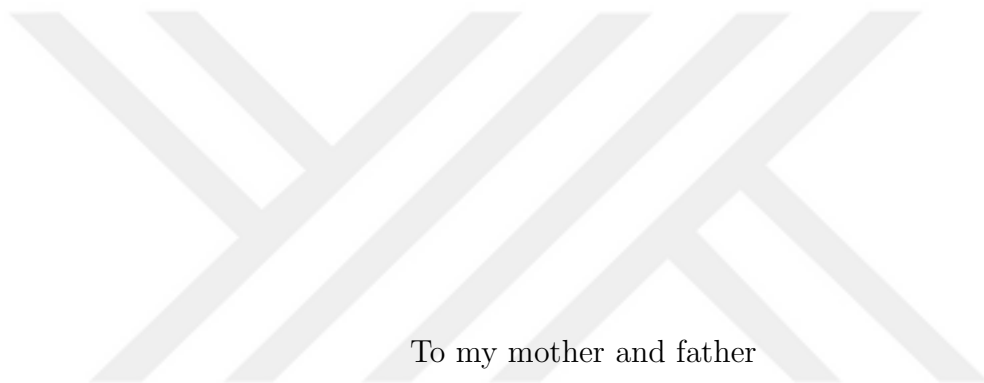




To my mother and father

A GAME THEORETIC MODEL ON POST-INSOLVENCY PROCEDURES

Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

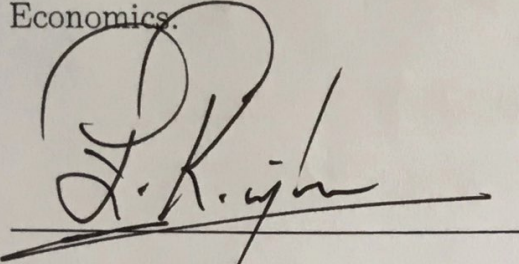
DENİZ BAYTEMÜR

In Partial Fulfillment of the Requirements For the Degree of
MASTER OF ARTS

THE DEPARTMENT OF
ECONOMICS
İHSAN DOĞRAMACI BILKENT UNIVERSITY
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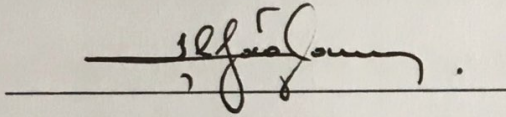
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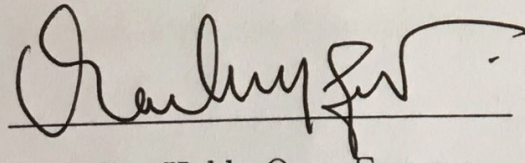
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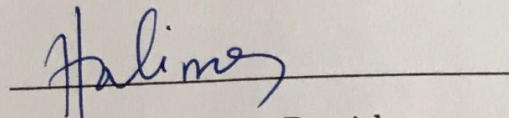
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Economics.



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ABSTRACT

A GAME THEORETIC MODEL ON POST-INSOVCENCY PROCEDURES

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September 2017

This thesis utilizes the game theory literature with asymmetric information to model post-insolvency options of the indebted firm. We center the study on Turkish bankruptcy system and compare the system to an alternative state, which is namely the Benchmark state. In the first state, the indebted firm has three options: Liquidation, Reorganization, and Adjournment of Bankruptcy; while the last option, which is unique to Turkish system, is not available in the latter. These two systems are compared in terms of resulting welfare of the creditor. The comparison indicates that the Benchmark state generally serves better to creditor. However, in certain cases this relation is reversed and effects of the changes in model parameters in these two states are different.

Keywords: Adjournment of Bankruptcy, Bargaining, Insolvency.

ÖZET

ACİZ TAKİP EDEN İMKANLAR ÜZERİNE BİR OYUN MODELİ

Baytemür, Deniz

Yüksek Lisans, Ekonomi Bölümü

Tez Yöneticisi: Yard. Doç. Dr. Emin Karagözoğlu

Eylül 2017

Bu tez, borca batık firmanın aciz sonrası imkanlarını modellemek için asimetrik bilgili oyun teorisi literatüründen faydalanmaktadır. Bu çalışmada Türk iflas sistemini merkez aldık ve bu sistemi, Benchmark state olarak anlandırduğumuz alternatif bir sistemle karşılaştırdık. İlk durumda, borca batık firmanın İflas (Tasfiye), Yeniden Yapılandırma ve İflasın Ertelenmesi şeklinde üç ayrı seçeneği varken ikinci durumda, son seçenek mevcut değildir. Bu iki sistem alacaklının refahı açısından karşılaştırılmıştır. Karşılaştırma, Benchmark sistemin çoğunlukla alacaklının lehine olduğunu işaret etmektedir. Öte yandan, belirli bazı durumlarda bu ilişki tam tersinedir ve model parametrelerindeki değişimlerin iki sisteme etkisi birbirinden farklı olmaktadır.

Anahtar Kelimeler: Aciz Hali, İflasın Ertelenmesi, Pazarlık.

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CHAPTER 1

INTRODUCTION

The limited liability rule is a crucial characteristic of the corporations which gains further importance in insolvency situations. The limited liability rule determines the scope of shareholders' accountability: The shareholders are only liable to the firm for their capital commitments. Thus, the liability of the firm and the liability of the shareholders are two separate components. Furthermore, the law commands that the liability of the firm is limited to the amount of its assets. Hence, in case of a bankruptcy, the shareholders are not subject to execution proceedings for the firm's debt, unless any fictitious transaction is proven (Turkish Commercial Code, Art. 329). The fact that firm is liable with only up to its assets makes it vital to access information on the firm's capital structure, due to the risk that the debt owed to the creditor will not be paid fully. It is an undeniable fact that the shareholders have information advantage over the creditors about the financial statements of the firm, since they are entitled to access these statements unlike the creditors. Moreover, it is often observed that this power is abused to manipulate these statements for various reasons, concealing financial distress or sometimes filing fraudulent bankruptcy petition, for instance. When the information asymmetry is combined with the unbalanced and critical power, the law that will be enforced in case of any conflict should precisely deem these circumstances and have necessary measures

against the hazardous nature of this structure. Therefore, the methods offered by the bankruptcy system that will be applied in the occurrence of a business failure should be carefully analyzed. A famous saying among law scholars about the bankruptcy system goes: “Bankruptcy is bankrupt.”,¹ which draws even further attention to understanding its framework and results.

The Turkish bankruptcy system provides, mainly, three options to a firm whose assets are insufficient to cover its debt. The first option to resolve insolvency is *Liquidation* which corporations are obliged to address, unless they apply for other options, as soon as they realize indebtedness. (Bankruptcy and Enforcement Code, Art. 179). The firm is liquidated via court proceedings and money obtained from the sale is distributed among creditors according to the Absolute Priority Rule (APR). This procedure is similar to Chapter 7 of the U.S. Code. The shareholders receive a payment only after the creditors are paid fully due to the APR. In other words, it is necessary to cover the entire debt owed to the creditor before shareholders can receive any of the money obtained. The second option for a financially distressed firm is *Reorganization* which is regulated according to Bankruptcy and Enforcement Law Art. 309 ff., and is similar to Chapter 11 proceedings in the U.S. Code. Reorganization can be viewed as a bargaining procedure between the firm and its creditors over the maturity and amount of debts, along with operational restructuring (Bankruptcy and Enforcement Code, Art. 309 and 11 U.S.Code § 1123).

The last option, which in many ways is unique to the Turkish bankruptcy system, is *Adjournment of Bankruptcy*. This procedure is adopted from the Swiss Code of Obligations (Art. 725), yet, has gone through numerous reforms. There are some remedies in other countries that resemble the adjournment procedure, however our system is distinctive from many aspects; its scope,

¹Prof. Dr. Ejder Yilmaz, during a private talk, November 2016, Bilkent University/Ankara.

parties involved or remedies against it, so forth. Hence, we consider this procedure as an additional option that is available only in the Turkish bankruptcy system.²

The motivation behind this work is, first of all, to understand the structure and results of the bankruptcy system. As it is mentioned before, there exists information asymmetry between the firm and the creditors, primarily on the financial structure of the firm. This induces the presence of strategic interactions which enable us to develop a game theoretic model with asymmetric information and to examine its outcomes. It is not only the theoretic interest that triggered this study. But more essentially, the motive is that the results of this bankruptcy system is observable in everyday life and many people are directly influenced by the outcomes of this system; sometimes as a creditor, a shareholder or an employee. On the one hand, immediate liquidation of a firm with a recovery potential may result in limited payment to the creditors. However, on the other hand, granting additional survival options for an 'ill' firm, a poorly managed firm, would most probably leave the creditors with even less payment. This kind of inefficient results are closely related to asymmetric information between the firm and the firm's opposite party. We attempt to model this information asymmetry within the post-insolvency procedures in a simple bargaining setup, and eventually, present the impacts of this system on the creditor's welfare.

²The U.S. Federal Code regulates suspension of bankruptcy on the scope of tariffs and custom duties. For further information, see 19 CFR § 162.80.

In the public newspapers are there more than thousands of news about bankruptcy, especially about the Adjournment cases, over the past year. “16 thousand firms are on the verge of bankruptcy.”³, “Aggravated fraud case is filed against the Adjournment of Bankruptcy”⁴ are just two examples of headlines from newspapers. While the constant debate about the pros and cons of the adjournment plays on, the Turkish system offers a unique proceeding for more than ten years, which has not been included in a game-theoretic model yet. By studying this sui generis procedure, we aim to explain how it affects the welfare of the creditor compared to an alternative system. Over the past four years, more than three thousand firms have applied for Adjournment, whereas Reorganization has hardly ever been practiced in Turkey since it is first introduced (Deynekli, 2011). Most of the Adjournment cases have drawn media’s attention for both their scope and dubious results. Law scholars and practitioners point out that our Adjournment regime carries fundamental problems (Arslan, 2008). In this study, as well as bringing a theoretical explanation for some of these problems, we try to screen the policy impact of the bankruptcy systems.

In this thesis, we focus on Reorganization procedure in the context of simple bargaining game that is played between the creditor and the firm, where the firm has information advantage over the creditor concerning its financial statements and the quality of the management, which we capture these under the concept of ‘type’. The study contributes to the existing literature in multiple dimensions. First of all, the bankruptcy system in Turkey has never been modeled formally in an economical framework. Although there are models explaining Reorganization process, none of them includes the unique Adjournment process. Secondly, despite the existing literature on models of Reorganization, none of them explicitly solves for an asymmetric information

³Cumhuriyet, 09.20.2016.

⁴Haberturk, 05.25.2015.

bargaining problem. Finally, our study provides a comparison between two existing regimes in the world in terms of what they offer to a financially distressed firm and how well they serve the creditor's interest.

The thesis is organized as follows: Chapter 2 briefly examines the existing literature on the topic, Chapter 3 gives a summary of the legal background, Chapter 4 describes the model, Chapter 5 summarizes the equilibrium results for all possible cases, Chapter 6 provides a comparative statics of the model parameters, Chapter 7 discusses the welfare comparison and the policy implications, and Chapter 8 presents the conclusion.

CHAPTER 2

RELATED LITERATURE

The bankruptcy system and its effects on the parties involved have long been under examination. Many scholars address the issue from an empirical perspective. The very interest is frequently on the comparison between liquidation, Chapter 7, and reorganization, Chapter 11 of the US Bankruptcy Code. For instance, Bris, Welch and Zhu (2006) compare two procedures in terms of their costs, and abilities to satisfy the creditors. In their empirical study focusing on 300 firms, they find that despite the heterogeneous nature of liquidation costs, it is safe enough to conclude that Reorganization performs better in covering debts compared to liquidation. Some other empirical studies focus on the topic in terms of the procedure costs and provide evidence in line with the argument that reorganization costs are relatively lower than liquidation costs (Anderson and Betker, 1995; Gilson, 1997; Maksimovic and Phillips, 1998).

In addition to this line of work, there are studies combining the theoretic and empirical aspects of the issue. Eraslan (2008) introduces a game theoretic model that captures bargaining within reorganization under perfect information. As a further step, she estimates the model in order to observe and measure the effects of the liquidation value over the process. Yilmaz and Eraslan (2014) model reorganization as a bargaining procedure that includes financial and

operational restructuring, where the creditors have private information. Their main question is to understand effect of the time ordering of these two subjects of bargaining in the efficiency of the solution. They come up with an analysis on how the timing determines the efficiency of bargaining procedure.

There are other studies modeling reorganization as a bargaining procedure. Baird and Picker (1991) analyze how the two rules, Automatic Stay and Absolute Priority Rule, that govern the Reorganization process affect the bargaining procedure. They model the bargaining procedure as an alternating offers game with complete information where there is an exit option and players' time preferences are different. Besides challenging the existing assumptions, they impose an alternative regime to be applied and examine how the new rules may affect the procedures. After pointing out that there are two options available for an indebted firm, Bebchuck and Chang (1992), similarly model reorganization as a sequential bargaining procedure during which the initial value of the firm may change. They mainly compare the expected payoff of the different creditor classes in reorganization and study how it differs from the payoff they will receive in liquidation. They explain the positive payoff obtained by shareholders despite insolvency by three possible sources: the financial distress costs that would incur in case of an agreement delay, the volatility in the asset value during the bargaining process, and the possible loss in value in Chapter 7 sale.

Reorganization procedure has long been examined with regards to its relationship with Absolute Priority Rule (APR). This rule obliges firms to satisfy certain types of creditors (e.g., secured creditors) before making any payment to unsecured ones and shareholders. However, deviations from this rule are observed to be frequent in reorganization. Baird and Bernstein (2006), from an initially legal perspective, explain these deviations with the existence of

uncertainty about the valuation of the firm. The value that is distributed between creditors is determined hypothetically before the negotiations begin. The real value of the assets may be higher than this assumed calculation. Besides, the unbalanced power in accessing the firm's financial statements creates information asymmetry. These two factors together are supported to explain deviations from APR rule in case of reorganization.

Adjournment of Bankruptcy is a highly disputable topic among law scholars and practitioners. This procedure was introduced to the Turkish bankruptcy system in 2003 and has become very popular among financially distressed firms in the past ten years. The aim of this regulation is to give a second chance to a firm in a business failure and comfort the firm in order to pay debts to creditors (Atalay, 2007). If the insolvency condition is resolved with liquidation, it is very likely that the most of the creditors would not receive a complete payment. Additionally, firms' financial distress may sometimes be due to external factors rather than internal organizational problems. Global financial crises, or an unexpected situation in the market may result in firms being indebted. Hence, it is not always the best option to dissolve the firm, but rather it is better to give the firm a recovery option (Ruzgaresen, 2009). The initial aim in providing these additional options is to protect the rights of the creditors (Oztek, 2006). In other words, while equipping the insolvent firm with recovery opportunity, the law should guard the rights of the creditors in order not to create an unbalanced system.

It has been observed that firms have applied for Adjournment of the Bankruptcy somehow more frequently than it was expected. The possible danger of the procedure is providing an immunity to the firm from execution proceedings during the time of the adjournment. This rule, which is named as Automatic Stay in the US practice, has two sides. On the one hand, it is the

main motive behind the Adjourment procedure: By providing an immunity to the firm, the law aims to create a safe environment for the firm to realize its recovery plan without being subject to further demands. In comparison to Reorganization, which is lack of this feature in Turkish practice, the firm is more capable of performing a structurally qualified plan. On the other hand, the rule is precarious in terms of entitling the problematic firm with power. If the failure of the firm is due to bad management, this opportunity may be easily exploited; such as using it as a tool to hide assets. When this danger is combined with the high number of applications, which has exceeded a thousand over the past two years, it becomes vital to understand what this system offers from an economical perspective.

In this thesis, following a similar reasoning, we model the Reorganization as a simple bargaining game that is played between the firm and the creditor. We only include one representative creditor, so that we ignore the possible effects of the APR. We mainly do this because the question that we pose is not related to the number of the creditors. We aim to make a welfare comparison between two regimes in terms of what creditor receives. Including more than one creditor not only complicates the solution, but also makes it harder to observe the welfare effect. Moreover, we focus on the options available to the firm. In doing so, we analytically solve the model in terms of the expected payoffs received by the players. From this aspect, we exclude operational restructuring side of the bargaining problem since we would like to observe the welfare effect of two systems and how the model parameters contributes to this effect.

In this study, we concentrate on a bankruptcy problem and investigate the structure of it by relying on a theoretical model of asymmetric information, and, finally characterize the equilibria that depends on belief of the creditor on the type of the firm, and other model parameters, such as success probability,

initial level of assets, etc. Our simple bargaining game, which is captured in Reorganization option, is played for one period in which the uninformed party, the creditor, makes the offer depending on her prior belief. This kind of asymmetric information bargaining game is studied by Fudenberg and Tirole (1983), and we utilize their solution method in this study. For the convenience concerns, from here on the creditor will be referred as “she”, and the firm which is assumed to be governed by a manager will be referred as “he”.



CHAPTER 3

LEGAL BACKGROUND

In this section, in order to make the model easier to comprehend, we first expound the legal aspect of the issue. In doing so, we summarize the post-insolvency options of a financially distressed firm under three topics.

a. Liquidation: A financially distressed firm has couple of options to overcome this problem, according to the Turkish bankruptcy system. The first option available to the firm is to demand its own bankruptcy according to the Enforcement and Bankruptcy Code. This option aims to terminate the legal entity of the corporation via court proceedings. Thus, the firm is liquidated by a court through selling its assets and the money is distributed to creditors according to Absolute Priority Rule. This rule determines the order of payment to the creditors (Art. 206). Since the firm's assets are already insufficient to cover its debt and liquidation is a costly procedure, some creditors, especially the unsecured ones are under the risk of not receiving full payment, even sometimes any payment at all. The corporations are obliged to file for a bankruptcy petition when they realize they are over-indebted unless they apply for another option determined by the law (Art. 179, Art. 345/A).

b. Adjournment of the Bankruptcy: If the firm does not prepare a bankruptcy petition, he can prepare an Adjournment of the Bankruptcy petition with a recovery project (Art.179). According to this procedure, the firm applies to a court with a convincing recovery project in order to receive a Adjournment. The project is required to be sound and reasonable in terms of providing a convincing recovery hope (Oztekin, 2007). From this aspect, it is not enough for the firm to submit some vague or abstract recovery steps. But rather firm has to come up with a concrete project that explicitly points out how he will overcome this problem, so that the cash drain will turn into cash flow (Oztekin, 2006).

If the petition of Adjournment is accepted by the court, then the bankruptcy is, in the first place, suspended for a year. In order for his petition to be accepted, it is required for the firm to provide sufficient evidence to show that the amount that will be distributed to the creditors in case of successful application of the recovery plan is not less than the amount that would be received immediately in liquidation. During the Adjournment period, the creditors are subject to an automatic stay, meaning that they cannot commence execution proceedings against the firm. In other words, not only the bankruptcy, but also the debts are suspended. The firm is governed by a trustee who is appointed by the court during this period (Art. 179/ a-b-c).

At the end of the year, if the firm does not provide solid evidences of recovery according to the prepared plan, the court automatically decides for liquidation. Thus the firm must be successful in running the recovery project. The success of the recovery project is determined according to whether the over-indebtedness is overcome (Musul, 2008). Hence, it is not enough for the firm to increase its assets compared to its initial value. Moreover, he has to resolve the insolvency so that liquidation is no longer a threat (Ozekes, 2007). The Supreme Court of Turkey has also pointed out this issue in one of its decision by saying that “...

the firm is not financially recovered, in other words the assets have not increased to cover liabilities...” (Supreme Court Assembly of Civil Chambers, 2005).

c. Reorganization: The other option that a financially distressed firm can follow instead of liquidation is Reorganization (Art. 209). This procedure, which in many ways is similar to Chapter 11, is special to corporations. Although, unlike Adjournment, insolvency is not required for reorganization, the over-indebted firms can follow this proceeding as well. According to law, the firm, instead of submitting the recovery plan to court, negotiates and bargains over the plan with creditors. If the firm manages to agree with the determined majority of the creditors, he can avoid from bankruptcy by having the agreement ratified by the court. Thus, the firm does not need to convince the judge, but now he has to convince the creditors. Reorganization is roughly a bargaining procedure between the creditors and the firm, which involves both financial and organizational reorganization. In our model we only included financial reorganization which is modeled as a bargaining procedure over the current debt. It is worthwhile mentioning that in Turkey, Reorganization has almost never been observed as a way of overcoming insolvency.

In addition to these options, the Turkish system also provides concordat and resignation from priority option for a financially distressed firms to avoid from bankruptcy. Yet, these procedures’ main concerns are changing the amount and the maturity of the debts in principle. In fact, changing the maturity can be represented as revaluing the current debt, which is represented by bargaining in Reorganization. Thus we aim to cover all these options by Reorganization in our model.

Like the Anglo-Saxon system, Turkish bankruptcy system offers additional ways to an indebted firm rather than liquidation to overcome insolvency, due to social

welfare concerns (Yilmaz, 2009). The growing trend affecting the bankruptcy systems is to give a second chance to a distressed firm. This idea has its roots from global crises. Due to the broad scope of recent crises that have affected almost all industries, even though a firm did not have an organizational problems, it would still end up indebted. The immediate liquidation of such firms is neither beneficial for the firm nor for its creditors. A 'successful' bankruptcy system should give these types of firms (in our setting, high type firms) a second chance while canalizing others (low type firms) to liquidate immediately. However, the ongoing tendency to provide a second chance to the firms carries some hazards against the rights of creditors. When a rescue opportunity is given to a problematic firm that has a small chance to recover, the creditors will generally end up with receiving smaller amount than they would receive under liquidation. Thus, these new systems must be also examined how well they cover the debts owed to creditor. Our study makes a welfare comparison of the creditor by comparing two alternative states of the world.

CHAPTER 4

THE MODEL

First, Nature determines the type of the firm, where the firm can be of type High and Low. At $t=0$, the total value of the firm is V^0 and he has debt which is normalized to $D=1$, that will mature at $t=1$. If the firm chooses not to exert any effort, his value will increase only with interest rate, R and become $(1 + R)V^0$ at $t=1$. Yet, the debt will also increase with the same interest rate. The firm is indebted, meaning that the value at $t=1$ is insufficient to cover his debt, $V^0 < 1$.

At $t=0$, since the firm has two options, he can choose not to supply any effort, which will end him up with Liquidation at $t=1$. If he sticks up with this, he will liquidate at $t=1$ with the liquidation value being $\alpha(1 + R)V^0$, that will be obtained by the creditor. We assume $\alpha \in (0, 1)$. As it is pointed out above, liquidation procedure is more costly than other options. Thus we normalize the other costs to 0, rather than preparation of the recovery plan, and assume that it is the liquidation option which is costly. If firm liquidates at $t=1$, he has an outside option that is equal to $\bar{V}$.

The other option available to the firm at $t=0$ is to supply some effort, e_H or e_L namely. Effort levels represent the quality of the recovery project and determine

the firm's value under success. In real-life settings, exerting high effort implies that that firm would hire qualified trustees or experts, carefully examine his financial/organizational problems, and seek for investment options, etc. On the one hand, this kind of toilsome preparations are time and money consuming. It is clearly easier and cheaper to prepare a plan without bothering extra effort. On the other hand, investigating the actual reasons that cause a business failure and exerting a considerable amount of effort will most probably increase the resulting value of the firm.

After supplying the effort, firm can either apply for Adjournment of the Bankruptcy or Reorganization at $t=1$. Adjournment is a process held by a court and Reorganization is a one-shot bargaining between the creditor where the creditor makes a take it or leave it offer to firm without knowing the type of the firm.

If the firm applies for Adjournment, the court decides whether or not to accept the petition depending on the observable effort level. We assume that both the court and the creditor can observe effort level, however they cannot detect the type of the firm. The rationale behind this assumption is that the type of the firm is closely linked to the organizational and management skills of the ones that govern the firm. This qualification, besides being not directly observable, can change over time. Firm may change its managers as a part of recovery plan. Another possibility is that the failure of the firm may be attributed to the external factors as well as internal ones, and this identification is an arduous task. The effort level, on the other hand, though imperfectly, can be signaled via the recovery plan. A well informed judge or a creditor can evaluate what kind of effort did the firm exert by examining the plan.

If the court observes high effort level, it will accept application with probability $\bar{r}$, and with probability $\underline{r}$ if it observes low effort level. If the application is rejected, the players will receive liquidation payoffs, minus the cost of effort for firm. If the application is accepted, Nature determines success or failure depending on the effort level and the firm's type. The success probability depends only on the type however, the value that will be realized in case of success depends on the effort level.¹ If the firm fails, its value is decreased to 0 and the firm liquidates where the outside option $\bar{V}$ is no longer available.

If the firm chooses Reorganization, he plays a one period simple bargaining game with asymmetric information where creditor makes a take it or leave it demand that will only be paid under success. If firm rejects this demand, players will receive liquidation payoffs, minus the cost of effort for the firm. If he accepts, Nature determines success or failure depending on effort level and firm's type. Similarly, in case of failure, liquidation realizes without the outside option.

Initial Condition:

$$V^0 \leq 1 \tag{1}$$

This denotes the insolvency condition of the firm.

Assumption 1:

$$0 < \alpha < 1 \tag{2}$$

This captures the costs of liquidation. As a natural result, firm receives 0 under liquidation.

¹By building the model in this way, we allow the low type to reach the highest value. Similarly, there is a chance for the high type firm to 'mess up' and end up with nothing. As we pointed out above, the recovery plan not only includes investment plans, but it also includes management adjustments. Even though a firm is of low type, he can still make a good investment decision and run it with an adequate management. Following the same logic, a well managed firm may fail in operating its plan and diminish its value to zero.

Assumption 2:

$$V^H > V^M > (1 + R)^2 > (1 + R)^2 V^0 > 0 \quad (3)$$

Let $B(x)$ represent the payoff function of the creditor. We assume that creditor is risk neutral. Thus her utility is linear in the monetary payoff she receives, ie.

$$B(x) = x$$

Let $F(V - x, e)$ represent the payoff function of the firm. We assume that the firm has an additively separable payoff function, and c represents the cost of effort.

$$F(V - x, e) = V - x - c(e_j)$$

where $c'(e) > 0$ and $c''(e) \geq 0$.

The firm has an information advantage over the creditor about his type, i.e., the creditor does not know the type of the firm. Nevertheless, she can observe the effort level. Following Fudenberg and Tirole (1983), we characterize the equilibrium of the bargaining game depending on creditor's belief on the firm's type.²

²Asymmetric information bargaining is most frequently analyzed in an experimental manner. Forsythe, Kennan and Sopher (1991), while comparing the theoretic literature with their experimental results, refer to the same study that we utilize. For further reading on the experimental results of such games. For further reading on the experimental aspect of the asymmetric information bargaining, we kindly refer to Mitzkewitz and Nagel (1993), Guth, Huck and Ockenfels (1996), and Camerer, Nave and Smith (2015).

4.1 The Benchmark State: Without Adjournment

First, we consider the game without the Adjournment option. Hence, the insolvent firm has two options. This is the Benchmark state, in which the firm has only two options to overcome insolvency. Fudenberg and Tirole (1983) suggest two possible strategic behaviour of the creditor under asymmetric information: soft and tough depending on the relation between her prior belief on the firm's type, and her expected payoff.

4.1.1 Symmetric information

Since the firm and creditor play a simple bargaining game where the creditor has a right to issue ultimatum, she will offer the firm just the amount that is, in expectation, equal to his outside option. Let X_j^i denotes how much creditor demand when she observes type $i \in \{H, L\}$ and effort level $j \in \{H, L\}$. The individual rationality conditions for the firm and the creditor are:

$$p^i(V^s - X_j^i) - c(e_j) \geq (1 + R)\bar{V} \quad (4.1)$$

$$X_j^i \geq \alpha(1 + R)^2 V^0 \quad (4.2)$$

where i denotes the type, j denotes the effort level and V^s denotes the value under success. If the first inequality does not hold, the firm will not accept the demand of the creditor. If the second one fails to hold, creditor is not willing to make a demand. The demand coming from the creditor will be the amount that makes the firm indifferent with his outside option. The corresponding demands are:

$$X_H^H = V^H - \frac{((1+R)\bar{V} + c(e_H))}{p^H}$$

$$X_H^L = V^H - \frac{((1+R)\bar{V} + c(e_H))}{p^L}$$

$$X_L^H = V^M - \frac{((1+R)\bar{V} + c(e_L))}{p^H}$$

$$X_L^L = V^M - \frac{((1+R)\bar{V} + c(e_L))}{p^L}$$

4.1.2 Asymmetric information

a. High Effort Level

The creditor observes high effort level but does not observe the type of the firm, i.e., the size of the pie. Creditor will demand X_H^H and only the high type firm will accept, whenever $\theta p^H X_H^H > (\theta p^H + (1-\theta)p^L)X_H^L$, meaning that when his expected earning from doing so exceeds the low offer, which will be accepted by any type of firm. This strategy of the creditor is labeled as “tough”. When $\frac{\theta p^H}{\theta p^H + (1-\theta)p^L} > \frac{X_H^L}{X_H^H}$, she will demand X_H^H and only high type firms will accept. On the contrary, when the creditor plays “soft”, i.e., when $\frac{\theta p^H}{\theta p^H + (1-\theta)p^L} \leq \frac{X_H^L}{X_H^H}$, then she will demand X_H^L , and both the high type and low type firms will accept it.

b. Low Effort Level

Similarly, creditor will play tough, demand X_L^H , and only the high type firms will accept, whenever $\theta p^H X_L^H > (\theta p^H + (1-\theta)p^L)X_L^L$ and demand X_L^L when she plays soft due to her prior belief. Similarly, they will fail to agree if the firm is of low type, when the creditor plays tough.

Lemma 4.1.1. Creditor’s posterior belief on the firm being high type is either equal to her prior or it is 1, after she observes effort level.

Proof. Suppose creditor observes high effort level. She has a prior θ that the

firm is of high type. Let μ denotes creditor's posterior about firm is of high type. She will demand X_H^H if and only if $\mu p^H X^H > (\mu p^H + (1 - \mu p^L)) X^L$. Creditor must update her belief using Bayes' rule:

$$\mu = \frac{\theta \alpha^H}{\theta \alpha^H + (1 - \theta) \alpha^L}$$

where α^i denotes the probability that a type i firm chooses high effort level, $i \in \{H, L\}$.

For high type to choose high effort level, he must choose e_H over e_L and reorganization over liquidation. Let $\tilde{X}^H$ and $\tilde{X}^L$ denotes what firm expects creditor to demand when creditor observes high and low effort respectively. IR condition for the high type in high and low effort levels can be written as:

$$V^H - V^M - \frac{(c(e_H) - c(e_L))}{p^H} \geq \tilde{X}^H - \tilde{X}^L \quad (1)$$

In the absence of Adjournment, $\tilde{X}^H \geq \tilde{X}^L$ as creditor will demand more when she observes high effort level due to higher continuation payoff.

For low type to choose high effort level, similarly, let $\hat{X}^H$ and $\hat{X}^L$ denotes the expected demand coming from creditor when she observes high and low effort respectively. Low and high type firms will expect same demand when creditor plays soft due to above mentioned rule offered by Tirole and Fudenberg. So $\hat{X}^i = \tilde{X}^i$. Then we must have:

$$V^H - V^M - \frac{(c(e_H) - c(e_L))}{p^L} \geq \tilde{X}^H - \tilde{X}^L \quad (2)$$

LHS of (1) is strictly higher than that of (2). This implies whenever (2) holds, (1) also holds. When creditor observes high effort level, she will demand more as the expected value is higher compared to low effort level. Thus RHS of both equations are positive.

Choosing reorganization over liquidation implies:

$$V^H - \frac{((1+R)\bar{V} + c(e_H))}{p^H} \geq \tilde{X}^H \quad (3)$$

$$V^H - \frac{((1+R)\bar{V} + c(e_H))}{p^L} \geq \tilde{X}^H \quad (4)$$

Similarly, LHS of (3) is strictly higher than (4). Together with the condition above, this implies that whenever the inequalities hold for low type, i.e., when low type chooses high effort over low effort and Reorganization over Adjournment, high type firm will do so, as well. This will yield to a pooling equilibrium.

For the creditor to update her belief, she must calculate α^H and α^L . However, she perfectly knows continuation values of both types. If (1) holds, then α^H is equal to 1. If (2) holds together with (1), then $\mu = \theta$. Which means that she cannot update her belief when the condition holds for low-type firm, meaning that her prior belief is equal to her posterior. If (1) holds but not (2), then $\alpha^L = 0$, and $\mu = 1$. This implies, she knows the type of the firm when IR condition does not hold for low-type firm. Thus she determines the optimal demand depending on her posterior only, because posterior is either 1 or equal to prior. As a result she will either demand X_H^H or X_H^L when she observes high effort. The same reasoning holds for the low effort level as well. $\square$

Lemma 4.1.2. Whenever creditor plays tough, she is sure that firm is of high type, ie., her posterior is equal to 1.

Proof. Suppose creditor observes high effort level and she plays tough, ie. $\theta p^H X_L^H > (\theta p^H + (1-\theta)p^L)X_L^L$. Then from low-type firm's perspective, he is sure that he will face a demand that induces lower expected utility than liquidation. Expected payoff of accepting the tough demand is:

$$\begin{aligned}
& p^L(V^H - V^H + \frac{((1+R)\bar{V} + c(e_H))}{p^H}) \\
&= p^H/p^L(1+R)\bar{V} - (1 - p^L/p^H)c(e_H) < (1+R)\bar{V}
\end{aligned}$$

Thus any low type firm will choose not to supply any effort, as he would reject the demand anyway and liquidate in the first period. $\square$

Lemma 4.1.3. Whenever creditor plays soft, her posterior is equal to her prior.

Proof. Suppose creditor observes high effort level and she plays soft, ie.

$\theta p^H X_H^H \leq (\theta p^H + (1 - \theta)p^L)X_H^L$. Then any type of firm will accept this demand. From the perspective of the low type firm, he knows that he will face a demand that is just equal to his outside option, which is $(1+R)\bar{V}$. Thus he will not choose Reorganization. This is already true for the high type firm since the corresponding demand under perfect information is higher than this, since $p^H(V^H - X_H^L) - c(e_H) > p^H(V^H - X_H^H) - c(e_H) = (1+R)\bar{V}$. As a result, the high type firm has profitable deviation to choose Reorganization over Liquidation. Thus the creditor cannot update her belief, because when low type applies for Reorganization; the high type firm will apply for sure. The same reasoning holds for the low effort level as well. $\square$

4.2 The Modified State: With Adjournment

In the Modified state, the financially distressed firm, after exerting some effort, can choose Adjournment rather than Reorganization. As we stated above, the court determines the sake of the Adjournment petition based on the observable effort level. The expected payoff of the firm is denoted by $E\{^f P_j^i\}$ where i stands for the type of the firm and j stands for the effort level:

$$\begin{aligned}
E\{^f P_H^H\} &= \bar{r}p^H(V^H - (1+R)^2) + (1 - \bar{r})(1+R)\bar{V} - c(e_H) \\
E\{^f P_H^L\} &= \bar{r}p^L(V^H - (1+R)^2) + (1 - \bar{r})(1+R)\bar{V} - c(e_H)
\end{aligned}$$

$$E\{^f P_L^H\} = \underline{r}p^H(V^M - (1 + R)^2) + (1 - \underline{r})(1 + R)\bar{V} - c(e_L)$$

$$E\{^f P_L^L\} = \underline{r}p^L(V^M - (1 + R)^2) + (1 - \underline{r})(1 + R)\bar{V} - c(e_L)$$

Similar to the Benchmark state, the creditor will make a demand so that the firm is indifferent between his outside option, which is now $\max\{(1 + R)\bar{V}, E\{^f P_j^i\}\}$. The corresponding demands are shown in the Appendix section.



CHAPTER 5

RESULTS

Depending on creditor's posterior, we have pooling and separating equilibria. The highest prior belief would result in separating equilibria while other values of her belief induces pooling equilibria.

5.1 Benchmark State

5.1.1 Separating equilibrium

Separating equilibrium only exists when one type chooses Liquidation and other prefers Reorganization.

Creditor plays TT

When creditor plays Tough independent from the observed effort level, liquidation becomes more profitable for the low type. When creditor observes high effort, she will demand X_H^H . If the low type firm accepts this demand and reorganizes, his expected payoff would be:

$$\begin{aligned}
& p^L(V^H - X_H^H) - c(e^H) \\
&= p^L(V^H - X_H^H) - c(e^H) \\
&= \frac{p^L((1+R)\bar{V} - (p^H - p^L)c(e^H))}{p^H}
\end{aligned} \tag{5.1}$$

It is clear that Liquidation payoff, $\bar{V}$ is strictly higher than (1). The same reasoning applies for the low effort, as well. Thus, low type would prefer Liquidation over Reorganization. Since creditor's tough demand X_H^H and X_L^H are the amounts that in expectation, equate the payoff of the firm to outside option, $\bar{V}$, the high type firm is indifferent between choosing low or high effort. If he prefers high effort, we would have separating equilibrium where the high type firm prefers high effort level and the low type firm prefers liquidation when the prior belief of the creditor satisfies these conditions below:

$$\frac{\theta p^H}{\theta p^H + (1-\theta)p^L} \geq \frac{X_L^H}{X_H^H} \tag{5.2}$$

$$\frac{\theta p^H}{\theta p^H + (1-\theta)p^L} \geq \frac{X_L^L}{X_H^L} \tag{5.3}$$

5.1.2 Pooling equilibria

Pooling equilibria exist when both type of firms choose Liquidation over Reorganization or when they choose Reorganization with high effort or low effort.

Creditor plays TS

Certain values of θ allows for this case to occur. When creditor observes low effort level, she plays soft and demand “low pie”, X_L^L which corresponds to the low type firm's continuation payoff. When creditor observes high effort level, she plays tough and demand X_H^H . High type is better off choosing low effort:

$$p^H(V^H - X_H^H) - c(e^H) < p^H(V^H - X_L^L) - c(e^L)$$

$$(1 + R)\bar{V} < p^H/p^L((1 + R)\bar{V} + (p^H - p^L)c(e^L)) \quad (5.4)$$

As explained above, the low type firm is indifferent between Liquidation and Reorganization. Thus, both types will reorganize with low effort when the below condition holds:

$$\frac{X_L^L}{X_L^H} > \frac{\theta p^H}{\theta p^H + (1 - \theta)p^L} \geq \frac{X_H^L}{X_H^H} \quad (5.5)$$

Creditor plays ST

Creditor can either play TS or ST depending on the relationship between his prior belief and demands, X . If the equation (6) holds, then both types reorganize with high effort because like in the TS case, low type cannot exert low effort since tough demand makes him worse off. Thus he will exert high effort. High type firm is better off exerting high effort than low since creditor demands tough, which is his continuation payoff, when she observes low effort. Hence, both types will reorganize with high effort.

$$\frac{X_H^L}{X_H^H} > \frac{\theta p^H}{\theta p^H + (1 - \theta)p^L} \geq \frac{X_L^L}{X_L^H} \quad (5.6)$$

Creditor plays SS

Playing soft will leave low type indifferent between exerting effort and liquidation. Due to our assumption, low type exerts low effort whenever he is indifferent. High type can either exert high or low effort level. However if he exerts high effort, then creditor can perfectly distinguish that firm is of high type when she observes high effort. When creditor makes this distinction, she would play tough rather than soft. But following equation (4), we know that

high type receives strictly higher payoff when he makes agreement with the soft-playing creditor. Thus, high type has a profitable deviation. As a result, he chooses reorganization with low effort. Since the resulting strategies in TS and SS are same, creditor will not play SS when she is able to play TS.

$$\frac{X_L^H}{X_H^H} > \frac{\theta p^H}{\theta p^H + (1 - \theta)p^L} \quad (5.7)$$

$$\frac{X_L^L}{X_H^L} > \frac{\theta p^H}{\theta p^H + (1 - \theta)p^L} \quad (5.8)$$

5.2 The Modified State

The demand of the creditor depends on his prior and the relation between Adjournment outcomes and liquidation. We assume the low type prefers low effort level when he is indifferent. In order to ensure reader-friendliness, we place the derivations in the Appendix Section, and included the interpretation of the cases here. A brief summary of these cases is provided in the Table 5.1.

Case 1

As the outside option, Adjournment with high effort level brings highest expected return for both types. Then creditor must demand accordingly, i.e., demand an amount that will yield same return to the firm as Adjournment with high effort level. The Tough and Soft demands of the creditor corresponding to high and low efforts are shown by equations (1), (2), (3), and (4) in the Appendix section under Case 1. The creditor will either play TT, TS, ST or SS.

When the outside option is high enough, the tough demand in low effort will correspond the high types' continuation payoff. When this is the case, we have both separating and pooling equilibria.

a. Separating equilibrium: If creditor plays tough in both effort levels, only high type firm reorganizes with high effort level and low type firm prefers

Adjournment with high effort level.

b. Pooling equilibria: If creditor plays tough in high effort and soft in low effort or soft in both efforts, both types choose reorganization with low effort. When she plays soft in high and tough in low, both types reorganize with high effort. When she plays soft in both effort levels, both types will choose Adjournment with low effort. The reasoning is as follows: The low type firm is indifferent between choosing high and low effort when creditor plays soft in both. However by assumption, he will choose low effort. If high type firm chooses high effort, the creditor will be able to distinguish between types and will not demand soft when she observes high effort. Thus high type will exert low effort, too.

Interpretation: When θ is low enough, so that the creditor believes it is unlikely that firm is of high type, she prefers to agree with both types, thus she demands 'low pie' and plays soft. As a result, both types reorganize. In the lowest prior, both types reorganize with low effort and high type benefits from asymmetric information. When creditor is willing to agree with both types, neither type of the firms is willing to exert high effort since it is more costly. On the other extreme, when creditor believes that the firm is of high type with high enough probability, she only makes agreement with the high type. When this is the case, the low type firm will shift to his best attainable option, which is Adjournment with high effort.

When outside option is low enough, then the tough demand in low effort will correspond to low types' continuation value. If this is the case, we would not

have a pooling equilibria since the creditor is perfectly able to distinguish types:

Separating equilibrium: If creditor plays tough in both effort levels, high type will choose reorganization high effort and low type will choose reorganization with low effort. If creditor plays soft in both effort levels, high type will reorganizes with high effort and low type reorganize with low effort as both will be better off then. Similarly if creditor plays tough in high and soft in low effort, low type reorganizes with low and high type reorganizes with high effort. As a result, in the equilibrium, the creditor will always play tough/tough and we will not have an asymmetric information problem.

Interpretation: This case occurs when the cost of exerting effort is too low so that the difference between these costs are higher than outside option. This is shown in the Appendix section, 1.2. When this difference is high enough, it is not profitable for the low type to exert high effort. This means it is costly to prepare good recovery plan, compared to an inferior one. But costs can not be too high since the expected payoff must be positive. When firm has no better outside option, he will choose to agree with the creditor. On the one hand, success payoff is high enough to outrace adjournment with low effort for both types. No matter what the prior is, high type firms exert high effort and low type firms exert low effort. Since the expected payoff of the low type puts more weight to outside option, especially in low effort, and when this is low enough; creditor can demand more from low type in this case. In this case, no one benefits from asymmetric information since the creditor can distinguish between types perfectly when she observes the effort level.

Case 2

Adjournment with high effort brings highest expected payoff to high type and Adjournment with low effort brings highest expected payoff to low type. Tough

demand in both effort levels correspond to high types' continuation value. The values does not allow creditor to play Soft in high and Tough in low. The corresponding demands are shown by equations (5), (6), (7), and (8) in the Appendix section.

- a. Separating equilibrium: When creditor plays tough/tough, high type reorganizes with high effort and low type chooses Adjournment with low effort.
- b. Pooling equilibria: Creditor plays tough in high effort and soft in low effort, then both types reorganize with low effort.

Interpretation: This case occurs when the cost of exerting high effort is high enough so that the expected payoff of low type is insufficient to cover it. On the other hand, high type is still better off exerting high effort. This is due to the low success probability of low type. For the low type to choose high effort in Reorganization, the demand of the creditor must be low enough. But the creditor is unlikely to make such a low demand, because it is most probably less than her outside option, which is her Liquidation payoff $\alpha(1 + R)^2V^0$. Thus the low type will either reorganize with low effort or choose Adjournment with low effort.

Case 3

Adjournment with high effort level brings highest expected payoff to the high type, but Liquidation brings highest payoff to the low type. Tough demand in both effort levels correspond to high types' continuation value. The creditor will follow the same strategy as she would follow in the Benchmark state. The corresponding demands are shown by equations (9), (10), (11), and (12) in the Appendix section. These demands are always weakly less than the demands in the Benchmark state.

a. Separating equilibria: When creditor plays tough in both effort levels, only high type can afford to reorganize with high effort. Low type chooses liquidation.

b. Pooling equilibria: When creditor plays soft in high and tough in low, both types reorganize with high effort. When she plays tough in high and soft in low, both types reorganize with low effort. Similarly, when she plays soft in both effort levels, both types reorganize with low effort.

Interpretation: This case corresponds to the high cost of exerting any type of effort level so that low type can not afford it. The success probability of the low type is too low so that even under success, he is unable to compensate the cost of any effort level. In order to convince the low type to Reorganize, the creditor shall demand a small amount.

Case 4

Adjournment with low effort brings highest expected payoff to both types.

Tough demand in both efforts corresponds to high type's continuation payoff.

The creditor will either play TT, TS, ST or SS. The corresponding demands are shown by equations (13), (14), (15), and (16) in the Appendix section.

a. Separating equilibrium: When creditor plays tough in both effort levels, only high type firm reorganizes with high effort. Low type chooses Adjournment with low effort.

b. Pooling equilibrium: When creditor plays soft in high and tough in low, both

types reorganize with high effort. When she plays tough in high and soft in low, both types reorganize with low effort. Similarly, when she plays soft in both effort levels, both types reorganize with low effort.

Interpretation: This case occurs when cost of exerting high effort is too high for any type to exert it. This corresponds to high cost of preparing a good recovery plan, so that firms prefer to prepare lower quality plans, even though it pays less under success. Unless the prior belief is too high, we would have a pooling equilibria when the high type firm benefits from the asymmetric information.

Case 5

Adjournment with low effort brings highest expected payoff to the high type and Liquidation brings highest payoff to the low type. Tough demand in both effort levels correspond to high types' continuation value. The creditor will follow the same strategy as she would follow in the Benchmark state. The corresponding demands are shown by equations (13), (14), (15), and (16) in the Appendix section. These demands are always weakly less than the demands in the Benchmark state.

- a. Separating equilibria: When creditor plays tough in both effort levels, only high type can afford to reorganize with high effort. Low type liquidates.
- b. Pooling equilibria: When creditor plays soft in high and tough in low, both types reorganize with high effort. When she plays tough in high and soft in low, both types reorganize with low effort. Similarly, when she plays soft in both effort levels, both types reorganize with low effort.

Interpretation: This case corresponds to the high cost of exerting any type of

Table 5.1: Summary of Cases

Summary of Cases			
Cases	Separating Eq.	Pooling Eq.	Comments
Case1.1.	High type: R_H Low type: A_H	Both R_L Both R_H	Low cost of e_H and high outside option.
Case1.2.	High type: R_H Low type: R_L	None	Relatively low outside option compared to Case1.1. No asym.info problem.
Case2	High type: R_H Low type: A_L	Both R_L	Higher cost of e_H .
Case3	High type: R_H Low type: Liq	Both R_L Both R_H	High cost of both effort levels, low type is unlikely to exert effort.
Case4	High type: R_H Low type: A_L	Both R_L Both R_H	High outside option with high cost of effort.
Case5	High type: R_H Low type: Liq	Both R_L Both R_H	High cost of high effort, low cost of low effort.
Case6	High type: R_H Low type: Liq	Both R_L Both R_H	Highest cost of efforts with high outside option.

(R_j and A_j represent the chosen option in equilibria where j denotes the effort level)

effort level so that low type can not afford it. Also, the cost of high effort is high so the high type firm will exert low effort. The success probability of the low type is too low for him to compensate the cost of exerting effort. In order to convince the low type to reorganize, the creditor shall demand a small amount.

Case 6

Liquidation brings highest payoff to both types, as the outside option. This case is as without Adjournment analysis. This case occurs when the expected value under success minus the costs is not as profitable as the outside option under liquidation, which is $(1 + R)\bar{V}$.

CHAPTER 6

COMPARATIVE STATICS and DISCUSSION

In this section, we compare the results of a change in initial asset level (V^0) and success probability (p^i) on the agreement rates and the welfare of creditor.

6.1 Initial Assets V^0

The less assets are available, the more the firm is indebted. When the level of indebtedness is high, meaning that the level of initial assets is low compared to the debt owed, the firm is more likely to choose Reorganization. Since we normalized the debt owed to creditor to 1, high debt will correspond to low initial assets. At the first glance, it can be thought that demand of the creditor increases with her claim. However in our setting, creditor makes the offer and her claim being high compared to initial assets makes her more willing to make acceptable demands. Because, in case of rejection, she will receive a small amount. This will imply less coverage of her claims. When the debt increases, the amount that creditor will get decreases relatively, in case of rejection. Thus, high amount of debt makes a pressure on creditor to make acceptable demands. When initial assets decrease, creditor is more willing to make agreement. This increases the domain of the acceptable demands coming from the creditor because creditor is only willing to make an acceptable demand when her demand is weakly higher than her outside option which is initial assets. Since

the condition whether or not creditor will make an acceptable demand depends on the initial assets, the lower initial assets will enlarge the domain of the demands coming from the creditor. In other words, creditor desires an agreement only if $X_j^i \geq \alpha(1 + R)^2 V^0$ where i denotes the type and j denotes the effort level. While V^0 decreases, this equality becomes more likely to hold for any X . As a result, low level of initial assets makes agreements more likely.

Increasing V^0 generally causes Benchmark state to pay better to creditor. As we mentioned above, low indebtedness means that initial assets are high. When the prior belief of the creditor is high, she is only willing to make agreement with high type firm. If this is the case, the low type firms will either prefer Liquidation or Adjournment. When low type firms prefer Adjournment, this may bring less to creditor compared to Benchmark demand as the success probability of the low type is low. More formally, consider Case 1 where the outside option for the low type is Adjournment with high effort. When the prior belief of the creditor on the type of the firm is high enough, she will play TT. In the Benchmark state, the creditor will receive $\alpha(1 + R)^2 V^0$ from the low type firm, whereas in the Modified state, her expected payoff at $t=2$ is:

$$E\{X_H^L\} = p^L \bar{r}(1 + R)^2 + (1 - \bar{r})\alpha(1 + R)^2 V^0$$

Payoff in the Benchmark state is weakly higher when $p^L/\alpha \leq V^0$, and it becomes even higher with an increase in initial asset level.

However for certain cases, increasing V^0 may make the Modified state better in terms of the welfare of the creditor. When the success probability of the low type is low enough, or the cost of exerting high effort is high, low type firm cannot afford preparing a high quality recovery plan but the high type firm, due to high success probability can still afford a good recovery plan. This would

imply Case 2 settings, where the outside options for the high and low type firms are Adjournment with high and low effort, respectively. If the prior belief of the creditor is high enough, low type firm cannot reorganize, hence will choose Adjournment with low effort. In this case, an increase in the initial asset level makes Modified state to pay higher to creditor compared to Benchmark state, in which both types reorganize. However, if the court is not selective enough, Benchmark state will still pay better to creditor.

6.2 Success Probabilities p^H and p^L

With the increase of the success probabilities, in most cases, the demand of the creditor increases which is more clear by looking at the demands under Benchmark state or the demands under Modified state in the Appendix section. The expected value of the firm always increases with the success probability, as the value under failure is 0. Hence, except in one sub-case in Modified state (Case 1.b), the creditor can make higher demands to make the firm indifferent to his outside option. As a result, agreements becomes more likely under Reorganization since this increasing demand is more likely to be higher than the creditor's outside option, $\alpha(1 + R)^2V^0$.

In Benchmark state, increasing p^i will increase the demand of the creditor since it always increases the continuation payoff. As a result the agreement rates increase. Increasing success probability also increases the tendency of the firms to exert high effort. By increasing the demand, this also increases the welfare of the creditor. This also the case for Modified state, meaning that increasing success probability increases the welfare of the creditor.

In modified state, we can talk about two competing effects that determine the demand of the creditor. These are welfare and risk effects. Welfare effect means that when the continuation payoff of the firm increases, the demand of the creditor increases. Risk effect works in the opposite direction: When it is more likely for the firm to success, creditor requires less compensation to agree. Thus the demand of the creditor decreases when success probability is higher. In modified state, it is generally the welfare effect which dominates. However in subcase of Case 1, the risk effect dominates: In this case, tough demand corresponds to the low type's continuation payoff. This case occurs when the outside option is low enough compared to the difference between costs of the efforts. Since the firm is already more willing to agree with low types, increasing success probability decreases the risk of not receiving the agreed demand. As a result, the demand of the creditor decreases.

CHAPTER 7

WELFARE COMPARISON and POLICY IMPLICATIONS

In this chapter, after presenting the welfare comparison of the creditor in two states, we aim to highlight the policy implications of our model.

7.1 Welfare Comparison

In Table 6.1, we provide a comparison between two alternative regimes in terms of the expected payoff of the creditor. In the Benchmark state, the firm is lack of Adjournment option, while in the Modified state, he can also apply for Adjournment. In most of the cases, the Benchmark state is better in covering the debts owed to creditor. When creditor follows the same strategy in both states, the Benchmark state is always in favor of the creditor. The reasoning is as follows: In the Reorganization procedure, the creditor makes a demand that makes the firm indifferent to his outside option. The outside option of the firm is the maximum of the expected payoffs of Adjournment and Liquidation in the Modified state, while in the Benchmark, it is always equal to Liquidation.

Table 7.1: Welfare Comparison

Welfare Comparison of the Creditor		
Benchmark	Modified	Result
TT	TT, ST or SS in Case 1.1	Benchmark is better unless the initial assets are too low.
ST or SS	SS in Case 1.1	Benchmark is better.
TT	TT in Case 1.2	Modified is better unless initial assets are too high.
ST	TT in Case 1.2	Modified is better.
SS	TT in Case 1.2	Modified is better for certain values.
TT	TT in Case 2	Benchmark is better unless the initial assets are too low.
ST or SS	TT in Case 2	Modified is better unless the initial assets are too low.
SS	SS in Case 2	Benchmark is better.
TT	TT in Case 3	Benchmark is better.
TT	ST in Case 3	Benchmark is better unless initial assets are too low.
ST	SS in Case 3	Modified is better.
SS	SS in Case 3	Benchmark is better.
TT	TT, ST or SS in Case 4	Benchmark is better unless the initial assets are too low.
ST or SS	ST or SS in Case 4	Benchmark is better.
TT	TT in Case 5	Benchmark is better.
TT	ST in Case 5	Benchmark is better unless initial assets are too low.
ST	SS in Case 5	Modified is better.
SS	SS in Case 5	Benchmark is better.

To be more clear, in the Modified state, the creditor's demand satisfies the following equality: $p^i(V^s - X_j^i) = \max\{(1 + R)\bar{V}, E\{^f P_j^i\}\}$, where i denotes the type, j denotes effort level and V^s is the value under success. Since $\max\{(1 + R)\bar{V}, E\{^f P_j^i\}\} \geq (1 + R)\bar{V}$ always holds, the corresponding demands in the Benchmark state is always weakly higher than the ones in the Modified state. Thus Adjournment, by increasing the outside option, decreases the demand of the creditor for same effort levels.

Not only the presence of Adjournment option decreases the demand, but it also makes agreements less likely, since the creditor is only willing to agree when $X_j^i \geq \alpha(1 + R)^2 V^0$. When the expected payoff of the firm from Adjournment is

very high, this inequality fails to hold, and the creditor is no longer willing to make agreement. As a result, firm will choose Adjournment over Liquidation. This case occurs when the value under success, V^s , and the success probability, p^i , is high. Then, the Modified state may pay better to the creditor unless the initial asset level is not very low, because the creditor receives initial assets when the Adjournment petition is rejected.

As we mentioned in the previous chapters, in the Turkish practice, Reorganization has been merely observed. One possible explanation for the phenomenon is that the creditor has a high prior belief on the type of the firm so that all low type firms switch to their second best option, rather than Reorganization. This may result in a less payment to creditor when the firm is highly indebted. However when the unwillingness to choose Reorganization is due to the high success probabilities, and high outside option $\bar{V}$, the creditor may receive a higher payoff unless the firm is not highly indebted.

7.2 Policy Implications

The policy tools can be summarized under three categories: the cost of recovery plan, acceptance rates and the outside option under Reorganization, $\bar{V}$.

Costs: When the difference between the cost of preparing high quality and low quality recovery plan is low, the firm is more likely to exert high effort, whenever he can afford both. In real settings this would correspond to low cost of hiring trustees, or specialist or low risks in investment opportunities. The increase in costs may increase or decrease the welfare of the creditor.

If the prior belief of the creditor is so low, she would like to agree with both types. Suppose, we are in Case 1, meaning that the outside option for the firm is Adjournment with high effort. If the cost of exerting high effort increases, so that it becomes more costly to hire trustees, etc., the low type firm can no longer afford high quality recovery plan. Thus he will either switch to low effort or to Liquidation. When only the cost of preparing high quality plan increases, the demand and the welfare of the creditor decreases, since the case will now convert from Case 1 to Case 2, where the demands of the creditor are less. (The demand (2) is less than (6) and (4) is less than (8) in the Appendix section.) And when the firm becomes no longer able to exert any effort level and liquidate directly, the welfare of the creditor may increase since there is a failure probability in the other options, unlike Liquidation. Yet, the welfare decreases compared to the Reorganization, since the creditor only makes agreement when her demand is weakly higher than her liquidation payoff, $\alpha(1 + R)^2V^0$.

Now consider the case that creditor is only willing to make agreement with high types, and as a result low type firms choose Adjournment. The expected payoff of the creditor in this case is $\underline{r}p^L(1 + R)^2 + (1 - \underline{r})\alpha(1 + R)^2V^0$, if the firm exerts low effort. Increasing the cost of effort will increase the welfare of the creditor if $p^L \geq \alpha(1 + R)^2V^0$, which is generally the case due to low success probability. Briefly, increasing the costs may positively affect the welfare of the creditor if this increase will result in a separating equilibrium in terms of the chosen option.

Outside option $\bar{V}$: One of the most important factors affecting the equilibrium results is the outside option available for the firm under Liquidation. The outside option depends on credibility and competence of the owners of the firm, meaning that how well they can survive after Liquidation. Although in most settings, outside option is exogenous and taken as given, this

can be actually controlled by the policy. Social planner can implicitly determine the outside option by adopting additional limitations to the banking and bankruptcy system. If the firms are free from credit concerns, the outside option increases. This causes firms, especially the low type ones, to exert low effort. A possible policy tool to govern this is to keep strict reports about the managers and owners of the financially distressed firms so that their future credits are under examination. Because, if the outside option is low, firms are more likely to exert high effort, which increases the amount that is paid to creditor. On the other hand, outside option is inversely related with the demand of the creditor. Thus, tightening future credibility of the firm increases the demand of the creditor. When outside option is high, firms are more likely to choose Adjournment with low effort, or in the highest level, they would simply not bother to exert any effort and liquidate immediately.

In Benchmark state, a higher outside option lowers the demand of the creditor. As a result the agreement rates decrease and welfare of the creditor decreases.

In Modified state, a higher outside option may increase the welfare of the creditor. In Case 2 settings, a low type firm with low success probability cannot afford high quality plan. If the prior belief of the creditor is high enough, the low type firm will choose Adjournment. As we mentioned above, the expected payoff of the creditor in this case is $\underline{r}p^L(1+R)^2 + (1-\underline{r})\alpha(1+R)^2V^0$. With an increase in the outside option, the low type firm would switch to Liquidation, which may increase the welfare of the creditor when $p^L \geq \alpha V^0$ holds. In this case, both the firm's and the creditor's expected payoff increases, implying that there is a room for policy intervention whenever the success probability is low enough.

Acceptance Rates: Higher acceptance rates will decrease the welfare of the creditor unless this causes the firm to switch to Adjournment. Whenever the prior belief of the creditor is low enough for her to agree with both types, increasing the acceptance rates will decrease the demand and the welfare of the creditor. Even in the higher prior, high acceptance rates again decreases the welfare of the creditor since it is usually the low type who prefers Adjournment and his success probability is low. Higher acceptance rates only increases the welfare of the creditor when the level initial assets is too low, or the liquidation process is too costly meaning that α is low. If this is the case, giving a second chance to a firm will be beneficial for the creditor unless the success probability is not very low.

If the courts accept Adjournment with low effort as frequent as with high effort, meaning that the acceptance rates are close to each other, firms are tend to exert low effort, which is not surprising. This will decrease the welfare of the creditor. In the extreme levels, this will discourage the creditor to make any agreement at all, since the demand may become lower than her outside option, $\alpha(1 + R)^2V^0$. This result can explain the infrequency of Reorganization practices in Turkey: The high number of acceptance of the adjournment petitions escalate the continuation payoff of the firm to a level that the creditor cannot decrease her demand further to compensate this payoff. Hence, adjournment is always more profitable for the firm than any agreement with the creditor. This would discourage the firms from Reorganization and motivate Adjournment applications.

CHAPTER 8

CONCLUSION

8.1 Conclusion

This thesis focuses on the story after the financial distress of the firm. Many countries, including Turkey, offer some recovery options to an insolvent firm rather than obliging the firm to bankruptcy, and *Liquidation*, eventually. Although this additional options may be beneficial to both firm and the creditor, they carry some hazards at the same time. While other bankruptcy systems mainly provides one additional option, *Reorganization*, another procedure is available in the Turkish system, which is *Adjournment of the Bankruptcy*. Following this, we practically characterize two states, Benchmark and Modified, to capture post-insolvency procedures and compare the model results. Before filing for one of the options, which are namely *Reorganization* and *Adjournment of the Bankruptcy*, firm's financial structure is not completely observable by neither the court nor the creditor. The key problem here is that the firm has information advantage over the court and the creditor, and this advantage can be misused. By taking this information asymmetry into consideration, we design a simple bargaining model with asymmetric information, in which the uninformed party, the creditor, makes the demand.

The results of the game, first of all, suggest that the Benchmark state, where the Adjournment option is not available, is generally better in terms of the welfare of the creditor. Secondly, the policy implications for two states are not same; while increasing the recovery costs always decreases the creditor's welfare in the Benchmark state, it may increase her expected payoff in the Modified state.

The infrequent application to Reorganization in the Turkish practice may be due to two reasons, according to our modeling. Either the creditor's are not willing make agreement with every firm, meaning that their prior is too high, or the Adjournment option brings very high payoff to the firm. If the first case is accurate, it must be the low type firms who abstain from Reorganization. In order to increase the welfare of the creditor in this case, the recovery costs should be increased so that the low type firms, the firms with slight recovery hope, shift to Liquidation directly. If it is the latter, it may be due to inadequately selective courts or the high outside option of the firm. A lower outside option of the firm will encourage him to prepare a more qualified plan, and ultimately, this will add up to the welfare of creditor. Our model suggests that in these cases, the policy maker should tighten the rules that govern the banking system, and closely monitor the financially distressed firms so that their outside option under liquidation is lowered.

8.2 Future Work

For the best of our knowledge, this thesis is the first work that introduces the unique Adjournment option to a bankruptcy model and draws a comparison between two states of the world. For this reason, the study is insufficient to cover certain aspects of the problem, yet is promising to trigger future work on the subject.

We utilize a simple bargaining model that excludes the dynamic structure of the insolvency and the Reorganization process. Moreover, we only include one creditor, since the number of creditor is not related to our focus, as well as omitting number of firms. In the Adjournment application, we simplify the decision making mechanism of the court.

Future work along these lines, may analyze the problem from a dynamic approach, so that rather than playing a one shot game, there may be number of periods during which the value to be distributed changes. To incorporate the court into strategic interaction process, the Adjournment practice can be modeled as a signaling game, in which the firm send costly signals to the court to persuade them, and get his application ratified. Another future work may include a population of firms, together with a different class of creditors to see whether the Absolute Priority Rule affects the model results.

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APPENDIX A

Analytical Solutions for Equilibria

In this appendix, we will first provide the corresponding demands of the creditor in the Modified state, and present the analytical solutions for the equilibria of 6 possible cases that may occur in the Modified state. Let $E\{^f P_j^i\}$ denotes expected payoff of the firm where i is the type and j is the effort level and X_j^i denotes the offer of creditor when she knows the type i and observes effort level j .

Assumption: When he is indifferent, low type firm chooses to exert low effort level.

$$E\{^f P_H^H\} = \bar{r}p^H(V^H - (1 + R)) + (1 - \bar{r})(1 + R)\bar{V} - c(e_H)$$

$$E\{^f P_H^L\} = \bar{r}p^L(V^H - (1 + R)) + (1 - \bar{r})(1 + R)\bar{V} - c(e_H)$$

$$E\{^f X_L^H\} = \underline{r}p^H(V^M - (1 + R)) + (1 - \underline{r})(1 + R)\bar{V} - c(e_L)$$

$$E\{^f P_L^L\} = \underline{r}p^L(V^M - (1 + R)) + (1 - \underline{r})(1 + R)\bar{V} - c(e_L)$$

Whenever the creditor can observe the type of the firm, she will make a demand to leave the firm indifferent between his outside option, which is now $\max\{(1 + R)\bar{V}, E\{^f P_j^i\}\}$. If $\max\{(1 + R)\bar{V}, E\{^f P_j^i\}\} = (1 + R)\bar{V}$ always, then

we have the same results with the Benchmark state.

Case 1

$E\{^f P_H^H\}$ and $E\{^f P_H^L\}$ is highest among effort levels and liquidation. The demands of the creditor, under perfect information are:

$$\begin{aligned} p^H(V^H - X_H^H) - c(e_H) &= E\{^f P_H^H\} \\ X_H^H &= V^H - \bar{r}(V^H - (1 + R)) - \frac{(1 - \bar{r})(1 + R)\bar{V}}{p^H} \end{aligned} \quad (\text{A.1})$$

$$\begin{aligned} p^L(V^H - X_H^L) - c(e_H) &= E\{^f P_H^L\} \\ X_H^L &= V^H - \bar{r}(V^H - (1 + R)) - \frac{(1 - \bar{r})(1 + R)\bar{V}}{p^L} \end{aligned} \quad (\text{A.2})$$

$$\begin{aligned} p^H(V^M - X_L^H) - c(e_L) &= E\{^f P_H^H\} \\ X_L^H &= V^M - \bar{r}(V^H - (1 + R)) - \frac{(1 - \bar{r})(1 + R)\bar{V}}{p^H} + \frac{c(e_H) - c(e_L)}{p^H} \end{aligned} \quad (\text{A.3})$$

$$\begin{aligned} p^L(V^M - X_L^L) - c(e_L) &= E\{^f P_H^L\} \\ X_L^L &= V^M - \bar{r}(V^H - (1 + R)) - \frac{(1 - \bar{r})(1 + R)\bar{V}}{p^L} + \frac{c(e_H) - c(e_L)}{p^L} \end{aligned} \quad (\text{A.4})$$

We have two subcases.

$$1.1 \quad (1 + R)(1 - \bar{r})\bar{V} \geq c(e_H) - c(e_L)$$

We have $X_H^H > X_H^L$ and $X_L^H \geq X_L^L$ thus tough demands correspond to high types' and soft demands correspond to low types' continuation value. Under asymmetric information, creditor plays tough when $\theta p^H X_H^H > (p^H + p^L) X_H^L$ and $\theta p^H X_L^H > (p^H + p^L) X_L^L$ in high and low effort respectively. When creditor can

play TS, he either plays TT or TS because both TS and SS would result in both types reorganizing with low effort. Thus when he can play TS, we have one separating and one pooling equilibria.

When creditor can play ST, he will either play TT, ST or SS depending on her prior. When he plays TT, we have separating equilibrium where in high type reorganizes with high effort while low type chooses the adjournment. If he plays ST or SS, we have pooling equilibria. Both types reorganize with high effort in the first one, while both reorganize with low effort in the latter.

$$1.2 \quad (1 + R)(1 - \bar{r})\bar{V} < c(e_H) - c(e_L)$$

We have same demands but now $X_L^H < X_L^L$, thus tough demand in low effort corresponds to low types' continuation value. Creditor plays tough when $\theta > \frac{X_H^L}{X_H^H}$ and $\theta > \frac{X_L^H}{X_L^L}$ in high and low effort respectively.

Creditor can either play tough/soft or soft/tough depending on the values. Yet, no matter what the values are, all demands will result in high type choosing high effort and low type choosing low effort. When creditor plays tough in both efforts, high type can not afford low effort and low type can not afford high effort. Thus high type reorganizes with high and low type reorganizes with low effort. If creditor plays soft in both efforts, similarly high type reorganize with high and low type reorganize with low effort level. Thus, creditor will always play TT no matter what her prior is.

Comments: This case occurs when outside option is low enough. Since low type puts more weight to outside option in his payoff function, his continuation value increases more with outside option. As a result, tough demand correspond to low types' continuation value in low effort. No matter what characteristic creditor follows, it results in high type choosing high and low type choosing low

effort. Thus we do not have pooling equilibrium here. When creditor plays tough in high effort and soft in low effort, high type reorganizes with high effort and low type reorganizes with low effort. As a result, whenever creditor observes low effort, she is sure that creditor is low type and will demand X_L^L and whenever observes high effort, demands X_L^H . **In equilibrium**, creditor plays tough in both efforts and we would have separating equilibrium.

Case 2

$E\{^f P_H^H\}$ and $E\{^f P_L^L\}$ bring highest expected payoff for high and low type respectively.

$$X_H^H = V^H - \bar{r}(V^H - (1 + R)) - \frac{(1 - \bar{r})(1 + R)\bar{V}}{p^H} \quad (\text{A.5})$$

$$X_H^L = V^H - \underline{r}(V^M - (1 + R)) - \frac{(1 - \underline{r})(1 + R)\bar{V}}{p^L} - \frac{c(e_H) - c(e_L)}{p^L} \quad (\text{A.6})$$

$$X_L^H = V^M - \bar{r}(V^H - (1 + R)) - \frac{(1 - \bar{r})(1 + R)\bar{V}}{p^H} + \frac{c(e_H) - c(e_L)}{p^H} \quad (\text{A.7})$$

$$X_L^L = V^M - \underline{r}(V^M - (1 + R)) - \frac{(1 - \underline{r})(1 + R)\bar{V}}{p^L} \quad (\text{A.8})$$

Comment: This case is observed when the success probability of high type is high enough for high type and low enough for low type. We have $X_H^H > X_H^L$ and $X_L^H > X_L^L$, thus tough demands correspond to high types' continuation value in both effort levels.

Due to value structure, the creditor can not play ST. Thus creditor will either play TT, TS or SS. As it is explained above, creditor will not play SS. When creditor plays TT, we have separating equilibrium and we have pooling when

she plays TS.

Case 3

$E\{^f P_H^H\}$ and liquidation bring highest expected payoff for high and low type respectively.

$$X_H^H = V^H - \bar{r}(V^H - (1 + R)) - \frac{(1 - \bar{r})(1 + R)\bar{V}}{p^H} \quad (\text{A.9})$$

$$X_H^L = V^H - \frac{((1 + R)\bar{V} + c(e_H))}{p^L} \quad (\text{A.10})$$

$$X_L^H = V^M - \bar{r}(V^H - (1 + R)) - \frac{(1 - \bar{r})(1 + R)\bar{V}}{p^H} + \frac{c(e_H) - c(e_L)}{p^H} \quad (\text{A.11})$$

$$X_L^L = V^M - \frac{((1 + R)\bar{V} + c(e_L))}{p^L} \quad (\text{A.12})$$

We have $X_H^H > X_H^L$ and $X_L^H > X_L^L$, thus tough demands correspond to high types' continuation value in both effort levels. Creditor can either play TS or ST, together with TT and SS.

Case 3.a: Play Soft/Tough

Separating Equilibrium: When creditor plays tough in both effort levels, high type reorganizes with high effort and low type liquidates.

Pooling equilibria: When she plays soft in high and tough in low, both types reorganize with high effort. When creditor plays SS, both types reorganize with low effort. Because if high type were to choose exerting high effort, when creditor plays SS, he will be able to distinguish between types. Thus he would not demand soft when he observes high effort. Thus high type will exert low effort, too.

Case 3.b: Play Tough/Soft

Separating Equilibrium: When creditor plays tough in both effort levels, high type reorganizes with high effort and low type liquidates.

Pooling equilibria: When she plays tough in high and soft in low, both types reorganize with low effort. When creditor plays soft in both effort levels, low type reorganizes with low effort. Here, if high type reorganizes with high effort, then creditor will be able to distinguish between types when she observes high effort. Then she will demand tough when she observes high effort. However, this would yield lower payoff to the firm. Thus high type firm will reorganize with low effort, too. Creditor will not play SS as it would be same as playing TS.

Case 4

$E\{^f P_L^H\}$ and $E\{^f P_L^L\}$ bring highest expected payoff for high and low type respectively. We have $X_H^H \geq X_H^L$ and $X_L^H > X_L^L$ thus tough demand correspond to high type's continuation payoff in both effort levels. Creditor can either play tough/soft or soft/tough.

$$X_H^H = V^H - \underline{r}(V^M - (1 + R)) - \frac{(1 - \underline{r})(1 + R)\bar{V}}{p^H} - \frac{c(e_H) - c(e_L)}{p^H} \quad (\text{A.13})$$

$$X_H^L = V^H - \underline{r}(V^M - (1 + R)) - \frac{(1 - \underline{r})(1 + R)\bar{V}}{p^L} - \frac{c(e_H) - c(e_L)}{p^L} \quad (\text{A.14})$$

$$X_L^H = V^M - \underline{r}(V^M - (1 + R)) - \frac{(1 - \underline{r})(1 + R)\bar{V}}{p^H} \quad (\text{A.15})$$

$$X_L^L = V^M - \underline{r}(V^M - (1 + R)) - \frac{(1 - \underline{r})(1 + R)\bar{V}}{p^L} \quad (\text{A.16})$$

Case 4.a: Play Soft/Tough

Separating Equilibrium: When creditor plays tough in both effort levels, high type reorganizes with high effort and low type chooses adjournment with low effort.

Pooling equilibria: When she plays soft in high and tough in low, both types reorganize with high effort. When creditor plays SS, both types reorganize with low effort.

Case 4.b: Play Tough/Soft

Separating Equilibrium: When creditor plays tough in both effort levels, high type reorganizes with high effort and low type chooses adjournment with low effort.

Pooling equilibria: When she plays tough in high and soft in low, both types reorganize with low effort. When creditor plays soft in both effort levels, low type reorganizes with low effort. Here, if high type reorganizes with high effort, then creditor will be able to distinguish between types when she observes high effort. Then she will demand tough when she observes high effort. However, this would yield lower payoff to the firm. Thus high type firm will reorganize with low effort, too.

Case 5

$E\{^f P_L^H\}$ and liquidation bring highest expected payoff for high and low type respectively.

$$X_H^H = V^H - \underline{r}(V^M - (1 + R)) - \frac{(1 - \underline{r})(1 + R)\bar{V}}{p^H} - \frac{c(e_H) - c(e_L)}{p^H} \quad (\text{A.17})$$

$$X_H^L = V^H - \frac{((1+R)\bar{V} + c(e_H))}{p^L} \quad (\text{A.18})$$

$$X_L^H = V^M - \underline{r}(V^M - (1+R)) - \frac{(1-\underline{r})(1+R)\bar{V}}{p^H} \quad (\text{A.19})$$

$$X_L^L = V^M - \frac{((1+R)\bar{V} + c(e_L))}{p^L} \quad (\text{A.20})$$

We have $X_H^H > X_H^L$ and $X_L^H > X_L^L$, thus tough demands correspond to high types' continuation value in both effort levels. Creditor can either play TS or ST, together with TT and SS.

Case 5.a: Play Soft/Tough

Separating Equilibrium: When creditor plays tough in both effort levels, high type reorganizes with low effort and low type liquidates.

Pooling equilibria: When she plays soft in high and tough in low, both types reorganize with high effort. When creditor plays SS, both types reorganize with low effort. Because if high type were to choose exerting high effort, when creditor plays SS, he will be able to distinguish between types. Thus he would not demand soft when he observes high effort. Thus high type will exert low effort, too.

Case 5.b: Play Tough/Soft

Separating Equilibrium: When creditor plays tough in both effort levels, high type reorganizes with high effort and low type liquidates.

Pooling equilibria: When she plays tough in high and soft in low, both types reorganize with low effort. Creditor will not play SS as it would be same as playing TS.

Case 6

Liquidation brings highest payoff to both types. This is is same as the analysis in the Benchmark state.

