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**Systematizing the Empirical Research on Corporate Distress.
What Board Features Affect Survival?**

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Abstract

Over the years, understanding the possible antecedents of corporate distress has received considerable interest among the scholars and practitioners of management worldwide. Also, much of the evolving empirical research around this topic has been increasingly devoted to studying what board features can increase or decrease the survival of distressed firms. Although still fragmented, the advancements within this kind of research have demonstrated that particular board features count. Thus, this article aims at providing both the management scholars and practitioners with the systematization of these advancements. The findings from the present review show that board independence tends to prevent distress situations and increase the survival of those firms that initiate their restructuring. The board heterogeneity and low tenure can also count. Finally, it is evidenced that the heterogeneity of the statistical methods employed by the extant literature has increased proportionally with the time and journal ranking of the reviewed publications.

Keywords: board of directors, corporate distress, systematic review.

SYSTEMATIZING THE EMPIRICAL RESEARCH ON CORPORATE DISTRESS. WHAT BOARD FEATURES AFFECT SURVIVAL?

INTRODUCTION

It is a matter of fact that, at least over the last thirty years, the empirical research on corporate distress has been receiving an ever growing interest among the scholars and practitioners of management worldwide and the management literature has witnessed an increasing number of key articles related to this topic (e.g. Bercovitz & Mitchell, 2007; Daily, 1996; Daily & Dalton, 1994a; 1995; Dowell, Shackell, & Stuart, 2011; Fortune and Mitchell, 2012; Johnson, Hoskisson, & Hitt, 1993; Tripsas & Gavetti, 2000). This research area plays a pivotal role especially at the present time, due to the dramatic consequences recently inherited, at macro, meso and micro levels, from the global financial crisis.

Corporate crisis (D'Aveni & MacMillan, 1990; Wiesenfeld, Wurthmann, & Hambrick, 2008) and corporate turnaround (Chen & Hambrick, 2012; Hoskisson, Johnson, & Moesel, 1994) have been detected as the two most relevant macro-domains within the evolving research on corporate distress. Although, currently, a unique definition of crisis is still missing in the literature, there is a broad consensus on its meaning, which is a situation of continued negative profitability that puts firms at the risk of being selected out from their competitive environment (Arthaud-Day, Trevis Certo, Dalton, & Dalton, 2006; Mellahi & Wilkinson, 2004). Similarly, turnaround has been defined in various ways (Lohrke, Bedeian, & Palmer, 2004; Stopford & Baden-Fuller, 1990), such as merely surviving (e.g. Bibeault, 1982; Donaldson, 1994) or, differently, definitely regaining sustainable competitive advantage (e.g. Hoskisson & Turk, 1990; Wiersema, 1995). Nonetheless, it is common knowledge that both these research sub-domains have mainly been focusing on those firms whose survival is significantly challenged (Agarwal-Tronetti, Sarkar, & Echambadi, 2002). This is why, for the

scope of this article, the term *corporate distress* (Altman, 1983; Gilson & Vetsuypens, 1993) is used to embrace both.

Scholars have developed a plethora of heterogeneous research perspectives to investigate the issues associated with corporate distress. Attention has been mainly given to the studying of its internal (i.e. firm specific) and/or external (i.e. environmentally related) determinants, as well as to the planning of interpretative models for its *ex ante* prevention or for its *ex post* recovery (e.g. Altman, 1968; Argenti, 1976; Billings, Milburn, & Schaalman, 1980; Miller, 1990; Slatter, 1984; Zimmerman, 1991). Furthermore, along with the evolving research on the boards of directors (Aguilera & Jackson, 2010; Golden & Zajac, 2001; Hambrick, van Werder, & Zajac, 2008; Jensen & Zajac, 2004),¹ scholars have also been devoting considerable time to empirically addressing the question of what board characteristics (e.g. independence, size or socio-demographic features) increase or decrease the survival of the distressed firms (e.g. D'Aveni, 1989, 1990; Filatotchev & Toms, 2003; Hambrick & D'Aveni, 1988, 1992; Mueller & Barker III, 1997; Wiersema, 1995).

To date, the extant empirical evidence about the illustrated research question seems mature enough to warrant a systemic discussion, as it has generally demonstrated that particular board features count. Still, this evidence appears currently to be fragmented and this is why systematizing its research results can be particularly relevant to both scholars and practitioners (Aguilera, Filatotchev, Gospel, & Jackson, 2008; Daily, McDougall, Covin, and Dalton, 2002). Thus, this article aims at contributing to fill this gap by providing its readers with the results of a systematic literature review, whose methods stem from other important literature assessments recently published in the management literature (e.g., David & Han, 2004; Newbert, 2007).

¹ It is worth mentioning that, in the present article, the term *board of directors* is also used for conceptualizing 'top management teams', although it is acknowledged that some differences exist between these concepts. As these differences appear not to be relevant to the aims of this article, the term 'board of directors' is preferred, in that it best fits the terminology used within most of the studies considered in the research dataset.

Interesting results emerge from the analysis. In fact, it is evidenced that board independence tends to prevent distress, as well as to increase the survival of those firms that initiate their restructuring. Furthermore, it is demonstrated that board heterogeneity and low tenure can also count. Finally, it is highlighted that the heterogeneity of the statistical methods employed by the reviewed literature has increased proportionally with time and the journal ranking of the publications.

The article is structured as follows: first, the theoretical framework of the review is introduced; second, the review methods are described. Third, the results are presented in terms of *what* (board observations), *how* (statistical methods) and *where* (journal rankings) evidences respectively. The article concludes by addressing the *when* (temporal trends) question and by discussing the theoretical and practical implications of the findings, as well as some challenging avenues for further research.

THEORETICAL FRAMEWORK

Over the years, scholars have not provided the management literature with unique definitions of corporate distress and this concept has been widely associated with terms such as corporate mortality, death, crisis, exit, bankruptcy, decline or rentrenchment (e.g. Daily, 1995; Hambrick & D'Aveni, 1988; Weitzel & Johnson, 1989). Nonetheless, to date, a wide consensus exists about the most vivid meaning of the concept – that it is convergently considered as a dramatic situation in which a firm suffers from continuous negative profitability. It is known that this situation is undeniably risky and, in most of the cases, the distressed firm has to start immediate and appropriate corrective interventions (i.e. turnaround plans), if its top decision makers and stakeholders want to avoid its final failure. Also, it is known that these interventions are often associated with the opening of legal procedures, such as the *Chapter 11* of the *Bankruptcy Code* in the United States (Lee, Peng, & Barney, 2007;

Lee, Yamakawa, Peng, & Barney, 2011; Li & Guesinger, 1991). Although presenting different facets worldwide, these procedures are commonly aimed at helping the distressed firms' survival or, in the case of their ineluctable failure, at rationalizing the final liquidation of the assets belonging to them.

Over the second half of the twentieth century, the empirical research on corporate distress witnessed the development of two partially intertwined perspectives, the *macro* and *micro* analytical approaches. The macro analytical approach (e.g. Shrivastava, Mitroff, Miller, & Miglani, 1988) mainly investigated distress by focusing largely on the collapse of whole economic systems, business industries or well defined geographical areas. This approach was generally implemented because of a number of negative events which, between the end of the 1960s and the beginning of the 1970s, featured the main international economies. Thus, those studies which can be included in this approach were mainly committed to studying the industrial downturns associated with the increasing bargaining power of the workforce, or with the increasing energy costs raised by the international oil crisis.

The micro-analytical approach can be basically divided into two main directions. The former direction was mostly financial, in that it was composed of those studies which were devoted to implementing models for the effective predicting of corporate bankruptcy (e.g. Altman, 1968, 1983; Ohlson, 1980). The latter direction, in which the present article is positioned, was the strategic/behavioral perspective (e.g. Smart & Vertinsky, 1977). This perspective mostly devoted time to the understanding of the internal (i.e. firm specific) and/or external (i.e. environmentally related) antecedents associated with the distress of single firms.

What has become progressively evident to management scholars is that identifying the determinants of corporate distress is not an easy task for researchers and practitioners. In fact, the risk of capturing significant evidence on specific responsibilities attributable to corporate executives is not rarely high and this makes accessing proper data often difficult. This is also

why, over the years, several approaches have been adopted (Van Witteloostuijn, 1998), with research methods varying from quantitative analyses based on cross-sectional samples (e.g. Brüderl & Schüssler, 1990; Hambrick & D'Aveni, 1992) to qualitative case studies based on in-depth field interviews (e.g. Abatecola, 2009; Tripsas & Gavetti, 2000).

Along with its evolving interpretation by scholars, corporate distress has shifted from being considered as just an exceptional and extraordinary pathological event, towards being considered as a permanent component of industrial systems worldwide. In particular, the strategic/behavioral perspective has generally maintained that corporate distress can be often conceptualized as the combined mix of internal and external antecedents contemporarily occurring, with each case of distress presenting its own individual peculiarities. Specifically, scholars have generally considered corporate distress as a situation in which a firm suffers a sustained economic, financial and organizational disequilibrium. As Slatter maintains (1984: 14), these situations require immediate and appropriate corrective interventions, otherwise no prospect of a possible future is available to the distressed firms. Relatedly, Billings, Milburn, and Schaalman (1980: 304) state that these interventions can be of one of three kinds. First, no interventions have to occur when the corporate top decision makers believe that the corporate distress will spontaneously end. Second, routine interventions have to occur when the distress can be solved through the extant organizational knowledge. Third, original interventions have to occur when the distress can be solved only through the acquiring of new organizational knowledge.

Also, it has been maintained that corporate distress is rarely a sudden event, in that, over the years, it has generally been found that this situation is much more often the extreme consequence of an increasing *decline* of corporate profitability, due to strategic and/or organizational mistakes (Cameron, Sutton, & Whetten, 1988; D'Aveni, 1989, 1990).

It is worth noting that the concept of decline has not to be associated only with the sustained increase of negative profitability, but also with the sustained decrease of positive profitability. When further amplified by an internal or external triggering event, the *status* of decline, which can be considered as somehow informal, often shifts into the *status* of corporate distress. As already introduced in this section, the latter *status* is a formal situation which causes corporate bankruptcy if no appropriate corporate restructuring is promptly started (Bibeault, 1982; Donaldson, 1994; Zimmermann, 1991).

Over the years, one of the most relevant research streams associated with corporate distress has followed the wider evolution of the research on boards of directors (hereafter boards), with scholars devoting considerable time to empirically addressing the question of what board characteristics (e.g. independence, size or socio-demographic features) increase or decrease the survival of distressed firms. In particular, the first empirical analyses appeared in the 1980s and investigated corporate distress mainly in relation to board turnover (D'Aveni, 1989; Schwartz & Menon, 1985) or socio-demographic features (D'Aveni, 1989; Hambrick & D'Aveni, 1988). These analyses were substantially aimed at exploring whether these variables could be predictors of survival or not.

In the early 1990s, some breakthrough articles (e.g. D'Aveni, 1990; D'Aveni & MacMillan, 1990) influenced the future literature and the empirical research on the board/distress relationship definitely gained momentum. Most of the studies within that decade focused on data from the United States and used matching samples. As in the 1980s, the relationship between distress and board turnover continued to dominate the research agenda (e.g. Daily & Dalton, 1995; D'Aveni, 1990; Denis & Denis, 1995; Gales & Kesner, 1994; Gilson, 1990; Hambrick & D'Aveni, 1992; Mueller & Barker III, 1997; Wiersema, 1995). At the same time, board independence (i.e. the presence of an appropriate amount of outside directors within the board), started to play a pivotal role (Daily, 1995; Daily & Dalton,

1994a, 1994b, 1995; Gales & Kesner, 1994; Hambrick & D'Aveni, 1992; Johnson *et al.*, 1993; Mueller & Barker III, 1997). Also in this case, scholars tried to test whether board independence could be a predictor of corporate survival or not.

In the last decade, different research directions also emerged and the relationship between distress and CEO turnover became the topic most often investigated (Arthaud-Day *et al.*, 2006; Brockmann, Hoffman, & Dawley, 2006; Clapham, Schwenk, & Caldwell, 2005; Elloumi & Gueyiè, 2001; Parker, Peters, & Turetsky, 2002). The United States continued to be the most sampled geographical area, but scholars also increased their enquiries within other contexts, such as Europe and Asia. Single samples of firms became basically preferred to matching samples.

In conclusion, the evidences collected by scholars over the years have demonstrated that certain board features count for predicting corporate survival in distress contexts, but these evidences have not yet been systematized (Aguilera *et al.*, 2008; Daily *et al.*, 2002). Thus, the results of the analysis presented in the following pages are aimed at contributing to fill this gap.

METHODS

The theoretical framework illustrated in the previous section constitutes the basis of this literature review, which substantially tries to address the following research questions: *i) Do particular board characteristics positively affect the survival of the distressed firms? ii) How has the empirical research on this topic evolved over the years? iii) How have the statistical techniques been developed?*

As these research questions suggest, the main goal of this research is to address the *what* and *how* questions about the content of the evolving empirical literature on board effectiveness in situations of corporate distress. Thus, a systematic review method was

adopted and its specific criteria basically conformed to those adopted by other recent systematic reviews published in the management area, in particular that by David and Han (2004) about the empirical literature related to transaction cost economics and that by Newbert (2007) about the empirical literature associated with the resource based view of the firm. Thus, the present review focused only on double peer-reviewed journal articles, with the computer based research performed at the beginning of 2012 by using the academic journals within the *EBSCO-Host* and *JSTOR* databases.² It appears worth of mention that only the articles published until December, 31st, 2011, were considered for potential inclusion in the dataset.

In the *first* phase, searches were made for all the journal publications containing the terms (*bankruptc** OR *cris** OR *decline** OR *default** OR *distress* OR *fail** OR *restructur** OR *surviv** OR *turnaround**) as the primary key word in their abstract.³

In the second phase, the substantive relevance of the articles was ensured by requiring that the articles selected in the previous phase also contained at least one of the following key words (*corporat** OR *enterprise** OR *firm** OR *org**) in their abstract.

In the third phase, the articles' relevance was ensured by requiring that those articles selected in the second phase also contained at least one of the following seven keywords (*board** OR *CEO* OR *Chief* OR *director** OR *entrepreneur** OR *govern** OR *TMT* OR *top management team*) in their abstract. It is worth mentioning that the keywords selected in these three phases derived from the theoretical framework presented in the previous section of this article.

In the fourth phase, in order to ensure the empirical content of the articles, it was decided to select only those articles that, from the third phase, contained at least one of the following

² As it has been recently pointed out (David & Han, 2004; Newbert, 2007), restricting the search to only those articles published in double peer-reviewed journals increases and enhances quality control. This is why it was decided to exclude edited books, letters from editors, book reviews, conference proceedings and articles published in non peer-reviewed journals.

methodological keywords in their abstract: *empirical* OR *event history* OR *quantitative* OR *statistic*^{*}. This criterion warrants additional discussion. It is evident that the keywords selected in this phase deliberately determined the exclusion both of conceptual articles (e.g. Castrogiovanni, Baliga, & Kidwell, 1992; Hoskisson & Turk, 1990; Khandwalla, 1983-1984) and case studies (e.g. Huse & Zattoni, 2008). The reason for their exclusion is similar: conceptual articles do not pertain to the empirical scope of the review. Similarly, case studies and qualitative analyses were both excluded because, as has been recently observed (David & Han, 2004; Newbert, 2007) there is no systematic way to code the results of such studies in a way that is comparable to the results of quantitative analyses.

In the fifth phase, the articles selected in the fourth phase (N = 77) were further scanned by reading all their abstracts and texts for substantive context and empirical content, thus controlling their connection with the research topic. Two *fit for purpose* criteria (Denyer, Tranfield, & van Aken, 2008) were specifically adopted for determining the final relevance of the articles, thus for deciding their inclusion/exclusion within/from the dataset. In particular, it was decided to include only those articles that, contemporarily, meet the following two criteria:

1. in the articles, a situation of corporate distress (crisis or turnaround) had to be associated with the sampled firms formally and, in particular, the text of the articles had to explicitly associate the sampled firms with bankruptcy procedures (e.g. *Chapter 11*). If this formal association was absent, the words used by the author(s) in the text had to associate, with no doubt, the sampled firms to high risks of final mortality.
2. the articles had to explicitly test the possible association between corporate distress and, at least, one of the main board variables generally used by strategists within their

³ The asterisk at the end of a keyword allowed for different suffixes (e.g. *crisis* or *crises*).

studies about corporate governance over the years. As was recently observed (Aguilera & Jackson, 2010; Daily, Dalton, & Cannella, 2003; Hambrick et al., 2008), these variables are: a) board size (Jensen, 1993), i.e. the number of directors within the board; b) board independence (Westphal & Zajac, 1997), i.e. the number of outside directors within the board; c) board socio-demographic features (e.g. age, tenure, functional background or level and kind of education) from the upper echelons theory (Carpenter, Geletkanycz, & Sanders, 2004; Hambrick & Mason, 1984) or board personality traits, as the latest extensions of this theory (Chatterjee & Hambrick, 2007; Hambrick, 2007); d) board turnover (Wiersema, 1995; Wiersema & Zhang, 2011), i.e. the changing of most of the directors within the board; e) CEO turnover (Carroll, 1984), i.e. the changing of the CEO within the board; f) CEO duality (Daily & Dalton, 1992), i.e. the overlapping between the roles of the Chief Executive Officer and the board Chairperson. It is worthy of mention that attention was also dedicated to board compensation (Yawson, 2006), ownership structure (Thomsen & Pedersen, 2000), and interlocking directorates (Zajac, 1988; Zajac & Westphal, 1996).

Thus, in this phase, all those articles that were related to the board/distress relationship, but did not strictly meet both these criteria, were excluded. In particular, 41 articles were selected for inclusion. Finally, in the sixth and last phase, the *snowballing* technique was adopted for supporting (and eventually integrating) the results from the previous phases. This technique allowed for the inclusion of another 3 articles.

The final population of the dataset, therefore, consists of 44 quantitative articles published in 26 journals from 1985 to December, 31st, 2011.⁴ It can be noticed that this population is

⁴ All the publications in the dataset are preceded by an asterisk in this articles' reference list. Available upon request, the full dataset shows a synoptic view of the publications, which includes several features (i.e. year of publication, authors' primary research field, sample size, country, sector, observation period, clusters, dependent and independent variables, statistical methods).

consistent with the populations used in several other recent systematic reviews published within the strategic management field (e.g. Campbell-Hunt, 2000; Dalton, Daily, Ellstrand, Johnson, 1998; Ketchen et al., 1997; Stankovic & Luthans, 1997).

RESULTS

Table 1 provides readers with an overview of the population according to three different periods of publication (Period 1: 1980-1989; Period 2: 1990-1999; Period 3: 2000-2011).

 INSERT TABLE 1 ABOUT HERE

The articles were published irregularly between 1985 and 2011, with only three articles published between 1985 and 1989. Publications increased between 1990 and 1995, then decreased until 2004.

Twenty-three articles (52%) in the dataset constitute a single sample of firms that filed for bankruptcy, while 21 articles (48%) present matching samples. Most of the matching samples (N = 16, or 76%) are composed of bankrupt/non-bankrupt firms, followed by turnaround/non-turnaround firms (N = 3, or 14%). Sixteen matching samples are completely equal according to the firm business sector, size and number of observations. In one matching sample (Lee & Yeh, 2004), the number of observations is different (45 bankrupt and 88 non-bankrupt firms), size and business sector being equal. Two matching samples (Clapham et al., 2005; Sheppard, 1994) present the same number of observations but vary per firm size and business sector. Finally, in two samples (Davidson III, Worrell, & Dutia, 1993; Yawson, 2006), business sector, size and number of observations are different.

Declared in all the articles, the observation period is 11 years on average. Based on the breakthrough article by Hambrick and D'Aveni (1988), another five articles use the same observation period, i.e. from 1972 to 1982 (Daily & Dalton, 1994b; D'Aveni, 1989, 1990; D'Aveni & MacMillan, 1990; Hambrick & D'Aveni, 1992). The longest observation period is 119 years (Haveman & Khaire, 2004), while the shortest is five months (Minichilli & Hansen, 2007).

As for geographic sources, 29 articles (66%) are based on American data, five articles use European data, two use Asian data and one article focuses on data from Australia. Seven articles do not specify the country of analysis. While most of the articles ($N = 22$, or 50%) do not specify the sample business sector, the other articles classify their sample as *industry* ($N = 16$, or 36%) or *service* ($N = 6$, or 14%). The industry label is quite often referred to as manufacturing activities.

Board Observations

Two macro-categories of articles constitute most of the dataset. The former category pertains to articles that observe the impact of particular CEO or board variables, taken as independent variables, on a crisis or turnaround context, taken as dependent variables. In contrast, the latter category pertains to those articles that explore the impact of a crisis or turnaround context, taken as independent variables, on particular CEO or board features, taken as dependent variables. While the distinction between dependent and independent variables is specifically highlighted in the full dataset, this distinction is not taken into account in Figure 1. This figure shows the observations in the dataset sorted and clustered in a *two X two* matrix, with the focus on crisis or turnaround contexts and the focus on CEOs or boards shown on the X and Y axes respectively.

 INSERT FIGURE 1 ABOUT HERE

First, it is worth mentioning that, in the presented matrix, the CEOs receive specific attention, as single board subgroups, because it is known that, over the years, strategists have devoted great effort to the understanding of how CEOs, rather than boards more generally, specifically behave (e.g. Boone & De Brabander, 1993, 1997; Boone & Van Witteloostuijn, 1996; Hambrick & Fukutomi, 1991; Miller & Droge, 1986; Miller & Toulouse, 1986; Papadakis & Bourantas, 1998).

Second, it is worth noting that some articles were clustered more than once in the matrix to improve the quality of the results (e.g. Daily & Dalton, 1994a, 1994b, 1995; D'Aveni, 1989, 1990; Filatotchev & Toms, 2003). In fact, the X axis distinguishes the articles taking into account if they specifically refer to a crisis or turnaround situation; thus, all those observations based on matching samples were clustered twice (i.e. both as crisis observations and turnaround observations). As for the Y axis, all those observations that look at the features of CEOs only, were clustered as CEO observations, while all those observations that look at the behavior of boards in general, rather than at CEOs only, were clustered as board observations. Also, all those observations that regard boards in general, but also have an explicit focus on CEOs, were clustered twice (i.e. as both CEO and board observations).

Third, from the combined use of the X and Y axes, four clusters and 85 overall observations were derived. Cluster IV (crisis-board) is the most populated cluster, with 30 hits (36%). Cluster I (turnaround-board) follows with 25 hits (29%). Cluster II (turnaround-CEO) and Cluster III (crisis-CEO) receive respectively 14 (or 16%) and 17 (or 20%) observations.

The board variables that receive an amount of observations at least sufficient for theoretical interpretation are highlighted in table 1. As the table shows (in decreasing number

of overall observations), these variables are: board independence, board turnover, CEO turnover, board socio-demographic features, board size and CEO duality. These observations are discussed below.

First, the question whether board independence (i.e. the significant presence of outside directors on the board) increases or decreases the survival of distressed firms was addressed. This question receives 15 observations out of 44 (34%), all regarding the years between 1990 and 2011. From three articles (20%), no conclusive results on the investigated relationship are given (Daily & Dalton, 1994a, 1995; Simpson & Gleason, 1999), while two articles (13%) within the third decade find that board independence is associated with corporate bankruptcy (Berry et al., 2006; Evans et al., 2002). Despite these exceptions, ten articles (67%) broadly find that board independence counts in improving the survival rate of distressed firms.

Second, whether the observations focus on board turnover as a consequence or an antecedent of corporate distress and whether this turnover enhances corporate survival or not, was explored. All comprised in the years between 1990 and 2011, these observations receive 14 hits out of 44 (32%). Apart from Daily and Dalton (1995) and Haveman (1993), all the articles focus on board turnover as a consequence, rather than an antecedent of the corporate distress (indeed, Daily and Dalton (1995) look at both these issues). Thus, four articles out of 13 (31%) observe that board turnover somehow enhances the survival of distressed firms (Denis & Denis, 1995; Mueller & Barker III, 1997; Perry & Shivdasani, 2005; Wiersema, 1995). In contrast, four articles (31%) arrive at the conclusion that board turnover diminishes corporate recovery (Daily & Dalton, 1995; D'Aveni, 1989, 1990; Hambrick & D'Aveni, 1992). Finally, in five articles (38%) the relationship between board turnover and corporate renewal does not generate conclusive results (Arthaud-Day et al., 2006; Gales & Kesner, 1994; Gilson, 1990; Jostarndt & Sautner, 2008; Schwartz & Menon, 1985).

Third, the questions whether the observations focus on CEO turnover as a consequence or an antecedent of the distress and whether CEO turnover enhances firm survival or not were addressed. Apart from Schwartz and Menon (1985), all the observations are made during the years between 1990 and 2008 and receive 13 hits out of 43 (30%). Only Daily and Dalton (1995), Haveman (1993) and Haveman and Khaire (2004) focus on CEO turnover as an antecedent, rather than a consequence, of corporate distress (again, Daily and Dalton (1995) look at both these issues). Thus, three articles out of 11 (27%) observe that CEO turnover has a positive impact on firm survival (Brockmann et al., 2006; Clapham et al., 2005; Davidson III et al., 1993), while one article (9%) finds that it does not (Daily & Dalton, 1995). Seven articles (64%) arrive at no definite conclusions on this research question (Arthaud-Day et al., 2006; Elloumi & Gueyiè, 2001; Gilson, 1990; Gilson & Vetsuypens, 1993; Parker et al., 2002; Perry & Shivdasani, 2005; Schwartz & Menon, 1985).

Fourth, the review investigated whether certain board socio-demographic features can predict firm survival in distress contexts. Taken as an overall topic, these features are observed in ten articles out of 44 (23%). The percentage declines, however, if the number of observations received by each sub-variable is specifically considered. The board tenure (i.e. the average time of the presence of the directors within the board) is the most investigated variable, with four observations out of ten (40%). Three articles (75%) find that high board tenure reduces the survival of distressed firms (D'Aveni, 1990; Greening & Johnson, 1996; Johnson et al., 1993) while one article (25%) suggests the opposite (Hambrick & D'Aveni, 1992). Similar results apply to board heterogeneity (i.e. the composition of the board in terms of the different ages, gender and capabilities of its directors), which receives three observations (30%). The empirical evidences converge in finding that heterogeneity reduces the possibility of firm distress (Filatotchev & Toms, 2003; Greening & Johnson, 1996; Minichilli & Hansen, 2007). Thirty percent of the observations also see a relationship

between corporate distress and the board level of education. Two articles (67%) find that a high level of education enhances firm survival (D'Aveni, 1990; Greening & Johnson, 1996), while one article (33%) indicates the opposite (Johnson et al., 1993). Equal observations (20%) occur in those studies that explore the relationship between corporate distress and the age or core function expertise of the directors. However, while the former relationship produces contrasting evidence (Greening & Johnson, 1996; *versus* Mudambi & Treichel, 2005), the lack of core function expertise is univocally considered as a predictor of diminished corporate survival (D'Aveni, 1989; Hambrick & D'Aveni, 1992).

Fifth, the research explored whether smaller boards enhance the survival of distressed firms. Two studies (25%) find that smaller boards are associated with increased financial performance (Dowell et al. 2011; Fich & Slezak, 2008). In contrast, four studies (50%) find that smaller boards are associated with greater probabilities of distress (Gales & Kesner, 1994; Gilson, 1990; Hambrick & D'Aveni, 1992; Mueller & Barker III, 1997). Two studies (25%) suggest that no conclusions are possible (Mudambi & Treichel, 2005; Simpson & Gleason, 1999).

Sixth, the research asked whether CEO duality enhances firm survival or not. As for the observations regarding board size, this kind of investigation receives seven observations out of 44 (16%). Duality is explicitly associated with bankruptcy in three studies (43%) (Daily & Dalton, 1994b, 1995; Elloumi & Gueyiè, 2001) and turnaround in two studies (28.5%) (Mueller & Barker III, 1997; Simpson & Gleason, 1999), while two studies (28.5%) find strict relationships to be ambiguous (Brockmann et al., 2006; Daily & Dalton, 1994a).

Statistical Methods

The *how* question was then addressed, in that the statistical methods used in the selected publications were deepened. The articles analyse 11,649 firms and range from 30 to 1,501,

with a mean of 271.1 and a median of 114 (inter-quartile range, 83–237.5). Table 2 shows the statistical methods used in the articles.

 INSERT TABLE 2 ABOUT HERE

Twenty-one articles (48%) use the *test of differences between groups and/or variables* method. While the tests of differences between groups allow comparing the variables of interest in two or more independent samples, the tests of differences between variables allow comparing two or more variables of interest in the same dependent sample. The *discriminant analysis* is used in only two articles (5%). This technique allows classifying a set of observations into predefined classes (such as the *status* of the firms, including healthy/bankrupt, turnaround/non-turnaround, etc.) to determine the class of an observation, based on a set of variables known as predictors or input variables. Some studies (N = 9, or 20%) use the *linear regression* model, which includes any approach to modelling the relationship between a dependent variable and the observed values of one or more independent variables, where the model depends linearly on unknown parameters that have to be estimated from the data. Twenty-one articles (48%) use the *logit* model, while the use of the *probit* model is marginal (N = 1, or 2%). In general, both the logit and probit models allow for the representation of the existing relationship between a dependent variable (a discrete variable representing a choice or category from a set of mutually exclusive choices or categories) and one or more independent variables (presumed to affect the choice or category). These models differ, since the logit uses the logistic cumulative distribution function, while the probit uses the inverse cumulative distribution function associated with the standard normal distribution. The *Poisson* and *tobit* models are also marginally used (in both cases N = 1, or 2%). The Poisson model is useful for representing count data from a

contingency table and assumes that the response variable has a Poisson distribution and the logarithm of its expected value can be modelled by a linear combination of unknown parameters. The tobit model is based on a regression, in which the dependent variable is restricted in its range due to censoring or truncation. From a set of explanatory variables, this model explains the probability of the dependent variable being at or below (above) a certain limit. The *survival analysis* methods study the effects of multiple continuous or categorical attributes on the time of events, such as the time spent by a firm in the healthy group. These methods are used in five articles (11%). The survival analysis allows for: *i*) the estimating and interpreting of survival characteristics (i.e. Kaplan-Meier plots, Median estimation, Confidence intervals); *ii*) the comparing of the survival among different groups (i.e. Log-rank test); *iii*) the assessing of the relationship between the explanatory variables and the survival time (i.e. Cox regression model). Finally, two studies (5%) use the *event study* method when determining the impact of specific events on shareholder returns and expected profitability. As for corporate restructuring, this method allows for the analysis of the financial consequences of decisions (such as the CEO and the board turnover).

In order to analyse the combined use of the different statistical methods, an adjacency matrix was defined. This is an n by n matrix, where n is the number of the statistical methods. In the case of edges from the generic statistical method X to the generic statistical method Y, the element $a_{x,y}$ is equal to the number of xy edges, otherwise it is equal to 0 (see Table 3).

 INSERT TABLE 3 ABOUT HERE

This matrix allows for the obtaining of a graphical representation of the combined use of the statistical methods (see Figure 2).

INSERT FIGURE 2 ABOUT HERE

Table 4 illustrates the use of the statistical methods over time.

INSERT TABLE 4 ABOUT HERE

The articles in the first period (1980-1989) exclusively use the tests of differences between groups/variables (N = 3, or 100%) and the logit model (N = 2, or 67%). In the second period (1990-1999), the use of these models decreases to 48% and the methods' heterogeneity increases (i.e. linear regression, N = 3, or 14%; discriminant analysis and event studies methodologies, N = 2, or 10%; tobit, N = 1, or 5%; survival analysis, N = 1, or 5%). Finally, the articles in the third period (2000-2011) further reduce the use of the tests of differences between groups and/or variables (N = 8, or 40%) while the use of the logit increases slightly (N = 9; or 45%). Some articles use linear regression (N = 6, or 30%) and survival analysis (N = 4, or 20%). The use of the probit, Poisson methods and event history is not relevant (in all cases N = 1, or 5%).

Table 5 shows the relationship between the statistical methods and the various clusters.

INSERT TABLE 5 ABOUT HERE

The three articles that fall solely in Cluster I (Evans et al., 2002; Johnson et al., 1993; Wiersema, 1995) use only the tests of differences between groups/variables and the linear regression. The heterogeneity increases for the nine articles that fall solely in Cluster IV (Betker, 1995; Fich & Slezak, 2008; Greening & Johnson, 1996; Hambrick & D'Aveni, 1988;

Lee & Yeh, 2004; Mudambi & Treichel, 2005; Okazaki, Sawada, & Wang, 2007; Sheppard, 1994; Yawson, 2006). No study is comprised solely in Cluster II and the two articles that fall solely in Cluster III (Boone, De Brabander, & Hellemans, 2000; Haveman & Khaire, 2004) use the logit and the survival analysis respectively.

Table 6 categorizes the articles per academic journal.

 INSERT TABLE 6 ABOUT HERE

The articles within the dataset are published in 26 international journals. As for their journal ranking, by coding these articles through the *2010 Association of Business School Academic Journal Quality Guide* (ABS, 2010), 35 hits (or 80%) appear in top journals: 28 (or 64%) in the 4-ranked and 7 (or 16%) in the 3-ranked. No articles appear in the 2-ranked, 4 (or 9%) in the 1-ranked and 5 (or 11%) in the not-ranked journals. The *Academy of Management Journal* and the *Strategic Management Journal* receive the highest number of hits (N = 5 and N = 5 respectively). As for the authors' primary research field, the pure management background is the most common (74%), followed by finance (21%).⁵

Relatedly, Table 7 illustrates the use of the statistical methods on the basis of the ranking of the journals in which the articles appear.

 INSERT TABLE 7 ABOUT HERE

The tests of differences between groups/variables are the most frequently used statistical methods (N = 2, or 50%) in the articles published in the 1-ranked journals, followed by the linear regression, the logit, the probit and the Poisson models (in all these models, N = 1, or

⁵ Minor weights (5%) pertain to other fields, such as accounting, marketing and psychology.

25%). The logit is the most frequently used statistical method (N = 5, or 71%) in those articles published in the 3-ranked journals. In these journals, the logit is followed by the tests of differences between groups/variables (N = 3, or 43%), linear regression (N = 2, or 29%) and survival analysis (N = 1, or 14%) respectively. The most relevant heterogeneity is observed in the 4-ranked journals. In fact, the tests of differences between groups/variables are the most often used (N = 14, or 50%), followed by the logit (N = 13, or 46%), linear regression (N = 4, or 14%), survival analysis (N = 3, or 11%), discriminant analysis (N = 2 or 7%) and event study (N = 3, or 11%), and tobit (N = 1, or 4%). Finally, the linear regression and tests of differences between groups/variables are the most often used statistical methods in those journals with no available ranking (in both the cases N = 2, or 50%). The logit (N = 1, or 25%) and the survival analysis (N = 1, or 25%) follow.

DISCUSSION AND IMPLICATIONS

Empirical research on the relationship between boards and the context of corporate distress has increased over the last three decades. To date, scholars are even more committed to stimulating the debate on how boards can contribute to effective corporate restructuring and whether certain board features can enhance the survival of distressed firms.

Valuable evidences emerge from analysis presented in the extant empirical literature. How this literature has been evolving and what scholars could research further in the future has been systematically addressed. Three main research results warrant additional discussion.

First, as for the *what* question, i.e. whether specific board attributes increase or decrease corporate survival, *board independence* is the most addressed variable within the dataset. It is known that this variable is pivotal in the more general debate on the effectiveness of corporate governance and researchers are currently debating whether outside directors can improve performance or not (e.g. Abatecola & Poggesi, 2010; Abatecola, Caputo, Mari, & Poggesi,

2012; El Mehdi, 2007; Lin, Ma, & Su, 2009; *versus* Cho & Kim, 2007; Choi & Hasan, 2005). In distress contexts, the evidence from this review suggests that board independence really counts in improving corporate survival. For example, in the 1990s it was found that outside directors were fewer in the bankrupt firms than in the non-bankrupt firms (Hambrick & D'Aveni, 1992) and that their representation was positively related to the boards' involvement in the corporate restructuring (Johnson et al., 1993). Similarly, in the period leading up to the bankruptcy declaration, the declining firms experienced a loss of outside directors (Gales & Kesner, 1994) and bankrupt firms had more affiliated directors than the non-bankrupt firms (Daily & Dalton, 1994b). Also, some scholars found that the proportion of outside directors was positively associated with successful turnarounds and negatively associated with corporate liquidations (Daily, 1995) and that the turnaround firms were more likely to have a greater outside control of the board (Mueller & Barker III, 1997). Finally, in the years between 2000 and 2008, it was found that significant improvements affected the operating performance for those firms with outside directors, that initiated restructurings (Perry & Shivdasani, 2005) and that the boards with independent directors were more likely to avoid bankruptcy (Elloumi & Gueyiè, 2001; Fich & Slezak, 2008).

The *board and/or CEO turnover* have also received a valuable number of hits. Still, the present analysis reveals that further empirical refinement is needed for definitive conclusions on their effectiveness in terms of improved corporate performance within the distress contexts, thus consistent with those past claims that effective turnarounds can also start from within the organizations (e.g. Carroll, 1984; Donaldson, 1994; Singh, House, & Tucker, 1986; Virany, Tushman, & Romanelli, 1992).

The evidences about board turnover seem particularly interesting. For example, some articles show that the forced resignations of the top managers were preceded by large and significant declines in operating performance, but followed by large improvements in it

(Denis & Denis, 1995). Moreover, those firms which experienced non-routine (not retirement related) executive succession events within the board, subsequently underwent more restructuring activities than those firms without routine executive turnover (Wiersema, 1995). Similarly, by the end of their recoveries, the turnaround firms had their boards employing a significantly smaller proportion of their pre-decline top managers, as compared to the non-turnaround firms (Mueller & Barker III, 1997). In particular, if outside directors were hired, corporate performance improved (Perry & Shivdasani, 2005).

Conversely, some articles arrive at opposite conclusions. For example, D'Aveni (1990) found that prestigious managers were imported to the board to raise overall prestige, but this was not enough. The *Bailout* phenomenon occurred, with most of the incumbent top managers leaving their firms to avoid the *stigma* of bankruptcy about two years before the declaration. Hambrick and D'Aveni (1992) provide evidence that corporate deterioration brought about team deterioration, through a combination of voluntary departures, scapegoating, and limited resources for attracting new executive talent (*corporate deterioration as a downward spiral*). Daily and Dalton (1995) obtained similar evidence.

Taken as a whole, the *board socio-demographic features* have received quite considerable attention, but this attention declines if one considers the number of observations which each sub-variable has been given. Although still limited, the existing evidence suggests that *board heterogeneity* and *low level tenure* can both enhance corporate survival, while the *lack of core function expertise* acts conversely. As for *board size*, although the number of sample observations is among the most limited within the dataset (N = 8), the specific evidence in the distress contexts seems to contradict some general agency theorist expectations that *smaller is better* (e.g. Hermalin & Weisbach, 2003; Jensen, 1993; Nguyen & Faff, 2006-07; Yermack, 1996). Finally, *CEO duality* has received the most limited number of observations (N=7). In

this regard, the specific evidence seems to suggest that separation of the roles of CEO and the board Chairperson, rather than duality, can enhance the survival of distressed firms.

In sum, on the one hand, the existing evidences about board size, CEO duality, and single socio-demographic features (i.e. tenure, heterogeneity, and core function expertise) are convergent, although these variables should receive more empirical tests in the future to consolidate these evidences. On the other hand, the existing evidences about the board and the CEO turnover have produced no conclusive results, although researchers have devoted considerable time to these variables. The board independence constitutes the sole exception, since most of the existing studies agree that the presence of outside directors enhances the survival of distressed firms.

Second, as for the *how* question, i.e. what statistical methods have been applied over the years, the articles have mainly used: *i)* the *tests of differences between groups/variables*, comparing the board variables in two or more independent samples (e.g. bankruptcy/non-bankruptcy firms; turnaround/non-turnarounds firms) or in the same dependent sample; *ii)* the *logit* model for representing the existing relationship between a dependent discrete variable (e.g. bankruptcy event) and one or more independent corporate governance variables; *iii)* the *linear regression* model for representing the linear relationship between a dependent variable (e.g. the board involvement in strategic restructuring) and the observed values of one or more independent variables (e.g. the board composition). In general, the heterogeneity of the statistical methods has increased proportionally to the time and journal ranking of the reviewed publications.

Third, as for the *when* and *where* questions, most of the first (1980-1989) and second (1990-1999) period studies (N = 24) analysed US companies, mainly referred to the board turnover, socio-demographic features, or independence, and used matching samples. On the

other hand, the third period (2000-2011) studies (N = 20) devoted attention also to non-US companies, mainly referred to the CEO turnover and used single samples of firms.

In particular, the earliest article dates back to 1985 when empirical research on the role of boards in the distress contexts was still limited. Only three articles (7%) were published in the 1980s and this happened in the second half of the decade. All those studies used matching samples, focused on US data and declared the observation period. In those articles, the distress was investigated mainly in relation to the board turnover (D'Aveni, 1989; Schwartz & Menon, 1985) and socio-demographic features (D'Aveni, 1989; Hambrick & D'Aveni, 1988).

Two very innovative articles (D'Aveni, 1990; D'Aveni & MacMillan, 1990) influenced the emerging empirical literature on the investigated topic at the beginning of the 1990s. As evidenced by the sharp increase in the number of articles published in that decade (N=21), research on the relationship between corporate distress and board features gained momentum. Although the relationship between corporate distress and board turnover (N=9) still played a fundamental role (as in the previous period), the board independence also became dominant, with nine observations too. Most of the studies during the 1990s focused on US data (71%; for the remaining 29% the data source is not available) and used matching samples (57%).

The number of quantitative articles published in the last period is comparable to the 1990s (N=20, or 45%). At the same time, different research approaches and features emerged. In fact, the studies drawing on non-US data became more frequent, as strategists started to examine the relationship between boards and corporate distress also in different contexts, such as UK (Filatotchev and Toms, 2003; Yawson, 2006), Australia (Evans et al., 2002), Belgium (Boone et al., 2000), Canada (Elloumi & Gueyiè, 2001), Germany (Jostarndt & Sautner, 2008), Japan (Okazaki et al., 2007), Norway (Minichilli & Hansen, 2007), Taiwan (Lee & Yeh, 2004) and Venezuela (Garay et al., 2007). Furthermore, single sample studies (70%) were used more than matching sample studies. In addition, although the majority of the

studies did not explicitly mention the firm business sector (55%), the declared samples referred not only to industrial firms (20%), but also to service firms (25%). Finally, it is worth noting that the relationship between corporate distress and CEO turnover resulted in the research subfield being most often explored (37%).

The present analysis also produces a number of implications for future research on various issues related to corporate distress. For example, the future quantitative studies could define research settings more broadly. Focusing on a complete set of board variables might provide scholars with a better analytical framework to explore the relationship between corporate boards and distress. Further, addressing the following questions could improve the quality of the future research.

First, are the changes affecting some board variables, such as the board or CEO turnover, always the consequences of distress or can they also be its possible antecedents? The presented results show that the existing literature has nearly always analysed these variables as consequences, while, despite limited exceptions (e.g. Daily & Dalton, 1995; Haveman, 1993; Haveman & Khaire, 2004), it has rarely examined their role as potential determinants.

Second, who (and when) decides these board changes? Although the existing studies do not seem to address this aspect, it could be expected that different scenarios can occur according to what stakeholders (e.g. shareholders, banks or governments) decide the changes and according to what stages of the firm's life cycle are considered by these changes.

Third, what is the role of the top decision maker's personality? Although this article has illustrated that the relationship between the board socio-demographic features and distress has received attention over the years, scholars should develop more extended research frameworks. In particular, these frameworks could adopt validated and *all inclusive* psychometric instruments for assessing the top decision makers' overall personality traits (Abatecola, Mandarelli, & Poggesi, 2013). In this regard, the *Five-Factor Model of*

personality (McCrae & Costa 1987, 1990)⁶ has been proved to be valid across different cultures and many results from psychology and psychiatry currently support its overall reliability as an all-inclusive personality model. Also, strategists may explore qualitative approaches to understand the actual board involvement, such as the development of contingency, behavioural, and evolutionary perspectives (Huse, 2009).

Fourth, do the environmental variables (e.g. market-oriented systems *versus* bank-oriented systems, legal procedures and bankruptcy codes) matter? The present results have demonstrated that, when examining the board/distress relationship, the empirical literature has used mostly US samples, although some studies on non US-samples were recently published. Thus, the results from this review suggest the need to understand the role of the environment at broader levels, as the impact of different (non-US) contexts on corporate crises and turnarounds has still not received proper attention. Thus, more information on international comparisons seems to be needed.

The findings from this research have implications also for practitioners. It is believed that some board/CEO features can help in avoiding crises and promoting successful turnarounds. As an example, the review has shown that having more outside directors tends to prevent crisis situations and to increase the survival of the restructuring firms. Reinforcing the board capabilities' heterogeneity may also help in preventing/resolving their corporate crises. The board turnover may have a positive effect, too, as suggested by the discussed negative effect of the board tenure.

⁶ Also known as *Big Five*, the five-factor personality model comprises five core personality traits: *i*) extraversion; *ii*) emotional stability (*versus* neuroticism); *iii*) agreeableness (*versus* antagonism); *iv*) conscientiousness; *v*) openness to experience.

CONCLUSION

This article has presented the main results regarding the systematic assessment of the evolving empirical literature about the relationship between the board of directors and the corporate distress. In particular, the review has specifically addressed the following research questions: i) Do particular board characteristics positively affect the survival of distressed firms? ii) How has the empirical research on this topic evolved over the years? iii) How have the statistical techniques been developed?

The presented results suggest that the empirical research on the investigated topic has expanded tremendously over the last 30 years. Several changes are observable across different periods, in terms of the variables explored and the statistical methods applied.

Some final remarks on the methods used in this work have to be made. Although rigorous, transparent and replicable criteria were used in selecting and analyzing the publications, some physiological limitations persist in the adopted criteria. First, the present dataset may not be exhaustive of all the existing literature on the investigated topic. In fact, as evidenced in previous reviews of this kind (David & Han, 2004; Newbert, 2007), the *EBSCO-Host* and *JSTOR* databases may not contain all the possible studies published in this field. Thus, by changing the reference database(s), the results reported herein could potentially change. Second, the criteria through which articles were selected may have defined the population in ways that other keywords and other researchers may not have. Nonetheless, it is believed that the *snowballing* technique, used in the present article, should constitute a good insurance against these possible limitations. Third, it could be argued that a meta-analysis can refine the presented results, which are substantially qualitative evidence-based. In this regard, what is definitely evident is that, to date, the great heterogeneity of the board variables, as well as of the statistical techniques, is predominant within the investigated empirical literature. Thus, while the size of the presented population does not seem to constitute a pivotal obstacle for

providing readers with quantitative based meta-analytic syntheses (e.g. Campbell-Hunt 2000; 2004; Dalton et al., 1998; Ketchen et al., 1997; Stankovic & Luthans 1997), this heterogeneity instead seems to be.

In conclusion, this article has not been aimed at being conclusive or exhaustive, in that it has been much more aimed at providing strategists with a first systematization of the extant empirical results about the board/distress relationship. The article has shown that interesting evidences already exist and that, also, much remains to be done, both conceptually and methodologically, in the future. It is firmly believed that the top decision makers of corporations will benefit from understanding what kinds of board capabilities and socio-demographic features allow for successful turnaround strategies, as well as what combination of board members is best suited to deal with different crises. At the same time, further supporting (or eventually refuting) the *anchoring trap* (Hammond, Keeney, & Raiffa, 1998) that boards and/or CEOs must be replaced to achieve successful turnaround strategies, will be valuable for the corporate shareholders as well as for other stakeholders.

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Tables and Figures

TABLE 1
The Evolution of Empirical Research on Board Effectiveness in Contexts of Corporate Distress

Feature	Period 1	Period 2	Period 3	Overall
<i>Summary</i>				
Number of articles	3 (7%)	21 (48%)	20 (45%)	44 (100%)
<i>Sample</i>				
Unique sample	0 (0%)	9 (43%)	14 (70%)	23 (52%)
Matching samples	3 (100%)	12 (57%)	6 (30%)	21 (48%)
<i>Geographical source of data</i>				
Americas	3 (100%)	15 (71%)	11 (55%)	29 (66%)
Europe	0 (0%)	0 (0%)	5 (25%)	5 (11%)
Asia	0 (0%)	0 (0%)	2 (10%)	2 (5%)
Australia	0 (0%)	0 (0%)	1 (5%)	1 (2%)
Not Available	0 (0%)	6 (29%)	1 (5%)	7 (16%)
<i>Business sector</i>				
Industry	3 (100%)	9 (45%)	4 (20%)	16 (36%)
Service	0 (0%)	1 (5%)	5 (25%)	6 (14%)
Not Available	0 (0%)	11 (52%)	11 (55%)	22 (50%)
<i>Board variables (a)</i> (in descending order per overall number of observations)				
Board independence (number of outside directors)	0 (0%)	9 (43%)	6 (30%)	15 (34%)
Board turnover	2 (67%)	9 (43%)	3 (15%)	14 (32%)
CEO turnover	1 (33%)	5 (24%)	7 (35%)	13 (30%)
Board socio-demographic features	2 (67%)	4 (19%)	4 (20%)	10 (23%)
Board size	0 (0%)	5 (24%)	3 (15%)	8 (18%)
CEO duality	0 (0%)	5 (24%)	2 (10%)	7 (16%)

a Because most of the reviewed articles simultaneously focus on more than one board variable, the sum of the percentages associated with them has not to be equal to 100.

TABLE 2
Statistical Methods Used in the Articles (a)

Statistical method	Observations (N=44)
Tests of differences between groups / variables	21 (48%)
Logit model	21 (48%)
Linear regression model	9 (20%)
Survival model	5 (11%)
Event History	3 (7%)
Discriminant Analysis	2 (5%)
Probit model	1 (2%)
Poisson model	1 (2%)
Tobit model	1 (2%)

a Because most of the sampled articles simultaneously use more than one statistical method, the sum of the percentages associated with them has not to be equal to 100.

TABLE 3
Combined Use of the Statistical Methods (Number of xy Edges)

Statistical method	Tests of differences between groups/variables	Discriminant analysis	Linear regression model	Logit model	Probit model	Poisson model	Tobit model	Survival model	Event study
Tests of differences between groups/variables	-	-	-	-	-	-	-	-	-
Discriminant analysis	0	-	-	-	-	-	-	-	-
Linear regression model	4	0	-	-	-	-	-	-	-
Logit model	11	0	1	-	-	-	-	-	-
Probit model	1	0	0	0	-	-	-	-	-
Poisson model	1	0	0	0	1	-	-	-	-
Tobit model	0	0	0	0	0	0	-	-	-
Survival model	0	0	0	1	0	0	0	-	-
Event study	1	0	0	0	0	0	0	0	-

TABLE 4
Use of the Statistical Methods over Time (a)

Period	N	Tests of differences between groups/variables	Discriminant analysis	Linear regression model	Logit model	Probit model	Poisson model	Tobit model	Survival model	Event study
3	20	8 (40%)	0 (0%)	6 (30%)	9(45%)	1(5%)	1 (5%)	0(0%)	4 (20%)	1 (5%)
2	21	10 (48%)	2 (10%)	3 (14%)	10(48%)	0(0%)	0 (0%)	1(5%)	1 (5%)	2(10%)
1	3	3 (100%)	0 (0%)	0 (0%)	2 (67%)	0(0%)	0 (0%)	0(0%)	0 (0%)	0 (0%)

a Because most of the sampled articles simultaneously use more than one statistical method, the sum of the percentages associated with them has not to be equal to 100.

TABLE 5
Clusters and Statistical Methods (a)

Cluster(s)	N	Tests of differences between groups / variables	Discriminant analysis	Linear regression model	Logit model	Probit model	Poisson model	Tobit model	Survival model	Event study
I	3	2 (67%)	0 (0%)	2 (67%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
I,II	3	2 (67%)	0 (0%)	1 (33%)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (33%)	0 (0%)
I,II,III,IV	7	3 (43%)	1 (14%)	1 (14%)	4 (57%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
I,IV	11	7 (64%)	1 (9%)	2 (18%)	4 (36%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (9%)
I,III,IV	1	1 (100%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
II,III	4	3 (75%)	0 (0%)	1 (25%)	0 (0%)	1 (25%)	1 (25%)	0 (0%)	0 (0%)	1(25%)
III	2	0 (0%)	0 (0%)	0 (0%)	1 (50%)	0 (0%)	0 (0%)	0 (0%)	1 (50%)	0 (0%)
III,IV	3	0 (0%)	0 (0%)	0 (0%)	1 (33%)	0 (0%)	0 (0%)	0 (0%)	2 (67%)	0 (0%)
IV	9	3 (33%)	0 (0%)	1 (11%)	7 (78%)	0 (0%)	0 (0%)	1 (11%)	1 (11%)	0 (0%)

a Because most of the sampled articles simultaneously use more than one statistical method, the sum of the percentages associated with them has not to be equal to 100.

TABLE 6
Articles Distribution per Journal (a)

Journal	Period 1	Period 2	Period 3	Overall
Academy of Management Journal	2	2	1	5
Strategic Management Journal	0	4	1	5
Journal of Management	0	3	0	3
Administrative Science Quarterly	1	1	0	2
Corporate Governance: An International Review	0	0	2	2
CG: The International Journal of Business in Society	0	0	2	2
Journal of Business	0	1	1	2
Journal of Business Research	0	2	0	2
Journal of Business Venturing	0	0	2	2
Journal of Finance	0	2	0	2
Journal of Management Studies	0	1	1	2
Corporate Ownership and Control	0	0	1	1
Emerging Markets Finance and Trade	0	0	1	1
Human Resource Management	0	1	0	1
International Journal of Business Studies	0	0	1	1
International Review of Economics and Finance	0	1	0	1
Journal of Banking and Finance	0	0	1	1
Journal of Change Management	0	0	1	1
Journal of Corporate Finance	0	0	1	1
Journal of Financial Economics	0	1	0	1
Journal of Management and Governance	0	0	1	1
Journal of Managerial Issues	0	0	1	1
Management Science	0	1	0	1
Organization Science	0	1	0	1
Organization Studies	0	0	1	1
Review of Quantitative Finance and Accounting	0	0	1	1

a In descending order per overall observations.

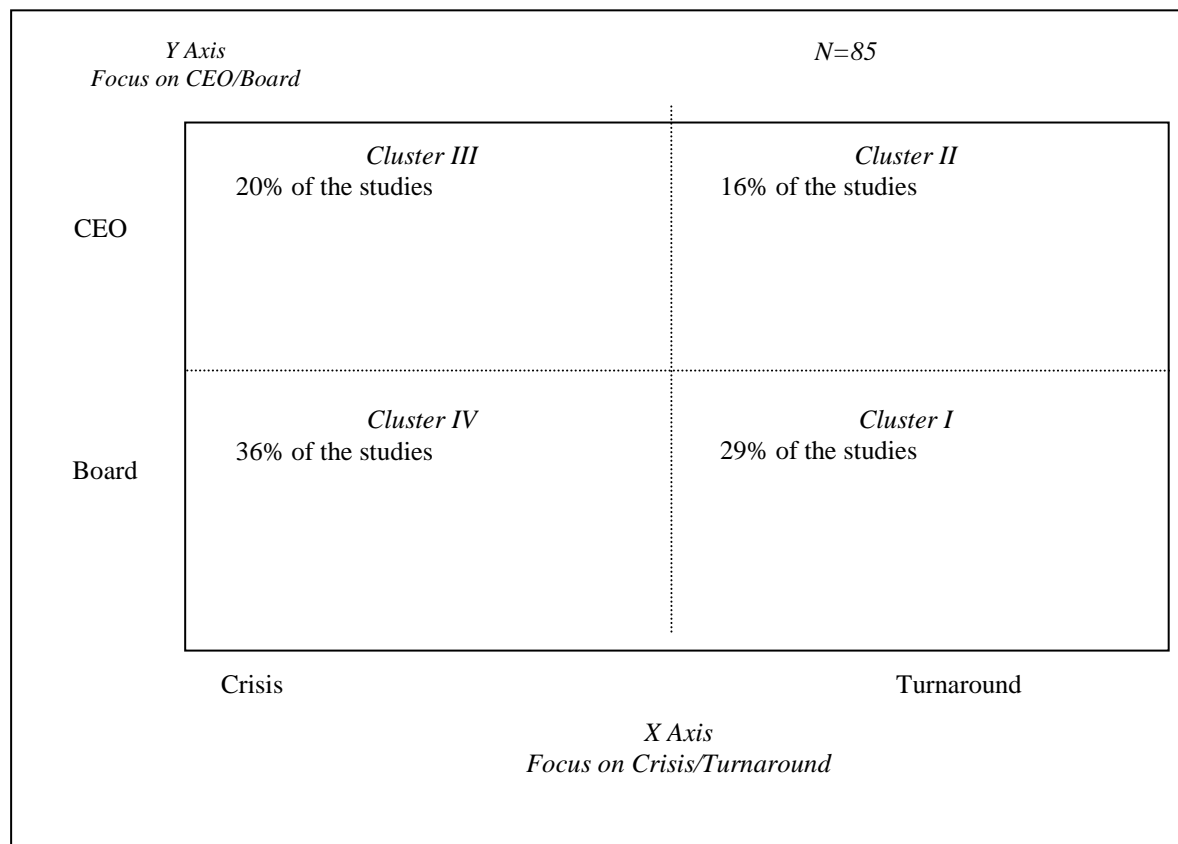
TABLE 7
Statistical Methods per Journal Ranking (a)

Ranking	N	Tests of differences between groups/variables	Discriminant analysis	Linear regression model	Logit model	Probit model	Poisson model	Tobit model	Survival model	Event study
4	28	14 (50%)	2 (7%)	4 (14%)	13 (46%)	0 (0%)	0 (0%)	1 (4%)	3 (11%)	3 (11%)
3	7	3 (43%)	0 (0%)	2 (29%)	5 (71%)	0 (0%)	0 (0%)	0 (0%)	1 (14%)	0 (0%)
2	1	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
1	4	2 (50%)	0 (0%)	1 (25%)	1 (25%)	1 (25%)	1 (25%)	0 (0%)	0 (0%)	0 (0%)
N.A (b)	4	2 (50%)	0 (0%)	2 (50%)	1 (25%)	0 (0%)	0 (0%)	0 (0%)	1 (25%)	0 (0%)

(a) Because most of the sampled articles simultaneously use more than one statistical method, the sum of the percentages associated with them has not to be equal to 100.

(b) N/A = Ranking not available.

FIGURE 1
Clusters of Observations (a)



(a) Because most of the sampled articles were clustered more than once, the sum of the clusters' percentages has not to be equal to 100.

FIGURE 2
Combined Use of the Statistical Methods (Graphical Representation of Xy Edges)

