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Keywords: Bankruptcy, benefits of control, capital structure, investment, law and economics

JEL Classifications: G31, G32, G33, K00

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Managers' Personal Bankruptcy Costs and Risk-Taking*

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June 19, 2017

Abstract

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1 Introduction

Pioneered by La Porta, Lopez-de Silanes, Shleifer, and Vishny (1997, 1998), several empirical studies document a positive role of stronger creditor rights in contributing to larger financial markets and economic growth.[1] The underlying theoretical argument is compelling. If creditors expect higher recovery rates in default states, they are willing to provide more credit at a cheaper price ex ante. Consequently, advocates of strong creditor rights often argue that strengthening creditor rights leads to a Pareto improvement by expanding the available contracting space. An implicit assumption in this argument is that strengthening creditor rights does not make previously existing contracts infeasible. However, due to its mandatory nature, bankruptcy law may overwrite private contracts available under a regime of weaker creditor rights. In this case, the optimality of a stronger creditor rights regime depends on whether the set of available contracts dominates the set of contracts available under a weaker creditor rights regime.

The theoretical literature provides several arguments in favor of strong creditor rights. Strengthening creditor rights can mitigate problems associated with incomplete contracting, such as risk-shifting or strategic default[2]. Additionally, making bankruptcy states costlier for managers can elicit managerial effort and prevent the manager from investing in inefficient, self-serving projects (Grossman and Hart 1982; Innes 1990; Zwiebel 1996). However, ex ante incentive effects of stronger creditor rights are not unambiguously benign. If bankruptcy states are sufficiently costly for managers, they may try to prevent default states to the extent that they forego positive NPV projects that involve risk (Donaldson 1969; Amihud and Lev 1981; Eberhart and Senbet 1993). Moreover, risk-shifting in distressed firms can be exacerbated when bankruptcy states are costlier for managers (White 1989; Gertner and Scharfstein 1991).

Given the rich theoretical literature, empirical evidence on the ex-ante incentive effects of different aspects of bankruptcy law is surprisingly scant. Most existing studies examine how aggregate measures of creditor protection affect the size of credit markets, with mixed results. While La Porta et al. (1997, 1998), Levine (1998, 1999), Djankov, McLiesh, and Shleifer (2007), Qian and Strahan (2007), Djankov et al. (2008), and Haselmann, Pistor,

[1] Levine (1998, 1999), Djankov, McLiesh, and Shleifer (2007), Qian and Strahan (2007), Djankov, Hart, McLiesh, and Shleifer (2008), and Haselmann, Pistor, and Vig (2010).

[2] Jensen and Meckling (1976), Townsend (1979), Diamond (1984), Gale and Hellwig (1985), Bolton and Scharfstein (1990), Hart and Moore (1998), Bebchuk (2001).

and Vig (2010) find that stronger creditor rights lead to larger credit markets, Acharya and Subramanian (2009) and Acharya, Amihud, and Litov (2011) present evidence that stronger creditor rights are associated with lower firm-level leverage. For a reform in India that facilitates creditors' access to collateral, Vig (2013) documents a decline in the demand for secured credit. The mixed empirical evidence suggests that aggregate measures of creditor rights are too crude a measure to capture the subtle effects of different aspects of creditor rights. Additionally, understanding the channels through which creditor rights affect real firm decisions is important for policy implications.

In this paper, I assess how managers' personal bankruptcy costs affect firms' financing and investment decisions. Consistent with the ambiguous theoretical predictions, views on the merits and demerits of bankruptcy regimes that impose high personal bankruptcy costs on managers vary widely. While Skeel (1993) emphasizes the disciplining effects of high personal bankruptcy costs by denying the "soft landing" of a debtor-controlled reorganization to prevent managers from "gambling excessively with the firm's assets", Rasmussen (1994) expresses concerns about excessive conservatism induced by high personal bankruptcy costs leading to "a significant underinvestment problem even where the firm is solvent". Understanding which of these views dominate in the data has important implications for the optimal design of bankruptcy law.

The Unified Bankruptcy Act of 2005 (UBA) in Korea provides exogenous variation in managers' personal bankruptcy costs, allowing me to examine their effect on firms' financing and investment decisions. Under the pre-reform "auction" system, incumbent management was forced to resign upon bankruptcy filing, and a court-appointed trustee would auction the firm to new investors.[3] In contrast, under the post-reform "management stay" system, incumbent management stays in control of the firm during the reorganization process, similar to Chapter 11 in the U.S.[4] The main insight that emerges from the analysis is that firms curb risk-taking under the auction system when bankruptcy states are costly for managers.[5]

[3]Gilson 1989 shows that following job loss in bankruptcy, it is unlikely that managers will find new employment in senior management. The same is true in the Korean data. The psychology literature identifies job loss as one of the most detrimental events for happiness (Di Tella, MacCulloch, and Oswald 2001; Helliwell 2003; Layard 2005).

[4]Section 2 provides a detailed description of changes to the bankruptcy law under the UBA. The introduction of management stay in corporate reorganization was considered the most significant change to bankruptcy proceedings (Ko 2007; Park 2008). Under the pre-reform regime, management was replaced in 95.34% of the cases, compared with only 11.86% after the reform.

[5]The reform affects personal bankruptcy costs of managers and controlling shareholders. For most of the (private) firms in the sample ownership and control are not separated. The results in the paper combine the effects of changes in managers' and controlling shareholders' personal bankruptcy costs.

Specifically, firms take on lower leverage, forego profitable investment projects that involve risk, and reduce both innovation input (R&D investment) and output (patents).

The main identification strategy for evaluating the reform's effects is to compare changes in financing and investment decisions for risky firms that are sensitive to changes in bankruptcy proceedings to changes in safe firms that are less sensitive to changes in bankruptcy proceedings. After the reform, firms in the highest risk quintile increase their debt to assets ratio by about seven percentage points more than firms in the lowest risk quintile. Additionally, their investment to assets ratio increases by three and a half percentage points more than for safe firms, and innovation input (R&D expenses) and output (patents) increase relative to safe firms. Moreover, I find that interest rates relatively increase for risky firms after the reform, particularly for risky firms in which creditor claims are not well-protected (firms with a low share of tangible assets). This suggests that the increase in leverage under the management stay system is driven by an increase in the demand for credit, rather than an increase in the supply of credit. Together, these findings are consistent with an increase in risk-taking under the management stay system.

To rule out the possibility that the results are affected by other time-series changes that could systematically affect risky firms more than safe firms, and to sharpen the identification of the underlying channel, I exploit cross-sectional differences in the reform's effects. Loss of control under the pre-reform auction system is particularly costly in firms where private benefits of control are large.[6] Thus, if the increase in leverage and investment under the management stay system is driven by a reduction in the likelihood of job loss for the manager and ownership transfer away from controlling shareholders, the effects should be stronger for firms in which the private benefits of control are large, such as family firms and other firms with concentrated ownership. Indeed, I find that the increase in leverage and investment after the reform is significantly higher for family firms and firms with more concentrated ownership. This suggests that private benefits of control play an important role in determining firms' willingness to take risks under a regime that imposes high bankruptcy costs on managers.

Additionally, since their wealth is more concentrated in the firm, managers tend to be more risk-averse than shareholders (Jin 2002). Thus, they have a preference for financing and investment strategies that reduce the risk of default (Leland and Pyle 1977; Amihud and Lev 1981; May 1995; Tufano 1996; Graham, Harvey, and Puri 2013). Wealth concentration tends

[6]Nenova (2003) and Dyck and Zingales (2004) document that private benefits of control are high in Korea (16–48% of firms' market capitalization).

to be more extreme for managers who hold a larger fraction of the firm's stocks (Jensen and Meckling 1976; Friend and Lang 1988). In the case of forced resignation in bankruptcy, these managers simultaneously experience a large shock to their labor income and their financial wealth.[7] Accordingly, I find that risky firms with higher CEO shareholdings increase leverage and investment more after the reform. This further strengthens the evidence that allowing managers to stay in control of the firm increases their willingness to take more risk.

Firms' willingness to take risks in the pursuit of profitable investment opportunities is a fundamental driver of long-run economic growth (DeLong and Summers 1991; Acemoglu and Zilibotti 1997; Baumol, Litan, and Schramm 2007; John, Litov, and Yeung 2008). Lowering managers' personal bankruptcy costs to increase their willingness to take risk could reduce underinvestment in positive NPV projects and thereby contribute to economic growth (Rasmussen 1994). However, low personal bankruptcy costs may induce managers to engage in inefficient overinvestment and increase risk-shifting incentives (Jensen 1986; Harris and Raviv 1990; Skeel 1993; Zwiebel 1996).[8]

Evaluating the efficiency of investment is challenging. To provide some suggestive evidence to differentiate between the alternative mechanisms, I examine whether the additional investment under the management stay system is undertaken by firms with or without good investment opportunities. I find that risky firms with good investment opportunities increase investment significantly more after the reform, providing suggestive evidence that the additional investment goes to profitable investment projects. This interpretation is further strengthened by a relatively higher increase in profits for risky firms after the reform. Strikingly, the increase in profits is driven by precisely those firms that increase investment most after the reform. Additionally, I find that risky firms' cash flow volatility increases after the reform, further suggesting that the increase in investment is driven by firms' willingness to invest in riskier projects when managers' personal bankruptcy costs are lower. Together, these results suggest that the threat of job loss under the auction system leads firms to forego profitable investment projects to reduce the risk of entering bankruptcy states, consistent with Donaldson (1969), Amihud and Lev (1981), and Rasmussen (1994).

[7]Theoretically, it is not unambiguously clear that managers who own a larger fraction of their firm's shares would reduce risk at the expense of expected profits as higher ownership increases the costs managers bear from inefficient investment that may reduce firm value. Empirically, Friend and Lang (1988) and Gormley and Matsa (2015) find that the risk-aversion effect dominates and that firms with higher inside ownership reduce risk.

[8]Nini, Smith, and Sufi (2009) find that firm value increases after firms sign a new debt contract with a restriction on investment, suggesting that creditor control may reduce value-destroying overinvestment.

Given the potentially foregone investment in positive NPV projects under the auction system, one natural question is why firms and investors cannot contract around the inefficiencies. One alternative is financing with new equity. However, while issuing equity itself does not increase default risk, investment in risky projects still increases the risk of entering financial distress. Moreover, even if additional investment has positive NPV under debt financing, equity financing might be prohibitively costly in the presence of information asymmetries (Myers and Majluf 1984). Alternatively, firms and creditors could restructure the firm's debt outside the court-supervised reorganization procedure to avoid mandatory management resignation and ownership transfer. However, private debt restructuring under incumbent management during the pre-reform regime is impeded by existing creditors' inability to credibly commit to not invoking in-court proceedings that provide them with a high degree of control, as bankruptcy law overwrites private contracts.[9]

Another possibility open to firms to mitigate managers' lower willingness to take risk under the auction system is to alter the design of the their compensation contracts. However, there are limits in legally feasible contracts. The Korean system does not allow for contracts that assign a higher priority of payments to managers above other employees and creditors. One possibility for providing managers with high priority payments in default states is to make them secured creditors. The downside of this contractual arrangement in bankruptcy is that it reduces the amount of secured debt that the firm can issue in the market. Additionally, transfers to the manager are constrained by the funds available to the firm in default states, which might be significantly lower than what is needed to compensate the manager for the loss of future labor income and private benefits.

The results in this paper contribute to the literature on the optimal design of bankruptcy law. Empirical evidence on the effects of ownership transfer in bankruptcy is scarce.[10] Strömberg (2000), Thorburn (2000), and Eckbo and Thorburn (2003) provide descriptive evidence from Sweden which uses an auction system, including forced CEO resignation, for bankrupt firms. They argue that the auction system does not lead to excessive liquidation, honors the priority of claims, and is quicker and less costly than U.S. Chapter 11 cases.

[9]Consistent with the low incentive for creditors to compromise in out-of-court workouts before the reform, out-of-court restructuring consistently fails before the reform, resulting in liquidation (52.29% of pre-reform workouts, compared with 23.74% of post-reform workouts). Even when workouts succeed, managers lose control in the majority of cases (see Section 2.3 for details).

[10]Baird (1986), Bebchuk (1988), and Aghion, Hart, and Moore (1992) discuss auction mechanisms in bankruptcy theoretically.

Additionally, they argue that distressed firms do not engage in excessive risk-shifting.[11] However, comparing evidence from different bankruptcy regimes across countries is tricky, as they are embedded in different institutional environments. The switch from an auction to a management stay system through the UBA provides a unique opportunity to compare the effects of an auction system and a management stay system in an otherwise fairly persistent institutional environment. The results in the paper highlight that ownership transfer and forced management resignation in an auction system can lead firms to abandon investment in positive NPV projects involving risk.

Moreover, the results in this paper provide evidence of an important channel that can explain the negative relationship between the level of creditor rights and firm leverage documented in previous studies (Acharya and Subramanian 2009; Acharya, Amihud, and Litov 2011; Vig 2013). While these papers document a negative effect of stronger creditor rights on the demand for credit, the empirical evidence presented in these papers is silent about the channel through which stronger creditor rights affect firms' demand for credit. The results in this paper show that private benefits of control play an important role in reducing firms' demand for credit under strong creditor rights.

This paper also relates to the literature on the impact of managerial risk-aversion on firms' financing and investment decisions. The results in this paper show that higher personal bankruptcy costs lead managers to curb risk-taking (Amihud and Lev 1981; Friend and Lang 1988).[12] Whether lowering personal bankruptcy costs improves managers' risk-taking incentives depends on whether managers otherwise take on too much or too little risk. In situations where managers are prone to excessive risk-taking and overinvestment, mandatory management replacement in bankruptcy might mitigate risk-taking and overinvestment problems.[13] In contrast, in situations where managers take on too little risk and underinvest, a bankruptcy law that imposes high personal bankruptcy costs on managers aggravates the problems.

An important question is how generalizable the results are to other institutional environments. It seems plausible that the results apply to countries with high levels of family

[11] Eckbo and Thorburn (2003) argue that CEOs abstain from risk-shifting to increase the probability of being rehired by the firm.

[12] Koudijs and Salisbury (2017) show that household investment increases when household assets are shielded from creditors following a change in marital porperty laws in the U.S. south in the 19th century.

[13] Koudijs and Salisbury (2016) argue that banks run by managers with less skin-in-the-game take on higher leverage without increasing the overall level of investment.

ownership where private benefits of control are large. Family ownership is the most common form of ownership structure in mid-income and developing countries (La Porta, Lopez-de Silanes, and Shleifer 1999; Claessens, Djankov, and Lang 2000; Faccio and Lang 2002). Additionally, contrary to common perception, family ownership is also prevalent in most developed countries, even in the U.S. (Anderson and Reeb 2003; Villalonga and Amit 2006; Holderness 2009). Thus, private benefits of control are an important consideration for shareholders and managers in a large fraction of firms around the world. This suggests that the documented results are relevant beyond the specific context in this paper.

The remainder of the paper is organized as follows. Section 2 describes the institutional setting, Section 3 provides a theoretical framework for the empirical analysis, Section 4 describes the data, Section 5 outlines the empirical strategy, Section 6 presents the results, Section 7 discusses alternative explanations and provides results from robustness tests, and Section 8 concludes.

2 Institutional Background

This section provides a brief summary of the legislative history of the Unified Bankruptcy Act (UBA) and describes the changes in corporate bankruptcy proceedings. Additionally, it documents evidence regarding the real effects of the law on bankruptcy filings and on outcomes in in-court reorganizations and out-of-court workouts.

2.1 Legislative History

On March 31, 2005, President Rho Moo-Hyun proclaimed the UBA. As of April 1, 2006, the UBA replaced four separate laws governing corporate liquidation, different corporate reorganization proceedings, and personal bankruptcy. The reform process leading to the UBA was triggered by the Asian Financial Crisis in 1997. In exchange for financial aid, the IMF and the World Bank demanded (among other changes) a modernization of bankruptcy laws in accordance with international best practice, essentially with U.S. bankruptcy law.[14] While other reforms were implemented during or soon after the crisis, the bankruptcy reform process spanned eight years. After the IMF's intervention, existing bankruptcy laws underwent

[14]Other countries affected by the Asian financial crisis also underwent bankruptcy reform in the aftermath of the crisis (Indonesia in 1998, Thailand in 1998/1999) on the initiative of the IMF.

amendments to increase transparency and efficiency in 1998 and the Korean Government and the IMF agreed that a new comprehensive bankruptcy law was necessary.

In 1999, with World Bank funding, the Ministry of Justice gathered a group of consultants, led by a Korean law firm (Shin and Kim) and an American law firm (Orrick, Herrington & Sutcliffe). In December 2000, the group submitted a first draft outlining several different policy options to the Ministry of Justice. A Ministry of Justice drafting team circulated different drafts to judges, the Korean bar association, and the bankers' association in the course of the 2001 to 2003 period, for comments and feedback. In 2003, the team submitted the final draft to the IMF for review. Due to critical comments from the Judiciary Committee, the draft was substantially revised and introduced to the National Assembly in late 2004. Finally, the National Assembly enacted the UBA in March 2005. As initially demanded by the IMF and the World Bank, the resulting law ultimately bore a close resemblance to US bankruptcy law introduced in the Bankruptcy Reform Act of 1978.

2.2 Changes in Bankruptcy Law

Before the UBA, two separate bankruptcy proceedings regulated corporate restructuring. Under the Composition Act, intended for usage by small firms with simple debt structures, a restriction that was strictly applied from 1998 (Park 2005), incumbent management stayed in control of the firm and developed a plan for restructuring.[15] Under the Corporate Reorganization Act, bankruptcy filing triggered the replacement of incumbent management by a court-appointed trustee.[16] It was standard court practice for the trustee to engage in a sales process closely resembling the auction system in Sweden (Ko 2007).

The UBA merged the two separate reorganization laws governed by the Corporate Reorganization Act (CRA) and the Composition Act into a single rehabilitation proceeding. The new rehabilitation procedure conserved most of the features of the CRA. Thus, the merger effectively meant the abolition of the composition procedure (Ko 2007, Halliday and Carruthers 2009). However, while the new rehabilitation procedure conserved most of the

[15] If the court considered that a firm was too large or that its debt structure was too complex, it changed the filing into a reorganization or liquidation filing (Park 2005). Park (2008) notes that many companies that applied for composition were transferred to liquidation proceedings. Consequently, composition filings occurred only rarely after 1998. Since composition filings only apply to small firms, they are to a large extent irrelevant for the firms in the sample.

[16] Park (2008): "The incumbent management might be appointed as a trustee [...], but in practice, there were virtually no cases in which the incumbent management managed to keep their positions."

features of the CRA, the main changes concerned the treatment of managers during the reorganization process, and refraining from using an auction process as the standard procedure in bankruptcy proceedings. Whereas under the CRA incumbent management was replaced by a court-appointed trustee, the new rehabilitation procedure introduced a management stay system that allowed debtor-management to remain in control and negotiate a restructuring plan with the firm's creditors.[17]

The introduction of the UBA had significant effects on managers and owners of bankrupt firms. In 88.14% of the rehabilitation cases in the sample, the CEO remained in control of the firm under the post-reform regime, compared to only 4.76% of the cases under the pre-reform regime (see Table 1). Under the pre-reform reorganization system, ownership transfer occurred in 90.91% of the cases in the sample that did not result in liquidation, whereas during rehabilitation filings under the new system ownership was transferred to new investors in only 19.09% of the cases. This change in the treatment of management and owners significantly reduced their personal bankruptcy costs. Eckbo, Thorburn, and Wang (2016) document that CEOs who stay in management following filing for Chapter 11 in the U.S. experience no change in future compensation, whereas CEO who are forced to exit the firm experience a combined loss in equity value and foregone future compensation of $18.2 million, which is equivalent to more than twelve times their pre-departure income. This reduction in the adverse consequences for managers increased the willingness of firms to file for in-court reorganization (Ko 2007; Park 2008; Halliday and Carruthers 2009). Reorganization filings increased from 57 in 2005 to 117 in 2006 and 215 in 2007 (Table 2, Panel A). In contrast, liquidation filings did not increase, suggesting that the increase in reorganization filings was not driven by economic conditions.

2.3 Alternative Restructuring Mechanisms

Before a firm defaults, debtors and creditors have the option to renegotiate the firm's obligations outside of court. This may allow them to undo potential inefficiencies of in-court bankruptcy proceedings through a private agreement. Since both contracting parties have the option to default to in-court reorganization procedures, the expected outcome from in-

[17]Following a rehabilitation filing the court appoints the incumbent management as receiver, except for cases in which: financial distress can be attributed to fraudulent activity on the part of management, the company's creditors provide reasonable grounds for appointing a third-party receiver, or the court considers the appointment of a third-party receiver essential for the rehabilitation procedure. In practice, incumbent management remains in control in virtually all rehabilitation cases (Ko 2007).

court proceedings (minus potential costs) is a benchmark for both contracting parties to reach an agreement out-of-court. Due to their private nature, it is generally difficult to obtain data on the outcomes of out-of-court renegotiations. In Korea, firms with assets over 50 billion Korean won (the threshold was reduced to 5 billion Korean won in June 2004) are required to engage in officially supervised workout negotiations under some conditions. This provides a sample of workouts for which data on workout outcomes is available.

The evidence suggests that creditors were rarely willing to compromise with managers under the pre-reform regime due to the high control they enjoyed in in-court proceedings. Creditors required the departure of incumbent management and controlling shareholders in the majority of cases[18] and private workouts were less likely to succeed before the reform (Table 2, Panel B). In 2004, the fraction of workouts that resulted in bankruptcy or liquidation was 60.00%, in 2005 it was 44.58%. After the reform, creditors' willingness to restructure firms out-of-court increased substantially, and the failure rate dropped to 22.23% in 2006, and 25.35% in 2007. During the financial crisis period, the failure rate in private workouts increased slightly, but remained below pre-reform values.

It is possible that workouts in smaller firms led to different outcomes than for large firms required to file for official workout proceedings. However, anecdotal evidence on workout proceedings for the period from June 2004 when smaller firms were also required to register their workout proceedings suggests that smaller firms were hesitant to engage in workouts, as management and shareholders resented the loss of control in workout proceedings.[19] Overall, the evidence from private workouts suggests that workouts did not remedy the high costs of bankruptcy states for managers and owners before the UBA.

3 Theoretical Framework

This section presents a stylized model of debt financing motivated by the institutional environment in Korea, to provide a theoretical framework to guide the empirical analysis.

[18]For 84% of cases in official workouts in 2001, the CEO was forced to resign (Financial Supervisory Service of Korea 2001).

[19]Money Today, August 8, 2004, 'Bank-SME Workouts in Slump'.

3.1 Investment Opportunity

Consider a cashless firm with assets in place. There are four periods ($t = 0, 1, 2, 3$). Cashflows are not verifiable and there is no discounting. In period $t = 0$, the firm can invest in a positive NPV project that yields either C_1^H with probability θ, or C_1^L with probability $1-\theta$ in period $t = 1$. The project requires an investment of I in period $t = 0$ that needs to be financed by outside investors. In period $t = 2$ the firm's assets in place generate a cashflow of either C_2^H with a probability of γ, or C_2^L with a probability of $1-\gamma$. For simplicity, let $C_1^H = C_2^H = C^H$ and $C_1^L = C_2^L = C^L$. In period $t = 3$, the firm's assets in place generate a cashflow of C_3, which can be viewed as the long-run (expected) value of the firm.[20] Figure 1 depicts the cashflows generated by the firm. The firm is run by an entrepreneur who also owns the firm. If the entrepreneur stays in control of the firm into period $t = 3$, she enjoys a private benefit B. The private benefit is not transferable to new investors. While in the model there is no distinction between ownership and management, in the context of the reform, the private benefit can be interpreted both as a benefit to the manager from running the firm (labor income, non-pecuniary benefits of control) as well as for shareholders (private benefits of control).

3.2 Financing Choices

I assume that the only way to finance the project is by risky short-term debt, that is $C_L < I < C^H$. Since cashflows are not verifiable, a contract that stipulates state-dependent repayments does not fulfill the revelation principle, as the firm would always have an incentive to report the state that requires lower repayments. Thus, the optimal contract requires a state-independent payment of R.[21]

3.3 Bankruptcy Proceedings

If the firm does not repay the debt in period $t = 1$, bankruptcy proceedings are invoked. Under the pre-reform system, creditors have the option to liquidate the firm at liquidation value L. If they choose not to liquidate the firm, the firm is sold to new investors, who will

[20] I assume that C_3 cannot be pledged. This is equivalent to assuming that there is an ϵ probability that $C_3 = 0$, where ϵ is infinitesimally small.

[21] The mandatory nature of bankruptcy law does not allow creditors to randomize bankruptcy filing with different probabilities across states to alter repayment incentives.

pay P, the expected value of all future cashflows.[22] I assume that liquidation is inefficient ($L < C_3$). Under the post-reform regime, the entrepreneur stays in control of the firm for one period after bankruptcy filing. Creditors can only liquidate the firm after cashflows in the next period $t = 2$ are realized and cannot sell the firm to new investors. Under the post-reform regime, the firm can use the cashflows from period $t = 2$ to repay its creditors to exit bankruptcy proceedings to prevent liquidation. The firm and the creditors can renegotiate the payment during the management stay period. The entrepreneur's payoff from keeping control of the firm beyond period $t = 2$ is $C_3 + B$, which is the maximum she is willing to pay to the creditors. The creditors' outside option is the liquidation value L. Thus, the renegotiated repayment S is between $C_3 + B$ and L and depends on the relative bargaining power of the entrepreneur and the creditors.[23] To restrict the problem to the interesting case where preventing default in the second period is optimal for the entrepreneur if the good state occurs and the increase in the expected private benefit is higher than the efficiency loss from liquidation, I assume that $2C^L < S \leq C^L + C^H$ and $\gamma B > (1-\gamma)(C_3 - L)$.

3.4 Solutions

For the pre-reform system, the entrepreneur faces the following maximization problem, where her maximization is over the decision to invest or not ($\mathbb{1}_{inv} \in \{0, 1\}$):

$$\max_{\mathbb{1}_{inv}} \quad \mathbb{1}_{inv} \left[\theta \left[C^H + \gamma C^H + (1-\gamma)C^L + C_3 + B - R\right]\right] \\ +(1 - \mathbb{1}_{inv}) \left[\gamma C^H + (1-\gamma)C^L + C_3 + B\right]$$

If the firm invests and the high state occurs, the firm can repay its creditors and continue operations under the entrepreneur's control. Thus, the entrepreneur retains all cashflows minus the payment to the investor and enjoys her private benefit. In the low state the payoff to the entrepreneur is zero, as the firm cannot repay its debt and will be sold to new investors (and we assumed that $P \leq R$). If the firm does not invest, the entrepreneur enjoys her private benefit from operating the firm and obtains the cashflows generated by the assets in place.

[22] For simplicity, I assume that creditors receive the full sales price P. This can be justified by assuming either that the expected value of future cashflows does not exceed R.

[23] Note that R cannot be greater than S. If R were higher than S, the firm would prefer to default and renegotiate the payment to S. Thus, a condition for the creditor to break even and financing to occur is that creditors have sufficient bargaining power such that $S \geq R$. Otherwise, the contract is not renegotiation-proof.

For financing to be viable, the creditors' participation constraint must be satisfied. That is, creditors need to break even to be willing to provide credit. I assume that capital markets are competitive such that the participation constraint is satisfied with equality:

$$\theta\left[R\right]+(1-\theta)\left[C^{L}+\gamma C^{H}+(1-\gamma)C^{L}+C_{3}\right]=I \qquad (IR^{B}_{pre})$$

which leads to a required repayment of $R_{pre}=\frac{I-(1-\theta)(\gamma C^{H}+(2-\gamma)C^{L}+C_{3})}{\theta}$ for creditors to break even.

To ensure that the firm repays its creditors in the high state, the payoff after repayment must be at least as high as the payoff in the event of not repaying the creditors:

$$C^{H}+\gamma C^{H}+(1-\gamma)C^{L}+C_{3}+B-R\geq C^{H}-C^{L} \qquad (IC^{F}_{pre})$$

which implies a minimum value for the private benefit of $\underline{B}_{pre}=R-2C^{L}-\gamma(C^{H}-C^{L})-C_{3}=\frac{I-2C^{L}-\gamma(C^{H}-C^{L})-C_{3}}{\theta}$ to ensure repayment.

In order for the entrepreneur to invest in the first period, the expected payoff after investment needs to be at least as high as the expected payoff in the case of no investment. Thus, the firm's participation constraint is:

$$\theta\left[C^{H}+\gamma C^{H}+(1-\gamma)C^{L}+C_{3}+B-R\right]\geq\gamma C^{H}+(1-\gamma)C^{L}+C_{3}+B \qquad (IR^{F}_{pre})$$

which, after plugging in R from the solution of IC^{F}_{pre}, implies a maximum value for the private benefit of $\overline{B}_{pre}=\frac{\theta C^{H}+(1-\theta)C^{L}-I}{1-\theta}$. If the private benefit increases above this threshold, the entrepreneur would not be willing to invest in the project, as the expected cost from losing her private benefit would be too high.

For the post-reform system, the entrepreneur maximizes:

$$\begin{aligned}\max_{\mathbb{1}_{inv}}\mathbb{1}_{inv}[\theta&\left[C^{H}+\gamma C^{H}+(1-\gamma)C^{L}+C_{3}+B-R\right]\\&+(1-\theta)\gamma\left[C^{H}+C_{3}+B-(R-C^{L})\right]]\\&+(1-\mathbb{1}_{inv})\left[\gamma C^{H}+(1-\gamma)C^{L}+C_{3}+B\right]\end{aligned}$$

Compared with the pre-reform period, the firm now has the option of avoiding bankruptcy in the low state, if during the reorganization period $t=2$ the high cashflow C^{H} is realized.

The creditors' participation constraint becomes:

$$\theta[R] + (1-\theta)\left[\gamma R + (1-\gamma)(2C^L + L)\right] = I \qquad (IR^B_{post})$$

which leads to a required repayment of $R_{post} = \frac{I-(1-\theta)(1-\gamma)(2C^L+L)}{\theta+(1-\theta)\gamma}$ for creditors to break even.

Proposition 1. *The cost of credit is higher under the post-reform regime: $R_{post} > R_{pre}$.*

Proof. In equilibrium, payment to creditors (R) is constrained by the high state cashflows (C_H), thus $R_{post} = \frac{I-(1-\theta)\left[C^L+\gamma R+(1-\gamma)(C^L+L)-\gamma C^L\right]}{\theta} \geq \frac{I-(1-\theta)\left[C^L+\gamma C^H+(1-\gamma)(C^L+L)\right]}{\theta}$.
From the assumption that liquidation is inefficient, i.e., $L < C_3$, it follows that $\frac{I-(1-\theta)\left[C^L+\gamma C^H+(1-\gamma)(C^L+L)\right]}{\theta} > \frac{I-(1-\theta)\left[C^L+\gamma C^H+(1-\gamma)(C^L+C_3)\right]}{\theta} = R_{pre}$. □

Under the post-reform regime, the entrepreneur's incentive constraint to repay creditors becomes:

$$2C^H + C_3 + B - R \geq 2C^H - 2C^L \qquad (IC^F_{post})$$

which implies a minimum value for the private benefit of $\underline{B}_{post} = R_{post} - 2C^L - C_3$ to ensure repayment. Note that if (IC_F) is satisfied, the incentive constraint for the firm is also satisfied for the case when the sum of cashflows in periods $t = 1$ and $t = 2$ is $C^H + C^L$.

Proposition 2. *The minimum level of private benefits required to incentivize the entrepreneur to repay creditors and make investment feasible is higher under the post-reform regime: $\underline{B}_{post} > \underline{B}_{pre}$.*

Proof. Since equilibrium payments to creditors are lower under the pre-reform regime ($R_{post} > R_{pre}$) and cash flows in the high state are higher than cash flows in the low state, $C_H > C_L$, $\underline{B}_{post} = R_{post} - 2C^L - C_3 > R_{pre} - 2C^L - C_3 > R_{pre} - 2C^L - C_3 - \gamma(C^H - C^L) = \underline{B}_{pre}$. □

The participation constraint for the entrepreneur under the post-reform system becomes:

$$\theta\left[C^H + \gamma C^H + (1-\gamma)C^L + C_3 + B - R\right] + (1-\theta)\gamma\left[C^L + C^H + C_3 + B - R\right] \geq \gamma C^H + (1-\gamma)C^L + C_3 + B \qquad (IR^F_{post})$$

which, after plugging in R from IR^B_{post}, implies a maximum value for the private benefit of $\overline{B}_{post} = \frac{\theta C^H+(1-\theta)C^L-I}{1-\theta} \cdot \frac{1}{1-\gamma} + (L - C_3)$.

Proposition 3. *The maximum level of private benefit under which the entrepreneur is willing to finance the project with risky debt is higher under the post-reform regime:* $\overline{B}_{post} > \overline{B}_{pre}$.

Proof. From the assumption that the increase in the expected private benefit from the higher probability of the entrepreneur staying in control in the high state is larger than the efficiency loss from liquidation in the low state ($\gamma B > (1-\gamma)(C_3 - L)$), it follows that $\overline{B}_{post} = \frac{\theta C^H + (1-\theta)C^L - I}{1-\theta} \cdot \frac{1}{1-\gamma} + (L - C_3) = \overline{B}_{pre} \cdot \frac{1}{1-\gamma} - (C_3 - L) > \overline{B}_{pre}$. □

Proposition 4. *The higher the liquidation value* L*, the smaller the difference between* $\underline{B}_{post}$ *and* $\underline{B}_{pre}$*, the larger the difference between* $\overline{B}_{post}$ *and* $\overline{B}_{pre}$*, and the lower the difference between* R_{post} *and* R_{pre}.

Proof. The pre-reform values R_{pre}, $\underline{B}_{pre}$, and $\overline{B}_{pre}$ are independent of L. For the post-reform period, $\frac{\partial R_{post}}{\partial L} = -\frac{(1-\theta)(1-\gamma)}{(1-\theta)\gamma+\theta} < 0$, $\frac{\partial \underline{B}_{post}}{\partial L} = -\frac{(1-\theta)(1-\gamma)}{(1-\theta)\gamma+\theta} < 0$, and $\frac{\partial \overline{B}_{post}}{\partial L} = 1 > 0$. □

3.5 Discussion

The shift from the pre-reform auction system to the post-reform management stay system has two main implications for the entrepreneur's incentives. First, higher expected payoffs in default states, stemming from the reduced likelihood of losing control over the firm and therefore losing her private benefit B, weakens the entrepreneur's incentive to repay creditors. This leads to a higher minimum level of the private benefit required to incentivize the entrepreneur to repay creditors and make investment feasible. Second, the possibility for the entrepreneur to stay in control of the firm through financial distress under the management stay system makes the entrepreneur more willing to undertake risky investment, as the risk of losing her private benefit is reduced.[24] This makes it easier to fulfill the entrepreneur's participation constraint, even when private benefits are large.

Together, these factors imply a shift of the investment region (see Figure 2). For low levels of private benefits, investment is only feasible under the pre-reform auction system. For intermediate levels of private benefits, investment may be feasible under both the pre-reform auction and the post-reform management stay system.[25] For high levels of private benefits,

[24] Retaining the private benefit of control with a higher likelihood can also be reinterpreted as managers and shareholders being more likely to participate in the low state after the reform.

[25] The investment regions need not overlap. Depending on the parameter values, there may be intermediate levels of private benefits for which investment is infeasible under both regimes.

investment only occurs under the post-reform management stay system. This implies that firms in which private benefits are large are more likely to invest under the management stay system. In contrast, for firms in which private benefits are low, the weaker incentives to repay creditors under the post-reform management stay system lead to less financing being available to undertake investment projects. Thus, whether the level of investment in the economy is higher before or after the reform depends on the distribution of private benefits.

The shift from the pre-reform auction system to the post-reform management stay system has a clear prediction for the cost of credit. Before the reform, when creditors experience higher recovery in default, they demand lower compensation in other states. Thus, pre-reform repayments R_{pre} are lower than post-reform repayments R_{post}. The effect is mitigated when liquidation values L are higher, as this increases payments to creditors in default states under the post-reform regime and therefore lowers repayments in other states.

4 Data

This section describes the data used for the empirical analysis in this paper. I obtain data on corporate bankruptcy filings from the Korea Information Service (KIS). The data on bankruptcy filings is merged with accounting data from financial statements of Korean firms submitted to the Financial Supervisory Commission and processed by KIS.[26]

Descriptive statistics are gathered in Table 3. The table depicts descriptive statistics separately for the full sample and for the riskiest and safest quintiles of firms based on their measure of interest coverage.[27] Following standard practice, I drop utility and financial firms. The average firm has total assets of 78,977 million won.[28] Firms in the highest default risk quintile are smaller on average with 65,275 million won, compared to firms in the safest quintile with 173,466 million won. This is driven by some large firms in the group of safe firms. The median firm size is similar with 14,473 million won for risky, and 13,457 for safe firms. The average debt to asset ratio in the sample is 34.48%, with 48.24% for the riskiest firms and 12.54% for the safest firms. Interest rates are higher for risky firms with 9.69%

[26]Firms with assets of more than seven billion Korean won are required to submit financial statements to the FSC.

[27]For the small number of firms with zero debt interest coverage is not defined. Since these firms could be very safe but also be so risky that they are unable to access credit markets, it is not clear how to classify these firms. While I decide to drop these firms from the sample, all results in the paper hold when adding these firms to the safest quintile of firms.

[28]As a rough rule of thumb 1,000 won correspond to about 1 dollar.

compared to 4.16% for safe firms. The average cash to asset ratio is 7.28%, with 5.88% for the riskiest and 13.22% for the safest firms. Finally, firms' investment divided by assets is 6.51% for the average firm. Risky firms' investment to assets ratio is 4.35%, compared with 7.97% for the safest firms.

Data on patents is available from the Korea Intellectual Property Rights Information Service at www.kipris.org.kr. This data includes all patent applications and indicates whether a patent was granted. There are 25,812 firm-year observations in which a firm successfully applies for at least one patent. The average number of patent applications for the full sample is 11.04. For the safest quintile of firms, the average number of patent applications is 26.14, while for the riskiest firms the average number is 9.77. The high level of innovation even in risky firms highlights the importance of the design of bankruptcy law for innovation.

KIS collects ownership data from firms' annual reports. Panel C provides descriptive statistics on family ownership, ownership concentration, and CEO ownership. Family ownership is defined as the total ownership by the controlling shareholder, members of their family, ownership by co-founders, and ownership by shareholders with a share of at least 50%. Ownership concentration is defined as the Herfindahl index of the individual shareholders' ownership shares. CEO ownership is the fraction of the firm's shares owned by the CEO and their family. For the average firm, family ownership is 48.48%. Consistent with the literature on family firms, family ownership is negatively correlated with firm risk (Anderson, Mansi, and Reeb 2003; John, Litov, and Yeung 2008; Paligrova 2010). In the safest quintile of firms, family ownership averages to 51.15%. In the riskiest quintile, average family ownership is 41.75%. The Herfindahl index of ownership concentration for the average firm in the sample is 42.43%. Ownership concentration is higher for the safest quintile of firms with 43.32% than for the riskiest firms with 39.78%. Average CEO ownership in the sample is 32.81%, with a higher CEO ownership fraction in safe firms with 31.34% and a lower CEO ownership share in risky firms with 23.29%. This is consistent with higher CEO wealth concentration being associated with lower firm risk.

5 Empirical Strategy

This section describes the empirical strategy employed to analyze the effects of managers' personal bankruptcy costs on firms' financing and investment decisions.

The main identification strategy examines changes in financing and investment decisions for firms that are the most sensitive to bankruptcy law design (risky firms), and firms that are least sensitive to changes in bankruptcy law (safe firms). This empirical strategy implies the following regression equation:

$$\begin{aligned} DebtA_{it} &= \alpha + \alpha_{ind,t} + \gamma \cdot controls_{it-1} + \beta_1 \cdot DR_{it-1} + \beta_2 \cdot event_t \\ &\quad + \beta_3 \cdot DR_{it-1} * event_t + \epsilon_{it} \end{aligned} \tag{1}$$

where $DebtA_{it}$ is firm i's debt to asset ratio in year t, $controls_{it-1}$ denotes a set of lagged control variables that are commonly found to affect leverage, DR_{it-1} is a rank variable ranging from one for the safest quintile to five for the riskiest quintile of firms based on firms' interest coverage measure, which is a simple measure of default risk that can be computed for both public and private firms.[29] The dummy variable $event_t$ takes the value of zero before (2001–2005), and one after the reform (2006–2010).

To assess the reform's effect on firms' investment decisions and the cost of credit, I follow the same estimation strategy, replacing the dependent variable with investment scaled by assets ($InvA_{it}$) and interest payments scaled by total debt (IR_{it}), respectively. The parameter of interest is β_3, which compares real firm performance for risky firms relative to safe firms before and after the reform. Industry-year fixed-effects $\alpha_{ind,t}$ control for industry-specific shocks. Thus, equation (1) compares changes in leverage for risky and safe firms in the *same industry, in the same year*. As outlined in Section 3, the predictions for β_3 depend on the relative importance of private benefits. If private benefits are relatively important, firms are reluctant to take on additional debt to finance investment before the reform, leading to an increase in leverage and investment after the reform. If private benefits are less important, firms' incentives to repay creditors in some cases are insufficiently strong to make financing feasible under the post-reform management stay system, leading to lower leverage and investment after the reform. The cost of credit should be unambiguously higher under the post-reform regime when creditors' control in bankruptcy states is reduced.

A common concern when comparing firms in different bankruptcy regimes is that exposure to the regime endogenously affects what types of firms become risky. In the specific context of this paper, firms classified as safe and risky firms before the reform may sys-

[29]The results in the paper are highly robust to alternative measures of risk. *All* results in the paper are qualitatively identical when estimating the probability of default based on observable firms characteristics in the spirit of Altman (1968).

tematically differ from firms classified as safe and risky firms after the reform, in terms of unobserved characteristics that are correlated with the outcome measures. One way to address this problem is by measuring DR_i during the pre-event period and saturating the specification with firm fixed effects, to absorb differences in time-invariant unobserved firm characteristics. However, this methodology implicitly assumes that either the sorting variable is very persistent, or the sorting variable is not correlated with the dependent variable. If both assumptions are violated, this type of sorting introduces an estimation bias in β_3.

To illustrate this problem, consider leverage as the dependent variable. Default risk is strongly correlated with leverage, and the average *surviving* firm sorted into the high default risk quintile before the reform experiences a decrease in default risk after the reform, due to a survivorship and mean-reversion bias.[30] Together, this implies that β_3 is biased downwards. In the same way, the estimation of β_3 is biased for investment and the cost of credit when sorting firms into default risk quintiles before the reform, with the sign of the bias depending on the correlation between default risk and the respective dependent variable.

To overcome this problem, I implement an alternative estimation strategy to control for unobservable firm characteristics that may affect the estimation of β_3 in equation (1), similar to the approach in Becker and Stromberg (2012). I sort firms into quintiles according to their default risk measure in 2001 and 2005 separately. I then estimate equation (1) separately for the 2001–2004 period and the 2005–2008 period, where $event_t$ takes the value of zero in years 2001 and 2005, and one for the years 2002–2004 and 2006–2008, respectively.[31] This provides two estimates for $\hat{\beta}_3$, one for the 2001–2004 period ($\hat{\beta}_3^{placebo}$), and one for the 2005–2008 period ($\hat{\beta}_3^{reform}$). Provided that the survivorship bias is equal both after 2005 and after 2001, the difference $\hat{\beta}_3^{reform} - \hat{\beta}_3^{placebo}$ cancels out the estimation bias, delivering an unbiased estimate $\hat{\beta}_3^{unbiased}$.[32]

[30] Firms sorted into the high default risk group before the reform either improve their financial situation by generating high profits or by restructuring their debt, or they default and exit the sample. Thus, the average *surviving* firm is less risky after the reform and has lower leverage.

[31] Becker and Stromberg (2012) exploits geographical rather than time-series variation in regulations by examining changes in outcome variables for risky firms across states.

[32] Additionally, I sort firms at the end of the sample period in 2010 and estimate equation (1) for the 2010-2013 period, to obtain an alternative estimate for $\hat{\beta}_3^{placebo}$. This mitigates concerns that survivorship bias might be different before and after the reform.

The estimate for $\hat{\beta}_3^{unbiased}$ can be obtained directly by estimating:

$$\begin{aligned} DebtA_{it} &= \alpha + \alpha_t + \alpha_{i,UBA} + \gamma \cdot controls_{it-1} + \beta_1 \cdot DR_i + \beta_2 \cdot event_t \\ &\quad + \beta_3 \cdot DR_i * event_t + \beta_4 \cdot UBA_t + \beta_5 \cdot DR_i * UBA_t + \beta_6 \cdot event_t * UBA_t \quad (2) \\ &\quad + \beta_7 \cdot DR_i * event_t * UBA_t + \epsilon_{it} \end{aligned}$$

where UBA_t is one for the 2005–2008 period and zero for the 2001–2004 (or 2010–2013) period. Then, $\hat{\beta}_7 = \hat{\beta}_3^{reform} - \hat{\beta}_3^{placebo} = \hat{\beta}_3^{unbiased}$.[33]

Finally, I present results from cross-sectional tests that strengthen the interpretation of the results and further reduce the set of alternative explanations in Section 6, and I discuss remaining alternative explanations in Section 7.

6 Results

This section presents and discusses the main results from estimating equations (1) and (2) and presents results from cross-sectional analysis that strengthen the interpretation of the main results and provide additional insights into the underlying mechanism.

6.1 Reform Effect

The top panel in Figure 3 depicts the time series evolution of firms' debt to assets ratio for the riskiest (black line) and the safest (gray line) firms. While the UBA had no effect on the safest firms' debt to asset ratio, risky firms' debt to asset ratio increases sharply after the reform in 2006, from about 42 percent to 52 percent. The bottom panel of Figure 3 shows that the effect of the UBA increases monotonically with default risk. Figure 4 shows the same plots for firms' interest expenses to debt ratio. Interest rates of risky firms start to increase from 2006 (black line), whereas for safe firms interest rates remain unchanged after the enactment of the UBA. As for the changes in leverage, the change in interest rates after the reform increases monotonically with default risk (Panel B). The combination of an increase in quantity (leverage) and price (interest rates), suggests that making bankruptcy states less costly for managers leads to an increase in the demand for credit. Figure 5

[33] As an additional robustness test, I sort firms according to the riskiness of the industry in which they operate, rather than sorting them according to firm-level measures.

depicts the same plots for firms' investment to assets ratio. Risky firms' investment to asset ratio starts to increase significantly after 2006 (black line), whereas for safe firms investment stays constant after the enactment of the UBA. Again, investment increases monotonically with default risk after the reform (Panel B). The graphical evidence from Figures 3 to 5 suggests that changes in leverage, investment, and interest rates for risky firms coincide with the enactment of the UBA, and that the effects are monotonically increasing with firms' likelihood of entering default states.

Next, I confirm the insights from the graphical analysis statistically by estimating equation (1). Control variables include profitability, asset tangibility, investment opportunities, and firm size for leverage regressions. For interest rate regressions, leverage is added as a control variable. Investment regressions additionally include cash to asset as a control variable. Standard errors are clustered at the industry level.

The results are displayed in Table 4. The estimates in column I are the statistical equivalent of the graphical analysis displayed in Figure 3. After the introduction of the UBA, leverage increases by 2.49 percentage points more per risk quintile. To account for the possibility that there is a systematic change in industry composition or other observable firm characteristics in the groups of risky firms after the reform, column II adds industry fixed effects and firm-level controls. This reduces the magnitude of the reform effect to 0.76 percentage points per default risk quintile. The strictest specification in column III includes industry-year fixed effects to control for industry-specific shocks, which leaves the results almost unaffected with 0.84 percentage points per default risk quintile.[34] In columns IV to VI, I replace the dependent variable with firms' interest expenses scaled by total debt. I find that interest rates increase for risky firms after the UBA relative to safe firms by 34 basis points per risk quintile (column IV). The results are similar when adding firm controls and industry fixed effects with 31 basis points per risk quintile (column V), and after including industry-year fixed effects with 25 basis points per default risk quintile (column VI). The increase in interest rates suggests that the increase in leverage is driven by an increase in the demand for, rather than supply of credit. Columns VII to IX show the results for investment. After the enactment of the UBA, firms' investment to assets ratio increases by 0.87 percentage points more per default risk quintile (column VII). Adding industry fixed effects and firm-level controls slightly reduces the effect to 0.60 percentage points (column

[34] I additionally control for differences in firms' reactions to the UBA due to differences in firm characteristics, by interacting the control variables with the event dummy to allow for a differential effect of the control variables before and after the reform which leaves the results unaffected.

VIII). With industry-year fixed effects, the reform effect is 0.67 percentage points per default risk quintile (column IX). These results suggest that risky firms use a large fraction of the additional credit for investment.

To ensure that the results are not driven by unobservable firm characteristics or macro shocks that differentially affect risky firms, I examine changes in firms' leverage, investment, and the cost of credit *within the same firm* by estimating equation (2). Comparing changes in firms' financing and investment decisions for firms sorted in the year before the reform with changes for firms sorted at the beginning (or the end) of the sample period purges changes in firms' financing, investment, and interest rates after the enactment of the UBA from survivorship and mean-reversion bias. This requires that risk sorting of firms does not differ between 2001 and 2005 such that mean-reversion and survivorship bias are similar for firms sorted in both years. While both 2001 and 2005 fall into the pre-reform regime it could be that risk sorting changes in anticipation of the reform.

To examine whether changes in risk sorting occur that could affect the estimation of the results, Figure 6 plots the time series evolution of different firm characteristics for firms in the riskiest and safest quintiles from 2001 to 2005. The plots show that firms sorted into the riskiest and safest quintiles show no significant changes in their cash to assets ratio, leverage, interest rates, investment to assets ratio, or assets tangibility ratio during the 2001 to 2005 period, respectively. While total assets of the average risky and safe firm are somewhat more volatile this is mainly driven by some large firms and the values for 2001 and 2005 are very similar. Together this supports the view that firms sorted in the same risk quintile in 2001 and 2005 do not differ in term of observable characteristics, which suggests that mean-reversion and survivorship bias do not differ for these firms due to differences in (observable) firm characteristics.[35]

Figure 7 plots the time series evolution of risky (black line) and safe (gray line) firms' debt to assets ratios (top Panel), cost of credit (middle Panel), and investment to assets ratios (bottom Panel) from 2005–2008. The change from one year to the next is the growth rate in the respective variable minus the growth rate for 2001 sorted firms. For example the adjusted debt to assets ratio in 2006 equals: $DebtA_{2005} + [(DebtA_{2006} - DebtA_{2005}) -$

[35]To mitigate the concern that mean-reversion and survivorship bias are different under the post-reform regime, I sort firms into to risk quintiles at the end of the sample period in 2010 and correct the post 2005 changes by changes for the 2010 sorted firms. All results remain qualitatively identical and quantitatively similar. This suggests that differences in survivorship bias or mean-reversion effects between the regimes do not affect the results.

$(DebtA_{2002} - DebtA_{2001})] = DebtA_{2006} - (DebtA_{2002} - DebtA_{2001})$.[36] There is a clear increase in risky firms' leverage, cost of credit, and investment to assets ratio, whereas for safe firms there is no such increase after the enactment of the UBA. Importantly, all three plots show the same patterns as the plots in Panel A of Figures 3 to 5. Thus, the increase in leverage, interest rates, and investment for risky firms relative to safe firms after the reform is not driven by differences in unobservable firm characteristics between risky and safe firms.

Table 5 complements the graphical analysis in Figure 7. The parameter $DR_i * event_t * treated_{it}$ is the difference in the estimate of the interaction between DR_i and the $event_t$ dummy in the 2005–2008 regression compared with the 2001–2004 regression in columns I–VI. For example, the coefficient in column I shows that the debt to asset ratio increased by 1.01 percentage points more per default risk quintile after the UBA, relative to the increase in leverage per default risk quintile after 2001. The cost of credit increases by 47 basis points more per default risk quintile (column II), and the investment to assets ratio increases by 1.11 percentage points more per default risk quintile (column III). Columns IV–VI show the results after adding firm fixed effects to track changes *within the same firm* over time. The reform effect is qualitatively unaffected by adding firm fixed effects with similar magnitudes. Columns VII–IX control for survivorship bias by sorting firms at the end of the sample period in 2010 instead of sorting firms at the beginning of the sample period. The results are qualitatively identical and quantitatively similar to the corresponding results in columns IV–VI. Together, these results provide strong evidence that the reform effects are not driven by unobserved firm characteristics. To facilitate comparison to the within-firm estimates in columns IV–IX, columns X–XII replicate the main findings from Table 4 for the same 2005–2008 period. The estimates are similar in magnitude compared to the estimates in columns IV–IX, further strengthening the evidence that the estimates in Table 4 are not biased upwards due to unobservable firm characteristics. If anything, the results from the basic estimation strategy in equation (1) are somewhat *lower* than the within-firm estimates.

An additional way to abstract from potentially endogenous risk-sorting at the firm-level is to sort firms according to the riskiness of the industry that they operate in. Industry-level risk is very persistent and the ranking of industries according to average interest coverage is almost identical before and after the UBA. The results from industry-sorting are collected in Table 6. After the enactment of the UBA, firms in riskier industries increase leverage by 0.23 percentage points more per risk quintile (column I). Interest rates relatively increase

[36] It is important to note that any anticipation effects of the reform leading firms to change their leverage or investment behavior would bias the results towards zero with this estimation strategy.

for firms in risky industries, by 39 basis points per risk quintile after the reform (column II). Similarly, investment to assets increases significantly more for firms in risky industries, by 0.21 percentage points per quintile under the management stay system (column III). Since the average firm in a risky industry is less risky than the average firm in the quintile of riskiest firms based on firm-level sorting, it is not surprising that the results are lower in magnitude compared to the results based on firm-level sorting in Table 4. Overall, the results in Table 6 confirm that the reform effects are not driven by endogenous firm-level sorting into risk-quintiles around the reform.

6.2 Risk-Curbing Channel

Heterogeneity in firm ownership provides variation in the effect of the UBA on managers' personal bankruptcy costs. Ownership transfer is particularly costly for managers who are controlling shareholders and enjoy private benefits of control (Anderson, Mansi, and Reeb 2003; Paligrova 2010; Faccio, Machica, and Mura 2011; Lins, Volpin, and Wagner 2013). Family firms and firms with high ownership concentration are thus more adversely affected by the transfer of control in bankruptcy states under the pre-reform auction system, compared with diversified shareholders in widely held firms. Accordingly, I find that the relative increase in risky firms' leverage (Table 7, column I) and investment (column III) after the reform is significantly stronger for family firms. When splitting firms into quintiles according to their ownership concentration (Herfindahl index), the results are similar with a higher increase in leverage (column IV) and investment (column VI) for risky firms with more concentrated ownership.

Similarly, managers are more sensitive to forced resignation in bankruptcy under the auction system if their financial wealth is concentrated in the firm. Financial wealth of managers is more concentrated and more correlated with labor income in firms in which managers hold a larger share of the firm's stock. In this case, managers have a particularly strong incentive to avoid bankruptcy states before the reform if their ownership stake in the firm is high.[37] Accordingly, I find that firms in which CEOs hold a higher fraction of stocks increase leverage (column VII) and investment (column IX) more. Taken together, the

[37]Theoretically, the prediction of CEO ownership is ambiguous. On the one hand high CEO shareholdings increase the concentration of the CEO's wealth in the firm (labor income and financial wealth). On the other hand, any investment distortions that reduce firm value are more costly for CEOs who own a larger fraction of the firm's shares. Empirically, Friend and Lang (1988) and Gormley and Matsa (2015) show that the risk-aversion motive dominates.

results in Table 7 provide additional evidence that firms curb risk-taking before the reform to avoid bankruptcy states under the auction system when managers' personal bankruptcy costs are higher.

6.3 Supply of Credit

The previous results show an increase in interest rates for risky firms after the enactment of the UBA. The increase in leverage for risky firms after the reform, in combination with the increase in the cost of credit, suggests an increase in the demand for credit. To examine whether the supply of credit is affected by the switch from the auction to the management stay system as well, I exploit cross-sectional differences in creditors' sensitivity to changes in bankruptcy proceedings. The loss of control in reorganization procedures is more costly for creditors when their claims are not well protected. One factor that protects creditors' claims in bankruptcy and mitigates the risk-shifting and strategic default problem is a higher liquidation value of the firm's assets (see Proposition 4). The higher share of cases ending in liquidation after the reform (see Table 1) reenforces the view that recovery values in liquidation for creditors matter under the UBA. Higher liquidation values are associated with collateral from tangible assets (Barro 1976; Stiglitz and Weiss 1981; Hart and Moore 1994, 1998; Lacker 2001; Jimenez, Salas, and Saurina 2006). Thus, if the increase in the cost of credit is partly driven by a negative effect on the supply of credit due to weaker creditor rights under the UBA, the increase should be *lower* for firms with a high fraction of tangible assets. In contrast, a pure demand effect provides no differential prediction for changes in interest rates for firms with different degrees of asset tangibility.

In columns I–III of Table 8, I sort firms according to their tangibility ratio in the year before the enactment of the UBA. I find that interest rates increase *less* for risky firms with a high fraction of tangible assets (column II). This is consistent with creditors demanding a higher compensation for the loss of control in bankruptcy proceedings for firms in which recovery values are lower in liquidation consistent with Proposition 4. Facing a lower increase in financing costs, risky firms with a higher fraction of tangible assets increase leverage slightly more after the reform (column I), and invest more (column III). These results suggest that the UBA had both a positive effect on the demand for credit and a negative effect on the supply of credit. The previous results suggest that the demand effect dominates the supply effect, the results in columns I–III in Table 8 show that the net effect on leverage and investment is more positive when the negative supply effect is weaker.

6.4 Efficiency of Additional Investment

The previous results show that the introduction of management stay and the associated increase in managers' personal bankruptcy costs leads to more investment. Whether the documented increase in leverage and investment is economically desirable depends on the efficiency of the additional investment. The auction system may have prevented managers from engaging in overinvestment and risk-shifting (Jensen 1986; Harris and Raviv 1990; Skeel 1993; Zwiebel 1996) by increasing their personal bankruptcy costs. Alternatively, high personal bankruptcy costs may have led to underinvestment in positive NPV projects that involve risk (Donaldson 1969; Amihud and Lev 1981; Rasmussen 1994).

From the outset, it is important to emphasize that it is challenging to evaluate the efficiency of corporate investment. To provide some suggestive evidence of whether the introduction of management stay improves or distorts investment decisions relative to the auction system, I combine two separate pieces of evidence. First, I examine whether the increase in investment can be attributed to firms with good investment opportunities or is undertaken by firms without good investment opportunities. Second, I examine changes in firms' profits to analyze whether the additional investment goes to positive or negative NPV projects. Finally, I explore changes in firms' cash flow volatility to examine whether firms' willingness to take risk increases after the reform.

In Table 8, columns IV–VI, I sort firms into quintiles according to their average level of investment opportunities before the enactment of the UBA. Since the sample includes many private firms, I use lagged sales growth as a proxy for investment opportunities, as is standard in the literature (Lehn and Poulsen 1989; Shin and Stulz 1998; Badertscher, Shroff, and White 2013). I find that risky firms with good investment opportunities experience a *higher* increase in their debt to assets ratio than firms that lack good investment opportunities (column IV), and use a large fraction of the additional credit for investment (column VI). Significantly higher investment by firms with good investment opportunities provides initial evidence that the introduction of management stay encourages more investment in good investment projects, rather than overinvestment in unprofitable projects.

In Table 9, I examine changes in profits after the introduction of the UBA. Growth in profits is defined as the one year change in the level of net income scaled by firm assets at the beginning of the year.[38] I find that profits grow relatively more for risky firms under the

[38]Replacing net income by a simpler measure (sales - costs of sales) that abstracts from accounting effects,

management stay system than for safer firms, by 0.14 percent of firm assets per default risk quintile (column I). The effect remains highly significant after controlling for industry fixed effects and firm-level controls with 0.27 percent (column II), and industry-year fixed effects with 0.27 percent per default risk quintile (column III).

Consistent with the previous results, profits increase particularly strongly for those risky firms that increase investment more. Profits increase more for risky family firms (column IV), risky firms with concentrated ownership (column V), risky firms with high CEO shareholdings (column VI), and for risky firms with good investment opportunities (column VIII). Interestingly, for risky firm with a higher fraction of tangible assets for which relatively higher investment is driven by a higher supply of credit profits do not grow significantly more (column VI). These results suggest that the additional investment goes to positive NPV projects, leading to higher profits for the risky firms that increase investment.[39]

Finally, Table 10 depicts information on changes in cash flow volatility around the UBA. For each firm, I estimate cash flow volatility separately for the pre-reform period and the post-reform period, and regress cash flow volatility on firms' average default risk measure for the respective period. Risky firms' cash flow volatility increases significantly more after the reform compared with safe firms' cash flow volatility (column I). The increase in cash flow volatility for risky firms relative to safe firms is even higher after controlling for industry-fixed effects and firm controls (column II), and industry-event fixed effects (column III). The increase in cash flow volatility is higher for risky family firms (column IV), risky firms with concentrated ownership (column V), risky firms with higher CEO shareholdings (column VI), and risky firms with good investment opportunities (column VIII). Again, for risky firms with a larger fraction of tangible assets in which creditors retain more control in bankruptcy states there is no significant increase in cash flow volatility after the reform (column VII). These results strengthen the view that firms are willing to take on more risk under the management stay system when managers' personal bankruptcy costs are lower.

such as depreciation, leaves the results qualitatively unaffected and quantitatively even stronger. I examine the growth rate of the *level* of profits as it is not clear how additional investment affects profitability (ROA). It could be that firms only invest in the most profitable projects before the reform and abstain from lower (but still positive) NPV projects because they are reluctant to take on more leverage for financing those projects. Hence, even if the additional investment goes to positive NPV projects after the reform, *average* profitability may go down.

[39]Overall, the evidence on changes in investment is consistent with Eckbo and Thorburn (2003) who argue that allowing CEOs to participate in the future value of the firm in bankruptcy improves CEOs' incentives to run the firm efficiently.

6.5 Effects on Innovation

A significant fraction of innovation is undertaken by risky firms. Thus, the design of bankruptcy proceedings is highly relevant for innovative firms.[40] To test for the effect of managers' personal bankruptcy costs on innovation, I examine changes in innovation input and output after the enactment of the UBA. In columns I–III in Table 11, I study changes in firms' R&D expenses to assets ratio. I find that after the reform, risky firms increase investment in R&D more than safe firms, by 0.10 percentage points per default risk quintile (column I). The effect is similar when adding industry fixed effects and firm controls (column II), with 0.12 percentage points per default risk quintile, and industry-year fixed effects (column III) with 0.13 percentage points per default risk quintile.

In columns IV–VII, I examine changes in innovation output. For the subsample of firms that successfully apply for at least one patent during the sample period, I examine changes in the number of successful patent applications after the enactment of the UBA. To control for differences in the size of firms in the groups of risky and safe firms after the reform, I scale the number of patents by firms' book value of assets (in billon Korean won). Risky firms apply for slightly more patents after the reform, with 0.052 patents per billion won in assets per default risk quintile (column IV). After controlling for industry-fixed effects and firm characteristics, the difference is 0.0042 patents per billion won of assets (column V). Controlling for industry-year fixed effects, the effect is similar, with 0.036 patents per billion won of assets per default risk quintile (column VI). In column VII, I examine the full sample of firms, including firms that never successfully apply for a patent during the sample period. Risky firms apply for more patents after the reform with 0.015 patents per billion won of firm assets per default risk quintile in the full sample. Together, these results suggest that reducing managers' bankruptcy costs increases innovation.

7 Discussion and Robustness Tests

This section discusses alternative contracting solutions, examines the potential role of agency conflicts for the results in the paper, and discusses the potential influence of the financial crisis period for the results in the paper.

[40] Manso (2011) shows theoretically that making failure less costly for managers may encourage innovation.

7.1 Alternative Sources of Financing

This section discusses different ways of financing additional investment before the reform and outlines why these alternative sources of financing may not have been used. One obvious alternative to financing investment with risky debt is equity. However, while issuing equity does not increase the risk of default directly, investment in risky projects still increases the risk of entering financial distress, making managers unwilling to finance highly risky projects even with equity. Moreover, equity investment might be prohibitively costly for some projects in the presence of information asymmetry (Myers and Majluf 1984). In the context of Korean firms, where ownership and control are often not separated and private benefits of control are high, existing owner-managers might be unwilling to share control rights with new shareholders. This may prevent financing with common equity making equity financing more costly. Similarly, new shareholders might demand compensation for becoming minority shareholders in a firm with rent-extracting controlling shareholders that exceeds the gains from additional investment. Finally, a large fraction of the firms in the sample are private firms with limited access to equity markets.

Alternatively, firms could finance new investment by selling assets. This requires that asset sales are not prohibited by debt contracts, which would lower the firm's ability to obtain secured financing. Additionally, firms are constrained to selling assets that are not vital to their current operations. Thus, while in some cases financing new investment with asset sales might be feasible, generally firms face constraints on their ability to liquidate their assets for new investment.

If investment projects are profitable, firms might be able to receive additional debt financing in distress and thereby avoid bankruptcy filing. However, given the high level of control and the option to acquire the firms' shares in pre-reform reorganization proceedings, existing creditors may prefer for the firm to default precisely when it is profitable. This is because under the auction system creditors have the option of obtaining ownership of the firm, which transfers their fixed claim into a residual claim on the firm. This residual claim might yield higher returns than their fixed claim (Rasmussen 1994). A competitive bidding process could reduce this type of rents. However, for the large firms in the sample, a competitive auction process may not always occur due to the limited number of potential bidders (Shleifer and Vishny 1992; Meier and Servaes 2015) and existing creditors' informational advantage. Reaching out to new creditors could overcome this incentive problem. Information

asymmetry, in combination with covenants that prevent the issuing of new debt with equal priority is likely to make financing from new creditors costly, which may exceed the benefits from additional investment. Taken together, while some alternative forms of financing might be available before the reform, in many cases alternative sources of financing might be prohibitively costly or do not overcome the fundamental problem that managers hesitate to invest in risky projects regardless of the source of funding.

7.2 Alternative Contracting Solutions

An alternative way to salvage debt financing is using private workouts. Shareholders can negotiate with their creditors outside the court-supervised reorganization procedure, to avoid mandatory management resignation and ownership transfer. One problem with private workouts is that they suffer from free-rider problems. Creditors who refuse to participate in the workout benefit from other creditors' willingness to forgive part of their claims (Roe 1987). While the Korean system provides a work-out procedure that attempts to overcome the free-rider problem by making agreements that are accepted by three-quarters of all and three-quarters of secured creditors binding for all creditors in large firms, this procedure is rarely used, with only a handful of cases per year during the sample period. The main impediment to creditors agreeing to out-of-court restructuring before the reform is their high level of control in in-court proceedings, combined with their legal power to force firms into in-court proceedings. Thus, creditors cannot credibly commit to abstain from bringing the firm into in-court reorganization. These renegotiation frictions are reflected in a significantly higher failure rate in private workouts under the auction system (52.29%), compared with a lower failure rate under the management stay system (28.08%). Thus, the incentive structure under the auction system prevents managers from retaining control over the firm in out-of-court workout proceedings.[41]

Another possibility for firms' to mitigate managers' lower willingness to take risks under the auction system is to change the design of their compensation contracts. However, there are constraints to legally feasible contracts. The Korean system does not allow for contracts that assign a higher priority to payments to managers above other employees and creditors.[42] One possibility to provide managers with payments with high priority in default states is

[41] Empirically, managers are forced to resign in 81% of documented out-of-court restructurings.

[42] Even if this were possible, it might significantly increase the cost of debt financing if repayments to creditors were reduced in default states due to higher priority claims of managers.

to make them secured creditors. The downside of this contractual arrangement is that it reduces the amount of secured debt that the firm can issue in the market. Additionally, transfers to managers are constrained by the funds available to the firm in default states, which might be significantly lower than what is needed to compensate managers for the loss of future labor income and private benefits.

7.3 Efficient Resolution of Distress

Differences in the resolution of financial distress may affect the main results documented in the paper. Firms in distress may have tried to avoid default before the reform, as it would trigger ownership transfer and forced management resignation. In this case, lower investment before the reform could be a consequence of these attempts to delay bankruptcy when firms are distressed. Highly distressed firms could for example prevent default by selling assets, or by trading off future returns for contemporaneous cash flows by cutting down on investment. While this mechanism also implies that pre-reform auction system generates inefficiencies, the channel would be somewhat different from risk-curbing through adjusting financing and investment before distress occurs. However, while this mechanism could explain the behavior of some of the most riskiest firms in the high risk group that are already financially distressed, it cannot explain why investment increases more for the second, third and fourth highest quintiles of risky firms that are more sensitive to the design of bankruptcy law, but are not in distress. Thus, while differences in the resolution of financial distress might contribute to the overall effect on investment for some firms in the highest default risk group, they cannot explain the monotonic increase in the reform effect with default risk for non-distressed firms.

Additionally, the pre-reform auction system could be generally inefficient because the receiver and the new managers do not run the firm as effectively as it was run under incumbent management. However, this alternative explanation is not consistent with several of the results reported in this paper. First, the receiver could re-appoint the manager if she has superior information. This is not the case in any of the pre-reform restructuring cases (in virtually all cases, the manager does not even return after the receiver exits the firm). Second, if receivership is generally inefficient, it is not clear why creditors charge *lower* interest rates before the reform. This is rather consistent with bankruptcy states being costly to managers, but less costly for creditors. Third, if the pre-reform system was inefficient overall, out-of-court restructuring should have been frequently used to negotiate around this inefficiency. Instead, out-of-court workouts were significantly more likely to fail before the reform,

and creditors also demanded the replacement of management and a change in ownership in most cases. Finally, some of the cross-sectional tests cannot be explained by inefficiencies in the auction system, for example differences in ownership should not be relevant, as the inefficiencies of the receivership system should apply to all firms.

7.4 Agency Conflicts

For the most part of the paper, managers are viewed as owner-managers, which is the most common form of ownership in Korea, particularly for the many private firms in the sample. Thus, agency problems between managers and shareholders play a less important role than they would for a sample of widely held firms with highly diversified shareholders. The cross-sectional results on ownership show that managers' incentives are particularly important in shaping firms' financing and investment decisions when ownership is more concentrated and shareholders are less diversified, aligning their incentives more with those of managers. This is particularly relevant in the context of the reform, as the adverse consequences of default, including ownership transfer, are more costly for less diversified shareholders. Thus, when assessing the role of governance for the effects documented in the paper, it seems plausible that dispersed ownership, in combination with governance mechanisms that better align managers' incentives with those of diversified shareholders, may mitigate the risk-aversion effects of the auction system.

7.5 Financial Crisis Period

An important concern is whether the financial crisis period starting in 2008 could have an effect on the results documented in the paper by affecting risky and safe firms differentially. The main concern relates to the increase in the costs of credit for risky relative to save firms. For other results in the paper, for example higher investment by risky firms after 2005, effects of the financial crisis period would actually point in the opposite direction.

Two pieces of evidence strongly suggest that the results on interest rates are not driven by the financial crisis period. First, interest rates start to increase in 2006, the year when the reform was implemented, rather than coinciding with the crisis period in 2008 (Figure 4.). Second, interest rates of risky firms remain at a higher level even after the sample period in 2010 (Figure 8.). This suggests that the effects are not specific to the financial crisis period,

but a persistent feature under the new bankruptcy regime.

8 Conclusion

An important aspect of bankruptcy law is how it affects firms' financing and investment decisions ex ante. While a large body of theoretical literature outlines the merits and deficiencies of various bankruptcy proceedings, empirical evidence on the effects of different aspects of bankruptcy law design on firms' financing and investment decisions is scarce. This paper documents that making bankruptcy states costly for managers may lead to negative effects on the demand for credit by managers' willingness to take risk. When the private benefits of control are high, managers may curb risk-taking in order to avoid bankruptcy states to the extent that firms give up profitable investment projects and reduce innovative activities.

Following a bankruptcy reform in Korea that abolished a reorganization regime in which management was replaced by a court-appointed receiver and ownership was transferred to new investors, replacing it with a management stay system similar to Chapter 11 in the US, I find that risky firms, which are most sensitive to the design of bankruptcy law, increase leverage, investment, and innovation when managers are allowed to stay in control of the firm during reorganization. The additional investment seems to go to positive NPV projects. Firms with good investment opportunities increase investment more, and risky firms' profits increase more after the reform. The increase in profits occurs precisely for those firms that increase investment after the reform. Consistent with an increase in firms' willingness to take on more risk, risky firms' cash flow volatility significantly increases after the reform relative to safer firms. Large controlling shareholders and CEOs with high shareholdings incur particularly high personal bankruptcy costs before the reform when they are deprived of the private benefits of control through ownership transfer. Accordingly, I find that family firms with large controlling shareholders and firms with high CEO shareholdings exhibit a higher increase in leverage and investment after the reform.

An important question is how generalizable the results are to different institutional environments. Nenova (2003) estimates that private benefits of control constitute 46% of firms' market capitalization in Korea. In addition to the high value of private benefits, concentrated ownership is pervasive. It seems plausible that the results apply to countries with high levels of family ownership where private benefits of control are high. Family control is the typical

ownership structure in emerging economies, but is also widespread in developed countries (La Porta, Lopez-de Silanes, and Shleifer 1999; Claessens, Djankov, and Lang 2000; Faccio and Lang 2002). When looking beyond the very largest firms, concentrated ownership is also common in the US (Anderson and Reeb 2003; Villalonga and Amit 2006; Holderness 2009). Thus, private benefits of control are an important consideration in a large fraction of firms around the world. This suggests that the documented results are relevant beyond the institutional context examined in this paper.

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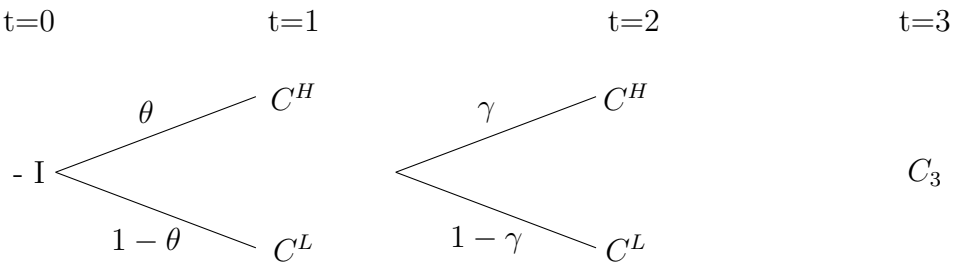
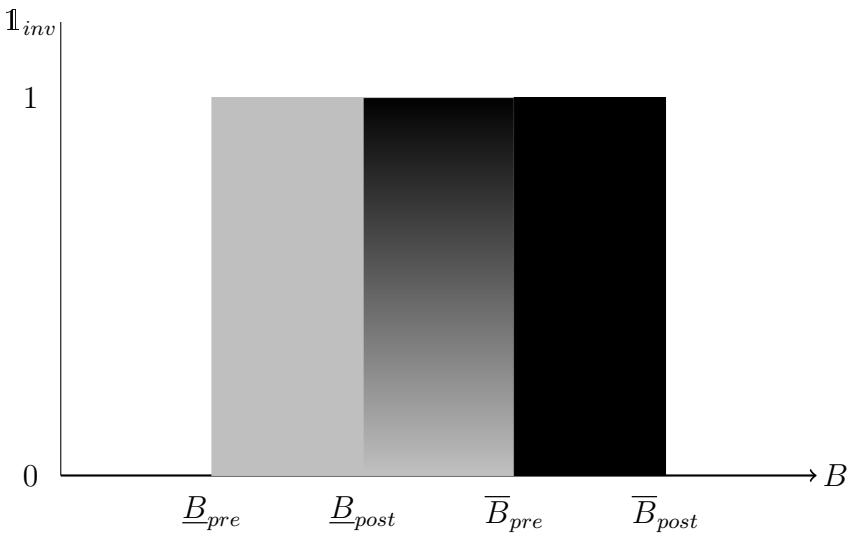
Figure 1: **Cashflows**



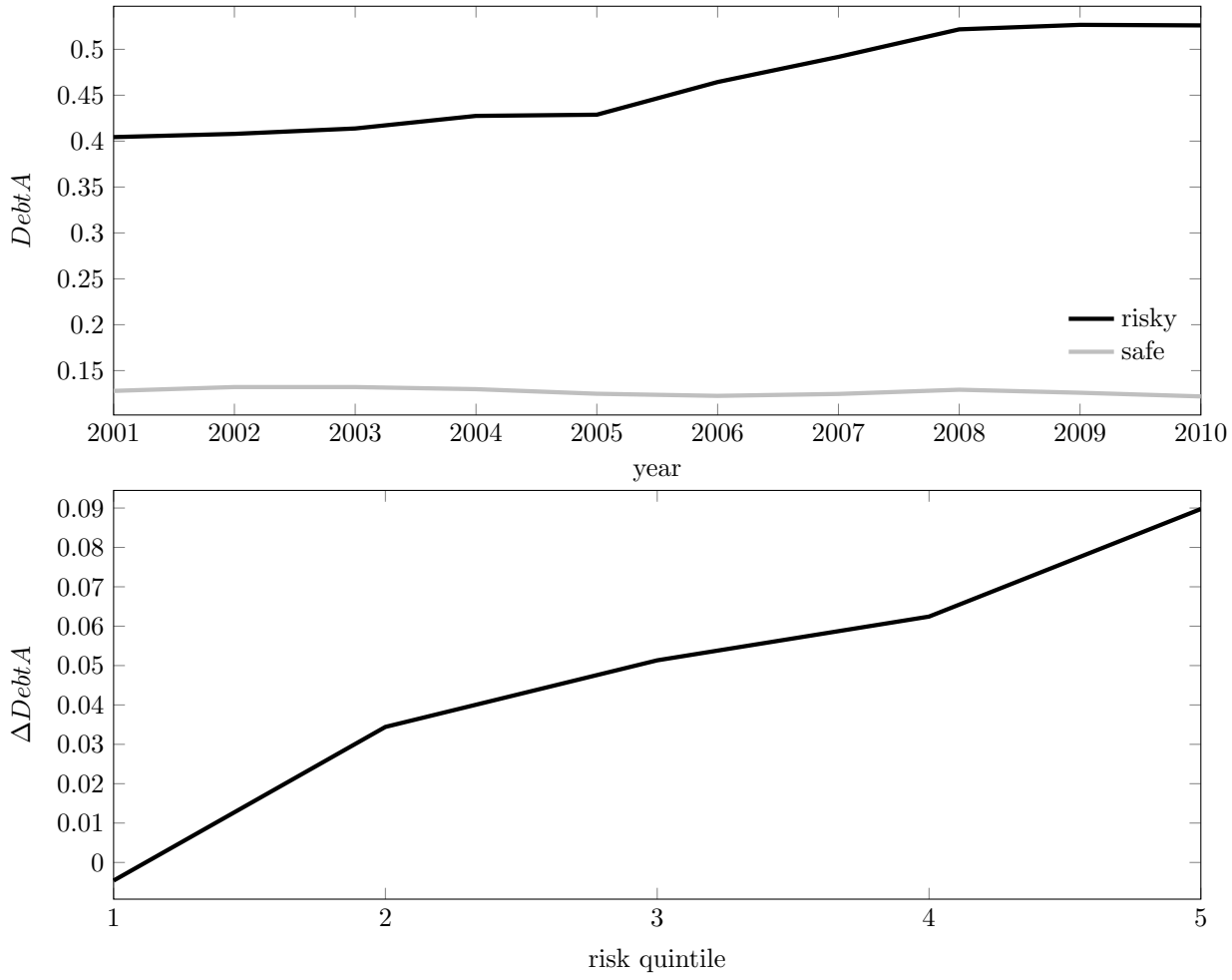
This figure shows the cashflows that occur in each period of the model.

Figure 2: **Investment Regions**



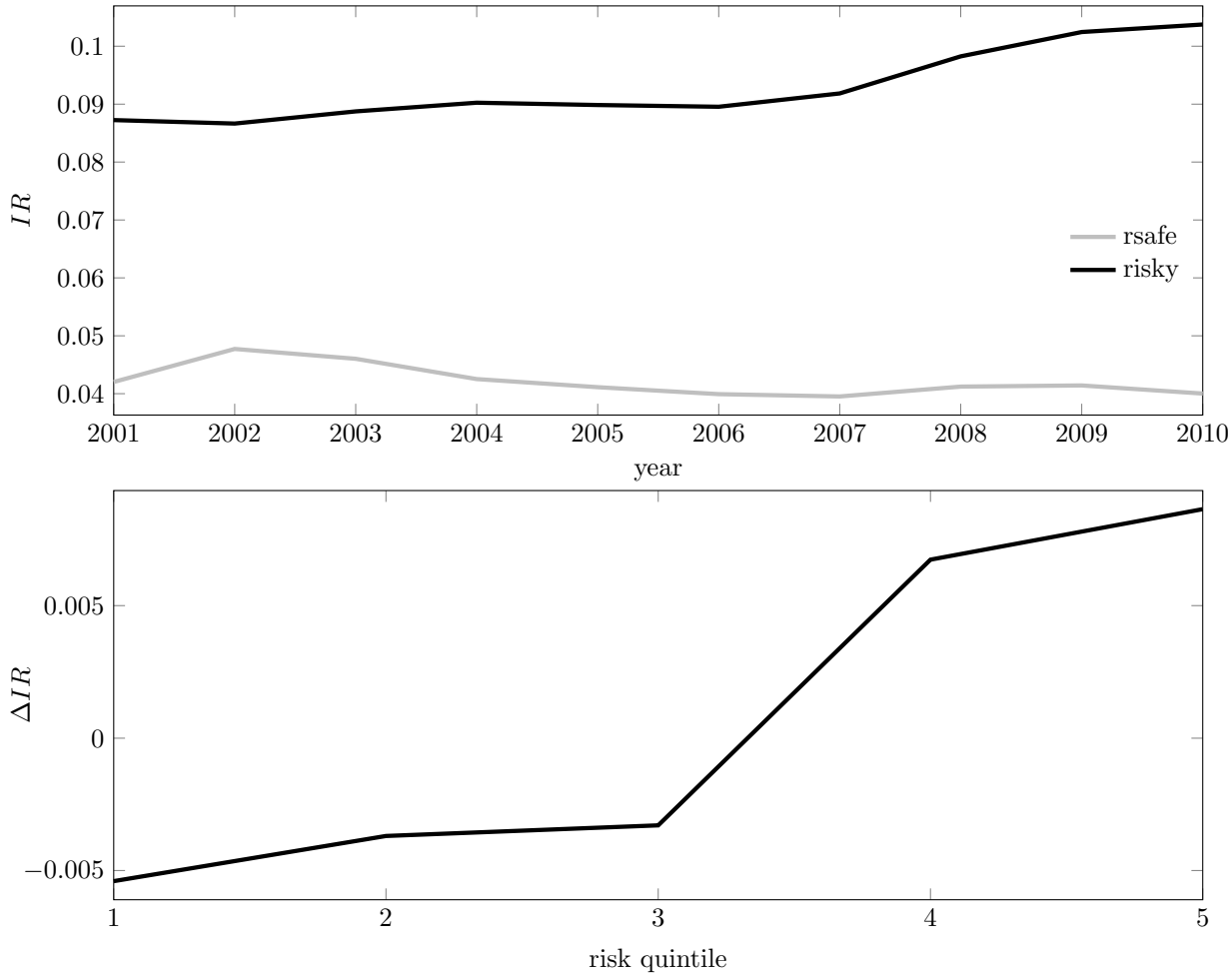
This figure illustrates the effect of the reform on firms' investment decision (y-axis) depending on the entrepreneur's private benefit (x-axis). Under the post-reform period (black), the investment region is shifted rightward between $\underline{B}_{post}$ and $\overline{B}_{post}$, compared with the pre-reform period investment region (gray) between $\underline{B}_{pre}$ and $\overline{B}_{pre}$.

Figure 3: **Leverage**



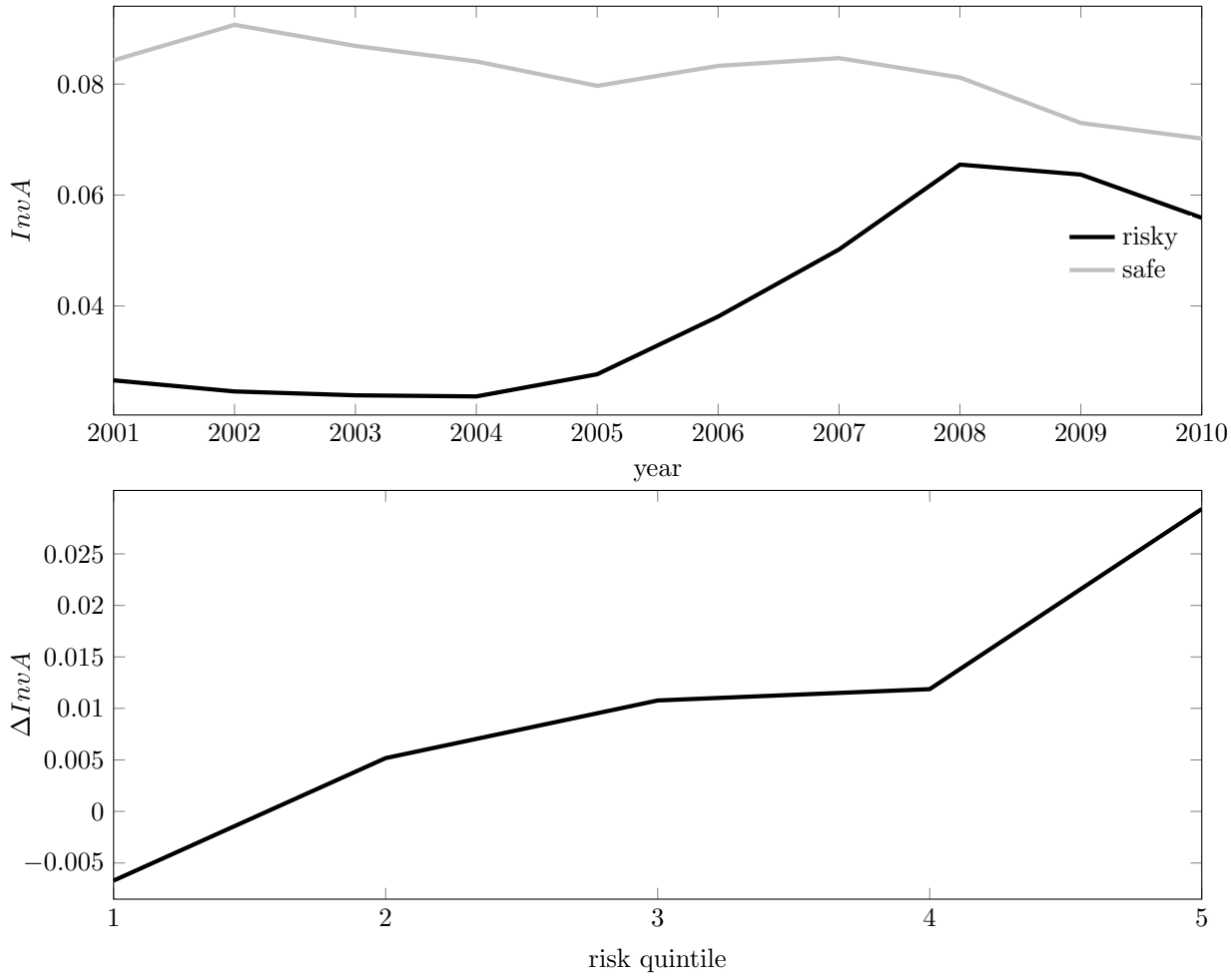
The top panel of this figure plots the time series evolution of firms' debt to assets ratio around the enactment of the UBA in 2006 for the riskiest (black line) and the safest (gray line) quintile of firms. The bottom panel plots the average change in the debt to assets ratio between the post- and pre-reform periods for firms in different default risk quintiles, from one for the safest up to five for the riskiest firms.

Figure 4: **Cost of Credit**



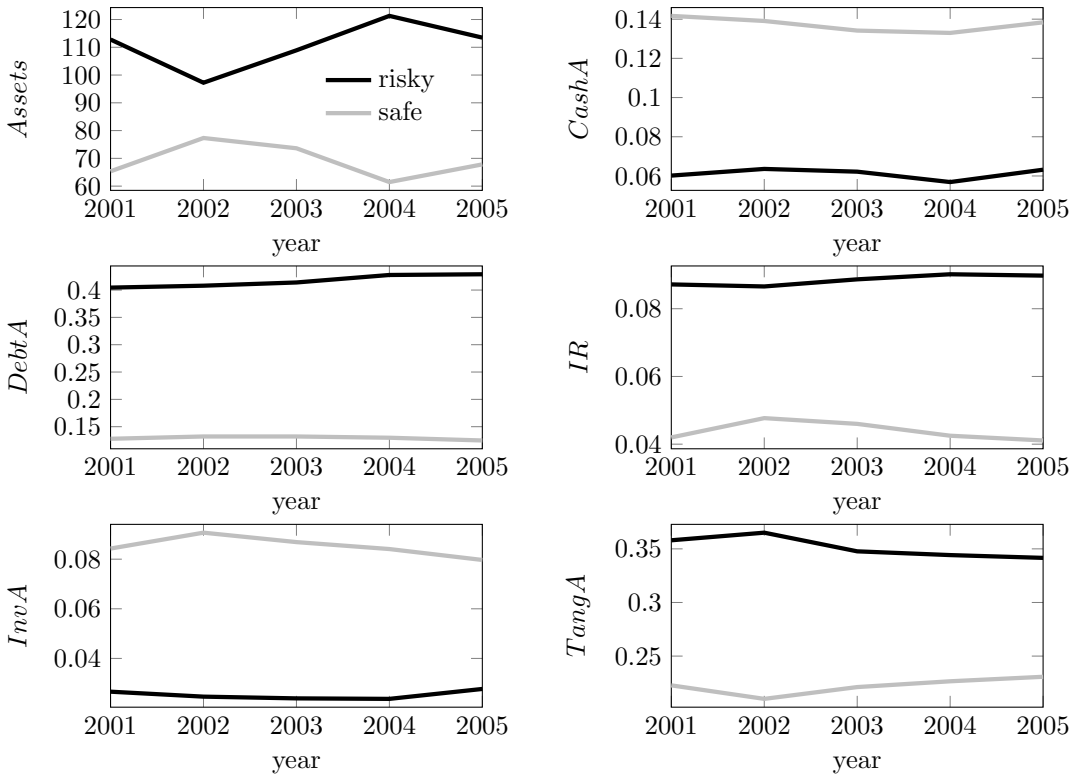
The top panel of this figure plots the time series evolution of firms' interest expenses to total debt ratio around the enactment of the UBA in 2006 for the riskiest (black line) and the safest (gray line) quintile of firms. The bottom panel plots the average change in the interest expenses to debt ratio between the post- and pre-reform periods for firms in different default risk quintiles, from one for the safest up to five for the riskiest firms.

Figure 5: **Investment**



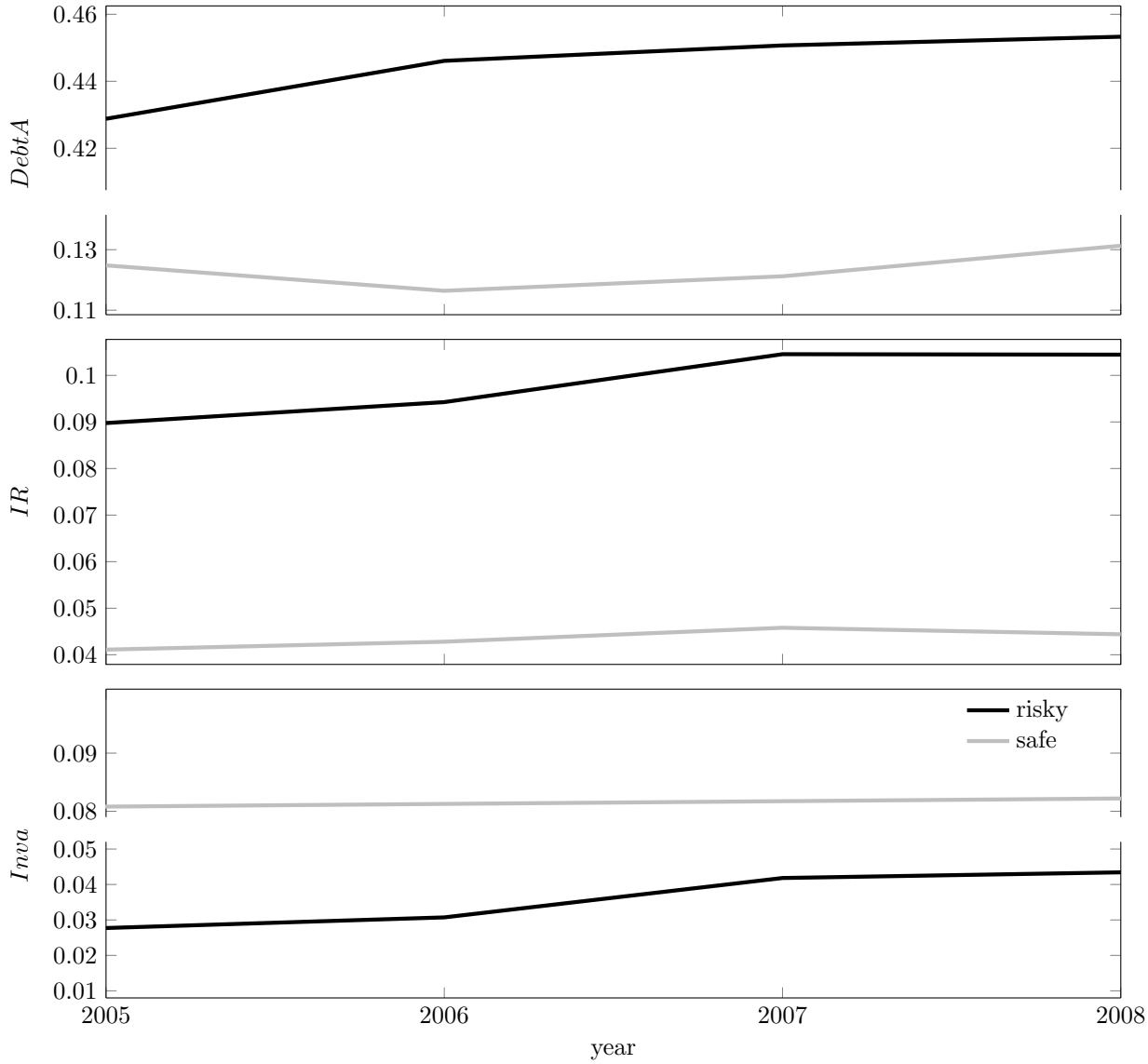
The top panel of this figure plots the time series evolution of firms' investment to assets ratio around the enactment of the UBA in 2006 for the riskiest (black line) and the safest (gray line) quintile of firms. The bottom panel plots the average change in the investment to assets ratio between the post- and pre-reform periods for firms in different default risk quintiles, from one for the safest up to five for the riskiest firms.

Figure 6: **Pre-reform Trends**



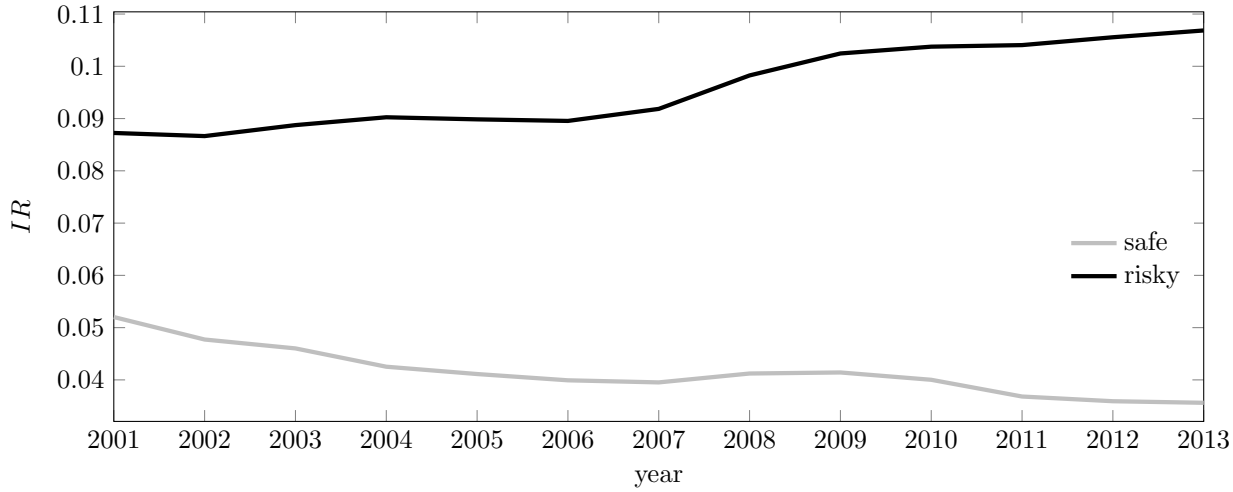
This figure plots the time series evolution of different firm characteristics (total assets (in billion Korean won), cash to assets, debt to assets, interest expenses to total debt, investment to asset, and the share of tangible assets in total assets) for the riskiest (black lines) and safest quintiles (gray lines) of firms before the enactment of the UBA.

Figure 7: **Within-Firm Changes**



The top panel of this figure plots firms' average debt to assets ratio around the enactment of the UBA in 2006 for the riskiest (black line) and the safest (gray line) quintile of firms. The middle panel plots firms' average interest expenses to debt ratio, and the bottom panel plots firms' average investment to assets ratio. Firms are sorted into default risk quintiles in 2005. The changes in firm characteristics are adjusted for changes for firms sorted into default risk quintiles in 2001. For example, the debt to assets ratio in 2006 is the debt to asset ratio in 2005, plus the debt to assets growth rate in 2006, minus the debt to assets growth rate in 2002 for firms sorted into the respective default risk quintile in 2001.

Figure 8: **Cost of Credit - Post-Sample Trend**



The top panel of this figure plots the time series evolution of firms' interest expenses to total debt ratio from 2001 to 2013 for the riskiest (black line) and the safest (gray line) quintile of firms.

Table 1: Bankruptcy Cases

Panel A: All filings		I All filings	II Composition	III Reorganization	IV Rehabilitation
Number filings		421	25	42	354
Share liquidation (%)		36.34	60.00	26.19	35.88
Duration (months)		41.98	56.56	34.12	41.88
CEO stay (%)		79.81	88.00	4.76	88.14
Ownership transfer (%)		30.71	25.00	90.91	19.09
Panel B: Filings by ownership		**I All filings**	**II Composition**	**III Reorganization**	**IV Rehabilitation**
Number filings	Family firms	126	10	6	110
	Non-family firms	169	6	27	136
Share liquidation (%)	Family firms	29.37	40.00	16.67	29.09
	Non-family firms	31.36	33.33	22.22	33.09
Duration (months)	Family firms	44.39	60.90	43.17	42.95
	Non-family firms	39.70	50.00	33.44	40.49
CEO stay (%)	Family firms	88.10	90.00	16.67	91.82
	Non-family firms	69.23	83.33	3.70	81.62
Ownership transfer (%)	Family firms	32.69	33.33	100.00	21.43
	Non-family firms	29.55	20.00	86.67	17.65

This table lists data on reorganization cases in the sample. Composition and reorganization filings are under the pre-reform system, and rehabilitation filings under the post-reform system. The top panel depicts the number of filings, the share of reorganization cases resulting in liquidation, the duration of the reorganization proceedings in months, the fraction of cases in which the incumbent CEO stays in control during the reorganization proceedings, and the fraction of cases in which existing shareholders are replaced during reorganizations. The data on ownership transfer comprises cases not resulting in liquidation for which ownership data is available. The bottom panel depicts the same information separately for family and non-family firms.

Table 2: Bankruptcy Filings and Workouts

Panel A: Bankruptcy Filings	I	II	III	IV
Year	Reorganization	Composition	Rehabilitation	Liquidation
2001	31	51		170
2002	28	29		108
2003	38	48		303
2004	35	81		162
2005	22	35		129
2006			117	132
2007			215	132
2008			582	191
2009			1192	226
2010			1227	253

Panel B: Workouts	I	II	III	IV
Year	Total Cases	Successful	Failed	Failure Rate
2004-Q4	360	144	216	0.6000
2005	581	322	259	0.4458
2006	1491	1161	330	0.2213
2007	1353	1010	343	0.2535
2008	1219	771	448	0.3675

Panel A of this table lists the number of reorganization and composition filings from 2001 to 2005, rehabilitation filings from 2006 to 2010, and liquidation filings from 2001 to 2010. Panel B lists data about workouts. FOr every year from 2004–2008, the table depicts the number of workouts cases (column I), either successfully resolved (column II), or resulting in bankruptcy or liquidation (column III), for all firms with debt below 50 billion won that initiate a workout proceeding.

Table 3: Descriptives

Panel A: Accounting data		obs	mean	median	std
Total assets (in million KRW)	full sample	183,889	78,977	12,374	907,501
	low risk	36,781	173,466	13,457	1,883,279
	high risk	36,773	65,275	14,473	543,166
Debt to assets	full sample	183,856	0.3448	0.3077	0.2834
	low risk	36,770	0.1254	0.0635	0.1635
	high risk	36,758	0.4824	0.4136	0.3820
Interest rates	full sample	176,716	0.0665	0.0465	0.01086
	low risk	32,913	0.0416	0.0214	0.0973
	high risk	35,022	0.0969	0.0577	0.1554
Cash to assets	full sample	183,377	0.0728	0.0283	0.1146
	low risk	36,699	0.1322	0.0772	0.1514
	high risk	36,623	0.0588	0.0152	0.1148
Invest to assets	full sample	181,275	0.0651	0.0007	0.2183
	low risk	36,592	0.0797	0.0053	0.2240
	high risk	35,350	0.0435	-0.0009	0.2289
Panel B: Patent data		obs	mean	median	std
Number of patents	full sample	25,812	11.04	2.00	143.42
	low risk	6,514	26.14	2.00	274.05
	high risk	3,699	9.77	2.00	85.93
Panel C: Ownership data		obs	mean	median	std
Family ownership share	full sample	157,286	0.4848	0.4994	0.3408
	low risk	31,416	0.5115	0.5100	0.3357
	high risk	29,778	0.4175	0.3357	0.3545
Ownership concentration	full sample	157,286	0.4243	0.3480	0.2784
	low risk	31,416	0.4332	0.3547	0.2905
	high risk	29,778	0.3978	0.3250	0.2919
CEO ownership share	full sample	157,286	0.3281	0.3000	0.2792
	low risk	31,416	0.3134	0.2809	0.2759
	high risk	29,778	0.2329	0.1738	0.2528

This table provides descriptive statistics on accounting data (Panel A), patent data (Panel B), and ownership data (Panel C), separately for the full sample, and for firms in the lowest and highest default risk quintiles.

Table 4: Reform Effect

Dep var:	I $DebtA_{it}$	II $DebtA_{it}$	III $DebtA_{it}$	IV IR_{it}	V IR_{it}	VI IR_{it}	VII $InvA_{it}$	VIII $InvA_{it}$	IX $InvA_{it}$
DR_{it}	0.0777***	0.0655***	0.0661***	0.0114***	0.0173***	0.0177***	-0.0158***	-0.0100***	-0.0102***
	[0.0027]	[0.0016]	[0.0017]	[0.0015]	[0.0014]	[0.0015]	[0.0017]	[0.0008]	[0.0008]
$DR_{it} * event_t$	0.0249***	0.0076***	0.0084***	0.0034***	0.0031***	0.0025***	0.0087***	0.0060***	0.0067***
	[0.0052]	[0.0021]	[0.0020]	[0.0013]	[0.0011]	[0.0009]	[0.0016]	[0.0009]	[0.0010]
Observations	183,854	163,444	163,444	176,726	157,820	157,820	194,469	162,929	162,929
R-squared	0.220	0.300	0.321	0.031	0.111	0.142	0.009	0.058	0.093
Year FE	yes	yes	-	yes	yes	-	yes	yes	-
Ind FE	no	yes	-	no	yes	-	no	yes	-
Ind-Year FE	no	no	yes	no	no	yes	no	no	yes
Controls	no	yes	yes	no	yes	yes	no	yes	yes
Clustered SE	ind	ind	ind	ind	ind	ind	ind	ind	ind

This table shows the results of regressing firms' debt to asset ratio ($DebtA_{it}$), annual interest rates (IR_{it}), and investment to assets ratio ($InvA_{it}$) on a lagged default risk variable that takes the value of one for the safest quintile of firms, up to five for the riskiest quintile of firms (DR_{it}), and the interaction of the default risk variable with a dummy variable ($event_t$) that takes the value of zero for the pre-reform period from 2001–2005, and one for the post-reform period from 2006–2010. Standard errors are reported in brackets. The bottom of the table provides information on fixed effects and the clustering of standard errors. Details on control variables for each regression can be found in the text. ***, and ** denote statistical significance at the 1%, and the 5% levels, respectively.

Table 5: Reform Effect - Unobservable Firm Characteristics

Dep var:	I $DebtA_{it}$	II IR_{it}	III $InvA_{it}$	IV $DebtA_{it}$	V IR_{it}	VI $InvA_{it}$	VII $DebtA_{it}$	VIII IR_{it}	IX $InvA_{it}$	X $DebtA_{it}$	XI IR_{it}	XII $InvA_{it}$
DR_i	0.0542***	0.0139***	-0.0087***									
	[0.0023]	[0.0016]	[0.0016]									
$DR_i * event_t$	0.0024	-0.0014	-0.0017									
	[0.0024]	[0.0016]	[0.0019]									
$DR_i * UBA_t$	-0.0171***	-0.0060***	0.0017	-0.0099***	-0.0046***	-0.0061***	-0.0113***	-0.0018***	-0.0066***			
	[0.0016]	[0.0011]	[0.0015]	[0.0012]	[0.0009]	[0.0015]	[0.0013]	[0.0007]	[0.0013]			
$DR_i * event_t * UBA_t$	0.0101***	0.0047***	0.0111***	0.0059***	0.0042***	0.0139***	0.0071***	0.0021**	0.0148***			
	[0.0019]	[0.0014]	[0.0022]	[0.0014]	[0.0011]	[0.0022]	[0.0014]	[0.0010]	[0.0019]			
DR_{it}										0.0693***	0.0186***	-0.0102***
										[0.0021]	[0.0023]	[0.0013]
$DR_{it} * event_t$										0.0038**	0.0014*	0.0090***
										[0.0015]	[0.0008]	[0.0015]
Observations	145,674	139,020	145,246	145,674	139,020	145,246	161,808	152,936	161,340	67,856	65,761	67,694
R-squared	0.289	0.121	0.099	0.813	0.545	0.414	0.822	0.541	0.409	0.325	0.146	0.100
Firm FE	no	no	no	yes	yes	yes	yes	yes	yes	no	no	no
Ind-Year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Clustered SE	ind	ind	ind	ind	ind	ind	ind	ind	ind	ind	ind	ind

Columns I–IX of this table shows the results of regressing firms' debt to asset ratio ($DebtA_{it}$), annual interest rates (IR_{it}), and investment to asset ratio ($InvA_{it}$) on a default risk variable that takes the value of one for the safest quintile of firms, up to five for the riskiest quintile of firms (DR_i), a dummy variable ($event_t$) that takes the value of zero for the years 2001 (columns I–VI), 2010 (columns VII–IX) and 2005, and one for the 2002–2004 (columns I–VI), 2011–2013 (columns VII–IX) and 2006–2008 periods, a dummy variable (UBA_t) that takes the value of zero from 2001–2004 (columns I–VI) and 2010–2013 (columns VII–IX), and one from 2005–2008, and the interaction of the independent variables. Columns X–XII replicate the main tests from Table 4 for the 2005–2008 period. Standard errors are reported in brackets. The bottom of the table provides information on fixed effects and the clustering of standard errors. Details on control variables for each regression can be found in the text. ***, and ** denote statistical significance at the 1%, and the 5% levels, respectively.

Table 6: Reform Effect - Industry-Level Sorting

Dep var:	I $DebtA_{it}$	II IR_{it}	III $InvA_{it}$
$DR_{ind} * event_t$	0.0023**	0.0039**	0.0021**
	[0.0010]	[0.0015]	[0.0009]
Observations	154,561	143,015	154,118
R-squared	0.207	0.116	0.057
Year FE	yes	yes	yes
Ind FE	yes	yes	yes
Controls	yes	yes	yes
Clustered SE	ind	ind	ind

This table shows the results of regressing firms' debt to asset ratio ($DebtA_{it}$) interest rates (IR_{it}), and investment to asset ratio ($InvA_{it}$) on a default risk measure that takes the value of one for the safest, up to five for the riskiest quintile of firms based on the average riskiness of firms in the industries in which the firms operate (DR_{ind}), and the interaction of the default risk measure with a dummy variable ($event_t$) that takes the value of zero for the pre-reform period from 2001–2005, and one for the post-reform period from 2006–2010. Standard errors are reported in brackets. The bottom of the table provides information on fixed effects and the clustering of standard errors. Further details on control variables for each regression can be found in the text. ***, **, and * denote statistical significance at the 1%, the 5%, and the 10% levels, respectively.

Table 7: Ownership

Dep var:	I $DebtA_{it}$	II IR_{it}	III $InvA_{it}$	IV $DebtA_{it}$	V IR_{it}	VI $InvA_{it}$	VII $DebtA_{it}$	VIII IR_{it}	IX $InvA_{it}$
DR_{it}	0.0585***	0.0181***	-0.0086***	0.0498***	0.0189***	-0.0085***	0.0511***	0.0215***	-0.0010
	[0.0024]	[0.0015]	[0.0011]	[0.0032]	[0.0021]	[0.0015]	[0.0035]	[0.0015]	[0.0015]
$DR_{it} * event_t$	0.0066***	0.0032**	0.0054***	-0.0007	0.0037*	0.0036**	0.0045	0.0006	0.0037**
	[0.0021]	[0.0015]	[0.0012]	[0.0031]	[0.0023]	[0.0017]	[0.0030]	[0.0017]	[0.0018]
$family_i$	-0.0245***	0.0042*	0.0076						
	[0.0061]	[0.0025]	[0.0046]						
$family_i * event_t$	-0.0149**	0.0019	-0.0198***						
	[0.0075]	[0.0035]	[0.0054]						
$family_i * DR_{it}$	0.0107***	-0.0093***	-0.0015						
	[0.0025]	[0.0011]	[0.0014]						
$family_i * DR_{it} * event_t$	0.0073***	-0.0001	0.0052***						
	[0.0026]	[0.0014]	[0.0016]						
$herf\ owner_i$				-0.0060***	0.0008	0.0024			
				[0.0022]	[0.0013]	[0.0016]			
$herf\ owner_i * event_t$				-0.0075***	0.0013	-0.0067***			
				[0.0024]	[0.0014]	[0.0018]			
$herf\ owner_i * DR_{it}$				0.00048***	-0.0007	-0.0003			
				[0.0008]	[0.0005]	[0.0005]			
$herf\ owner_i * DR_{it} * event_t$				0.0037***	-0.0002	0.0014***			
				[0.0009]	[0.0005]	[0.0005]			
$ceo\ owner_i$							0.0089***	0.0048***	0.0161***
							[0.0024]	[0.0010]	[0.0020]
$ceo\ owner_i * event_t$							-0.0056**	-0.0016*	-0.0082***
							[0.0024]	[0.0010]	[0.0020]
$ceo\ owner_i * DR_{it}$							0.0044***	-0.0016***	-0.0029***
							[0.0009]	[0.0003]	[0.0005]
$ceo\ owner_i * DR_{it} * event_t$							0.0018**	0.0009**	0.0012**
							[0.0009]	[0.0004]	[0.0006]
Observations	124,502	121,262	124,221	124,502	121,262	124,221	124,502	121,262	124,221
R-squared	0.338	0.147	0.110	0.342	0.147	0.110	0.393	0.147	0.116
Ind-Year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Clustered SE	ind	ind	ind	ind	ind	ind	ind	ind	ind

This table shows the results of regressing firms' debt to asset ratio ($DebtA_{it}$), annual interest rates (IR_{it}), and investment to asset ratio ($InvA_{it}$) on a lagged default risk variable that takes the value of one for the safest quintile of firms, up to five for the riskiest quintile of firms (DR_{it}), a dummy variable ($event_t$) that takes the value of zero for the pre-reform period from 2001–2005, and one for the post-reform period from 2006–2010, a dummy variable that takes the value of one for family firms, and zero for non-family firms ($family_i$) in columns I–III, a variable that sorts firms into quintiles according to the Herfindahl index of ownership concentration ($herf\ owner_i$) in columns IV–VI, and a variable that sorts firms into quintiles according to CEOs' ownership share ($ceo\ owner_i$) in columns VII–IX, and the interactions of all independent variables. Standard errors are reported in brackets. The bottom of the table provides information on fixed effects and the clustering of standard errors. Details on control variables for each regression can be found in the text. ***, **, and * denote statistical significance at the 1%, the 5%, and the 10% levels, respectively.

Table 8: Cross-Sectional Tests

	I	II	III	IV	V	VI
	Tangibility			Investment Opportunities		
Dep var:	$DebtA_{it}$	IR_{it}	$InvA_{it}$	$DebtA_{it}$	IR_{it}	$InvA_{it}$
DR_{it}	0.0659***	0.0168***	0.0155***	0.0866***	0.0206***	0.0033**
	[0.0045]	[0.0024]	[0.0019]	[0.0027]	[0.0017]	[0.0015]
$DR_{it} * event_t$	0.0077*	0.0075***	-0.0151***	-0.0067**	-0.0021	0.0025
	[0.0041]	[0.0021]	[0.0029]	[0.0029]	[0.0019]	[0.0017]
$tang_i$	0.0054	0.0019	0.0797***			
	[0.0035]	[0.0016]	[0.0037]			
$tang_i * event_t$	-0.0173***	0.0014	-0.0590***			
	[0.0036]	[0.0014]	[0.0038]			
$tang_i * DR_{it}$	-0.0009	0.0000	-0.0091***			
	[0.0012]	[0.0005]	[0.0008]			
$tang_i * DR_{it} * event_t$	0.0024**	-0.0012**	0.0092***			
	[0.0012]	[0.0005]	[0.0010]			
IO_i				0.0400***	0.0042***	0.0359***
				[0.0025]	[0.0013]	[0.0031]
$IO_i * event_t$				-0.0144***	-0.0025*	-0.0194***
				[0.0025]	[0.0014]	[0.0026]
$IO_i * DR_{it}$				-0.0078***	-0.0015***	-0.0044***
				[0.0008]	[0.0004]	[0.0007]
$IO_i * DR_{it} * event_t$				0.0058***	0.0019***	0.0016***
				[0.0008]	[0.0004]	[0.0006]
Observations	143,153	139,191	142,793	139,034	135,361	139,916
R-squared	0.313	0.142	0.132	0.340	0.140	0.117
Ind-Year FE	yes	yes	yes	yes	yes	yes
Controls	yes	yes	yes	yes	yes	yes
Clustered SE	ind	ind	ind	ind	ind	ind

This table shows the results of regressing firms' debt to asset ratio ($DebtA_{it}$), interest rates (IR_{it}), and investment to asset ratio ($InvA_{it}$) on a lagged default risk variable that takes the value of one for the safest quintile of firms, up to five for the riskiest quintile of firms (DR_{it}), a dummy variable ($event_t$) that takes the value of zero for the pre-reform period from 2001–2005, and one for the post-reform period from 2006–2010, a variable that sorts firms into quintiles according to their pre-reform level of asset tangibility ($tang_i$) in columns I–III, and a variable that sorts firms into quintiles according to their pre-reform level of investment opportunities (IO_i) in columns IV–VI, and the interactions of all independent variables. Standard errors are reported in brackets. The bottom of the table provides information on fixed effects and the clustering of standard errors. Details on control variables for each regression can be found in the text. ***, **, and * denote statistical significance at the 1%, the 5%, and the 10% levels, respectively.

Table 9: Investment - Growth in Firm Profits

Dep var:	I	II	III	IV	V	VI	VII	VIII
	$\Delta\ Profits_{it,t-1}/Assets_{it-1}$							
DR_{it}	0.0093***	0.0126***	0.0118***	0.0034***	0.0056***	0.0067***	0.0028*	0.0106***
	[0.0008]	[0.0008]	[0.0008]	[0.0009]	[0.0015]	[0.0013]	[0.0015]	[0.0010]
$DR_{it} * event_t$	0.0014*	0.0027***	0.0027***	0.0007	-0.0024	-0.0019	0.0011	-0.0055***
	[0.0007]	[0.0008]	[0.0009]	[0.0012]	[0.0019]	[0.0019]	[0.0023]	[0.0013]
$family_i$				0.0176***				
				[0.0035]				
$family_i * event_t$				-0.0097**				
				[0.0047]				
$family_i * DR_{it}$				-0.0045***				
				[0.0011]				
$family_i * DR_{it} * event_t$				0.0035***				
				[0.0013]				
$herf\ owner_i$					0.0059***			
					[0.0013]			
$herf\ owner_i * event_t$					-0.0030*			
					[0.0017]			
$herf\ owner_i * DR_{it}$					-0.0016***			
					[0.0004]			
$herf\ owner_i * DR_{it} * event_t$					0.0019***			
					[0.0004]			
$ceo\ owner_i$						0.0070***		
						[0.0010]		
$ceo\ owner_i * event_t$						-0.0044***		
						[0.0015]		
$ceo\ owner_i * DR_{it}$						-0.0019***		
						[0.0003]		
$ceo\ owner_i * DR_{it} * event_t$						0.0015***		
						[0.0005]		
$tang_i$							-0.0024*	
							[0.0013]	
$tang_i * event_t$							0.0015	
							[0.0019]	
$tang_i * DR_{it}$							-0.0004	
							[0.0004]	
$tang_i * DR_{it} * event_t$							0.0004	
							[0.0006]	
IO_i								0.0202***
								[0.0012]
$IO_i * event_t$								-0.0162***
								[0.0016]
$IO_i * DR_{it}$								-0.0031***
								[0.0003]
$IO_i * DR_{it} * event_t$								0.0024***
								[0.0005]
Observations	183,866	164,102	164,102	138,140	138,140	138,140	143,249	139,250
R-squared	0.013	0.028	0.082	0.119	0.119	0.119	0.122	0.127
Year FE	yes	yes	-	-	-	-	-	-
Ind FE	no	yes	-	-	-	-	-	-
Ind-Year FE	no	no	yes	yes	yes	yes	yes	yes
Controls	no	yes	yes	yes	yes	yes	yes	yes
Clustered SE	ind	ind	ind	ind	ind	ind	ind	ind

This table shows the results of regressing firms' profits growth scaled by assets ($\Delta\ Profits_{it,t-1}/Assets_{it-1}$) on a lagged default risk variable that takes the value of one for the safest quintile of firms, up to five for the riskiest quintile of firms (DR_{it}), a dummy variable ($event_t$) that takes the value of zero in the pre-reform period from 2001–2005, and one for the post-reform period from 2006–2010, a variable that sorts firms into family firms and non-family firms ($family_i$) in column IV, a variable that sorts firms into quintiles according to their ownership concentration ($herf\ owner_i$) in column V, a variable that sorts firms into quintiles according to their CEO ownership share ($ceo\ owner_i$) in column VI, a variable that sorts firms into quintiles according to their pre-reform level of tangibility ($tang_i$) in column VII, a variable that sorts firms into quintiles according to their pre-reform level of investment opportunities (IO_i) in column VIII, and the interactions of all independent variables. Standard errors are reported in brackets. The bottom of the table provides information on fixed effects and the clustering of standard errors. Details on control variables for each regression can be found in the text. ***, **, and * denote statistical significance at the 1%, the 5%, and the 10% levels, respectively.

Table 10: Investment - Cash Flow Volatility

Dep var:	I	II	III	IV	V	VI	VII	VIII
				$cf\ vola_{it}$				
DR_{it}	0.1439***	0.1251***	0.1327***	0.2486***	0.5065***	0.4043***	0.0874**	0.4758***
	[0.0180]	[0.0194]	[0.0180]	[0.0289]	[0.0466]	[0.0461]	[0.0395]	[0.0361]
$DR_{it} * event_t$	0.0528***	0.0556***	0.0398***	0.0381	0.0047	0.0084	0.0433	-0.1199***
	[0.0178]	[0.0159]	[0.0147]	[0.0287]	[0.0423]	[0.0442]	[0.0462]	[0.0389]
$family_i$				0.3541***				
				[0.0758]				
$family_i * event_t$				-0.1862*				
				[0.1107]				
$family_i * DR_{it}$				-0.1524***				
				[0.0270]				
$family_i * DR_{it} * event_t$				0.0696*				
				[0.0366]				
$herf\ owner_i$					0.3264***			
					[0.0312]			
$herf\ owner_i * event_t$					-0.1525***			
					[0.0350]			
$herf\ owner_i * DR_{it}$					-0.1143***			
					[0.0109]			
$herf\ owner_i * DR_{it} * event_t$					0.0223**			
					[0.0109]			
$ceo\ owner_i$						0.1875***		
						[0.0323]		
$ceo\ owner_i * event_t$						-0.0659*		
						[0.0377]		
$ceo\ owner_i * DR_{it}$						-0.0764***		
						[0.0115]		
$ceo\ owner_i * DR_{it} * event_t$						0.0203*		
						[0.0122]		
$tang_i$							-0.0450	
							[0.0382]	
$tang_i * event_t$							-0.0027	
							[0.0475]	
$tang_i * DR_{it}$							0.0255**	
							[0.0112]	
$tang_i * DR_{it} * event_t$							0.0020	
							[0.0139]	
IO_i								0.4505***
								[0.0319]
$IO_i * event_t$								-0.2657***
								[0.0367]
$IO_i * DR_{it}$								-0.1065***
								[0.0098]
$IO_i * DR_{it} * event_t$								0.0558***
								[0.0120]
Observations	43,109	43,109	43,109	28,986	28,986	28,986	34,190	33,015
R-squared	0.373	0.407	0.417	0.461	0.467	0.463	0.450	0.460
Year FE	yes	yes	-	-	-	-	-	-
Ind FE	no	yes	-	-	-	-	-	-
Ind-Year FE	no	no	yes	yes	yes	yes	yes	yes
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Clustered SE	ind	ind	ind	ind	ind	ind	ind	ind

This table shows the results of regressing firms' cash flow volatility ($cf\ vola_{it}$) on a default risk variable that takes the value of one for the safest quintile of firms, up to five for the riskiest quintile of firms (DR_{it}), a dummy variable ($event_t$) that takes the value of zero for the pre-reform period from 2001–2005, and one for the post-reform period from 2006–2010, a variable that sorts firms into family firms and non-family firms ($family_i$) in column IV, a variable that sorts firms into quintiles according to their ownership concentration ($herf\ owner_i$) in column V, a variable that sorts firms into quintiles according to their CEO ownership share ($ceo\ owner_i$) in column VI, a variable that sorts firms into quintiles according to their pre-reform level of tangibility ($tang_i$) in column VII, a variable that sorts firms into quintiles according to their pre-reform level of investment opportunities (IO_i) in column VIII, and the interactions of all independent variables. For the dependent variable, cash flow volatility ($cf\ vola_{it}$) is computed separately for the pre-reform and post-reform period. The default rank variable and the control variables are the averages of the variables for the respective period. Standard errors are reported in brackets. The bottom of the table provides information on fixed effects and the clustering of standard errors. Details on control variables for each regression can be found in the text. ***, **, and * denote statistical significance at the 1%, the 5%, and the 10% levels, respectively.

Table 11: Innovation

Dep var:	I $RnDA_{it}$	II $RnDA_{it}$	III $RnDA_{it}$	IV $PatentsA_{it}$	V $PatentsA_{it}$	VI $PatentsA_{it}$	VII $PatentsA_{it}$
DR_{it}	-0.0044***	-0.0018***	-0.0022**	-0.0091***	-0.0075***	-0.0070***	-0.0034***
	[0.0007]	[0.0005]	[0.0006]	[0.0019]	[0.0017]	[0.0018]	[0.0008]
$DR_{it} * event_t$	0.0010*	0.0012**	0.0013**	0.0052***	0.0042***	0.0036**	0.0015**
	[0.0006]	[0.0006]	[0.0006]	[0.0016]	[0.0015]	[0.0016]	[0.0007]
Observations	30,006	28,603	28,603	68,270	64,748	64,748	164,120
R-squared	0.015	0.203	0.276	0.008	0.077	0.132	0.116
Year FE	yes	yes	-	yes	yes	-	-
Ind FE	no	yes	-	no	yes	-	-
Ind-Year FE	no	no	yes	no	no	yes	yes
Controls	no	yes	yes	no	yes	yes	yes
Clustered SE	ind	ind	ind	ind	ind	ind	ind

This table shows the results of regressing firms' R&D expenditures to asset ratio ($RnDA_{it}$) and the number of annual patent applications ($PatentsA_{it}$) per billion won of firms' assets on a lagged default risk variable that takes the value of one for the safest quintile of firms, up to five for the riskiest quintile of firms (DR_{it}), and the interaction of the default risk variable with a dummy variable ($event_t$) that takes the value of zero for the pre-reform period from 2001–2005, and one for the post-reform period from 2006–2010. Standard errors are reported in brackets. The bottom of the table provides information on fixed effects and the clustering of standard errors. Details on control variables for each regression can be found in the text. ***, **, and * denote statistical significance at the 1%, the 5%, and the 10% levels, respectively.

Appendix A. Unified Bankruptcy Act

This section lists the additional changes in corporate reorganization law due to the UBA.

- The UBA does not contain an automatic stay mechanism. The court may, however, grant a comprehensive stay order restricting claim enforcement of secured and unsecured creditors. Under the CRA the debtor had to apply to the court for stay orders for each creditor separately.
- Under the UBA, the debtor may sell part of the firm before the confirmation of a rehabilitation plan if approved by the court and not in violation with other procedural regulations. In contrast, under the CRA any sale on account of the firm was prohibited until the confirmation of a reorganization plan.
- Under the CRA, all creditors needed to file their claims before a deadline set by the court for the claims to be considered. The new act assumes all claims to be filed if they appear on a list of creditors submitted by the receiver (typically debtor's management).
- Under the CRA, a viability test compared the liquidation value and the value of the company as a going concern. In the event of the liquidation value exceeding the continuation value the court was bound to mandate liquidation of the company. Under the UBA each creditor is guaranteed to receive at least the amount they would receive under liquidation unless the creditor agrees to a lower amount. The old law did not provide such a guarantee to creditors.
- Under the UBA, the establishment of a creditors' committee is mandatory. The creditor committee coordinates the interest of the creditors and may demand specific information from the debtor and request an investigation of the rightfulness of management control during rehabilitation.
- Under the UBA, international bankruptcy proceedings may be recognized in Korea for the settlement of international cases, whereas under the old law only bankruptcy proceedings filed for in Korea were recognized.

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