors' expenses, then $s = 1.0$, $j = .50$, and social welfare is $W = .0125$; the probability of violating the APR is 0 percent.

U.S. System. If the firm finances junior creditors' expenses only and seniors finance their own expenses, then $s = .33$, $j = .75$, and social welfare is $W = .0203$; the probability of violating the APR is 49.26 percent.

Partial Senior Reimbursement: Socially Optimal. The second-best solution with firm reimbursement of only senior expenses yields second-best values of $s = .505$, $j = .556$, and welfare $W = .0248$. In the optimal reimbursement policy, the firm reimburses a fraction $1 - \delta_s = .72$ of the senior professional expenses; the APR is violated with a probability of 28 percent.

Partial Senior Reimbursement: Managerial Firm-Value Maximization. The second-best solution, with partial senior reimbursement to maximize firm value, yields second-best values of $s = .47$, $j = .56$, and welfare $W = .0247$. In the optimal reimbursement policy, the firm reimburses senior creditors a percentage $1 - \delta = 69.1$ percent of their professional expenses, and the rest is financed by the creditors themselves. Junior creditors carry their own expenses; the APR is violated with a probability of 29.4 percent.

Government Partial Asymmetric-Reimbursement System. The second-best solution with multipayor reimbursement and asymmetric creditor treatment yields second-best values of $s = .51$, $j = .54$, and welfare $W = .0249$. In the optimal reimbursement policy, the government reimburses a fraction $1 - \gamma_s = .31$ of the senior professional expenses; the APR is violated with a probability of 27 percent.

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