CERGE
Center for Economics Research and Graduate Education
Charles University Prague

Essays on Corporate Bankruptcy

Ondřej Vychodil

Dissertation

Prague, August 2010

Ondřej Vychodil

Essays on Corporate Bankruptcy

Dissertation

Prague, August 2010

Dissertation Committee

Gérard Roland (University of California, Berkeley; chair)

Libor Dušek (CERGE-EI; local chair)

Jan Hanousek (CERGE-EI)

Evžen Kočenda (CERGE-EI)

Referees

Michelle J. White (University of California, San Diego, and NBER)

Laurent Weill (Université Robert Schuman, Strasbourg)

To my wife Eva.

Summary of Referee Reports

Michelle J. White (Professor of Economics, University of California, San Diego, and Research Associate, NBER):

> "Overall, I thought that the dissertation is very promising and definitely deserving of a Ph.D. after some revisions."

Laurent Weill (Full Professor of Economics, Université Robert Schuman, Strasbourg):

> "I would like to stress the high quality of the Ph.D. thesis by Ondřej Vychodil. In his thesis, he shows impressive skills to manipulate all the required concepts for the analysis. Indeed, his thesis provides three consistent essays which provide significant contributions to the understanding of the bankruptcy law. The most impressive element of the thesis may be the fact that Ondřej Vychodil does not provide only theoretical or empirical contributions or did not limit his analysis to positive or normative implications: he provides contributions for all these dimensions."
>
> "Thus, my opinion is that the thesis is undoubtedly acceptable to go to a defense. This is an excellent thesis which provides consistent and complementary essays on very relevant and complicate issues."

In addition to these general statements, the referee reports listed various specific comments and suggestions for revisions which are not included in the quotations above. These specific comments and suggestions have been incorporated into the final version of the Dissertation.

The first chapter, being a joint work with Ondřej Knot, has been also reviewed by **Jan Švejnar** (Professor of Economics and Public Policy, University of Michigan) and **Randall K. Filer** (Professor of Economics, Hunter University of New York) – referees assigned to Ondřej Knot's Dissertation. Their comments have been incorporated as well. Thus the final version of Chapter 1 in my Dissertation is identical to the final version of this chapter in Ondřej Knot's Dissertation.

Table of Contents

List of Tables

List of Figures

Abstract

The dissertation consists of three chapters on corporate bankruptcy.

In the first chapter (joint with Ondřej Knot), we develop a model of a debt contracting problem under bankruptcy regimes differing by a degree of softness. In the model, the degree of softness is associated with the extent to which the absolute priority rule can be violated. We show that when the degree of softness can be set individually for each project, then the debtor's tendency to excessive risk-taking can be eliminated and the first best solution can be attained. When it is given exogenously by a bankruptcy law, then a completely tough law results in a lower distortion from the first best than a soft law with a moderate degree of softness.

In the second chapter, I document that the recent Czech bankruptcy practice tended to delay the ultimate exit of a firm when it can be expected to have a harsher ex-post effect on the firm's employees. I regress bankruptcy duration on unemployment rate, size and other controls, applying three alternative methods – OLS regression, parametric duration (survival) analysis, and quantile regression – on the cross-section population of 903 Czech corporate bankruptcies that were completed during 2004 by the distribution of returns among creditors. I show that bankruptcy procedures last longer in an environment with higher unemployment rate. Moreover the magnitude of the unemployment rate's effect on duration increases with the firm's size. These results are observed for the first four years of a bankruptcy procedure, after which they are no longer evident.

In the third chapter, I present a dozen elementary ex ante inefficencies of too soft or too tough corporate bankruptcy laws and clusters them in five types – debt contracting (credit rationing, creditor structure, other), project choice (effort choice, risk choice, entrenchment), debtor's bankruptcy decision (strategic default, staving off bankruptcy, gambling on resurrection), creditor's bankruptcy decision (inefficient liquidation) and provision of private information (debtor's incentive to share, creditor's incentive to monitor). I introduce an extension of the simple incomplete contracting framework of Schwartz (2002) as a unifying to illustrate seven of these inefficiencies and, thus, connect several approaches that might seem mutually incoherent. The chapter may also serve as an introductory textbook on the ex ante (in)efficiency of corporate bankruptcy.

Abstrakt

Disertace sestává ze tří kapitol na téma insolvence podniků.

V první kapitole (společná práce s Ondřejem Knotem), představujeme model, který analyzuje uzavíráním dlužnických kontraktů za přítomnosti hazardního boje o záchranu (angl. gambling on resurrection) v režimech úpadkového práva lišících se ve stupni měkkosti. V modelu je stupeň měkkosti svázán s mírou, do jaké může být porušeno pravidlo absolutní priority. Ukazujeme, že pokud lze stupeň měkkosti stanovit individuálně pro každý projekt, lze dlužníkovu tendenci k přílišnému riskování zcela eliminovat a dosáhnout společensky optimálního výsledku. Pokud je ale stupeň měkkosti určen exogenně úpadkovým právem, zcela tvrdý zákon může vést k menší odchylce od optimálního stavu, než měkčí zákon se středním stupňem měkkosti.

Druhá kapitola dokládá, že ještě nedávno platná praxe v českých konkurzech vykazovala tendenci odkládat konečný výstup firmy z trhu v situacích, kdy je možné očekávat tvrdší dopad na zaměstnance podniku. Na datech o všech 903 českých konkurzech, které byly dokončeny vydáním rozvrhového usnesení v roce 2004 odhaduji závislost doby trvání konkurzu na míře nezaměstnanosti, velikosti podniku a dalších kontrolních proměnných za použití tří alternativních metod - regrese metodou nejmenších čtverců (OLS), parametrické analýzy durace a kvantilové regrese. Výsledky ukazují, že konkurzy trvají déle v prostředí s vyšší mírou nezaměstnanosti. Intenzita tohoto efektu navíc roste s velikostí firmy. Tyto výsledky jsou pozorovány pro první čtyři roky konkurzu a pro déle trvající konkurzy neplatí.

Třetí kapitola představuje dvanáct základních ex ante neefektivit příliš měkkého nebo příliš tvrdého úpadkového zákona a člení je do pěti typů - uzavírání dluhového kontraktu (omezená dostupnost úvěrů, úvěrová struktura, ostatní), volba projektu (volba manažerského úsilí, volba rizika, zakopávání se v pozicích), rozhodování dlužníka o konkurzu (strategický úpadek, oddalování konkurzu, hazardní boj o záchranu), rozhodování věřitele o konkurzu (neefektivní likvidace) a sdílení privátních informací (ochota dlužníka ke sdílení, ochota věřitele k monitorování dlužníka). Rozšířením jednoduchého modelu, který vytvořil Schwartz (2002), získávám jednotící model, kterým lze ilustrovat sedm ze zmíněných neefektivit a propojit tak různé přístupy, které se jeví jako vzájemně nekonzistentní. Kapitola může také posloužit jako učební text na téma ex ante (ne)efektivity právní úpravy úpadku podniků.

Acknowledgments

I would like to thank *Libor Dušek* for stimulating remarks and challenging suggestions, and *Jan Hanousek*, *Evžen Kočenda*, and *Gérard Roland* for helpful comments. My sincere thanks go to *Lucian A. Bebchuk* and *Philippe Aghion* who agreed to supervise me during my Fall 2005 stay at Harvard University and let me attend relevant courses and John M. Ohlin seminars on corporate governance as well as Law and Economics seminars at the Harvard Law School. I am also grateful to my research fellow *Ondřej Knot* for stimulating debates and to my colleagues from the *Working Group 'S22' for the Insolvency Law* at the Czech Ministry of Justice for discussions on the insolvency law beyond the scope limitted by the economic science. Last but not least, I would like to thank to the referees, *Michelle J. White* and *Laurent Weill*, for their remarks and suggestions.

Czech Republic, Prague
August 2010

Ondřej Vychodil

Introduction

"Capitalism without bankruptcy is like Christianity without hell."
Frank Borman, Commander of Apollo 8 (born 1928)

"Bankruptcy is a legal proceeding in which you put your money in your pants pocket and give your coat to your creditors."
Joey Adams, American Comedian (1911-1999)

"The liberation of the public revenue, if it has ever been brought about at all, has always been brought about by a bankruptcy; sometimes by an avowed one, but always by a real one, though frequently by a pretended payment."
Adam Smith, Scottish moral philosopher (1723-1790)

The standard justification for the existence of bankruptcy law is the need to resolve a situation where creditors' claims are mutually inconsistent, i.e., *there are multiple creditors and there are not enough assets to compensate them all according to their contracts.* Without the automatic stay on individual debt collection in bankruptcy, creditors would be motivated to "run on assets" in order to be the first to collect. The Nash equilibrium resulting from their optimal individual strategies would not be socially optimal. This particular market failure represents the usual explanation of the need for a bankruptcy law.[1]

Bankruptcy laws differ around the world. As Hart (2000) notes with respect to bankruptcy laws: "[I]t is unlikely that 'one size fits all'. That is, although some bankruptcy

[1]For arguments why firms have multiple creditors at all, see Bolton and Scharfstein (1996) and Berglof, Roland, and von Thadden (2003).

procedures can probably be rejected as being manifestly bad, there is a class of procedures that satisfy the main criteria of efficiency. Which procedure a country chooses or should choose may then depend on other factors, e.g., the country's institutional structure and legal tradition."

In general, we can distinguish between bankruptcy systems that are *tough* on debtors (i.e., assigning strong control rights to creditors) and those that are *soft* (i.e., limiting creditors' rights substantially). Existing bankruptcy laws range from extremely tough to extremely soft. The way bankruptcy law is written and practiced affects firms in bankruptcy – *ex post efficiency* – as well as the actions of sound firms and their creditors – *ex ante efficiency*.

In my dissertation, I present three pieces of theoretical and empirical research on corporate bankruptcy I have conducted at CERGE-EI in the past years. Chapter 1, *Bankruptcy Regimes and Gambling on Resurrection*, is a joint work with my coleague Ondřej Knot, a PhD. candidate at CERGE-EI.[2] Chapter 2, *Judges' Bias Towards Continuation in Bankruptcy: The Case of the Czech Republic*, and Chapter 3, *On the Ex Ante Efficiency of Corporate Bankruptcy Law*, are my own. While the first two chapters focus on two narrow issues of debtor's gambling on resurrection (*theoretical model*) and judicial discretion (*empirical analysis of data on Czech bankruptcies*), the last chapter provides a more synthetic view on various ex ante (in)efficiencies of corporate bankruptcy law (*a text-book-like theoretical description*).

The three chapters attempt to find answers to the following questions: First, is it generally valid that the ex ante inefficiency known as debtor's gambling on resurrection diminishes with increasing softness of bankruptcy law? Second, do Czech bankruptcy judges take into account the social impacts of the firm's exit and tend to prolong the process of exit in order to save jobs? Finally, is there a way to interconnect various models on the ex ante efficiency of corporate bankruptcy law through one theoretical framework?

All three chapters are mutually interconnected. All are devoted to the implications of the legal design of bankruptcy regime for the economic behavior of respective parties (specifically debtors, creditors, bankruptcy judges). I believe that each chapter contributes with its findings to the economic literature on corporate bankruptcy. However, it is by no surprise that the results open new questions that deserve further research.

[2]The previous version of this chapter was published as CERGE-EI Working Paper No. 290 in February 2006.

Chapter 1

Bankruptcy Regimes and Gambling on Resurrection

Co-authored by ***Ondřej Knot***

(Previous version published in February 2006 as CERGE-EI Working Paper No. 290)

Abstract

We develop a model of a debt contracting problem under bankruptcy regimes differing by a degree of softness. In the model, the degree of softness is associated with the extent to which the absolute priority rule can be violated. We show that when the degree of softness can be set individually for each project, then the debtor's tendency to excessive risk-taking can be eliminated and the first best solution can be attained. When it is given exogenously by a bankruptcy law, then a completely tough law results in a lower distortion from the first best than a soft law with a moderate degree of softness.

Keywords: corporate bankruptcy, debt contracts, ex ante efficiency
JEL classification codes: G33, K12, K39

1.1 Introduction

A question often debated among bankruptcy scholars is whether firm value in bankruptcy should be divided in accordance with the absolute priority rule (APR). In particular, the issue is whether it is optimal that shareholders receive some payoff only after all the creditors have been paid in full. In the bankruptcy literature,[1] bankruptcy laws are usually divided into tough and soft, depending on how a firm's management is treated. But because providing the management with a favorable treatment is usually associated with more APR violations, we use the categories "tough" and "soft" to denote whether the law enables APR violations (soft law) or prevents them (tough law).

In this paper, we analyze the debt contracting problem in the presence of *gambling on resurrection*, i.e. debtor's excessive risk taking in the situation of privately observed high probability of financial distress, under different bankruptcy regimes.[2] We first show that if the degree of softness can be determined endogenously, i.e. agreed upon between the debtor and the creditor, the first-best solution can always be attained. In reality, however, this is not possible due to the multiplicity of creditors with different seniority levels, for each of which the optimal degree of softness would be different. We then examine the situations, in which, as in practice, the degree of softness is given exogenously by the bankruptcy law. A sufficiently soft law can eliminate the debtor's moral hazard problem and leads to optimal investment level, though at the cost of higher interest rates. Under a law that is insufficiently soft, however, this moral hazard problem gets even worse than under a completely tough law. We also show that the gambling on resurrection argument for soft law is further weakened if a possibility for creditors to verify the firm's situation is introduced.

In the literature, one may find arguments both in favor of soft law and tough law.[3] In line with the claim of Hart (2000) that there is no "one size fits all" solution in bankruptcy

[1] For an up-to-date survey of the economic literature on both personal and corporate bankruptcy see White (2007). In our paper, we deal with corporate bankruptcy only.

[2] The debtor's gambling on resurrection is necessarily accompanied with misreporting (not confessing the observed situation to creditors). Infamous examples of such "cooking of books" prior to the failure include the cases of Enron's top management prior to the company's bankruptcy or Mr. Bernard Madoff within his Ponzi scheme of about $ 50 bn. On the sovereign level, one may argue about the Greek government's alleged misreporting on its fiscal situation. A clear example from economies that have transformed from plan to market within the last two decades is the behavior of the top management and some shareholders of Investicni a Postovni Banka few years prior to the third largest Czech bank's failure in 2000 which costed Czech tax payers about $ 8 bn.

[3] For a summary of some *pros* and *cons* of soft and tough bankruptcy laws see Knot and Vychodil (2005).

legislation, one may say that each of these *pros* and *cons* is of different relevance and strength in different countries.[4]

One of the ex ante efficiency arguments for soft law has been the *gambling on resurrection* hypothesis, which states that under APR, debtors tend towards excessive risk-taking and delaying bankruptcy filing once they privately observe that they are on the verge of bankruptcy. Violation of APR is believed to suppress this type of moral hazard problem by giving shareholders a positive payoff even though the creditors are not paid in full. In this paper, we show that this is not generally valid and should thus be viewed with caution.

The most discussed example of a law enabling APR violations has been Chapter 11 of the U.S. Bankruptcy Code of 1978. Although *de iure* APR is supposed to hold in Chapter 11, vast empirical evidence has been collected to support the hypothesis that *de facto* APR is violated in bankruptcy cases under Chapter 11.[5] After a bankruptcy filing, the automatic stay prevents creditors from further debt collection efforts, the management has an exclusive position to present a plan of reorganization, and the consent of a class of creditors with the plan can be replaced, under the cram down procedure, by a court decision. These are just examples of rules that enable the management to enforce APR violations on the creditors. Certainly, the U.S. case is just one of many and we can observe very different bankruptcy laws around the world with different degrees of APR violation.

There are several papers similar to our paper. In the model of Bebchuk (2001) the APR violations increase the distortions of management's decision-making in favor of risky projects (they worsen the gambling on resurrection problem). In our model, too, we observe this effect for certain parameter values. Unlike Bebchuk, however, we find that under different parameter values a soft law can actually eliminate the gambling on resurrection problem and lead to optimal investment level. The law, however, needs to be "soft enough" to have this effect.[6]

[4]Some authors explicitly studied various country-related specific factors that should be taken into account when designing an optimal bankruptcy law. For instance, Baird and Rasmussen (2002) and Baird and Rasmussen (2003) stress the importance of capital structure and the functioning of asset markets, Berkovitch and Israel (1998) emphasize information structure, while Lambert-Mogiliansky, Sonin, and Zhuravskaya (2003) and Biais and Recasens (2002) study the effects of corruption among judges.

[5]See, e.g., Franks and Torous (1989), Eberhart, Moore, and Roenfeldt (1990), LoPucki and Whitford (1990), Weiss (1990), Bebchuk and Picker (1993), Franks and Torous (1994), Betker (1995), Longhofer and Carlstrom (1995), Weiss and Wruck (1998), Carapeto (2000).

[6]The difference between our model and Bebchuk's comes from the fact that Bebchuk assumes the project characteristics are given *ex ante* and are private information of the firm. In Bebchuk's model,

Another related paper is Bester (1994). In Bester's model, the low state automatically implies default, while in the high state the debtor can either repay or default strategically. Thus the high-type debtor might pretend to be a low-type and the creditor cannot distinguish between financial and strategic default. In our model, instead, we focus on the situation of the low-type pretending to be the high-type and of the creditor's lowered ability to distinguish between success-driven continuation and gambling on resurrection.

Finally, in the model of Povel (1999), the debtor also receives a private signal on the project's type, unobservable by creditors, and decides either to file for bankruptcy or continue running the firm. Nonetheless, in Povel's model the debtor, in addition, chooses her effort level between the initial financing period and receiving the signal. The main idea of that model lies in the trade-off between incentives to invest effort and incentives to reveal private information about the project's type. Soft bankruptcy law worsens the former while improving the latter. In our model, we assume away the effort choice and show that even the pure effect of the law's softness on incentives to reveal true information is twofold. Under some circumstances, softening bankruptcy law strengthens the debtor's motives for gambling on resurrection and misreporting.

The model we present in this paper is, we believe, both realistic and tractable. In general, it draws the connection between financial contracting and bankruptcy law. More specifically, it allows – among other things – for inspecting the links between bankruptcy law design, credit rationing, company's misreporting, cost of monitoring, profitability of projects, and size of firms. An important part of the paper are simulations showing, for each of the bankruptcy regimes, the sensitivity of the individual variables to parameter changes.

The paper is structured as follows. The following section describes the setup of the model and defines contracts and strategies. Section 1.3 analyzes the benchmark situation when the degree of softness of bankruptcy law is specified endogenously in the contract. In the fourth section we treat the degree of softness as an exogenous parameter and analyze the effects of different values of this parameter on investment level, interest rate and strategy choice. Section 1.5 introduces the possibility for the creditor to verify, with a certain cost, the debtor's report. The sixth section considers what happens when we allow the parties to renegotiate the contract in period 1. Section 1.7 concludes.

---

once the project is started, there are no more decisions concerning its characteristics. On the other hand, we assume that the project's characteristics are common knowledge at the time when the project is financed. Only after that, the debtor privately learns information about how the project's chances to succeed changed and may choose a risky or a safe strategy.

1.2 The Model

1.2.1 Setup

We study a relationship between a debtor, who owns a firm,[7] and a bank. We assume the debtor is both the firm's owner and its manager and has limited liability. The debtor has an opportunity to undertake a profitable project and needs financing from the bank in order to do so. Bank credit is the only source of financing for the debtor.[8] The initial investment in the project is determined by both parties. During the life of the project the debtor receives private information about the probability of the project's success. The information may be either good or bad. The project's characteristics are such that it is optimal to continue if the information is good (the probability of success is high) and to quit if the information is bad (the probability of success is low). The incentives of the debtor, however, may be to continue the project even if the information is bad.

The project, if successful, can bring $\beta(K)$ where K is a non-negative initial investment. We assume a particular form of $\beta(K)$, namely $\beta(K) = B \ln(K+1)$ where $B > 0$. Note that $\beta(0) = 0$, $\beta'(K) > 0$, and $\beta''(K) < 0$. The decreasing returns imply that there is an optimal level of investment, one at which the marginal benefit equals the marginal cost. An important property of different bankruptcy regimes that we examine is whether they induce the optimal investment level. The whole investment K is financed by debt which means that the debt level equals the size of investment. In exchange for the provided financing, the bank is promised to obtain $(1+r)K$ at the end of the game, unless the firm goes bankrupt. We assume the risk-free interest rate is zero. The credit market is competitive which means that, in equilibrium, the bank's expected profit will be zero and the debtor of the firm will capture all the surplus from the relationship which also means that the debtor's expected profit is a perfect measure of the social gain from the project.

The relationship extends over three periods. In period 0 a credit contract is signed and investment is realized. The contract specifies the principal K, the interest rate r, and the strategy to be followed in period 1. In period 1 the debtor receives private information about the state of the world, either truthfully or untruthfully reveals it to the creditor, and decides on a further strategy – either continue running the project (strategy S_C) or quit the project (strategy S_Q). In period 2 outcomes are realized and returns divided

[7] Under a firm we understand primarily a collection of assets used in a particular business.

[8] This assumption is common in existing models on ex ante effects of a bankruptcy law and does not limit the validity of the model's implications.

according to the contract and, in the case of bankruptcy, according to the bankruptcy law.

There may be two states of the world in period 1, the good state (H) and the bad state (L), with probabilities p and $(1-p)$, respectively, where $0 < p < 1$. If the debtor decides to quit the project (strategy S_Q), a recovery value γK, where $0 < \gamma < 1$, is obtained with certainty, no matter whether the state of the world is H or L. If the debtor decides to continue the project (strategy S_C) in state H, the project continues and yields the good outcome, $B\ln(K+1)$, with certainty. However, in state L, strategy S_C results in the good outcome, $B\ln(K+1)$, only with probability π, and in the bad outcome, 0, with probability $1-\pi$, where $0 < \pi < 1$. For a project that had been financed in period 0 we must have $B\ln(K+1) > \gamma K$, otherwise the project would always be liquidated in period 1 and would have never been financed in period 0. Therefore, if the debtor observes that the state of the world is H, she continues the project for sure. The only decision node regarding the choice between strategy S_C and strategy S_Q is thus in state L.

The firm's value before the start of the project is $V > 0$. This can be thought of as the value of the assets the firm possesses and that may serve as collateral.

Throughout the paper, besides providing analytic derivations of optimal contracts under different legal and institutional setups, we illustrate these contracts by simulations on a numerical example with parameters given as $p = 0.6$, $\pi = 0.2$, $\gamma = 0.65$, and $V = 1$, unless stated otherwise. Graphical representations of these simulations are given in Appendix 1.A.2.

1.2.2 Contracts and Strategies

Both the debtor and the bank are risk-neutral agents who maximize their expected profits. A strategy $S_i \in \{S_C, S_Q\}$ is the debtor's decision whether to continue (S_C) or quit (S_Q) the project in state L. A contract is a triple $\{K, r, S_i\} \in \Re^2_+ \times \{S_C, S_Q\}$. The bank lends the firm K in period 0 and the debtor promises on behalf of the firm to repay $(1+r)K$ in period 2. The debtor also commits to follow strategy S_i in period 1 if state L occurs. Denote the debtor's and the bank's expected profit in period t as $F_t(K, r, S_i)$ and $G_t(K, r, S_i)$, respectively, where $t = 0, 1$.

A contract $\{K, r, S_i\}$ is *incentive compatible* if in period 1 – when the debtor decides whether to quit or continue – $F_1(K, r, S_i) \geq F_1(K, r, S_j), i \neq j$. A contract is *feasible* if it is incentive compatible and $G_0(K, r, S_i) \geq 0$. The debtor's maximization problem has,

thus, the following form:

$$\max_{(K,r,S_i)\in\Re^2_+\times\{S_C,S_Q\}} F_0(K,r,S_i) \tag{1.1}$$

s.t.

$$F_1(K,r,S_i) \geq F_1(K,r,S_j), \qquad i \neq j, \tag{1.2}$$

$$G_0(K,r,S_i) \geq 0. \tag{1.3}$$

In period 1 the debtor privately learns the state of the world, reports it to the creditor, and chooses between strategies S_C and S_Q. The creditor cannot observe the state of the world, but only observes the choice of strategy.[9] If the period 1 state of the world is H, there is no moral hazard as continuation (S_C) is the optimal strategy for both the debtor and the creditor. Thus, if state H occurs, the project continues smoothly to period 2. If the period 1 state is L and the contract requires the debtor to follow S_Q, then, for certain levels of K and r, the debtor has an incentive to misreport (i.e., report state H) and to follow S_C.

This is where our model differs from the previous literature, which usually defines a good state as a realization of high cash flows which the debtor can divert instead of paying to the lender.[10] There the principal-agent problem is particularly salient in the good state. Our model explores the case – more common in reality, we believe – in which the moral hazard problem occurs in the bad state, in which the debtor is tempted to continue and gamble on resurrection, while the optimal solution is to quit.

A crucial parameter of our model, in addition to those defined above, is the degree of softness of bankruptcy law, α, satisfying $0 \leq \alpha \leq 1$. This parameter determines the fraction of the residual value of a bankrupt firm that is captured by the debtor. Thus, $\alpha = 0$ means completely tough law and the higher the value of α the softer is the law. Bankruptcy laws do not specify α explicitly and it is, therefore, not possible to find its value directly in the laws themselves. α is rather a consequence, sometimes unintended, of the way a law is written and applied by the courts. An important factor affecting α is whether the law enables for reorganization and under what circumstances. Whereas in liquidation, most bankruptcy laws ensure (at least on the paper) full adherence to

[9]Formally, the assumption that the report will be made by the debtor seems redundant, but it will become utilized later in the treatment with verification. In fact, here we assume that the debtor can report untruthfully without any risk of detection because the cost of verification is infinitely high.

[10]See, e.g., Bester (1994), Berglof and von Thadden (1994), Bolton and Scharfstein (1996), Hart and Moore (1998), and Berglof, Roland, and von Thadden (2003).

the absolute priority rule (APR), deviations from APR are typically possible in reorganization, which means that the equity holders can retain part of the value even though the creditors are not repaid in full. Another factor affecting α is the way the control of the bankruptcy process is split between the debtor, the creditors and the court. When the debtor retains some control, she may be able to capture some value even though she should receive nothing according to strict interpretation of the law.

Even though α cannot be found directly in the bankruptcy law, there is some empirical evidence concerning its value. A number of studies have estimated the size of deviations from the APR under the U.S. Chapter 11 (reorganization chapter), typically measured – following Franks and Torous (1989) – as the amount paid to equity divided by the amount distributed to creditors under the reorganization plan. This measure, denoted as ΔAPR, slightly differs from the degree of softness α, which represents the share of the amount paid to equity on the total amount paid to equity and creditors. Thus, to translate ΔAPR to α, one needs to use $\alpha = \frac{1}{1+\frac{1}{\Delta}}$. Using this transformation it can be stated that, for example, Eberhart, Moore, and Roenfeldt (1990) found an average degree of softness in their sample of 7.0%, ranging from 0% to 26.5%, while Betker (1995) saw it in another sample at 2.8%.[11]

In the following two sections, we solve the model for two different setups: one in which α is determined endogenously within the contract (section 1.3) and another in which α is given exogenously by the law (section 1.4).[12]

As we will show below, the setup with α specified endogenously weakly dominates, in terms of social welfare, the setup with α specified exogenously in the bankruptcy law. The reason is that the law will necessarily fix α at some constant level, which will not be optimal for most of the projects in the economy. Within the boundaries of this paper, it would, therefore, be better to leave it on the parties to specify the degree of softness themselves, setting it at a level optimal for the project in question and avoiding the application of the law altogether.[13] The law, however, exists also for other reasons than specifying the ratio, in which the value is divided between the debtor and the creditor(s).

[11] In terms of ΔAPR, the estimate of an average deviation from the APR by Eberhart, Moore, and Roenfeldt (1990) was 7.5%, ranging from 0% to 36%, while that of Betker (1995) was 2.9%. A summary of similar empirical observations can be found in White (2007).

[12] For a discussion of the possibility of voluntary contracting for the violation of APR in the case of bankruptcy, see Povel (1999) and Schwartz (1998).

[13] Specifying the exactly optimal α in a contract is, however, not possible either. This is, among others, due to complex and constantly changing debt structure (multiple creditors with different seniorities), changing values of underlying parameters and impossibility to measure some of the underlying parameters.

Its main function is to provide a collective framework for the resolution of a firm's debts in a situation when its assets are less than its liabilities and, as such, it also determines the rules for the division of the firm value, i.e. specifying the degree of softness.[14]

1.3 Endogenous Choice of the Degree of Softness

Assume, first, that the contract in period 1 specifies α in addition to the principal (K), the interest rate (r), and the strategy (S_i). When α is endogenous, then α, K and r will always be set at such levels that the debtor prefers the socially optimal strategy S_Q in state L because this maximizes his expected profit. The debtor's maximization problem then is

$$\begin{aligned} \max_{K\geq 0,\, r\geq 0,\, 0\leq\alpha\leq 1} \quad & p[V + B\ln(K+1) - (1+r)K] + \\ & +(1-p)\max\{V+\gamma K-(1+r)K;\alpha(V+\gamma K)\} \end{aligned} \tag{1.4}$$

s.t.

$$\begin{aligned} \text{ICC:} \quad & \max\{V+\gamma K-(1+r)K;\alpha(V+\gamma K)\} \geq \\ & \geq \pi[V+B\ln(K+1)-(1+r)K]+(1-\pi)\alpha V, \end{aligned} \tag{1.5}$$

$$\text{PC:} \quad p(1+r)K + (1-p)\min\{(1+r)K;(1-\alpha)(V+\gamma K)\} - K \geq 0. \tag{1.6}$$

When designing the contract, the debtor maximizes her expected payoff formulated in the maximand. With probability p, state H will occur in period 1 and the project will continue till period 2. Then the debtor retains the value of the firm's assets (independent of the project) and the project's upside payoff and is able to repay the whole debt.[15] With probability $(1-p)$, state L occurs and the debtor quits the project. Depending on what yields her higher payoff, she chooses between *out-of-bankruptcy liquidation*, which gets her full value of the firm minus the value of the debt, and *filing for a bankruptcy*

[14]The main justification for the law's existence is muting creditors' incentives to race to be the first to collect. As White (2007) puts it: *"When creditors realize that a debtor firm might be insolvent, they have an incentive to race against each other to be first to collect. This is because, as in a bank run, the earliest creditors to collect will be paid in full, but later creditors will receive nothing. The race to be first is inefficient, since the first creditor to collect may seize assets that the firm needs for its operations and, as a result, may force the firm to shut down. Early shutdown wastes resources because the piecemeal value of the firm's assets may be less than their value if the assets are kept together and the firm sold as a going concern."*

[15]Note that if the occurrence of state H had not implied full repayment in period 2, the creditor would not have been willing to lend in period 0.

reorganization, which frees her from the full debt repayment and gets her fraction α of the total remaining firm's value.

Obviously, the debtor's payoff after quitting the project, both from out-of-bankruptcy liquidation and from bankruptcy reorganization, must be higher than her expected profit from continuation. The incentive compatibility constraint (1.5) assures that the debtor will never gamble on resurrection in state L. The gamble would have got him the upside payoff with probability π and fraction α of the firm's assets with probability $(1-\pi)$. Since α is endogenous, the contract sets it at such a level that incentivizes the debtor to choose the first best strategy, S_Q, in state L. Such α can always be found as the creditor is willing to accept higher α when compensated by a higher interest rate. From the creditor's participation constraint (1.6) we can see that in the extreme case of $\alpha = 1$, the interest rate would reach $r = \frac{1-p}{p}$.

Let us first consider what the first best solution looks like. The maximization problem in this case is

$$\max_{K \geq 0} \; V + pB\ln(K+1) + (1-p)\gamma K - K \tag{1.7}$$

and the first best level of K is

$$K^{FB} = \frac{pB}{1-(1-p)\gamma} - 1. \tag{1.8}$$

K^{FB} is the level of K that generates the highest surplus. Because the debtor has all the bargaining power and captures all the ex ante surplus, she would like to set $K = K^{FB}$. This will, therefore, be the optimal level of K with α and r adjusted to satisfy the ICC (1.5) and PC (1.6). Because the debtor's maximization problem does not lead to a unique solution for α and r – higher α implies higher r, but the optimal level of K and the ex ante expected profits of the debtor and the creditor remain the same – we assume that they are both set to the minimum level still satisfying the constraints. If $\alpha = 0$ and $r = 0$ satisfy the ICC for $K = K^{FB}$, then these are the optimal values. Whether this is possible depends on the model parameters. In particular, consider parameter B, which can be thought of as the project's upside or profitability, and denote the maximum value for which $\alpha = 0$ and $r = 0$ is compatible with the ICC as B_1. With these assumptions and notation the solution to the debtor's maximization problem can be shown to take on the values stated in the following proposition.

Proposition 1. The solution to the debtor's maximization problem with endogenous

determination of α is

$$
\begin{aligned}
K^{en} &= \frac{pB}{1-(1-p)\gamma} - 1 \quad = K^{FB}, \\
r^{en} &= \begin{cases} 0 & \text{if} \quad B \leq B_1, \\ \frac{1-p}{p}\left[1-(1-\alpha^*)\frac{V+\gamma K^{FB}}{K^{FB}}\right] & \text{otherwise,} \end{cases} \\
\alpha^* &= \begin{cases} 0 & \text{if} \quad B \leq B_1, \\ \frac{V+pB\ln(K^{FB}+1)-[1-(1-p)\gamma]K^{FB}}{V+\frac{p+(1-p)\pi}{\pi}\gamma K^{FB}} & \text{otherwise,} \end{cases} \\
S &= S_Q.
\end{aligned} \tag{1.9}
$$

The main point of the previous proposition is that when the degree of softness can be determined freely in the contract, the first best solution (level of investment and the optimal strategy choice) can always be attained. When the project is not too profitable ($B < B_1$), a completely tough law ($\alpha = 0$) will produce the first best solution. The debtor is never tempted to continue the project in the bad state and the creditor is always repaid in full, which means he is willing to accept $r = 0$. When, on the other hand, the project's profitability exceeds a certain threshold ($B \geq B_1$), the debtor needs to be incentivized to liquidate the project in the bad state by receiving a fraction of the firm's residual value. The creditor is not always repaid in full and needs to receive positive r in order to satisfy his participation constraint. The threshold B_1 depends positively on the firm's value V and the degree to which the project assets can be re-deployed elsewhere (γ). It depends negatively on the probability of the good state (p) and on the probability of project success in the bad state (π). The negative dependence on p results from the dependence of K^{FB} on p: higher p leads to higher K^{FB}, which increases the value of the project and makes it more tempting for the debtor to continue in the bad state.

In Appendix 1.A.2 we demonstrate the dependence of K, α and r on the model's parameters. The optimal investment K is linearly increasing in the project upside parameter B. α and r are discontinuous functions of B. They both equal zero as long as the ICC (1.5) can be satisfied for $K = K^{FB}$, $r = 0$, $\alpha = 0$; they both jump up discontinuously when this is no longer possible.

1.4 Exogenously Given Degree of Softness

The framework developed in the previous section allows us to analyze bankruptcy laws with various degrees of softness. In this section, we assume that α is given exogenously. We begin with the tough law case where $\alpha = 0$ and continue with the analysis of the soft law case where $\alpha > 0$.

1.4.1 Tough Bankruptcy Law

Under the tough law regime, α is exogenously set to 0, which means that the debtor receives nothing whenever the creditor is not paid in full. Only the choice of K and r in period 0 can be used to affect the debtor's decision on which strategy to choose in period 1. For the extensive form representation of the game under tough bankruptcy law see Figure 1.1 in Appendix 1.A.1.

There are two possible situations. First, the level of K is such that the debtor prefers S_Q in state L. In this case the debt is riskless and $r = 0$. The reason is that for such a contract to be feasible the debtor must obtain some payoff after quitting the project which, given $\alpha = 0$, also means that the bank will be repaid in full. Given that the debtor can credibly commit to strategy S_Q, the maximization problem becomes

$$\max_{K \geq 0} \{V + pB \ln (K + 1) + (1 - p)\gamma K - K\} \tag{1.10}$$

s.t.

$$\text{ICC:} \quad V + \gamma K - K \geq \pi[V + B \ln (K + 1) - K]. \tag{1.11}$$

Second, the level of K is such that the debtor prefers S_C in state L, which means that full repayment is no longer guaranteed (the project fails with probability $1 - \pi$) and, hence, r will be positive to compensate the bank for the risk. Because of the credit market competitiveness and the risk-neutrality assumption, the interest rate will only ensure that the bank will just break even in expected terms and its expected profit will be zero. Given that the debtor prefers strategy S_C in state L, the maximization problem becomes

$$\max_{K \geq 0, r \geq 0} \{[p + (1 - p)\pi][V + B \ln (K + 1) - (1 + r)K]\} \tag{1.12}$$

s.t.

$$\text{PC:} \quad [p + (1-p)\pi](1+r)K + (1-p)(1-\pi)V - K \geq 0. \tag{1.13}$$

In the former maximization problem, the participation constraint would be redundant as the creditor gets repaid for sure and is willing to lend at a riskless interest rate. On the other hand, in the latter problem, the incentive compatibility constraint is not needed because the contract involving S_C becomes optimal only when the distortion associated with satisfying the ICC for S_Q is so large that it becomes too costly to deter the debtor from the choice of the risky strategy S_C. Such a contract will automatically involve $r > 0$.[16]

We denote the contracts that solve the two problems as $\{K_Q^T, 0, 0, S_Q\}$ and $\{K_C^T, r_C^T, 0, S_C\}$, respectively. The superscript T stands for tough law and the subscripts Q and C for, respectively, quitting and continuation. The debtor decides which of the two types of contract to offer to the creditor. Thus she compares her ex ante payoff from the contract $\{K_Q^T, 0, 0, S_Q\}$ with that from the contract $\{K_C^T, r_C^T, 0, S_C\}$.

Quitting the Project in the Bad State

When the optimal contract is the one involving quitting in state L, then the problem given by (1.10) and (1.11) can be solved in the following way:

- As long as the ICC (1.11) is not binding for $K = K^{FB}$, the first best can be implemented: $\{K, r, \alpha, S_i\} = \{K^{FB}, 0, 0, S_Q\}$.

- When the ICC (1.11) is binding for $K = K^{FB}$ (K^{FB}, is too large for S_Q to be incentive compatible), we need to decrease K below its first best level to K_Q^T given by

$$(\gamma + \pi - 1)K_Q^T - \pi B \ln(K_Q^T + 1) + (1-\pi)V = 0. \tag{1.14}$$

  Although the solution cannot be obtained in the closed form, it can be shown that

$$\frac{\partial K_Q^T}{\partial V} > 0; \qquad \frac{\partial K_Q^T(\pi)}{\partial \pi} < 0; \qquad \frac{\partial K_Q^T(B)}{\partial B} < 0; \qquad \frac{\partial K_Q^T}{\partial p} = 0. \tag{1.15}$$

[16] This can be shown as follows. Suppose the debtor can repay the bank in full even after the project fails and there is only V left. The debtor thus remains in the residual claimant position in all the situations that may occur which rules out the gambling on resurrection type of moral hazard. Absent this type of moral hazard, the debtor would always choose the socially optimal strategy, which is S_Q.

Thus, under the tough law, given strategy choice S_Q,

$$K_Q^T = \begin{cases} \frac{pB}{1-(1-p)\gamma} - 1 & = K^{FB} \quad \text{if (1.11) is not binding,} \\ K_Q^T \text{ given by (1.14)} & < K^{FB} \quad \text{otherwise.} \end{cases} \tag{1.16}$$

Continuing the Project in the Bad State

When the optimal contract involves project continuation in state L, we can derive the following solutions to the problem given by (1.12) and (1.13):

$$K_C^T = [p + (1-p)\pi]B - 1 \quad = K_C^{FB} < K^{FB}, \tag{1.17}$$

$$r_C^T = \frac{1 - [p + (1-p)\pi]}{p + (1-p)\pi} \left(1 - \frac{V}{[p + (1-p)\pi]B - 1}\right) > 0 \tag{1.18}$$

where K_C^{FB} is the first best K *given that the project is always continued in period 1.* In this case, the investment level is smaller than the first best level and there is always a positive interest rate.

Optimal Contract under Tough Law

Ex ante the debtor decides which of the two types of contract to offer to the creditor. Thus she compares her ex ante payoff from the contract $\{K_Q^T, 0, 0, S_Q\}$ with that from the contract $\{K_C^T, r_C^T, 0, S_C\}$. The debtor will prefer the latter contract to the former, iff

$$\begin{aligned} [p + (1-p)\pi][V + B\ln(K_C^T + 1) - (1 + r_C^T)K_C^T] > \\ > V + pB\ln(K_Q^T + 1) + (1-p)\gamma K_Q^T - K_Q^T. \end{aligned} \tag{1.19}$$

If the debtor could always commit to S_Q in the contract, she would prefer this strategy ex ante and set the investment level to $K = K^{FB}$ which would maximize her ex ante expected payoff. However, for parameter values such that ICC (1.5) is violated for $K = K^{FB}$, the debtor would not honor the commitment. Thus, in order to make the commitment to S_Q incentive compatible, we need to have $K_Q^T < K^{FB}$, which leads to a debtor's profit smaller than the first best social gain. If this dead-weight loss becomes large enough, it is no longer optimal to decrease K any further. At this point, giving the debtor incentives to choose S_Q becomes more costly than accepting the choice of S_C. This means that S_C becomes the optimal strategy with investment level $K = K_C^T$ and interest rate $r = r_C^T$.

We now examine how K^T, r^T and the strategy choice evolve when we change the upside of the project, B, holding the other parameters – p, π, γ, V – constant. To facilitate the analysis, we use a special notation for two particular values of B. As defined already in section 1.3, B_1 denotes the level of B at which ICC (1.5) becomes binding for $K = K^{FB}$, i.e., the level at which the first best is no longer achievable under tough law. Now we denote B_2 the level of B at which the costs of inducing the debtor to choose S_Q equal the costs of choosing S_C over S_Q, i.e., for $B > B_2$ the optimal contract assumes continuation of the project in state L. It can be shown that $B_1 \leq B_2$. Referring to these two thresholds, we can describe the dependence of K^T on B.[17]

Proposition 2. Under the tough law,

$$K^T = \begin{cases} \frac{pB}{1-(1-p)\gamma} - 1 & = K_Q^{FB} = K^{FB} \quad \text{if} \quad B \leq B_1, \\ K_Q^T \text{ given by (1.14)} & < K^{FB} \quad \text{if} \quad B_1 < B \leq B_2, \\ [p + (1-p)\pi]B - 1 & = K_C^{FB} < K^{FB} \quad \text{otherwise,} \end{cases}$$

$$r^T = \begin{cases} 0 & \text{if} \quad B \leq B_2, \\ \frac{1-[p+(1-p)\pi]}{p+(1-p)\pi}\left(1 - \frac{V}{[p+(1-p)\pi]B-1}\right) & \text{otherwise,} \end{cases}$$

$$S_i^T = \begin{cases} S_Q & \text{if} \quad B \leq B_2, \\ S_C & \text{otherwise.} \end{cases}$$

Proposition 2 divides the projects under tough law environment into three categories. First, for projects whose upside relative to the firm's value is rather small ($B < B_1$), the first best amount of K can be lent by the creditor, since the debtor can credibly commit to liquidate the project in the bad state and repay the creditor in full. In this case, the debtor is able to cover the whole loss from the firm's residual value V and, therefore, acts in a socially optimal way, liquidating the project in the bad state. Second, for projects with medium upside relative to the firm's value ($B_1 \leq B < B_2$), if lent the first-best amount, the debtor would prefer to continue the project, because the vision of the project succeeding, however unlikely, is attractive enough for him to gamble on resurrection. K has to be decreased to make the quitting strategy more attractive (see Figure 1.7 in Appendix 1.A.2), which means the debtor can only obtain debt financing below the efficient scale. Third, for projects with upside too high relative to the firm's value ($B_2 \leq B$), it is not efficient to deter the debtor from continuing by reducing the

[17] Note again that we are interested only in those situations when $K_Q^{FB} > 0$ and the socially optimal strategy is S_Q.

invested amount. The best available solution is to accept ex ante that the project will continue regardless of the state of the world and reflect the risk of less-than-full repayment at a higher interest rate.

For projects in the second and third category, the problem with gambling on resurrection in the bad state arises due to the fact that the firm's value V is assumed to be fixed. The problem could be eliminated if the firm's value could be increased sufficiently, relative to the size of the project. This could be done by increasing equity financing. Therefore, in countries with functioning capital markets, the ex ante inefficiencies of the tough law are less of an issue because when facing such a project the debtor could raise new capital to bring the resulting leverage ratio to an acceptable level.[18]

The dependence of K on B is illustrated in Figure 1.8 in Appendix 1.A.2. Figure 1.9 then illustrates the debtor's expected profit in period 0 as a function of B. As we assume the credit market to be perfectly competitive, the debtor's expected profit represents the whole social surplus generated by the project.

1.4.2 Soft Bankruptcy Law

Having analyzed the moral hazard problem in a regime of tough bankruptcy law in section 1.4.1, we now move to a regime of soft bankruptcy law characterized by $\alpha > 0$. This regime enables the debtor of a bankrupt firm to always keep a fraction of the firm's value, even if the creditors are not paid in full. In other words, the soft law enables violation of APR.

An often-cited example of a soft bankruptcy law is the U.S. Bankruptcy Code, especially its reorganization chapter, Chapter 11. There is substantial evidence that the APR is often violated in Chapter 11 cases. Longhofer and Carlstrom (1995), for example, survey the existing empirical literature on APR violations and find, based on that literature, that in a sample of large corporations with publicly traded securities, APR violations occur in 75% of reorganizations.

We model the soft law by assuming exogenously given $\alpha > 0$ (the extensive form representation of this game is shown in Figure 1.2 in Appendix 1.A.1). As before, we are particularly interested in the effects on the debtor's strategy choice in state L and, implicitly, on the level of investment K and interest rate r.

[18] A testable hypothesis would be that in countries with tough bankruptcy laws, we should observe lower leverage ratios and also lower real interest rates.

The difference from the case of $\alpha = 0$ analyzed in section 1.4.1 is that if the debtor gambles on resurrection in state L and this gamble fails, she still keeps fraction $\alpha > 0$ of the firm's remaining value. Thus her expected payoff from continuation is larger by $(1-\pi)\alpha V$, which is added to the right hand side of ICC (1.11). To induce her to choose S_Q in state L for $K = K^{FB}$ and $r = 0$ the following modified ICC must hold:

$$V + \gamma K^{FB} - K^{FB} \geq \pi[V + B\ln(K^{FB} + 1) - K^{FB}] + (1-\pi)\alpha V. \tag{1.20}$$

In this case, by increasing the payoff from continuation in the bad state, the soft law makes the gambling on resurrection more attractive.

For $K = K^{FB}$ and $r = 0$ to be the solution, the value kept by the debtor after out-of-bankruptcy liquidation and full repayment must be larger than what she could obtain from filing for bankruptcy, i.e., the following must hold

$$V + \gamma K^{FB} - K^{FB} \geq \alpha(V + \gamma K^{FB}). \tag{1.21}$$

If the condition of having both (1.20) and (1.21) hold is violated, the solution with $K = K^{FB}$ and $r = 0$ cannot be achieved. It may still be possible to achieve a solution with $K = K^{FB}$ and $r > 0$, provided α is high enough to induce the debtor to choose S_Q, i.e., provided that

$$\alpha(V + \gamma K^{FB}) \geq \pi[V + B\ln(K^{FB} + 1) - (1 + r^S)K^{FB}] + (1-\pi)\alpha V, \tag{1.22}$$

where r^S is given by solving the bank's participation constraint (holding with equality) as

$$r^S = \frac{1-p}{p}\left[1 - (1-\alpha)\frac{V + \gamma K^{FB}}{K^{FB}}\right]. \tag{1.23}$$

In this case, as in the case with endogenous α, the debtor obtains a large enough share of the pie to induce him to act in the socially optimal way and to liquidate the project in the bad state. The bank, although not repaid in full in state L, is willing to finance the project at the socially efficient level because it is compensated by a higher payoff in state H.

When the project upside given by B is high and the law's degree of softness given by α is low (both (1.20) and (1.22) are violated), the first best cannot be achieved for the given α. The situation is then similar to the one under tough law. The optimal contract

$\{K^S, r^S, S_i\}$ will be determined as the solution to one of the following maximization problems:

1. **Quitting in state** L. In the optimal contract, $r = 0$ and the investment K is such that the debtor prefers S_Q in state L so that the creditor gets repaid in full. The maximization problem then becomes

$$\max_K \quad p[V + B\ln(K+1)] + (1-p)(V + \gamma K) - K \tag{1.24}$$

s.t.

$$V + \gamma K - K \geq \pi[V + B\ln(K+1) - K] + (1-\pi)\alpha V. \tag{1.25}$$

The optimal K is obtained by solving (1.25) held with equality, i.e., K^S is given by

$$(\gamma + \pi - 1)K^S - \pi B \ln(K^S + 1) + (1-\alpha)(1-\pi)V = 0. \tag{1.26}$$

2. **Continuation in state** L. K and r are such that in the bad state the debtor prefers to continue the project. The maximization problem becomes:

$$\max_{K,r} \quad [p + (1-p)\pi][V + B\ln(K+1) - (1+r)K] + (1-p)(1-\pi)\alpha V \tag{1.27}$$

s.t.

$$[p + (1-p)\pi](1+r)K + (1-p)(1-\pi)(1-\alpha)V - K \geq 0. \tag{1.28}$$

Here, the optimal investment is $K = [p+(1-p)\pi]B - 1 = K_C^{FB} < K^{FB}$. The optimal interest rate is positive and is obtained by substituting K_C^{FB} in the participation constraint (1.28) holding with equality.

When deciding which of the two possible contracts described above is the best, the debtor compares the expected payoffs from each, i.e., the values of the objective function at the optimal solution, and chooses the one with the highest payoff.

We now summarize the above derivations in the following proposition.

Proposition 3. Under the soft law with exogenously given α, the optimal levels of K and r are determined as follows.

- If (1.20) and (1.21) hold, $K^S = K^{FB}, r^S = 0, S_i^S = S_Q$.

- If (1.20) and (1.22) hold but (1.21) does not hold, $K^S = K^{FB}$, r^S is given by (1.23), and $S_i^S = S_Q$.

- If neither (1.20) nor (1.22) hold, then the first best is not attainable and $K < K^{FB}$. The debtor will decide between a contract involving quitting in the bad state (case 1 above) and a contract involving continuation in the bad state (case 2 above), depending on which of the contracts yields her higher expected profit in period 0.

The key conclusion of the soft law analysis is that if the law is not soft enough (if the constraint (1.22) is violated), it further worsens the gambling on resurrection problem observed under tough law by making the continuation strategy in the bad state more attractive for the debtor. The consequence is higher inefficiency given by the higher difference between the feasible (K^S) and the optimal (K^{FB}) investment level. If, on the other hand, the law is soft enough (if the constraint (1.22) holds), then the debtor behaves in the socially optimal way, liquidating the project in the bad state. The practical question is when the law is soft enough. For the parameters here, this is the case for $\alpha = 0.5$, meaning that the debtor would have to retain 50% of the firm's value in bankruptcy. Compared to the empirically observed values of the degree of softness under Chapter 11 – which range from 0% to 26.5%, with an average below 10% (as discussed in section 1.2.2) – this seems to be unrealistically high. If such a high level cannot be achieved in practice, then tougher law will produce better results.

1.5 Possibility of Verification under Tough Law

In this section, we explore the possibility of creditors' verification of the firm's information about the state of the world in period 1. We focus on the tough law setup ($\alpha = 0$) and introduce a new parameter to the analysis – the cost of verification, c. Verification offers another instrument, besides those explored in previous sections, to solve the gambling on resurrection problem and, possibly, to improve efficiency. We will show under what conditions it will be used and what benefits it brings. For the extensive form representation of the game, see Figure 1.3 in Appendix 1.A.1.

As discussed before, the debtor would like to commit to the socially efficient strategy, S_Q, ex ante because this would enable him to obtain financing in the amount K^{FB} and

would maximize the debtor's expected payoff. However, since the state of the world is the debtor's private information, such a commitment would not be credible if *ex post*, in state L, the debtor would prefer S_C. Previously we assumed that the only ways to solve this problem were to reduce K below the optimal level or to use APR violation to incentivize the debtor to choose the safe strategy. In this section we instead introduce the possibility that the bank is able to verify, at a certain cost, the debtor's report of the state of the world and, thus, make sure that the debtor liquidates the project in the bad state.

If the debtor reports state H, the bank can decide to verify this information, which costs it c. We assume a perfect monitoring technology is used: If the bank decides to verify, it will learn the true state with certainty. If it finds the state is H, nothing happens and the project continues to period 2. If it uncovers misreporting, i.e., if it finds that the state is L, it will take control of the business and obtain the lesser of full payoff $(1+r)K$ and the firm's entire value $V+\gamma K$. We denote q the probability that the bank will decide to verify the state of the world reported by the debtor. We also assume that following the discovery of misreporting, the debtor obtains nothing even if the bank is paid in full. This reflects the fact that the bank is in control and it will not exert any effort to obtain value in excess of $(1+r)K$.

Note that without this "punishment" assumption, partial verification ($q < 1$) would never be sufficient to induce the debtor to choose S_Q in situations in which she, without verification, would prefer S_C. This is simply because she could never do worse by lying than by truth-telling. Full verification ($q = 1$) would always be necessary in this case. Note also that the cost of verification, although paid by the bank, will eventually be borne by the debtor. This is because we assume a competitive credit market, which means that the bank's expected profit is zero under all circumstances and the whole surplus goes to the debtor. The verification cost cuts into this surplus.

Depending on the parameter values, the optimal solution for $\{K, r, S_i\}$ and q can take four different forms:

1. **No Verification, First Best**, $\{K^{FB}, 0, S_Q\}$ and $q = 0$. After borrowing $K = K^{FB}$ at $r = 0$, the debtor chooses S_Q in state L even without verification. Verification is unnecessary and will not be used. Note that this is the case of $B \leq B_1$.

2. **No Verification, First Best not Attainable**, $\{K < K^{FB}, 0, S_Q\}$ and $q = 0$. At $K = K^{FB}$ the debtor would choose S_C in state L but lowering K below the first

best level costs her less than the expected cost of verification she would have to pay the bank in the form of interest rate.

3. **Probabilistic Verification**, $\{K < K^{FB}, r = \frac{pcq}{K}, S_Q\}$ and $q > 0$. Without verification the debtor would choose S_C and a probabilistic verification ($0 < q < 1$) is sufficient to induce her to choose S_Q. This is the case when full repayment is possible after quitting the project, i.e., the debtor still receives a certain payoff following the choice of S_Q. $K < K^{FB}$ because the marginal cost of increasing K is higher than in the social planner's problem by $c\frac{\partial q}{\partial K}$. The bank has to be compensated for the expected verification cost pqc, thus $r = pqc/K > 0$. If the debtor reports H, the bank verifies with probability q which is set endogenously in such a way that the debtor never lies. He reports state H only when it really occurs, which happens with probability p. Thus, the ex ante probability that the bank will need to bear the verification cost c is pq.

4. **Full Verification**, $\{K = K^{FB}, r = \frac{pc+(1-p)[(1-\gamma)K-V]}{pK} > 0, S_Q\}$ and $q = 1$. If full repayment is impossible after the choice of S_Q in state L, the debtor would choose S_C for any $q < 1$. In order to induce the debtor to choose S_Q we therefore need to have $q = 1$. At this level of q, the marginal cost of increasing K is the same as in the social planner's problem (since $\frac{\partial q}{\partial K} = 0$) and we will have $K = K^{FB}$. The interest rate will again compensate the bank for the verification cost and also for the risk of less than full repayment if state L occurs.

5. **No Verification, Continuation**, $\{K_C^{FB} < K^{FB}, r = \frac{1-[p+(1-p)\pi]}{p+(1-p)\pi}\big(1 - \frac{V}{K_C^{FB}}\big), S_C\}$ and $q = 0$. The debtor may always offer a contract involving the choice of S_C in state L if she compensates the bank for the risk of less than full repayment in the case of project failure and keeps her participation constraint satisfied.

From these alternatives, the debtor will propose a contract that yields her the highest expected payoff and is feasible. Cases 1, 2 and 5 are the same as under tough law without verification. In what follows, we analyze problems 3 and 4 in more detail. Before that, however, we make some comments common to both of them.

First, we assume that the creditor can credibly commit to verifying with the probability $q^*(K, r)$ ex ante.[19] Otherwise, the creditor would have an inconsistency problem:

[19]This is a realistic assumption in the sense that the banking business is based on reputation and, thus, the bank's commitment is actually enforced by the other business it has. Committing to verification and then not doing it would have a reputational cost for the bank.

he would like to commit to verifying with probability q^* but – once this commitment is made and the debtor adapts his behavior in the desired way – to renounce this commitment and save the cost c. We would then have mixed-strategy equilibria which would complicate the analysis and lead us away from the point of our interest.

Second, unlike in the situation without verification, the expected payment of the firm to the bank is $K + pcq^*(K, r) > K$. If there is verification, the interest serves to compensate the bank for the actual verification cost that it incurs, not (or not only) for the risk of less than full repayment. Compared with the social planner solution, the verification cost is therefore a source of inefficiency.

Finally, note that the creditor will not want to increase q above $q^*(K, r)$ because this increases his cost without any increase in return – for $q = q^*(K, r)$ the debtor will choose S_Q anyway. Note also the discontinuity in the returns to increasing the verification probability q – for some $q < q^*(K, r)$ the bank will only ensure the choice of S_Q if it actually verifies, while for $q = q^*(K, r)$ the debtor will always prefer S_Q. Because of this discontinuity, the bank will either verify with probability $q = q^*(K, r)$ or not verify at all. Any intermediate level of q cannot be optimal.

1.5.1 Probabilistic Verification

Consider first the problem when full repayment is possible after the project is quit, which means that for the optimal K and r we have $V+\gamma K \geq (1+r)K$. In this case, probabilistic verification is sufficient to induce the debtor to quit in state L. In other words, q may always be set to such a level that the debtor prefers the sure payoff from quitting to the lottery induced by continuation.

The firm's maximization problem is then

$$\max_{K,r} \quad \{V + pB\ln(K+1) + (1-p)\gamma K - (1+r)K\} \tag{1.29}$$

s.t.

$$V + \gamma K - (1+r)K \geq (1-q)\pi[V + B\ln(K+1) - (1+r)K], \tag{1.30}$$

$$rK \geq pcq. \tag{1.31}$$

Equation (1.30) is the incentive compatibility constraint which ensures that the debtor will prefer S_Q. It is the analogue of (1.11) in the case without verification, the difference

being that the expected payoff from continuation is multiplied by the probability $(1-q)$ that misreporting will go through; with probability q, the bank will discover the misreporting, will seize control, and the debtor will receive nothing. Equation (1.31) is the participation constraint. We can express the optimal q from (1.30) held with equality as $q^*(K,r) = 1 - \frac{V+\gamma K-(1+r)K}{\pi[V+B\ln(K+1)-(1+r)K]}$, substitute it into (1.31) and solve the modified maximization problem. This yields the following first-order conditions:

$$(K) \quad p\frac{B}{K+1} + (1-p)\gamma - (1+r) + \lambda[r - pcq_K^*(K,r)] = 0, \tag{1.32}$$

$$(r) \quad -K + \lambda[K - pcq_r^*(K,r)] = 0. \tag{1.33}$$

Using (1.33) to express λ and substituting back to (1.32) yields

$$p\frac{B}{K+1} + (1-p)\gamma - (1+r) + \frac{K[r - pcq_K^*(K,r)]}{K - pcq_r^*(K,r)} = 0. \tag{1.34}$$

From equation (1.34) and from the participation constraint (1.31) holding with equality we can obtain the optimal levels of K and r for the situation in which the creditor verifies the firm's report in period 1 with probability $q \in (0,1)$, i.e., $K_p^V(q)$ and $r_p^V(q)$. Here, the superscript V denotes "verification", while the subscript p denotes that the verification is "partial".

Denote F_C the firm's payoff if the project ends successfully and F_Q the firm's payoff if the project is quit in period 1. Differentiating $q^*(K,r)$ with respect to K and r, we obtain

$$q_K^* = \frac{[(1+r)-\gamma]F_C - [(1+r) - \frac{B}{K+1}]F_Q}{\pi(F_C)^2} \geq 0, \tag{1.35}$$

$$q_r^* = \frac{K(F_C - F_Q)}{\pi(F_C)^2} \geq 0. \tag{1.36}$$

Because $q_r^* \geq 0$ and from (1.33) $\lambda = \frac{K}{K - pcq_r^*}$, we have $\lambda \geq 1$. The shadow cost associated with the participation constraint (in which q is endogenously determined to satisfy the ICC) is in general higher than one. This means that, in this regime, increasing the amount borrowed, K, by one dollar increases the expected costs (here the value of the debt) by more than one dollar because the verification probability q needs to be increased as well. This formally shows what we have already mentioned before, namely the fact that with probabilistic verification we will have $K < K^{FB}$.

The optimal probability of verification, $q^*(K, r)$, does not depend on c, but c affects whether verification will or will not be used. If the creditor verifies with probability $q^*(K, r)$, the debtor will always choose S_Q and the bank will always be repaid in full. The gain from verification for the bank is $(1-p)(1-\pi)[(1+r)K - V]$ and the cost is $pcq^*(K, r)$. The bank will, therefore, want to verify the firm's report if

$$c \leq \frac{(1-p)(1-\pi)}{p\ q^*(K_p^V, r_p^V)}[(1+r_p^V)K_p^V - V]. \tag{1.37}$$

1.5.2 Full Verification

Consider now the case when after quitting the project in state L full repayment is impossible. Because S_C offers her a positive payoff with at least some probability, the debtor would never choose S_Q for $q < 1$ and, therefore, we need to have $q = 1$. In this case the firm's maximization problem can be written as

$$\max_{K,r} \quad p[V + B\ln(K+1) - (1+r)K] \tag{1.38}$$

s.t.

$$p[(1+r)K - c] + (1-p)(V + \gamma K) - K \geq 0. \tag{1.39}$$

Because the bank always verifies the debtor's report ($q = 1$) the expected verification cost is pc. The first-order conditions are:

$$(K) \quad \frac{pB}{K+1} - (1+r)p + \lambda[p(1+r) + (1-p)\gamma - 1] = 0, \tag{1.40}$$

$$(r) \quad -pK + \lambda pK = 0. \tag{1.41}$$

From the FOC for r we have $\lambda = 1$. The marginal cost of borrowing an additional dollar is just one dollar. Using this in the FOC for K, we can obtain the solution for K,

$$K_f^V = \frac{pB}{1-(1-p)\gamma} - 1 = K^{FB}. \tag{1.42}$$

The intuition for this result is that in this regime, the verification probability is fixed, $q = 1$, and therefore the verification cost that the bank needs to be compensated for incurring is fixed as well at $rK = pc$. Therefore, if the cost does not change with K, the

optimal K will be the one maximizing the overall surplus, which is K^{FB}. Substituting K^{FB} into the participation constraint (1.39) holding with equality we obtain the following solution for r:

$$r_f^V = \frac{c}{K^{FB}} + \frac{1-p}{p}\left(1-\gamma-\frac{V}{K^{FB}}\right). \tag{1.43}$$

Because the gain from verification for the bank is $(1-p)[V+\gamma K-\pi(1+r)K-(1-\pi)V]$ and the cost of full verification is pc, the bank will want to verify the firm's report if

$$c \leq \frac{1-p}{p}\left\{\pi V + \left[\gamma - \pi(1+r_f^V)\right] K^{FB}\right\}. \tag{1.44}$$

1.5.3 Optimal Contract under the Possibility of Verification

In the previous sections, we have shown the optimal contracts under tough and soft bankruptcy laws, assuming the creditor cannot verify the state of the world in period 1. In other words, we have implicitly assumed the cost of verification to be prohibitively high. Under these circumstances, the feasible investment (K) was at social optimum until a certain level of the project upside (B), but fell short of the efficient level for higher upsides.

Once the cost of verification falls below a critical threshold, it starts to pay off for the creditor to verify the state of the world and the under-investment problem starts to diminish. For zero verification cost, the socially optimal investment level becomes feasible for all values of the project upside.

Figures 1.13 through 1.16 in Appendix 1.A.2 illustrate these findings by means of simulations.

1.6 Allowing for Renegotiation

So far, we have assumed away the possibility of renegotiation. Now, although we believe and argue below that this is not an unreasonable assumption, we will consider how the situation changes when renegotiation is allowed.[20] The first argument for not including renegotiation in the basic setup is that the bank may want to build a reputation of not being willing to renegotiate in order to prevent strategic defaults by other debtors. In our model, the bank does not need such a reputation because the debtor has nothing to gain from defaulting in the good state (we assume all the firm's value consists of verifiable

[20]For a general analysis of debt-renegotiation in bankruptcy see, e.g., Janda (2002).

assets, so the bank could turn to court to enforce the payment). However, in reality, strategic default may be an issue for the bank and it may have an incentive to develop such a reputation. The second reason is that under renegotiation, the bank effectively forgives part of the debtor's non-contingent payment specified in the contract. Although this may actually be more profitable for the bank than doing nothing and allowing the debtor to continue the project, relevant laws may treat such debt forgiveness by bank officers as illegal.

We describe the effects of renegotiation for the case of tough law and then only mention the differences under soft law. The only node in the game where renegotiation can take place is state L in period 1. In addition, considering renegotiation only makes sense in the suboptimal case when the first best cannot be reached, i.e., for $B > B_1$. In this case, the debtor has an incentive to continue the project although the action maximizing the firm's value is to quit the project. Therefore, there is room for a mutually advantageous renegotiation of the initial contract.

The bargaining situation is shown in Figure 1.17 in Appendix 1.A.2. The x-axis denotes the debtor's payoff, the y-axis the bank's payoff. The maximum payoff for both is $V + \gamma K$ and the line connecting these payoffs on the x- and y-axis is the Pareto frontier, with the slope -1. In the status quo point without renegotiation, the debtor's expected payoff is $\pi[V + B\ln(K+1) - (1+r)K]$ and the bank's expected payoff is $\pi(1+r)K + (1-\pi)V$. These payoffs also determine the threat points of the debtor and the bank denoted by P_d and P_b, respectively. The bargaining takes place between these two points on the Pareto frontier.

In state L, the debtor can contact the bank, reveal that state L occurred, and offer to quit the project if she receives a certain payoff. The maximum payoff the debtor can obtain depends on the bargaining powers of the debtor and the bank. We analyze two cases – first, when the debtor has all the bargaining power, and second, when the bank has all the bargaining power.

1.6.1 Different Allocations of Bargaining Power

Suppose first that the debtor possesses all the bargaining power within the renegotiation process, i.e., that the debtor is able to hold the bank down to its threat point P_b where its payoff is $\pi(1+r)K + (1-\pi)V$. The debtor's payoff from renegotiation in state L is, therefore, $V + \gamma K - \pi(1+r)K - (1-\pi)V$. The bank's and debtor's payoff in the

good state are the same as without renegotiation, i.e., $V + B\ln(K+1) - (1+r)K$ for the debtor and $(1+r)K$ for the bank. The debtor's maximization problem in period 0 can thus be written as

$$\max_{K,r} \quad [p + (1-p)\pi][V - (1+r)K] + pB\ln(K+1) + (1-p)\gamma K \tag{1.45}$$

s.t.

$$\text{PC:} \quad [p + (1-p)\pi](1+r)K + (1-p)(1-\pi)V - K \geq 0. \tag{1.46}$$

If, alternatively, the bank has all the bargaining power, the debtor is held down to her threat point and her payoff from the renegotiation in state L is therefore the same as from continuation, i.e., $\pi[V + B\ln(K+1) - (1+r)K]$. The bank captures the rest of the firm's value after quitting the project, which is equal to $V + \gamma K - \pi[V + B\ln(K+1) - (1+r)K] < (1+r)K$.[21] In state H the payoffs are again the same as without renegotiation and the debtor's maximization problem can be written as

$$\max_{K,r} \quad [p + (1-p)\pi][V + B\ln(K+1) - (1+r)K] \tag{1.47}$$

s.t.

$$\text{PC:} \quad p(1+r)K + (1-p)\{V + \gamma K - \pi[V + B\ln(K+1) - (1+r)K]\} - K \geq 0. \tag{1.48}$$

[21] The inequality can be explained as follows. As mentioned above, renegotiation will only take place in the suboptimal case where the debtor would prefer to continue the project at $K = K^{FB}$, while the optimal strategy is to quit the project. This means that the debtor's expected payoff from continuation is higher than from quitting and paying the bank in full. Therefore, if after quitting the debtor receives as much as she expects to gain from continuation, the bank cannot be repaid in full.

1.6.2 Optimal Contract under Renegotiation

The solutions to the two alternative maximization problems are

$$K^T_{Rd} = K^T_{Rb} = \frac{pB}{1-(1-p)\gamma} - 1 = K^{FB}, \tag{1.49}$$

$$r^T_{Rd} = \frac{1-[p+(1-p)\pi]}{p+(1-p)\pi}\left(1 - \frac{V}{\frac{p}{1-(1-p)\gamma}B - 1}\right), \tag{1.50}$$

$$r^T_{Rb} = \frac{1-[p+(1-p)\pi]}{p+(1-p)\pi}\left[1 - \frac{V}{\frac{p}{1-(1-p)\gamma}B - 1}\right. \tag{1.51}$$

$$\left. - \frac{\gamma - \pi B \ln\left(\frac{p}{1-(1-p)\gamma}B\right)}{(1-\pi)\left(\frac{p}{1-(1-p)\gamma}B - 1\right)}\right] < r^T_{Rd}, \tag{1.52}$$

where subscripts Rd and Rb denote the treatment with renegotiation when all the bargaining power resides with the debtor (Rd) or the bank (Rb), respectively; T indicates the tough law regime ($\alpha = 0$).

We see that when renegotiation is possible, then irrespective of whether the debtor or the bank is in the position of making the take-it-or-leave-it offer, the first best can be attained. The optimal investment level in both cases is $K = K^{FB}$ and the debtor follows strategy S_Q in state L. The distribution of the bargaining power only affects, in a predictable way, the interest rate. The intuition behind having $r^T_{Rd} > r^T_{Rb}$ is the following. Because the bank is supposed to just break even in period 0, then a higher payoff from renegotiation in state L enables it to decrease the payoff in state H, which means to decrease the interest rate.

Under the soft law, renegotiation would also occur only in state L and only if the debtor would, without renegotiation, prefer to continue the project. The situation would be similar as under tough law; only the status quo payoffs and therefore the threat points of the parties would shift. Renegotiation would again enable the parties to attain the first best. The interest rate would be higher than under tough law because the debtor's threat point is higher and the bank's threat point is lower, which increases the debtor's and decreases the bank's payoff from renegotiation. This holds irrespective of who has more bargaining power.

1.7 Conclusion

Soft bankruptcy laws are believed to mitigate the gambling on resurrection problem by not fully wiping out the existing shareholders in the case of financial distress. Our model confirms this stylized fact; our main conclusion is, however, that the degree of softness needs to be sufficiently high to achieve this result. If the law is not soft enough, the situation reverses to "the tougher, the better".

We see two practical issues with the soft law. First, although a sufficiently soft law outperforms a completely tough one, it can be very difficult to find the optimal degree of softness for a given economy – there is no one-size-fits-all solution both in terms of different projects and different creditor types. Hence it might seem reasonable for the policy maker to fully preserve APR, rather than trying to find the optimal degree of APR violation. Moreover, could the optimal degree be found, it might still be impossible to reach it in practice. Even the best-known example of a clearly soft law, Chapter 11, is empirically documented as being substantially tougher than the optimal degree of softness found in our paper.

This paper deals with the situation in which the debtor can stop a project at a time when substantial value can still be recovered. The practical benefits of the APR violation may occur once the bankruptcy procedure has been started, by motivating the debtor to cooperate. How these benefits compare with the drawbacks identified in our paper is a question which deserves further research.

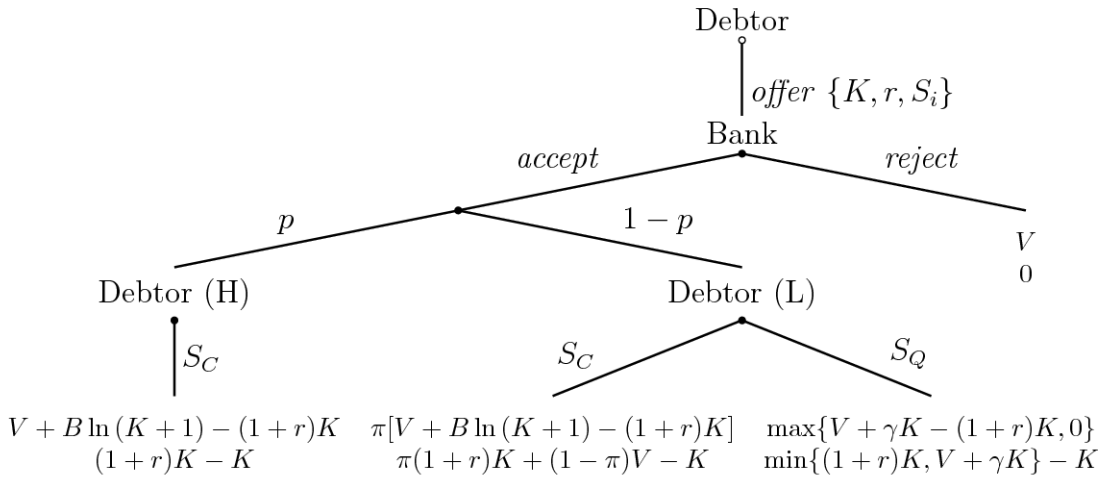
1.A Appendix

1.A.1 Extensive Form Representations

Tough Law

Figure 1.1 provides the extensive form representation of the tough law regime as analyzed in section 1.4.1. If state H occurs, the debtor continues for sure in order to get the upside payoff $V + B\ln(K+1) - (1+r)K$ (because quitting would yield him $V + \gamma K - (1+r)K$, which is lower) and the creditor is repaid in full. However, if state L occurs, the debtor can either misreport and choose a risky continuation to get the upside with probability π or safely quit. If she quits, then either she can repay full $(1+r)K$ to the bank and keep $V + \gamma K - (1+r)K$ or the residual value is insufficient for full repayment so that the debtor gets nothing and the bank gets back less than what was specified in the contract. If the debtor misreports in state L and follows S_C, the creditor gets full repayment with probability π and a partial repayment V with probability $(1-\pi)$. The creditor's payoff from rejecting the offered contract in the beginning, 0, represents the outside option from which the participation constraint is derived.

Figure 1.1: Extensive Game under Tough Law



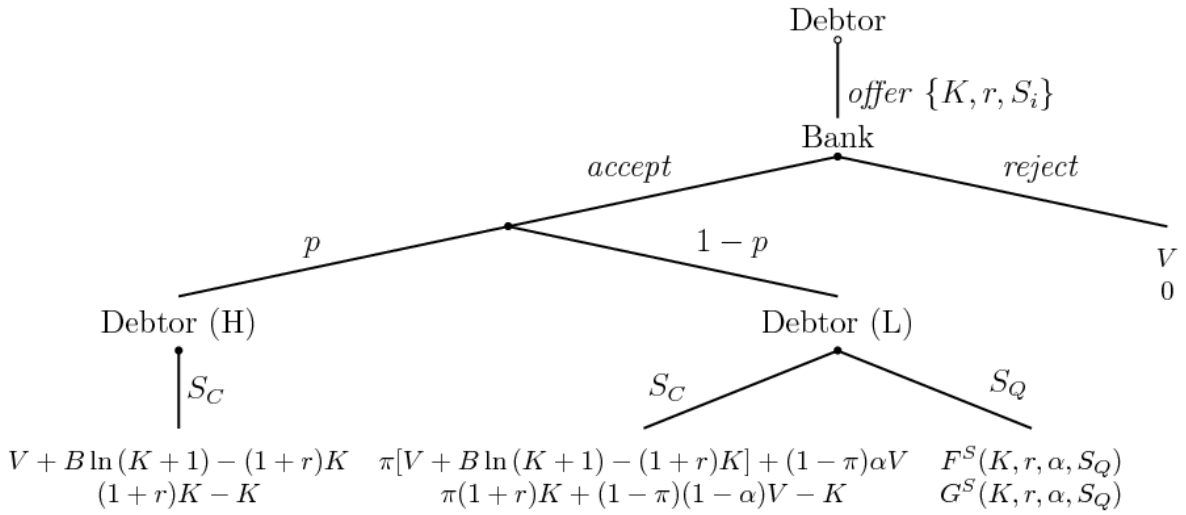
When analyzing the tough law regime, we assumed $V + \gamma K \geq (1+r)K$ so that quitting of the project in state L does not lead to bankruptcy. Had this assumption been violated, there would be no way to induce truth-telling and choice of S_Q in state L. However, as we show in the following paragraph, that assumption did not limit our analysis in any

way – whenever our solution in Proposition (2) implies $K^T = K^{FB}$, the assumption that $V + \gamma K \geq (1 + r)K$ always holds.

Soft Law

The extensive form representation of the soft law regime with exogenous α analyzed in section 1.4.2 is shown in Figure 1.2. The game with endogenous determination of α as analyzed in section 1.4.2 would look the same with α being added as the fourth parameter of the contract offered by the debtor to the creditor in period 0.

Figure 1.2: Extensive Game under Soft Law



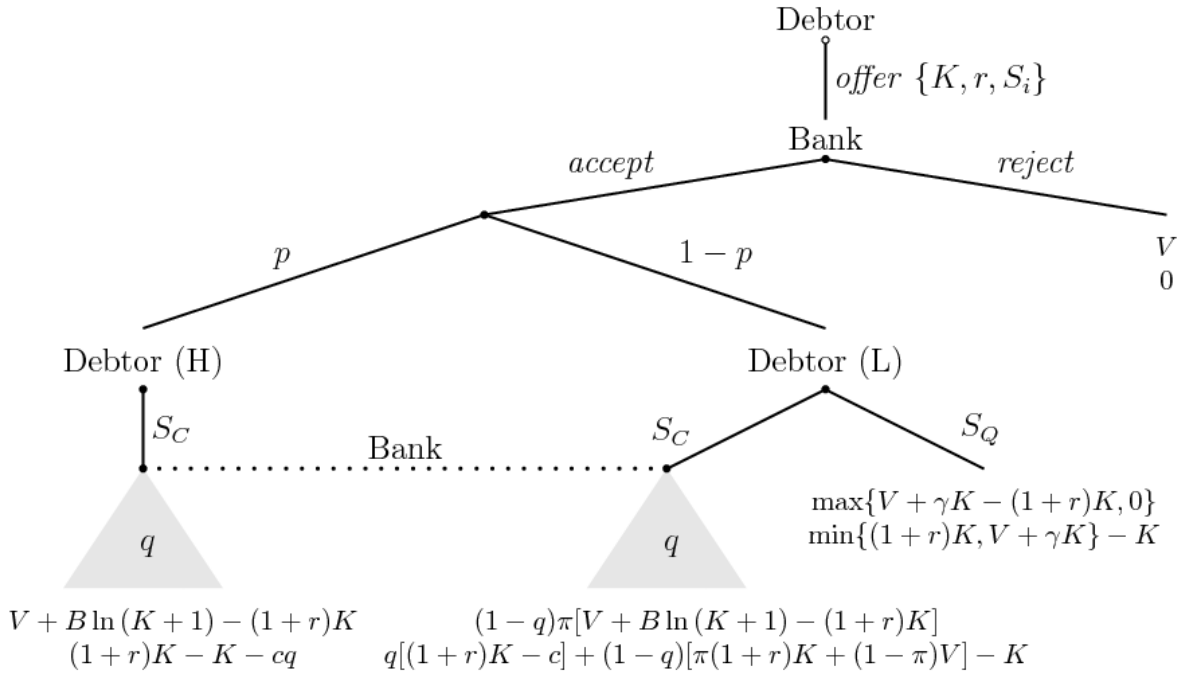
$$\text{where} \quad \begin{bmatrix} F^S(K,r,\alpha,S_Q) \\ G^S(K,r,\alpha,S_Q) \end{bmatrix} = \begin{bmatrix} \max\{V+\gamma K-(1+r)K;\alpha(V+\gamma K)\} \\ \min\{(1+r)K;(1-\alpha)(V+\gamma K)\}-K \end{bmatrix}$$

When state H occurs, the firm remains solvent and the payoffs are the same as under tough law. What changes are payoffs from both strategies after state L is observed by the debtor. The debtor's payoff from continuation is increased at the expense of the creditor by $(1 - \pi)\alpha V$. The debtor's payoff from quitting becomes either $V + \gamma K - (1 + r)K$ with full repayment $(1 + r)K$ to the creditor or $\alpha(V + \gamma K)$ with partial repayment $(1 - \alpha)(V + \gamma K) - K$ to the creditor.

Tough Law with Verification

Finally, Figure 1.3 depicts the game under the tough law regime with verification. In addition to the situation depicted in Figure 1.1, the bank has a chance to verify the state of the world if the debtor claims to be in state H and continues. Thus the verification cost cq enters the bank's payoffs. The debtor's payoff from misreporting is decreased by fraction q which represents the probability of being caught lying.

Figure 1.3: Extensive Game under Tough Law with Verification

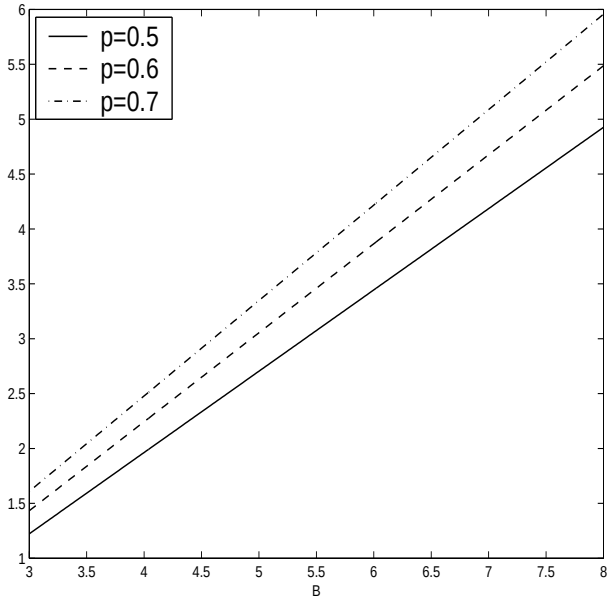


1.A.2 Graphical Simulations

Endogenous Degree of Softness

We consider the following parameter values: $V = 1$, $\gamma = 0.65$, and $\pi = 0.2$. We further consider three different values of p, namely 0.5, 0.6, and 0.7. Given these parameter values, we consider the dependence of K, α and r on the project upside B. Figure 1.4 depicts the dependence of K on B. In the whole range, the dependence of the investment level K on the project upside B is positive and K is higher for higher probability of high state p.

Figure 1.4: Optimal Investment Level under Endogenous Degree of Softness



More interesting are the functions for α and r, which are depicted in Figure 1.5 and Figure 1.6. They both equal zero as long as the ICC (1.5) can be satisfied for $K = K^{FB}$, $r = 0$, $\alpha = 0$; they both jump up discontinuously when this is no longer possible. The discontinuous jump in α is necessary to satisfy the ICC. For $B \leq B_1$ the amount that remains to the debtor after quitting and paying back in full is sufficient to induce her to quit because it is larger than the expected payoff from continuation. For $B > B_1$ this no longer holds and the debtor must receive more than after full repayment to be induced to quit, which is achieved by setting α to such a level that $\alpha(V + \gamma K)$ is larger than the expected return from continuation. When α jumps up then r must jump up as well to satisfy the creditor's PC.

Figure 1.5: Degree of Softness Consistent with the Optimal Strategy

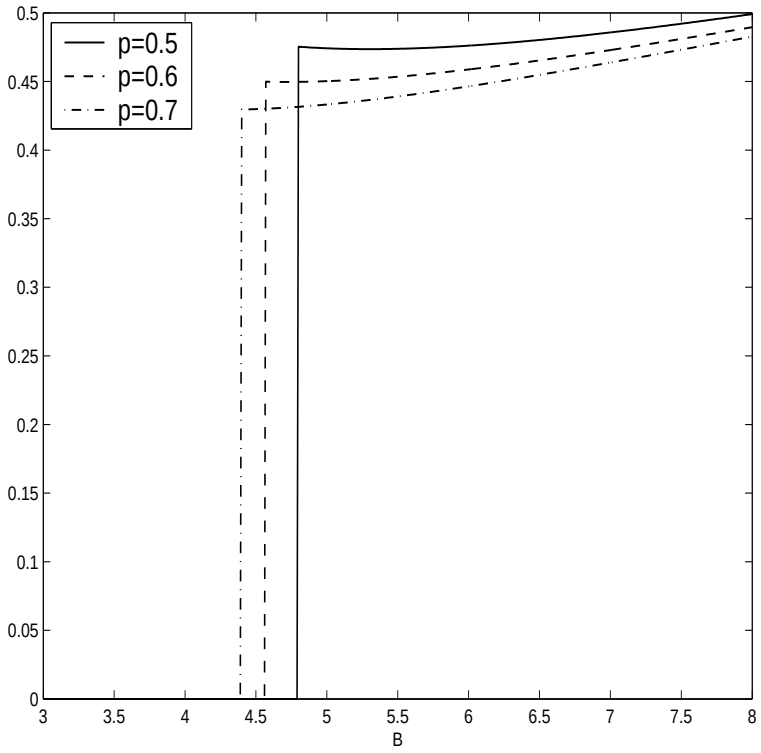
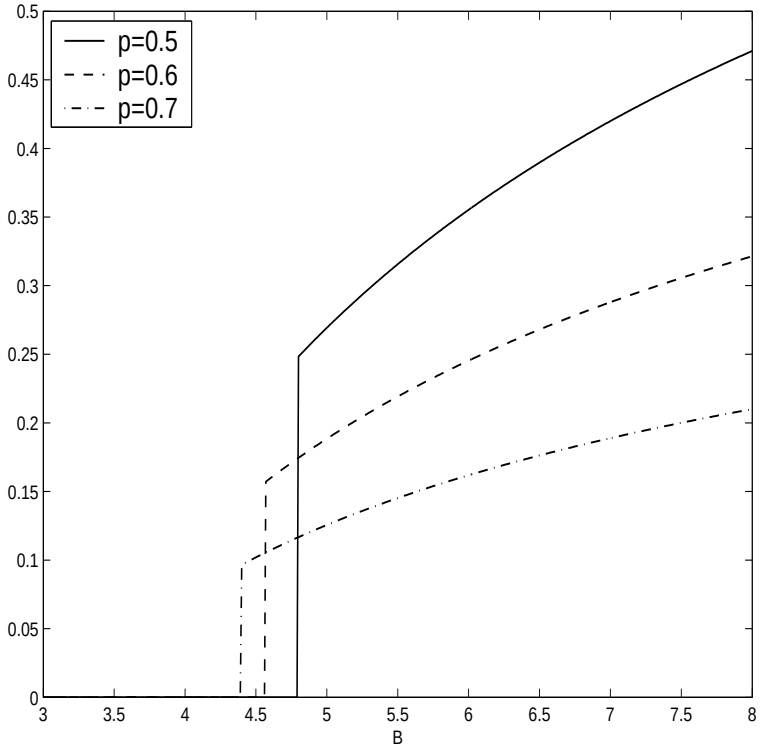


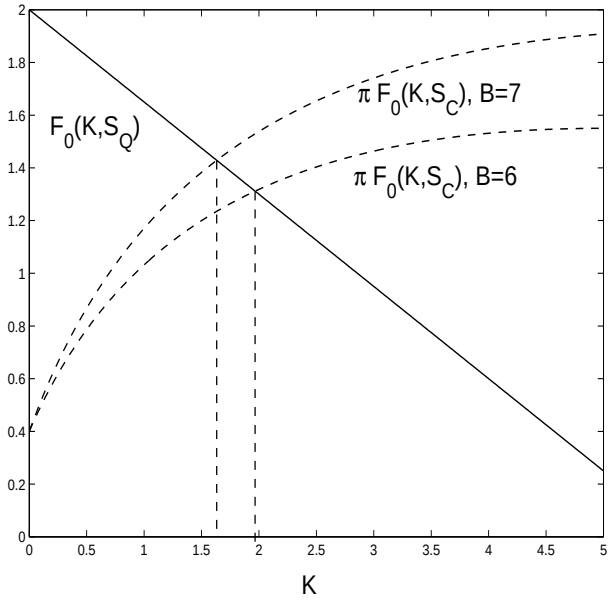
Figure 1.6: Interest Rate under Endogenous Degree of Softness and Optimal Strategy



Exogenous Degree of Softness, Tough Law

For a given K higher B increases the payoff from continuation while leaving the payoff from quitting unchanged (Figure 1.7). Thus, the higher B is the lower level of K compatible with the strategy to quit.

Figure 1.7: Debtor's Payoff from Continuation and from Quitting



The dependence of K on B is illustrated in Figure 1.8. Assuming $p = 0.6$, $\pi = 0.2$, $\gamma = 0.65$, and $V = 1$, the firm is able to finance the project on the efficient level $K = K^{FB}$ for $B \leq B_1 = 4.56$. At $B = B_1$, $K^T = K^{FB} = 2.70$. For values of $B > B_1$, K^T is decreasing in B to satisfy the incentive compatibility constraint (1.11). It reaches a minimum of 2.17 at $B_2 = 5.52$. At this point the inefficiency from further decreasing K exceeds that from choosing strategy S_C and, thus, S_C becomes the optimal strategy for the debtor. K jumps up discontinuously to 3.77. At this point, the interest rate also becomes positive, in particular, at $B = B_2$, $r = 0.11$. At the level of B_2, the expected profits of the debtor from both S_C and S_Q are the same and equal to 4.21.

Figure 1.9 then illustrates the debtor's expected profit in period 0 as a function of B. As we assume the credit market to be perfectly competitive, the debtor's expected profit represents the whole social surplus generated by the project. For $B \leq B_1$, the profit is the same as the first best social gain and the debtor follows S_Q. For $B_1 < B \leq B_2$, the profit falls short of the first best social gain but the debtor still follows S_Q. For $B > B_2$, the debtor prefers S_C and the profit falls short of the first best, but with B increasing the gap attenuates.

Figure 1.8: Investment Level under Tough Law

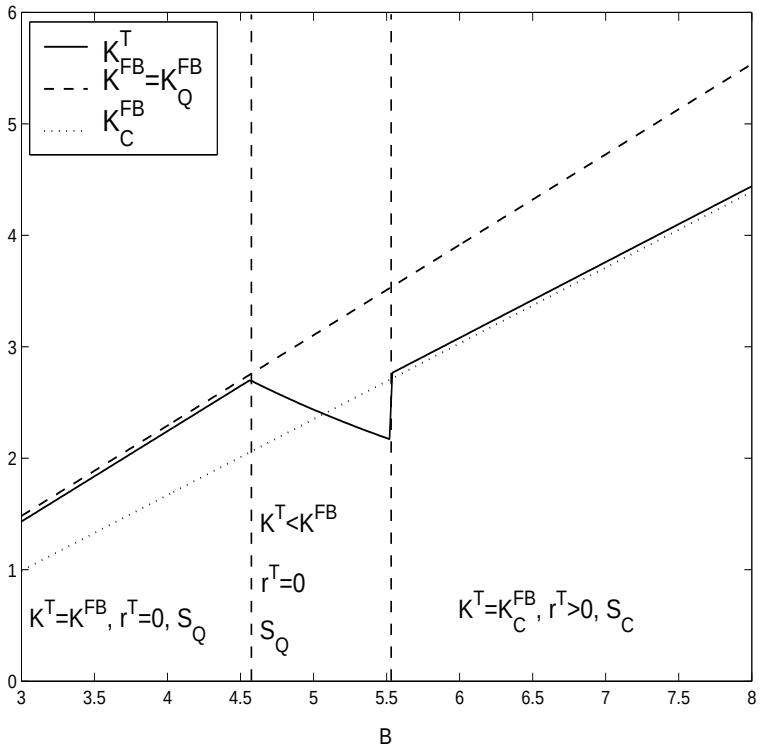
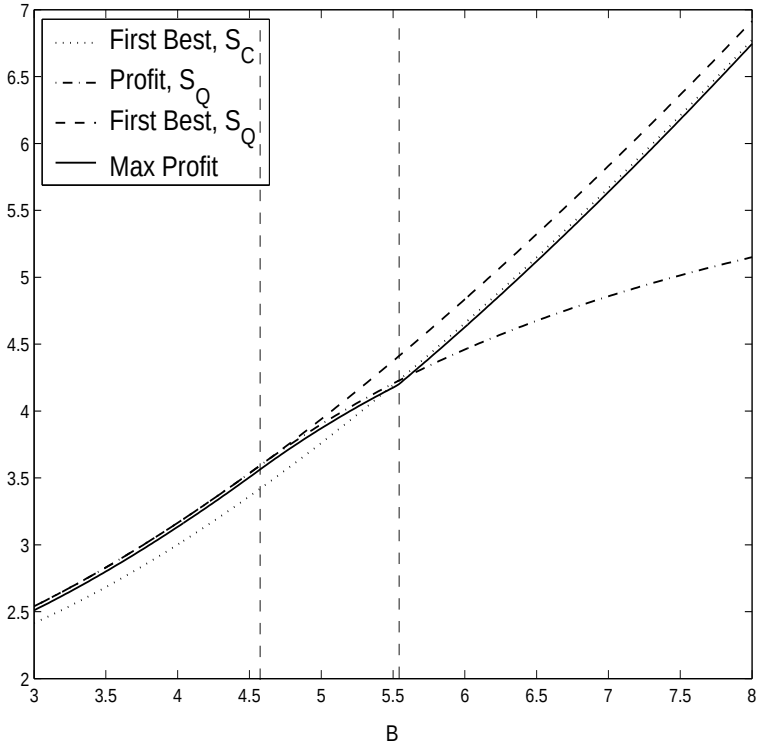


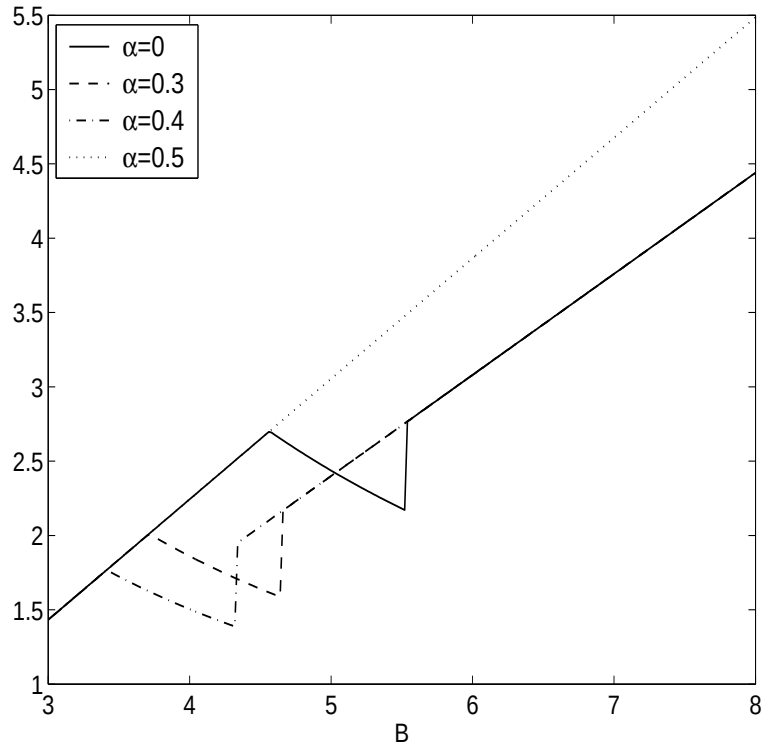
Figure 1.9: Debtor's Profit under Tough Law



Exogenous Degree of Softness, Soft Law

Simulations of the dependence of optimal K, r, and the debtor's profit on B and α are provided in Figures 1.10 through 1.12. Figure 1.10 shows that if α is high enough, the first best can be achieved. This is the case for $\alpha = 0.5$ which is sufficient to induce the debtor to choose S_Q for all levels of B. If α is not high enough to make the debtor choose S_Q, K essentially follows the same pattern as under tough law. For sufficiently low $B's$, K is identical with the first best and the debtor chooses S_Q. For $B's$ above a certain level (B_1), choosing S_Q is made credible only by decreasing K below K^{FB}. When ensuring S_Q by further decreasing K becomes too costly, S_C becomes the strategy to be chosen in state L and optimal K is adjusted accordingly, i.e., it jumps upward to K_C^{FB}, the optimal level *given the choice of* S_C *in state* L. The difference is, as already mentioned above, that S_C is now more attractive due to the APR violation after the project failure (the payoff from S_C rises by the term $(1-\pi)\alpha V$), so the constraint making S_Q incentive compatible starts to bind for lower upsides, and K needs to drop below the efficient level at a lower B.

Figure 1.10: Investment Level under Soft Law



Figures 1.11 and 1.12 then show the optimal interest rate and corresponding debtor's expected payoff, respectively.

Figure 1.11: Interest Rate under Soft Law

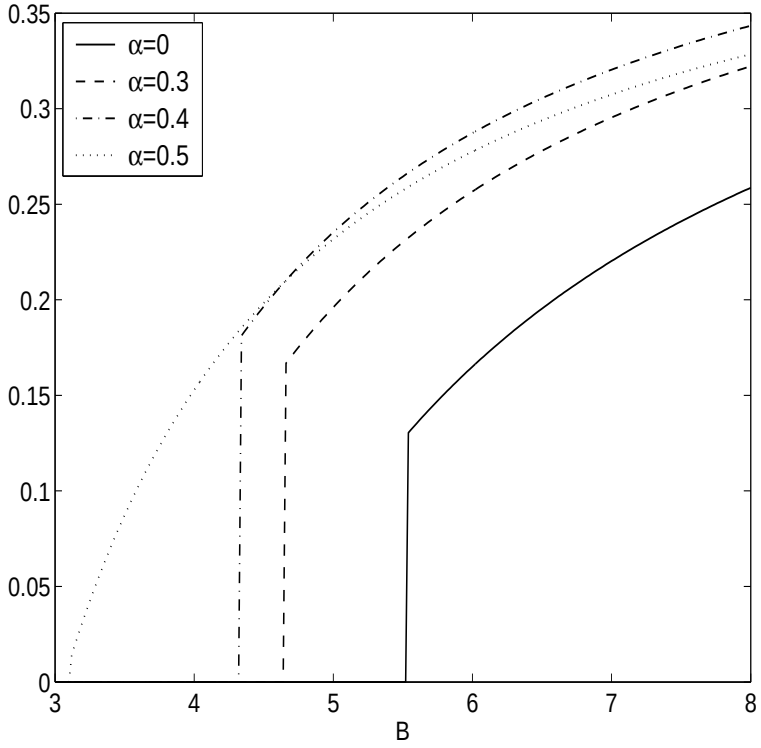
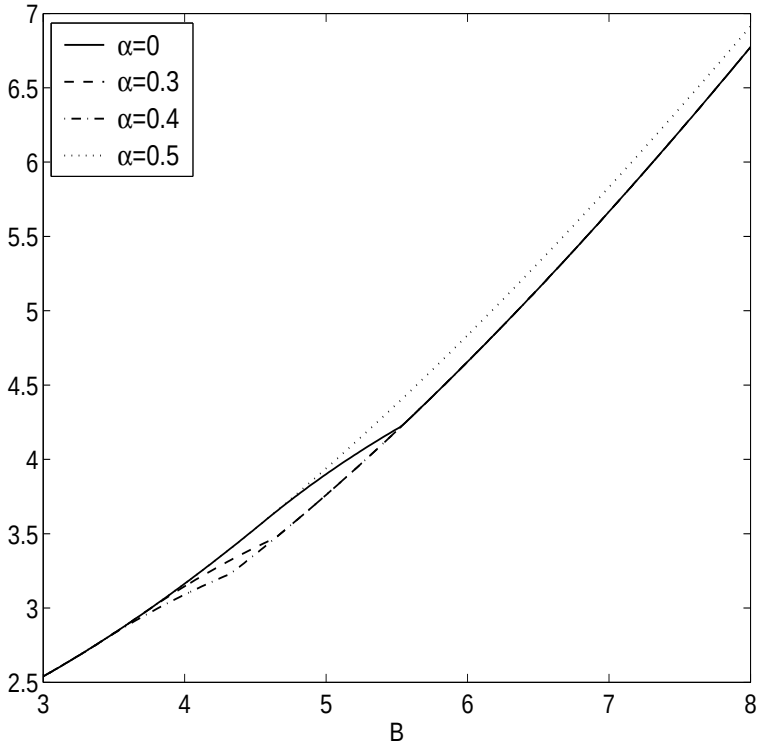


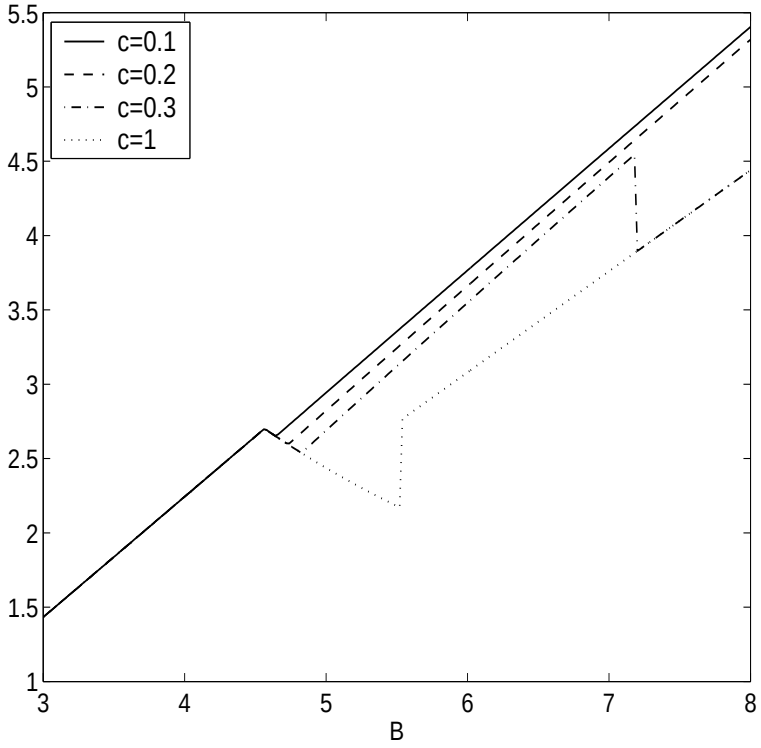
Figure 1.12: Debtor's Profit under Soft Law



Tough Law, Verification

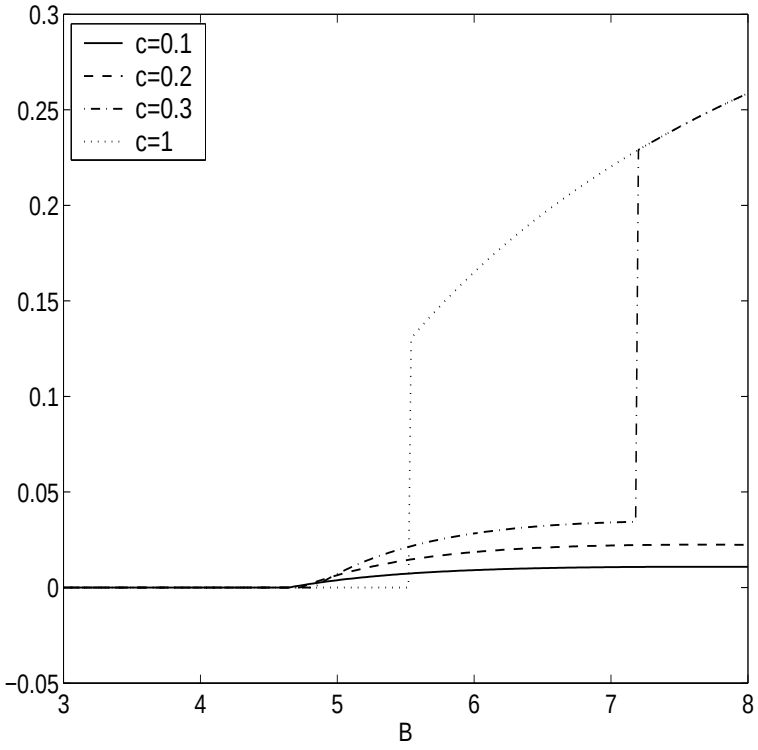
When verification is possible, then for $B \leq B_1$, the solution is the same as without verification and is identical with the first best. This represents the first part of the line in Figure 1.13 common to all levels of c. Above this level of B, quitting the project for $K = K^{FB}$ is not incentive compatible. For $B's$ only slightly above B_1 it is less costly to induce the debtor to quit by decreasing K below K^{FB} than to use verification. The lower the verification cost c, the lower the level of B at which verification starts to be used. From this point on, K is increasing in B although lower than K^{FB} as long as $q < 1$. For $c = 0.2$ and $c = 0.3$ the payoff from S_C eventually exceeds that from S_Q at a certain level of B. From this point on, the debtor will offer a contract assuming continuation in state L and K will be adjusted accordingly – it will be equal to K_C^{FB}, the optimal level *given the project is always continued.*

Figure 1.13: Investment Level with Verification Possibility



The interest rate, depicted in Figure 1.14, becomes positive at the level of B at which verification starts to be used. As mentioned above, it compensates the bank for the verification cost and, therefore, is lower for lower c. When S_C becomes the debtor's optimal strategy, the role of the interest rate changes – it compensates the bank for the risk of less than full repayment, as under the case without verification. At this point, the interest rate jumps upward.

Figure 1.14: Interest Rate with Verification Possibility



The debtor's payoff, depicted in Figure 1.15, is the same for all levels of c as long as verification is not used. From this point on, the lowest c, naturally, is associated with the highest expected payoff. When S_C becomes the optimal strategy, c does not affect the expected payoff any longer and, therefore, from this point on, it is the same for $c = 0.2$ and $c = 0.3$.

As Figure 1.16 shows, higher c means that verification starts to be used ($q > 0$) at higher B and that S_C becomes the optimal strategy at lower B. The range of $B's$ for which verification is used attenuates.

Figure 1.15: Debtor's Profit with Verification Possibility

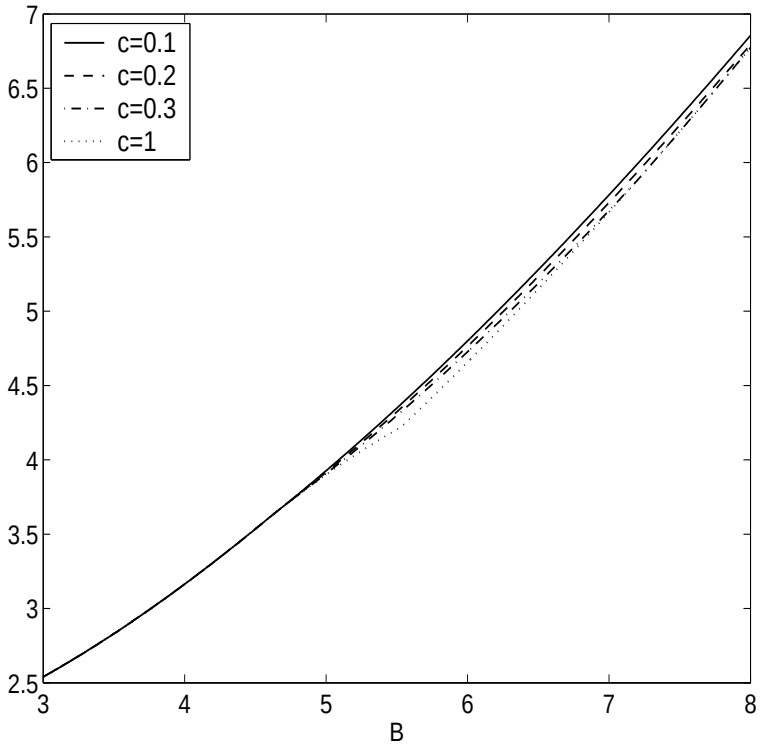
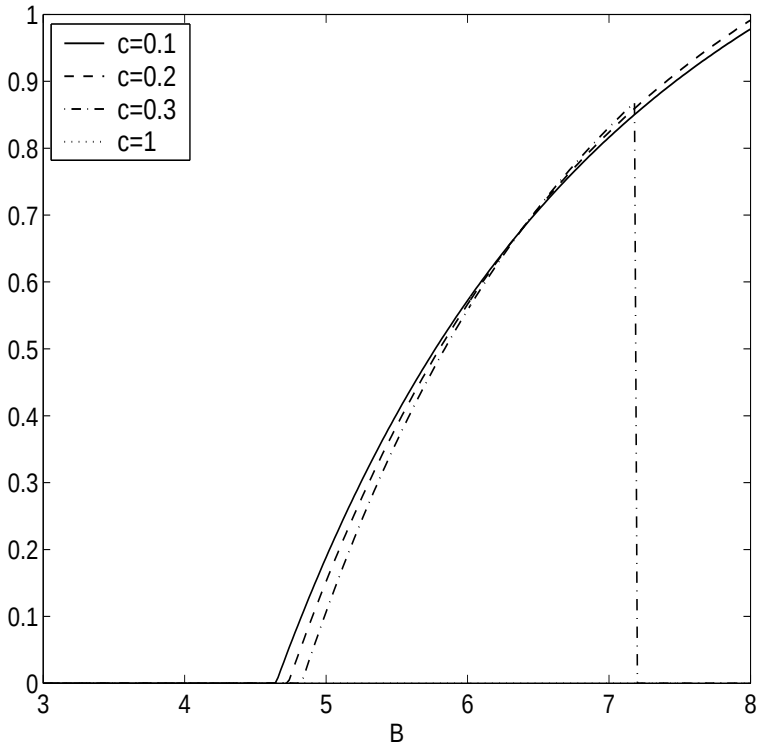
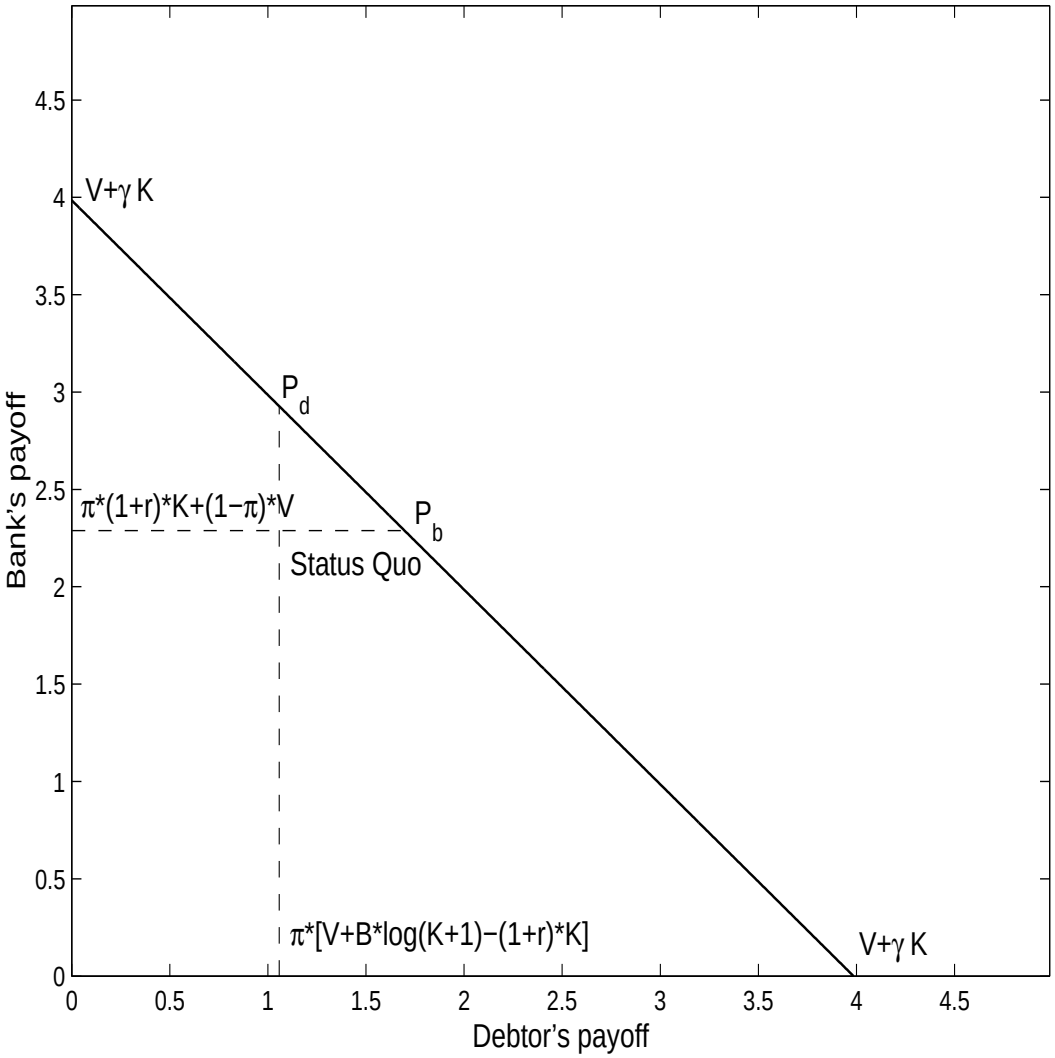


Figure 1.16: Probability of Verification



Renegotiation

Figure 1.17: Renegotiation



Chapter 2

Judges' Bias Towards Continuation in Bankruptcy: The Case of the Czech Republic

Abstract

I document that the recent Czech bankruptcy practice tended to delay the ultimate exit of a firm when it can be expected to have a harsher ex-post effect on the firm's employees. I regress bankruptcy duration on unemployment rate, size and other controls, applying three alternative methods – OLS regression, parametric duration (survival) analysis, and quantile regression – on the cross-section population of 903 Czech corporate bankruptcies that were completed during 2004 by the distribution of returns among creditors. I show that bankruptcy procedures last longer in an environment with higher unemployment rate. Moreover the magnitude of the unemployment rate's effect on duration increases with the firm's size. These results are observed for the first four years of a bankruptcy procedure, after which they are no longer evident.

Keywords: corporate bankruptcy, judicial discretion, analysis of duration
JEL classification codes: C31, C41, G33

2.1 Introduction

Until recently, Czech bankruptcy procedures had been, according to World Bank statistics, the lengthiest in Europe and the second lengthiest in the world.[1] Between 1991-2007, the Czech bankruptcy system was defined by the Act on Bankruptcy and Composition[2] that was increasingly criticized by local and international experts. Only in 2008, the Czech bankruptcy system was reformed by the introduction of a completely new Insolvency Act[3] to replace the Act on Bankruptcy and Composition. In this paper, I show that one of factors prolonging Czech corporate bankruptcy procedures under the old bankruptcy regime was judges' bias towards continuation.

The Act on Bankruptcy and Composition, defined the goal of the procedure in not more than one sentence: "The goal of bankruptcy and composition is to reach relative satisfaction of creditors from the bankruptcy estate under conditions set in the Act."[4] Although the definition is quite vague, it suggests that bankruptcy judges should act in the interest of creditors. But did they? This paper aims to shed light on the judges' behavior. The way judges approach bankruptcy played a substantial role as the law entrusted them with a large degree of discretion.[5]

During the last two decades, the Czech Republic has undergone a systemic change from a centrally planned economy of a Soviet type to a market economy of a Western type. While formal institutions (written norms and rules, laws) can change quickly, informal institutions (e.g. judges' approach to the law in our case) develop very slowly.[6] Some of the behavior of judges under the old regime can be expected to be present also under the new regime and to play a role in what effects the new law will deliver.

A seminal article on judges' bias towards continuation has been written by Weiss and Wruck (1998). The authors analyzed the behavior of judge Burton Lifland in the Eastern Airlines' bankruptcy. Judge Lifland had a reputation as a pro-debtor judge, described by a Forbes magazine article entitled 'A Bankrupt's Best Friend' as a judge who "believes that when Congress (...) reformed Chapter 11, it wanted to give high priority to keeping bankrupt businesses going rather than having them liquidated for the benefit of creditors.

[1] See WorldBank (2008). As of 2007, only India out of the sample of 149 countries was reported to have lengthier bankruptcy procedures than the Czech Republic.

[2] Act No. 328/1991 Coll., 30-times amended during 1991-2007.

[3] Act No. 182/2006 Coll., in force since 1 January 2008.

[4] Par. 2/3 of the Act on Bankruptcy and Composition

[5] See Mitchell (1998) or Richter (2004).

[6] See North (1990) for the concept of path dependency and formal versus informal institutions.

Lifland's pro-debtor reputation is so widespread that companies which want to stiff their creditors are known to 'forum shop' to get their cases before him."[7] The authors concluded that the Eastern Airlines case illustrated "how court-sponsored asset stripping can destroy value" and argued that this was evidence of a problem with the US Chapter 11 itself.

A number of researchers have analyzed time spent in Chapter 11 reorganization in the US.[8] Bandopadhyaya (1994) etimated the hazard rate of a firm's exit from Chapter 11 protection using the Weibull duration model. Li (1999) applied a Bayesian approach to estimating duration models to predict time spent in Chapter 11 on the default data of high yield bonds. Orbe, Ferreira, and Nunez-Anton (2002) applied a censored partial regression model on the same data. Partington et al. (2001) and later Stevenson et al. (2007) used Cox's proportional hazard model to predict the duration of Chapter 11 bankruptcy. Denis and Rodgers (2007) estimated the determinants of Chapter 11 bankruptcy duration using ordinary least squares regressions. While all these papers were limited to Chapter 11, Helwege (1999) analyzed which factors determined the length of time US junk bonds spent in default, using both ordinary least squares regressions and the proportional hazard function model (with qualitatively the same results).

Such kind of research for European jurisdictions is very rare and started only recently. Dewaelheyns and Hulle (2007) applied hazard regression models to estimate duration of Chapter-11-like reorganizations in Belgium and found, inter alia, that Belgian reorganizations are less efficient and lengthier compared to the results that have been documented on the US firms in Chapter 11. In the European context, an interesting empirical paper on judges' decision-making in resolving financial distress is Blazy et al. (2007). The authors show, among others, that French courts actively work to protect employment by facilitating continuation.

I am not aware of any empirical research on bankruptcy duration and on bankruptcy judges' decision-making on data from transition economies where the phenomenon of corporate bankruptcy as such has been present only for the last two decades or less.

What my paper shares with the above-mentioned papers is the methods and the dependent variable – bankruptcy duration. What makes the paper different from the

[7] Weiss and Wruck (1998) referring to Forbes, April 1, 1991, pp. 99-102.

[8] Yet another issue is the relationship between duration and other ex post outcomes of bankruptcy, such as returns to stakeholders or costs of bankruptcy. Among the authors who analyze more outcomes of bankruptcy at once, some approach them as separate outcomes of a bankruptcy procedure (see e.g. Stevenson et al. (2007) for duration and payoff to shareholders), others apply methods to test for their mutual interdependence (e.g. Covitz, Han, and Wilson (2006) used instrumental variables to control for the endogeneity of restructuring time and creditor return).

above-mentioned is that

- my sample consists of firms operating in the Czech Republic (where bankruptcy law history was interrupted for a 40-year period between 1950 and 1990),
- I analyze duration of corporate bankruptcies in general (there was no reorganization chapter in the Czech bankruptcy law at the time covered by the sample), and
- my main explanatory variable is unemployment rate as I test for the judicial bias towards continuation stemming from judges' fear from lower labor demand in the region once the firm exits from the bankruptcy procedure to the ultimate non-existence.

In this paper, I apply three alternative methods – OLS regression, parametric duration (survival) analysis, and quantile regression – on a cross-section dataset comprising the population of all 903 corporate bankruptcies that were completed during 2004 by the distribution of returns among creditors in order to answer the following question. Do bankruptcies last longer (i.e. is exit of a firm prolonged) when the exit can be expected to have a harsher ex post effect on the firm's employees? Put differently, *do Czech judges take into account the social impacts of the firm's exit and tend to overcontinue in order to save jobs?*

I show that bankruptcy procedures tend to last longer in firms that operate in districts with higher unemployment rate compared to other districts. For a firm of the most frequent size with registered capital of CZK 100 thousand, a 1.7 percentage points difference in the unemployment rate implies one month difference in bankruptcy duration. Moreover the magnitude of the unemployment rate's effect on duration is increasing with the firm's size. A ten-fold change in the firm's registered capital (to CZK 1 million) translates to strengthening this effect by 50%. This result is observed for the first four years of a bankruptcy procedure, after which it is no longer evident.

In the following two sections, I introduce the general issue of judicial discretion in bankruptcy and present in a nutshell the institutional background for the Czech case. In Section 2.4, I describe the data set, define variables, provide summary statistics, and formulate the hypotheses. Section 2.5 provides the results of the three alternative methods and the last section concludes.

2.2 Role of Courts in Bankruptcy

Bankruptcy regimes differ around the world and one of the distinguishing factors is discretion of judges. One can discuss judges‘ discretion at various decision nodes: whether to declare bankruptcy or reject petition, approve reorganization or not, appoint (replace) bankruptcy trustee, approve the distribution of assets to creditors etc.

In the absence of a bankruptcy law, decisions regarding the fate of an insolvent debtor rest in the hands of creditors who decide from the position of residual claimants. When there is more than one creditor, such a situation is likely to cause a run on the debtor's assets. Bankruptcy law is there to solve the problem of an insolvent debtor that has multiple creditors.

The vast majority of economic literature on judges' discretion in bankruptcy focuses on the judge's decision whether to allow for reorganization, i.e., be "softer" on the debtor, or not. One can identify three main arguments in favor of judges' discretion or, in this case, in favor of allowing a judge to decide for reorganization even against creditors' will. All these three arguments focus on ex-post efficiency, not taking into account the ex-ante effects of discretion.

First, the presence of multiple creditors (of multiple classes) implies a *collective action problem* due to which it is costly for creditors to jointly find a solution that maximizes the total value of the firm, i.e., the size of their common pie. According to this argument, the judge is there to prevent powerful creditors from taking steps that maximize their payoffs at the expense of the overall efficiency of the insolvency solution.[9]

The second argument stems from the *asymmetric information problem.* As managers know the actual situation in the insolvent firm better than creditors and cannot credibly disclose their knowledge, creditors tend to prefer liquidation to reorganization even if managers know that reorganization would deliver higher value to creditors, at least in the long run. Thus, the judge is there to give managers a chance to get their firm out of crisis. This approach implies that it is (at least ex-post) optimal to pay a sort of information rent to managers even though it is at the immediate expense of creditors.[10]

The third argument states that liquidation is usually connected with considerable *social costs* (externalities on employees, suppliers, consumers, etc.) and the judge is there to account for them when choosing between liquidation and reorganization.[11]

[9]See for example Berglof, Roland, and von Thadden (2003).
[10]See for example Berkovitch and Israel (1999).
[11]See for example Biais and Recasens (2002).

There is a substantial difference between understanding ex-post efficiency in the social cost argument as opposed to the former two. According to the first two arguments, ex-post efficiency is equivalent to the maximization of the value the residual claimants may get back from the firm. This understanding is implicitly embedded in U.S. bankruptcy law. On the other hand, the third argument assumes that a continuation of a hardly viable firm (at the expense of creditors and/or tax payers) is socially preferred to the redistribution of its assets connected with layoffs, unutilized specific investments and breaking networks. This approach is close to that of French law.[12]

These arguments related to the reorganization decision apply analogically to various other decisions of the judge in the course of the bankruptcy proceeding, such as whom to appoint as bankruptcy trustee, whether to replace the trustee, whether to approve the proposal of the distribution of assets among claim-holders, whether to allow for DIP financing[13] etc.

Supposedly, a bankruptcy judge who perceives herself as an agent of all creditors (arguments 1 and 2) whose mission is to protect property rights tends to behave differently than a judge who believes she should minimize all social costs of her decisions (argument 3). An additional concern regarding judges' decision-making in bankruptcy procedures is their capability of economic considerations. Yet another issue is judicial corruption which makes a judge to be driven by self interest rather than property rights protection or social welfare maximization.[14]

There is a stream of literature on judicial discretion in bankruptcy that has theoretically approached and empirically documented that the outcomes of bankruptcy procedures within a given bankruptcy code vary substantially across bankruptcy judges.[15] In my paper, the approach is different. Instead of testing judicial discretion of different judges, I test common bias of bankruptcy judges in one legal system. When considerations of different approaches come into play in my analysis, they are only at the level across regional courts, not across individual judges.

[12]See Blazy et al. (2007) for analysis of the French bankruptcy practice.

[13]Debtor-in-possession financing or "DIP financing" is a special form of financing provided for companies in financial distress. Usually, this security is more senior than debt, equity, and any other securities issued by a company. It aims to give a troubled company a new start.

[14]See Weiss and Wruck (1998), Biais and Recasens (2002), Lambert-Mogiliansky, Sonin, and Zhuravskaya (2003), Djankov et al. (2008) for judicial corruption in bankruptcy. For more general analysis of judicial corruption see Buscaglia (2001) focused on developing Latin-American countries and Karklins (2002) focused on post-communist countries.

[15]See for example Giammarino and Nosal (1996), Bris, Welch, and Zhu (2006), Chang and Schoar (2006), and Gennaioli and Rossi (2008).

One of the questions for this paper analyzing data on Czech bankruptcies is "What do Czech bankruptcy judges percieve as the goal of a bankruptcy proceeding?" This perception is likely formed by the definition of bankruptcy proceeding in the Czech legislation of past years, by the 40-year experience with socialist ideology and each judge's education and personality.[16]

2.3 Institutional Background

2.3.1 Czech Bankruptcy Legislation

Bankruptcy procedures examined in this paper were all governed by the Act on Bakruptcy and Composition No. 328/1991, valid between 1991 and 2007. This Act was introduced into the Czech legal system in 1991 after a 40-year absence of insolvency legislation, being strongly inspired by the former pre-WWII Act of 1931.

The course of a Czech bankruptcy procedure according to the Act on Bankruptcy and Composition can be summarized as follows. A petition is filed by the debtor or a creditor. The court either rejects it for one of the reasons listed in the law or declares bankruptcy. The law specifies only two reasons for rejection – lack of assets or absence of evidence that the debtor is in the situation of insolvence as defined by the law. If the petition is rejected due to lack of assets, the judge simultaneously files a proposal to erase the company from the Commercial Register (par. 12a/4). If the petition is rejected based on the inability of the filing creditor to prove insolvence, the creditor is liable to damages caused to the debtor by the petition, unless the creditor proves no damage occured (par. 4a/4).

When bankruptcy is declared, the procedure starts and all the actors (court, trustee, debtor, creditors) interact in the space defined by the law. These interactions include, inter alia, registering the claims, electing the creditors' committee, appointing/replacing the trustee, disposing of the company's property, selling the estate and concluding contracts on behalf of the company. The bankruptcy procedure (under the bankruptcy regime in effect during 1991-2007) usually lasts for several years despite the fact that the ammendment of 1998 formally introduced a duty for the trustee to complete bankruptcy

[16]Within the long-lasting debate about how the malfunctioning bankruptcy regime should be modified, I often heard from judiciary-related participants of the discussion (who dominated the issue for many years) that the substance of a bankruptcy procedure is that it is a legal dispute between the debtor and several creditors whether the creditors have a right to get back some returns from a failed business and that any termination of a firm‘s operation is unfortunate for the society.

within 18 months. The procedure can basically have two alternative fates. Either the judge cancels bankruptcy for lack of assets, or – and these cases I examine in this paper – she completes it by the distribution of returns among the claimants.

Between 1991 and 2007, the Act on Bankruptcy and Composition was thirty times amended, of which six amendments were quite significant and the remaining ones were virtually immaterial or just technical.[17] As of 1 January 2008, the heavily criticized Act on Bakruptcy and Composition No. 328/1991 was replaced by a new Insolvency Act No. 182/2006, which represented the main building block of a reform that had been long time called for from various experts from both within and outside the country.[18]

One of the most often criticized characteristics of the Czech bankruptcy system was its evident bias towards liquidation. The Act on Bakruptcy and Composition had nothing like the U.S. Chapter 11. It defined two types of procedures:

- bankruptcy (Czech term "konkurs") — Chapter-7-like framework for liquidation,
- composition (Czech term "vyrovnani") -– settlement framework for continuation.

Composition, being in general more flexible and more debtor-friendly than bankruptcy, represented a faster and less costly solution to the situation of insolvency. However, it was much less frequent, as it required an agreement on the redesign of property rights over the debtor's assets to be reached between the debtor and the creditors.

Only the debtor could file for composition and he could do so unless the court had already adjudicated a bankruptcy proceeding. A composition could consist in issuance of new shares or other securities issued by the debtor or even in kind, e.g., in surrendering of a part of values not immediately connected with the debtor's entrepreneurial activity. Within the composition application, creditors who had no priority must have been offered a payment of at least 30% of their claims within two years from the submission of the application. Necessary conditions for the court to confirm the composition included that priority claims had been paid or their payment had been assured and that creditors of

[17]The thirty amendments include twenty-seven amendments by law and three changes through decisions of the Constitutional Court. A summary of the main changes can be found e.g. in Diblik (2004).

[18]I had the honor to actively participate at designing the bankruptcy reform during 2004-2005 within the Office of the Vice Prime Minister for Economic Affairs. The works at the government level had been completed by 2005 and the Parliament approved the law in 2006. The new Act came into effect in January 2008. Since then, I have been a member of the Working Group 'S22' for the Insolvency Law at the Czech Ministry of Justice that has continuously monitored the application of the law and, when needed, provides unifying explanations for judges and the public and suggests corrections to the new law.

other claims had been satisfied to the same extent unless they have agreed to a more advantageous satisfaction of a certain creditor.

Insolvent debtors in the Czech Republic opted for composition very rarely. The reason for virtually no use of composition was the fact that only a few debtors were able to fulfill strict legal requirements while proposing a solution acceptable for creditors. This did not change even after the amendment to the Act made in May 2000 which reduced the minimum that had to be offered to creditors without priority from 45% to 30%. And as the returns from bankruptcy proceedings very rarely reached 30%, debtors lacked reasons for opting for composition. Thus, bankruptcy procedures (rather than composition procedures) were used as an almost exclusive solution to insolvency situations in the Czech economy – out of all 14,310 procedures launched (i.e. approved petitions) during 1998-2004, only 34 were compositions and all the remaining were bankruptcies. In other words, there were 420 bankruptcies for each composition.

2.3.2 Judicial Discretion in Czech Bankruptcies

Judicial discretion played quite a significant role in bankruptcy procedures within the old regime. While on paper the Czech Act on Bankruptcy and Composition was quite tough (especially did not include something like the U.S. Chapter 11), the amount of judicial discretion meant the law was quite "soft" in reality. As Mitchell (1998) puts it: "A final problem with the Czech bankruptcy procedure is the heavy reliance on the court."[19]

In this paper, I analyze data on completed bankrutcies. This represents a subset of those bankruptcies that had been declared at all. Therefore, nothing can be observed about the judicial discretion in the decision whether to declare bankruptcy in the first place. The focus is on the discretion once the bankruptcy has been declared and the bankruptcy procedure has started. There were several parts of the old Czech bankruptcy law that allowed for such discretion, the main being the following decision making powers of the judge.

1. Replace trustee – the judge may at any time replace the bankruptcy trustee. The judge has practically complete discretion as the law states that the judge may on his own replace the trustee for "important reasons", while it is upon the judge to decide what is an important reason and what is not. See par. 8/6.

[19]Mitchell (1998), page 12.

2. Deny trustee replacement – the judge may reject creditors' proposal to recall the trustee. The judge has practically complete discretion as the law implies that the judge may on his own decide whether the proposal to recall trustee is based on "important reasons" or not. See par. 8/6.

3. Postpone the deadline for trustee's final report – the trustee is required by law to submit the final report (i.e. to complete bankruptcy procedure) within 18 months after the declaration of bankruptcy but the judge may prolong this term if he sees that "the circumstances of the case give reason for that". See par. 14a/2.

4. Define the bankruptcy estate. See pars. 17 through 19.

5. Approve/review registered claims. See pars. 20 through 25b.

6. Approve the realization (sale) of assets. See pars. 27 through 29.

7. Approve the distribution list. See pars. 30 through 33.

The judge could use all these powers to effectively prolong a bankruptcy procedure should she wish to do so. Finally, the judge also completes the bankruptcy proceeding, but this is an automatic step immediately after the distribution list has been approved. Claimants get paid according to the distribution list and bankruptcy is discontinued.[20] See pars. 44 and 44a.

From what is generally known about the Czech bankruptcy practice before 2008, the firms' assets were liquidated very slowly – often sold in not a very transparent way or after they had lost a large portion of their value. Pre-bankruptcy management was often kept in the company by the bankruptcy trustee – more often than one could expect from looking at the bias toward liquidation discussed above. Finally, secured creditors frequently belonged to those most disapointed by the way they were treated in the bankruptcy of their debtor. Unfortunately, there is no hard data that would confirm and quantify these observations based on anecdotal evidence, media coverage and experts' and practitioners' debates on various fora.

[20]No debts can be paid prior to the payments according to the distribution list which concludes the procedure.

2.4 Data

I use firm-level cross-section data comprising all 903 corporate bankruptcy cases that were completed during 2004 by the distribution of returns among claim-holders.

To understand what the sample covers and what it dos not cover, one needs to understand the link between the data set and general statistics on the Czech bankruptcy procedures, for which I present annual statistics as published by the Ministry of Justice (MoJ). The MoJ statistics include only a few dozen parameters followed annually, sliced per court regions and shown separately for bankruptcies and compositions. Most relevant parameters of Czech bankruptcies (excluding compositions which generally represented anyway less than 0.5% of all cases) from the MoJ statistics for the years of 1998 – 2007, on country level only, are provided in Table 2.1.

The top part of the Table refers to filings and decisions regarding bankruptcy petitions, i.e. relate to the inflow of cases into bankruptcy procedures. The number of bankruptcy petitions filed per year grew from 4,300 in 1998 to 4,600 in 2000 and then continuously declined to 3,600 in 2004. In the following years the number of petitions started increasing again to reach 4,200 in 2006.[21] The total filings per year peaked in 2007 at 5,000 as many debtors that balanced on the verge of financial distress preferred to file for bankruptcy under the then still effective Act on Bankruptcy and Composition rather than under the new, more creditor-oriented, Insolvency Act effective since January 1, 2008. However, in spite of increasing number of petitions filed per year between 2004 and 2007, the number of declared bankruptcies was slightly decreasing during the same period.

The middle part of Table 2.1 shows the fate of already initiated bankruptcy procedures, i.e. to the outflow of cases from bankruptcy. The number of terminated bankruptcy cases per year increased from some 300 in 1998 to almost 1,900 five years later in 2003 and remained stable at 1,800–2,000 per year for the following five years.

The bottom part of the Table shows the resulting load of bankruptcy cases running as

[21] Interestingly, the increase was driven by debtors' filings (constantly increasing in 2002–2007, while creditor's filings markedly fell between 2002 and 2004 and remained flat afterwards. The ratio of petitions filed by the debtor thus continuously increased from 51% in 2002 to 72% in 2007. This can be likely attributed to the fact that during that time it became increasingly clear that, even after the complex amendment in 2000, Czech bankruptcy procedures delivered negligible returns to creditors and did so only after a considerably long time, as documented for example by the WorldBank (2008) or Knot and Vychodil (2006b). Hence, creditors often tried hard to avoid bankruptcy while, paradoxically, debtors were increasingly using bankruptcy as a way of escaping their creditors. There has been anecdotal evidence documented in the Czech press that creditors, under a debtor's credible threat of filing for bankruptcy, were willing to compensate debtors for not filing for bankruptcy and preferred out-of-bankruptcy renegotiation of the debt when possible.

of the end of each year and average duration of these still incomplete cases. By the end of 1997, the judicial system had been already loaded by some 3,000 running bankruptcy cases. In the following five years, the annual inflow to bankruptcy (number of declared bankruptcies) exceeded the annual outflow (number of terminated cases), resulting in a continuous increase of the number of running cases to almost 9,000 in 2002. In 2003 and the following years, the annual inflow of new cases was lower than the annual outflow. Thus the number of running cases scaled back below 6,000 until the end of 2007.

As for the statistical description of the Czech bankruptcy regime's situation in 2004, where my data set comes from, there were about 3,600 petitions filed in that year, of which 64% were filed by the debtor and 36% by a creditor. The number of bankruptcies declared during the year was about 1,400. About 2,000 cases were terminated during the same period, of which some 800 were cancelled for the lack of assets and almost 1,200 were completed by the distribution of returns among claimants. Four times as many cases, about 8,000, remained unresolved as at the end of 2004 with an average duration of 46 months (measured from the bankruptcy declaration till the end of 2004). The sample of 903 bankruptcy cases used in this paper is a population of all corporate bankruptcy cases completed by the distribution of returns among the claimants subset of the almost 1,200 cases mentined above. The remaining 300 were personal bankruptcies which are beyond the scope of this paper.

The cross-section data set used for the analysis in this paper is comprised of data publicly available in the Commercial Register (*Obchodni rejstrik*) and Register of Bankrupts (*Evidence upadcu*) as well as data available in a paid database Commercial Bulletin (*Obchodni vestnik*) which includes also data gathered in the Collection of Deeds (*Sbirka listin*).[22] Representativeness of the sample is ensured by the fact that it is equal to a snap-shot population of all corporate bankruptcy procedures that were completed by the distribution of returns to claim-holders between January 1 and December 31, 2004.

Czech Republic is administratively divided into 77 districts, comprising 76 districts and the capital city of Prague.[23] Bankruptcy procedures are governed by 8 regional courts.

[22]The data has been collected in cooperation with Ondrej Knot within a project sponsored by the Global Development Network under the 2004 Regional Research Competition Grant. Some data that the law prescribes to be submitted to the Collection of Deeds are available electronically within the Commercial Bulletin database, some are only archived at the courts in a paper form (and have not been made electronically accessible yet), and some have not been submitted at all. Our sample includes only the electronically reported ones. Even these must be collected manually, as the databases on the Internet do not allow for an automatic export of the data.

[23]Districts are equivalent to NUTS 4 regions or also LAU 1 regions according to the Eurostat classification.

Table 2.2 provides the list of court regions. Two of these courts are seated in Prague – the Prague Municipal Court covering the Prague district and the Prague Regional Court covering 12 districts of Central Bohemian region that ring Prague. Nevertheless, I treat these two court regions as a joint court region comprising 13 districts because the agenda of these two Prague-based courts has been rather mixed together in the past since there were some transfers of competences and cases between these two courts around the year 2000. Hence, in this paper, I use 77 district dummies and 7 court dummies to identify the seat of the bankrupt company and the court administering the case, respectively. Table 2.2 shows in its lower part the match between court regions and their districts.[24]

The way districts and court regions enter the analysis can be expressed as follows: In this paper, I analyze 903 bankruptcy cases (governed by 7 regional courts) of 903 firms (operating in 77 districts). As can be seen in the next section, the main variables in my analysis are duration of the bankruptcy procedure, unemployment rate, and some characteristics of the firm. It is important to stress here that while all other variables are on the level of the firm, the unemployment rate is observed on the level of district. Court regions enter the analysis only as region dummies that may filter off the specificities of respective courts in their deciding about bankruptcies.

2.4.1 Variables and Summary Statistics

Tables 2.3 and 2.4 provide the list of all variables used, their definitions and summary statistics. Closer description of the sample via these variables follows.

Duration (Dur). The sample is a set of all Czech corporate bankruptcy procedures completed during 2004 by the distribution of returns among claim-holders. Thus all cases ended in 2004 but started in various years prior to 2004. The exact dates of the start and end of the procedure are reported in the data. Duration ranges from 11 to 127 months with the mean at 50.6 months. In other words, the oldest case started in 1994, while the average case started in 2000. Figure 2.1 provides the histogram of duration.

Note that as both start-date and end-date of the bankruptcy procedure are known

[24]For some reason, this match does not apply in 13 out of the 903 bankruptcy cases. These 13 bankruptcies were administered by a different court than their venue. Brno court, in addition to bankruptcies of its own districts, administered also bankruptcies of 3 firms from Prague City district (AB), Prague court solved bankruptcies of 1 firm from Brno City district (BM) and 1 from Nachod district (NA), Plzen court administered bankruptcies of 1 firm from Prague City district (AB) and 1 from Chomutov district (CV), and Ostrava court solved bankruptcies of 6 firms from Trebic district (TR).

for all 903 observations, the problem of censoring, otherwise typical for an analysis of duration, does not arise here. Instead, the problem rather appears in the sample selection – the sample includes only cases that have been brought to an end in 2004 but analyzing such a sample may produce a bias stemming from the fact that longer-lasting cases are under-represented. There is no way my analysis can correctly handle that issue. However, this problem is heavily mitigated by the fact that major observations of this paper, for reasons explained below, are built on the analysis of the subsample of shorter-lasting procedures.

Unemployment rate (UR, $Unemp$). I use data on unemployment rate in the district where the firm is seated. Ministry of Labor and Social Affairs (MoLSA) provides monthly unemployment rates for the 77 districts starting in January 1995. I denote these rates UR. Czech Republic's average UR evolved from 3.1% in January 1995 to 9.5% in December 2004. In January 1995, the UR ranged from 0.3% in Prague (AB) to 8.5% in the North-Moravian district of Novy Jicin (NJ) with the mean of 3.6% and standard deviation of 1.85%. By December 2004, the minimum increased to 2.9% in Prague-West (PZ) and the maximum to 22.7% in North-Bohemian Most (MO) with the mean of 9.7% and standard deviation of 3.92%.

Let $Unemp$ be defined as the deviation of the district's UR from the Czech Republic's UR at the month of bankruptcy declaration, normalized by standard deviation of UR across districts:

$$Unemp = \frac{UR_{i,t_0} - UR_{Czech,t_0}}{StDev(UR_{t_0})_{i=1,...,77}}, \tag{2.1}$$

where t_0 denotes the month when bankruptcy was declared[25] and $i = 1, ..., 77$ denotes the district the firm is registered in. I use the normalization by the standard deviation in order to filter off the effect of increasing unemployment over time. After this normalization, $Unemp$ in January 1995 ranges from -1.67 (AB) to 2.73 (NJ) and in December 2004 it ranges from -1.66 (PZ) to 3.38 (MO). For histogram of $Unemp$ per firm see Figure 2.1.

Registered capital (Cap). Registered capital (alternatively called "capital" through the paper), reported in thousands of Czech korunas (CZK), is the only proxy available for the size of the firm. This variable is available for 877 observations only as 26 companies do

[25] t_0 ranges from January 1994 to November 2003. UR_{t_0} is available for 880 observations only as for the remaining 23 cases bankruptcy was declared between January and Decemmber 1994, for which consistent measures of unemployment rates are not known. For these observations, I impute the value as at January 1995 so that $Unemp$ is available for all 903 observations.

not report registered capital in the Commercial Register – these include all 13 companies of *v.o.s.* legal form, 7 of 61 cooperatives, and 6 of 20 companies of "other" legal form. As shown in Figure 2.2, two-fifths of the 877 companies (for which *Cap* is reported) have registered capital of exactly CZK 100 thousand which is the minimum requirement for limited liability companies, one-third is sized between CZK 100 thousand and CZK 1 million, and one quarter of the companies are larger. For obvious reasons, I will use registered capital in its logarithmic form *LogCap* in the statistical analysis.

Liquidation (*Liq*). As opposed to the notions of "liquidation" above in the sense of the opposite to the "continuation" or "reorganization" of the business, from now on throughout the paper I will use the term in the sense defined by the Czech legal term "likvidace". The Czech Commercial Code defines liquidation in paragraphs 70 through 75b as a process of voluntary dissolution of the company, typically based on the decision of the company's management. Within liquidation, a liquidator is appointed who pays out all the liabilities of the company, then distributes the "residual liquidation value" to the owners and, finally, makes official steps to erase the company from the Commercial Register. It may happen during liquidation (more specifically, during the structuring of the liabilities' repayment) that the residual liquidation value appears to be negative which might trigger bankruptcy via a petition filed either by a creditor or by the liquidator on behalf of the debtor.[26] When a firm in liquidation enters bankruptcy, the liquidation procedure is interrupted until the completion of the bankruptcy procedure.[27] The fact whether the firm is in liquidation at a given moment may serve as a proxy for the fact whether the firm still operates its business or has already stopped its activities and limitted the number of its employees to a necessary minimum at that moment. 192 of the companies (22%) were already in the procedure of liquidation as defined above when entering bankruptcy, while the remaining four fifths of the firms entered bankruptcy procedure from a standard, non-liquidation regime.

Prior1994. This dummy divides the sample into 670 (74%) old firms and 233 (26%) new firms. The most represented cohort in the sample is that of 1992 (193 obs.), followed by 1991, 1993, and 1994 (150, 136, and 113 respectively). Other cohorts are considerably

[26]Note that in the sample, creditors triggerred only 24% of all bankruptcies that had been preceded by liquidation but as much as 40% of those bankruptcy procedures that had not been preceded by liquidation.

[27]See par. 13a/1 of the Act on Bankruptcy and Composition.

less represented in the sample. Only 33 firms of all 903 whose bankruptcy was completed in 2004 existed before the end of 1989 when the socialist economy started turning to the free market. 1991-1994 were the years when the majority of Czech companies were being privatized, which gave a strong impulse to the emergence of many thousands of new firms – by spin-offs of privatized firms, creation of new supply chains, creation of intermediary owners of the privatized firms or assets, etc. Hence variable *Prior*1994 can be treated as a proxy for privatization and thus may remove potential problem of endogeneity. As there was, among Czech firms, virtually no selection by exit prior to privatization, many firms (as well as their successors, supply firms or intermediary owners) went bankrupt a couple of years after they had been privatized.[28] Bankruptcies of these firms might be substantially different from bankruptcies of firms that started operating as private from the very beginning. The large-scale privatization was completed in 1994, therefore dummy *Prior*1994 can partly filter off the privatization effect.

NoExit. Interestingly, only 530 (59%) firms had been erased from the Commersial Registry by November 2008, while as much as 373 (41%) companies still existed, of which 81 were undergoing the process of liquidation. For a closer look, let us relate this new variable to variable *Liq*. As has been stated above, 192 firms had been already in liquidation when entering bankruptcy. Of these, 129 had been erased from the Commercial Register by November 2008 (that is some 4 years after the bankruptcy had been completed), while the remaining 63 still existed – of which 61 in liquidation and 2 back in the normal regime). 711 firms entered bankruptcy from the normal (non-liquidation) regime. Of these, 401 had ceased to exist by November 2008 and 310 were still registered (20 in liquidation and 290 in the normal regime).

Legal form. The sample includes 697 limited liability companies (*s.r.o.*), 110 corporations (*a.s.*), 13 *v.o.s.* companies, 2 *k.s.* companies (these 15 together can be understood as partnerships, hereafter treated as a joint category called *vos*),[29] 61 cooperatives

[28]This absence of "pre-selection" was one of the main factors distinguishing the Czech way of privatization especially from that of Hungary – see Kouba, Vychodil, and Roberts (2005). Quite opposite to the Czech case, Hungary implemented a very drastic selection of companies early in the transition process. The Hungarian bankruptcy law effective since January 1992 introduced a duty for every debtor with a debt overdue 90 days to file for its bankruptcy and as much as 4,231 bankruptcies and 10,062 liquidations were filed only during the first three months of 1992, representing about 17 percent of the country's employment, 14 percent of production and 26 percent of export.

[29]*v.o.s.* and *k.s.* denote verejna obchodni spolecnost and komanditni spolecnost, respectively.

(*druzstvo*), and 20 other companies (these include 16 state enterprises, 1 national enterprise, 1 SPV of a political party and 2 "clubs").

Court regions. Although the number of cases completed in 2004 varies across the seven courts, none of the courts seems to be more overloaded than others as the higher number of cases is connected with an adequately higher number of judges. Within the sample, in each court there were roughly ten cases completed in 2004 per judge. As shown in Figure 2.3, Plzen, Ceske Budejovice and Usti nad Labem constitute a cluster with the number of judges between 5 and 8 and a low number of cases, while Hradec Kralove, Brno and Ostrava employ 12 to 15 bankruptcy judges and administer a medium number of cases. The Prague court, comprising in fact two courts (the municipal court and the regional court), has 24 judges and 236 cases.

The data set used in this paper has several limitations. Firstly, it does not include any information about the economic performance and capital structure of the firm which might easily be the main determinant of duration. Secondly, the ultimate return for creditors is not reported, so duration is the only observed outcome of the procedure (not mentioning that it is just an ex-post outcome which does not allow us to mention anything about the ultimate ex-ante efficiency). Thirdly, only completed bankruptcies are included which does not allow for an examination why at a certain point in time some bankruptcies are completed and other continue. Nevertheless, despite these and few other limitations one can think of, the data still carry information that calls for an analysis.

2.4.2 Hypotheses

I test whether bankruptcy judges are biased towards continuation. In other words, my analysis tests an **overcontinuation hypothesis** saying that the judge perceives completion of bankruptcy as an unfortunate situation and tries to defer it, investing the firm's assets to the prolongation of the firm's existence rather than to the increase of returns for creditors. This hypothesis has several implications and connotes separate hypotheses.

First, the overcontinuation tendency of judges should be especially strong when the firm operates in an environment with high unemployment (see Hypothesis H_U below). Second, I expect the unemployment rate effect to interact with the effects of liquidation (Hypothesis H_L) and registered capital (Hypothesis H_C).

Hypothesis H_U. Other things being equal, unemployment rate has a positive effect on bankruptcy duration, i.e.,

$$\frac{\partial Dur}{\partial Unemp} > 0. \tag{2.2}$$

Hypothesis H_L. As stated above, about one-fifth of the firms had been already in the process of liquidation while entering the bankruptcy process. In these firms, it is almost clear that once the bankruptcy has been completed, the firm is not revitalized, it does not operate any more, activity is stopped, supplier chain damaged and employees fired.[30] Thus, the judges' unwillingness to complete the bankruptcy procedure quickly in the situation of high unemployment is stronger in these cases than in others. In other words, in firms under liquidation the effect of unemployment on duration is stronger.[31]

$$\frac{\frac{\partial Dur}{\partial Unemp}}{\partial Liq} > 0. \tag{2.3}$$

Hypothesis H_C. The larger the firm, the more jobs disappear when the firm ceases to exist. Therefore the judges' unwillingness to complete the bankruptcy procedure quickly in the situation of high unemployment is stronger in larger firms. That is, in large firms the effect of unemployment on duration is stronger.[32]

$$\frac{\frac{\partial Dur}{\partial Unemp}}{\partial Cap} > 0. \tag{2.4}$$

2.5 Results

In this section, I test the three above-mentioned hypotheses using three alternative statistical methods. The dependent variable is *Duration* which I use in both linear and logarithmic form, *Dur* and *LogDur*, to test for linear as well as log-linear dependence of duration on the unemployment rate.[33] On the right hand side, I use normalized unemployment rate *Unemp*, liquidation dummy *Liq*, size variable *LogCap*, firm's time of

[30] Indeed, out of 192 firms that entered bankruptcy from the liquidation regime only 2 were in November 2008 still registered in the Commercial Register under "normal" (i.e. non-bankruptcy, non-liquidation) regime. Out of 711 firms that entered bankruptcy from the "normal" regime as many as 290 were in November 2008 still registered under "normal" regime.

[31] Beside H_L, the expected sign of the sole effect of liquidation on duration is positive: $\frac{\partial Dur}{\partial Liq} > 0$.

[32] Beside H_C, the expected sign of the sole effect of size on duration is positive: $\frac{\partial Dur}{\partial Cap} > 0$.

[33] While in the linear function the rate translate one-to-one to the months of duration, in the log-linear function it translates one-to-one to the relative change of duration.

origin dummy $Prior1994$, continuation-after-bankruptcy dummy $NoExit$, and 5 legal form dummies denoted jointly $LegForm$.[34] In addition, I either do or do not include the seven court region dummies Reg. Including them might allow for the filtering of the fixed regional effects from the unemployment effect. Hence, in whatever statistical method I use, I run it through four specifications (denoted a through d):

$$a: \quad Dur = f\ (Unemp, Liq, LogCap, Prior1994, NoExit, LegForm), \tag{2.5}$$

$$b: \quad Dur = f\ (Unemp, Liq, LogCap, Prior1994, NoExit, LegForm, Reg), \tag{2.6}$$

$$c: \quad LogDur = f\ (Unemp, Liq, LogCap, Prior1994, NoExit, LegForm), \tag{2.7}$$

$$d: \quad LogDur = f\ (Unemp, Liq, LogCap, Prior1994, NoExit, LegForm, Reg). \tag{2.8}$$

Note that in specifications b and d, region dummies are added as opposed to specifications a and c, respectively. The inclusion of region dummies is rather problematic as there might be a multicolinearity between the regions and the unemployment rate.

The important thing we should be aware of is that, although the standardized unemployment rate as defined by equation (2.1) is observed in different times for different cases (i.e. in the month of bankruptcy declaration, t_0, which ranges from January 1994 to November 2003), all the analysis in this paper is pure cross-section. The dependent variable as well as all the regressors are time invariant characteristics of the firm (Liq, $LogCap$, $Prior1994$, $NoExit$, $LegForm$), of the bankruptcy procedure it went through (Dur, $LogDur$, Reg), or of the district it is seated in ($Unemp$).

To remind, the data is represented by 903 corporate bankruptcy procedures in the Czech Republic that were completed by the distribution of returns among claim-holders within the period from January 1 through December 31 of 2004. This is both an advantage and a drawback. On the one hand, the data set represents the whole population of bankruptcy cases completed in 2004. On the other hand, such data allow only limited space for examining the decision of the judge whether to complete the banktuptcy procedure in a given moment or let it continue as there is no information about the cases that were not completed.

The bias of bankruptcy judges towards continuation is likely to be observed especially

[34]Variable $NoExit$ describes the state of the firm 4 years after tha bankruptcy has been completed. Thus, including $NoExit$ in the left hand side of the regressions assumes that the fact whether the firm was or was not erased from the Commercial Register by four years after the bankruptcy reflects an unobserved characteristic of the firm that plays a role in bankruptcy duration.

during the first years of the bankruptcy procedure, while later, when the case has been running for say six, eight, ten years, the judge might have both weaker motivation to and less opportunities how to further prolong the case. Therefore, it makes sense to run regressions not only on the whole sample, but to test their validity also on a subset of shorter cases. As a threshold I use median of duration which is between 46 and 47 months. So I define the subsample by $Duration \leq 47$ which contracts the sample of 877 observations to a sample of 455 observations. Table 2.5 summarizes statistics of the continuous variables on this subsample. For summary of dummy variables and conditional statistics of duration on the sample of 877 firms and on the subsample of 455 firms see Table 2.6.

In my analysis, I apply three alternative methods:

1. OLS regression analysis – used, e.g., by Helwege (1999) and Denis and Rodgers (2007) for estimating the time spent in default.

2. Duration (survival) analysis – used extensively for empirical studies on bankruptcy duration, see Bandopadhyaya (1994), Li (1999), Helwege (1999), Partington et al. (2001), Orbe, Ferreira, and Nunez-Anton (2002), Covitz, Han, and Wilson (2006), Dewaelheyns and Hulle (2007), and Stevenson et al. (2007).

3. Quantile regression – used by Koenker and Bilias (2001) to analyze unemployment duration data and argued by Fitzenberger and Wilke (2006) to outperform standard survival analysis methods.

Each of these approaches has some drawbacks. However, if some clear pattern is confirmed by all three methods, the persuasiveness of the result can be high. To further foster the validity of the result, the summary of the respective results is followed by a robustness check via altering the proxy for unemployment.

2.5.1 OLS Regression Analysis

The first method I use is the standard OLS multiple regression, although this method is not the most frequent in examining bankruptcy duration, mainly due to the fact that the time variable is often assumed to follow other than normal distribution.[35]

[35]For examples of applying OLS in studying time in default see Helwege (1999) and Denis and Rodgers (2007).

Unemployment and Duration (Testing H_U)

First, I run OLS regression on the whole sample. Columns $1a$ through $1d$ in Table 2.7 stand for specifications (2.5) through (2.8). The *Unemp*'s coefficient is positive and significant at 10% level only in the log-linear specification without region dummies, while insignificant in all other regressions. The coefficient of 0.03 means that change of *Unemp* by 1 unit translates to a 3 per cent change in duration in the same direction. Thus, e.g. a procedure that lasts 4 years and 2 months in a district with *Unemp* of -1.00 would last 6 months longer (that is 12% longer) in a district with *Unemp* of 3.00.[36]

Second, I replicate the same only for the subsample of 50% shortest cases to test the effect of unemployment rate on prolonging bankruptcy in the first years. Median of duration is between 46 and 47 months. So I define the subsample by $Duration \leq 47$ (i.e. below four years) which contracts the sample of 877 observations to a sample of 455 observations. As can be seen in regressions $1'a$-d of Table 2.7, the *Unemp*'s coefficient is significantly positive – at 10% level for the log-linear regression with region dummies and at 5% level for all other regressions.

To sum up, the OLS regression analysis provided evidence for hypothesis H_U, i.e. for statement (2.2) on the subsample of shorter bankruptcy cases. In $1'b$ (i.e. linear specification with region dummies), almost 15% of the variation of *Duration* is explained by the variation of the regressors and the coefficient for *Unemp* is 1.6, meaning that one-unit difference in *Unemp* makes 1.6-month difference in bankruptcy duration.

Interaction with Liquidation (Testing H_L)

To test H_L, i.e. (2.3), which states that *Unemp* plays a bigger role in companies that are in liquidation, I divide the sample of 877 observations to 698 with $Liq = 0$ and 179 with $Liq = 1$. There the chance of the firm's recovery is smaller and thus the threat of loosing jobs is larger. Indeed, $Liq = 0$ delivers insignificant coefficients, while $Liq = 1$ delivers positive and significant coefficients for *Unemp* – see regressions $2a$-d in Table 2.8. Interestingly, when I apply this test on the subsample of shorter bankruptcies, the picture reverses. In all 4 specifications, *Unemp*'s coefficients are positive and significant for $Liq = 0$, while insignificant for $Liq = 1$ – see regressions $2'a$-d in Table 2.8. Thus the hypothesis is not confirmed.

An alternative way of testing H_L is to add an interaction variable $[Unemp * Liq]$ to

[36]Recall that *Unemp* is a standardized measure of unemployment that ranges from -1.97 to +3.77.

the eight specifications in Table 2.7. However, the coefficients for $[Unemp * Liq]$ are not significantly larger than zero.[37]

Hence, OLS regressions do not provide any support for the hypothesis that the positive relationship between the unemployment rate and the duration of the bankruptcy case is stronger for cases where the firm in bankruptcy had been already in the process of liquidation when entering the bankruptcy procedure.

Interaction with Size (Testing H_C)

To test inequality H_C, i.e. (2.4), I add an interaction variable $[Unemp * LogCap]$ to the specifications 1*a*-*d* and 1′*a*-*d*. When I include all observations, I get regressions 3*a*-*d* where the coefficients for both $Unemp$ and $[Unemp * LogCap]$ are insignificant. Hence, I do not show the results for these regressions in a table.

However, when using the subsample of 455 cases only, the result confirms the hypothesis H_C – see regressions 3′*a*-*d* in Table 2.9. $Unemp$ as such is no more significant and all the significance is taken over by the new variable $[Unemp * LogCap]$ which reaches values around 1.15 for $Duration$ and 0.04 for $log(Duration)$, all four coefficients being significant at 5% level. At the same time, *LogCap per se* remains still positive and significant at 1% level.[38]

This test confirms the hypothesis that at least in its first 4 years the effect of the unemployment rate on prolonging bankruptcy procedure is stronger the larger the firm is. To interpret these results, let us focus on regression 3′*b*. About 15% of duration's variance is explained by the variance of regressors, while the coefficient for $[Unemp * LogCap]$ is 1.14, significant at 5% level. This means that in firms of registered capital equal to CZK 100 thousand[39], one unit difference in $Unemp$ translates to 2.3 month difference in bankruptcy duration. In a larger firm whose registered capital is about CZK 1 million ($LogCap = 3$), the implied difference is 3.4 months.[40]

[37] I do not show these eight regressions in a table.

[38] The individual effect of H_C on duration is of the expected sign as coefficients for *LogCap* are significantly positive for all 8 regressions in Table 2.7.

[39] Recall that 40% of all firms are exactly of this size. In the subsample of 455 observations with duration below median, the ratio of the CZK 100,000-sized firms is 45%. Capital of CZK 100 thousand is equivalent to $LogCap = 2$.

[40] Compare to the results of regression 1′*b*.

2.5.2 Duration (Survival) Analysis

OLS analysis is not necessarily the best way of testing the overcontinuation hypothesis. An alternative statistical method is (parametric) duration analysis, known also as "survival analysis", "time to event analysis" or "hazard rate analysis", which estimates the survival function (i.e. the probability of surviving of an event to some time t) and the hazard function (i.e. the instantaneous rate at which failure of an event occurs at time t). Here, the *event* is occurence of a firm in a bankruptcy procedure and the *failure* is the completion of the procedure by the distribution of returns among creditors. For an introduction of this method, see for example Kiefer (1988).

The majority of the empirical studies on bankruptcy duration use duration (survival) analysis in some form. Helwege (1999) and Dewaelheyns and Hulle (2007) applied general proportional hazard function model, Partington et al. (2001) and Stevenson et al. (2007) used Cox's proportional hazards model, Covitz, Han, and Wilson (2006) estimated a censored lognormal survival through maximum likelihood method, Bandopadhyaya (1994) used survival model with Weibull distribution, Orbe, Ferreira, and Nunez-Anton (2002) applied a censored partial regression model, and Li (1999) introduced Bayesian duration models.

The main advantage of survival analysis compared to OLS stems from the fact that the dependent variable (time of exit from bankruptcy) is likely not to be normally distributed. Instead, it may follow for example an exponential, log-normal or Weibull distribution.[41]

Unemployment and Duration (Testing H_U)

I run the survival analysis estimations assuming various distributions (lognormal, log-logistic, exponential, Weibull, Gamma, Gompertz, and Cox). Based on the Akaike Information Criterion, I select Weibull specification as the most suitable. Throughout the specifications for the whole sample, time ratios for $Unemp$ are insignifficantly different from 1, see regressions 4*a*-*d* in Table 2.10. Replicating the same on the subsample of shorter cases one gets regressions 4′*a*-*d* shown in Table 2.10. Time ratios are significantly larger than 1 for all these four regressions: significant at 10% level when region dummies are excluded, while significant at 5% when region dummies are included.

To iterpret these results, column 4′*b* in Table 2.10 shows that the increase of $Unemp$ by

[41] Another frequent reason for using survival analysis is the problem of censoring but this advantage of the method over OLS is irrelevant in this paper. Due to the construction of my sample, censoring is not an issue here as I know the start-date and end-date for all observations.

one unit increases duration by 5%, when controlled for region dummies. Alternatively, the fourth column suggests somewhat stronger relationship. The increase of $Unemp$ by one per cent (i.e. for example from 3.00 to 3.03) increases duration by 1.4%; put differently, $Unemp$'s growth by a half would imply prolongation of bankruptcy by 70%.

Interaction with Liquidation (Testing H_L)

To verify statement (2.3), I continue in the survival analysis using Weibull distribution and divide the sample to two subsamples with $Liq = 0$ vs. $Liq = 1$. According to H_L, the effect of $Unemp$ should be stronger when $Liq = 1$. However, this is not what comes out from the results as shown in Table 2.11. On the whole sample, $Unemp$ is insignificantly different from one for both $Liq = 0$ and $Liq = 1$. On the sample of 455 shorter cases, I get the following picture. For regressions without region dummies ($5'a$ and $5'c$), the $Unemp$ is insignificant for both subsamples. Once regions are included ($5'b$ and $5'd$), the subsample defined by $Liq = 0$ delivers time ratios significantly larger than 1 at 5% level, specifically at 1.058 and 1.016 for the linear and log-linear forms, respectively, while on the subsample with $Liq = 1$, $Unemp$ remains insignificant.

The alternative test that adds the interaction variable $[Unemp * Liq]$ to the basic specifications in Table 2.10 does not confirm the H_L hypothesis either as the coefficients for $[Unemp * Liq]$ are not significantly larger than zero.[42]

Thus, similarly to the OLS method, neither parametric duration analysis provided support for the hypothesis H_L.

Interaction with Size (Testing H_C)

I test statement (2.4) again, as in the OLS section, using an interaction variable $[Unemp* LogCap]$. As shown in Table 2.12, estimates for the time ratios for the interaction variable are insignificantly different from 1, both on the full sample and on the subsample. Hence, the method of parametric survival analysis does not provide evidence for statement (2.4) of H_C.[43]

[42] These eight regressions are not shown in a table.

[43] As for the individual effect of size on duration, time ratios for $LogCap$ in Table 2.10 are significantly above 1 in all but two regressions (those on the whole sample with region dummies dropped) so that the effect ranges from 1.1% in $4'd$ to 4.5% in $4b$.

2.5.3 Quantile Regression Analysis

Yet another way to approach the data on bankruptcy duration is quantile regression as introduced by Koenker and Bassett (1978) and further developed, for example, by Koenker and Hallock (2001). Quantile regression estimates the median (or any other quantile), rather than the mean which is the case of ordinary least squares regression. Thus quantile regression is, in general, more robust in response to large outliers.

As Koenker and Bilias (2001) argued, applying the method on unemployment duration data, "quantile regression offers a constructive complement to existing statistical methods of survival analysis. By enabling the researcher to focus attention on particular regions of the conditional duration distribution, quantile regression offers a more flexible approach than the more conventional transformation models in which covariates are assumed to exert a pure location-shift effect" (p. 22).

Fitzenberger and Wilke (2006) compare quantile regression to standard duration models: "By modelling the distribution of the duration in a flexible semiparametric way, quantile regression does not impose modelling assumptions that may not be empirically valid, e.g. the proportional hazard assumption. Quantile regression models are more flexible than accelerated failure time models or the Cox proportional hazard model because they do not restrict the variation of estimated coefficients over the quantiles" (p. 105).

Although quantile regression is not at all as widespred in the existing bankruptcy duration literature as the survival analysis, I add quantile regression as a third alternative method to see whether it delivers results consistent with those of the first two methods.

Unemployment and Duration (Testing H_U)

As discussed above, adding region dummies to the regressions might be problematic. In quantile regressions, there is yet additional reason for being careful when interpreting results of specifications that include regions dummies. In quantile (decile) regressions, the sample of 877 observations is split into ten subsamples of about 88 observations each. In such a small sample it makes quite a difference in the degrees of freedom whether the seven region dummies are added to the ten basic regressors (and a constant) or not.

First, I look at quantile regression results when region dummies are not included as controls. When I quantile-regress duration according to specification 2.5, the resulting *Unemp* coefficients for the first four deciles range between 0.9 and 1.5, significant (or in the case of the first decile close to significant) at 10% level, while for the 5th and

higher deciles the coefficients are insignificant – see the left chart in Figure 2.4. Running the quantile regression jointly on the 40% quantile delivers $Unemp$ coefficient of 1.4, significant at 5% level.

Replicating the same using $LogDur$ as the dependent variable gives about the same picture – see the right chart in Figure 2.4. The $Unemp$ coefficients for the first four deciles range from 0.035 to 0.050, while the joint result on the 40% quantile is 0.037, significant at 5% level.

When regions are included in quantile regressions, $Unemp$ is no more significant for any decile. It may mean that the part of duration that seemed to be explained by the unemployment rate is, instead, explained by regional differences in bankruptcy practice. But the loss of significance once I control for regions can also be due to multicolinearity and/or small number of degrees of freedom. For the remaining specifications of quantile regressions I present only those without region dummies.

It can be stated that the method of quantile regression confirms the hypothesis H_U being valid for about the first 3.5 years of the bankruptcy procedure.

Interaction with Liquidation (Testing H_L)

To see whether (2.3) holds, I again, as in OLS regression analysis and survival analysis, divide the sample into two subsamples according to Liq and expect the $Unemp$ effect under $Liq = 1$ to be positive and stronger than under $Liq = 0$. The results of this test, depicted in the top part of Figure 2.5, are confirmative in two deciles. $Unemp$ is insignificant for all deciles in the top charts ($Liq = 0$), while significantly positive for the 1st and 4th deciles in the bottom charts ($Liq = 1$).

Alternatively, I use the interaction variable $[Unemp * Liq]$ in addition and see results as shown in the bottom part of Figure 2.5. The interaction coefficient is significantly positive only for the 1st and 6th deciles, while $Unemp$ remains significant in the first three deciles. Estimate for Liq remains insignificant through all deciles.

All this provides just implausible support for the hypothesis H_L.

Interaction with Size (Testing H_C)

Figure 2.6 shows results for the regressions with $[Unemp * LogCap]$ added to the regressions in Figure 2.4. The effect of the interaction variable is insignificant in all but the first

decile. Thus, quantile regression does not provide support for statement (2.4) of H_C.[44]

2.5.4 Summary of the Empirical Results

I applied three alternative statistical methods – OLS regression, parametric duration (survival) analysis, and quantile regression – on the population of all 903 Czech corporate bankruptcies that were completed during 2004 by the distribution of returns among creditors. As a result, I confirmed the hypothesis that, in the first four years of the bankruptcy procedure, bankruptcy duration is positively affected by the level of unemployment in which the firm operated when it became bankrupt. I also showed that the magnitude of this effect is the stronger the larger the firm is. I did not confirm the hypothesis that the unemployment effect is stronger in firms that had been already in liquidation prior to entering bankruptcy.

By all three alternative methods used, hypothesis H_U of a positive effect of the unemployment rate on bankruptcy duration has been confirmed to hold for the first four years of bankruptcy and not to hold for longer lasting cases. Without region dummies, the effect of a one unit increase of $Unemp$ on duration ranges from +0.6 to +1.3 months depending on the method used (on the whole sample).[45] When region dummies are included, both OLS and survival analysis deliver a *+1.6 month* effect for the subsample under four years, while quantile regression gives insignificant results for all quantiles.

Hypothesis H_L presumed that Liq intensifies the effect of $Unemp$. This hypothesis has been rejected by all methods used. Only the quantile regression shows support for H_L to hold for the first and sixth deciles of the sample.

Hypothesis H_C on the joint multiplicative effect of size and unemployment was confirmed only for shorter cases and only by some methods. All four OLS specifications on the subsample of cases lasting below four years suggest that a one unit positive change in $Unemp * LogCap$ increases duration by approximately 1.2 month. This means that for companies with registered capital of CZK 100,000 the $Unemp$ effect is estimated at *+2.4 months*, while for a company with capital of CZK 1 million, the effect gets *+3.6 months*.

[44]The sole effect of size is of the expected sign and is quite strong for about the first 4.5 years of the bankruptcy procedure. In the elementary quantile regressions in Figure 2.4, *LogCap* is significantly positive through the first six deciles. Running the quantile regression jointly on the 60% quantile gives an estimate of *LogCap* coefficient of 4.5 in the linear form and 0.085 in the log-linear form, both significant at 1% level.

[45]The effect ranges from +0.6 in survival analysis through +1.0 month in OLS to +1.3 months in quantile regression.

To better interpret the normalized $Unemp$ effect on duration it is useful to express it in terms of the effect of the unemployment rate as reported by the MLSA, UR_{t_0}, on duration. As stems from equation 2.1, ΔUR_{t_0} can be obtained as $\Delta Unemp$ divided by the standard deviation of UR_{t_0} throughout the 77 districts. The month of the declaration of bankruptcy for the subsample of the cases lasting less than 4 years ranges from March 2000 to November 2003. In the months within this time frame, the standard deviations range from 3.8 to 4.2 with the mean at 4.0, implying that the effect expressed in UR_{t_0} is about 4 times weaker than that expressed in $Unemp$. Hence, above mentioned $Unemp$ effects of *+1.6 / +2.4 / +3.6* on duration are equivalent to *+0.4 / +0.6 / +0.85* effects of UR_{t_0} on duration.

Thus, to sum up, the main quantitative results are that a 2.5pp increase in the unemployment rate is consistent with a 1-month increase in bankruptcy duration.[46] Controlling for the interaction between unemployment and size, the effect shows up with higher magnitude.[47] In firms with registered capital of CZK 100,000 (and these represent 40% of the sample), a 1.7pp increase in the unemployment rate is associated with a 1-month increase in duration. In firms of CZK 1 million registered capital (5% of firms are of this size, 31% have capital between CZK 100 thousand and 1 million) only a 1.2pp increase suffices to prolong bankruptcy by 1 month.[48]

2.5.5 Robustness Check

Finally, I make a robustness check of the results. For the robustness check I use two other alternative measures of unemployment rate in the district where the firm operates: the rate at the end of 2002 (denoted $UR2002$) and the change of unemployment rate between 1996 and 2004 (denoted $URdiff$ and defined as $UR2004$-$UR1996$). Year 2002 represents the middle point of the average-lasting case, while 1996-2004 represents an 8-year span covering the vast majority of the cases. The average unemployment rate as of end-2002 across districts was 8.8 per cent, while the average difference between 1996 and 2004 unemployment rates across districts was 5.6 per cent.

I replicate the regressions using these two alternative measures of unemployment. Again, the general picture is that hypothesis H_U is confirmed (especially on the shorter

[46] $2.5 = \frac{1}{0.4}$, i.e. having 1 unit change of X associated with 0.4 unit change of Y is equivalent to having 2.5 units change of X associated with 1 unit change of Y.

[47] though lower robustness to the change of estimation method – see section 2.5.5

[48] $1.7 = \frac{1}{0.6}$ and $1.2 = \frac{1}{0.85}$.

cases subsample), while no support is found for hypothesis H_L and hypothesis H_C is confirmed on the subsample by some of the methods.

When I replicate the base-case regressions with no interaction variables (i.e. those from Table 2.7, Table 2.10, and Figure 2.4) using $UR2002$ instead of $Unemp$, I obtain significantly positive coefficient estimates for this variable. $URdiff$ delivers weaker results, with P-value around 20%. The results of the replication of regressions using the product of unemployment and size as additional regressor (i.e. those from Table 2.9, Table 2.12, and Figure 2.6) are also similar to the original ones, though weaker – coefficients for the interaction variables are positive and significant at 10% level but the coefficients for $LogCap$ would be significant only at about 20% level.

Thus the elementary pattern is confirmed also by a different measure of the unemployment rate variable. However, for reasons discussed above in this paper, $Unemp$ provides more appropriate measure for examining the effect of unemployment rate on bankruptcy duration.

2.6 Conclusion

The goal of this paper was to test the overcontinuation hypothesis in Czech corporate bankruptcy procedures under the old regime. The hypothesis was formulated in three parts – a direct effect of unemployment rate on duration and interactions of this effect with the fact whether the firm was still in business when entering bankruptcy and with the firm's size. Applying three alternative statistical methods on the population of all 903 Czech corporate bankruptcies that were completed during 2004 by the distribution of returns among claimants, I confirmed the hypothesis that, in the first four years of the bankruptcy procedure, bankruptcy duration is positivelly affected by the level of unemployment in which the firm operated when it became bankrupt. I also showed that the magnitude of this effect is the stronger the larger the firm is. I did not confirm the hypothesis that the unemployment effect is stronger in firms that had been already in liquidation prior to entering bankruptcy.

The result has an interesting implication for understanding what was happening in Czech bankruptcies prior to the reform. During the period of the last ten years of the pre-reform bankruptcy regime in the Czech Republic, the lengthiness of bankruptcy procedures was becoming a more and more severe problem for the economy. Statistics on the agenda of Czech bankruptcy courts provided by the Ministry of Justice suggest that

the average duration of bankruptcy cases still running at the end of 1998, 1999, and 2000 was about 2 years, suddenly jumped to 3 years in 2001 and then steadily increased to exceed 4 years in 2007. At the same time, the unemployment rate in the Czech Republic dramatically increased from 3.5% in 1996 to 9.4% in 1999. Then it stabilized around levels of 9-10% for the following four years. During the period 2005–2007, the unemployment rate steadily decreased to 6%. Looking at this development of bankruptcy duration and unemployment rate in the light of the issue presented in the paper, one can conclude that one of the reasons for the sudden increase of average bankruptcy duration in 2001 was the threefold increase in the unemployment rate between 1996 and 1999. If judges were really concerned about direct social consequences when applying their discretion within bankruptcy procedures, then the prolongation of bankruptcy procedures would be revealed in cases that were initiated in the late 1990s, i.e. exactly those that were to terminate around 2001 or 2002. Put more generally, one of the factors determining the duration of Czech bankruptcies under the old regime could be the unemployment rate.[49]

With the effect from 2008, the old Czech bankruptcy law has been replaced by a new regime. Although the new bankruptcy law clearly states that its goal is to maximize returns for creditors as a whole and represents a crucial change in many parameters towards creditor-oriented, judges still have several possibilities of discretion that they can use for delaying the exit of the firm if they personally perceive the potential effects of the ultimate exit to have harsh impact on the surrounding community. And the judges who practice the new law are those who practiced the old one in the past. Thus, what we observed in this paper may be not only a description of past behavior but also an important aspect that can play a role under the new regime as well.

Despite the limitations of the data set used, this paper still represents the most indepth empirical analysis of Czech bankruptcy procedures in the recent economic literature. An interesting follow-up in the future would be a similar test made several years after the new regime came into force. That could be a valuable empirical test of the Northian idea of path dependence in an environment of quickly changing formal institutions and stagnating complementary informal institutions.

[49]In addition to various institutional factors that have been repeatedly mentioned in the public debate.

2.A Appendix

2.A.1 Tables

Table 2.1: Statistics on Czech Bankruptcy Procedures

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Petitions filed	4,289	4,322	4,618	4,016	3,985	3,891	3,627	3,870	4,203	4,992
by debtor	n.a.	n.a.	n.a.	n.a.	2,041	2,233	2,318	2,636	2,991	3,612
by creditor	n.a.	n.a.	n.a.	n.a.	1,940	1,658	1,309	1,234	1,212	1,351
Declared bankruptcies	2,019	1,998	2,489	2,470	2,146	1,719	1,435	1,230	1,238	1,104
Terminated cases	284	601	925	1,589	1,728	1,864	1,997	1,999	1,840	1,832
Cancelled	n.a.	n.a.	n.a.	n.a.	824	770	795	654	694	748
Completed	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,158	1,227	1,072	1,083
Other way	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	44	118	74	1
Running cases	4,645	6,039	7,549	8,413	8,799	8,616	8,043	7,255	6,648	5,922
below 1 year	1,746	1,657	1,275	1,425	1,493	1,295	1,223	1,085	1,174	1,012
1 – 3 years	1,967	2,830	3,396	3,226	3,031	2,919	2,311	2,123	1,746	1,536
3 – 5 years	831	1,166	1,786	2,172	2,248	2,092	1,879	1,778	1,348	1,025
5 – 7 years	101	386	1,092	1,590	1,235	1,365	1,402	1,251	1,158	1,010
above 7 years					792	945	1,228	1,018	1,222	1,339
Average duration	23	28	25	38	40	43	46	46	47	50

Notes: All bankruptcy procedures, i.e. corporate and personal bankruptcies. Compositions not included.

Petitions filed = Number of bankruptcy petitions filed during the year. Bankruptcy petition can be filed either by the debtor or by any of its creditors.

Declared bankruptcies = Number of declared bankruptcies, i.e. number of approved bankruptcy petitions, during the year. Bankruptcy declaration initiates the bankruptcy procedure.

Terminated cases = Number of bankruptcy procedures that were terminated during the year. This figure comprises predominantly those procedures cancelled for lack of assets and those completed by the distribution of returns among claimants).

Running cases = Number of bankruptcy procedures that were still active as of the end of the year.

Average duration = Average duration (in months) of the cases that were running at the end of the year, measaured as period between the bankruptcy declaration and the end of 2004. Author's calculation using the assumption that average durations in the respective buckets are 6 months, 24 months, 48 months, 72 months, and 96 months. For years 1998–2001, average duration of the bucket "above 5 years" is assumed at 84 months.

Source: Ministry of Justice.

Table 2.2: Coverage of Regions and Districts by Courts

Court Name	Territory	Notation	Coverage
Prague		Pr	13 districts
- Municipal Court	City of Prague		1 district
- Regional Court	Central Bohemia		12 districts
Ceske Budejovice	Southern Bohemia	C	8 districts
Plzen	Western Bohemia	Pl	10 districts
Usti nad Labem	Northern Bohemia	U	10 districts
Hradec Kralove	Eastern Bohemia	H	11 districts
Brno	Southern Moravia	B	14 districts
Ostrava	Northern Moravia	O	11 districts
Total	Czech Republic		77 districts

Court	Districts
Pr	**AB**, BE, BN, KH, KL, KO, MB, ME, NB, PB, PH, PZ, RA
C	**CB**, CK, JH, PI, PE, PT, ST, TA
Pl	CH, DO, KT, KV, PJ, **PM**, PS, RO, SO, TC
U	CL, CV, DC, JN, LB, LN, LT, MO, TP, **UL**
H	CR, HB, **HK**, JC, NA, PU, RK, SM, SY, TU, UO
B	BK, **BM**, BO, BV, HO, JI, KM, PV, TR, UH, VY, ZL, ZN, ZR
O	BR, FM, JE, KI, NJ, OL, OP, **OV**, PR, SU, VS

Note: Capital districts, i.e. those that are regional administrative centers and where regional courts are located, are highlighted in bold.

Table 2.3: Continuous variables

Variable	Description	Notation	Obs.	Mean	St.D.	Min	Max
Duration	Months elapsed between the	Dur	903	50.58	23.42	11	127
	month of bankruptcy declaration and the month of proceeds' division among creditors	$LogDur$	903	3.81	0.50	2.40	4.84
Unempl.	District's unemployment	UR_{t_0}	880	7.24	4.13	0.30	22.20
rate	rate at the end of month of bankruptcy declaration in percentage	$Unemp$	903	-0.21	1.08	-1.96	3.33
Capital	Firm's registered capital	Cap	877	12,020	55,272	25	689,200
	in CZK thousands	$LogCap$	877	2.59	0.92	1.40	5.84

Table 2.4: Dummy variables

Variable	Description	Notation	Obs.	1	0
Liquidation	Was the company in liquidation when it entered bankruptcy procedure? 1=Yes, 0=No	Liq	903	192	711
Prior1994	Did the firm start its operations in 1994 at the latest? 1=Yes, 0=No	$Prior1994$	903	670	233
NoExit	Was the firm still registered in November 2008? Yes=1, No=0	$NoExit$	903	373	530
Legal form	limited liability	sro	903	697	-
	corporation,	as	903	110	-
	partnership,	vos	903	15	-
	cooperative,	$coop$	903	61	-
	other	$other$	903	20	-
Municipality	City or town of the company's registered seat		903	-	-
District	77 region dummies derived from $Municipality$		903	-	-
Court region	7 region dummies – Brno,	B	903	120	-
	Ceske Budejovice,	C	903	68	-
	Hradec Kralove,	H	903	149	-
	Ostrava,	O	903	155	-
	Plzen,	Pl	903	88	-
	Praha,	Pr	903	236	-
	Usti nad Labem	U	903	87	-

Table 2.5: Continuous variables (subsample $Dur \leq 47$)

Variable	Obs.	Mean	St.Dev.	Min	Max
Dur	455	32.04	9.42	11	47
$LogDur$	455	3.42	0.34	2.40	3.85
UR_{t_0}	455	8.10	4.20	2.80	22.20
$Unemp$	455	-0.20	1.05	-1.73	3.13
Cap	455	7,448	49,981	25	689,200
$LogCap$	455	2.47	0.78	1.40	5.84

Table 2.6: Summary Statistics – Duration by Dummy Variables

		Full sample			Subsample $Dur \leq 47$		
Variable		Freq.	Mean	St.D.	Freq.	Mean	St.D.
Liq	1	20%	53.2	24.0	20%	33.5	8.1
	0	80%	49.5	22.8	80%	31.7	9.7
$Prior1994$	1	73%	54.7	23.1	61%	33.5	8.8
	0	27%	37.9	18.0	39%	29.7	9.9
$NoExit$	1	41%	54.7	23.0	33%	32.9	9.2
	0	59%	47.1	22.6	67%	31.6	9.5
Legal form	sro	79%	48.9	22.7	83%	31.8	9.5
	as	13%	52.3	22.9	12%	33.2	8.9
	vos	0%	65.0	65.1	0%	19.0	-
	coop	6%	59.3	21.8	4%	36.2	6.1
	other	2%	62.3	29.8	1%	26.0	11.2
Court region	B	13%	48.9	20.3	14%	34.5	7.4
	C	8%	54.2	19.5	5%	34.6	9.1
	H	16%	52.0	22.0	15%	34.1	8.6
	O	17%	41.3	19.2	24%	31.6	9.4
	Pl	10%	41.4	22.5	13%	29.1	9.9
	Pr	26%	49.6	24.3	26%	30.3	10.1
	U	10%	72.4	19.1	3%	37.4	7.5
Total		877	50.2	23.1	455	32.0	9.4

Table 2.7: OLS Regression Results – Testing H_U

	(1a)	(1b)	(1c)	(1d)
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Intercept$	28.79***	33.60***	3.30***	3.44***
	(10.35)	(9.18)	(55.52)	(43.90)
$Unemp$	1.01	-0.25	0.03*	0.00
	(1.48)	(-0.24)	(1.83)	(0.02)
Liq	-0.05	-0.13	-0.00	-0.01
	(0.00)	(-0.07)	(-0.02)	(-0.15)
$LogCap$	2.35**	2.70***	0.06***	0.07***
	(2.17)	(2.66)	(2.73)	(3.13)
$Prior1994$	16.16***	15.06***	0.37***	0.35***
	(9.57)	(9.49)	(10.18)	(10.15)
$NoExit$	7.44***	6.07***	0.16***	0.15***
	(4.90)	(3.73)	(4.93)	(4.32)
$LegForm$	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
R^2	14.8%	26.1%	16.3%	27.0%
$Adj.R^2$	13.9%	24.8%	15.4%	25.8%
N	877	877	877	877

	(1′a)	(1′b)	(1′c)	(1′d)
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Intercept$	25.08***	29.46***	3.16***	3.31***
	(14.68)	(11.67)	(51.23)	(36.36)
$Unemp$	0.95**	1.62**	0.03**	0.05*
	(2.25)	(2.20)	(2.19)	(1.81)
Liq	1.02	0.92	0.05	0.04
	(0.88)	(0.80)	(1.15)	(1.08)
$LogCap$	1.72**	1.48**	0.06**	0.05**
	(2.44)	(2.13)	(2.40)	(2.06)
$Prior1994$	3.63***	3.73***	0.14***	0.14***
	(4.01)	(4.21)	(4.14)	(4.36)
$NoExit$	1.67*	2.34**	0.06*	0.09**
	(1.76)	(2.22)	(1.75)	(2.35)
$LegForm$	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
R^2	8.7%	14.2%	9.1%	14.9%
$Adj.R^2$	6.8%	11.3%	7.3%	12.0%
N	455	455	455	455

Note: t-statistics in parentheses; *=10%, **=5%, ***=1% significance. Regressions $1a - d$ include all 877 observations, while regressions $1'a - d$ include 455 observations with duration below median only.

Table 2.8: OLS Regression Results – Testing H_L

	$(2a)$	$(2b)$	$(2c)$	$(2d)$
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Liq = 0$**:**				
$Intercept$	31.63***	34.46***	3.34***	3.45***
	(10.03)	(8.39)	(48.18)	(38.23)
$Unemp$	0.68	-1.16	0.02*	-0.01
	(0.92)	(-1.02)	(1.33)	(-0.51)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
R^2	16.3%	28.0%	17.0%	28.6%
$Adj.R^2$	15.3%	26.6%	16.0%	27.2%
N	698	698	698	698
$Liq = 1$**:**				
$Intercept$	22.57***	36.84***	3.24***	3.54***
	(3.32)	(4.26)	(24.60)	(20.91)
$Unemp$	2.59	4.17*	0.05	0.07
	(1.54)	(1.70)	(1.50)	(1.52)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
R^2	14.9%	30.6%	16.9%	30.7%
$Adj.R^2$	10.9%	24.7%	13.0%	24.8%
N	179	179	179	179

	$(2'a)$	$(2'b)$	$(2'c)$	$(2'd)$
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Liq = 0$**:**				
$Intercept$	24.29***	29.39***	3.13***	3.30***
	(11.68)	(10.12)	(41.25)	(31.20)
$Unemp$	0.99**	2.02**	0.03*	0.06*
	(2.09)	(2.43)	(1.96)	(1.96)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
R^2	7.8%	15.5%	7.8%	15.9%
$Adj.R^2$	6.0%	12.4%	6.0%	12.8%
N	366	366	366	366
$Liq = 1$**:**				
$Intercept$	28.20***	32.95***	3.30***	3.45***
	(8.68)	(5.33)	(30.07)	(16.51)
$Unemp$	0.65	0.61	0.03	0.02
	(0.66)	(0.36)	(0.81)	(0.39)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
R^2	12.8%	16.8%	15.7%	19.4%
$Adj.R^2$	4.1%	1.1%	7.3%	4.1%
N	89	89	89	89

Note: t-statistics in parentheses; *=10%, **=5%, ***=1% significance. Term "Other ctrls" denotes set of other controls: $LogCap$, $Prior1994$, $NoExit$, and $LegForm$ dummies. Regressions $2a - d$ are based on all 877 observations, while regressions $2'a - d$ on 455 observations with duration below median only.

Table 2.9: OLS Regression Results – Testing H_C

	$(3'a)$	$(3'b)$	$(3'c)$	$(3'd)$
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Intercept$	24.13***	28.42***	3.13***	3.27***
	(13.76)	(11.13)	(49.38)	(35.52)
$Unemp * LogCap$	1.16**	1.14**	0.04**	0.04**
	(2.23)	(2.24)	(2.08)	(2.11)
$Unemp$	-1.85	-1.22	-0.06	-0.05
	(-1.40)	(-0.83)	(-1.27)	(-0.91)
$LogCap$	2.14***	1.88***	0.07***	0.07**
	(2.94)	(2.64)	(2.86)	(2.53)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
R^2	9.7%	15.2%	10.0%	15.8%
$Adj.R^2$	7.7%	12.1%	8.0%	12.7%
N	455	455	455	455

Note: t-statistics in parentheses; *=10%, **=5%, ***=1% significance. Term "Other ctrls" denotes set of other controls: $Prior1994$, $NoExit$, and $LegForm$ dummies.

Table 2.10: Survival Analysis Results (Weibull Distibution) – Testing H_U

	(4a)	(4b)	(4c)	(4d)
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Unemp$	1.013	0.988	1.003	0.997
	(1.00)	(-0.62)	(1.01)	(-0.58)
Liq	1.010	0.998	1.002	0.999
	(1.26)	(-0.04)	(0.18)	(-0.12)
$LogCap$	1.027	1.045**	1.008	1.012**
	(1.26)	(2.15)	(1.42)	(2.30)
$Prior1994$	1.407***	1.386***	1.089***	1.085***
	(10.88)	(10.78)	(10.50)	(10.44)
$NoExit$	1.136***	1.108***	1.033***	1.027***
	(4.57)	(3.29)	(4.51)	(3.36)
$LegForm$	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
$Log-likelihood$	-551.728	-505.313	618.653	663.822
$Prob > Chi^2$	0.00%	0.00%	0.00%	0.00%
N	877	877	877	877

	(4′a)	(4′b)	(4′c)	(4′d)
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Unemp$	1.019*	1.050**	1.006*	1.014**
	(1.69)	(2.30)	(1.68)	(2.22)
Liq	1.003	1.008	1.002	1.003
	(0.10)	(0.25)	(0.17)	(0.31)
$LogCap$	1.044**	1.040**	1.012**	1.011*
	(2.13)	(1.96)	(2.07)	(1.90)
$Prior1994$	1.080***	1.086***	1.023***	1.024***
	(3.14)	(3.40)	(3.10)	(3.34)
$NoExit$	1.032	1.039	1.010	1.011
	(1.26)	(1.34)	(1.28)	(1.37)
$LegForm$	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
$Log-likelihood$	-90.770	-81.376	457.524	466.446
$Prob > Chi^2$	0.32%	0.01%	0.36%	0.02%
N	455	455	455	455

Note: Time ratios reported, z-statistics in parentheses; *=10%, **=5%, ***=1% significance.

Table 2.11: Survival Analysis Results (Weibull Distibution) – Testing H_L

	(5a)	(5b)	(5c)	(5d)
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Liq = 0$**:**				
$Unemp$	1.010	0.965	1.003	0.992
	(0.66)	(-1.63)	(0.74)	(-1.46)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
$Log-likelihood$	-439.323	-400.865	487.147	524.423
$Prob > Chi^2$	0.00%	0.00%	0.00%	0.00%
N	698	698	698	698
$Liq = 1$**:**				
$Unemp$	1.026	1.065	1.006	1.015
	(0.96)	(1.56)	(0.88)	(1.47)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
$Log-likelihood$	-105.840	-88.277	137.969	154.670
$Prob > Chi^2$	0.02%	0.00%	0.03%	0.00%
N	179	179	179	179

	(5′a)	(5′b)	(5′c)	(5′d)
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Liq = 0$**:**				
$Unemp$	1.020	1.058**	1.006	1.016**
	(1.53)	(2.35)	(1.54)	(2.27)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
$Log-likelihood$	-89.910	-80.346	349.567	358.711
$Prob > Chi^2$	0.98%	0.03%	1.22%	0.05%
N	366	366	366	366
$Liq = 1$**:**				
$Unemp$	1.019	1.028	1.004	1.007
	(0.79)	(0.62)	(0.72)	(0.56)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
$Log-likelihood$	4.529	7.438	113.879	116.548
$Prob > Chi^2$	30.68%	36.09%	29.72%	38.52%
N	89	89	89	89

Note: t-statistics in parentheses; *=10%, **=5%, ***=1% significance. Term "Other ctrls" denotes set of other controls: $LogCap$, $Prior1994$, $NoExit$, and $LegForm$ dummies. Regressions $5a-d$ are based on all 877 observations, while regressions $5'a-d$ on 455 observations with duration below median only.

Table 2.12: Survival Analysis Results (Weibull Distibution) – Testing H_C

	(6a)	(6b)	(6c)	(6d)
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Unemp * LogCap$	0.991	0.998	0.998	0.999
	(-0.69)	(-0.12)	(-0.68)	(-0.16)
$Unemp$	1.037	0.992	1.009	0.998
	(0.99)	(-0.21)	(0.99)	(-0.16)
$LogCap$	1.025	1.044**	1.007	1.012**
	(1.16)	(2.12)	(1.32)	(2.27)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
$Log-likelihood$	-551.493	-505.306	618.885	663.835
$Prob > Chi^2$	0.00%	0.00%	0.00%	0.00%
N	877	877	877	877

	(6′a)	(6′b)	(6′c)	(6′d)
Dep.Var.:	Dur	Dur	$LogDur$	$LogDur$
$Unemp * LogCap$	1.023	1.024	1.007	1.007
	(1.41)	(1.47)	(1.38)	(1.44)
$Unemp$	0.964	0.991	0.990	0.997
	(-0.90)	(-0.21)	(-0.87)	(-0.22)
$LogCap$	1.049**	1.046**	1.014**	1.013**
	(2.35)	(2.18)	(2.29)	(2.12)
Other ctrls	Yes	Yes	Yes	Yes
$Regions$	.	Yes	.	Yes
$Log-likelihood$	-89.707	-80.225	458.544	467.555
$Prob > Chi^2$	0.27%	0.01%	0.31%	0.02%
N	455	455	455	455

Note: z-statistics in parentheses; *=10%, **=5%, ***=1% significance. Term "Other ctrls" denotes set of other controls: Liq, $Prior1994$, $NoExit$, and $LegForm$ dummies.

2.A.2 Figures

Figure 2.1: Histogram of *Duration* and *Unemp*

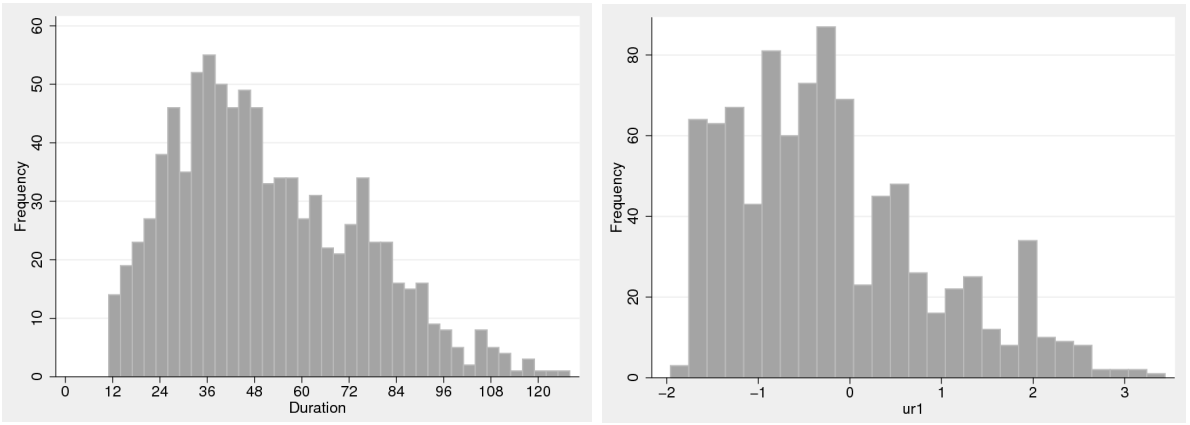


Figure 2.2: Cases by Registered Capital

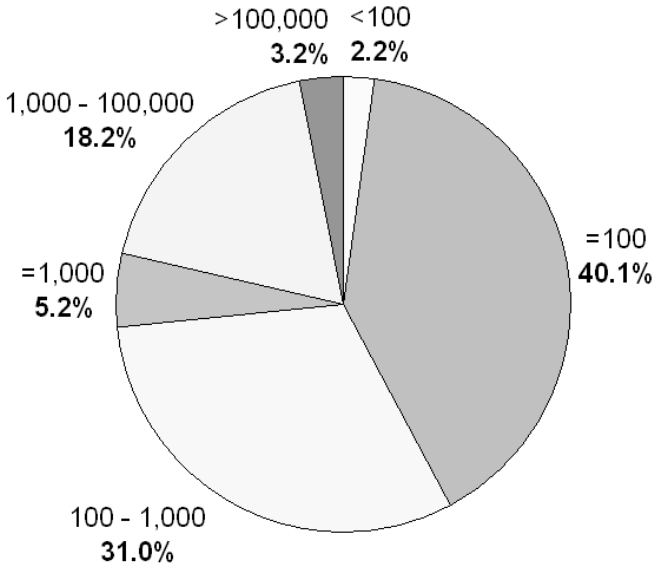
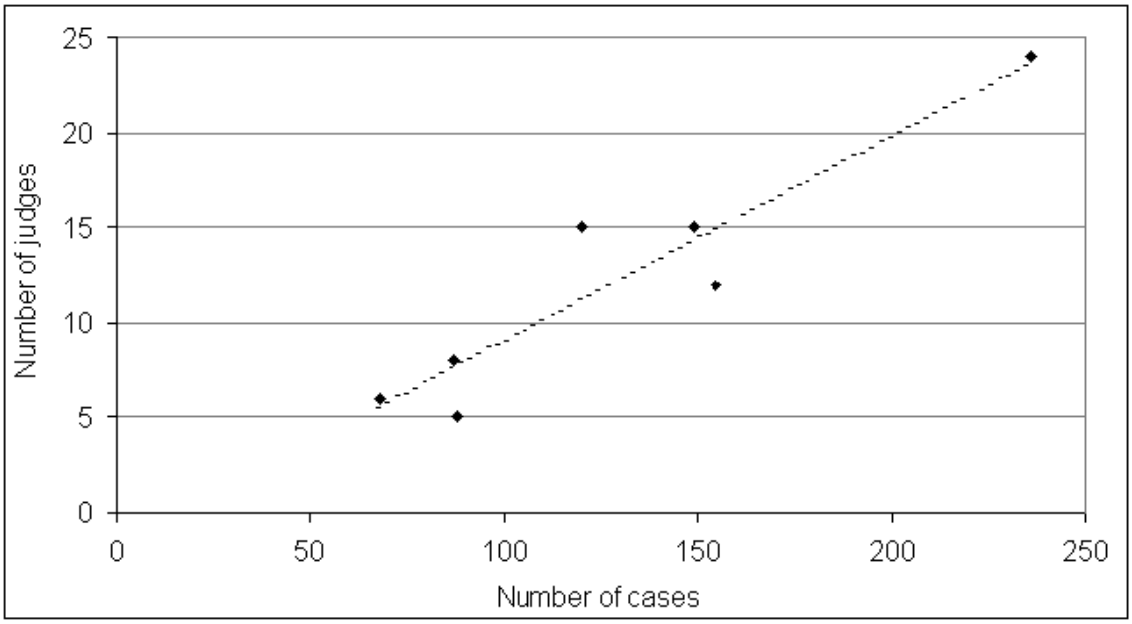


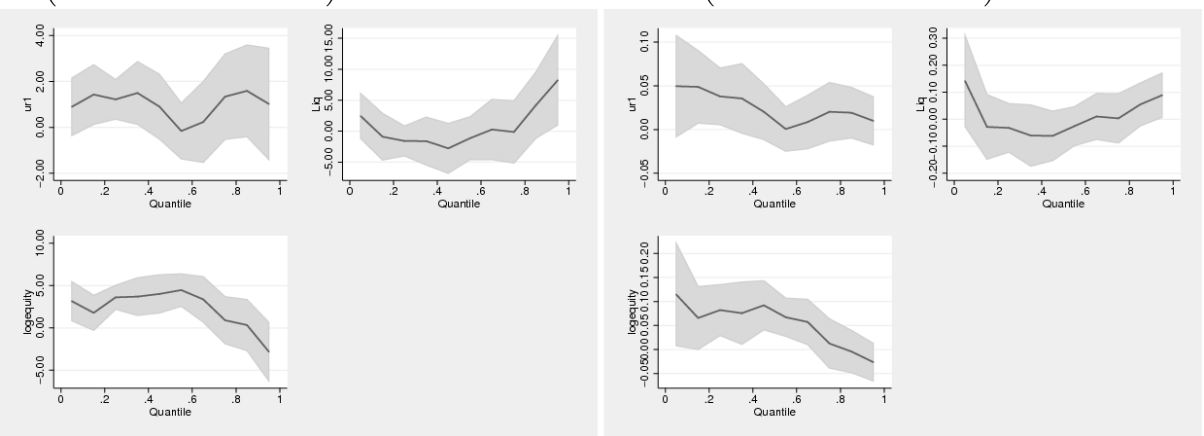
Figure 2.3: Judges and Cases per Court



Note: Depicted points refer (from left to right) to bankruptcy courts of Ceske Budejovice, Usti nad Labem, Plzen, Brno, Hradec Kralove, Ostrava, and Prague.

Figure 2.4: Quantile Regression Results – Testing H_U

$Dur\left(Unemp, Liq, LogCap, other\right)$ $LogDur\left(Unemp, Liq, LogCap, other\right)$

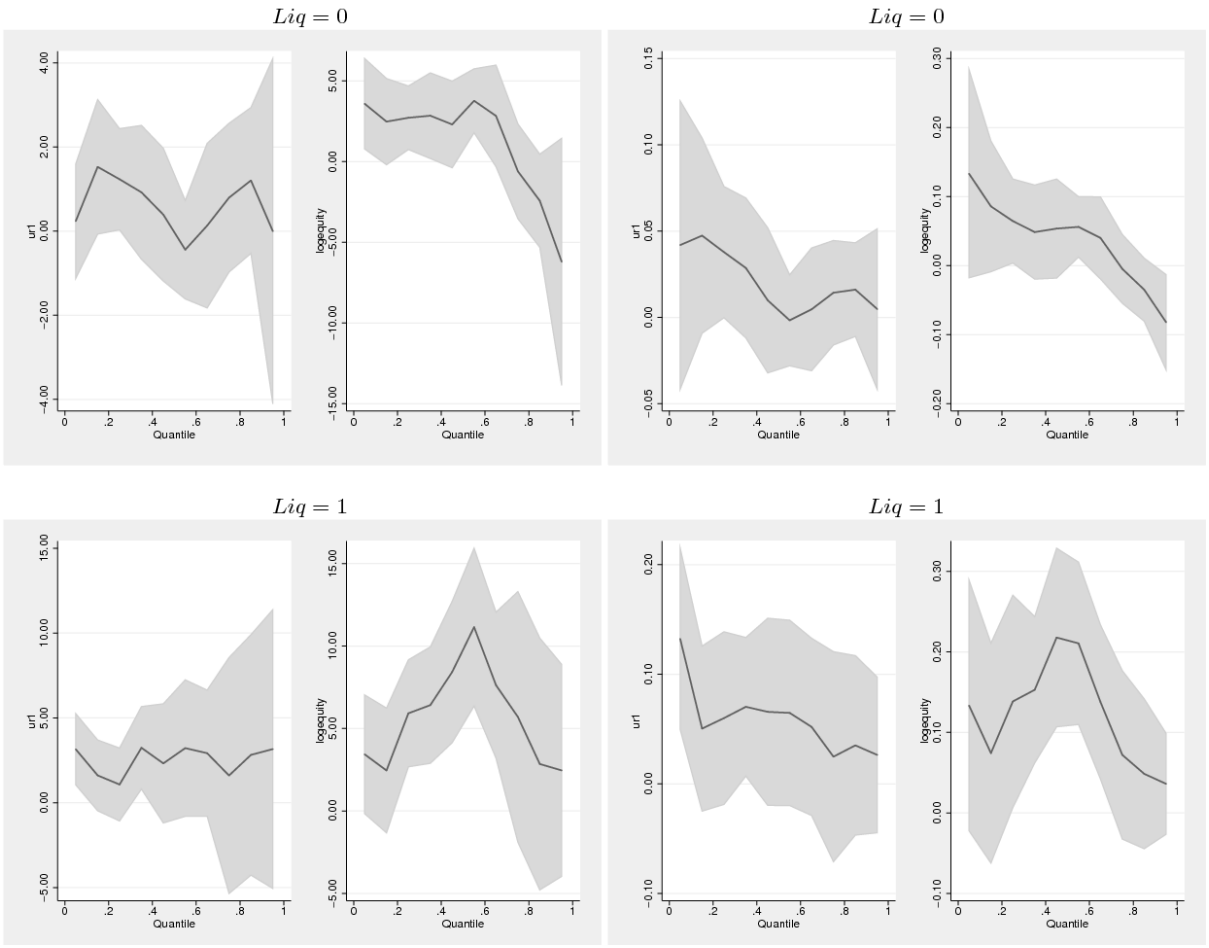


Note: 90% confidence intervals. *Other* denotes other controls – $Prior1994$, $NoExit$, and $LegForm$ dummies.

Figure 2.5: Quantile Regression Results – Testing H_L

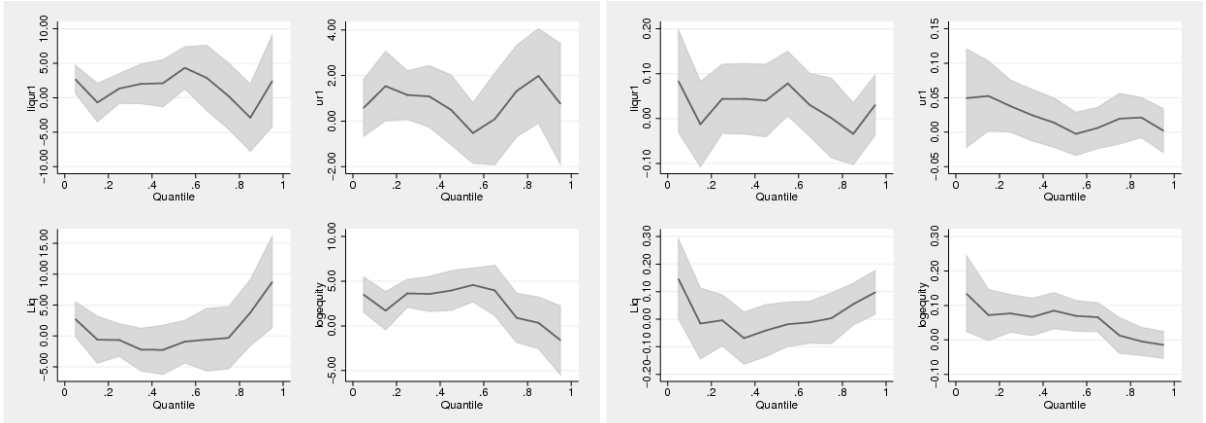
$Dur\Big(Unemp, LogCap, other\Big)$ on two subsamples

$LogDur\Big(Unemp, LogCap, other\Big)$ on two subsamples



$Dur\Big([Unemp * Liq], Unemp, Liq, LogCap, other\Big)$

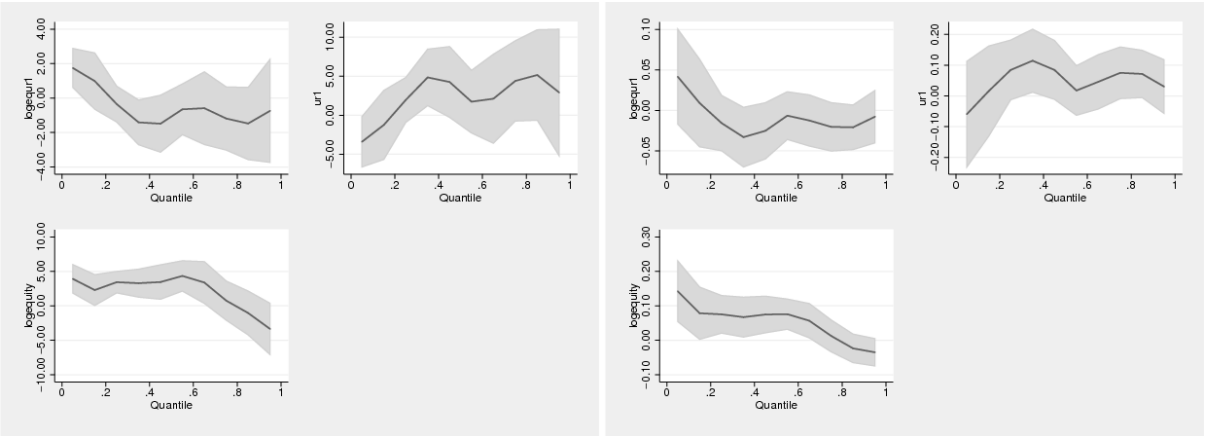
$LogDur\Big([Unemp * Liq], Unemp, Liq, LogCap, other\Big)$



Note: 90% confidence intervals. *Other* denotes other controls – $Prior1994$, $NoExit$, and $LegForm$ dummies.

Figure 2.6: Quantile Regression Results – Testing H_C

$Dur\Big([Unemp * LogCap], Unemp, Liq, LogCap, other\Big)$ $LogDur\Big([Unemp * Liq], Unemp, Liq, LogCap, other\Big)$



Note: 90% confidence intervals. *Other* denotes other controls – $Prior1994$, $NoExit$, and $LegForm$ dummies.

Chapter 3

On the Ex Ante Efficiency of Corporate Bankruptcy Law

Abstract

I present a dozen elementary ex ante inefficencies of too soft or too tough corporate bankruptcy laws and clusters them in five types – debt contracting (credit rationing, creditor structure, other), project choice (effort choice, risk choice, entrenchment), debtor's bankruptcy decision (strategic default, staving off bankruptcy, gambling on resurrection), creditor's bankruptcy decision (inefficient liquidation) and provision of private information (debtor's incentive to share, creditor's incentive to monitor). I introduce an extension of the simple incomplete contracting framework of Schwartz (2002) as a unifying to illustrate seven of these inefficiencies and, thus, connect several approaches that might seem mutually incoherent. The paper may also serve as an introductory textbook on the ex ante (in)efficiency of corporate bankruptcy.

Keywords: corporate bankruptcy, debt contracts, ex ante efficiency
JEL classification codes: G33, K39

3.1 Introduction

In this paper I focus on the optimal design of corporate bankruptcy law from the ex ante efficiency point of view. I introduce a unifying model that, with some variations, allows for illustration of the majority of the ex ante effects of corporate bankruptcy law.

In the existing economic literature on bankruptcy, I identify dozen of different ex ante inefficiencies which can be sorted into five groups according to the decision nodes of the debtor-creditor game. This taxonomy is partly linked to the typology of models on corporate bankruptcy as provided by White (2007). Introducing a unifying model – which is an extension of the simple incomplete contracting framework of Schwartz (2002) – I put together several approaches that might seem mutually incoherent and attempt to reduce some of the "frictions" in the literature that have been caused especially by a variety of notations and underlying assumptions used in different models. The paper may also serve as an introductory textbook on the ex ante (in)efficiency of corporate bankruptcy.

The economic literature on bankruptcy has strongly developed during the last two decades, building especially on the corporate governance/finance literature, law and economics, contract theory, and new institutional economics in general. The origins of the economic analysis of bankruptcy, however, go back to the 1930's when a lawyer Adolph Berle and an economic historian Gardiner C. Means published "The Modern Corporation and Private Property" and a young economic researcher Ronald H. Coase wrote his "The Nature of the Firm". While Berle and Means (1932) set the main building block for the agency theory, Coase (1937) provided, through the discovery of transaction costs, the departure point for property rights theory. Both these streams largely developed during the sixties and seventies when Jensen and Meckling (1976), in their seminal work, triggered an ongoing synthesis of them to a wider stream of corporate governance (and corporate finance) literature which expanded during the 1980's.[1] The boom of the economic literature on bankruptcy – especially theoretical – followed in the 1990's.

There have been few review studies written on the bankruptcy literature, including White (1998) and White (2007). Basically, optimal bankruptcy law is such that it achieves the best balance between the ex ante efficiency and the ex post efficiency. Looking for

[1] In the 1980's a plenty of empirical literature made an invaluable service for the corporate governance/finance theory and together with privatization and deregulation waves, in the 1990's, this stream experienced the largest boom. Comprehensive literature surveys are provided by Shleifer and Vishny (1997) and Becht, Bolton, and Roell (2007).

the best suited bankruptcy procedure gets complicated by the fact that each of the two categories of efficiency has various, often mutually conflicting, subcategories. For example, a feature of a bankruptcy law that mitigates one form of ex ante inefficiency (e.g. credit rationing) may aggravate its other form (e.g. debtor's underinvestment in human capital).

In this paper, I focus on the issue of the ex ante efficiency of corporate bankruptcy law. First, I summarize approaches toward the question what goals a good bankruptcy regime should achieve and present the main parameters that make bankruptcy laws differ from one place to another. Then, in Section 3.3, I introduce the basic unifying theoretical framework and in the next section I present a taxonomy of the ex ante efficiency issues of bankruptcy procedures, explain them and illustrate their logic using the framework. The final section concludes.

3.2 Goals and Parameters of Bankruptcy Law

3.2.1 Goals of Bankruptcy Law

During the last two decades, among bankruptcy scholars few have attempted to define the goals of a bankruptcy procedure – see Hart (1995) and (2000) and Bebchuk (2001), and Claessens and Klapper (2005), and Blazy, Umbhauer, and Weill (2008).

Hart (1995) explains that the rationale for a formal bankruptcy procedure rests in carrying out the disposition of the debtor's assets in an orderly manner when there are multiple creditors. Hart summarizes three desirable goals for a bankruptcy procedure:

- to achieve an *ex post efficient outcome*, i.e. to maximize the total value of the proceeds (in money terms) received by the existing claimants,
- to preserve the *ex ante bonding role of debt* by penalizing managers adequately in bankruptcy states (however, in order to avoid gambling with the assets, the procedure should not be too harsh to managers), and
- to preserve the *absolute priority of claims* with senior creditors being at the top and ordinary shareholders at the bottom.

As these goals (particularly the first two) may be in mutual conflict, Hart adds, a good bankruptcy procedure should find a reasonable balance between them. He provides three reasons for the desirability of the absolute priority preservance: it increases

creditor's incentive to lend, avoids inefficient rent-seeking stemming from discrepancy between bankruptcy and non-bankruptcy states (see also Jackson (1986)), and increases management's ability of commitment via issuing senior debt. Altogether, these three reasons for preserving the absolute priority can be labeled a *desirability to preserve the viability of credit markets*. Hart also mentions the existence of a critique of the absolute priority rule, referring to White (1989), according to which absolute priority preservance motivates managers to gamble for resurrection if things go badly. Hart provides counterarguments and adds that the requirement not to be too harsh on managers is already covered under the second goal.

Five years later, Hart (2000) repeated the three goals of bankruptcy. However, he slightly softened the third goal as opposed to the previous definition by claiming: "Good bankruptcy procedure should preserve the absolute priority of claims, except that some portion of value should possibly be reserved for shareholders."

Bebchuk (2001) states that an "important goal for bankruptcy is attaining an optimal division of bankruptcy value," while there are two principal aspects of optimality – ex ante and ex post. However, according to Bebchuk, "ex post division that is optimal is the one that would have the best overall effect on ex ante incentives and behavior." Absolute priority rule is then something which Bebchuk examines with a question whether or not the absolute priority rule preservance delivers ex post and ex ante efficiency of bankruptcy procedure. In other words, Bebchuk implicitly agrees with the Hart's second goal, ex ante efficiency, while considering the first goal as a direct implication of it (rather than a separate goal) and the third one as an instrument that may or may not lead to reaching efficiency (rather than a goal *per se*).

Claessens and Klapper (2005) view the goals of bankruptcy in a wider sense. Insolvency regimes include several features, such as whether there is an automatic trigger, who can file for reorganization/liquidation, who prepares reorganization proposals, whether management is able to stay during reorganization, or whether there is an automatic stay on assets. Goals of insolvency regime are then to balance the following:

- to protect rights of creditors and other stakeholders,
- to obviate premature liquidation of viable firms,
- to "prevent managers and shareholders from taking imprudent loans,"
- to prevent creditors from lending with a high probability of default,

- to "provide for a degree of entrepreneurship in the economy," and
- to "deliver an ex post efficient outcome, in the sense that the highest total value is obtained for the distressed firm with the least direct costs and loss in going concern value."

Balancing these incentives is further complicated by judicial systems. This list of goals can be thought of as an extension of Hart's list. The first goal mentioned by Claessens and Klapper actually replaces Hart's goal of the absolute priority preservance. It again addresses the requirement on preserving viable credit market but in a way that allows even for the vialotaion of the absolute priority (e.g. via Chapter-11-like reorganization) if such a violation delivers ultimately higher payoffs to creditors than the absolute priority preservance. The following four goals represent special examples of the ex ante efficiency and the last restates Hart's first goal. However, here the ex post efficiency is defined as maximization of total value for the firm, while Hart talked about maximizing proceeds for the firm's claimants (which is in fact an identical definition, supposing that the total value is fully distributed among the claimants) and Bebchuk derived ex post optimality from ex ante optimality.

Blazy, Umbhauer, and Weill (2008), defining ex post efficiency as the maximization of value of a distressed company by considering all the stakeholders, also put it that optimal bankruptcy law is such that balances well ex ante and ex post efficiency. They summarized four functions of a court-governed bankruptcy procedure:

- to coordinate interests between diverse claimants or, in other words, to solve the lack of coordination between creditors,[2]
- to produce information through the court-governed investigation in the costly state verification situation of default,
- to reduce uncertainty and thus help in the determination of the value of assets and of claims,[3] and
- to sanction managers whose bad or tricky choices increased the financial consequences of default.

[2]This coordination function may be achieved through mechanisms such as stay of claims, voting procedures, and/or court enforcement etc.

[3]Bankruptcy law may reduce uncertainty, for example, by setting whether absolute priority is attained or violated in some way, helping in the verification of claims or transferring control from previous managers to creditors.

Although the systemization of goals and functions of bankruptcy law slightly differ across the literature, the essence of all definitions is that the goal of bankruptcy law is to best balance several issues of ex ante and ex post efficiency.

3.2.2 Parameters of Bankruptcy Law

Several researchers have examined, both theoretically and empirically the ex post and ex ante effects of various parameters of the bankruptcy law. The main reference dichotomy is a creditor-oriented approach (tough on the debtor) versus a debtor-oriented approach (soft on the debtor). Basically, a debtor-oriented procedure is such that emphasizes the protection of the debtor and her right to fail. On the contrary, a bankruptcy procedure that follows the creditor-oriented approach is such that focuses on the maximization of returns for creditors as the principal goal. In the literature, there are several criteria discussed that make a bankruptcy law soft in this sense. These include the violation of the absolute priority rule, possibility to opt for a reorganization chapter, judicial discretion, and judicial corruption.

Absolute priority rule (APR). Many researchers focus on the APR under which all secured claims must be paid before any unsecured claims are paid in bankruptcy. To name seminal examples, White (1992) and Bebchuk (2001) examine the ex ante and ex post effects of preservance or violation of the APR. The preservance of the APR can be viewed as an aspect that makes the bankruptcy procedure tough on the debtor. As Povel (1999) put it, a soft bankruptcy procedure necessarily implies some kind of reward to the debtor in bankruptcy regardless whether his debts are repaid or not, and thus must violate the APR to some degree.[4]

[4]It had been for a long time taken as a stylized fact that, in bankruptcy, all secured claims must be paid before any unsecured claims are paid. Bebchuk and Fried (1996) raised a doubt about the desirability of the absolute priority rule under all circumstances and proposed two rules of partial priority as a possible alternatives to the APR: the adjustable-priority rule and the fixed-fraction priority rule. According to the former, claims of non adjusting creditors (typically tort creditors, holders of government tax and regulatory claims, or too small, i.e. "rationally uninformed", creditors) are given the same priority as secured claims. According to the latter, only a fixed fraction of the secured claim is given priority while the remaining portion of the claim is considered as unsecured (this rule was present in the Czech Republic's bankruptcy law from 2000 to 2008 with the ratio fixed at 70%). The main drawback of the partial priority rule is its potential negative effect on the availability of secured credit ex ante. Bebchuk and Fried (1998) reacted to such a critique using a set of plausible arguments based on the US practice. However, not all of these arguments would hold in several other jurisdictions.

Reorganization chapter. Bankruptcy regimes may be also distinguished to those that include a special reorganization chapter (such as Chapter 11 in the US) and those that do not or where its use is rather limited. A reorganization chapter is, in principle, softer on the debtor than a liquidation chapter. This parameter, however, widely overlaps with the previous as it has been shown by many that the APR is violated under Chapter 11, see e.g. Franks and Torous (1989) and Carapeto (2000).

Judicial discretion. Weiss and Wruck (1998) illustrated with the case of the Eastern Airlines' bankruptcy how the court's overprotectiveness and even a "court-sponsored asset stripping" can destroy value. They concluded that a bankruptcy process should protect the distressed firm's assets not simply from a run by creditors but also from overly optimistic managers and misguided judges. Here, judicial discretion was taken as a parameter that can imply the bankruptcy regime to be soft on the debtor. On the contrary, Morrison (2003) found evidence on a sample of small and medium-sized firms that judicial discretion within the Chapter 11 regime does not harm creditors.

Judicial corruption. Judicial corruption can be considered as yet another parameter that has implications on the efficiency of soft law and tough law but, actually, it can also be considered as a parameter that makes bankruptcy law softer under certain circumstances. See Biais and Recasens (2002) for a theoretical model that takes judicial corruption into consideration and Lambert-Mogiliansky, Sonin, and Zhuravskaya (2003) for a theoretical analysis of judicial capture under a US-like bankruptcy regime accompanied with empirical evidence from data on Russian firms after the application of Chapter 11 in Russia.

Wihlborg (2002), referring to Wood (1995), sorted several bankruptcy regimes on the scale from extremely pro-creditor to extremely pro-debtor ones. According to this ranking, former British colonies in Africa, England, Ireland and Australia represent the most creditor oriented bankruptcy regimes while France, its former colonies in Africa and Belgium lie at the opposite extreme. In between, they list e.g. Germany, USA, Austria, Italy, and Spain (in the order from pro-creditor to pro-debtor regimes).

3.3 Modelling Ex Ante Efficiency of Bankruptcy Law

The shape of bankruptcy law has plenty of effects on the behavior of debtors and creditors in various periods of time preceding the bankruptcy situation. Before elaborating on these effects, I specify who is the *debtor* and who are the *creditors*.

3.3.1 Typology of Debtors and Creditors

As the issue of personal bankruptcy is not within the scope of this paper and only corporate bankruptcies are examined, the debtor is always a firm, generally speaking. Not the neoclassical black box firm defined just by the production function, but rather the Coasian "system of relationships" between its constituencies. Here, the corporate governance literature comes into play, as issues like ownership structure or size of the firm can make crucial differences in ex ante effects of bankruptcy law in the contracting period. The debtor may be a corporation, a limited liability company or of other type, it can be large, medium-sized or small, it may have listed shares, the owners of the firm may be publicly known or unknown, dispersed or concentrated, local or foreign.

Although these properties of the debtor may cause large differences in how bankruptcy affects the debtor (and in turn, through the debtor's behavior, other parties), the majority of the economic theories on bankruptcy define the debtor as entrepreneur/owner/manager in one person to isolate bankruptcy issues from those of corporate governance. The effects of ownership structure or size of the firm are more often represented in the empirical literature than in models.

Be that as it may, while the debtor is always one firm, creditors may be, and in a bankruptcy situation always are, multiple.[5] Creditors may be voluntary or involuntary, adjusting or non-adjusting to the existing debt structure, short-term or long-term, secured or unsecured, junior or senior. Typically, a debtor in bankruptcy owes to creditors of several types at once and the rights and priorities of respective types in bankruptcy are set differently in the law. This is also why quite a significant part of the theories on bankruptcy addresses the issue of creditors' taxonomy.

[5]For discussion of why there are multiple creditors at all and how their structure and types relate to bankruptcy law design, see Berglof and von Thadden (1994), Dewatripont and Tirole (1994), Bolton and Scharfstein (1996), or Berglof, Roland, and von Thadden (2003).

3.3.2 Unifying Model

The following model represents an extension of the incomplete contracting model of Schwartz (2002). In period t_0, an entrepreneur intends to run a project of initial cost I. The funding of the project must be fully raised on a competitive credit market. The entrepreneur signs a debt contract with a creditor. The contract specifies the nominal debt I and the repayment duty F to be fulfilled in period t_3. In other words, the contract sets interest rate i, where $I(1+i) = F$. In period t_1, the debtor chooses the level of effort which has a cost e. The effort level is private information of the debtor only.

In period t_2, the project ends up with a good result with probability p or in a bad result with probability $1-p$. The probability, $p = p(e;\theta)$, depends on the entrepreneur's effort e (p is increasing and concave in e), and a stochastic state variable θ.[6] The outcome of the project is $V > F$ in the good state and $v < F$ in the bad state. The realization of the project's result is observable by both debtor and creditor but not verifiable, implying that the contract signed in period t_0 is necessarily incomplete. In period t_2, the debtor decides whether to file for bankruptcy or stay out of the bankruptcy process. The bankruptcy procedure itself costs c (with $0 \leq c \leq v$), meaning that if the bad state realization is followed by bankruptcy the final payoff to be distributed is $x = v - c > 0$.

In period t_3, payoffs are realized and distributed. The distribution of payoffs in case of bankruptcy is determined by the bankruptcy law. There is a continuum between an extremely tough and an extremely soft bankruptcy law. Under a completely tough law, the APR holds and the debtor gets nothing unless the creditor gets the full repayment F. Under a law with a softness degree α (with $0 \leq \alpha \leq 1$), fraction α of the bankruptcy returns is given to the debtor and fraction $(1-\alpha)$ to the creditor.

This setup of the game allows us to shed light on the majority of the ex-ante inefficiencies of bankruptcy law known from the existing theoretical literature.

3.4 Ex Ante Effects of Banktuptcy Law

In this section, I systematically summarize various ex ante effects of bankruptcy law as discussed by various authors and illustrate the majority of these effects using the model introduced above. A natural point of departure for my work is White (2007) who provided

[6] Due to the stochastic element θ, even a debtor who exerts a very high level of effort may default and, vice versa, even with minimum effort the firm might be able to repay its debt and continue operating if the outside conditions (represented by θ) are fortunate enough.

a survey of theoretical and empirical literature on corporate and personal bankruptcy. White summarizes the theoretical research on corporate bankruptcy as consisting of the following five types of models:

A. Models of the *bankruptcy decision* – i.e. how the debtor's decision whether to file for bankruptcy or not when financially distressed is affected by the bankruptcy regime.

B. Models of the *investment decision* – i.e. how the bankruptcy law induces the debtor's decision to choose ex ante a safe or a risky project.

C. *Filtering failure* models – i.e. how the debtor's choice of the bankruptcy procedure (liquidation/reorganization) ex post is affected by the bankruptcy law.

D. Models on *strategic default* – i.e. how the bankruptcy regime creates incentives for a solvent debtor to file for bankruptcy and what are the trade-offs to these perverse incentives.

E. Models on *effort levels* – i.e. how the debtor's effort in the project ex ante reacts to the bankruptcy rules.[7]

Below I introduce a taxonomy of ex ante effects of corporate bankruptcy law which is partly linked to White's classification of corporate bankruptcy models:[8]

1. *Debt contracting* inefficiencies ([i] credit rationing, [ii] suboptimal structure of creditors, [iii] other).

2. Debtor's inefficient *choice of business strategy* ([iv] underinvestment in effort, [v] excessive risk-taking in the initial project choice, [vi] managerial entrenchment).

3. *Debtor's* inefficient *bankruptcy decision* ([vii] strategic default, [viii] staving off bankruptcy, [ix] gambling on resurrection).

4. *Creditor's* inefficient *bankruptcy decision* ([x] inefficient liquidation).

5. Inefficient *provision of information* ([xi] debtor's unwillingness to share information with creditor, [xii] creditor's insufficient monitoring of the debtor).

[7]For models of types 1 and 2 a complete information set up is sufficient, while for models 3 through 5 to hold, information asymmetry (incomplete information) needs to be assumed.

[8]The first type and the last type are not analyzed in White (2007), for the relationship of the other four types to White's taxonomy of models see Table 3.1.

3.4.1 Debt Contracting

The game begins when the debtor and creditors meet and agree on the conditions of the debt contract. The debt contracting phase typically comes for different creditors at different times and some of them usually become creditors involuntarily just before the firm's bankruptcy (e.g. employees, tax authorities or trading partners/suppliers). However in the analysis of bankruptcy effects on debt contracting, only the main voluntary creditors are usually considered. Typically it can be a bank that provides a loan or an investor that buys the firm's bonds.

The main issues that are relevant for considering whether a given bankruptcy procedure delivers optimal output at the debt contracting stage are credit rationing and the efficiency of the creditors' structure.

[i] Credit rationing under soft law

Credit rationing, i.e. lower accessibility of credit, usually in the form of increased interest rate for which creditors are willing to lend, is virtually the most discussed ex ante effect of a bankruptcy law. In general, credit rationing is expected to take place when the existing legal system provides weak protection of creditors (a) in the situation when the firm is solvent and/or (b) under the insolvency regime. Thus, soft bankruptcy law (for which weak protection of creditors is characteristic) is expected to produce credit rationing ex ante. See, for example, Hart (2000) for an argument that the absolute priority rule increases creditor's incentive to lend.

To illustrate credit rationing in the framework of the model introduced above,[9] it suffices to put together the creditor's zero profit condition with the definition of the simple relationship between i, F and I:

$$I = pF^* + (1-p)(1-\alpha)x, \tag{3.1}$$

$$F^* = I(1+i^*). \tag{3.2}$$

Equations (3.1) and (3.2) imply

$$i^* = \frac{1-p}{p}\left[1 - \frac{(1-\alpha)x}{I}\right], \tag{3.3}$$

[9] Assuming that bankruptcy procedure is opted for in the bad state and is not used in the good state as would be the case of strategic default described as item [vii] in section 3.4.3 below.

meaning that i^* is increasing in α and decreasing in x. Note that x represents the pie to be distributed between the debtor and the creditor, while α stands for the share of the pie to be given to the debtor (and $1-\alpha$ to the creditor). Intuitively, both lower x and higher α translate into lower creditor's proceeds in bankruptcy, which makes the creditor increase i^* in order to compensate for the lower payoff in the bad state.[10]

Several authors model a trade-off between credit rationing elimination (possible effect of a tough law) and some positive effect of a soft law. For example, Biais and Mariotti (2009) present a model to argue that under a soft bankruptcy law, debtors have limited ability to commit ex ante to high liquidation rates as these are not systematically enforced and, therefore, agents are credit rationed. However, the authors conclude that some credit rationing ex ante might be desirable as it trades-off with inefficient liquidation ex post. A crucial assumption made in their model is that continuation is efficient while liquidation is not. As Knot and Vychodil (2005) argued, referring to the findings of Baird and Rasmussen (2002) and Baird and Rasmussen (2003), the case for soft law weakens when this assumption is relaxed.

Schwartz (2002) examined a trade-off at the lending stage between encouraging the debtor to exert optimal effort and inducing the debtor to enter bankruptcy if the project fails. The argument goes that the higher interest rate under soft law lowers the success payoff to the debtor and, in turn, makes firms choose a lower effort level when pursuing projects than is socially optimal (see item [iv] in section 3.4.2 below).

[ii] Suboptimal debt structure under soft law

Other authors have discussed the effect of bankruptcy law on the debt structure ex ante, arguing that, depending on the bankruptcy regime, e.g. an appropriate use of secured debt or an increased number of creditors can improve the ability of ex post renegotiation to avoid inefficient liquidations.

Bester (1994) presented a theoretical model explaining how prospects of future debt renegotiation affect creditor's security interests at the contracting date. As the creditor's threat to file for bankruptcy is not necessarily credible, he might be willing to renegotiate the debt contract and forgive part of the debt. Being aware of this problem that stems from information asymmetry, creditors tend to issue debt that is secured by outside assets (especially in high-risk investment projects) in order to reduce the debtor's motives for

[10] Note that this extends the notion of the interest rate being decreasing in x made by Schwartz (2002) to also apply to the opposite effect of α on the interest rate.

strategic defaults.[11] In Bester's model, the probability of renegotiation is given as an exogenous parameter b, ranging between $b = 0$ (creditor's threat to file for bankruptcy is never credible as he always prefers renegotiation) and $b = 1$ (creditor's threat to file for bankruptcy is always credible). Bester did not mention the role of the bankruptcy law design but it could be argued that the legislator may increase b by designing a tougher bankruptcy law. In this logic it can be stated that under tough law the effect examined by Bester may be reduced as opposed to the situation under soft law.

Bolton and Scharfstein (1996) modeled optimal debt structure on the basis of a trade-off between deterring defaults on the one hand and not making unavoidable defaults too costly on the other. The authors demonstrated that the debtor-creditor contract ex ante sets such a debt structure – number of creditors, distribution of security interests, and voting rights for potential renegotiations – that optimizes the ex post result of the negotiations that follow default. The authors did not explicitly address the role of bankruptcy law in the model but they argued at the end of the article that if the voting rule set exogenously by Chapter 11 is less stringent than the optimal rule, the creditors compensate for it through adjusting the other parameters of the contract to make it harder to renegotiate – i.e. increase the number of creditors and/or spread out security interests. Hence, as long as the bankruptcy law is tough enough that the voting rule is at least as stringent as the optimal rule (note that the optimal value differs from one project to another), the debt structure adjusts freely as described in the model. However, once it becomes softer, the inefficiency of the outcome increases with further softening of the law.[12]

Schwartz (1997), revisiting the ban on contracting about bankruptcy, argued that collective action problems sometimes do yield to contractual solutions, meaning that prisoner's dilemma vanishes if the prisoners can write an enforceable contract not to confess. One of Schwartz's main arguments was that once debtors and creditors could freely contract for bankruptcy, the debtors would not be forced to adjust their capital structure ex ante and, hence, underinvestment could be reduced.

[11] For empirical support for the hypothesis of positive relationship between the presence of collateral and risk premium (especially under a lower degree of information asymmetries) see Weill and Godlewski (2006).

[12] Alderson and Betker (1995) then showed empirically that firms with high liquidation costs choose capital structures that make financial distress less likely, i.e. structures that tend to include public and unsecured debt without covenants (rather than private and secured debt with restrictive covenants) and also to use more equity. The authors did not discuss the impact of the bankruptcy law but it can be argued that their conclusion holds especially under a bankruptcy system that is tougher on the debtor.

[iii] Other effects in the contracting period

Blazy, Umbhauer, and Weill (2008), modeling theoretically the effects of legal sanctions (for the debtor) under bankruptcy on the design of debt contracts – specifically on the choice of the project and parameters of financing – derived several interesting conclusions. According to one of them, increasing sanctions enhance the probability of choosing the best project but once the severity of sanctions reaches a certain level, the best equilibrium is achieved and further increase is justified only if future shocks can affect the parameters of the economy. That is, a tough law ensures better choice of the project than a soft law but an extremely tough law is not necessary for reaching the optimum. Another implication of the model is that increased severity is paradoxically beneficial for debtors as it forces them to select the most profitable projects and, in turn, they are charged a lower interest rate (in line with the credit rationing argument above).

3.4.2 Debtor's Choice of Business Strategy

Once the debt contract is signed, the debtor starts investing the sources he borrowed. His decisions, however, might be further from the socially optimal ones under one bankruptcy regime than under another. As all these ex ante effects of bankruptcy law come only after the debt contracting phase, they themselves impact the shape of the optimal contract at the first stage. They could, for example, aggravate credit rationing in the contracting phase.

[iv] Underinvestment in effort under soft law

As mentioned above in section 3.4.1, Schwartz (2002) related credit rationing to the debtor's investment in effort. Higher interest rate under soft law makes firms choose lower effort levels, via decreasing the success payoff to the debtor. Let us describe the underinvestment problem in the incomplete contracting framework introduced above.

In the good state, the creditor gets repayment F and the debtor, being the residual claimant, receives $V - F$. In the bad state, the outcome x is split to the creditor's payoff $(1 - \alpha)x$ and the debtor's payoff αx. The social planner's optimization problem is

$$\max_{e \geq 0} \; p(e;\theta)V + (1 - p(e;\theta))x - e - I, \tag{3.4}$$

with the solution

$$(V - x)p'(e^{SP}; \theta) = 1. \tag{3.5}$$

The firm's optimization problem is

$$\max_{e \geq 0} \; p(e; \theta)(V - F) + (1 - p(e; \theta))\alpha x - e - I, \tag{3.6}$$

with the solution

$$(V - F - \alpha x)p'(e^{Firm}; \theta) = 1. \tag{3.7}$$

Since $F > x$, equations (3.5) and (3.7) imply $p'(e^{SP}; \theta) < p'(e^{Firm}; \theta)$. As p is increasing and concave in e, we see that for all $\alpha \in [0; 1]$ the firm underinvests in effort:

$$e^{Firm} < e^{SP}. \tag{3.8}$$

Equation (3.7) defines e^{Firm} as a decreasing function of α, implying that the debtor's effort is maximized by $\alpha = 0$ (tough law).

This way of demonstrating the underinvestment is similar to that used by Schwartz (2002), just with the parameter α added into the problem. Schwartz (2002) implicitly assumed tough law (meaning $\alpha = 0$ in my setup). In that case, the reason for underinvestment is the fact that the difference between the upside and downside for the debtor is smaller than the difference between the social planner's upside and downside. Thus the firm is much less motivated in the costly trying to reach the upside. When we allow for a softer procedure, via introducing α that can be positive, the inefficiency is even further enhanced. Positive α increases the downside for the debtor and, thus, further closes the gap between the two extreme payoffs, lowering the debtor's motivation to invest in effort.

[v] Excessive risk-taking in the initial project choice under soft law

When the APR is violated in bankruptcy, debtors might tend to favor riskier investments when making the project choice.[13] This is caused by the standard moral hazard problem. Even if the risky project offers a lower expected return than a safer project, the debtor might prefer it because the potential upside is captured by him while potential losses

[13]Note that the excessive risk-taking in the initial project choice under soft law is different from the gambling on resurrection under tough law (see effect [ix] in section 3.4.3). Debtor's decision making in the initial project choice fundamentally differs from the decision making later on in the situation of financial distress.

would be partly borne by the creditors. See for example Jensen and Meckling (1976), Green (1984), or Bebchuk (2001).

To illustrate this issue within my framework, I change the debtor's decision problem in period t_1 from choosing the level of effort affecting the probability of the project's success to choosing between a safe and a risky project, embedding the model of Bebchuk (2001) into the framework above. If the safe project is chosen in t_1, the outcome in t_2 is $S > F$. If the risky project is chosen instead, the outcome is θR, where R is the expected return of the risky project (known at t_1) and θ is a random variable, continuously distributed through the interval $(0; \theta)$, with $E[\theta] = 1$. θ is realized at t_2. It is ex-ante socially optimal to choose the risky project only if $R > S$, but the debtor may be motivated to go for the risky project even if $R < S$ and this inefficiency is further aggravated by the softness of the bankruptcy law.

Under tough law, the condition for the debtor to choose the risky project in t_1 is:

$$E_\theta \max[\theta R - I(1+i); 0] \geq \max[S - I(1+i); 0], \tag{3.9}$$

i.e., $R \geq R^{TOUGH}(i)$, where $R^{TOUGH}(i)$ denotes the value of R that makes the two sides of (3.9) equal. This implies that for any i,

$$R^{TOUGH}(i) < S. \tag{3.10}$$

Under soft law, the debtor chooses the risky project in t_1 iff:

$$E_\theta \max[\theta R - I(1+i); \alpha(\theta R - c)] \geq \max[S - I(1+i); \alpha(S - c)], \tag{3.11}$$

i.e., iff $R \geq R^{SOFT}(i)$, where $R^{SOFT}(i)$ denotes the value of R that makes the two sides of (3.11) equal. Note that under perfectly tough bankruptcy law, i.e. if $\alpha = 1$, the inequality (3.11) becomes:

$$E_\theta \max[\theta R - I(1+i); \theta R - c] \geq \max[S - I(1+i); S - c], \tag{3.12}$$

which implies $R > S$, because c is assumed to be lower than $F = I(1+i)$.

It can be shown[14] that for any $F \leq (1-\alpha)S+\alpha c$, that is for any $i \leq (1-\alpha)\frac{S}{I}-(1-\alpha\frac{c}{I})$:

$$R^{SOFT}(i) < R^{TOUGH}(i). \tag{3.14}$$

Intuitively, the moral hazard appears even in the case of a perfectly tough bankruptcy law because the bankruptcy outcome cannot be negative (which could more discipline the debtor). When the law becomes softer, the debtor's payoff from the risky project increases – assuming that the interest rate remains unchanged – and thus the moral hazard is further strengthened.

[vi] Entrenchment and underinvestment in human capital under tough law

An issue that makes the violation of the APR attractive is that it is believed to reduce two ex ante inefficiencies of the APR regime – managers' overinvestment in assets that require their skills and at the same time their underinvestment in firm-specific human capital. The pioneers in addressing analytically this issue were Bebchuk and Picker (1993).

The first-mentioned inefficiency under tough law is that of managerial entrenchment. When the project fails, the manager gets nothing, unless he invested in a project that is specific to his skills. On the contrary, a violation of the APR gives the manager a fraction of the value of the failed project even in the case when he invested in a general project. Thus, softer law makes debtors less biased in favor of choosing manager-specific projects.

The second inefficiency under tough law is the debtor's unwillingness to invest in firm-specific human capital. Similarly to the entrenchment problem, violation of the APR increases the manager's payoff from default and hence his motivation to invest in firm-specific human capital. Bebchuk and Picker (1993) argued that under the soft regime, both choices are still suboptimal, though closer to the first best than under the tough regime. For analysis of underinvestment under a tough bankruptcy law see also Berkovitch, Israel, and Zender (1997) and Berkovitch, Israel, and Zender (1998).

[14]Proof: Assume $F \leq (1-\alpha)S + \alpha c$. This implies that the right-hand side (RHS) of (3.9) = RHS of (3.11) = $S - F$. We know that θ can be arbitrarily close to zero with some positive probability: $0 < Pr[I(1+i) > \theta R(1-\alpha)+\alpha c] = Pr[\alpha(\theta R - c) > \theta R - I(1+i)]$. This implies that the left-hand side (LHS) of (3.9) < LHS of (3.11), i.e. that:

$$E_\theta \max[\theta R - I(1+i); 0] < E_\theta \max[\theta R - I(1+i); \alpha(\theta R - c)]. \tag{3.13}$$

Furthermore, if $R = R^{TOUGH}(i)$, then LHS of (3.9) = RHS of (3.9) = RHS of (3.11). To make also LHS of (3.11) be the same, R must further fall. Thus $R^{SOFT}(i) < R^{TOUGH}(i)$. Q.E.D.

3.4.3 Debtor's Bankruptcy Decision

[vii] Strategic default under soft law

Another kind of moral hazard on the side of the borrower arises when the bankruptcy law is so favorable to the debtor that he prefers to trigger bankruptcy via a voluntary default on his debts. This happens when the debtor's payoff from bankruptcy is higher than that from continuing the project even though the expected total value from continuation still more than covers the claims of the creditors.

If the debtor's expected payoff from continuation due to unfavorable development of the project decreases below the expected payoff from default which is determined by the bankruptcy law, he decides to default even if continuation is socially optimal. Strategic default is typically treated in cash-diversion models as a situation of "observable" but not "verifiable" cash flows (in the language of Grossman and Hart (1986)) in which a high-type debtor pretends to be low-type – see, for example, Bolton and Scharfstein (1990), Bester (1994) Bolton and Scharfstein (1996), or Hart and Moore (1998).

This type of inefficiency can be illustrated using the theoretical framework introduced above. In the good state, the outcome is V and the debtor decides either to repay F and retain $(V - F)$ or to default strategically, i.e. enter bankruptcy, which gets him $max\{\alpha(V - c); V - c - F\}$. This payoff from strategic default reflects the assumption that the creditor's payoff is capped by F. If the cost of bankruptcy is sufficiently low and the bankruptcy sufficiently tough, the amount $(1 - \alpha)(V - c)$ exceeds F, in which case the creditor gets only F and the debtor gets $(V - c - F)$.

In such a case, the debtor has no reason to default strategically because bankruptcy procedure gets him $(V - c - F)$ which is strictly less than debtor's payoff $(V - F)$ from staying out of bankruptcy procedure. Hence, the necessary condition for strategic default to take place is:

$$(1 - \alpha)(V - c) < F. \tag{3.15}$$

Assuming 3.15, the debtor's payoff from strategic default is $\alpha(V-c)$, while the creditor gets $(1-\alpha)(V-c)$. This could mean that the softness of the law has in practice the form of the debtor being able to reap unobservable (or at least not verifiable) benefits from the bankruptcy estate.

The necessary and sufficient condition for the debtor to opt for strategic default in

the good state is thus:

$$V - F < \alpha(V - c), \tag{3.16}$$

which can also be expressed as

$$(1 - \alpha)(V - c) < F - c. \tag{3.17}$$

Note that validity of (3.18) implies that (3.15) holds as well.

In the bad state, the outcome is v and the debtor falls into bankruptcy which reduces the outcome to $(v - c) = x$, divided between the creditor and the debtor in proportion $(1 - \alpha) : \alpha$. Hence, if α is high enough to make (3.16) hold, the debtor's optimization problem ex ante becomes

$$\max_{e \geq 0} \; p(e;\theta)\alpha(V - c) + (1 - p(e;\theta))\alpha x - e - I, \tag{3.18}$$

with the solution

$$\alpha(V - v)p'(e^{SD};\theta) = 1. \tag{3.19}$$

The properties of $p(e;\theta)$ together with 3.18 imply

$$e^{Firm} < e^{SD} < e^{SP}. \tag{3.20}$$

Note that e^{SD} does not depend on F set by the creditor. In fact, as both the good and bad state result in bankruptcy, the creditor cannot affect his payoff by F (or interest rate r) in the contract ex ante, and thus his contract role is limited to providing financing only if $p(1 - \alpha)(V - c) + (1 - p)(1 - \alpha)x \geq I$, while not lending otherwise.

To sum up, the model allows for the illustration of the strategic default which occurs for sufficiently high α and low c so that 3.18 is satisfied. In such a case, interest rate becomes irrelevant as bankruptcy is inevitable. The debtor's effort to avoid the bad state is still suboptimal but larger than in the case without strategic default since his benefirt from default (when 3.18 holds) in the good state exceeds that from full repayment (when 3.18 does not hold).

[viii] Staving off bankruptcy under tough law

So far we have discussed the behavior prior to the situation of the project failure. Now we move to analyzing what happens once the debtor privately observes negative realization

of the project's outcome. Under some circumstances, the debtor might be inclined to either stave off bankruptcy or to gamble on resurrection (see item [ix] below), although the socially preferred option would be to file for bankruptcy (especially in order for the creditor to be willing to lend money in the first place).

A bankruptcy law that is too tough creates disincentives for debtors to use the system. If the project seems likely to fail but still generates some cash, the debtor might invest the firm's resources in an attempt to deter bankruptcy. Schwartz (2002) analyzed a trade-off between this drawback of the tough law on the one hand and underinvestment caused by higher interest rate under soft law on the other (see item [i] in section 3.4.1 above). Based on the analysis he argued against having a single mandatory bankruptcy system.

Povel (1999) called the behavior of a debtor trying to stave off bankruptcy as "playing a wait and pray strategy" and argued that soft law helps prevent the waste of resources in a situation when rescue is necessary but not undertaken in time. He analyzed a trade-off between this benefit of the soft law on the one hand and tough law's ability to increase debtor's incentive to generate sufficient earnings to repay on the other.[15]

[ix] Gambling on resurrection under tough law

Another ex ante effect of a bankruptcy law that is too harsh on the debtor is excessive risk-taking by financially distressed firms. This behavior is also known in the literature as "heads I win, tails I break even", "gambling on resurrection", "fourth-quarter football", "go for broke", or "all or nothing".[16] For a theoretical treatment of this inefficiency, see e.g. Gertner and Scharfstein (1991), Eberhart and Senbet (1993), Akerlof and Romer (1994), Hart (2000) or Knot and Vychodil (2006a).[17]

To illustrate this inefficiency, let us extend the model introduced above. The basic form of the model assumes that the realization of the project's result in t_2 is observable by both debtor and creditor, though not verifiable, and that the debtor decides in that period whether to file for bankruptcy or stay out of the bankruptcy process. Let us now assume that the realization whether the result in period t_2 is V or v is the debtor's private

[15] Opler et al. (1999), on the basis of their empirical analysis of the determinants and implications of corporate cash holdings, hypothesized that excess cash might allow management to avoid making rescue measures (when a firm runs into difficulties), using up the firm's cash to finance losses. DeAngelo, DeAngelo, and Wruck (2002) documented this pattern on the case of L. A. Gear, a U.S. firm that filed for Chapter 11 in 1998 after more than six years of suffering large losses and dramatically declining revenues.

[16] See Akerlof and Romer (1994) for the first two and Merton (1978), Hart (2000) and Knot and Vychodil (2005) for the other three expressions, respectively.

[17] An upgraded version of Knot and Vychodil (2006a) is included as the first essay of this dissertation.

information. The debtor's problem in t_2 is reformulated to the choice between strategies S_Q (quit) and S_C (continue) in the bad state. If the debtor decides for the strategy S_Q and quits the project, the bad outcome, v, is revealed to the creditor. If the debtor opts for strategy S_C and continues running the project, the outcome is V with probability π (where $0 < \pi < 1$) or 0 with probability $(1 - \pi)$.

Let us analyze the situation when the debtor observes outcome v in period t_2. Choosing S_Q implies confessing the bad state to the creditor and triggers bankruptcy with the outcome $(v - c)$. Choosing S_C instead delivers $\pi(V - F)$ to the debtor and πF to the creditor. Thus S_Q is socially optimal if:

$$(v - c) > \pi V. \tag{3.21}$$

Assume π is small enough to make S_Q socially optimal:

$$\pi < \frac{v - c}{V}. \tag{3.22}$$

As shown below, for sufficiently low α, i.e. for sufficiently tough law, the debtor chooses S_C even for this small π.

The firm prefers S_C if:

$$\alpha(v - c) < \pi(V - F), \tag{3.23}$$

that is,

$$\pi > \frac{\alpha(v - c)}{V - F}. \tag{3.24}$$

If $\alpha < \frac{V-F}{V}$, then there is a non-empty set of the levels of π that satisfy (3.22) and (3.24) simultaneously and, hence, incentivize the debtor to inefficiently gamble on resurrection. In the extreme case of perfectly tough law ($\alpha = 0$), this set is maximized and the debtor never opts for quitting the project because he would not get a penny from quitting, even if the probability of the gamble is as close to zero as possible.

Note that the following condition is always fulfilled:

$$0 < \frac{v - c}{V} < 1. \tag{3.25}$$

Thus the presented framework can be used to show gambling on ressurection under tough law (for $\pi < \frac{v-c}{V}$ and sufficiently low α) as well as insufficient effort to maximize the final outcome under soft law (for $\pi > \frac{v-c}{V}$ and sufficiently high α). The latter is an

alternative way of illustrating the underinvestment in effort under soft law than the one presented above (see item [iv] in section 3.4.2). This trade-off between tough and soft law is optimized when $\alpha = \frac{V-F}{V}$.

3.4.4 Creditor's Bankruptcy Decision

[x] Inefficient liquidation

The most discussed inefficiency stemming from the creditor's decision whether or not to file a bankruptcy petition on the debtor is the creditor's tendency, under tough bankruptcy law, to prefer the bankruptcy solution too much. Often, the literature analyzes the creditor's choice between the liquidation chapter and the reorganization chapter – i.e. post bankruptcy decision.[18] However, it should be made clear that the analysis of this paper is limited to ex ante effects only. That is, I am interested here in the creditor's decision whether or not to initiate bankruptcy at all.[19]

Aghion and Bolton (1992) showed that, as rephrased by Hart and Moore (1994), "inefficient liquidation arises because the debtor has non pecuniary benefits of control and owing to a wealth constraint, he cannot bribe creditors not to liquidate," whereas the term *liquidate* is used in the meaning *file for bankruptcy*.

This effect may be partially illustrated if we extend the model from section 3.3.2 by a possibility that the creditor (rather than the debtor) makes a bankruptcy decision in period t_2. The creditor's bankruptcy decision may be then examined separately in the good state and in the bad state.

Within the setup of the model, the creditor, once he has observed the good outcome V, has no motivation to opt for bankruptcy because, by definition, his payoff from bankruptcy cannot exceed the full payoff F which he gets if bankruptcy is not triggered:

$$\min\{(1-\alpha)(V-c); F\} \leq F. \tag{3.26}$$

[18] See, for example, Berkovitch and Israel (1999) arguing that the soft law "prevents creditors from forcing inefficient liquidation whenever continuation is more valuable. This is done by a means of threat to impose a penalty on creditors whenever they want to liquidate a firm that is economically viable (in equilibrium, the court never imposes a penalty, because the threat is sufficient to deter creditors from attempting to liquidate a firm with higher value in continuation than in liquidation)." They see this benefit of the soft law as additional to the insufficient transfer of information from the debtor to creditors (see item [xi] in section 3.4.5).

[19] The existence of alternative ways of the bankruptcy procedure, such as reorganization chapter and liquidation chapter of this or that form, are reflected in the value of α.

Moreover, bankruptcy in the good state is inefficient from the social planner's view as well, because the following condition always holds:

$$\alpha(V-c)+(1-\alpha)(V-c)<V. \tag{3.27}$$

Creditor's motivation to file for bankruptcy in the good state would appear if we assumed that the creditor's payoff from bankruptcy was higher in the situation when the creditor triggered bankruptcy himself than in the situation when the bankruptcy occured through the debtor's strategic default. Under this assumption, the creditor files for bankruptcy in the good state, accepting only partial repayment of the debt, in order to avoid even worse outcome caused by the debtor's strategic default. Of course, this would challenge the creditor's willingness to lend in the first place and lead to an increased interest rate.

If the observed outcome is v instead, the creditor would opt for bankruptcy if:

$$(1-\alpha)(v-c)>\pi(V-F)+\pi F, \tag{3.28}$$

while the condition for bankruptcy to be socially optimal is:

$$\alpha(v-c)+(1-\alpha)(v-c)>\pi(V-F)+\pi F. \tag{3.29}$$

Here the inefficiency appears when one of these two conditions is satisfied while the other is not. If $\pi > \frac{v-c}{F}$, both conditions are violated and no inefficiency takes place – the creditor does not file for bankruptcy and this behavior is socially optimal. In the opposite case of low π, (3.28) may be violated for sufficiently high α, while (3.29) always holds. Thus, when the bankruptcy law is too soft, the creditor himself might overly tend to avoid bankruptcy even in cases when the bankruptcy procedure would be a socially optimal solution.

3.4.5 Provision of Information

[xi] Insufficient transfer of information to creditor under tough law

Information assymetry lies in the core of many types of ex ante inefficiencies of bankruptcy law. It can be argued that under a tough bankruptcy law, information asymmetry might be aggravated as the debtor is less willing to share with creditors his private information

that the actual state of the project is not ideal. Hiding problems may help the debtor to gain some time to try several ways to avoid the extremely unpleasant situation of bankruptcy.

Berkovitch and Israel (1999) interpreted the fraction paid to the debtor in a soft bankruptcy procedure as an "information rent" which creditors pay in exchange for debtor's sharing of his private information about the financial distress with creditors. For closer analyses of the soft law's role in reducing information asymmetry, see also Baird (1991) and Heinkel and Zechner (1993).

To use my model framework, I build on the situation of gambling on resurrection described in Section 3.4.3, item [ix]. The debtor has private information that the project has ended with outcome v and decides whether to share it with the creditor or not. The debtor compares what he gets from hiding the information to his payoff from (credibly) sharing it. When the information is kept private to the debtor, he can make the choice between S_C delivering $\pi(V - F)$ and S_Q implying payoff $\alpha(v - c)$. Once the information is transferred to the creditor, the possibilities of the debtor are limited as the creditor can decide to initiate the bankruptcy procedure himself.

The debtor would choose S_C if π is sufficiently large to satisfy (3.24). The creditor would confirm the choice of S_C (i.e. would not interfere by initiating bankruptcy instead) if:

$$\pi > \frac{(1-\alpha)(v-c)}{F}. \tag{3.30}$$

Let π_D denote the RHS of (3.24) and π_C denote the RHS of (3.30):

$$\pi_D = \frac{\alpha(v-c)}{V-F}, \tag{3.31}$$

$$\pi_C = \frac{(1-\alpha)(v-c)}{F}. \tag{3.32}$$

For $\alpha = 0$:

$$\pi_D = 0 \quad < \quad \pi_C = \frac{v-c}{F}. \tag{3.33}$$

As α grows from 0 to 1, π_D linearly increases and π_C linearly decreases. When α reaches the threshold of $\frac{V-F}{F}$, both π_D and π_C become equal:

$$\pi_D = \pi_C = \frac{v-c}{V}. \tag{3.34}$$

After this point, $\pi_D > \pi_C$ and at $\alpha = 1$ they reach:

$$\pi_D = \frac{v - c}{V - F} \quad > \quad \pi_C = 0. \tag{3.35}$$

For $\alpha < \frac{V-F}{F}$, the debtor prefers S_C even in situations when the creditor prefers S_Q. Transfer of the information to the creditor in these situations implies that the creditor does not allow for continuation desired by the debtor and files for the debtor's bankruptcy right away. The scope of these situations, i.e. the difference $(\pi_C - \pi_D)$, is the largest for the extremely tough law ($\alpha = 0$) and diminishes as the law gets softer. At $\alpha = \frac{V-F}{F}$, the debtor becomes indifferent between sharing and hiding the information. It can be argued that this indifference remains even for larger values of α as the creditor has no reason to veto debtor's potential decision for S_C. As α then gets closer to one, the debtor is increasingly likely to file for bankruptcy even in situations when the creditor would prefer to give the project a chance. However, once the debtor files for bankruptcy (being objectively in default), the creditor can hardly do anything about it even if he knows all the parameters that are known to the debtor.

[xii] Low monitoring by creditors under both tough and soft law

Creditors might be unwilling to sufficiently monitor the debtor as monitoring is costly and its marginal payoff may be low. As argued by Cornelli and Felli (1997), violation of the APR incentivizes each creditor to free-ride on other creditors by inefficiently reducing their monitoring activity. On the other hand, when the APR is attained, the most senior creditor is guaranteed his claim and thus his incentives to monitor disappear, whereas the expected payoff for the remaining creditors is not high enough to motivate them to monitor the debtor efficiently. The authors demonstrated that suboptimal monitoring by creditors may be present under both tough and soft bankruptcy regimes.

3.5 Conclusion

The economic literature on the optimal design of bankruptcy law has been quite rich during the last two decades. Various ex ante and ex post effects and their mutual trade-offs have been analyzed in countless models. If we focus on the ex ante efficiency issues only, we see a dozen of them, clustered in five types – debt contracting, project choice, debtor's bankruptcy decision, creditor's bankruptcy decision and provision of private information. The most important decision node seems to be the initial moment of debt contracting when especially the interest rate is set to a level that reflects all potential inefficiencies to come in the later phases.

This taxonomy of ex ante inefficiencies of too soft or too tough bankruptcy laws, together with a unifying model able to illustrate majority of the issues, may serve as an introductory text on the economics of corporate bankruptcy. Indeed, many more issues remain open and unexplored rather than clarified by this simple framework, but before trying to get deeper into one selected issue one needs to grasp a basic understanding of the whole picture. This text is intended to provide that.

Note that the scope of the paper was limited to corporate bankruptcy (not covering the personal bankruptcy) and to ex ante effects (not discussing the decisions after the firm has been declared bankrupt). A number of issues remained out of the paper's scope, especially corporate governance issues (we assumed debtor=manager) and creditor structure (we assumed one creditor or, equivalently, a group of creditors acting jointly as one).

All ex ante efficiency issues mentioned in this paper have been more or less sufficiently covered by the theoretical literature. What is yet largely missing, however, is empirical research. There has been some empirical evidence on some of these issues made on U.S. data, much less on cross-country data and even less on specific experiences of other countries – European, Asian or other. The open scope for empirical verification of the validity of the above-presented issues in various institutional setups is vast. It is not by chance that the main message of both Berle and Means (1932) and Coase (1937) was that theoretical economics is of no value if it is not confronted with an empirically observed reality.

3.A Appendix

Table 3.1: Taxonomy of ex ante inefficiencies – relation to White (2005)

Taxonomy of ex ante inefficiencies	Types of models in White (2007)
1. Debt contracting	not analyzed
2. Debtor's choice of business strategy	types B and E
3. Debtor's bankruptcy decision	types A and D
4. Creditor's bankruptcy decision	type A
5. Provision of information	not analyzed

Note: The taxonomy of ex ante inefficiencies does not cover type C models of White (2007) as these analyze ex post rather than ex ante effects of bankruptcy law.

Bibliography

Aghion, Philippe, and Patrick Bolton. 1992. "An Incomplete Contracts Approach to Financial Contracting." *Review of Economic Studies* 59 (3): 473–494 (July).

Akerlof, George A., and Paul M. Romer. 1994, April. Looting: The Economic Underworld of Bankruptcy for Profit. NBER Working Paper No. 1869, National Bureau of Economic Research.

Alderson, Michael J., and Brian L. Betker. 1995. "Liquidation Costs and Capital Structure." *Journal of Financial Economics* 39 (1): 45–69 (September).

Baird, Douglas G. 1991. "The Initiation Problem in Bankruptcy." *International Review of Law and Economics* 11 (2): 223–232 (September).

Baird, Douglas G., and Robert K. Rasmussen. 2002. "The End of Bankruptcy." *Stanford Law Review* 55 (3): 751–790 (December).

———. 2003. "Chapter 11 at Twilight." *Stanford Law Review* 56 (3): 673–700 (December).

Bandopadhyaya, Arindam. 1994. "An Estimation of the Hazard Rate of Firms under Chapter 11 Protection." *Review of Economics and Statistics* 76 (2): 346–350 (May).

Bebchuk, Lucian A. 2001, August. Ex Ante Costs of Violating Absolute Priority in Bankruptcy. CEPR Discussion Paper No. 2914, Centre for Economic Policy Research.

Bebchuk, Lucian A., and Jesse Fried. 1996. "The Uneasy Case for the Priority of Secured Claims in Bankruptcy." *Yale Law Journal* 105 (4): 857–934 (January).

———. 1998, March. The Uneasy Case for the Priority of Secured Claims in Bankruptcy: Further Thoughts and a Reply to Critics. NBER Working Paper No. 6472, National Bureau of Economic Research.

Bebchuk, Lucian A., and Randal C. Picker. 1993. Bankruptcy Rules, Managerial Entrenchment, and Firm-Specific Human Capital. John M. Olin Law and Economics Working Paper No. 16, University of Chicago Law School.

Becht, Marco, Patrick Bolton, and Ailsa Roell. 2007. Corporate Law and Governance. in: Polinsky, A. M. and S. Shavell (eds.): *Handbook of Law and Economics (Volume 2)*, Chapter 12, 829-943, Elsevier.

Berglof, Erik, Gerard Roland, and Ernst-Ludwig von Thadden. 2003, August. Optimal Debt Design and the Role of Bankruptcy. Working Paper, Université de Lausanne, Ecole des HEC, DEEP.

Berglof, Erik, and Ernst-Ludwig von Thadden. 1994. "Short-Term Versus Long-Term Interests: Capital Structure with Multiple Investors." *The Quarterly Journal of Economics* 109 (4): 1055–1084 (November).

Berkovitch, Elazar, and Ronen Israel. 1998, March. Optimal Bankruptcy Laws Across Different Economic Systems. Working Paper No. 143, William Davidson Institute at the University of Michigan Business School.

———. 1999. "Optimal Bankruptcy Laws Across Different Economic Systems." *Review of Financial Studies* 12 (2): 347–377 (Summer).

Berkovitch, Elazar, Ronen Israel, and Jaime F. Zender. 1997. "An Optimal Bankruptcy Law and Firm-Specific Investments." *European Economic Review* 41 (3-5): 487–497 (April).

———. 1998. "The Design of Bankruptcy Law: A Case for Management Bias in Bankruptcy Reorganizations." *Journal of Financial and Quantitative Analysis* 33 (4): 441–464 (December).

Berle, Adolf A., and Gardiner C. Means. 1932. *The Modern Corporation and Private Property.* Harcout, Brace and World; reprint 1991 Transaction Publishers, New Brunwswick, New Jersey.

Bester, Helmut. 1994. "The Role of Collateral in a Model of Debt Renegotiation." *Journal of Money, Credit and Banking* 26 (1): 72–86 (February).

Betker, Brian L. 1995. "Management's Incentives, Equity's Bargaining Power, and Deviations from Absolute Priority in Chapter 11 Bankruptcies." *Journal of Business* 68 (2): 161–183 (April).

Biais, Bruno, and Thomas Mariotti. 2009. "Credit, Wages, and Bankruptcy Laws." *Journal of the European Economic Association* 7 (5): 939–973 (September).

Biais, Bruno, and Gilles Recasens. 2002, September. Corrupt Judges, Credit Rationing and the Political Economy of Bankruptcy Laws. Conference Proceedings, Bank of England.

Blazy, Regis, Bertrand Chopard, Agnes Fimayer, and Jean-Daniel Guigou. 2007. Financial versus Social Efficiency of Corporate Bankruptcy Law: the French Dilemma? CREFI-LSF Working Paper No. 07-02, Centre of Research in Finance - Luxembourg School of Finance, University of Luxembourg.

Blazy, Regis, Gisele Umbhauer, and Laurent Weill. 2008. How Bankruptcy Punishment Influences the Ex-Ante Design of Debt Contracts? CREFI-LSF Working Paper No. 08-04, Centre of Research in Finance - Luxembourg School of Finance, University of Luxembourg.

Bolton, Patrick, and David S Scharfstein. 1990. "A Theory of Predation Based on Agency Problems in Financial Contracting." *American Economic Review* 80 (1): 93–106 (March).

———. 1996. "Optimal Debt Structure and the Number of Creditors." *Journal of Political Economy* 104 (1): 1–25 (February).

Bris, Arturo, Ivo Welch, and Ning Zhu. 2006. "The Costs of Bankruptcy: Chapter 7 Liquidation versus Chapter 11 Reorganization." *The Journal of Finance* 61 (3): 1253–1303 (June).

Buscaglia, Edgardo. 2001. "An Analysis of Judicial Corruption and Its Causes: An Objective Governing-Based Approach." *International Review of Law and Economics* 21 (2): 233–249 (June).

Carapeto, Maria. 2000, September. Is Bargaining in Chapter 11 Costly? Working Paper, City University Business School.

Chang, Tom, and Antoinette Schoar. 2006, September. The Effect of Judicial Bias in Chapter 11 Reorganization. mimeo, Massachusetts Institute of Technology.

Claessens, Stijn, and Leora F. Klapper. 2005. "Bankruptcy around the World: Explanations of Its Relative Use." *American Law and Economics Review* 7 (1): 253–283 (Spring).

Coase, Ronald H. 1937. "The Nature of the Firm." *Economica* 16 (4): 386–405 (November).

Cornelli, Francesca, and Leonardo Felli. 1997. "Ex-Ante Efficiency of Bankruptcy Procedures." *European Economic Review* 41 (3-5): 475–485 (April).

Covitz, Daniel M., Song Han, and Beth Anne Wilson. 2006. Are Longer Bankruptcies Really More Costly? Discussion Paper No. 2006/27, Finance and Economics Discussion Series, Board of Governors of the Federal Reserve System.

DeAngelo, Harry, Linda DeAngelo, and Karen H. Wruck. 2002. "Asset Liquidity, Debt Covenants, and Managerial Discretion in Financial Distress: The Collapse of L.A. Gear." *Journal of Financial Economics* 64 (1): 3–34 (April).

Denis, Diane K., and Kimberly J. Rodgers. 2007. "Chapter 11: Duration Outcome and Post-Reorganization Performance." *Journal of Financial and Quantitative Economics* 42 (1): 101–118 (March).

Dewaelheyns, Nico, and Cyntia Van Hulle. 2007, October. Filtering Speed in a Continental European Reorganization Procedure. Draft paper for Financial Management Association Conference 2008, Prague, mimeo.

Dewatripont, Mathias, and Jean Tirole. 1994. "A Theory of Debt and Equity: Diversity of Securities and Manager-Shareholder Congruence." *The Quarterly Journal of Economics* 109 (4): 1027–1054 (November).

Diblik, Josef. 2004. Konkurz a vyrovnání – teorie a česká praxe (Bankruptcy and Composition – Theory and Czech Practice). M.A. Thesis (in Czech only), Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague.

Djankov, Simeon, Oliver Hart, Caralee McLeish, and Andrei Shleifer. 2008. "Debt Enforcement around the World." *Journal of Political Economy* 116 (6): 1105–1149 (December).

Eberhart, Allan C., William T. Moore, and Rodney L. Roenfeldt. 1990. "Security Pricing and Deviations from the Absolute Priority Rule in Bankruptcy Proceedings." *Journal of Finance* 45 (5): 1457–1469 (December).

Eberhart, Allan C., and Lemma W. Senbet. 1993. "Absolute Priority Rule Violations and Risk Incentives for Financially Distressed Firms." *Financial Management* 22 (3): 101–114 (Fall).

Fitzenberger, Bernd, and Ralf A. Wilke. 2006. "Using Quantile Regression for Duration Analysis." *Allgemeines Statistisches Archiv* 90 (1): 105–120 (March).

Franks, Julian R., and Walter N. Torous. 1989. "An Empirical Investigation of U.S. Firms in Reorganization." *The Journal of Finance* 44 (3): 747–67 (July).

———. 1994. "A Comparison of Financial Recontracting in Distressed Exchanges and Chapter 11 Reorganizations." *Journal of Financial Economics* 35 (3): 349–370 (June).

Gennaioli, Nicola, and Stefano Rossi. 2008. Judicial Discretion in Corporate Bankruptcy. CEI Working Paper No. 5/2008, Center for Economic Institutions, Institute of Economic Research, Hitotsubashi University.

Gertner, Robert, and David Scharfstein. 1991. "A Theory of Workouts and the Effects of Reorganization Law." *Journal of Finance* 46 (4): 1189–1222 (September).

Giammarino, Ronald M., and Ed Nosal. 1996. The Efficiency of Judicial Discretion in Bankruptcy Law. mimeo, University of British Columbia.

Green, Richard C. 1984. "Investment Incentives, Debt, and Warrants." *Journal of Financial Economics* 13 (1): 115–136 (March).

Grossman, Sanford, and Oliver Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94 (4): 691–719 (August).

Hart, Oliver. 1995. *Firms, Contracts, and Financial Structure*. Clarendon Lectures in Economics, Oxford University Press, Oxford.

———. 2000, September. Different Approaches to Bankruptcy. NBER Working Paper No. 7921, National Bureau of Economic Research.

Hart, Oliver, and John Moore. 1994. "A Theory of Debt Based on Inalienability of Human Capital." *The Quarterly Journal of Economics* 109 (4): 841–879 (November).

———. 1998. "Default and Renegotiation: A Dynamic Model of Debt." *The Quarterly Journal of Economics* 113 (1): 1–41 (February).

Heinkel, Robert, and Josef Zechner. 1993. "Financial Distress and Optimal Capital Structure Adjustments." *Journal of Economics and Management Strategy* 2 (4): 531–565 (Winter).

Helwege, Jean. 1999. "How Long Do Junk Bonds Spend in Default?" *Journal of Finance* 54 (1): 341–357 (February).

Jackson, Thomas H. 1986. *The Logic and Limits of Bankruptcy Law*. Harvard University Press, Cambridge, MA.

Janda, Karel. 2002. "Debt Renegotiation with Collateral under Asymmetric Information." *Czech Journal of Economics and Finance (Finance a uver)* 52 (11): 634–635 (November).

Jensen, Michael C., and William H. Meckling. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." *Journal of Financial Economics* 3 (4): 305–360 (October).

Karklins, Rasma. 2002. "Typology of Post-Communist Corruption." *Problems of Post-Communism* 49 (4): 22–32 (July/August).

Kiefer, N. 1988. "Economic Duration Data and Hazard Functions." *Journal of Economic Literature* 26 (2): 646–679 (June).

Knot, Ondrej, and Ondrej Vychodil. 2005. "What Drives the Optimal Bankruptcy Law Design?" *Czech Journal of Economics and Finance (Finance a uver)* 55 (3-4): 110–123 (March/April).

———. 2006a. Bankruptcy Regimes and Gambling on Resurrection. CERGE-EI Working Paper No. 290, Centre for Economic Research and Graduate Education – Economic Institute, Charles University in Prague and Czech Academy of Sciences.

———. 2006b. Czech Bankruptcy Procedures: Ex-post Efficiency View. IES Working Paper No. 3/2006, Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague.

Koenker, Roger, and Gilbert Bassett. 1978. "Regression Quantiles." *Econometrica* 46 (1): 33–50 (January).

Koenker, Roger, and Yannis Bilias. 2001. "Quantile Regression for Duration Data: A Reappraisal of the Pennsylvania Reemployment Bonus Experiments." *Empirical Economics* 26 (1): 199–220 (March).

Koenker, Roger, and Kevin F. Hallock. 2001. "Quantile Regression." *Journal of Economic Perspectives* 15 (4): 143–156 (Fall).

Kouba, Karel, Ondrej Vychodil, and Jitka Roberts. 2005. *Privatizace bez kapitálu: Zvýšené transakční náklady české transformace (Privatization without Capital: Increased Transaction Costs of the Czech Transition).* in Czech only, Nakladatelství Karolinum, Prague.

Lambert-Mogiliansky, Ariane, Konstantin Sonin, and Ekaterina Zhuravskaya. 2003. Capture of Bankruptcy: A Theory and Evidence from Russia. Working Paper, Center for Economic and Financial Research in Moscow.

Li, Kai. 1999. "Bayesian Analysis of Duration Models: An Application to Chapter 11 Bankruptcy." *Economics Letters* 63 (3): 305–312 (June).

Longhofer, Stanley D., and Charles T. Carlstrom. 1995. "Absolute Priority Rule Violations in Bankruptcy." *Federal Reserve Bank of Cleveland Economic Review* 31 (4): 21–30 (Q4).

LoPucki, Lynn M., and William C. Whitford. 1990. "Bargaining over Equity's Share in the Bankruptcy Reorganization of Large, Publicly Held Companies." *University of Pennsylvania Law Review* 139:125–196.

Merton, Robert. 1978. "On the Cost of Deposit Insurance When There Are Surveillance Costs." *Journal of Business* 51 (3): 439–452 (July).

Mitchell, Janet. 1998. Bankruptcy Experience in Hungary and the Czech Republic. Working Paper No. 211, The William Davidson Institute, University of Michigan Business School.

Morrison, Edward R. 2003. Bankruptcy Decision-Making: An Empirical Study of Small Business Bankruptcies. Working Paper No. 239, The Center for Law and Economic Studies, Columbia Law School, New York.

North, Douglas C. 1990. *Institutions, Institutional Change, and Economic Performance*. Cambridge University Press, New York.

Opler, Tim, Lee Pinkowitz, Rene Stulz, and Rohan Williamson. 1999. "The Determinants and Implications of Corporate Cash Holdings." *Journal of Financial Economics* 52 (1): 3–46 (April).

Orbe, Jesus, Eva Ferreira, and Vincent Nunez-Anton. 2002. "Length of Time Spent in Chapter 11 Bankruptcy: A Censored Partial Regression Model." *Applied Economics* 34 (15): 1949–1957 (October).

Partington, Graham, Philip Russel, Max Stevenson, and Violet Torbey. 2001. "Predicting Return Outcomes to Shareholders from Companies Entering Chapter 11 Bankruptcy." *Managerial Finance* 27 (4): 78–96 (April).

Povel, Paul. 1999. "Optimal "Soft" or "Tough" Bankruptcy Procedures." *Journal of Law, Economics and Organization* 15 (3): 659–84 (October).

Richter, Tomas. 2004, July. Studie k návrhu zákona o úpadku a zpøusobech jeho řešení (Study on the Proposal of the Insolvency Act). mimeo (in Czech only), Rada pro rozvoj podnikatelského prostředí, CzechInvest.

Schwartz, Alan. 1997. "Contracting about Bankruptcy." *Journal of Law, Economics and Organization* 13 (1): 127–146 (April).

———. 1998. "A Contract Theory Approach to Business Bankruptcy." *The Yale Law Journal* 107 (4): 1807–1851 (April).

———. 2002, April. The Law and Economics Approach to Corporate Bankruptcy. Global Corporate Governance Forum Research Network Meeting (April 5, 2002).

Shleifer, Andrei, and Robert Vishny. 1997. "A Survey of Corporate Governance." *Journal of Finance* 52 (2): 737–783 (June).

Stevenson, Maxwell, Brad Wong, Graham Partington, and Violet Torbey. 2007. "Surviving Chapter 11 Bankruptcies: Duration and Payoff?" *Abacus* 43 (3): 363–387 (September).

Weill, Laurent, and Christophe J. Godlewski. 2006. Does Collateral Help Mitigate Adverse Selection? A Cross-Country Analysis. LaRGE Working Paper No. 2006-02, Laboratoire de Recherche en Gestion et Economie, Université de Strasbourg.

Weiss, Lawrence A. 1990. "Bankruptcy Resolution: Direct Costs and Violation of Priority of Claims." *Journal of Financial Economics* 27 (2): 285–314 (October).

Weiss, Lawrence A., and Karen H. Wruck. 1998. "Information Problems, Conflicts of Interest and Asset Stripping: Chapter 11's Failure in the Case of Eastern Airlines." *Journal of Financial Economics* 48 (1): 55–97 (April).

White, Michelle J. 1989. "The Corporate Bankruptcy Decision." *Journal of Economic Perspectives* 3 (2): 129–151 (April).

———. 1992. Measuring Deviations from Absolute Priority Rule in Chapter 11. Working Paper, University of Michigan.

———. 1998. Corporate Bankruptcy. in: Newman, P. K. (ed.): *The New Palgrave Dictionary of Economics and the Law*, London: Macmillan Press.

———. 2007. Bankruptcy Law. in: Polinsky, A. M. and S. Shavell (eds.): *Handbook of Law and Economics (Volume 2)*, Chapter 14, 1013-1072, Elsevier.

Wihlborg, Clas. 2002. Insolvency and Debt Recovery Procedures in Economic Development – An Overview of African Law. WIDER Discussion Paper No. 2002/27, United Nations University.

Wood, Philip R. 1995. *Principles of International Insolvency.* London Sweet and Maxwell, London.

WorldBank. 2008. Doing Business 2009: Comparing Regulation in 181 Economies. World Bank, International Finance Corporation, and Palgrave Macmillan.