

Resolving a Dilemma of Signaling Bankrupt-firm Emergence: A Dynamic Integrative View

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RESOLVING A DILEMMA OF SIGNALING BANKRUPT-FIRM EMERGENCE: A DYNAMIC INTEGRATIVE VIEW

RESEARCH SUMMARY

Predicting the emergence of bankrupt firms relying on firm signals involves a stigma-related dilemma. On the one hand, bankrupt firms tend to send positive signals through restructuring to decouple themselves from the stigma of bankruptcy. On the other hand, the preexistence of the bankruptcy stigma may reduce the signaling effectiveness of firms' restructuring efforts, making the outcome prediction difficult. We address this dilemma by developing a dynamic integrative view to extend signaling theory, arguing that subsequent signals from key external stakeholders can effectively help evaluate bankrupt firms' quality and reduce the ambiguity in interpreting firms' restructuring signals. Using a sample of U.S. public bankrupt firms under Chapter 11 reorganization, we find evidence supporting the argument.

MANAGERIAL SUMMARY

Applications of signaling theory to predict reorganization outcomes are in their infancy. The dynamic integrative framework developed in this study is useful in identifying different types of signals and predicting outcomes of firms in crisis. The results of this study can be useful for various decision makers to predict the turnaround potential of bankrupt firms. Our results show that an increase in alliance partners, institutional investors, and securities analysts following a bankrupt firm predicts the firm's reorganization outcome. Moreover, firms that are able to gain positive attention from key stakeholders will also gain positive interpretations of their strategic efforts. Signals from alliance partners and institutional investors amplify the signaling effect of a firm's de-diversification effort in predicting its reorganization outcome.

Keywords: signaling theory, dilemma, stigmatized organization, a dynamic integrative view, reorganization outcome, de-diversification, stakeholder signal

INTRODUCTION

Bankrupt firm emergence has received considerable research attention as “hundreds of thousands of firms around the world declare bankruptcy each year” (Lee, Peng, and Barney, 2007: 257). Scholars agree that higher-quality firms are more likely to emerge from bankruptcy (Daily, 1994; Lee, Peng, and Barney, 2007). Nevertheless, it is not easy to assess the quality of bankrupt firms and predict their reorganization outcomes due to problems such as information asymmetry and damaged reputation (Trahms, Ndofor, and Sirmon, 2013). Signaling theory provides a promising lens to address the problem because it provides mechanisms in determining actors’ quality under conditions of information asymmetry (Spence, 1973, 2002). A basic consensus is that visible and credible signals are useful in communicating signalers’ unobservable qualities, thus predicting their prospects (Certo, 2003; for an extensive review, see Connelly *et al.*, 2011). However, the stigma created by the bankruptcy filing imposes new challenges for applying signaling theory in the post-bankruptcy context.

Specifically, although stigmatized firms tend to take actions to remove the stigma by decoupling themselves from discredited events (Boeker, 1992; Elsbach and Sutton, 1992), “behavioral changes may not be enough on their own to signal change and prevent or remove a stigma” (Devers *et al.*, 2009: 166). The strategy literature on portfolio restructuring has documented that it is common for bankrupt firms to engage in refocusing or de-diversification activities in order to emerge from the crisis (Brauer, 2006; Johnson, 1996; Moschieri and Mair, 2008). In our view, however, relying solely on a bankrupt firm’s de-diversification signal to predict its reorganization outcome presents a stigma-related dilemma.

On the one hand, de-diversification provides a credible signal to predict a bankrupt firm’s reorganization prospect. Over-diversification has been identified as a primary course for decline

and bankruptcy (Hambrick and D'Aveni, 1988) since resources in a firm with multiple businesses may flow toward less efficient segments and reduce its overall efficiency (Rajan, Servaes, and Zingales, 2000). De-diversification, as a correction to a prior error (Johnson, 1996; Moschieri and Mair, 2008), indicates that a bankrupt firm's turnaround strategy is underway. This effort may help a firm emerge from Chapter 11 bankruptcy (Denis and Rodgers, 2007) because concentration on core businesses may improve firm quality and lead to rejuvenation (Stopford and Baden-Fuller, 1990).

On the other hand, the initial negative signal of bankruptcy may overshadow the positive signal provided by a bankrupt firm's restructuring efforts. Stigmatized firms often bear significant loss of reliability and legitimacy (Devers *et al.*, 2009). Bankruptcy filing can stigmatize the bankrupt firm with a stereotype of low quality and reliability, tarnishing its reputation and image (Flynn and Farid, 1991; Sutton and Callahan, 1987). Such stigma can create ambiguities in interpreting the subsequent positive signals from the signaler. For example, Herbig and Milewicz (1995) found that damaged reputation negated the benefit of a firm's recent positive transaction records, a credible and positive signal about its trustworthiness in interfirm transactions. From this standpoint, visible and credible signals from a stigmatized signaler may not always effectively help communicate its quality and predict its prospect.

Our study strives to resolve the stigma by developing a dynamic integrative view. We start below with shifting research attention from a bankrupt firm's restructuring signals to signals emitted from external stakeholders' actions toward the bankrupt firm. Then, we develop hypotheses and test the idea that stakeholder signals are useful not only in predicting the firm's reorganization prospect, but also in amplifying the signaling effect of its de-diversification efforts. Finally, we discuss implications for advancing signaling theory.

THEORY AND HYPOTHESES

A Dynamic Integrative View of Reorganization Outcomes

A signal is a snapshot of a firm's unobservable quality at a particular time point (Davila *et al.*, 2003). The influence of a signal can grow weaker over time (Janney and Folta, 2006), especially when subsequent signals emerge. From the dynamic signaling perspective, although Chapter 11 bankruptcy filing stigmatizes firms with an initial negative signal about their quality, it also indicates the beginning of the reorganization process to alleviate the stigma (Jory and Madura, 2010; Lee, Peng, and Barney, 2007). Positive signals from actions of a bankrupt firm and its external stakeholders may emerge during this process as the firm improves its quality. Moreover, subsequent firm and stakeholder signals may interact with each other to alleviate the initial negative signal of the bankruptcy stigma. Our dynamic integrative view maintains that incorporating stakeholder signals is particularly useful as they reflect changes in firm quality over time and more accurately reflect the firm's reorganization prospects.

The dynamic integrative view is built on the notion that firms are embedded in their relationships with external stakeholders (Granovetter, 1985). Some key stakeholders can gain access to otherwise inaccessible information (Rao and Sivakumar, 1999), which allows them to assess the true quality of the firm. Our study highlights signals from three types of key stakeholders, alliance partners, institutional investors, and securities analysts, whose actions satisfy the two basic signaling criteria: visibility and credibility (Certo, 2003; Spence, 1973). First, actions of these stakeholders are highly visible. Second, it is difficult to manipulate these signals because stakeholders' investments and/or reputation are at stake. More importantly, signals from these stakeholders do not suffer from the stigma of bankruptcy. In addition, they tend to follow high-quality firms (Stuart, Hoang, and Hybels, 1999).

Following existing studies (e.g., Daily, 1995; Demers and Joos, 2007), we focus on the delisting of public firms as a negative outcome of reorganization, and stock market survival or being acquired as a positive outcome, to examine the extent to which stakeholder signals can predict the hazard of a bankrupt firm's delisting. Signaling effectiveness can be enhanced by signal frequency, an increase in observable signals during a certain period of time (Filatotchev and Bishop, 2002; Janney and Folta, 2006). We propose that an increase in stakeholders following a bankrupt firm provides a valuable signal that may not only predict its reorganization outcomes, but also amplify the signaling effect of the firm's de-diversification effort.

Positive Stakeholder Actions as Alternative Sources of Signal

Increase in Alliance Partners. Alliance activities provide a visible and credible signal reflecting desirable but unobservable firm quality such as competency, reputation, and reliability (Ozcan and Overby, 2008). This signal is particularly useful in evaluating the quality of bankrupt firms. Alliance formation is a negotiated process in which firms tend to find out critical information about each other's strengths and weaknesses. When forming alliances with a bankrupt firm, a particular concern is about the firm's quality. Potential partners will choose those that have the potential to revitalize in order to ensure stability against disruptive effects (Dyer and Singh, 1998). Thus, higher-quality bankrupt firms with the potential to emerge are more likely to attract alliance partners over time. In contrast, lower-quality bankrupt firms will have a difficult time doing so due to their lack of expected quality. As a result, an increase in the number of alliances formed by a bankrupt firm can serve as an important signal to predict the firm's emergence because more partners are willing to endow the firm with exchange contracts.

Hypothesis 1: A bankrupt firm's hazard of delisting from the stock market will be negatively related to an increase in alliances formed by the firm during the reorganization process.

Increase in Institutional Investors. Institutional investors control more than half of all the equity in U.S. public firms (Certo, 2003), including many bankrupt firms (Daily, 1996). Although investing in bankrupt firms involves high levels of risk, it can also multiply the market value of investors' equity many times if the firm revitalizes (Morse and Shaw, 1988). We argue that institutional investments in a bankrupt firm can generate a positive signal for two reasons. First, institutional investments hold "smart money" managed by fund managers who are investment experts (Sanders and Boivie, 2004: 172). They are capable of assessing a bankrupt firm's quality due in part to a reduced information asymmetry given their interactions with the firm's top executives. Second, institutional investors do not randomly choose bankrupt firms in which to invest. Instead, they must carefully choose a reliable firm that is more likely to survive in the stock market so as to reduce the valuation uncertainty. As such, these investors will follow higher-quality bankrupt firms with promising prospects. Taken together, an increase in the number of institutional investors a bankrupt firm attracted demonstrates that these investors have faith in the firm (D'Aveni, 1989), therefore signaling its perceived potential to emerge.

Hypothesis 2: A bankrupt firm's hazard of delisting from the stock market will be negatively related to an increase in institutional investors who invest in the firm during the reorganization process.

Increase in Securities Analyst Coverage. Securities analysts play an important role of collecting and disseminating information on public firms and analyst coverage is highly visible. Securities analysts are experts capable of evaluating firm quality in certain industries. They typically "favor covering firms whose stock market performance is expected to be good in the future and avoiding poor performers" (Rao, Greve, and Davis, 2001: 502). Evidence shows that analysts tend to abandon their coverage of firms that fall short of their expectations because the analyst's reputation is at stake. (Rao, Greve, and Davis, 2001). We maintain that higher-quality

bankrupt firms are more likely to attract, sustain, and even increase analysts' attention. Lower-quality bankrupt firms, on the contrary, may not be able to do so. Therefore, an increase in analyst coverage of a bankrupt firm signals that this firm has greater potential to emerge.

Hypothesis 3: A bankrupt firm's hazard of delisting from the stock market will be negatively related to an increase in securities analysts' coverage of the firm during the reorganization process.

Restructuring Signal and Stakeholder Signals: An Integrative Approach

Signal interpretation often relies on receivers' beliefs in a signaler based on the signaler's reputation rather than its intention (Ponzi, Fombrun, and Gardberg, 2011). Due to the stigma-related dilemma discussed above, restructuring signals from bankrupt firms are difficult to interpret. However, restructuring and stakeholder signals may interact. Exploring "how different types of signals interact with one another" has been viewed as one of the ways to advance signaling theory (Connelly *et al.*, 2011: 61). Our integrative approach clarifies key mechanisms whereby one type of signal can improve the interpretation of another.

We argue that stakeholder signals will amplify the signaling effect of de-diversification on reorganization outcomes for three reasons. First, although de-diversification is often viewed as a positive signal to refocus on core competence by firms in crisis (Johnson, 1996; Pandey and Verma, 2005; Moschieri and Mair, 2008), external interpretation of the signal can be obscured under the shadow of bankruptcy (Campbell, Hilscher, and Szilagyi, 2008). Stakeholder signals can help clarify the ambiguity about the positive progress of a bankrupt firm's de-diversification, which might be difficult to observe and interpret without such supports.

Second, the stigma of bankruptcy may even result in misleading interpretations of the firm's strategies due to negative perceptions or beliefs about the stigmatized firm (Ponzi *et al.*, 2011). However, a reduced information asymmetry can increase the confidence when evaluating

the firm's true value (Womack, 1996). Stakeholder signals can help reduce the information asymmetry as their endorsements disseminate information whereby the interpretation of restructuring signals can be better aligned with a firm's underlying quality. In contrast, the signal of de-diversification is less useful without stakeholders' endorsement.

Third, de-diversification is commonly desired by external stakeholders but for different reasons. Specifically, alliance partners are concerned about a firm's reliability or core competency on which they can depend (Jensen, 2004). Institutional investors pay attention to de-diversification because diversified firms often suffer from a discount of its stock price (Rajan, Servaes, and Zingales, 2000). Moreover, a diversified firm makes it difficult for analysts to estimate its true value (Zuckerman, 1999). Meanwhile, all these stakeholders tend to follow firms that demonstrate effective strategic changes to improve their qualities and enhance the potential of emergence. In such a manner, although the bankruptcy stigma makes it difficult to interpret a firm's de-diversification effort, the existence of strong stakeholder signals indicates that the de-diversification efforts of this firm can be viewed as a desirable action in line with the common expectation of these stakeholders. Taken together, we expect:

Hypothesis 4: An increase in (H4a) alliance partners, (H4b) institutional investors, or (H4c) securities analysts following a bankrupt firm during the reorganization process will strengthen the signaling effect of de-diversification on the firm's hazard of delisting.

METHOD

Sample Selection

Among all the public firms with financial and diversification data available in COMPUSTAT, we identified bankrupt firms from three sources: the UCLA-LoPucki Bankruptcy Research Database (BRD), the Security Data Corporation (SDC) Bankruptcy database, and the Sarbanes-Oxley (SOX) Bankruptcy database. We combined information from

these databases and excluded duplicated cases, which yielded a sample of 1,671 firms filing for Chapter 11 bankruptcy from 1992 to 2007. Following prior studies (e.g., Hotchkiss, 1995; Moulton and Thomas, 1993), we tracked each firm for five years after the bankruptcy year. We further excluded 1,321 firms that were delisted in the year of bankruptcy because all independent variables were lagged by one year. We included the inverse Mills ratio in our regression analyses to control for the potential sample selection bias (Heckman, 1976)

The final sample included 350 firms, of which 186 survived, 68 were acquired, and 96 were delisted. The unit of analysis is the firm-year. The 350 firms resulted in 1,787 firm-year observations. The annual time period for each firm started one year after its Chapter 11 filing until the cut-off year when a firm (1) survived after five years, (2) was acquired by another firm within the five years, and (3) was delisted for negative reasons within the five years.

Measures

Delisting. The dependent variable, bankrupt firm delisting, was coded “1” in the year of delisting, otherwise coded “0.” We used COMPUSTAT and CRSP for identifying deletion reasons and searched the Lexis-Nexus and Factiva databases to code the dependent variable. Note that being acquired by other firms has been viewed as a desired outcome rather than corporate failure (Daily, 1995). Thus, the acquired bankrupt firms were coded as “0.”

De-diversification. Using the COMPUSTAT segment database, we measured de-diversification as the change in the number of business segments between year t-1 and year t-2 (Zuckerman, 1999), namely, a decrease in the number of segments.

Increase in the number of alliance partners. This construct was measured by (the number of alliances in year t-1) – (the number of alliances in year t-2), that is an increase in the

number of alliances over time. We collected alliance data from the SDC Alliances database, and confirmed these alliances through a search of the Factiva and Lexis-Nexus databases.

Increase in the number of institutional investors. Similarly, using data from the Thomson-Reuters Institutional (13F) Holdings database, we calculated this variable as (the number of institutional investors in year t-1) – (the number of institutional investors in year t-2).

Increase in analyst coverage. Using the I/B/E/S database, we calculated this variable as (the number of analysts in year t-1) – (the number of analysts in year t-2).

We controlled for both financial and strategic explanations that are particularly relevant for bankruptcy research (Daily and Dalton, 1995). Specifically, we controlled for each firm's return-on-asset (ROA), assets (Moulton and Thomas, 1993), Tobin's q (logged) (Baker, Stein, and Wurgler, 2003), leverage ratio, and Altman Z-score (Altman, 1968). We also controlled for firms' geographic and business diversification, measured by foreign sales as a percentage of total sales (Sullivan, 1994) and the Herfindahl index (Palepu, 1985), respectively. The data were collected from the COMPUSTAT Geographic and Business Segment databases. We standardized the Herfindahl score to avoid potential multicollinearity. Moreover, we controlled for CEO change, as measured by the accumulated number of CEO turnovers occurring at a given firm for each year since the year of bankruptcy filing and firm downsizing, as measured by a decrease in the number of employees since a previous year.

Regarding environmental effects, we controlled for the period from 2002 to 2012, as the Sarbanes-Oxley Act (SOX) of 2002 mandates the disclosure of internal control effectiveness. We controlled for stock market volatility, which was computed by the annual deviance of Dow Jones index (French, Schwert, and Stambaugh, 1987). We also controlled for high-tech industry based

on a firm's four-digit SIC codes. To guard against other unobserved heterogeneity, we fixed industry effects based on firms' two-digit SIC codes (Amburgey and Miner, 1992).

Method of Analysis

We used event history technique to model the hazard of bankrupt firm delisting. Event history analysis models the hazard rate, which is the likelihood that a firm will be delisted at time t , given that it has not been delisted before t (Allison, 1999). Our estimations derived from the Cox proportional hazards regression model (Cox, 1972). We also clustered observations based on firm ID and year in model specification to address the potential problem of autocorrelation and heteroskedasticity (Wooldridge, 2002).

RESULTS

Table 1 provides means, standard deviations, and correlations. Table 2 reports the results of the event history analyses. Model 1 provides the baseline model including control variables only. Model 2 adds the independent variables. Models 3-5 add the three interactions, respectively. Model 6 is the full model including all predictor variables and interactions. The odds ratio of de-diversification is 0.96 (ns.), in line with the dilemma argument.

Insert Table 1 and Table 2 about here

Hypotheses 1, 2, and 3 predict that a bankrupt firm's hazard of delisting will be negatively related to increases in alliance partners, institutional investors, and securities analyst coverage, respectively. The evidence from Model 2 supports these three hypotheses. The odds ratio for increase in alliances is 0.71 ($p < 0.05$), indicating that increasing one new alliance is associated with a reduced hazard of delisting by 28.62 percent. The odds ratio of the increase in institutional investors is 0.99 ($p < 0.001$), indicating that increasing one institutional investor can

reduce hazard rate of delisting by 1.27 percent. The odds ratio of increase in analyst coverage is 0.69 ($p < 0.01$), indicating that a one-unit increase in securities analyst coverage is associated with a reduced hazard rate of delisting by 31.2 percent.

Hypothesis 4a predicts that a bankrupt firm's de-diversification efforts can better predict its delisting when it has formed more alliances. In Model 6, the odds ratio for the interaction between increase in alliances and de-diversification is 0.76 ($p < 0.05$) (see also Figure 1a). Likewise, Hypothesis 4b posits that the signaling effect of de-diversification is stronger when more institutional investors invest in the firm. The odds ratio for the interaction between the increase in institutional investors and de-diversification is 0.99 ($p < 0.001$) (see also Figure 1b). The two hypotheses are supported. However, Hypothesis 4c, which predicts that the effect of de-diversification is stronger when securities analysts increasingly follow the firm, is not supported.

Insert Figures 1a & 1b about here

DISCUSSION AND CONCLUSIONS

We have identified and resolved a stigma-related dilemma in the post-bankruptcy context by developing a dynamic integrative view. We contribute to signaling theory (Spence, 1973) by expanding its application scope to better understand signals emitted from stigmatized signalers. Our study highlights the interactive signaling dynamics in the reorganization process and shifts research focus from firm restructuring signal to stakeholder signals in terms of signal fit, i.e. how to identify “the link between a signal and the underlying quality” (Connelly *et al.*, 2011: 59). Our study goes one step beyond existing studies since we address the question of how signaling theory can be used to predict reorganization outcomes of stigmatized signalers.

The unique context allows us to enrich the signaling theory literature in two ways by specifying the dynamics of signals (i.e., reflecting the change in firm quality) and exploring the interaction of multiple signals (reorganization and stakeholder actions). First, the dynamic approach complements existing studies that rely on pre-filing conditions to explain reorganization prospects (e.g., Hotchkiss, 1995; Jory and Madura, 2010; Moulton and Thomas, 1993). Pre-filing conditions, while useful, are unable to shed light into the dynamic process of reorganization, given that bankrupt firms often undergo substantial changes. The stigma of bankruptcy may melt away over time when subsequent positive signals emerge. Second, existing studies have largely focused on the signals emitted by the bankrupt firm itself (e.g., financial disclosure or restructuring strategy) (Johnson, 1996; Moschieri and Mair, 2008). Our results show that de-diversification alone is not sufficient to predict the reorganization outcome. Instead, stakeholder signals not only predict reorganization outcomes, but also largely amplify the signaling effect of de-diversification, indicating that a focus on stakeholder signals beyond signals from the stigmatized signaler can be fruitful in the context of firms in crisis.

This study also adds to the corporate bankruptcy literature by enhancing its theoretical underpinning. As predicting turnaround outcomes is of great interest to scholars, managers, and investors, its importance has been stressed in recent decades (Denis and Rodgers, 2007; Trahms, Ndofor, and Sirmon, 2013). The scholarly challenge is to develop a theory that provides insights to understand this phenomenon. In this regard, our study is important because it provides valuable theoretical guidance for such prediction. Although we used a contextualized approach, our dynamic integrative perspective can be generalized to other contexts of organizational crisis. An organizational crisis is defined as “any event or condition that threatens the survival of the organization” (D’Aveni and MacMillan, 1990: 635), including corporate scandal, financial fraud,

or organizational decline. Such crisis is likely to send a negative signal about firm quality (Marcus and Goodman, 1991), making it difficult to evaluate a firm's true quality to emerge. According to our dynamic integrative view, subsequent positive actions of key external stakeholders are useful signals to help better assess the firm's unobservable quality, which may have important implications to various decision makers.

Several limitations of this study can be identified for further research. Specifically, the stigma-related dilemma depicts a valuable direction for future research by showing the importance of identifying and resolving other signaling dilemmas in different settings, which helps further clarify the application scope of signaling theory. We focused on the hazard of firm delisting after Chapter 11 bankruptcy, a typical organizational crisis. Future studies can benefit from extending the stakeholder-focused approach to different crises and identifying other relevant external stakeholders whose actions should be considered. Moreover, we relied only on three signals generated by stakeholder actions to assess the quality of a given bankrupt firm. Future research could extend our findings to explore other important stakeholder signals.

Future studies may benefit from further exploring the dynamic perspective through which the initial signal of an event are fading away. For example, it is possible that some external stakeholders may quickly respond to the original negative signal of bankruptcy filing, whereas others may react to the subsequent signals. These temporal differences may have different implications for organizational outcomes. As such, it will be important to explore the temporal distribution and influence of the emergence of subsequent signals. Finally, signaling effects may vary across different external stakeholders. Considering the insignificant results about the moderating effect of securities analysts, future research may adopt more nuanced approaches to explore the role of securities analysts when predicting adaptation outcomes.

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Table 1: Descriptive Statistics and Correlations*

	Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Firm performance	-1.46	40.37	1.00															
2	Firm assets (logged)	5.20	2.20	0.08	1.00														
3	Leverage ratio	3.90	93.30	0.00	0.02	1.00													
4	Altman Z score	-3.86	44.42	0.09	0.25	0.00	1.00												
5	Tobin's q (logged)	0.67	0.73	-0.35	-0.47	0.00	-0.31	1.00											
6	Foreign sales ratio	0.52	0.46	0.03	0.20	0.00	0.02	-0.16	1.00										
7	Product diversification	0.84	0.25	-0.02	-0.30	0.04	-0.03	0.12	-0.05	1.00									
8	CEO change	1.00	0.89	0.02	0.15	0.04	-0.01	0.00	-0.05	-0.11	1.00								
9	Downsizing	-0.36	6.84	0.00	-0.01	0.00	0.00	0.04	-0.02	0.06	0.04	1.00							
10	Regulatory change (SOX)	0.54	0.50	-0.03	0.14	0.04	-0.06	0.13	-0.18	-0.22	0.11	0.00	1.00						
11	Stock market shock	0.05	0.03	0.02	-0.03	-0.03	0.00	0.02	0.00	-0.01	-0.03	-0.03	-0.02	1.00					
12	High tech industry	0.14	0.35	-0.01	-0.15	-0.02	-0.09	0.16	-0.13	0.15	0.01	0.00	0.09	-0.02	1.00				
13	Increase in alliances	0.02	0.74	0.00	0.02	-0.01	0.00	-0.03	0.04	-0.01	0.00	-0.10	0.00	-0.02	0.06	1.00			
14	Increase in institutional investors	6.75	34.35	0.01	0.22	-0.01	0.03	0.02	0.04	-0.07	0.15	0.29	0.13	-0.01	0.00	-0.07	1.00		
15	Increase in securities analyst coverage	0.25	1.21	0.01	0.18	0.01	0.03	-0.01	0.02	-0.02	0.06	0.01	0.10	-0.02	0.03	-0.02	0.31	1.00	
16	De-diversification	0.07	1.09	0.00	0.09	-0.01	0.03	-0.06	0.01	-0.01	-0.02	-0.09	0.03	-0.06	0.00	0.67	-0.01	0.01	1.00
19	Delisting	0.07	0.25	0.00	-0.07	0.07	0.00	-0.05	-0.04	0.05	0.05	0.00	-0.08	0.02	-0.02	-0.04	-0.07	-0.09	-0.05

* Correlations with absolute values greater than or equal to 0.05 are significant at the 0.05 level.

Table 2: Results of Cox Event History Analysis of Post-Bankrupt Firm Delisting

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Odds ratio	Z	Odds ratio	Z	Odds ratio	Z	Odds ratio	Z	Odds ratio	Z	Odds ratio	Z
Firm performance	0.99**	-3.01	0.99**	-2.90	0.99**	-2.74	0.99**	-2.99	0.99**	-2.86	0.99**	-2.88
Firm assets (logged)	0.79***	-3.36	0.80**	-2.93	0.82**	-2.84	0.80**	-3.04	0.81**	-2.93	0.82**	-2.90
Leverage ratio	1.01***	8.65	1.01***	8.56	1.01***	8.65	1.01***	8.53	1.01***	8.30	1.01***	9.09
Altman Z score	0.99	-0.99	0.99	-0.87	0.99	-0.84	0.99	-0.85	0.99	-0.86	0.99	-0.87
Tobin's q (logged)	0.45*	-2.51	0.49*	-2.38	0.50*	-2.24	0.48*	-2.40	0.49*	-2.35	0.50*	-2.27
Foreign sales ratio	0.73	-1.13	0.76	-1.00	0.75	-1.07	0.75	-1.06	0.75	-1.03	0.75	-1.12
Product diversification	1.11	0.80	1.11	0.93	1.11	0.95	1.11	0.95	1.12	1.00	1.08	0.74
CEO change	1.21	1.56	1.23†	1.67	1.23†	1.62	1.22	1.59	1.23†	1.67	1.23†	1.61
Downsizing	1.01	0.69	1.01	1.47	1.01	1.57	1.01	1.05	1.01	1.40	1.01	1.02
Regulatory change (SOX)	0.68	-1.39	0.69	-1.35	0.67	-1.45	0.68	-1.36	0.69	-1.34	0.66	-1.49
Stock market shock	22.41	1.56	22.24	1.48	22.11	1.46	22.60	1.57	22.26	1.48	22.37	1.58
High tech industry	1.08	0.20	1.06	0.17	1.09	0.21	1.07	0.18	1.06	0.15	1.11	0.26
Inverse Mills ratio	0.71	-0.85	0.69	-0.86	0.73	-0.73	0.66	-0.97	0.69	-0.85	0.72	-0.77
Increase in alliances			0.71*	-2.32	0.60*	-2.17	0.81†	-1.59	0.76†	-1.86	0.56*	-2.46
Increase in institutional investors			0.99***	-5.54	0.99***	-3.75	0.99***	-5.51	0.99***	-4.33	0.99***	-4.87
Increase in securities analyst coverage			0.69**	-2.62	0.66**	-2.35	0.66**	-3.15	0.69*	-2.43	0.62**	-3.03
De-diversification			0.96	-0.51	0.93	-0.99	0.92	-1.14	0.93	-0.92	0.88†	-1.66
Alliance increase * De-diversify					0.81*	-1.97					0.76*	-2.21
Institutional investor increase * De-diversify							0.99***	-4.43			0.99***	-4.15
Securities analyst coverage * De-diversify									0.99	-0.23	1.02	0.42
Fixed industry effect	yes		yes		yes		yes		yes		yes	
Log pseudo-likelihood	-503.66		-493.62		-481.71		-472.64		-492.47		-460.63	
Wald Chi-square	2665.11***		8315.59***		8716.94***		9575.37***		8615.41***		10292.80***	

- a. The hazard rate of firm delisting is the dependent variable. We reported odds ratios and the Z-scores based on robust standard errors. Odds ratios are interpreted as the proportional change in hazard rate from a one-unit increase in the independent variable. 1 indicates no change. Odds ratios lower than 1 indicate that increases in independent variables decrease the hazard rate, and those greater than 1 indicate that increase in independent variables increase the hazard rate.
- b. † p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001

Figure 1a: Interaction between De-diversification and an Increase in Alliances

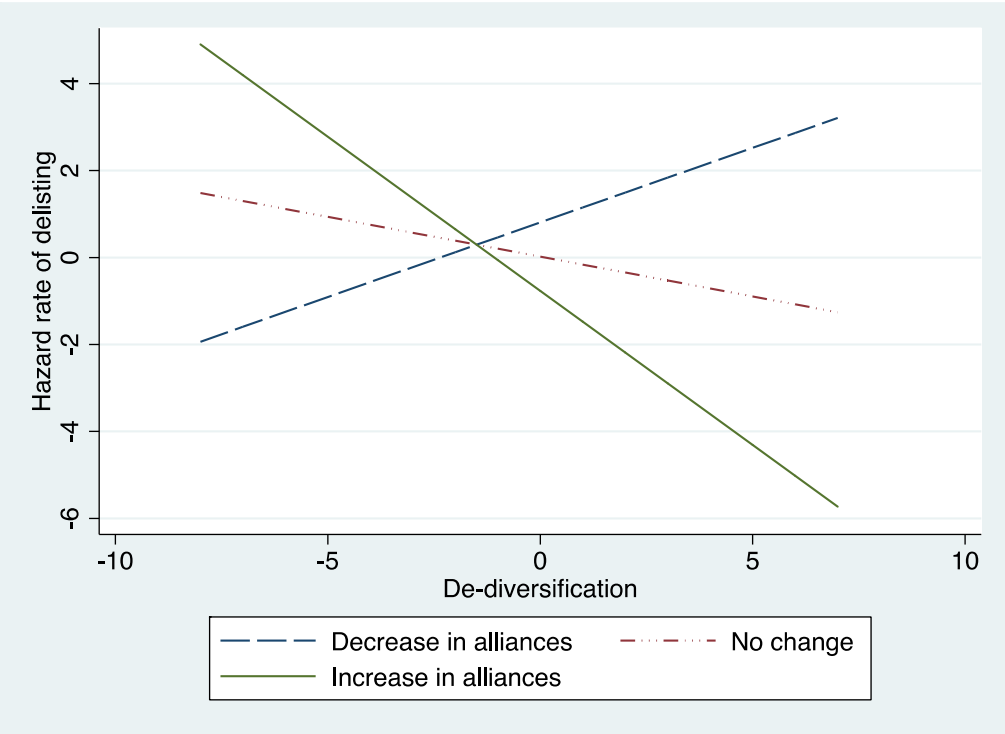


Figure 1b: Interaction between De-diversification and an Increase in Institutional Investors

