

# Are Bankruptcy Professional Fees Excessively High?

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**Abstract:** Chapter 7 is the most popular bankruptcy system for U.S. firms and individuals. Chapter 7 professional fees are massive. Theoretically, high fees might be an unavoidable cost of incentivizing professionals. I show empirically that most fees are actually an avoidable consequence of a suboptimal bankruptcy code. In Chapter 7, the key professional is a trustee, who liquidates assets in exchange for legally-mandated commissions. Exploiting kinks in the commission function, I estimate a structural model of moral hazard by trustees. While reducing commissions would harm trustee incentives, lowering liquidation values, I nonetheless find that lower commissions would benefit creditors enormously. The law that specifies commissions is thus far more costly than the moral hazard problem it aims to solve.

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# 1 Introduction

In the U.S., both firms and individuals file more bankruptcies under Chapter 7 than under all other bankruptcy chapters combined.<sup>1</sup> Chapter 7 creditors rely on bankruptcy professionals to liquidate the debtor's assets. Existing work shows that creditors typically pay these professionals massive fees (e.g., 25% of the liquidation proceeds). Surprisingly however, there is no evidence on how high bankruptcy professional fees *should* be to maximize creditor payoffs, a key bankruptcy objective. While paying fees is mechanically costly for creditors, fees also have a benefit — properly designed compensation could potentially incentivize professionals to create value for creditors. This suggests there is some optimal level of fees that maximizes creditor payoffs. Presuming that economic frictions could lead to suboptimally high fees, the bankruptcy code explicitly sets some professional fees. I show that the bankruptcy code sets these fees far above the optimal level. Changing the code to lower fees would dramatically benefit creditors, even after accounting for the effects on professionals' incentives.

Creditors rely on bankruptcy professionals to maximize their recovery. This creates a moral-hazard problem: professionals would work harder if they, rather than creditors, received the resulting value. I show the first evidence that bankruptcy professionals can improve creditor payoffs. Trustees, the professionals who supervise Chapter 7 liquidations, can increase liquidation values by as much as 7% if properly incentivized. Accordingly, I find that creditors can benefit from incentivizing trustees through commissions. Estimating a structural model, I show that if creditors could freely design contracts, they would set a trustee commission of roughly 2%. However, rather than letting creditors choose contracts, the bankruptcy code currently mandates a trustee commission that regularly reaches 25%. This implies that the bankruptcy code itself, rather than unavoidable economic frictions relating to firms or asset markets, creates a substantial component of direct bankruptcy costs. These previously unstudied bankruptcy-code-imposed professional fees turn out to have significant implications for the efficacy of Chapter 7.

Chapter 7 is an attractive setting to study bankruptcy professional fees for several reasons. First, the total liquidation proceeds provides a clear metric for evaluating success in a Chapter 7 case. Second, one professional has far more influence over a Chapter 7 liquidation

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<sup>1</sup>In 2019, for example, 480,206 Chapter 7 cases were filed, including 14,215 corporate cases. Across all chapters, there were 774,940 bankruptcies, including 22,780 corporate cases. See <https://www.uscourts.gov/statistics/table/f-2/bankruptcy-filings/2019/12/31>.

than any other agent: the trustee. Third, since trustees are private attorneys overseen by the Department of Justice (DOJ), the DOJ provides detailed data on trustee performance and compensation. I obtain this data for all Chapter 7 asset cases — those in which a trustee liquidates assets for creditors — over the period from 2006 to 2019. My main sample includes 547,655 Chapter 7 asset cases, of which 19,604 cases involve corporate debtors.

To identify how a trustee’s compensation affects her performance, I exploit legally mandated variation in trustee commissions. According to [11 U.S.C. §326](#) and [11 U.S.C. §330](#), trustees are compensated according to a kinked function of the total liquidation proceeds (“sales”). For example, trustees are legally entitled to 10% of each dollar of sales between \$5,000 and \$50,000, but only receive 5% of the next \$950,000 of sales. Intuitively, if a trustee’s cost of effort for producing another dollar of sales is between 0.05 and 0.10, then that trustee will optimally exert effort to produce sales of exactly \$50,000. If many trustees incur such effort costs, the distribution of sale values will demonstrate “bunching” at \$50,000. I formalize this intuition following the standard bunching methodology ([Saez, 2010](#)) to produce a measure of how strongly trustee performance depends on trustee compensation.

Exploiting this bunching for identification, I estimate a structural model of trustee moral hazard. In my model, heterogeneous trustees choose sale values to maximize their utility. Higher sale values correspond to higher compensation, which trustees enjoy. However, trustees incur disutility from the effort involved in producing higher sale values. Following a commonly used parameterization ([Saez, 2010](#); [Chetty, Friedman, Olsen, and Pistaferri, 2011](#); [Kleven, 2016](#)), the disutility of effort is summarized by an “elasticity” parameter. I identify this elasticity parameter using the extent of the bunching at the kinks in the commission function: bunching occurs when a discontinuously lower commission no longer justifies a trustee’s effort costs, so significant bunching indicates high effort costs. Estimating my model, I evaluate how trustee behavior and creditor payoffs would change if the legally mandated trustee commission schedule were to change. Importantly, this counterfactual assumes that nothing else changes, including an unobserved latent variable representing factors such as trustee talent, asset quality, macroeconomic conditions, or market liquidity.

I find two main results. First, I show that trustees are capable of improving sale values when properly incentivized. Empirically, the distribution of sale values demonstrates bunching at the kinks, such as \$5,000 and \$50,000, of the commission function specified by Section [11 U.S.C. §326](#). This bunching implies that trustees respond to lower commissions

by exerting less effort, lowering sale values. Estimating my model, I show that trustees would improve sale values by as much as 7% if they could keep all the sale proceeds (e.g., if trustees owned all the bankruptcy claims). However, this first-best solution to the moral hazard problem is infeasible because trustees likely cannot afford to buy all claims from all creditors. Indeed, I estimate that such a transfer of claims to trustees would have the largest benefit in the largest cases, in which it is least feasible for trustees to buy all of the claims.

Since the first-best solution is infeasible, I estimate the second-best solution in which creditors design trustee contracts to maximize creditor payoffs. My second result is that this optimal contract pays trustees far less than the current bankruptcy-code-mandated compensation. Whether I focus on linear or piecewise linear contracts, the optimal contract entails a trustee commission of roughly 2%. The median realized commission in my sample is 25% for individual cases and 13% for corporate cases. Accordingly, I show that lowering trustee commissions to the optimal level would benefit creditors dramatically. Reducing commissions to the optimal level would harm trustee incentives, lowering sale values, but would nonetheless increase creditor payoffs by 28% in the median asset case. Lower commissions would especially benefit creditors in small bankruptcies. Reducing legally-mandated professional fees would thus have a surprisingly large impact on the efficacy of the most popular bankruptcy system in the U.S.

The kinks in the current commission schedule correspond to round-number sale values, which appear frequently in my data. I account for this using round-number fixed effects. My bunching estimator compares the observed number of cases at kinks to the number of cases one would expect at such round numbers. Indeed, in a placebo test, I find no bunching at \$100,000, a round number that is not a kink in the trustee commission function. More importantly, failing to account for the high frequency of round numbers would lead me to *overestimate* the optimal trustee commission. Intuitively, the optimal commission depends on how much trustees must be compensated for their effort costs. By definition, my estimate of effort costs increases monotonically with the observed degree of bunching. If I overestimate bunching by underestimating the prevalence of round numbers, then my low estimate of the optimal trustee commission is actually an upper bound. In this sense, the prevalence of round-number sale values is unlikely to explain my results.

High trustee commissions, while harmful for creditors, might be necessary to prevent trustees from quitting. Trustees likely require a certain level of compensation to forgo their

outside opportunities and incur fixed effort costs. I test this hypothesis using a novel hand collected dataset of trustee participation decisions. I construct a state-year panel of trustees currently accepting cases.<sup>2</sup> Controlling for state and year fixed effects, I document an economically and statistically insignificant correlation between average trustee compensation and trustee participation decisions. This evidence is suggestive that few trustees would quit if commissions were reduced. More importantly, overall trustee compensation could be maintained at its current level, despite a reduction in creditor-paid commissions, if debtor-paid filing fees were increased in *nonasset cases*: those in which legal exemptions protect all of the debtor’s assets. These filing fees could compensate trustees for any fixed costs associated with initiating cases, replacing current excessive commissions. Thus, if commissions are necessary to incentivize trustee participation, then creditors in asset cases are subsidizing unrelated debtors in nonasset cases.

While my empirical exercise focuses on trustee compensation in Chapter 7 bankruptcy, my results have broader implications. In corporate finance theories, changing bankruptcy costs can impact capital structure decisions (Kraus and Litzenberger, 1973), industry competition (Brander and Lewis, 1988), and managerial agency conflicts (Morellec, Nikolov, and Schürhoff, 2012). Based on a calibrated dynamic-capital-structure model (Strebulaev and Whited, 2012), my results imply that reducing trustee commissions could increase the value of a typical *nonbankrupt* small business by 3%.<sup>3</sup> Further, excessive professional fees in Chapter 7 could harm bank incentives to liquidate nonviable firms, creating a novel explanation for zombie firms (Caballero, Hoshi, and Kashyap, 2008). Of course, it is also possible that excessive Chapter 7 trustee fees could create efficiency gains by causing debtors to choose alternative bankruptcy chapters (Antill and Grenadier, 2019).

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<sup>2</sup>If a trustee chooses to be on the panel of available trustees, then cases are assigned to them without their input according to a quasi-random algorithm.

<sup>3</sup>Using a sample of corporate Chapter 7 bankruptcies, I define a typical bankrupt small business as one whose sale value is equal to the 25th percentile of sale values. Using the same sample, I estimate that the total creditor payoff could be improved by 15% for a typical bankrupt small business. In Appendix C, I use a calibrated dynamic-capital-structure model (Strebulaev and Whited, 2012) to show that a 15% improvement in creditor payoffs corresponds to a 3% improvement in nonbankrupt firm value. Applying the same calculation for a bankrupt firm at the 50th percentile of sale values, I find that a 2% improvement in nonbankrupt firm value is feasible.

## 1.1 Contribution to the Literature

This paper contributes two findings to the literature. First, I show the first evidence that bankruptcy professionals can create value for creditors if properly incentivized, at least for the trustees who supervise the most popular bankruptcy system in the U.S. Second, I show that creditor recovery could nonetheless be substantially improved by a feasible reduction in direct bankruptcy costs associated with Chapter 7 trustee compensation.

This paper contributes to the literature on direct bankruptcy costs.<sup>4</sup> This existing literature shows that a significant fraction of bankruptcy estates are paid out in professional fees. To my knowledge, none of these papers provide empirical evidence that bankruptcy fees successfully incentivize bankruptcy professionals to create value for creditors.<sup>5</sup> Similarly, none of these papers provide evidence that current compensation schemes are far more generous than the creditor-recovery-optimizing level of compensation.

This paper also contributes to the literature on bunching models (Saez, 2010; Chetty et al., 2011; Kleven, 2016; Blomquist and Newey, 2017; Alvero and Xiao, 2020; Cox, Liu, and Morrison, 2020). The methodology that I use is standard in this literature (Kleven, 2016). However, this methodology has never been used to study bankruptcy.

Finally, I contribute to the nascent literature on structural estimation in bankruptcy. This literature has focused on models of Chapter 11 (Eraslan, 2008; Jenkins and Smith, 2014; Dou, Taylor, Wang, and Wang, Forthcoming; Antill, Forthcoming).<sup>6</sup> In contrast, this paper estimates a model of Chapter 7. Also, none of the papers in this literature consider the friction I study: moral hazard by bankruptcy professionals.

## 1.2 Paper Structure

Section 2 provides relevant institutional details about Chapter 7 and describes the data. Section 3 describes my methodology. Section 4 presents my main results. Section 5 discusses the potential impact on my results from extending my model to include trustee participa-

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<sup>4</sup>See LoPucki and Doherty (2011); Weiss (1990); Warner (1977); Bris, Welch, and Zhu (2006); Lawless and Ferris (1997); Jiménez (2009).

<sup>5</sup>Goyal and Wang (2017) find that key employee retention plans are associated with a higher probability of emergence from Chapter 11.

<sup>6</sup>Many other studies estimate default-cost parameters within capital-structure models: see, for example, Hennessy and Whited (2007); Hackbarth and Sun (2015); Glover (2016); Kim (2020).

tion decisions, fixed effort costs, trustee heterogeneity, time-discounting costs, and optimal nonlinear contracts. Section 6 concludes.

## 2 Background and data

This section summarizes relevant institutional details and describes my data.

### 2.1 Institutional details

The United States Trustee Program (USTP), a component of the DOJ, oversees approximately 1,100 private trustees across the country.<sup>7</sup> According to [Morrison, Pang, and Zytznick \(2019\)](#), “trustees are private lawyers with their own practices, which they pursue in tandem with their trustee activities.” Whenever a firm or individual files for Chapter 7 bankruptcy, the USTP representative in the associated region appoints<sup>8</sup> one private trustee to the case.

In a Chapter 7 case, the private trustee’s role is to identify the debtor’s nonexempt assets, liquidate them, and disburse the sale proceeds ([11 U.S.C. §704](#)). Trustees frequently oversee many different asset sales within a single Chapter 7 case. For simplicity, I use the term “sale value” to refer to the sum of the proceeds from all sales in a given case.

The goal of the trustee is to maximize creditor recovery; Section [11 U.S.C. §704](#) states that trustees are supposed to serve “the best interests of parties in interest,” and the USTP explicitly states that its mission is to promote the efficiency of the bankruptcy system for stakeholders and creditors.<sup>9</sup> Trustees maximize creditor recovery by obtaining high sale prices for the debtor’s assets. Trustees can also improve creditor recovery by identifying additional assets. If the debtor made a payment or sold assets prior to bankruptcy in a manner that meets the conditions of [11 U.S.C. §548](#), the trustee can force the recipient to surrender the assets or payment to the bankruptcy estate. By aggressively pursuing the surrender of such assets and payments ([11 U.S.C. §548](#) calls this “avoiding transfers”), the trustee can create additional value for creditors. Similarly, [Morrison, Pang, and Zytznick](#)

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<sup>7</sup>See <https://www.justice.gov/ust/bankruptcy-data-statistics/chapter-7-trustee-final-reports>.

<sup>8</sup>If multiple private trustees serve in a particular region, then private trustees are typically assigned to cases by a quasi-random system. Unlike the random assignment of judges, the random assignment of trustees can in some cases be manipulated ([Morrison, Pang, and Zytznick, 2019](#)). See [11 U.S.C. §701](#) for details.

<sup>9</sup>See <https://www.justice.gov/ust> for details.

(2019) argue that trustees often extend the bankruptcy until the debtor receives a tax refund, which the trustee can seize for the estate.

To incentivize trustees to maximize creditor recovery, trustee compensation in asset cases is linked to creditor payoffs. Trustee compensation is an increasing function of disbursements: the sales proceeds that the trustee distributes to creditors. Section 11 U.S.C. §326 states that trustee compensation cannot exceed a given formula of disbursements. In 2005, this limit became a commission – absent extraordinary circumstances, trustees in asset cases are paid according to the formula of Section 11 U.S.C. §326.<sup>10</sup> Table 1 lists this formula. Trustees receive 25 cents per dollar of disbursements for the first \$5,000 of disbursements. There is a “kink” at \$5,000; trustees receive 10 cents for each dollar of disbursements between \$5,000 and \$50,000. There are similar kinks at \$50,000 and \$1,000,000, where the marginal compensation rates fall to 5% and 3%, respectively. In addition to commissions in asset cases, trustees receive a \$60 filing fee from the debtor in each case.<sup>11</sup>

## 2.2 Data

I obtain data from the USTP. According to their website,<sup>12</sup> “when a chapter 7 case with assets is closed, the trustee files a final report that accounts for the disposition of assets, as well as the distribution of funds to creditors.” I obtain anonymized final reports for the universe of asset cases concluding during the period 2006-2019. In each asset case, I observe the total sale proceeds, which I refer to as the sale value. I also observe the total trustee compensation. I exclude cases with missing or weakly negative values for either variable. This reduces my sample from 797,564 to 793,391 cases.

Table 2 displays summary statistics. Across all Chapter 7 asset cases, the median sale value is equal to \$4,400. In roughly 75% of cases, the sale value is less than \$10,000. Table

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<sup>10</sup>Section 11 U.S.C. §330(a)7 was introduced by the Bankruptcy Abuse Prevention And Consumer Protection Act. This section states that in “determining the amount of reasonable compensation to be awarded to a trustee, the court shall treat such compensation as a commission, based on section 326.” The United States Court of Appeals for the Fourth Circuit similarly ruled in *In re Rowe* that “absent extraordinary circumstances, Chapter 7 trustees must be paid on a commission basis, as required by 11 U.S.C. §330(a)(7).” For details, see <http://business-finance-restructuring.weil.com/wp-content/uploads/2014/06/Rowe-No-13-1270-4th-Cir-4-29-2014.pdf>.

<sup>11</sup>See 11 U.S.C. §330(b). As of January 2021, the Bankruptcy Administration Improvement Act of 2020 provides an additional \$60 from Chapter 11 fees.

<sup>12</sup>See <https://www.justice.gov/ust/bankruptcy-data-statistics/chapter-7-trustee-final-reports>.



2 also reports statistics on trustee compensation. The trustee receives 22% of the sale value in the median case. In 75% of cases, the trustee receives at least 14% of the sale value.

As discussed above, Section 11 U.S.C. §326 determines trustee compensation by the formula in Table 1. Absent extraordinary circumstances, this formula is treated as a commission. Nonetheless, there are some cases in which the compensation is strictly less than the limit. Table 2 displays summary statistics for the ratio of the realized compensation to the commission. Trustee compensation is equal to the commission in more than 50% of cases. Trustees thus receive the full commission in the majority of cases. Trustee compensation is within 9% of the full commission in 75% of cases. For my main analysis, I limit my sample to those cases in which the trustee compensation is within 1% of the full commission. This “commission” sample includes 547,655 cases — roughly 70% of the full sample. The second panel of Table 2 displays summary statistics for this commission sample.

The USTP provides an analogous dataset for the subset of Chapter 7 cases involving a corporate debtor during the period 2006-2015. My corporate sample consists of those cases involving a corporate debtor in which the trustee compensation is within 1% of the full commission. The third panel of Table 2 provides summary statistics for this corporate sample. As expected, the cases are larger, with a median sale value of \$30,003. Since 90% of cases have sale values under \$433,989, I focus my analysis on the first two kinks of the commission function at \$5,000 and \$50,000.

### 3 Methodology

This section describes my methodology. Section 3.1 presents my model of trustee behavior. In my model, a trustee can exert costly effort to improve the sale value in a Chapter 7 case. As in practice, the trustee’s compensation is an increasing function of the sale value. The trustee chooses the level of the sale value to maximize her utility, trading off the cost of the necessary effort with the associated commission.

Section 3.2 describes the reduced-form methodology by which I test a key model prediction: sale values near the kinks of the commission function should be observed more frequently than other sale values. Section 3.3 describes the method-of-moments approach that I use to estimate the model of Section 3.1. Section 3.4 describes how my estimated model allows me to quantify the role of trustee compensation in determining liquidation

values. In Section 4, I apply this methodology to several samples and present the results.

### 3.1 Model of trustee behavior

Let  $i$  index bankruptcies. I define a positive random variable  $V_i$  representing the unobservable characteristics of the debtor and trustee in bankruptcy  $i$ . For example, the value of  $V_i$  might vary with factors such as the nature of the assets in bankruptcy  $i$ , the set of possible buyers for the assets, and the skill of the assigned trustee. Higher values of  $V_i$  correspond to higher potential sale values in bankruptcy  $i$ . I assume that each  $V_i$  is distributed according to a density  $f_V$ , where  $f_V$  is identical across bankruptcies. The econometrician never observes the realization of  $V_i$ .

I assume that the trustee observes  $V_i$  and chooses the realized sale value  $S_i$  to maximize her utility. The trustee's utility is increasing in her compensation. The trustee's compensation is determined by an increasing function  $C(S_i)$  of the sale value:

$$C(s) \equiv \mathbf{1} \left( s \leq K \right) \pi_0 s + \mathbf{1} \left( s > K \right) \left[ \pi_1 s + K \left( \pi_0 - \pi_1 \right) \right], \quad (1)$$

where  $\pi_0 \geq \pi_1$  and  $K$  are known positive constants. For example, setting  $\pi_0 = 0.25$ ,  $\pi_1 = 0.10$ ,  $K = \$5,000$ , the function  $C$  is the actual function by which trustees are compensated for cases with less than \$50,000 in sales.

Following the literature (Saez, 2010; Chetty et al., 2011; Kleven, 2016), I assume that the trustee maximizes an isoelastic utility function, with some elasticity parameter  $e \geq 0$  that I will estimate, that is quasi-linear in compensation:

$$U(s, v) \equiv C(s) - \frac{v}{1 + 1/e} \left( \frac{s}{v} \right)^{1+1/e}. \quad (2)$$

The trustee enjoys compensation  $C(s)$ , but she incurs disutility from producing a higher sale value  $s$ . To achieve a marginal increase in  $s$ , the trustee incurs a marginal effort cost:

$$\text{MEC}(s, v, e) \equiv \frac{\partial}{\partial s} \left| - \frac{v}{1 + 1/e} \left( \frac{s}{v} \right)^{1+1/e} \right| = \left( \frac{s}{v} \right)^{1/e} > 0. \quad (3)$$

The marginal effort cost is thus the positive magnitude of the marginal disutility associated with a marginal increase in  $s$ . The trustee observes  $V_i = v$  and chooses the sale value

$s$  to solve:

$$\sup_s U(s, v). \quad (4)$$

Without loss of generality, one can add the constraint  $S_i \leq V_i$  to place a ceiling on the feasible levels of the sale value. This implies that the marginal effort cost  $\text{MEC}(s, v, e)$  is a decreasing function of  $v$  and an increasing function of  $e$ .

The following lemma, which summarizes results derived in a different context in [Saez \(2010\)](#), describes optimal trustee behavior.

**Lemma 1.** *The solution  $s^*(v) \equiv \operatorname{argmax}_s U(s, v)$  to the trustee's problem (4) is given by:*

$$s^*(v) = \begin{cases} v\pi_0^e & v \leq K\pi_0^{-e} \\ K & v \in (K\pi_0^{-e}, K\pi_1^{-e}) \\ v\pi_1^e & v \geq K\pi_1^{-e}. \end{cases} \quad (5)$$

If  $\pi_0 = \pi_1 = 1$ , Lemma 1 implies that trustees always choose a sale value  $s^*(V_i) = V_i$ . In this sense,  $V_i$  represents the sale value that the trustee would achieve in bankruptcy  $i$  if the trustee were to receive the full sale value herself. In practice,  $\pi_1 < \pi_0 < 1$  (Table 1). The coefficients  $\pi_m^e$ ,  $m = 0, 1$  reflect the extent to which trustees reduce sale values in response to the marginal compensation rate  $\pi_m$ . Intuitively, a trustee that expects a marginal compensation rate  $\pi_m$  will increase the sale value until the marginal effort cost is equal to  $\pi_m$ . The marginal effort cost is an increasing function of  $e$  (equation (3)), so higher values of  $e$  correspond to lower sale values.

Recall that the compensation function  $C(s)$  has a “kink” at  $s = K$ ; the derivative  $C'(s)$  is equal to  $\pi_0$  for  $s < K$  while it is equal to  $\pi_1 < \pi_0$  for  $s > K$ . Lemma 1 shows that this kink introduces bunching behavior. If  $v \in (K\pi_0^{-e}, K\pi_1^{-e})$ , then the trustee's marginal effort cost at  $s = K$  lies between  $\pi_1$  and  $\pi_0$ . Since the marginal effort cost is less than  $\pi_0$ , the marginal compensation rate for  $s < K$ , such a trustee will not want to lower the sale value below  $K$ . Since the marginal effort cost is greater than  $\pi_1$ , the marginal compensation rate for  $s \geq K$ , such a trustee will not want to raise the sale value above  $K$ . Thus, such a trustee optimally sets the sale value equal to  $K$ .

### 3.1.1 Bunching and the redistribution of mass

Lemma 1 implies bunching behavior: a high frequency of cases with a sale value equal to  $K$ . These cases would have had a higher sale value if not for the discontinuous decline in the marginal commission rate. The model-implied sale value distribution thus features fewer cases with sale values just above  $K$  than there would be in a counterfactual distribution without bunching behavior.

Importantly, this does not imply that there should be an observable scarcity of cases with sale values just above  $K$ . These sale values just above  $K$  are rare relative to an unobserved counterfactual distribution, not relative to anything that is observable. While the spike in the frequency of sale values at  $K$  is observable, it is impossible to directly measure the sale values that would have been chosen in the absence of bunching behavior. In Appendix D, I demonstrate this with an illustrative example. Figure D.1 plots one example in which the bunching mass appears to come from the left of the kink and another example in which the mass appears to come from the right of the kink. In both examples, sale values are actually determined by Lemma 1 with  $e = 0.08$ . In both examples, my estimation approach estimates  $e$  to within 0.00001.

Equation (5) implies that the bunching interval, the interval of  $v$  values for which  $s^*(v) = K$ , has length  $K (\pi_1^{-e} - \pi_0^{-e})$ . If  $\pi_1 < \pi_0 < 1$ , which is the case in practice, then the length of this bunching interval is an increasing function of  $e$ . Thus, holding all other parameters fixed, the frequency of cases in which  $S_i = K$  should increase with the parameter  $e$ .

## 3.2 Bunching estimator

For any kink  $K$  of the commission function (Table 1), the model predicts a high frequency of cases with sale values equal to  $K$ . Following the literature (Chetty et al., 2011), I test this prediction with a reduced-form bunching estimator. Constructing the estimator involves three steps, which I now describe. I apply the estimator in Section 4.

### 3.2.1 Binning the data

Fix a kink  $K$ . I aggregate my data into bins, based on the observed sale value. First, I choose a lower threshold  $\underline{S}$  and an upper threshold  $\bar{S}$  such that  $\underline{S} < K < \bar{S}$ . Next, I define a collection of  $N + 1$  bins of width  $w \equiv (\bar{S} - \underline{S})/N$ . For  $j = 0, 1, \dots, N$ , I define the  $j$ th bin

midpoint as  $x_j \equiv \underline{S} + jw$ . I focus exclusively on the subsample of bankruptcies in which the observed sale value  $S_i$  is contained in  $[x_j - \frac{w}{2}, x_j + \frac{w}{2})$  for some bin  $j$ . I let  $b_j$  denote the observed number of bankruptcies in bin  $j$ :

$$b_j \equiv \sum_i \mathbf{1} \left[ S_i \in [x_j - \frac{w}{2}, x_j + \frac{w}{2}) \right]. \quad (6)$$

My bunching estimator evaluates whether there are more bankruptcies near the kink than would be expected given the distribution of sale values slightly further from the kink. Let  $\mathcal{E} \equiv \{j : |x_j - K| \leq \Delta\}$  denote indices corresponding to bins that are close to the kink  $K$ : bins with a midpoint  $x_j$  that lies within  $\Delta$  dollars of the kink. The number of bankruptcies near the kink is defined as  $\sum_{j \in \mathcal{E}} b_j$ .

### 3.2.2 Accounting for round numbers

To predict the number of bankruptcies that one would expect near the kink in the absence of bunching, I estimate the following equation by ordinary least squares:

$$b_j = \beta_0 + \sum_{m=1}^M \beta_m x_j^m + \sum_{r=1}^R \left( \delta_r + \gamma_r x_j \right) \rho_{rj} + \epsilon_j. \quad (7)$$

The first two terms in equation (7) model the number of bankruptcies  $b_j$  in bin  $j$  as an  $M$ th order polynomial in the bin midpoint  $x_j$ .

As I will show, sale values corresponding to round numbers (i.e., \$1,000 or \$10,000) tend to appear more commonly than other sale values. The third term in equation (7) flexibly models the frequency of round-number sale values. Letting  $r$  index round numbers  $\mu_r$ , I define the indicator  $\rho_{rj}$  that is equal to one if bin  $j$  is centered at a multiple of the round number  $\mu_r$ : formally,  $\rho_{rj} \equiv \mathbf{1} \left( x_j / \mu_r \in \mathbb{N} \right)$ . I add  $\delta_r + \gamma_r x_j$  to the predicted value of  $b_j$  for any bin  $j$  centered at a multiple of the round number  $\mu_r$ . The parameters  $\{\underline{S}, \bar{S}, N, w, \Delta, M\}$  and the round numbers  $\mu_r, r = 1, 2, \dots, R$  vary across specifications.

Consider the following example. When I estimate bunching behavior at  $K = \$50,000$ , I assume that multiples of \$5,000 might be more common than other sale values ( $\mu_1 = \$5,000$ ). In addition to this effect, I assume that multiples of \$10,000 might be especially common ( $\mu_2 = \$10,000$ ). Estimating equation (7), I confirm that both statements are true ( $\delta_1 >$

0,  $\delta_2 > 0$ ). I also find that round numbers are less salient in large cases:  $\gamma_1 < 0$  and  $\gamma_2 < 0$ , so the likelihood of a round-number sale value declines with the size of the bankruptcy. I account for all of this in Section 4 when I estimate (7) to form an out-of-sample prediction for how many bankruptcies we would expect to see with a sale value of \$50,000.

It is extremely unlikely that my results are driven by the high frequency of round-number sale values. In fact, frequent round-number sale values will lead to an *overestimate* of the optimal level of trustee compensation, which I already find is quite low. Specifically, if I fail to account for the higher frequency of round-number sale values, then there will appear to be a spike in the frequency of cases at the round-number kinks in the commission function. As I explain in Section 3.3, this will lead to a large estimate of  $e$ , implying that trustees should optimally receive a large commission (Section 3.4). I find the opposite. Moreover, Section 4 shows that my specification almost perfectly fits the observed frequency of round-number sale values. Nonetheless, to address this concern, I conduct a placebo test (Figure D.3) in which my estimator reveals no bunching at \$100,000, a very round number that is not a kink in the trustee commission function.

### 3.2.3 Calculating the estimator

I construct the bunching estimator by estimating equation (7) excluding the bins  $j \in \mathcal{E}$  near the kink. Using the estimated regression coefficients, I construct fitted values  $\hat{b}_j$  for these excluded bins. The bunching estimator is defined as:

$$\mathbb{B} \equiv \frac{\sum_{j \in \mathcal{E}} (b_j - \hat{b}_j)}{\sum_{j \in \mathcal{E}} \hat{b}_j}. \quad (8)$$

High values of  $\mathbb{B}$  indicate bunching in the sense that there are more bankruptcies near the kink  $K$  than would be expected given the distribution of sale values further from the kink.

Specifically, the bunching estimator  $\mathbb{B}$  is equal to the difference between the actual and predicted number of bankruptcies near the kink, expressed as a percentage of the predicted number of bankruptcies near the kink. Lemma 1 implies that, holding all other parameters fixed, the frequency of cases in which  $S_i = K$  should increase with the parameter  $e$ . In this sense, a large estimate of  $\mathbb{B}$  comprises reduced-form evidence that the value of  $e$  is high.

### 3.3 Model estimation

In my model, the key parameter  $e$  summarizes how costly it is for trustees to obtain high sale values. This section describes the procedure by which I estimate  $e$ . I first summarize the procedure. Intuitively, for any fixed value of the parameter  $e$ , my model allows me to invert observed sale values to obtain implied  $V_i$  values. Given these implied  $V_i$  values, it is straightforward to estimate the density  $f_V^e$  of  $V_i$  implied by a value of  $e$ . Any fixed value of  $e$  also implies a bunching interval  $(K\pi_0^{-e}, K\pi_1^{-e})$  of  $V_i$  values such that the trustee chooses  $s^*(V_i) = K$ . Combining these, each value of  $e$  implies a frequency of sale values near the kink  $K$ . I estimate  $e$  by matching the observed frequency of sale values near the kink  $K$  to the frequency implied by the model. I now formally describe this procedure, which I implement in Section 4.

Fix a kink  $K$  of the commission function, with associated compensation rates  $\pi_0, \pi_1$ . For a fixed value of  $e$ , the inverse of  $s^*(\cdot)$  (Lemma 1) is defined at any  $x \neq K$  by:

$$\sigma_e(x) \equiv x \times \left( \pi_0^{-e} + \mathbf{1}[x > K] (\pi_1^{-e} - \pi_0^{-e}) \right). \quad (9)$$

For any  $x \neq K$ ,  $\sigma_e(x)$  is equal to the value of  $V_i$  such that the trustee optimally produces the sale value  $x$ . I form bins, as in Section 3.2, such that no bin endpoint is equal to a kink of the commission function. It follows from equation (6) that:

$$b_j = \sum_i \mathbf{1} \left( V_i \in [\sigma_e(x_j - \frac{w}{2}), \sigma_e(x_j + \frac{w}{2}) \right). \quad (10)$$

I define an estimate  $f_j^e$  of the average density  $f_V$  on the interval  $[\sigma_e(x_j - \frac{w}{2}), \sigma_e(x_j + \frac{w}{2})$  by the ratio:

$$f_j^e \equiv \frac{b_j}{\sigma_e(x_j + \frac{w}{2}) - \sigma_e(x_j - \frac{w}{2})}. \quad (11)$$

Given equation (10),  $f_j^e$  is a standard nonparametric estimator for the density  $f_V$  evaluated at  $\sigma_e(x_j)$ . Following Section 3.2, I model the average density  $f_j^e$  associated with bin  $j$  as a function of the bin midpoint:

$$f_j^e = \beta_0 + \sum_{m=1}^M \beta_m x_j^m + \sum_{r=1}^R \left( \delta_r + \gamma_r x_j \right) \rho_{rj} + \epsilon_j. \quad (12)$$

I estimate equation (12) by ordinary least squares, excluding bins  $j \in \mathcal{E}$  near the kink. Using the estimated regression coefficients, I construct fitted values  $\hat{f}_j^e$  for these excluded bins. I estimate  $e$  by minimizing the difference between the fitted values  $\hat{f}_j^e$  and actual values  $f_j^e$ :

$$\hat{e} \equiv \inf_e \left[ \sum_{j \in \mathcal{E}} \left( f_j^e - \hat{f}_j^e \right) \right]^2. \quad (13)$$

This is essentially an exactly identified method-of-moments estimator. The first term,  $\sum_{j \in \mathcal{E}} f_j^e$ , is equal to the number of cases with a sale value near the kink. Intuitively, this number depends on two model quantities: (i) the range of  $V_i$  values in the bunching interval  $(K\pi_0^{-e}, K\pi_1^{-e})$  such that the sale value  $s^*(V_i)$  is near the kink; and (ii) the density  $f_V$  of  $V_i$  values within the bunching interval. My identifying assumption is that the density  $f_V$  of  $V_i$  values within the bunching interval can be accurately extrapolated from the distribution of sale values outside the bunching interval. I impose this assumption by excluding the bins near the kink when estimating (12). Under this assumption, the predicted number of cases  $\sum_{j \in \mathcal{E}} \hat{f}_j^e$  depends primarily on the width of the bunching interval  $(K\pi_0^{-e}, K\pi_1^{-e})$ . The width of the bunching interval is a monotonically increasing function of  $e$ . Thus, my estimation procedure increases the parameter  $e$  until the observed number of cases  $\sum_{j \in \mathcal{E}} f_j^e$  with a sale value near the kink is consistent with the width of the bunching interval implied by  $e$ .

### 3.4 Quantifying trustee incentives

Given an estimate of the parameter  $e$ , my model produces useful metrics for quantifying the role of compensation in determining trustee performance. This section describes three metrics, which I estimate in Section 4.

First, I measure the extent to which trustees can manipulate sale values by asking the following counterfactual: what sale values would trustees obtain if trustees received 100% of the proceeds? For any sale value  $S_i$  that is not equal to any kink  $K$  of the commission function, I can use an estimate  $\hat{e}$  to calculate:

$$V_i = \sigma_{\hat{e}}(S_i) = \pi_{S_i}^{-\hat{e}} S_i, \quad (14)$$

where  $\pi_{S_i}$  is the marginal compensation rate associated with  $S_i$ . For example,  $\pi_{S_i} = .25$  for any  $S_i < \$5,000$ . As discussed in Section 3.1, the value  $V_i$  can be interpreted as the sale



value that the trustee would produce if the commission rate were 100%. Thus,

$$(\sigma_{\hat{e}}(S_i) - S_i)/S_i = \pi_{S_i}^{-\hat{e}} - 1 \quad (15)$$

represents the extent to which the trustee in case  $i$  could have improved the sale value, relative to the observed sale value.

Given the ability of trustees to improve the sale values, I next consider a counterfactual scenario in which creditors could choose how much to pay trustees. In my model, creditor payoffs are given by the difference between the sale value and the trustee's commission. The optimal commission rate trades off the direct cost of paying trustees with the benefit of inducing higher sale values. The following lemma characterizes the optimal contract for maximizing creditor payoffs. While I focus on linear contracts for tractability, Section 5.5 shows that this is unlikely to affect my results.

**Lemma 2.** *Consider the problem of choosing a commission schedule  $C^*(s)$  to solve:*

$$\sup_{C^*(\cdot)} \mathbb{E}[s^*(v) - C^*(s^*(v))] \quad (16)$$

*subject to*

$$s^*(v) = \operatorname{argmax}_s C^*(s) - \frac{v}{1 + 1/e} \left(\frac{s}{v}\right)^{1+1/e}. \quad (17)$$

*If  $C^*(\cdot)$  is constrained to be a linear function, then the solution to problem (16) is:*

$$C^*(s) = \frac{e}{e + 1} s. \quad (18)$$

Intuitively, high values of  $e$  correspond to high costs of trustee effort associated with improving sale values. Thus, when  $e$  is high, the optimal contract pays trustees a high marginal rate to ensure that the trustee exerts sufficient effort.

Finally, I calculate the payoffs that creditors would receive if trustee commissions were determined by the optimal rate of Lemma 2. If the trustee in case  $i$  were paid the optimal rate  $S_i \times e/(e + 1)$ , Lemma 2 implies that the sale value would be:

$$s^*(V_i) = V_i \left(\frac{e}{e + 1}\right)^e. \quad (19)$$

This implies a creditor payoff of:

$$V_i \left( \frac{e}{e+1} \right)^e \left( 1 - \frac{e}{e+1} \right). \quad (20)$$

Given an estimate  $\hat{e}$  of  $e$ , I can use the inverse function  $\sigma_{\hat{e}}(\cdot)$  to estimate the creditor payoff in case  $i$  under the optimal contract as:

$$\sigma_{\hat{e}}(S_i) \left( \frac{\hat{e}}{\hat{e}+1} \right)^{\hat{e}} \left( 1 - \frac{\hat{e}}{\hat{e}+1} \right), \quad (21)$$

as long as  $S_i$  is not equal to a kink of the commission function. I use equation (21) to quantify the extent to which creditor payoffs would improve if trustees were compensated under the optimal contract.

Of course, if trustees were paid according to the contract  $C^*(\cdot)$ , it is possible that some trustees might quit. The problem described in Lemma 2 does not include a participation constraint to guarantee that trustees will participate under the contract  $C^*(\cdot)$ . Section 5.1 considers the extent to which trustees quit in response to reductions in compensation. Section 5.2 shows that lowering trustee compensation can improve creditor recovery even if trustees incur fixed effort costs when initiating asset cases.

## 4 Results

In this section, I present my main results. Section 4.1 summarizes the key findings that hold across all samples. Section 4.2 presents results using the universe of Chapter 7 commission cases (Table 2(b)). Section 4.3 presents results for the subset of cases involving corporate debtors. Finally, Section 4.4 explains how small-business lenders are differentially affected by trustee commissions.

### 4.1 Summary of key findings

I implement the methodology described in Section 3 in four different samples. The model's predictions closely match the data, and the following key results hold across all four samples. First, trustees respond to incentives. Increasing trustee compensation would lead to a statistically significant increase in sale values. If trustees were able to buy all of the debt

and sell assets for their own profit, sale values would be 7% higher in extreme cases. Because trustees respond to incentives, creditors benefit from trustee compensation. I always reject the null hypothesis that the creditor-recovery-maximizing trustee commission rate is zero. Thus, if creditors could set trustee commission rates, they would choose a positive rate.

Second, despite the benefits of trustee compensation, the creditor-recovery-maximizing commission rate is between 1% and 2.68%. In contrast, the law sets a commission rate between 3% and 25%. Allowing creditors to set trustee compensation would increase creditor recovery by as much as 28% in extreme cases. Since marginal compensation rates are higher in small cases (Table 1), consumer and small-business lenders incur the largest relative losses from excessive compensation. Trustees could be incentivized to participate, despite lower commission rates, through higher filing fees in nonasset cases. Moreover, in Section 5.1, I show that trustee participation decisions appear to be unrelated to compensation.

## 4.2 Results based on all commission cases

This section presents results based on the universe of Chapter 7 commission cases (Table 2(b)). To begin, I apply the methodology of Section 3 to the first kink in the commission function,  $K = \$5,000$  (Table 1). Figure 1(a) plots a histogram of sale values between  $\underline{S} = \$3,000$  and  $\bar{S} = \$7,000$ , using bins of width  $w = \$100$ . Consistent with the model, there is a large spike in the distribution of sale values near the kink  $K = \$5,000$ . However, the distribution of sale values generally shows a high frequency of round-number sale values. Motivated by this, in my statistical analysis, I allow for the distribution of sale values to change discontinuously at multiples of \$500. I further allow for the distribution of sale values to change at multiples of \$1,000, in addition to what would be expected at a multiple of \$500. Formally, I estimate equation (7) using round numbers  $\mu_r = \$500, \$1,000$  and a 5th-order polynomial ( $M = 5$ ). I estimate the regression excluding bins centered within  $\Delta = \$250$  of the kink at  $K = \$5,000$ , then apply the estimated coefficients to produce fitted values for the excluded bins  $j \in \mathcal{E}$ . Table D.2 shows that my results are robust to assuming different values of  $w, \Delta, \underline{S}, \bar{S}, M$ , and  $\{\mu_r\}_{r=1}^R$ .

Figure 2(a) plots the fitted values from estimating equation (7). As in Figure 1(a), the blue bars plot the number of bankruptcies ( $b_j$ ) and the bin midpoints ( $x_j$ ) on the y-axis and x-axis, respectively. The green bars plot the fitted values from estimating equation (7). The

brighter bars near \$5,000 correspond to the bins  $j \in \mathcal{E}$  that I exclude in my regression. The predicted frequencies (the green bars) closely match the realized frequencies (the blue bars) for the bins that were used to estimate equation (7). However, Figure 2(a) shows that the realized spike in the frequency of cases near \$5,000 (the bright blue bars) is not captured by the predicted frequencies (the bright green bars), even after taking into account the frequency of round-number sale values. Following the methodology of Section 3.2, I estimate that  $\mathbb{B} = 0.2966$ . There are thus 30% more bankruptcies near the kink than the regression (7) would predict. Importantly, the regression (7) incorporates the high frequency of cases with round-number sale values. I bootstrap the entire estimation procedure, including the formation of bins, to calculate a bootstrapped standard error for  $\mathbb{B}$  equal to 0.0123. I thus strongly reject the null hypothesis that the frequency of cases near the kink at  $K = \$5,000$  is expected given the distribution of sale values away from the kink. Through the lens of my model, this provides reduced-form evidence that  $e$  is positive.

I repeat this analysis using the second kink in the commission function,  $K = \$50,000$ . I use analogous bins and regression specifications, which are described in Table 3. Figure 1(b) shows that there is a spike in the frequency of cases at  $K = \$50,000$ . Figure 2(b) shows that the spike at \$50,000 is larger than the regression (7) would predict. Using the second kink  $K = \$50,000$ , I estimate that  $\mathbb{B} = 0.133$  with a bootstrapped standard error equal to 0.028. As discussed in Saez (2010), the degree of bunching behavior depends on the magnitude of the change in the marginal compensation rate at the kink. It is thus not surprising that I find a smaller estimate of  $\mathbb{B}$  at the second kink, since the change in compensation rates ( $\pi_1 - \pi_0 = .05$ ) is smaller than the change at the first kink ( $\pi_1 - \pi_0 = .15$ ). In fact, the bunching behaviors at the two kinks both imply similar elasticity estimates, as I now show.

Using the first kink  $K = \$5,000$ , I estimate the elasticity parameter following the methodology of Section 3.3. I use the same bins and regression specifications as above (Table 3). The first row of Table 4 displays my estimate of  $\hat{e} = 0.0156$ . I bootstrap my estimation procedure 500 times to obtain a bootstrapped standard error of 0.0006. I repeat the estimation procedure using the second kink,  $K = \$50,000$ .<sup>13</sup> The second row of Table 4 displays my estimate of  $\hat{e} = 0.01$ . The bootstrapped standard error is 0.0021.

To evaluate the model fit, I calculate the model-predicted number of bankruptcies in

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<sup>13</sup>The bin definitions and regression-specification choices are displayed in the second row of Table 4.

sale-value bin  $j$  as  $\hat{f}_j^{\hat{e}} \left( \sigma_e(x_j + \frac{w}{2}) - \sigma_e(x_j - \frac{w}{2}) \right)$ .<sup>14</sup> In Figure 3(a), the green bars plot the model predictions for sale values near  $K = \$5,000$ . The predicted frequencies (the green bars) closely match the realized frequencies (the blue bars) for the bins that were used to estimate equation (12). In contrast to the regression predictions, the model-predicted frequencies also closely match the realized frequencies for the excluded bins near the kink. Thus, the bunching behavior predicted by the estimated model closely matches the realized frequency of cases with a sale value near the kink  $K = \$5,000$ . Figure 3(b) repeats the exercise for  $K = \$50,000$  and similarly shows that the model closely fits the data.

Using the estimated model, I calculate the key results. Following Section 3.4, I calculate the counterfactual sale values that trustees could have obtained if they had owned all of the debt. For each of the four statutory marginal commission rates (Table 1), I evaluate equation (15). The first row of Table 5 displays the corresponding potential improvements in sale values. For a case in which the marginal compensation rate is 0.25 (i.e., a sale value under \$5,000), I estimate that the trustee could improve the sale value by 2.18%. For a case in which the marginal compensation rate is 0.03, I estimate that the trustee could improve the sale value by 5.6%. The larger improvement is due to the larger counterfactual change in compensation — a 97 percentage point increase from 3% to 100%.

Next, I calculate the trustee commission rate that maximizes creditor recovery (Lemma 2). The second column of Table 4 displays my estimate of 1.53%. The bootstrapped standard error is 0.0006. This estimate is based on the elasticity estimate corresponding to  $K = \$5,000$ . The second row of Table 4 shows that my elasticity estimate corresponding to  $K = \$50,000$  implies an optimal commission rate of 1%. Table 2 shows that trustees earn more than ten times that rate in 90% of the sample.

Finally, I calculate the creditor losses associated with the suboptimal trustee compensation set by Section 11 U.S.C. §326. In each bankruptcy,<sup>15</sup> I apply equation (21) to estimate the counterfactual payoff that creditors would have received under the optimal compensation rate. This counterfactual payoff estimate accounts for the lower sale value that the trustee would have obtained under the lower counterfactual rate. Summing across cases, I estimate that the total dollars distributed to Chapter 7 creditors would have increased by 4.5% if

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<sup>14</sup>See equation (11).

<sup>15</sup>I exclude bankruptcies in which the sale value is within \$100 of a kink since the inverse  $\sigma_e(\cdot)$  is not defined at the kinks of the compensation function.

trustees were optimally compensated. This estimate is based on the kink  $K = \$5,000$ ; repeating the exercise using the kink  $K = \$50,000$ , I estimate that the total dollars distributed to creditors would have increased by 5.2%.

### 4.3 Results based on corporate cases

Next, I evaluate trustee behavior in corporate cases. This section presents results based on my sample of corporate Chapter 7 cases (Table 2(c)). As in the previous section, I apply the methodology of Section 3 to the first two kinks in the commission function,  $K = \$5,000$  and  $K = \$50,000$  (Table 1). Figure 4 shows that, consistent with the model and the results of the previous section, there are large spikes in the distribution of sale values near the kinks  $K = \$5,000$  and  $K = \$50,000$ .

For each of the two kinks, I estimate equation (7) to predict the number of bankruptcies in which the sale value is near the kink. Table 3 describes the regression specifications, estimation samples, and bin definitions, which mirror those used in Section 4.2. In Figure 5, the blue bars plot the number of bankruptcies in each bin. The green bars plot the fitted values from estimating equation (7). For each kink, the fitted values closely match the actual number of bankruptcies away from the kink. However, the regression predictions underestimate the frequency of cases at each kink. Table 4 shows my bunching estimates  $\mathbb{B} = 0.4124$  and  $\mathbb{B} = 0.1681$  corresponding to the kinks  $K = \$5,000$  and  $K = \$50,000$ , respectively. I once again strongly reject the null hypothesis that the frequency of cases near the kinks is expected given the distribution of sale values away from the kinks.

Following the methodology of Section 3.3, I use the bunching behavior near the kinks  $K = \$5,000$  and  $K = \$50,000$  to estimate the elasticity parameter. I use the same bins and regression specifications as above (Table 3). The third row of Table 4 displays a slightly higher elasticity estimate of  $\hat{\epsilon} = 0.0276$  corresponding to  $K = \$5,000$ . The estimate of  $\hat{\epsilon} = 0.0194$  corresponding to  $K = \$50,000$  more closely resembles the estimates from Section 4.2. I evaluate model fit as in Section 4.2. Figure 6 shows that the model closely fits the data.

The third and fourth rows of Table 5 show that trustees respond to incentives, with similar magnitudes to the corresponding estimates from Section 4.2. The estimates corresponding to  $K = \$5,000$  are slightly larger because of the higher elasticity estimate of 0.0276. In the

largest corporate cases, this estimate implies that trustees could have improved sale values by 10% if they were compensated at a rate of 100% instead of 3%. The second column of Table 4 shows that trustee behavior in corporate cases implies a similar optimal rate of compensation to the rates estimated in Section 4.2. The highest estimate implies that paying trustees 2.7% of the sale proceeds would optimize creditor recovery. Table 2 shows that trustees earn more than twice that rate in 90% of cases.

#### 4.4 The costs to small-business lenders

Estimating my model using the sample of corporate cases, I find that creditors would reduce trustee commissions if they could. My largest estimate of the creditor-recovery maximizing rate of compensation is 2.7%. For the largest bankruptcies, in which the sale value exceeds one million dollars, the marginal compensation rate is 3% (Table 1). In contrast, for the smallest cases in which the sale value is less than \$5,000, the marginal compensation rate is 25%. Lowering the rate of compensation to 2.7% thus has a much larger effect on small bankruptcies than large bankruptcies.

Figure 8 illustrates this, using the estimate  $\hat{e} = 0.0194$  based on the kink  $K = \$50,000$ . Within the sample of corporate bankruptcies, I estimate the quartiles of the sale-value distribution. Applying equation (21) to each quartile  $q$ , I estimate the counterfactual payoff that creditors would have received under the optimal compensation rate in a bankruptcy in which the sale value is equal to  $q$ . In a bankruptcy in which the sale value is equal to the 25th percentile of corporate bankruptcy sale values, the total creditor payoff would increase by 15% under the optimal compensation rate (Figure 8(b)). At the median sale value, the total creditor payoff would increase by 8% under the optimal compensation rate. Small-business lenders would thus benefit more from a reduction in trustee commissions than creditors in large bankruptcies. Figure 8(a) shows similar estimates using the estimate  $\hat{e} = 0.0276$  based on the kink  $K = \$5,000$ .

## 5 Additional results

In this section, I discuss the extent to which my results are robust to extending my model to include trustee participation decisions, fixed effort costs, trustee heterogeneity, time-

discounting costs, and nonlinear contracts. Section 5.1 shows that trustee participation decisions are uncorrelated with trustee compensation. Section 5.2 shows that lowering trustee compensation can substantially improve creditor recovery even if trustees incur sizeable fixed effort costs when initiating asset cases. Section 5.3 explains the role of trustee heterogeneity in my existing model and shows that explicitly accounting for heterogeneous trustee behavior has little impact on my results. Section 5.4 provides suggestive evidence that lowering trustee compensation would expedite bankruptcies, reducing time-discounting costs for trustees and creditors. Finally, in Section 5.5 I consider an extension with heterogeneous effort costs, in which the currently used piecewise-linear contract could theoretically be optimal, and I show that my results continue to hold.

## 5.1 Trustee participation

Most trustees are attorneys who work part time at law firms while serving as trustees (Morrison, Pang, and Zytneck, 2019). Many trustees thus have the outside option of quitting the trustee panel and working as a full time attorney elsewhere. In this section, I consider the extent to which trustee participation decisions, by which I mean the decisions of lawyers to enter or exit the panel of Chapter 7 trustees, depend on trustee compensation.

For each year  $t \in [2007, 2018]$ , I use the “wayback machine” to obtain the complete list of Chapter 7 trustees serving at the end of year  $t$  from the USTP website.<sup>16</sup> The resulting dataset includes the state in which each trustee worked. For each state  $s$ , I define  $\text{Exit}_{s,t}$  to equal the number of trustees that (i) served on the panel in state  $s$  at the end of year  $t - 1$  and (ii) did not appear on the panel at the end of year  $t$ . Likewise, I define  $\text{Entry}_{s,t}$  to equal the number of trustees that (i) served on the panel in state  $s$  at the end of year  $t$  and (ii) did not appear on the panel at the end of year  $t - 1$ . Figure 9(b) plots the total number of trustees entering the panel across all states ( $\sum_s \text{Entry}_{s,t}$ ) for each year  $t \in [2008, 2018]$ . Figure 9(c) plots the total number of trustees exiting the panel across all states ( $\sum_s \text{Exit}_{s,t}$ ) for each year  $t \in [2008, 2018]$ .

Using the Federal Judicial Center’s Integrated Database (FJC), I obtain the total number of nonasset cases filed in each state  $s$  in year  $t$  over the period from 2008 to 2018. I calculate the total number of cases filed in state  $s$  in year  $t$  as the sum of the number of nonasset

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<sup>16</sup>See <https://archive.org/web/> and [https://www.justice.gov/ust/eo/private\\_trustee/locator/7.htm](https://www.justice.gov/ust/eo/private_trustee/locator/7.htm). I use the list of trustees as of the last available date in each year.



cases (from FJC) and the number of asset cases (from the USTP). I calculate the total commissions received by trustees in state  $s$  and year  $t$  using the USTP. I calculate the total trustee compensation in state  $s$  in year  $t$  as the sum of (i) the total commissions and (ii) the product of \$60 and the number of cases filed (11 U.S.C. §330(b)).<sup>17</sup> Filing fees in nonasset cases account for 22% of total trustee compensation. Figure 9(a) plots the average trustee compensation, measured as total trustee compensation (in millions of dollars) across all states in year  $t$  divided by the total number of trustees serving at the end of the year  $t - 1$ . Figure 9 shows that there is no obvious correlation between average trustee compensation and trustee participation decisions.

To formally test whether trustee participation decisions are correlated with trustee compensation, I estimate the following panel regressions:

$$\text{Entry}_{st} = \beta \text{Average trustee compensation}_{st} + \alpha_s + \theta_t + \epsilon_{st} \quad (22)$$

$$\text{Exit}_{st} = \beta \text{Average trustee compensation}_{st} + \alpha_s + \theta_t + \epsilon_{st}. \quad (23)$$

In these equations, Average trustee compensation <sub>$st$</sub>  is the average level of trustee compensation, in millions of dollars, in state  $s$  in year  $t$ . I include state fixed effects ( $\alpha_s$ ) and year fixed effects ( $\theta_t$ ) to control for unobserved heterogeneity in the outside options of trustees. I cluster standard errors at the state level. Table 6 shows that the correlations between trustee compensation and trustee participation decisions are both economically and statistically insignificant. Taking the coefficient for Exit <sub>$st$</sub>  literally, average trustee compensation must fall by 7.87 million dollars ( $1 / .127$ ) to induce one trustee to exit.

I do not claim to measure the causal effect of trustee compensation on trustee participation decisions.<sup>18</sup> Instead, Table 6 simply shows that observed correlations do not support the idea that trustees would quit if their compensation were reduced. Even if this story were true, my results imply that a simultaneous increase in filing fees and reduction in commissions

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<sup>17</sup>Unlike the choice of effort provision that I model in Section 3.1, the decision to participate as a trustee is binary. Once a trustee agrees to be on the panel, cases are assigned to them without their input. For this reason, it is reasonable to think that the decision to participate depends on a trustee's total compensation, not marginal compensation per hour of work.

<sup>18</sup>Trustee compensation might be correlated with the compensation that trustees could receive in alternative jobs, creating an omitted variables problem. While the fixed effects that I include mitigate this concern, it is nonetheless likely that the coefficients in Table 6 do not represent causal effects.

would greatly improve creditor recovery.

## 5.2 Fixed costs

It is conceivable that trustees incur fixed costs, that are independent of realized sale values, when initiating Chapter 7 bankruptcies. By definition, the existence of these case initiation costs should not affect trustee behavior after a case begins. Adding a case initiation cost to my model would thus not change my existing parameter estimates, which are based on trustee efforts to improve sale values conditional on case initiation.

However, the presence of case initiation costs could affect my counterfactual analysis. When estimating the impact of a compensation reduction on trustee effort provision, I assume that trustees cannot quit. If case initiation costs are substantial, then trustees might quit in response to lower commissions, contrary to my assumption. Section 5.1 shows that trustee exits are uncorrelated with compensation. This result suggests that case initiation costs are small. Even if initiation costs are large, a creditor-benefiting reduction in commissions could be implemented without making trustees quit: an increase in nonasset-case filing fees could compensate trustees for initiation costs.

Another possibility is that trustees incur fixed costs when converting nonasset cases to asset cases. Trustees may attempt such a conversion by trying to find hidden nonexempt assets.<sup>19</sup> Like the initiation costs discussed above, the presence of these fixed conversion costs would not change my existing parameter estimates but could change my counterfactual analysis. If initiating the process of discovering hidden assets is costly, then trustees might respond to a reduction in asset-case commissions by converting fewer nonasset cases.

I cannot rigorously identify the extent to which trustees incur fixed costs when initiating the process of discovering hidden assets. However, these costs are unlikely to significantly impact my results for three reasons. First, conversions from nonasset to asset cases are rare: in the FJC, only 5.3% of nonasset cases are converted to asset cases. Second, the frequency with which nonasset cases are converted to asset cases is uncorrelated with trustee compensation. I show this using a regression analogous to equation (22) (Section 5.1) in Table D.3. Third, the following back-of-the-envelope calculation suggests that my results

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<sup>19</sup>While trustees might incur effort costs when discovering hidden assets, the actual process of converting to an asset case is likely virtually costless. For example, in the bankruptcy of Clio Holdings LLC, the actual conversion consisted of a two sentence notice filed by the trustee (1:20-bk-10080 Docket Entry 46).

are robust to relatively large fixed costs associated with asset-case initiation. Suppose that trustees incur a fixed cost  $\chi$  when converting nonasset cases to asset cases. Consider a counterfactual contract that pays trustees 100% of the sale proceeds up to  $\chi$ , to cover this fixed cost, then pays a flat commission  $\pi^*$ :

$$\hat{C}(S) = \min(S, \chi) + \pi^*(S - \chi)\mathbf{1}\left(S > \chi\right). \quad (24)$$

Suppose that the fixed cost  $\chi$  is equal to \$936, the median commission (Table 2). This is a very extreme assumption, implying that trustees incur such a huge cost from starting an asset case that they regret initiating 50% of asset cases. Even assuming such an implausibly large conversion cost, I find that creditors can benefit from lowering trustee compensation. Specifically, using my estimate  $\hat{e} = 0.0156$  (Table 4), I find that the optimal contract of the form (24) could improve creditor payoffs by 6% in an asset case involving \$45,000 of sales. This informal calculation shows that even if trustees incur large costs when converting nonasset cases to asset cases, my main result is unlikely to change: lowering trustee commissions would benefit creditors. Nonetheless, I cannot rigorously identify the effect of trustee compensation on the prevalence of asset cases.

### 5.3 Trustee and asset heterogeneity

My model includes an unobserved latent variable  $V_i$  representing the highest achievable sale value. This variable captures the effect on sale values of all omitted variables that are not in my dataset. In particular, through the role of  $V_i$ , my estimation accounts for the possibility that unobserved trustee, asset, or market characteristics determine sale values.

It is difficult to explicitly measure the importance of trustee heterogeneity because I cannot observe the identity of the trustee in each bankruptcy. However, I do observe when trustees use particular techniques to sell assets. I observe that trustees pay auctioneers to sell assets in 14% of cases. Trustees pay commissions to real-estate professionals to sell real-estate assets in 11% of cases. I reestimate my model in two distinct subsamples of my dataset: bankruptcies in which the trustee pays an auctioneer and bankruptcies in which the trustee pays a real-estate commission. Table D.1 shows that the results are quantitatively similar to my baseline results. These subsample analyses suggest that trustees that use

different asset-sale approaches have similar effort costs.<sup>20</sup>

I find surprisingly little heterogeneity in the effort costs associated with selling different assets. Specifically, I reestimate my model in the subsample of cases in which any real-estate assets were sold. Table D.1 shows results similar to my full-sample results. Similarly, I find no evidence that effort costs vary with macroeconomic conditions or asset-market liquidity.<sup>21</sup> Taken together, this suggests that trustees have a relatively standard set of techniques for improving sale values, which they apply when sufficiently motivated.

## 5.4 Time-discounting costs

I assume that neither creditors nor trustees incur time-discounting costs. I assume this because my methodology identifies the impact of trustee compensation on final sale values, not time-discounted payoffs. In practice, both creditors and trustees likely have nonzero discount rates.

If I were to explicitly model time-discounting costs, then a reduction in trustee compensation would have two effects: one on creditor payoffs and one on bankruptcy durations that determine discounting costs. I show that a reduction in compensation would (i) increase creditor payoffs and (ii) make trustees exert less effort, lowering sale values. The impact of lowering compensation on bankruptcy durations depends on whether trustee effort leads to longer or shorter bankruptcies.

To provide suggestive evidence on how trustee effort affects bankruptcy duration, I study the relationship between sale values and bankruptcy durations. For each sale-value bin  $j$ , I calculate the average bankruptcy duration, in days, for bankruptcies in bin  $j$ . Figure D.2 shows that bankruptcies with larger sale values tend to last longer. However, this simple correlation is likely due to the latent variable  $V_i$ . High realizations of  $V_i$  could correspond to bankruptcies with a large number of assets, which likely take a long time and lead to

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<sup>20</sup>Additionally, this shows that trustees rely on other professionals in a surprisingly small fraction of bankruptcies. While changing trustee compensation could change the extent to which trustees employ other professionals, my approach accounts for this: My bunching estimator reveals the ability of trustees to manipulate sale values, which includes the use of other professionals.

<sup>21</sup>I reestimate my model in a subsample of bankruptcies occurring during the recent financial crisis (December 2007 - June 2009). I also reestimate my model in the subsample of bankruptcies occurring in liquid asset markets, which I define as those years in which the number of new one family houses sold exceeds the sample median. I obtain data for house sales from the St. Louis Federal Reserve Bank (<https://fred.stlouisfed.org/series/HSN1FA>).

relatively high sale values for many levels of trustee effort. Comparing, for example, Figure D.2(a) to Figure D.2(b) is thus uninformative with respect to the effect of trustee effort.

However, another feature of Figure D.2 is more revealing: bankruptcies in bins corresponding to kinks in the commission function are especially short. This suggests that when trustees exert less effort, to realize a sale value equal to a kink, they shorten bankruptcies. Thus, while I do not rigorously model the effect of trustee effort on bankruptcy duration, Figure D.2 suggests that trustee effort exertion corresponds to longer bankruptcies. I estimate that lowering compensation would lead to both higher creditor payoffs and less trustee effort, implying shorter bankruptcies and lower discounting costs. This suggests that a structural estimation incorporating discounting costs would find an even greater creditor benefit from lower trustee commissions.

## 5.5 Nonlinear contracts and alternative parameterizations

In Appendix E, I consider a model extension in which the elasticity parameter  $e$  varies with the latent variable  $V_i$ . Ignoring the data, I show in this setting that the current kinked commission schedule could theoretically be optimal for creditors. I study an illustrative example with enormous effort costs that decline with the realization of  $V_i$ . In this hypothetical example, the optimal piecewise linear contract features marginal commissions of 25% and 10% for small and large bankruptcies, respectively.

However, the actual data look nothing like this hypothetical example. Importantly, Table 4 shows tiny effort-cost estimates in both small bankruptcies (near the kink  $K = \$5,000$ ) and larger bankruptcies (near the kink  $K = \$50,000$ ). Moreover, the estimates of  $e$  are quite similar in magnitude across samples. Because of this, when I estimate the optimal kinked commission schedule in this modified model setting, I find the optimal commission is always less than 2%. My estimates in Table 4 thus imply that my results are not driven by a specific functional form or my focus on optimal linear contracts.

## 6 Conclusion

In Chapter 7 bankruptcy, the most popular bankruptcy chapter in the U.S., the most important direct cost of bankruptcy is the compensation of a private trustee who is appointed to

liquidate the debtor's assets. Trustee compensation is an increasing function of the liquidation sale proceeds. I exploit kinks in this function to estimate a simple structural model of moral hazard by trustees. The model estimates reveal that current compensation practices incentivize trustees to exert effort and improve sale values. However, a creditor-recovery-maximizing contract would pay trustees considerably less than current practice. The model estimates thus suggest that creditor recovery would improve if trustees were paid less, even accounting for trustee incentives to provide effort. Hence, the direct costs of bankruptcy could feasibly be lowered through a small change in the bankruptcy code, benefiting creditors significantly.

The Bankruptcy Administration Improvement Act of 2020 was signed into law on January 12, 2021. The act establishes a Chapter 7 Trustee Fund to pay trustees an additional \$60 in all cases. According to the Justice department, 20 applicants applied for each open Chapter 7 trustee position prior to the act, suggesting that the additional \$60 is not necessary to induce trustee participation.<sup>22</sup> This increase in fixed compensation could thus be feasibly offset by a reduction in trustee commissions without making trustees quit. It is possible that lower commissions could differentially impact the participation decisions of high-talent trustees, leading to lower quality trustees in equilibrium. However, my reduced-form evidence shows that the correlation between trustee participation decisions and trustee compensation is surprisingly small, suggesting that a reduction in commissions would greatly benefit creditors.

The U.K. receivership system offers a practical alternative to the statutory trustee commissions set by Section 11 U.S.C. §326. When a firm defaults in the U.K., the most powerful creditor (the holder of the “floating charge”) appoints a receiver, who assumes the powers of the board of directors and uses them to maximize that creditor's recovery. The receiver frequently liquidates the firm's assets as a Chapter 7 trustee would do. [Franks and Sussman \(2005\)](#) document that when the Royal Bank of Scotland holds a floating charge on a defaulting firm, the bank initiates an auction in which potential receivers place bids describing their required compensation. The receiver whose compensation bid is most favorable for the bank is chosen. Such an auction, with a minimum compensation bid equal to the creditor-recovery-maximizing rate, could ensure trustee participation while maximizing creditor recovery. My results suggest that Chapter 7 creditors would enjoy much higher recovery rates under this feasible system.

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<sup>22</sup>See <https://www.wsj.com/articles/bankruptcy-watchdogs-push-congress-for-a-raise-1537988235>.

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Table 1: Trustee commissions under 11 U.S.C. §326

This table summarizes trustee compensation under Section 11 U.S.C. §326. Trustees receive the marginal compensation rate listed in the first column for each dollar of disbursements within the range given in the second column. See Section 11 U.S.C. §326 and Section 11 U.S.C. §330(a)7 for further details.

Marginal Compensation Rate	Total Disbursements
25%	Under \$5,000
10%	Between \$5,000 and \$50,000
5%	Between \$50,000 and \$1,000,000
3%	Over \$1,000,000

Table 2: Summary statistics

This table shows summary statistics. Limit refers to the limit on compensation, which is a commission in the absence of extraordinary circumstances, given in Table 1. The commission subsample includes the cases in which the trustee’s compensation is within 1% of this limit. The corporate sample includes cases involving a corporate debtor in which the trustee’s compensation is within 1% of the limit.

	P10	P25	P50	P75	P90	N
<i>Full Sample</i>						
Trustee Compensation	332.00	514.05	930.56	1,657.52	4,121.83	793,391
Sale Proceeds	1,500.00	2,391.00	4,400.00	10,029.67	42,851.62	793,391
Compensation / Limit	0.62	0.91	1.00	1.00	1.00	793,391
Compensation / Sales	0.08	0.14	0.22	0.25	0.25	793,391
	P10	P25	P50	P75	P90	N
<i>Commission Sample</i>						
Trustee Compensation	339.25	518.56	935.76	1,582.16	3,250.00	547,655
Sale Proceeds	1,356.43	2,073.05	3,741.34	8,306.42	25,000.00	547,655
Compensation / Sales	0.13	0.19	0.25	0.25	0.25	547,655
	P10	P25	P50	P75	P90	N
<i>Corporate Sample</i>						
Trustee Compensation	883.93	1,691.07	3,754.09	9,051.69	25,376.94	19,604
Sale Proceeds	3,520.57	9,345.83	30,003.38	114,832.85	433,989.97	19,604
Compensation / Sales	0.06	0.08	0.13	0.18	0.25	19,604

Table 3: Parameter choices for estimation procedure

This table displays the parameter values that I use in my estimation procedure described in Section 3. The first two rows describe parameter values for the estimation using the commission sample. The first and second rows display parameter values used in estimations based on the first kink ( $K = \$5,000$ ) and second kink ( $K = \$50,000$ ) of the commission function, respectively. In each estimation, I use consecutive bins of width  $w$  centered at sale values between  $\underline{S}$  and  $\bar{S}$ . I exclude bins centered at sale values within  $\Delta$  of the kink  $K$ . In estimating equations (7) and (12), I use polynomials of order  $M$  and flexibly control for multiples of the round numbers  $\mu_1$  and  $\mu_2$ . The third and fourth rows of the table show that I use the same parameter choices in estimations based on my corporate sample.

Sample	Kink	$w$	$\underline{S}$	$\bar{S}$	$\Delta$	$M$	$\mu_1$	$\mu_2$
All	\$5,000	\$100	\$3,000	\$7,000	\$250	5	\$500	\$1,000
All	\$50,000	\$1,000	\$30,000	\$70,000	\$2,500	5	\$5,000	\$10,000
Corporate	\$5,000	\$100	\$3,000	\$30,000	\$250	5	\$500	\$1,000
Corporate	\$50,000	\$1,000	\$30,000	\$70,000	\$2,500	5	\$5,000	\$10,000

Table 4: Model estimates

This table presents estimates from my model. The first two rows display estimates based on the commission sample. The third and fourth rows display estimates based on the corporate sample. The first and third rows display estimates based on bankruptcies in which the sale value is near the kink  $K = \$5,000$ . The second and fourth rows use bankruptcies near the kink  $K = \$50,000$ . The third column displays estimates of the elasticity parameter  $e$ . The fourth column displays estimates of the optimal compensation rate  $e/(e+1)$  (Lemma 2). The fifth column displays estimates of the bunching metric  $\mathbb{B}$  (Section 3.2). I bootstrap the estimation procedure 500 times and present bootstrapped standard errors in parentheses.

Sample	Kink	Elasticity	Optimal compensation	Bunching
All	\$5,000	0.0156 (0.0006)	0.0153 (0.0006)	0.2966 (0.0123)
All	\$50,000	0.0101 (0.0021)	0.01 (0.0021)	0.133 (0.028)
Corporate	\$5,000	0.0276 (0.0066)	0.0268 (0.0062)	0.4124 (0.0994)
Corporate	\$50,000	0.0194 (0.0093)	0.019 (0.0089)	0.1681 (0.0796)

Table 5: Counterfactual sale values without moral hazard

This table presents estimates of the extent to which trustees would improve sale values if the commission rate were 100%. The first two rows display estimates based on the commission sample. The third and fourth rows display estimates based on the corporate sample. The first and third rows display estimates based on bankruptcies in which the sale value is near the kink  $K = \$5,000$ . The second and fourth rows use bankruptcies near the kink  $K = \$50,000$ . Each element of the third column is equal to  $(.25)^{-\hat{\epsilon}}$ , where  $\hat{\epsilon}$  is the corresponding elasticity estimate from Table 4. This quantity represents the percentage (i.e., 2.18%) by which the trustee would improve the sale value - in a case in which the marginal compensation rate is 25% - if she received a commission rate of 100%. See Section 3.4 for details. The fourth, fifth, and sixth columns show equivalent estimates for bankruptcies in which the marginal compensation rate is 0.10, 0.05, or 0.03, respectively. I bootstrap the estimation procedure 500 times and present bootstrapped standard errors in parentheses.

Sample	Kink	$\pi = 0.25$	$\pi = 0.10$	$\pi = 0.05$	$\pi = 0.03$
All	\$5,000	0.0218 (0.0009)	0.0365 (0.0015)	0.0478 (0.002)	0.0561 (0.0023)
All	\$50,000	0.0141 (0.0029)	0.0235 (0.0049)	0.0307 (0.0065)	0.0361 (0.0076)
Corporate	\$5,000	0.039 (0.0094)	0.0656 (0.0161)	0.0861 (0.0214)	0.1016 (0.0254)
Corporate	\$50,000	0.0272 (0.0132)	0.0456 (0.0224)	0.0597 (0.0296)	0.0702 (0.035)

Table 6: Trustee regressions

This table displays ordinary least squares regressions of trustee participation decisions on average trustee compensation. In each state  $s$  in each year  $t$ , I calculate average trustee compensation as the total dollars paid to all trustees in state  $s$  in year  $t$  divided by the number of Chapter 7 trustees at the end of year  $t - 1$  in state  $s$ . I regress the number of trustees exiting the panel of Chapter 7 trustees in state  $s$  during year  $t$  on average trustee compensation, measured in millions of dollars. I include state fixed effects and year fixed effects. Column (1) displays the coefficient on average compensation. Column (2) displays the same coefficient from a regression in which the dependent variable is the number of trustees entering the panel of Chapter 7 trustees in state  $s$  during year  $t$ . I use a state-year panel for the period from 2008 to 2018. The panel is balanced, except for four missing observations from the Northern Mariana Islands. Standard errors, clustered at the state level, are shown in parentheses.

	Exit	Entry
	(1)	(2)
Average Trustee Compensation	-0.127 (0.090)	0.258 (0.157)
State FE	Y	Y
Year FE	Y	Y
Observations	579	579
Adj. R <sup>2</sup>	0.421	0.240

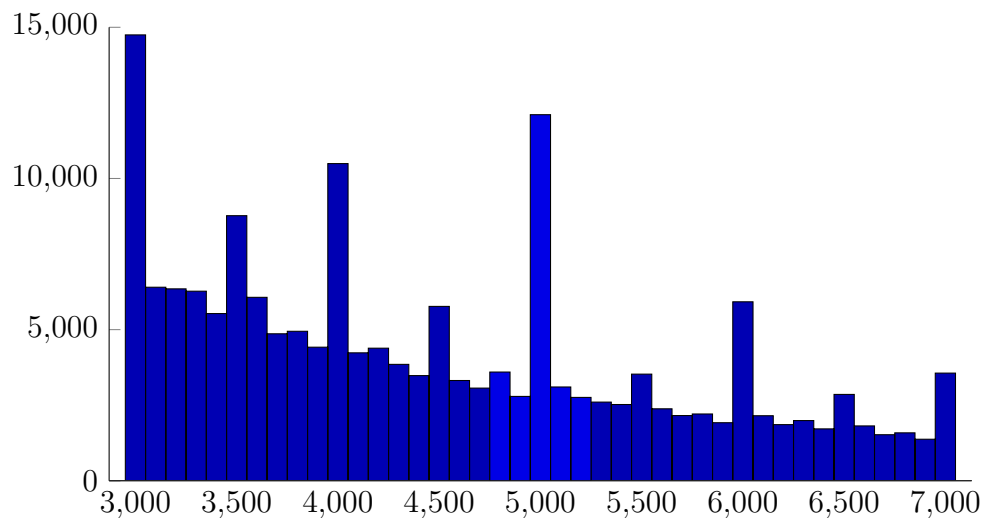
*Note:*

\* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

Figure 1: Histograms of sale values

This figure plots histograms of realized sale values. For each bin  $j$ , the blue bars plot the number of bankruptcies  $b_j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. Panel (a) displays bins with width  $w = \$100$  near the kink  $K = \$5,000$ . Panel (b) displays bins with width  $w = \$1,000$  near the kink  $K = \$50,000$ .

(a)  $K = \$5,000$



(b)  $K = \$50,000$

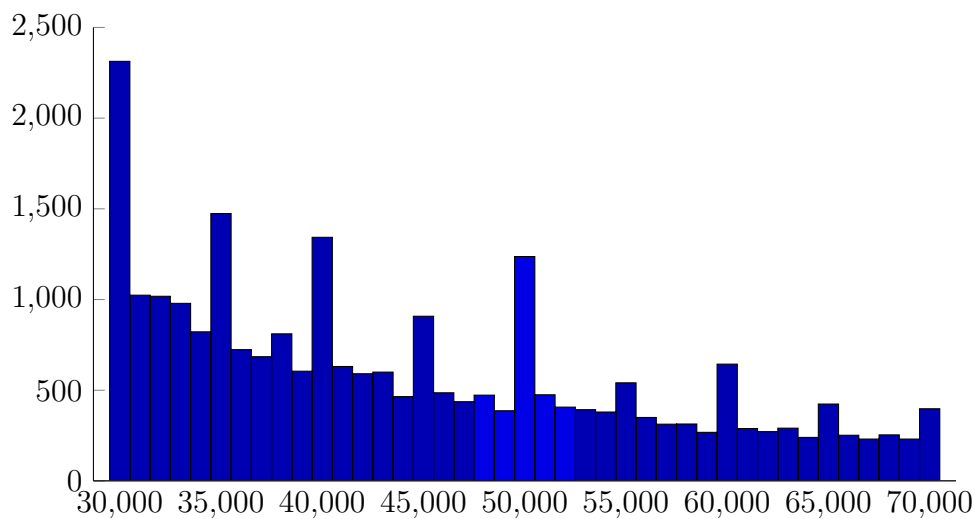
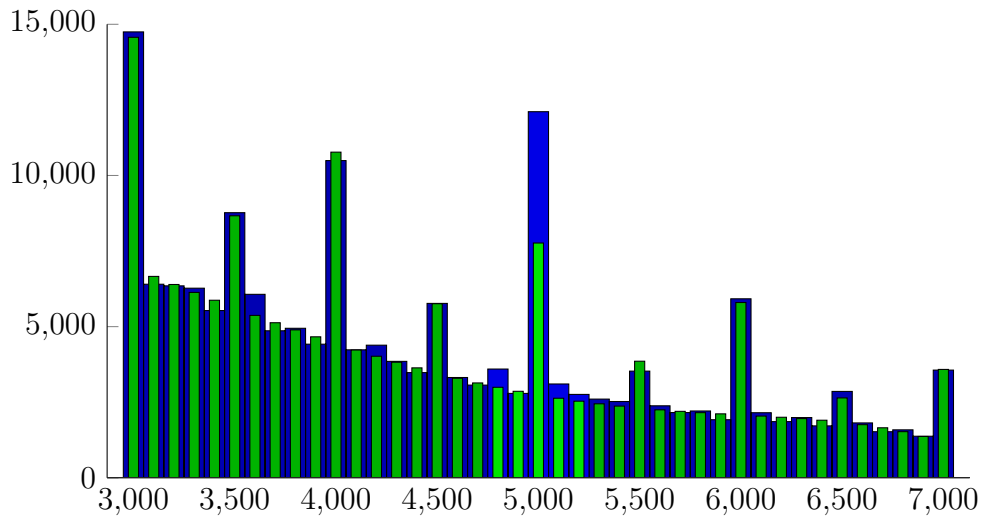




Figure 2: Histograms of regression-predicted sale values

This figure plots histograms of realized sale values and fitted sale values from equation (7). For each bin  $j$ , the blue bars plot the number of bankruptcies  $b_j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. The green bars plot the fitted number of bankruptcies, based on estimates of equation (7). The regression specifications and bin definitions for panels (a) and (b) are given in the first and second rows of Table 3, respectively.

(a)  $K = \$5,000$



(b)  $K = \$50,000$

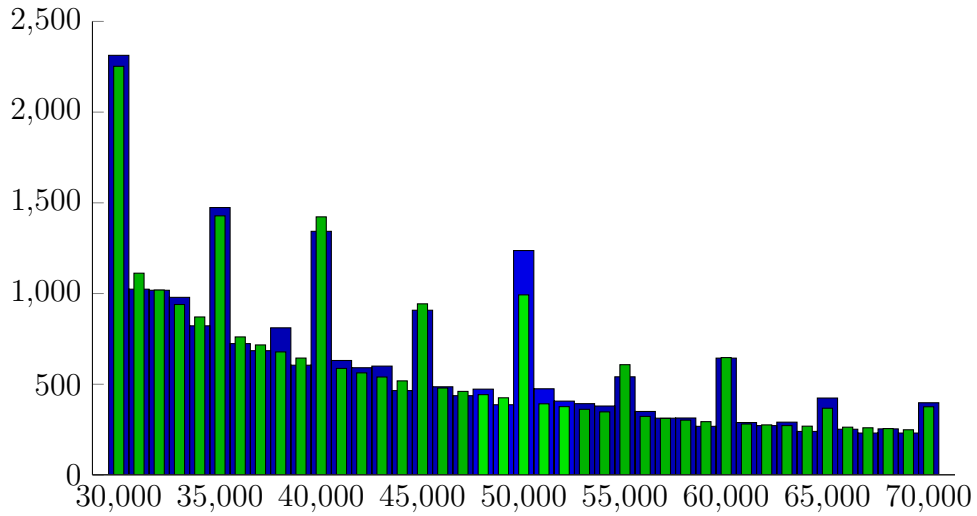
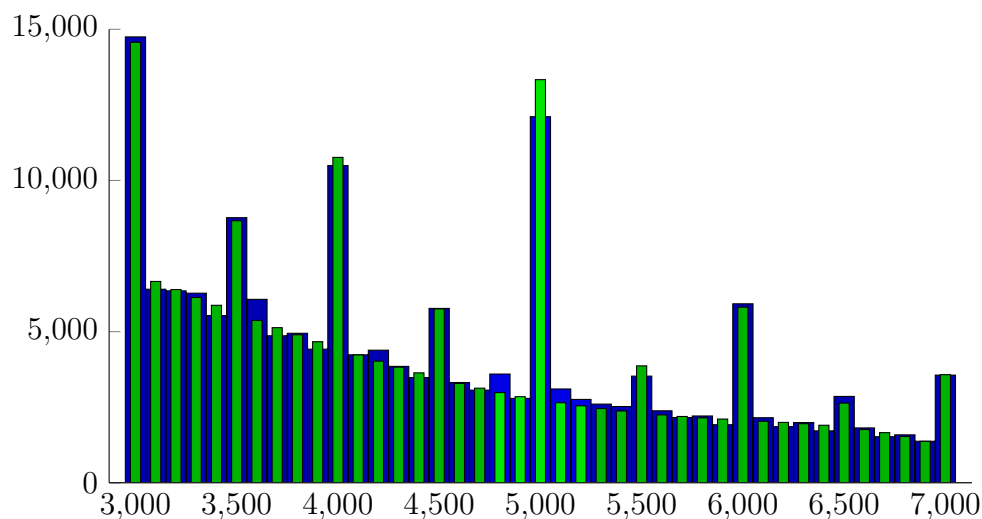


Figure 3: Histograms of model-predicted sale values

This figure plots histograms of realized sale values and fitted sale values from my model of trustee behavior. For each bin  $j$ , the blue bars plot the number of bankruptcies  $b_j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. The green bars plot the number of bankruptcies predicted by my model. I estimate the model using the procedure described in Section 3.3. The specifications and bin definitions for panels (a) and (b) are given in the first and second rows of Table 3, respectively.

(a)  $K = \$5,000$



(b)  $K = \$50,000$

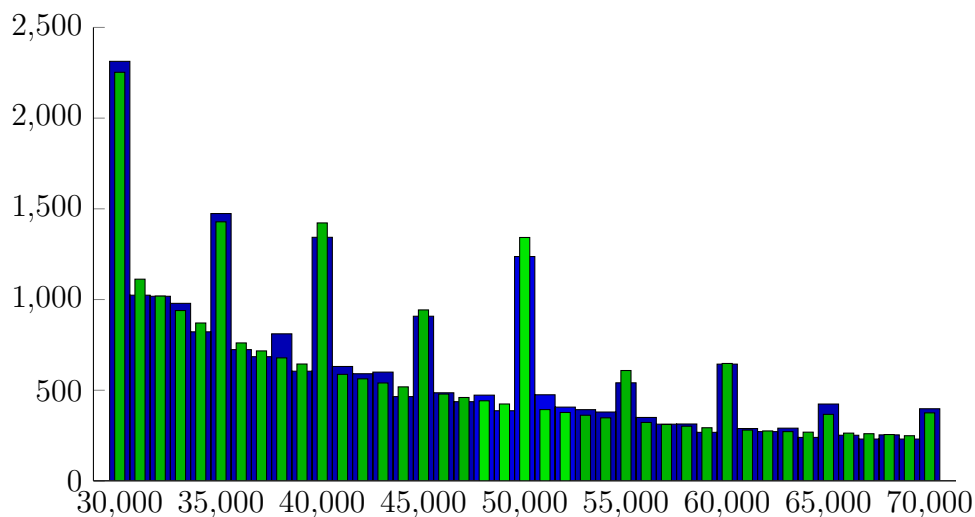


Figure 4: Histograms of sale values, corporate cases

This figure plots histograms of realized sale values in the sample of corporate cases. For each bin  $j$ , the blue bars plot the number of bankruptcies  $b_j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. Panel (a) displays bins with width  $w = \$100$  near the kink  $K = \$5,000$ . Panel (b) displays bins with width  $w = \$1,000$  near the kink  $K = \$50,000$ .

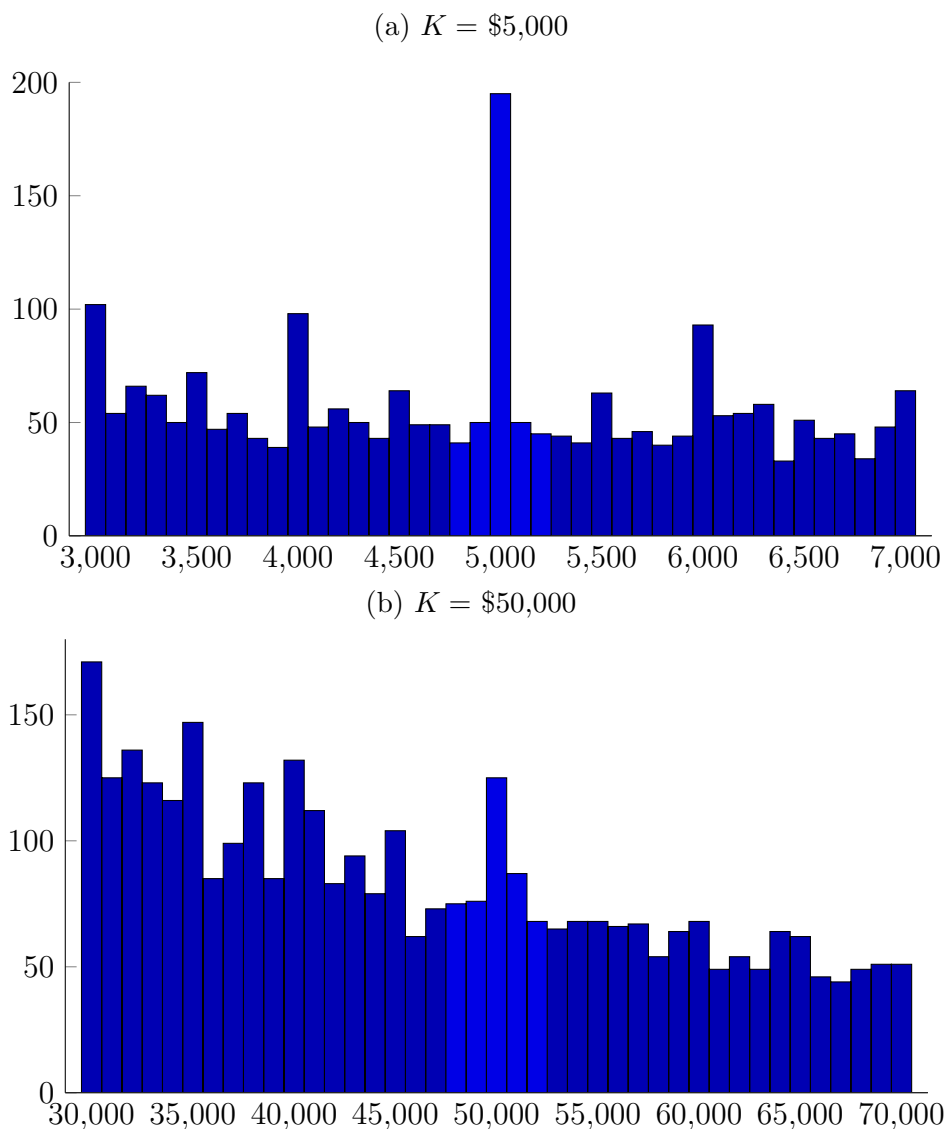
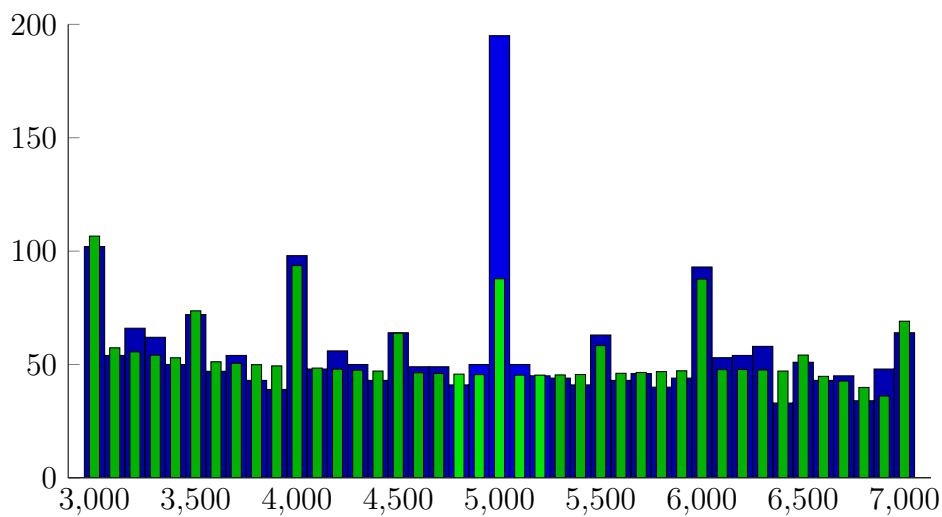


Figure 5: Histograms of regression-predicted sale values, corporate bankruptcies

This figure plots histograms of realized sale values and fitted sale values from equation (7), based on the sample of corporate cases. For each bin  $j$ , the blue bars plot the number of bankruptcies  $b_j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. The green bars plot the fitted number of bankruptcies, based on estimates of equation (7). The regression specifications and bin definitions for panels (a) and (b) are given in the third and fourth rows of Table 3, respectively.

(a)  $K = \$5,000$



(b)  $K = \$50,000$

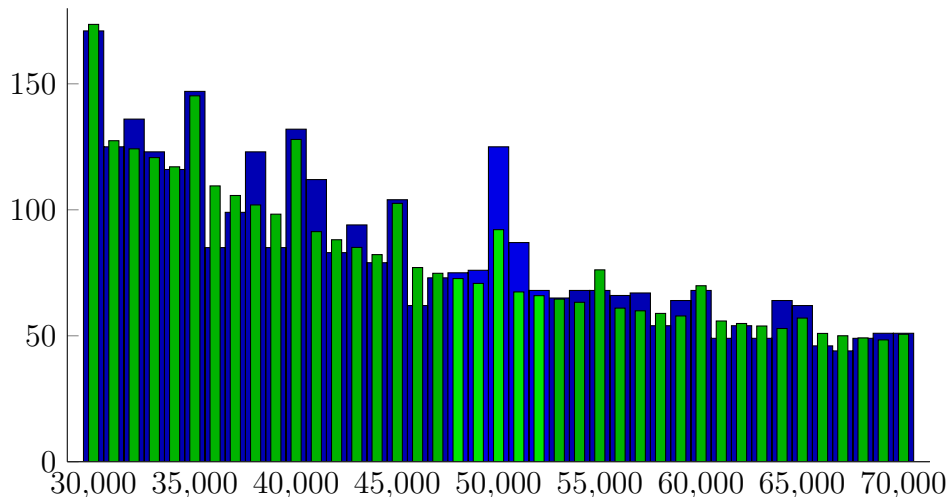
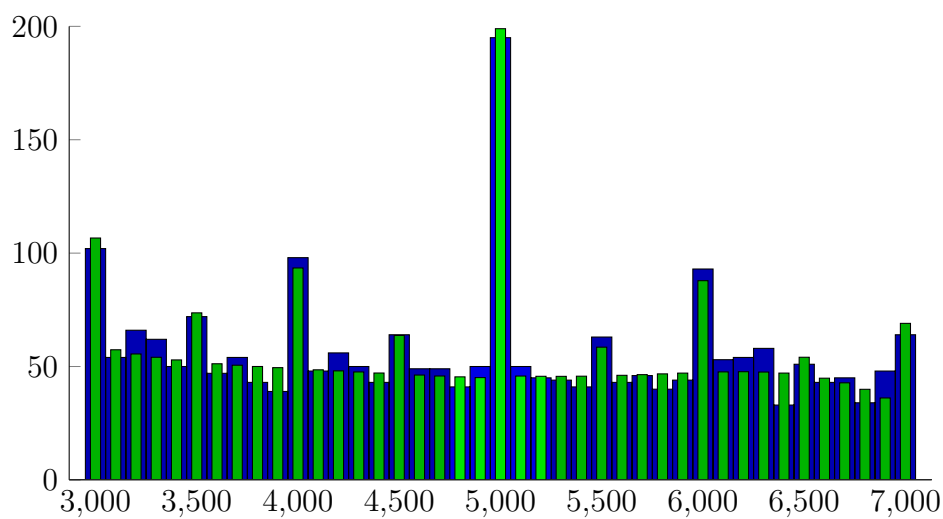


Figure 6: Histograms of model-predicted sale values, corporate bankruptcies

This figure plots histograms of realized sale values and fitted sale values from my model of trustee behavior, based on the sample of corporate cases. For each bin  $j$ , the blue bars plot the number of bankruptcies  $b_j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. The green bars plot the number of bankruptcies predicted by my model. I estimate the model using the procedure described in Section 3.3. The specifications and bin definitions for panels (a) and (b) are given in the third and fourth rows of Table 3, respectively.

(a)  $K = \$5,000$



(b)  $K = \$50,000$

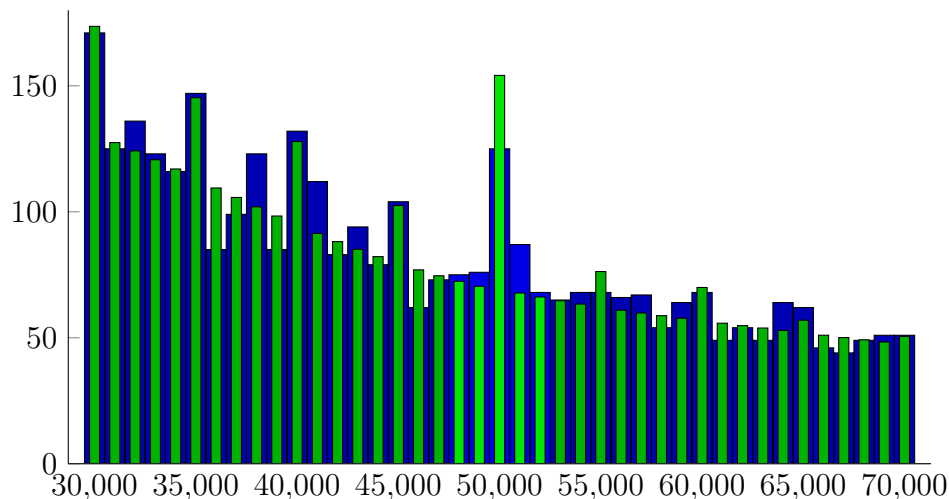
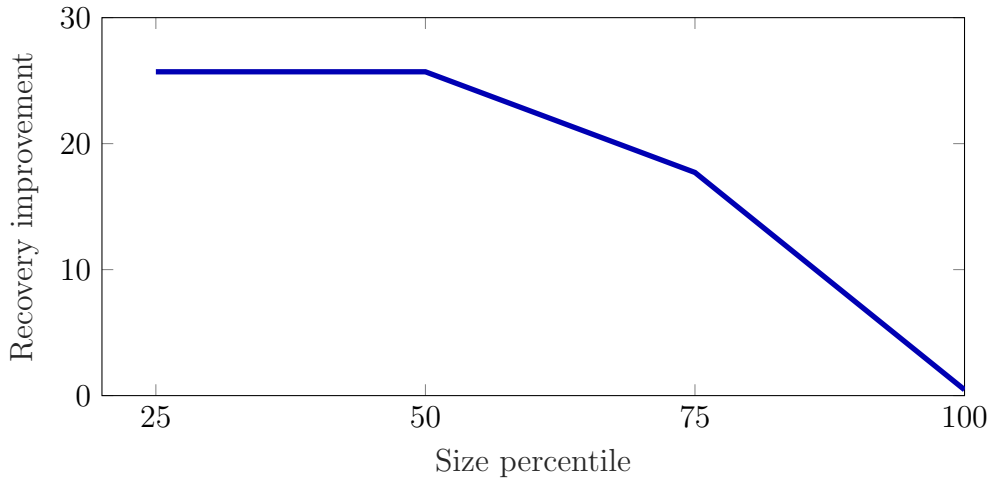


Figure 7: Counterfactual recovery improvements

Using the commission sample, I estimate the quartiles of sale values. Applying equation (21) to each quartile  $q$ , I estimate the counterfactual payoff  $\tilde{P}_q$  that creditors would have received under the optimal compensation rate in a bankruptcy in which the sale value is equal to  $q$ . I also calculate the creditor payoff  $P_q$  associated with  $q$ , given the current commission function. This figure plots  $100(\tilde{P}_q - P_q)/P_q$ , the percentage change in creditor payoffs, at the sale quartile  $q$ , from implementing the optimal compensation rate. Panel (a) computes  $\tilde{P}_q$  using the estimate  $\hat{e}$  based on  $K = \$5,000$ , while panel (b) computes  $\tilde{P}_q$  using the estimate  $\hat{e}$  based on  $K = \$50,000$  (see Table 4).

(a) Estimate based on  $K = \$5,000$



(b) Estimate based on  $K = \$50,000$

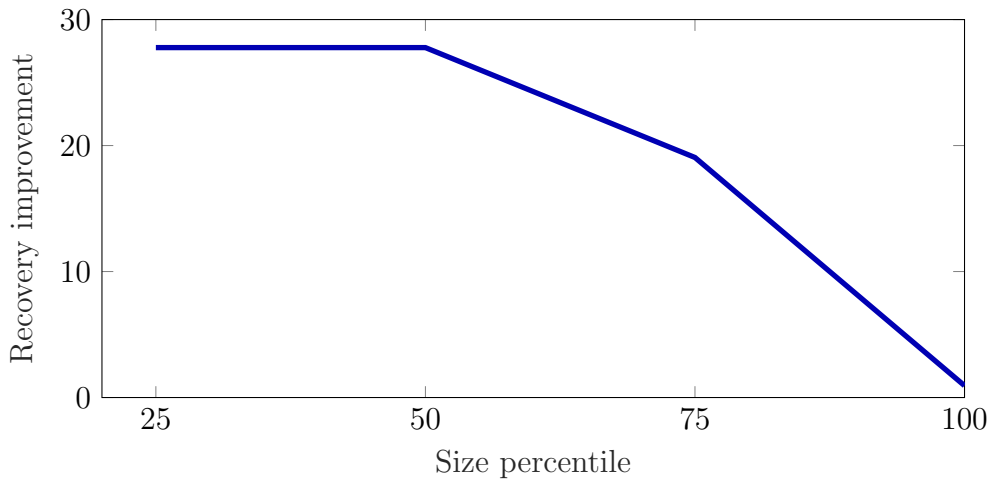


Figure 8: Counterfactual recovery improvements, corporate cases

Using the corporate sample, I estimate the quartiles of sale values. Applying equation (21) to each quartile  $q$ , I estimate the counterfactual payoff  $\tilde{P}_q$  that creditors would have received under the optimal compensation rate in a bankruptcy in which the sale value is equal to  $q$ . I also calculate the creditor payoff  $P_q$  associated with  $q$ , given the current commission function. This figure plots  $100(\tilde{P}_q - P_q)/P_q$ , the percentage change in creditor payoffs, at the sale quartile  $q$ , from implementing the optimal compensation rate. Panel (a) computes  $\tilde{P}_q$  using the estimate  $\hat{e}$  based on  $K = \$5,000$ , while panel (b) computes  $\tilde{P}_q$  using the estimate  $\hat{e}$  based on  $K = \$50,000$  (see Table 4).

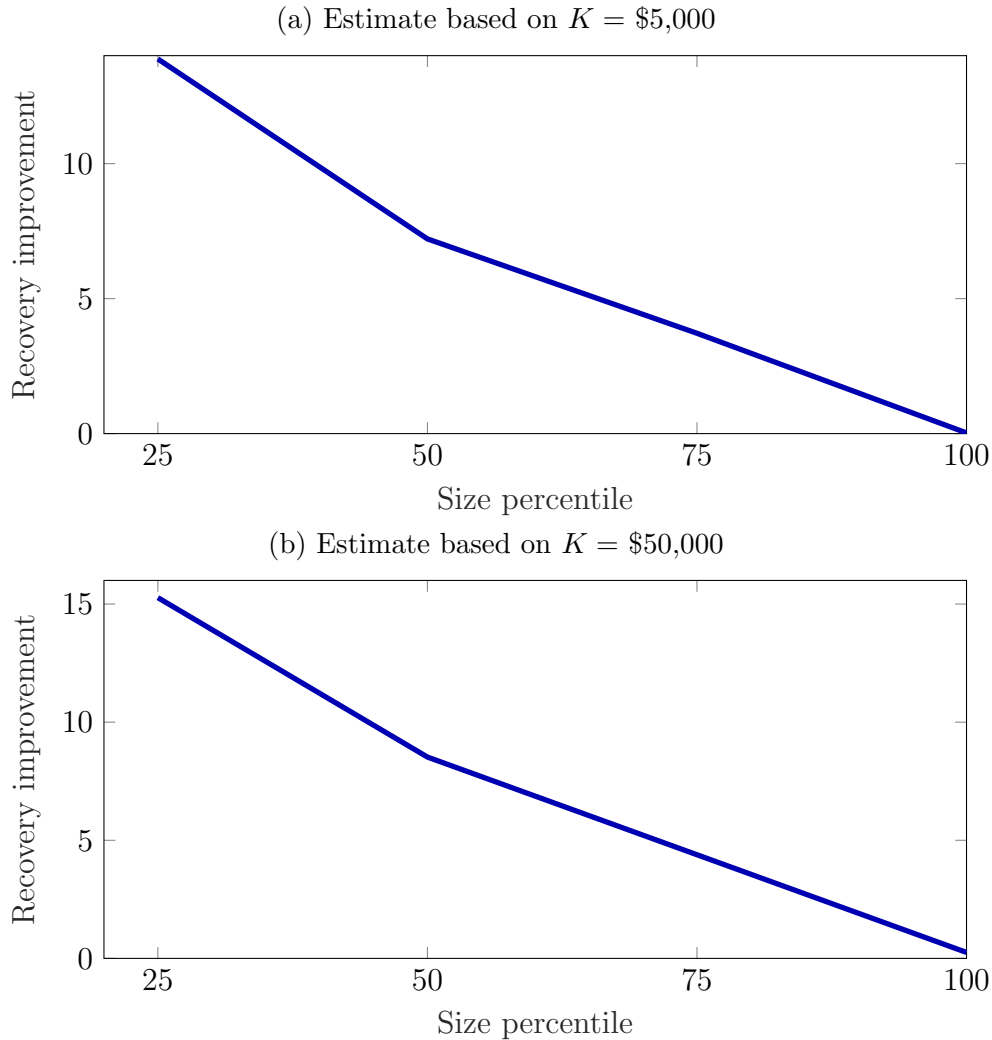
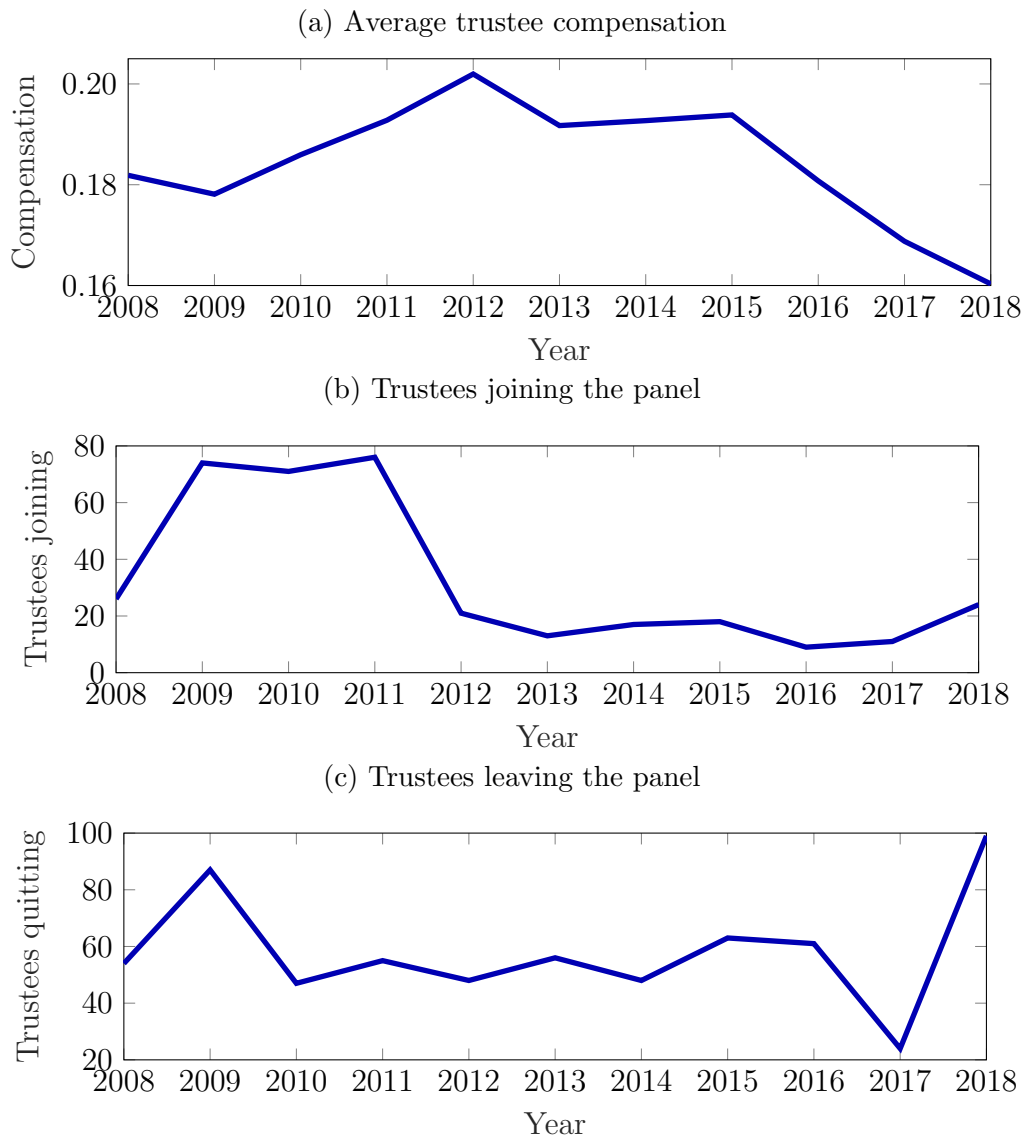


Figure 9: Trustee participation decisions

In each year  $t$ , I calculate average trustee compensation as the total dollars paid to all trustees in year  $t$  divided by the number of Chapter 7 trustees at the end of year  $t - 1$ . Panel (a) plots average trustee compensation, in millions of dollars, over time. Panel (b) plots the total number of trustees entering the panel of Chapter 7 trustees in each year. Panel (c) plots the total number of trustees exiting the panel of Chapter 7 trustees in each year.





## A Proof of Lemma 1

Proof: Fixing  $v$ , let  $s^*$  be a solution. Either  $s^* = K$  or the objective is differentiable at  $s^*$ . If the objective is differentiable at  $s^*$ , the derivative is

$$C'(s^*) = \left(\frac{s^*}{v}\right)^{1/e}.$$

By the definition of  $C$ , this is equal to

$$\pi_j = \left(\frac{s^*}{v}\right)^{1/e}$$

for some  $j$  such that  $C'(s^*) = \pi_j$ . This is a continuous function of  $s^*$ . From inspection, there exists some  $\xi$  such that the derivative exists and is negative for  $s > \xi$ . This implies that it is without loss of generality to consider  $s \in [0, \xi]$ . Since this set is bounded and the objective is continuous, a solution  $s^*$  exists. Suppose by contradiction that the objective is differentiable at  $s^*$  and the derivative is strictly positive or negative. By continuity, it has the same sign on the interval  $[s^* - \epsilon, s^* + \epsilon]$  for some small  $\epsilon$ , and thus the objective could be increased by a small deviation from  $s^*$ , contradicting the optimality of  $s^*$ . Thus if the objective is differentiable at  $s^*$ , the derivative must equal 0:

$$\begin{aligned}\pi_j &= \left(\frac{s^*}{v}\right)^{1/e} \\ s^* &= v\pi_j^e.\end{aligned}$$

In summary, there exists some solution, and any solution  $s^*$  either satisfies (i)  $s^* = K$ , or (ii)  $s^* = v\pi_j^e$  and  $C'(s^*) = \pi_j$  for some  $j$ . I claim that for any  $v$ , (ii) can hold for at most one  $s^*$ . Suppose by contradiction that (ii) held for two points  $s$  and  $s' > s$ :

$$\begin{aligned}s' &= v\pi_{j'}^e \\ s &= v\pi_j^e.\end{aligned}$$

Since  $s' > s$ , it must be that  $\pi_{j'} > \pi_j$ . But this is impossible since  $C'(s)$  is decreasing by definition, a contradiction. It follows that for any  $v$ , there exists at most one  $j$  such that

$s^* = v\pi_j^e$  and  $C'(s^*) = \pi_j$ .

Now, suppose that  $s^* = K$  is a solution. It must then be the case that

$$\pi_1 \leq \left(\frac{K}{v}\right)^{1/e} \leq \pi_0. \quad (\text{A.1})$$

If not, either a small increase or a small decrease from  $s = K$  would yield an increase in utility. Rearranging equation (A.1), it must be that

$$v \in [K\pi_0^{-e}, K\pi_1^{-e}].$$

## B Proof of Lemma 2

Consider the problem of choosing a compensation schedule  $C^*(s)$  to solve

$$\sup_{C^*(\cdot)} \mathbb{E}[s^*(v) - C^*(s^*(v))] \quad (\text{B.1})$$

subject to

$$s^*(v) = \operatorname{argmax}_s C^*(s) - \frac{v}{1 + 1/e} \left(\frac{s}{v}\right)^{1+1/e}. \quad (\text{B.2})$$

As in the statement of Lemma 2, I limit attention to linear contracts that can be written

$$C^*(s) = \pi^* s$$

for a constant  $\pi^*$ . Plugging this in, the derivative of the objective with respect to  $s$  is

$$\pi^* - v^{-1/e} s^{1/e}.$$

This is continuous and strictly monotonically decreasing in  $s$ , so the unique maximum is given by the first order condition:

$$s^*(v) = v(\pi^*)^e.$$

It follows that for any  $v$  and any choice of  $\pi^*$ , creditors recover

$$s^*(v) - C^*(s^*(v)) = v(\pi^*)^e - v(\pi^*)^{e+1}.$$

Maximizing this quantity with respect to  $\pi^*$ , a simple calculation shows that

$$\pi^* = \frac{e}{e+1}.$$

## C Dynamic capital structure model

In this appendix, I calibrate a standard dynamic-capital-structure model (Goldstein, Ju, and Leland, 2001; Strebulaev and Whited, 2012). Using the model, I show that increasing creditor payoffs in bankruptcy can significantly reduce the cost of credit for non-bankrupt firms. A 15% increase in creditor payoffs increases the value of a nonbankrupt firm by 3%. I now briefly outline the model and calibration.

The infinite-horizon model consists of two alternating phases. In the “ex-ante” phase, the equity holders of a firm issue a perpetual callable bond. The equity holders choose the coupon  $C$  to maximize the sum of the debt proceeds and the equity value of the levered firm. Once the value  $C$  is chosen, the ex-ante phase ends and the next “ex-post” phase begins. In the ex-post phase, equity holders solve a continuous-time optimal stopping problem to determine, in each instant, whether to default on the debt or refinance it. If equity holders refinance the debt, they call the bond and enter a new ex-ante phase. If equity holders default, the game ends.

I now describe the ex-post phase, in which the coupon  $C$  is fixed. Time is continuous and all agents are risk neutral. The firm has assets that produce earnings before interest and taxes (EBIT) of  $\delta_t dt$  per unit time, where  $\delta_t$  follows a geometric Brownian motion:

$$d\delta_t = \mu\delta_t dt + \sigma\delta_t dB_t. \tag{C.1}$$

In equation (C.1),  $B_t$  is a standard Brownian motion,  $\sigma > 0$  is a volatility parameter, and  $\mu$  is a drift parameter that is strictly lower than the risk-free rate  $r > 0$ . The firm pays taxes at a constant rate  $\tau$  and coupons are deductible, leading to a cashflow of  $(1 - \tau)(\delta_t - C)dt$  per unit time.

If equity holders default at time  $t$ , they receive 0 and the game ends. If equity holders

refinance at time  $t$ , they receive a payoff  $\mathcal{R}_t$  for a process  $\{\mathcal{R}_t\}_{t \geq 0}$  that is described shortly. Equity holders choose a default time  $\mathcal{T}^D$  and refinancing time  $\mathcal{T}^R$  to maximize the equity value:

$$\mathbb{E}(\delta) \equiv \sup_{\mathcal{T}^D, \mathcal{T}^R} \mathbb{E}^\delta \left[ \int_0^{\mathcal{T}^D \wedge \mathcal{T}^R} e^{-rt} (1 - \tau)(\delta_t - C) dt + \mathbf{1}(\mathcal{T}^D > \mathcal{T}^R) e^{-r\mathcal{T}^R} \mathcal{R}_{\mathcal{T}^R} \right], \quad (\text{C.2})$$

where  $\mathbb{E}^\delta$  refers to the expectation under the probability law of  $\delta_t$  given  $\delta_0 = \delta$ .

In the ex-ante phase, equity holders choose a coupon  $C$  to maximize the sum of the debt proceeds and the equity value of the levered firm. The value of the debt proceeds is equal to the value of the debt times  $(1 - q)$ , where  $q > 0$  is a refinancing-cost parameter. The value of the debt is equal to the sum of three components. The first component is the expected discounted sum of the coupons prior to default or refinancing. The second component is the expected discounted value of the creditor recovery in the event of bankruptcy. If equity holders default at time  $t$ , I assume that creditors recover  $(1 - \alpha)(1 - \tau)\delta_t / (r - \mu)$  for a parameter  $\alpha > 0$ . This recovery represents the value of receiving  $(1 - \tau)\delta_s$  in perpetuity, given a fraction  $\alpha$  of the starting value  $\delta_t$  is lost. The third component is the expected discounted value of receiving the par value  $P$  of the debt in the event of refinancing.

Given these assumptions, an equilibrium is given by constants  $\theta, P, C, \delta_B, \delta_R, \delta_0$  satisfying the following:

1. If the refinancing payoff process  $\mathcal{R}_t$  is given by  $\mathcal{R}_t \equiv \theta\delta_t - P$ , then the first hitting times  $\mathcal{T}^{\delta_B} \equiv \inf\{t : \delta_t \leq \delta_B\}$ ,  $\mathcal{T}^{\delta_R} \equiv \inf\{t : \delta_t \geq \delta_R\}$  solve the equity holders' problem:

$$\begin{aligned} (\mathcal{T}^{\delta_R}, \mathcal{T}^{\delta_D}) = \operatorname{argmax}_{\mathcal{T}^D, \mathcal{T}^R} \mathbb{E}^\delta \left[ \int_0^{\mathcal{T}^D \wedge \mathcal{T}^R} e^{-rt} (1 - \tau)(\delta_t - C) dt \right. \\ \left. + \mathbf{1}(\mathcal{T}^D > \mathcal{T}^R) e^{-r\mathcal{T}^R} \left( \theta\delta_{\mathcal{T}^R} - P \right) \right]. \end{aligned} \quad (\text{C.3})$$

2. If equity holders use the strategy  $(\mathcal{T}^{\delta_R}, \mathcal{T}^{\delta_D})$ , then  $P$  is the par value of the debt at

issuance given the starting value  $\delta_0$ :

$$P = \mathbb{E}^{\delta_0} \left[ \int_0^{\mathcal{T}^{\delta_D} \wedge \mathcal{T}^{\delta_R}} e^{-rt} C dt + \mathbf{1}(\mathcal{T}^{\delta_D} > \mathcal{T}^{\delta_R}) e^{-r\mathcal{T}^{\delta_R}} P + \mathbf{1}(\mathcal{T}^{\delta_D} \leq \mathcal{T}^{\delta_R}) e^{-r\mathcal{T}^{\delta_D}} \frac{(1-\alpha)(1-\tau)\delta_D}{r-\mu} \right]. \quad (\text{C.4})$$

3. If the refinancing payoff process  $\mathcal{R}_t$  is given by  $\mathcal{R}_t \equiv \theta\delta_t - P$ , the par value of debt is  $P$ , and equity holders use the strategy  $(\mathcal{T}^{\delta_R}, \mathcal{T}^{\delta_D})$ , then the equity holder's ex-ante value is  $\theta\delta_0$ :

$$\theta\delta_0 = (1-q)P + \mathbb{E}^{\delta_0} \left[ \int_0^{\mathcal{T}^D \wedge \mathcal{T}^R} e^{-rt} (1-\tau)(\delta_t - C) dt + \mathbf{1}(\mathcal{T}^{\delta_D} > \mathcal{T}^{\delta_R}) e^{-r\mathcal{T}^{\delta_R}} (\theta\delta_R - P) \right]. \quad (\text{C.5})$$

4. Given  $\delta_0$ , there are no values  $(\theta', C', \delta'_B, \delta'_R, P')$  consistent with 1-3 such that  $\theta' > \theta$ .

In an equilibrium, equity holders rationally anticipate that their ex-ante value is a linear function  $\theta\delta_{\mathcal{T}^R}$  of the EBIT  $\delta_{\mathcal{T}^R}$  at the time of refinancing. Equity holders must call the debt at par, paying  $P$ , to issue new debt and receive this value. Given this rational expectation, equity holders optimally use the specified strategy given by first hitting times  $\mathcal{T}^{\delta_R}, \mathcal{T}^{\delta_D}$ . Given this strategy and the coupon  $C$ , the value  $P$  at which debt is called is equal to the par value at issuance. The conjectured ex-ante value of equity is self consistent, in that  $\theta\delta_0$  is the ex-ante value given that equity holders receive  $\theta\delta_R$  if they refinance at  $\delta_R$ . Finally, the level of debt  $C$  is optimal, in that condition 4 ensures there is no alternative coupon that leads to a higher ex-ante firm value. Given the definition of an equilibrium, the model is stationary: when equity holders refinance for the  $m$ th time, they will optimally issue a coupon  $\delta_R^m C / \delta_0$  with par value  $\delta_R^m P / \delta_0$ , and subsequently use hitting-time strategies with thresholds  $\delta_R^m \delta_R / \delta_0$  and  $\delta_R^m \delta_B / \delta_0$ .

To calibrate the model, I use the benchmark values of  $r, \sigma, \mu, q, \tau$  given in Table 5 of [Strebulaev and Whited \(2012\)](#). Since the creditor payoff, defined as  $(1-\tau)(1-\alpha)\delta_B / (r -$

$\mu) \right) P$ , is proportional to  $1 - \alpha$ , I interpret a change from  $\alpha$  to  $\alpha'$  as changing creditor payoffs by  $Y(\alpha, \alpha')$  percent, where

$$Y(\alpha, \alpha') \equiv 100 \left( (1 - \alpha') / (1 - \alpha) - 1 \right).$$

Under this interpretation, changing  $\alpha$  from .14 to .01 increases creditor payoffs by 15%. Solving the model with  $\alpha = .14$  and  $\alpha = .01$ , I find that the equilibrium value of  $\theta$  increases 3%. Thus, a 15% increase in creditor payoffs increases the value of a nonbankrupt firm by 3%. Repeating the exercise, except with  $\alpha$  changing from .1 to .023, I find that a 8.5% increase in creditor payoffs increases the value of a nonbankrupt firm by 2%.

## D Additional Results

Table D.1: Model estimates, subsamples

This table presents estimates from my model based on subsamples of the commission sample. The first two rows display estimates based on the subsample in which the trustee paid an auctioneer. The third and fourth rows display estimates based on the subsample in which the trustee paid a commission to a real-estate agent. The fifth and sixth rows display estimates based on the subsample corresponding to bankruptcies starting during the financial crisis (December 2007 - June 2009). The seventh and eighth rows display estimates based on the subsample of cases in which any real-estate assets were sold. The ninth and tenth rows display estimates based on the subsample of cases occurring in liquid asset markets, which I define as those years in which the number of new one family houses sold exceeds the sample median. Odd rows display estimates based on bankruptcies in which the sale value is near the kink  $K = \$5,000$ . Even rows use bankruptcies near the kink  $K = \$50,000$ . The third column displays estimates of the elasticity parameter  $e$ . The fourth column displays estimates of the optimal compensation rate  $e/(e+1)$  (Lemma 2). The fifth column displays estimates of the bunching metric  $\mathbb{B}$  (Section 3.2). I bootstrap the estimation procedure 500 times and present bootstrapped standard errors in parentheses.

Sample	Kink	Elasticity	Optimal compensation	Bunching
Auction	\$5,000	0.0101 (0.0016)	0.01 (0.0016)	0.1701 (0.0282)
Auction	\$50,000	0.0034 (0.0055)	0.0034 (0.0055)	0.0357 (0.0571)
Real Estate Agent	\$5,000	0.0127 (0.0018)	0.0125 (0.0017)	0.2501 (0.036)
Real Estate Agent	\$50,000	0.0086 (0.0052)	0.0085 (0.0051)	0.1191 (0.0725)
Crisis	\$5,000	0.0122 (0.0015)	0.0121 (0.0014)	0.2376 (0.0289)
Crisis	\$50,000	0.0129 (0.0068)	0.0127 (0.0066)	0.1645 (0.0868)
Any Real Estate	\$5,000	0.0117 (0.0027)	0.0116 (0.0026)	0.2231 (0.0519)
Any Real Estate	\$50,000	0.0137 (0.0077)	0.0136 (0.0074)	0.1701 (0.0962)
Liquid Market	\$5,000	0.0172 (0.0009)	0.0169 (0.0009)	0.3316 (0.0186)
Liquid Market	\$50,000	0.0073 (0.003)	0.0072 (0.003)	0.1005 (0.0418)



Table D.2: Model estimates, alternative specifications

Starting with the baseline parameters in Table 3, I change some parameters and reestimate my model. This table presents the resulting estimates. For the results displayed in Panel (a) corresponding to  $K = \$5,000$ , I assume that  $w = \$125$ ,  $\Delta = 2.5w$ ,  $M = 4$ ,  $\underline{S} = \$2,500$ , and  $\bar{S} = \$7,500$ . For the results displayed in Panel (a) corresponding to  $K = \$50,000$ , I assume that  $w = \$1,250$ ,  $\Delta = 2.5w$ ,  $M = 4$ ,  $\underline{S} = \$25,000$ , and  $\bar{S} = \$75,000$ . For the results displayed in Panel (b) corresponding to  $K = \$5,000$ , I assume that  $w = \$50$ ,  $\Delta = 2.5w$ ,  $M = 3$ ,  $\mu_1 = \$250$ , and  $\mu_2 = \$500$ . For the results displayed in Panel (b) corresponding to  $K = \$50,000$ , I assume that  $w = \$500$ ,  $\Delta = 2.5w$ ,  $M = 3$ ,  $\mu_1 = \$2,500$ , and  $\mu_2 = \$5,000$ . Within each panel, the first two rows display estimates based on the commission sample. The third and fourth rows display estimates based on the corporate sample. The first and third rows display estimates based on bankruptcies in which the sale value is near the kink  $K = \$5,000$ . The second and fourth rows use bankruptcies near the kink  $K = \$50,000$ . The third column displays estimates of the elasticity parameter  $e$ . The fourth column displays estimates of the optimal compensation rate  $e/(e+1)$  (Lemma 2). The fifth column displays estimates of the bunching metric  $\mathbb{B}$  (Section 3.2). I bootstrap the estimation procedure 500 times and present bootstrapped standard errors in parentheses.

Sample	Kink	Elasticity	Optimal compensation	Bunching
Panel (a) Wider bins, wider range, different polynomial				
All	\$5,000	0.0162 (0.0008)	0.016 (0.0008)	0.2242 (0.0109)
All	\$50,000	0.0127 (0.0026)	0.0126 (0.0025)	0.1269 (0.0261)
Corporate	\$5,000	0.0295 (0.0086)	0.0286 (0.0081)	0.3161 (0.0927)
Corporate	\$50,000	0.0199 (0.0106)	0.0196 (0.0102)	0.1329 (0.0695)
Panel (b) Narrower bins, more round numbers, different polynomial				
All	\$5,000	0.015 (0.0004)	0.0147 (0.0003)	0.6403 (0.0153)
All	\$50,000	0.0111 (0.0011)	0.011 (0.0011)	0.3662 (0.0365)
Corporate	\$5,000	0.0292 (0.0043)	0.0284 (0.004)	0.9331 (0.1292)
Corporate	\$50,000	0.0135 (0.0047)	0.0133 (0.0046)	0.2624 (0.0896)

Table D.3: Conversions to Asset Cases

This table displays ordinary least squares regressions of conversions to asset cases on average trustee compensation. In each state  $s$  in each year  $t$ , I calculate average trustee compensation as the total dollars paid to all trustees in state  $s$  in year  $t$  divided by the number of Chapter 7 trustees at the end of year  $t - 1$  in state  $s$ . I regress the fraction of nonasset cases converted to asset cases in state  $s$  during year  $t$  on average trustee compensation, measured in millions of dollars. I include state fixed effects and year fixed effects. I use a state-year panel for the period from 2008 to 2018. The panel is balanced, except for four missing observations from the Northern Mariana Islands. Standard errors, clustered at the state level, are shown in parentheses.

	Conversion to Asset Case
	(1)
Average Trustee Compensation	-0.001 (0.004)
State FE	Y
Year FE	Y
Observations	579
Adj. R <sup>2</sup>	0.829

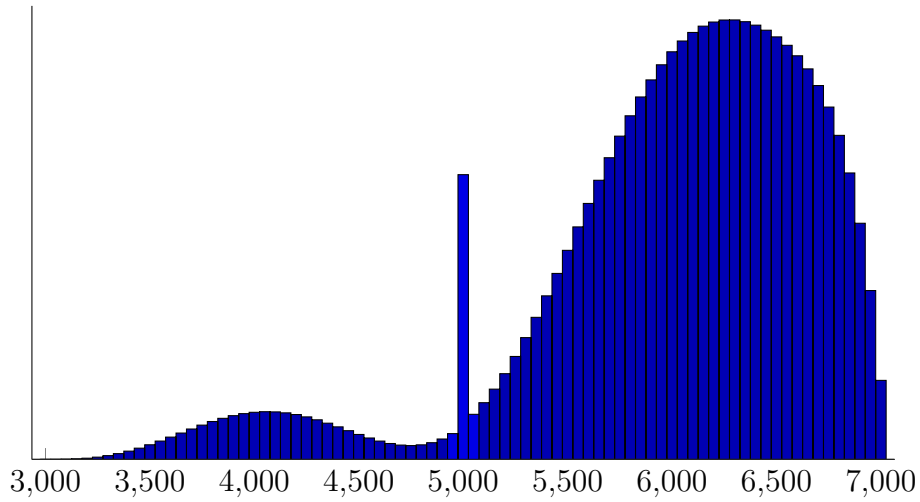
*Note:*

\* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

Figure D.1: Illustrative bunching examples

I assume a smooth distribution of  $v$  values and an effort cost parameter value  $e = .08$  and solve for the distribution of sale values according to Lemma 1. This figure plots histograms of model-implied sale values. For each bin  $j$ , the blue bars plot the number of bankruptcies  $b_j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. There is no spike in the  $v$  distribution: the spike at \$5,000 comes from the bunching behavior of Lemma 1. In panel (a), I construct the distribution of  $v$  values to make it appear that the bunching mass comes from the left of the kink. In panel (b), I construct the distribution of  $v$  values to make it appear that the bunching mass comes from the right of the kink. In both instances,  $e = 0.08$  and the bunching mass actually comes from the bunching interval  $v \in (K\pi_0^{-e}, K\pi_1^{-e})$  of Lemma 1.

(a) Bunching mass appears to come from the left



(b) Bunching mass appears to come from the right

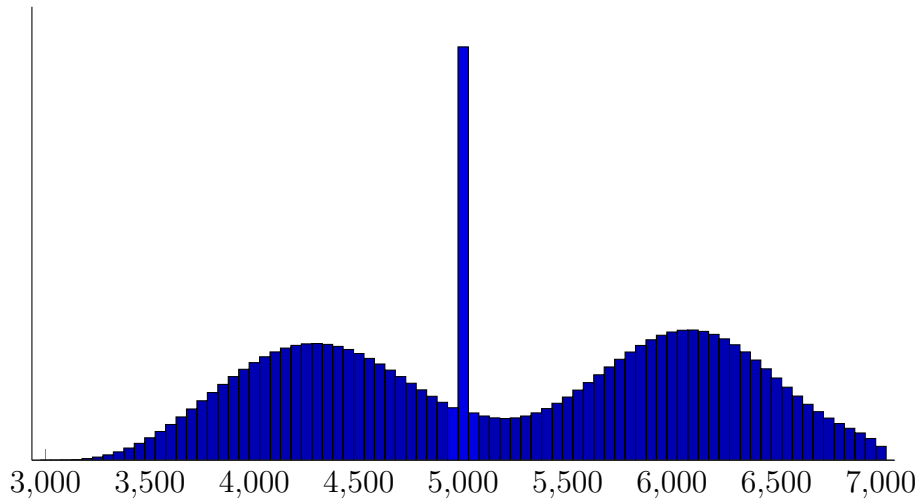


Figure D.2: Days open

This figure plots average bankruptcy case lengths, in days, as a function of sale values. For each bin  $j$ , the dots plot the average bankruptcy length (in days) for bankruptcies in bin  $j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. Panel (a) displays bins with width  $w = \$100$  near the kink  $K = \$5,000$ . Panel (b) displays bins with width  $w = \$1,000$  near the kink  $K = \$50,000$ .

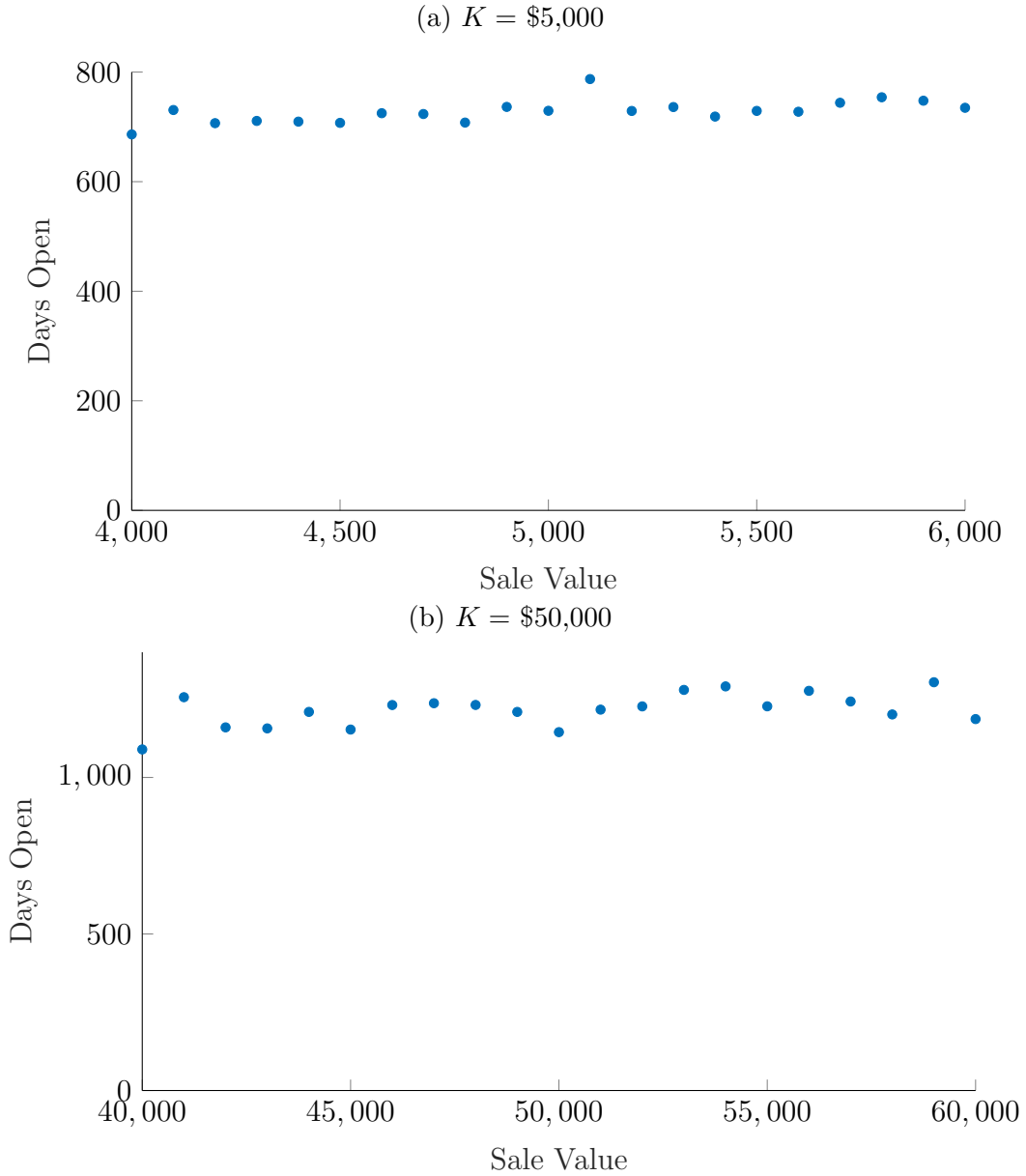
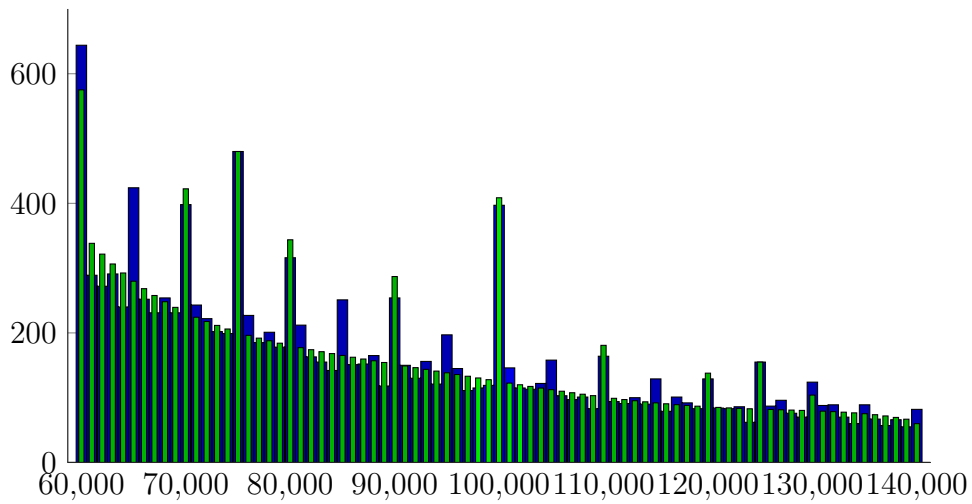


Figure D.3: Placebo at \$100,000

This figure plots a placebo test in which I estimate bunching at  $K = \$100,000$ , which is not a kink of the trustee commission function. This figure plots histograms of realized sale values and fitted sale values from equation (7). For each bin  $j$ , the blue bars plot the number of bankruptcies  $b_j$  and the bin midpoint  $x_j$  on the y axis and x axis, respectively. The green bars plot the fitted number of bankruptcies, based on estimates of equation (7). I use bins with width  $w = \$1,000$  near  $K = \$100,000$ . I estimate the regression using a specification with  $\Delta = \$2,500$ ,  $M = 5$ ,  $\mu_1 = \$10,000$ ,  $\mu_2 = \$25,000$ . I find an estimate of  $\mathbb{B} = -.0191$ .



## E Nonlinear contracts

In this appendix, I consider optimal nonlinear contracts in a model extension in which the elasticity parameter  $e$  varies with the latent variable  $V_i$ . Section E.1 describes the setting. Section E.2 describes an illustrative example with enormous effort costs that decline with the realization of  $V_i$ . In this hypothetical example, the optimal piecewise linear contract features a 25% commission for small bankruptcies and 10% for larger bankruptcies, consistent with the current commission schedule. Section E.3 shows that my empirical estimates (Table 4) are inconsistent with the parametric assumptions that justify the current commission schedule. Instead, in this modified setting, my empirical estimates imply the optimal piecewise linear contract is virtually linear with a commission of less than 2%, consistent with my main results.

### E.1 Modified setting

In the model of Section 3.1, the trustee's utility function is given by:

$$U(s, v) \equiv C(s) - \frac{v}{1 + 1/e} \left( \frac{s}{v} \right)^{1+1/e}. \quad (\text{E.1})$$

In this appendix, I instead consider a utility function in which the effort cost parameter  $e$  depends on  $v$ :

$$\hat{U}(s, v) \equiv C(s) - \frac{v}{1 + 1/e(v)} \left( \frac{s}{v} \right)^{1+e(v)-1}. \quad (\text{E.2})$$

For simplicity, I assume that the effort cost is a piecewise constant function of  $v$  with some discontinuity  $\bar{v}$ :

$$e(v) \equiv e_0 + \mathbf{1}(v > \bar{v}) (e_1 - e_0). \quad (\text{E.3})$$

If  $e_1$  is greater than (less than)  $e_0$ , it follows that effort will be disproportionately more (less) costly in large bankruptcies. As before, I assume in this appendix that trustees choose  $s$  to maximize utility.

## E.2 An illustrative example

Consider the following illustrative example, in which I make parametric assumptions to justify the current commission schedule. I parameterize equation (E.3) assuming that  $e_0 = 0.37$ ,  $e_1 = 0.08$ , and  $\bar{v} = 15,000$ . I assume that  $V_i$  is distributed according to a mixture of two uniform distributions. I assume that with probability 0.0196,  $V_i$  is uniformly distributed on the interval  $[35,000, 90,000]$ . With probability  $1 - .0196$ ,  $V_i$  is uniformly distributed on the interval  $[0, 15,000]$ .

I consider piecewise linear contracts of the form

$$C(s) = \pi_0 s + \mathbf{1} \left( s > K \right) \left( \pi_1 (s - K) + \pi_0 K \right). \quad (\text{E.4})$$

I assume that  $K = 10,000$  and calculate the marginal commission rates  $\pi_0, \pi_1$  that maximize creditor recovery:

$$\sup_{\pi_0, \pi_1} \mathbb{E}[s^*(v) - C(s^*(v))] \quad (\text{E.5})$$

subject to equations (E.3) and (E.4) and

$$s^*(v) = \operatorname{argmax}_s \hat{U}(s, v). \quad (\text{E.6})$$

I simulate 5.1 million realizations of  $V_i$  and search numerically for the optimal values of  $\pi_0$  and  $\pi_1$ . At the optimum, I find that  $\pi_0 = 0.25$  and  $\pi_1 = 0.10$ . This exercise thus confirms that in this appendix setting, there exist parameters such that the current commission schedule maximizes creditor payoffs.

Next, I use a Monte Carlo exercise to show that my estimation procedure accurately estimates  $e_0$  and  $e_1$  in this setting. Using the 5.1 million simulated  $V_i$  values, I calculate simulated sale values  $\{s^*(V_i)\}$  assuming the trustee faces the current commission schedule and optimizes equation (E.2). I apply the methodology of Section 3 to estimate  $e$  using data near the kink  $K = \$5,000$ . I estimate that  $\hat{e} = 0.3704$ , almost exactly the true value  $e_0 = 0.37$ . Likewise, applying my methodology to the simulated data near the kink  $K = \$50,000$  produces an estimate  $\hat{e} = 0.0806$ , almost exactly the true value  $e_1 = 0.08$ . This exercise confirms that if the parameter  $e$  varies with  $V_i$ , applying my methodology to a kink  $K$  gives an accurate estimate of the  $e$  value corresponding to the  $V_i$  values for which

the trustee chooses  $s = K$ .

### E.3 Estimating the optimal nonlinear contract

Next, I use my data to estimate the optimal nonlinear contract (E.5). In Section 4, I show that I estimate  $e = 0.0156$  using data near  $K = \$5,000$  and I estimate  $e = 0.0101$  using data near  $K = \$50,000$  (Table 4). These estimates are dramatically different from the estimates in the above illustrative example (0.3704 and 0.0806). Thus, my estimates are inconsistent with the hypothetical setting in which the current commission schedule maximizes creditor recovery. To be more precise, I take the simulated  $V_i$  values above and solve (E.5) assuming  $e_0$  and  $e_1$  correspond to my empirical parameter estimates:  $e_0 = 0.0156$  and  $e_1 = 0.0101$ . I find that the optimal contract is given by  $\pi_0 = 0.0145$  and  $\pi_1 = 0.0126$ . This exercise shows that even if I consider nonlinear contracts, the optimal contract always features a marginal commission rate less than 2%. I find this because all my estimates of  $e$  are small, regardless of the size of the bankruptcy (Table 4).

In summary, I consider a setting in which the trustee’s technology for selling assets varies with the size of the bankruptcy. I show that my existing methodology provides accurate “local” estimates of effort costs for each kink. Because of this, my results imply that the optimal nonlinear contract is virtually linear — because all estimates of  $e$  are similar — and always features marginal commissions of less than 2% — because all estimates of  $e$  are small.