THE WISDOM AND MADNESS OF CROWDS: HOW INFORMATION NETWORKS AND BOARD COGNITION HELP OR HINDER FIRM PERFORMANCE ACROSS THE BUSINESS CYCLE

ABSTRACT

We know little of why a minority of firms pursue counter-cyclical strategies and consequently outperform competitors during recessions. Based on the theory of institutional isomorphism, we hypothesize that these firms avoid the mimetic and normative pressures that promote strategic convergence during uncertainty. We demonstrate these effects at the board-level in a sample of 1,615 U.S. firms. Mimetic processes are evident, with firms' connectedness in board interlock networks attenuating profitability and decreasing firm value during recessions—a reversal of the positive effects during expansions. Normative pressures arise from homogeneity in directors' educational and professional experience, with greater consequences for long-term performance. Overall, recessionary performance is improved when firms occupy relatively isolated positions in informational networks and appoint directors from a range of backgrounds.

Keywords: strategic leadership; corporate governance; board interlocks; board composition; recession.

INTRODUCTION

During recessions, most firms reduce investment in marketing and R&D and instigate job and wage cuts to conserve resources (Fan et al., 2020), despite evidence that this exacerbates the impact of declining demand and environmental uncertainty (Dekimpe and Deleersnyder, 2018). A small minority of firms counter this trend: following the recessions of 1980, 1990, and 2000, 80% of U.S. firms struggled to restore profitability, while 9% outperformed competitors by 10% or more in terms of both revenue and profit growth (Gulati et al., 2010). These high-performers appear to view recessions as an opportunity to improve long-term performance, investing in areas that their peers neglect (Steenkamp and Fang, 2011). However, this conclusion is based on inferring strategic motives from patterns of investment—little is known about *why* specific firms

deviate from strategic norms (Dekimpe and Deleersnyder, 2018). What leads most firms to respond to recessions in homogenous ways, and what this can tell us about the minority that succeed despite this trend, thus remain open questions.

To address these, we draw on the theory of institutional isomorphism, which posits that environmental uncertainty leads to 'collective rationality' among firms and thus to homogeneous strategic responses (DiMaggio and Powell, 1983). This occurs through *mimetic processes*, where firms search for satisfactory strategies by imitating others, and *normative pressures* which produce common cognitive biases among decision-makers. The rarity of strong performance during recessions suggests that this may be due to an ability to avoid isomorphism, either by maintaining independence from peer firms (avoiding mimetic processes) or widening the cognitive scope of decision-making teams (avoiding normative pressure).

We propose that mimetic processes and normative pressures operate at the level of the board of directors—the key decision-making unit in times of strategic change (Carpenter and Westphal, 2001; Morais et al., 2020)—to affect firm performance. We assess mimetic processes by examining board interlock networks, utilizing three network-level measures of the degree to which a firm's board is *connected or isolated* from others in the network. We develop two director-level measures of normative pressures based on the *diversity or homogeneity* of directors' educational and professional experience. Our findings support institutional isomorphism as an explanation for widespread poor performance. Specifically, profitability, firm value, and investments in marketing and R&D during recessions are negatively related to the board's network centrality and ties to other industries, whereas intra-industry ties have a positive effect on performance and negative effects on investment, indicating benefits to isolation from the information environment and suggesting the presence of mimetic processes. We also find

evidence for normative pressures arising from homogeneity in director characteristics, with stronger effects on long-term value than near-term financial outcomes. In sum, firms perform better during recessions when their boards are less connected to others and appoint directors from a range of backgrounds.

These results offer several contributions to understanding how board-level factors influence firm-level outcomes. First, our findings highlight the nuanced effects of board interlock networks. We provide evidence of negative effects of connectedness contingent on environmental conditions: better-connected boards fare worse in recessions, whilst their relatively isolated peers exhibit stronger financial performance and higher stock valuations. Furthermore, our additional analyses demonstrate that firm failure is highest among moderately well-connected boards, indicating benefits to both isolation and connectedness. These findings challenge the notion that such networks are generally valuable (see Aalbers, 2020; Withers et al., 2020), suggesting a need for greater attention to the liabilities of board interlocks. Our findings also validate institutional isomorphism as a theoretical lens in this context: previous research has tended to examine strategic imitation in a positive light (e.g., Beckman and Haunschild, 2002; Westphal et al., 2001), leaving a gap in understanding of its negative effects. Second, we show that diversity in directors' functional and educational backgrounds differentially affects firm-level outcomes across the business cycle. In doing so, this study demonstrates the significance of individuals' characteristics for understanding strategic decision-making within networks, which has been neglected in network studies (Aalbers, 2020; Tasselli and Kilduff, 2020). Third, we clarify the internal variables that influence performance across the business cycle. Empirical research has focused on which investment decisions are beneficial during recessions, notably marketing and R&D (Dekimpe and Deleersnyder, 2018), whereas the antecedents of such

decisions have been overlooked (Bamiatzi et al., 2016). We address this gap, demonstrating that directors' exposure to and interpretation of information are critical determinants of whether firms make such counter-cyclical investments. Our Bayesian approach provides probabilistic estimates of the effects of our focal variables, offering actionable insights into how board-level decisions affect performance across the business cycle and across firms.

CONCEPTUAL DEVELOPMENT

Counter-cyclical investments and firm performance

Recessions threaten the performance and survival of all firms, narrowing the margin for error in strategic decisions and compelling managers to reconsider their strategic priorities (Fan et al., 2020; Garcia-Sanchez et al., 2014). Most firms respond accordingly: following the 2008 financial crisis, 96% of managers reported making significant changes to investment decisions (McKinsey & Company, 2009). Paradoxically, these are largely counterproductive, amplifying the negative impact of economic conditions (Dekimpe and Deleersnyder, 2018). Typical responses include reducing investment in marketing and R&D (Srinivasan et al., 2011) and implementing job and wages cuts (Bamiatzi et al., 2016) to conserve resources. These ostensibly rational responses to recessions frequently have unintended consequences: changes to the labor force exacerbate productivity declines, and cessation of demand-generating investments increases the difficulty of recovery once conditions normalize (Steenkamp and Fang, 2011).

These actions are referred to as *pro-cyclical*: firms conserve resources during economic contraction and expend during expansion.[1] Conversely, evidence suggests that *counter-cyclical*

[1] In line with previous research (e.g. Dekimpe and Deleersnyder, 2018; Reyes et al., 2020; Steenkamp and Fang, 2011), 'expansion' refers here to all non-contractionary periods of the business cycle, including periods of relatively low or stable economic growth.

strategies improve performance. Specifically, investments in advertising and R&D lead to higher profitability and stock returns both during recessions (Özturan et al., 2014; Srinivasan et al., 2011) and subsequent recovery (Steenkamp and Fang, 2011). Researchers have thus recommended that firms refrain from "blindly following the herd in an attempt to adhere to the wisdom of the crowd" and instead view recessions as an opportunity to strengthen long-term performance by investing in areas that competitors neglect (Dekimpe and Deleersnyder, 2018, p. 53). However, despite the prevailing evidence, few firms abide by this view (Gulati et al., 2010).

Institutional isomorphism and collective rationality

To explain why most firms adopt counterproductive strategies during recessions, we draw on the theory of institutional isomorphism, which posits that "individual [firms'] efforts to deal rationally with uncertainty and constraint often lead, in the aggregate, to homogeneity in structure, culture, and output" (DiMaggio and Powell, 1983, p. 147). Faced with sudden environmental change, firms thus tend to converge around a standardized set of strategic actions. We focus on two drivers of isomorphism: mimetic processes and normative pressures.[2]

Environmental uncertainty creates ambiguity surrounding the appropriate goals of a firm and the best way to achieve these goals (Duplat et al., 2020; Morais et al., 2020). Under such circumstances, firms are more likely to seek a viable solution than attempt to optimize decision-making, looking to peer firms and imitating their strategic actions (Cyert and March, 1963). These *mimetic processes* have been demonstrated in acquisitions (Haunschild, 1993), technology adoption (Burt, 1987), and the spread of organizational structures (Palmer et al., 1993). As imitation is facilitated by the formal and informal interorganizational ties between firms

[2] DiMaggio and Powell (1983) also identify *coercive pressures* as a third driver. However, these represent constraints imposed by regulatory bodies, setting mandatory standards across industries or sectors, and are thus unlikely to explain why isomorphism differs across firms.

(Mizruchi, 1996), mimetic pressures are greater for firms that are more well-connected to peers (Galaskiewicz, 1985).

Similar strategic responses to environmental threats also occur at the individual level. *Normative pressures* arise when a field becomes professionalized, as occurred in management during the twentieth century (DiMaggio and Powell, 1983). Greater requirements for formal education, with certain institutions being favored, leads to homogenization of the 'cognitive base' of managers. Professional associations further propagate a set of normative rules, creating "a pool of almost interchangeable individuals who occupy similar positions…and possess a similarity of orientation" (DiMaggio and Powell, 1983, p. 152). Despite the recent focus on increasing demographic diversity among managers and directors, educational and professional homogeneity remains pervasive: boards are dominated by directors with career paths in finance and operations, with fewer than 3% having experience in marketing or sales (Whitler et al., 2018). The backgrounds of a firm's leaders determine the lens through which information is interpreted and thus the strategic emphasis and goals of the firm (Hambrick and Mason, 1984; Rindova and Fombrun, 1999). Accordingly, lack of diversity in training and experience reduces the cognitive scope of decision-making teams, leading to a smaller set of options being considered and homogeneity in strategic choices (DiMaggio and Powell, 1983).

Overall, the theory of institutional isomorphism indicates that strategies are more likely to converge when firms have greater exposure to interorganizational networks and when there is little cognitive diversity among directors. The combined influence of mimetic processes and normative pressures suggests that, when faced with environmental uncertainty, decision-makers may rely on other firms for guidance and fall back on mental models shaped by their cognitive biases, rather than "make decisions on the basis of systematic analyses of goals, since such

analyses would prove painful or disruptive" (DiMaggio and Powell, 1983, p. 155). Recessions, as a source of environmental uncertainty, may instigate this isomorphic process and thus explain the homogeneity of strategic responses.

In the following sections, we examine how certain firms may avoid isomorphism and its negative consequences. We argue that mimetic processes are encouraged by a firm's *exposure* to information whereas normative pressures affect the *interpretation* of this information. Typically, these processes are difficult to study, as measurement of the cognitive processes of boards requires data that is internal to the firm (Kaplan, 2011; Mohammed et al., 2021). However, we may exploit the empirical setting of recessions to infer these mechanisms from an examination of firm performance, for two reasons explicated above. First, the relationship between deviation from strategic norms during recessions and financial performance is well-substantiated (Dekimpe and Deleersnyder, 2018; Frick, 2019). Second, the heightened uncertainty induced by macroeconomic threats leads to greater influence of the board over strategic decisions (Carpenter and Westphal, 2001; Morais et al., 2020). Accordingly, differences in factors that determine the degree of information exposure and cognitive scope of boards are likely to be related to firm performance during recessions. These are summarized in Figure 1.

- Insert Figure 1 here –

HYPOTHESES

Exposure to information: Board interlock networks

The primary conduit of mimetic processes is interorganizational networks (Galaskiewicz, 1985). Because a firm's strategic objectives are set by its board of directors (Finkelstein et al., 2009), the network of interest in the study of strategic imitation is the board interlock network, in which

two firms are connected by a director who serves on the board of both firms (Mizruchi, 1996). These *board interlocks* are key sources of information about external conditions (Westphal et al., 2001), and are thus highly relevant to board decision-making during recessions. While previous research has not directly examined the effect of board interlocks on strategic imitation across the business cycle, related literature suggests that a firm's position in the interlock network may be consequential for promoting or resisting isomorphic pressures.

The most common operationalization of a firm's network position is *network centrality,* where a large proportion of directors are connected to other boards which are, in turn, highly connected to others, leading to greater access to information within the network (Tuggle et al., 2010). Occupying a central position in the network facilitates the flow of environmental intelligence between boards, influencing opportunity identification (Mizruchi, 1996) and decision-making (Carpenter and Westphal, 2001) for the focal firm, which can lead to improvements in business processes (Beckman and Haunschild, 2002) and encourage adoption of best practices (Westphal et al., 2001). However, while these benefits may accrue to firms dependent on the *extent* of information to which they are exposed, evidence suggests that the informational *content* of board interlocks has differential consequences for firm-level outcomes (Srinivasan et al., 2018). For example, in terms of innovation outcomes, interlocks are not universally beneficial: when a focal firm's new product development is incremental, *intra-industry interlocks* are associated with positive outcomes as these provide relevant, context-specific market intelligence (Rowley et al., 2000; Srinivasan et al., 2018). Conversely, firms pursuing disruptive innovation do not benefit from access to industry information, but show performance improvements from *inter-industry interlocks* which provide less information on

current market conditions but a broader range of intelligence that may stimulate novel insights (Geletkanycz and Hambrick, 1997; Li, 2019).

In sum, board interlocks are a form of social capital that can improve firm-level outcomes via broader, more relevant, or more timely exposure—and thus increased opportunity to respond—to market intelligence (Srinivasan et al., 2018). Prior research has documented differential effects of overall network centrality, intra-industry, and inter-industry interlocks, suggesting that benefits are dependent on the scope of exposure and the overlap between incoming information and the requirements of the focal firm's strategy (Geletkanycz and Hambrick, 1997; Srinivasan et al., 2018). Isolation from board interlock networks therefore constrains strategic decision-making in two ways: *(1) decreased awareness of other firms' strategies* (the extent of information exposure) and *(2) increased reliance on context-specific market intelligence* (the informational content of board interlocks). However, when most firms' strategies are counterproductive and based on macroeconomic intelligence (i.e. during recessions) this may be advantageous, as the social process of isomorphism will exert less pressure on the isolated firm (Galaskiewicz, 1985).

Exposure to the strategic decisions of others will be lowest, and the salience of context-specific information highest, when a firm's overall position in a board interlock network is one of isolation, i.e., a firm has *low network centrality*. Mirroring beneficial effects under normal operating conditions, we hypothesize that the role of board interlocks in diffusion of best practices during a recession will be deleterious, encouraging widely adopted but detrimental resource allocation strategies. In support of this, firms with greater exposure to market intelligence are more likely to perform poorly during recessions (Özturan et al., 2014). When a firm's board is isolated from the network, decisions are likely to rely to a greater extent on

internal information and be less influenced by the strategic decisions of others. Accordingly, directors will face fewer isomorphic pressures, providing greater opportunity to pursue the counter-cyclical strategies that have been shown to improve firm performance (Dekimpe and Deleersnyder, 2018).

We consequently hypothesize that the positive effects of network centrality under normal operation conditions will be diminished during recessions. Given the lack of previous comparison of the effects of board interlocks in expansions and contractions, we may expect this diminishment to result in either net negative effect of network centrality on financial performance during recessions, or an attenuation of the predicted positive effects during expansions. We leave this as an empirical issue, and hypothesize:

> ***Hypothesis 1a (H1a)****: Firms with higher network centrality will exhibit stronger financial performance during expansions.*
>
> ***Hypothesis 1b (H1b)****: The positive effect of network centrality on financial performance will be attenuated or reversed during recessions.*

Inter- and intra-industry interlocks may also differentially affect isomorphic pressures, as the effects of these ties depend on the informational requirements of a firm's strategy (Li, 2019; Rowley et al., 2000; Srinivasan et al., 2018). The nature of environmental information upon which strategic decisions are based in a recession differs from prior empirical settings. Generally, industry-specific market intelligence is likely to be more salient than trends that affect all sectors (Srinivasan et al., 2018). In contrast, macroeconomic shocks shift the strategic focus of firms to formulating responses to the threat, with a consequent broad tendency towards pro-cyclical resource allocation decisions across all industries (Dekimpe and Deleersnyder, 2018). This suggests that collective rationality in recessions occurs at the *inter*-industry level, as firms shift their attention away from immediate competitive conditions. The salient market intelligence

thus becomes the adoption of pro-cyclical strategies across industries, which suggests the existence of a context-independent 'best practice' in responding to recessions (c.f. Porter and Siggelkow, 2008). Thus, inter-industry interlocks may negatively affect performance, as pressure to conform to cross-industry norms dominates other strategic concerns:

> ***Hypothesis 2a (H2a)****: Firms with a greater number of inter-industry interlocks will exhibit stronger financial performance during expansions.*
>
> ***Hypothesis 2b (H2b):*** *The positive effect of inter-industry interlocks on financial performance will be attenuated or reversed during recessions.*

In contrast, intra-industry interlocks do not broaden the scope of environmental intelligence beyond a firm's immediate competitive environment (Geletkanycz and Hambrick, 1997). Furthermore, intra-industry interlocks are formed through directors with a fiduciary duty to indirect competitors of the focal firm, discouraging the sharing of industry-specific intelligence across firms (Srinivasan et al., 2018). This has previously been shown to be detrimental to innovation due to a lack of information on both broad and particular market trends (Rowley et al., 2000). However, when this information may drive imitation of counterproductive strategies, context specificity in the information environment may protect against isomorphism as it necessitates a reliance on internal information. Given the equivocal findings discussed above, we expect heterogeneous effects of intra-industry interlocks under normal operating conditions, and therefore do not hypothesize a directional relationship during expansions. The above arguments thus suggest that firm-specific effects during recessions will be increasingly uniform, with those that may normally gain no benefit from intra-industry interlocks realizing an advantage:

> ***Hypothesis 3a (H3a)****: The effect of intra-industry interlocks on financial performance will be heterogenous across firms during expansions.*

> ***Hypothesis 3b (H3b)****: The effect of intra-industry interlocks will be more homogeneous and positive across firms during recessions**, such that firms with a greater number of intra-industry interlocks will exhibit stronger financial performance during recessions.*

Both prior research and our hypotheses do not therefore suggest that inter- and intra-industry interlocks act antagonistically, supporting the analysis of both variables (instead of a ratio, e.g., Li 2019). Rather, we predict opposing effects, but theorize that these arise from different mechanisms: increased pressure to mimic strategic decisions (inter-industry interlocks) versus limited information about peer firms and broad market trends (intra-industry interlocks).

To summarize, the information gained through board interlocks may cease to be beneficial when this encourages imitation of pro-cyclical strategies. As these are widespread, this negative effect is likely to be strongest when a firm's network is comprised of inter-industry interlocks. Conversely, when a board is isolated from the information environment by a network based on intra-industry interlocks or low network centrality, firm performance may improve as strategic decisions are more likely to rely on internal information.

Interpretation of information: Director diversity

Interlock networks affect the degree to which board members are exposed to environmental intelligence. How this is used in strategic decisions—and consequently, how this may affect firm-level outcomes—depends on the attention and interpretation of directors (Ocasio, 1997). The board is the key decision-making body when dealing with complex and uncertain strategic problems (Carpenter and Westphal, 2001; Rindova, 1999), and the backgrounds and experience of directors determine the lens through which such problems are viewed and resolved (Hambrick and Mason, 1984). Accordingly, firms respond differently to the same information based on the cognitive framework of the board (Forbes and Milliken, 1999) which in turn depends on the

characteristics of directors (Barroso-Castro et al., 2020; Kolev and McNamara, 2020; Westphal and Zajac, 2013).

A key determinant of leaders' cognition is experience in different functional areas (Gabaldon et al., 2018; McDonald et al., 2008). Two broad categories can be delineated: output-oriented, with a focus on demand generation (e.g., marketing and sales), and throughput-oriented, with a focus on efficiency and risk management (e.g., finance, operations, and legal). Although both are essential for firm performance, boards are predominantly throughput-oriented (Whitler et al., 2020). This suggest the influence of normative pressure: the cognitive base from which directors approach strategic threats is relatively homogenous, encouraging an emphasis on risk mitigation over demand generation (Whitler et al., 2018).

This may explain the popularity of pro-cyclical strategies despite their demonstrated ineffectiveness. If boards are dominated by throughput-oriented directors, recessions are likely to be seen as a need to reduce costs and inefficiencies: investments in marketing or R&D may be outside of the cognitive scope of decision-makers despite their benefits for performance during recessions and subsequent recovery. Conversely, directors with output-oriented functional experience are more likely to prioritize these demand-generation activities, and may therefore improve performance by widening the cognitive scope through which environmental signals are perceived (Bettis and Prahalad, 1995). However, even when output-oriented directors are present they typically remain a minority (Whitler et al., 2018). If other board members are biased towards efficiency and risk mitigation, in-group preferences may create resistance to alternative viewpoints (Westphal and Zajac, 1995). In support of this, Whitler et al. (2018) find that the performance impact of output-oriented directors is weakened when a large proportion of board members have a background in finance. Thus, we predict that resistance to the normative

pressures of throughput-oriented cognitive bias will require *diversity* in directors' functional experience, i.e., the extent to which directors' expertise indicates the existence of a lack of consensus, rather than the presence of an opposing view (c.f. Klarner et al., 2021).

As previous research has found equivocal effects of director diversity on firm performance (Boivie et al., 2011; Johnson et al., 2013), we predict heterogenous effects of functional diversity under normal operations conditions and a tendency towards more positive effects during recessions, as in H3 regarding intra-industry interlocks:

> ***Hypothesis 4a (H4a)****: The effect of functional diversity on financial performance will be heterogenous across firms during expansions.*
>
> ***Hypothesis 4b (H4b)****: The effect of functional diversity will be more homogeneous and positive across firms during recessions**, such that firms with higher functional diversity will exhibit stronger financial performance during recessions.*

Similarly, cognitive scope is also determined by formal education. DiMaggio and Powell (1983) note that the preference for qualifications from selected educational institutions in recruitment leads to homogeneity in the cognitive frameworks of leaders. Supporting this, Pfeffer and Fong (2002) observe that business school education prepares executives for identifying the same set of problems and responding with a standard set of solutions (see also Bell et al., 2018). The evidence that effective strategies in recessions are counter-cyclical in nature indicates an advantage to avoiding standardized solutions. Diversity of educational backgrounds among directors may therefore present similar benefits as functional diversity, by broadening the cognitive scope of decision-making. Thus, we hypothesize:

> ***Hypothesis 5a (H5a)****: The effect of educational diversity on financial performance will be heterogenous across firms during expansions.*
>
> ***Hypothesis 5b (H5b)****: The effect of educational diversity will be more homogeneous and positive across firms during recessions**, such that firms with higher educational diversity will exhibit stronger financial performance during recessions.*

In sum, we argue that an examination of the effects of information gained from interlock networks must also consider director attributes. Diversity of functional and educational experience widens the cognitive scope of decision-making teams, leading to differences in the interpretation of environmental intelligence and attention to strategic objectives. While previous research indicates equivocal effects of such diversity, we therefore theorize that this may increase resistance to isomorphic processes and improve firm performance during recessions.

MEASURES

Data and sample

We focus our investigation on large U.S. firms—a common empirical setting for board research due to the availability of director- and firm-level data and the importance of interlock networks to the U.S. economy (Withers et al., 2020). We begin with data from BoardEx, which provides details of (1) directors' employment and education history, (2) board interlocks, and (3) the composition of firms' boards and management. Data on the latter are provided from 1999 onwards, which defines our census date. We collected corresponding firm-year data from Compustat to measure firm characteristics and financial performance. Our sample therefore includes all firms that have at least one establishment in the U.S. and are publicly traded in U.S. stock markets (the coverage of Compustat) and report director information in BoardEx. We exclude firms with less than 10 million USD in total assets and those operating in the financial sector (SIC codes 60-69) and public administration (SIC codes 91-99), to ensure that our analyses are not biased by firms that are highly regulated and thus limited in their strategic choices.[3] Our final sample comprises 10,569 firm-year observations of 1,615 firms operating

[3] We thank an anonymous reviewer for highlighting that this issue may also apply to utilities firms operating in SIC codes 40-49. As a robustness check, we therefore also conduct all analyses excluding these firms from our sample.

between 1999 and 2019, with a mean of 6.5 years of data per firm. Table 1 summarizes all variables and data sources.

- Insert Table 1 here –

Network-level variables

To test the proposed mechanism through which a firm's connectedness affects strategic decisions during recessions, we require a measure that captures the overall exposure of a firm to environmental information via board interlock networks. There are four main approaches to quantifying centrality (Borgatti and Everett, 2006). Degree centrality represents a firm's total number of interlocks but provides no estimate of the informational role of these connections, while closeness and betweenness centrality capture a firm's ability to disseminate information rather than the influence of incoming information on the focal firm. The measure best suited to our context is *eigenvector centrality (EVC),* a weighted measure in which the weights are determined by the centralities of the firms connected to the focal firm (Mariolis and Jones, 1982). This captures direct information flows between the focal firm and others as well as the extent of information transmission: firms connected to other well-connected firms are likely to be exposed to more of the information contained within the network (Owen-Smith and Powell, 2004).

We therefore measure board interlock centrality using EVC (Srinivasan et al., 2018; Tuggle et al., 2010). We first construct a bimodal network in which directors are connected to the boards on which they serve, and two boards are connected by a shared director. From this we

The direction and magnitude of effects and degree of inter-firm variation is consistent between these two approaches, indicating that the sampling approach described above does not result in spurious findings. To maximize the generalizability of our results, we therefore report the analyses inclusive of utilities firms.

derive a unimodal network of firms based on the number of shared directors. In a network of *N* firms, the EVC of firm *i* connected to *M(i)* other firms is then calculated as:

(1) $$C_i = \frac{1}{\lambda}\sum_{j \in M(i)} a_{ij} C_j$$

Where a_{ij} = 1 if firm *i* is connected to firm *j* and zero otherwise. In eigenvector notation;

(2) $$AC = \lambda C$$

Where *C* is the vector of centralities, λ the vector of eigenvalues, and *A* the adjacency matrix containing the relationships between firms. We calculate C_i for each year in the sample, to capture shifts in a firm's centrality arising from changes to board composition over time. From the unimodal board interlock network, we also calculate our two measures of the informational content of board interlocks. We define *intra-industry interlocks* as the natural log of the number of connections between a focal firm and firms in the same 2-digit SIC code. *Inter-industry interlocks* are analogously defined as connections to firms in other 2-digit SIC codes.

Director-level variables

To measure diversity among directors we derive two measures using the coefficient of variation. This has been used analogously to measure heterogeneity in firm strategies and resource investments (see Nadkarni and Narayanan, 2007) as it provides an estimation of diversity that is independent of the value of the variable(s). This is well-suited to capture cognitive scope as it measures the variability, rather than the overall level, of functional or educational experience within the board.

Our measure of functional diversity is derived from job descriptions provided in the employment histories of directors. Following recent research, we use computer-aided text analysis to categorize job descriptions (Srinivasan et al., 2018; Whitler et al., 2018). However,

we build on prior approaches by using a probabilistic algorithm rather than word lists. This ensures that our measure captures changes in word usage across industries and time, which are not accounted for when using deterministic classifiers. For example, a dictionary-based approach may use the words ‘marketing’ or ‘sales’ to classify a director with marketing experience (Whitler et al., 2018). However, firms are increasingly adopting a broader range of positions at the strategic level (Gupta et al., 2020), leading to a proliferation of executive roles with non-standard titles (e.g., Chief ‘Branding’ or ‘Creative’ Officers) that this dictionary would overlook.

To overcome this issue, we classify job descriptions using guided Latent Dirichlet Allocation (LDA), a probabilistic topic modeling technique that simulates the human production of language to identify the latent thematic content (topics) of a collection of documents and the words most strongly associated with each topic (Blei, 2012). In basic LDA, no prior assumptions are made about the presence of topics or their associated words: the model aims to maximize the probability of observing the actual content of the documents. However, when certain words are common across all documents, the topics that dominate the model will not be semantically meaningful (Griffiths et al., 2007). For example, in this case, words such as ‘chief’, ‘director’ or ‘manager’ are highly prevalent in job descriptions but irrelevant to classification by functional area. Guided LDA circumvents this problem by biasing the identification of topics towards a set of ‘seed words’ (Blei and McAuliffe, 2008). This improves the likelihood of detecting the topics of interest whilst retaining the probabilistic nature of LDA and thus ensuring that relevant words omitted from the seed lists are included in the final model.

Online Appendix 1 provides details of the guided LDA procedure. Our final model identifies six functional areas, to which we assign each job description based on its highest topic probability. Next, we sum the total number of previous positions in each functional area for each

director-year. We then match these to firm-year observations and calculate the average experience in each functional area across all directors. *Functional diversity* is calculated as the standard deviation in experience across functional areas divided by the mean experience across all areas, such that higher values reflect greater variability in the experience of a firm's directors and lower values reflect a relatively even distribution of experience across the six areas.

We measure *educational diversity* analogously as the coefficient of variation of the number of qualifications held by directors, i.e., the standard deviation in the number of qualifications across directors divided by the mean number of qualifications. Higher values thus indicate firms in which directors have varying levels of formal education, while low values indicate that the educational backgrounds of directors are relatively homogenous.

Recession and financial performance

Following the methodology of previous studies of strategic decisions across the business cycle (e.g., Graham and Frankenberger, 2011; Reyes et al., 2020; Srinivasan et al., 2011) we identify recession years using classifications of peaks and troughs in economic activity from the National Bureau of Economic Research (NBER). As our data sources (BoardEx and Compustat) are provided on an annual basis, we identify a calendar year as a recession when more than six months (i.e., two quarters) of that year are classified as such, leading to three recession years in our sample: 2001, 2008, and 2009.

Few studies of strategic decisions across the business cycle examine the implications for overall firm financial performance, often using industry-specific or subjective measures or proximal outcomes such as sales volume (see review in Dekimpe and Deleersnyder, 2018). Consequently, we follow Steenkamp and Fang (2011) and measure financial performance as profitability, defined as a firm's net income in million USD.

Controls

We include key control variables that may affect firm performance across the business cycle and the formation and/or effects of network ties. At the firm-level, we control for *firm size,* defined as the natural log of total assets*; firm age;* and, *leverage,* measured as the firm's debt-to-equity ratio (Srinivasan et al., 2011; Steenkamp and Fang, 2011). We also include a lagged dependent variable to control for the effects of previous financial performance.

We also include controls to account for the fact that the impact of board-level decisions on performance is contingent on implementation (Lee and Puranam, 2016). Board members who also hold executive positions in the firm are more likely to generate consensus around decisions and ensure the utilization of market intelligence gained through board interlocks (Nguyen, 2012; Nyberg et al., 2010). CEO duality is a specific form of internal leadership where the CEO also serves as board Chair, which may be particularly effective in aligning responsibility for strategic actions across decision-making levels (Dalton et al., 2007). We consequently disaggregate this variable into *internal leadership,* measured as the total number of directors who also hold a position in the firm's top management team, and *CEO duality,* an indicator taking the value of 1 if the CEO also serves as board chair and zero otherwise.

We further control for *industry concentration,* measured using the Hirschmann-Herfindahl Index (sum of squared market shares) in the focal firm's 2-digit SIC code, and *industry turbulence,* calculated as the standard deviation of total industry revenues in the firm's 2-digit SIC code over the preceding three years divided by mean industry revenues over those years. We include these variables because competition and growth may affect the salience of economic trends (Steenkamp and Fang, 2011) and importance of board interlock networks (Li, 2019) for firms in different industries. Our model also includes industry dummies at the 2-digit

SIC code level, to account for other industry-level differences such as variations in levels of profitability. Instead of controlling for other aspects of firm-specific heterogeneity, we estimate these effects in our model. Table 2 presents descriptive statistics and correlations for all variables.

- Insert Table 2 here –

MODEL SPECIFICATION AND ESTIMATION

Three of our hypotheses (H3, H4 and H5) predict heterogenous effects of focal variables across firms during expansions, with a shift towards positive effects during recessions. This requires an approach that appropriately captures shifts in the distribution of firm-specific effects whilst enabling examination of sample-level effects. However, firm-level heterogeneity poses issues for isolating the effects of variables of interest. Standard approaches to panel data analysis address heterogeneity by including an individual intercept (fixed effects) or error term (random effects) for each firm. Whilst this improves the accuracy of estimates of *average* effects, the relevance of these is debatable: they represent effects for the "mythical average firm" rather than the *actual* effects for any real firm in the sample (Mackey et al., 2017, p. 339). This is insufficient when seeking to understand firms that diverge from sample-level trends (Hansen et al., 2004), as is the intention of this study in aiming to determine the factors that distinguish which firms deviate from the strategic consensus during recessions. Consequently, we account for firm heterogeneity via an alternative approach, explicitly incorporating this information to estimate firm-specific coefficients for each relationship of interest.

This is typically achieved using mixed-effects models, which estimate both an average effect and firm-specific deviation. However, with panel data, where there are many firm-specific

coefficients and few observations per firm, deviations are estimated with weak confidence (Rossi et al., 2005). We address this issue with a Bayesian hierarchical model. As with all Bayesian models, this approach estimates probability distributions rather than point estimates for each coefficient, explicitly incorporating uncertainty into the model. The hierarchical structure allows the estimation of firm-specific coefficients, as in mixed effects models. Estimation of firm-specific coefficients 'borrows strength' from information contained within the distributions for other units of analysis, allowing these to be estimated with greater confidence (Hahn and Doh, 2006). Thus, Bayesian estimation addresses the concerns with mixed effects models in the context of panel data and facilitates examination of firm-specific effects.

Our hierarchical model has two levels. In the first level, we estimate the effects of the independent variables on performance as:

(3) $$Y_{it} = \beta_{0_i} + \beta_{1_i} R_t + \sum_b \beta_i B_{bit-1} + \sum_b \beta_i R_t B_{bit-1} + \gamma_i X_{it-1} + \varepsilon_{it}$$

Where Y_{it} represents firm performance in year t, R_t is the dummy variable indicating whether year t is a recession year (and thus β_{1i} is the firm-specific estimate of the effects of recession on performance), B_{bit-1} is a vector of independent variables capturing board characteristics (network- and director-level variables), X_{it-1} of control variables, measured one period prior to the observation of firm performance and macroeconomic conditions, and $\varepsilon_{it} \sim N(0, \sigma_i^2)$. Performance is thus modeled as a function of economic conditions, board characteristics, the interaction between economic conditions and board characteristics, and controls:

(4) $$\Theta_i = f(\beta_i, \gamma_i)$$

While we include a comprehensive vector of control variables, we must also account for differences between industries, both in terms of the economic consequences of our identified recession years of 2001, 2008, and 2009 and persistent inter-industry differences in our dependent variable of profitability. We therefore introduce a second-level equation for each β and γ that models each parameter Θ_{ij} as a function of firm-specific variation around the hypermean $\overline{\Theta}$ and industry-specific mean Θ_j. We also use this second-level to address potential issues of endogeneity arising from the likely relationships between firm age and size, network- and director-level variables, and response to recessions. Larger, more mature firms tend to be more sensitive to macroeconomic changes and may be less able to quickly shift their strategies in response, due to the complexity of their value chains (Bamiatzi et al., 2016). Firm size and age also tend to be associated with more established interlock networks (Mizruchi, 2013, and see Table 2). Accordingly, these control variables may influence both our focal independent variables and dependent variable. We resolve this issue by modeling the impact of firm age and size in the second level of our model, estimating the effects of our board- and network-level independent variables on firm performance as a function of the potentially endogenous control variables (Dotson and Allenby, 2010; Mackey et al., 2017; Nandialath et al., 2014). Prior beliefs on Θ_i in Equation 4 therefore come from the average and industry-specific parameters, plus firm-specific variation coefficients for the influence of age and size:

$$\Theta_{ij} = \overline{\Theta} + \Theta_j + \delta_i X_i + \eta_{ij} \quad (5)$$

Where industry j is identified by a firm's 2-digit SIC code and $\eta_i \sim N(0, \sigma^2)$. We specify diffuse normal priors for the mean and variance of all parameters, of 0 and 10,000, respectively. The shape and scale parameters of the inverse gamma distributions used to sample the variance are given diffuse priors of 0.01. We estimate the model using Markov Chain Monte Carlo

(MCMC) methods, using Gibbs sampling. After 2,500 burn-in draws we keep 10,000 MCMC iterations for inference. Efficiencies for all parameters are higher than .95, representing an effective sample size (ESS) > 9,500. The close correspondence between the ESS and total iterations indicates that draws are independent (i.e., no autocorrelation) and thus that the model has converged. A high acceptance rate (81%) for sampling iterations provides further evidence of model convergence (see Online Appendix 2).

RESULTS

As our model provides firm-specific coefficients for each parameter we technically test our hypotheses for each of the 1,615 firms in our sample. Presenting these results individually is clearly impracticable. We therefore present the posterior distributions only, which is sufficient for examination of our hypotheses pertaining to changes in the distribution of firm-specific effects across the business cycle for network-level (Figure 2) and director level (Figure 3) variables. These distributions correspond to the main and interaction effects reported in Table 3, which details the mean, standard deviation (SD), Monte Carlo standard error (MCSE), and highest posterior density 95 percent credible intervals (HPD 95% CI). To quantify the extent of variance explained by our model, Table 3 also reports the correlation between actual values of the dependent variable and the predicted values obtained from the Bayesian estimation (see Gelman et al., 2013; Rossi et al., 2005). The percentage of firm-specific effects greater than zero represents the proportion of firms that show increased profitability as a result of higher values for each variable, enabling inference about the actual probability that a firm will derive benefit from a given variable. Support for our directional hypotheses thus comes from observation of the predicted effects across a majority of firms.

- Insert Table 3, Figure 2, and Figure 3 here -

H1a predicted that firms with higher board interlock centrality would exhibit stronger financial performance during expansions. H1b predicted that this effect would be attenuated during recessions. Our results support both hypotheses. During expansions, 100 percent of firms derive economic benefit from occupying a more central position in networks. In contrast, during recessions the contingent effect on profitability is negative for 98 percent of firms. This lack of overlap in the posterior distributions (shown in Figure 2 and by the HPD 95% CI in Table 3) indicates a consistent difference in effects across the business cycle and strongly supports H1.

H2 similarly stated that the positive effect of inter-industry interlocks on financial performance (H2a) would be attenuated during recessions (H2b). We observe a large difference in the distributions that both supports our hypotheses and corroborates prior research. During expansions, 100 percent of firms benefit from inter-industry interlocks, whereas the effect is negative for 100 percent of firms during recessions. Again, a lack of overlap in the HPD 95% CI for the recession and non-recession distributions indicates that the business cycle has substantial and consistent effects. Furthermore, the mean marginal effect (114.056 + -140.395 = -26.339) shows that on average, firms can expect a *reversal* (rather than attenuation) of the benefits gained from inter-industry interlocks; these become detrimental during recessions.

H3 concerned the effect of intra-industry interlocks, with H3a predicting heterogenous effects during expansion. The distribution of effects shown in Figure 2 supports this: 42 percent of firms experience increases in profitability from a higher level of intra-industry ties during non-recession years, suggesting that effects are highly contingent on firm-specific factors. However, during recessions we observe that 97 percent of firms exhibit stronger financial performance when intra-industry interlocks are higher. This lends strong support to H3b, indicating that firm-level determinants of the effect of intra-industry interlocks become less influential during

recessions, leading to more consistent effects across the sample. Furthermore, and similar to our findings related to inter-industry interlocks, we observe that the mean marginal effect (-3.070 + 65.229 = 62.159) reverses during recessions: whilst, on average, firms experience a detriment to performance during expansions, intra-industry interlocks are beneficial during recessions.

H4 and H5 pertain to the effect of director characteristics on financial performance, predicting heterogeneity in firm-specific effects of functional and educational diversity during expansions (H4a and H5a) and a shift towards positive effects in recessions (H4b and H5b). While non-recession year effects are not central to our investigation, it is notable that we observe less heterogeneity in firm-specific coefficients than H4a and H5a predict, with functional diversity negatively affecting performance for 100 percent of firms and educational diversity improving performance in 96 percent of firms during expansions. Positive mean contingent effects during recessions suggest support for H4b and H5b. However, while there is a clear rightward shift in the posterior distribution for functional diversity (H4b; see Figure 3) this is unclear for educational diversity (H5b), as the spread of firm-specific coefficients also increases during recessions (see also the HPD 95% CI in Table 3). We thus observe that the probability of a firm benefitting from functional diversity *increases* during recessions (0 versus 76 percent) whereas the likely benefit from educational diversity *decreases* during recessions (96 versus 53 percent). Thus, we infer support for H4b but no support for H5b: functional diversity is generally beneficial during recessions, but educational diversity has ambiguous effects at the sample level and is more likely to contribute to financial performance during expansions.

Interpreting the economic significance of these results requires some additional explanation. The mean effects in Table 3 (and the specific coefficients reported in this section) represent the expected value, in terms of profitability, that a firm is likely to gain (or lose) from a

single-unit change in the independent variable. For example, we find an average decrease in net income of -89.021 million USD during expansions when functional diversity (the coefficient of variation in directors' background) increases by one. A negative firm-specific coefficient is observed in 100 percent of firms in our sample, lending high confidence in the prediction that firms can, on average, expect substantial and detrimental results from functional diversity during expansion. Intra-industry interlocks have an expected negative effect on profitability (-3.070). However, the magnitude of this effect is small and positive coefficients are observed in only 42 percent of the sample, indicating that firms should have low confidence in the expectation of a negative effect. Economically significant effects can therefore be inferred when (a) mean effects show a large increase or decrease in the dependent variable[4] and (b) the distribution of firm-specific coefficients represents a consistent expectation of positive or negative effects.

ADDITIONAL ANALYSES

The results reported in Table 3 support institutional isomorphism as an explanation for poor performance during recessions. We followed prior research in defining performance as net income, as near-term financial viability is of primary concern during recessions (Steenkamp and Fang, 2011). Given this choice of dependent variable, three issues warrant further attention to ensure the robustness of our results and generalizability of implications.

First, profitability is distinct from the counter-cyclical investment decisions that are frequently the focus of the business cycle research. To examine how our findings relate to previous studies, we therefore conduct additional analyses to examine the effects of our network-

[4] The magnitude of effects that can be expected during a recession is given, as shown above, by taking the sum of the baseline and interaction mean coefficients. Thus, for example, intra-industry interlocks have a small average effect that is inconsistent across firms in expansions, but a large and consistent positive expected value during recessions (-3.070 + 65.229 = 62.159).

and director-level variables on the two most widely studied beneficial investments during recessions: advertising and R&D (Dekimpe and Deleersnyder, 2018). These analyses serve to investigate whether the mechanisms we propose – resistance to normative and mimetic processes as an explanation for superior recessionary performance – may also contribute to explaining counter-cyclical investments. For example, if the positive effects on profitability during recessions that we observe reflect a *decrease* in investments, this would suggest that counter-cyclical investments are driven by an alternative mechanism.

Second, while financial performance may be the primary concern in the near-term during recessions, our results cannot inform on the effects of board connectedness and diversity on longer-term or market outcomes. Consequently, we also examine the effects of network- and director-level variables on firm value as a proxy for the long-term earnings potential of a firm (Dekimpe and Deleersnyder, 2018; Deleersnyder et al., 2009).

Third, the benefits we observe for board isolation during recessions may be affected by survivorship bias. For example, as interlocks provide access to resources (Hillman and Dalziel, 2003), isolated firms may be less likely to survive recessions, when resource constraints are generally more severe (Bamiatzi et al., 2016). If this effect is present, the benefits we observe from isolation may reflect the presence of an omitted variable that increases the chance of survival for isolated firms and also contribute to their success during recessions, raising potential issues of endogeneity (Hill et al., 2020). Furthermore, an examination of firm survival can provide additional insights into the long-term implications of board connectedness and diversity. We therefore investigate whether connectedness and diversity affect firm failure rates.

Counter-cyclical investments

We estimate the effects of board interlocks and director characteristics on counter-cyclical investments using the same model as specified in Equation 3, in which Y_{it} is now specified as (1) *advertising expenditure* and (2) *R&D expenditure*. Table 4 presents the results.

- Insert Table 4 here -

In line with our main results, we observe a clear change in effects between expansions and recessions in most firms. Network centrality has a positive effect on both investments in 100 percent of firms during expansions, but a negative contingent effect during recessions for most firms, with only 38 percent of firm-specific effects above zero for advertising expenditure and 1 percent for R&D expenditure. Similarly, inter-industry interlocks lead to increased advertising and R&D expenditure during expansions (in 95 and 100 percent of firms, respectively), but this effect is attenuated in recessions, with negative contingent effects for 90 and 79 percent of firms, respectively. Functional diversity consistently decreases advertising and R&D expenditures during expansions but has a positive contingent effect in most firms (62 and 73 percent, respectively) during recessions. The directions of these effects are aligned with our main model, suggesting that the effects of these variables in our above analysis is related to a higher propensity to engage in counter-cyclical strategies. However, we observe that intra-industry interlocks have a positive effect on both investments during expansions and a negative contingent effect during recessions. Thus, while similar patterns of effects on profitability and investments for centrality, inter-industry interlocks, and functional diversity support our proposed mechanism, the attenuated effect of intra-industry interlocks during recessions suggests that this variable also positively affects recessionary performance via a different route.

Reflecting equivocal results for educational diversity in our main model, the distribution of firm-specific effects of this variable on counter-cyclical investments is mixed. On average, educational diversity reduces advertising and R&D expenditure during recessions, with negative mean contingent and marginal effects. However, we find consistent negative effects on advertising expenditure, and positive effects on R&D expenditure, during expansions. As for our main results, this suggests the need for further research on the firm-specific factors and performance metrics that determine the implications of director diversity.

Overall, these analyses suggest that our main results are partly explicable by the role of mimetic and normative pressures in discouraging counter-cyclical investments. Variables that have the most consistent effects on profitability—centrality, inter-industry interlocks and functional diversity—exhibit similar changes in the magnitude and direction of effects on counter-cyclical investments during recessions. Reflecting differential outcomes across firms in our main model, we find equivocal effects of educational diversity. Finally, the effects of intra-industry interlocks on R&D expenditure are inconsistent with this mechanism, suggesting an additional mechanism through which firms benefit from intra-industry ties during recessions.

Market performance

To gain additional insights into the effect of connectedness and director characteristics on long-term performance indicators, we estimate Equation 3 with Y_{it} specified as *firm value,* which we measure using the year's closing stock price. Results are presented in Table 5.

- Insert Table 5 here -

Providing further support for H1, 78 percent of firms benefit from network centrality during expansions, with a negative contingent effect for 87 percent during recessions. However,

in contrast to our main results, the mean marginal effect is also negative (0.100 + -0.285 = -0.185); thus, the positive effect of centrality on firm value is not only attenuated but *reversed* during recessions. We also find a negative contingent effect of inter-industry interlocks, corroborating H2b. However, the baseline effect is negative, with only one-quarter of firm-specific coefficients being positive during expansions. Thus, while the effect of inter-industry interlocks during recessions remains consistent with our main results, H2a is unsupported in this model and the contingent effect represents an exacerbation, rather than an inversion, of non-recession year effects. The effect of intra-industry interlocks, while demonstrating lower baseline heterogeneity than H3a predicts, also conforms to H3b: 91 percent of firm-specific coefficients are positive during recessions, with a reversal in the marginal effect analogous to our main results (-0.579 + 1.021 = 0.442). Taken together, these results suggest that mimetic processes have similar or greater consequences for long-term firm value than near-term profitability.

These results also suggest that normative pressures may be *more* consequential for long-term performance. The mean contingent effect of functional diversity is positive, consistent with our main model (and thus with H4b) but is also positive for 100 percent of firms (versus 76 percent; see Table 3). Furthermore, while the marginal effect of functional diversity remains negative in our main analysis, here we observe a reversal (-1.013 + 3.367 = 2.354). Similarly, while our main results are equivocal for educational diversity, here we see a clear shift in the posterior distributions: 10 percent of firm-specific coefficients are positive during expansions, 96 percent during recessions, and again the marginal effect is reversed (-1.037 + 2.660 = 1.623).

Overall, these results provide further support for our hypotheses, corroborating some findings of our main analysis and highlighting other notable differences. These are in line with

the theoretical mechanisms of isomorphism and suggest potentially greater consequences from mimetic and normative processes for long-term, rather than near-term, performance.

Firm survival

We use a proportional hazards model (Cox, 1972) to examine how board connectedness affects firm failure in expansions and recessions. A failure event is identified as the last year a firm is present in the sample (excluding the final year of our sample). Table 6 presents the results. We find a significant increase in firm failure for intra-industry interlocks and functional diversity only and no significant effects for our focal variables during recession years, suggesting that our analysis is not affected by survivorship bias.

- Insert Table 6 here –

To further explore these effects, we examine the survival curves, splitting our sample by quartile on each network- and director-level measure. Figure 3 shows the results. For functional diversity, we observe similar survival curves across all quartiles, corroborating the significant linear effect reported in Table 6. However, for all measures of connectedness, we find that firm failure is greatest in the middle two quartiles, with the most isolated and most connected firms—in terms of network centrality, intra- and inter-industry interlocks—exhibiting higher survival rates. This further suggests that our results are not biased in one direction by survivorship bias and indicates that both isolation and connectedness can confer benefits in terms of firm survival: *moderately* well-connected firms are at the highest risk of failure. Though we do not find a significant effect for educational diversity, Figure 4 also illustrates a trend toward higher survival among firms with less diverse boards. This is in line with the equivocal effects of educational diversity in our main analyses.

- Insert Figure 4 here –

DISCUSSION

This study sought to examine the characteristics of boards that contribute to widespread poor performance among firms during recessions. Based on the theory of institutional isomorphism (DiMaggio and Powell, 1983), we identify five network- and director-level variables as probable determinants of a firm's ability to resist mimetic and normative pressures and thus avoid this trend. Overall, our results lend support to institutional isomorphism as an explanation for the prevalence of counterproductive, pro-cyclical strategies during recessions by demonstrating that factors which reduce isomorphic forces are associated with increased investment in advertising and R&D, greater profitability, and higher stock valuations. We find strong support for mimetic processes, operating via social networks between firms, as an explanation for widespread poor performance during recessions: firms that are well-connected within the board interlock network exhibit weaker performance than their more isolated peers. In further support of the long-term implications of these effects, our analysis of firm failure indicates benefits to both isolation and connectedness, with failure rates highest among moderately well-connected firms. We also find evidence for the influence of normative pressures arising from directors' professional and educational experiences, with stronger effects on firm value than near-term financial performance. Using a Bayesian approach, we provide probabilistic inference about the effects of these variables that offers actionable insights for strategic decision-making.

Contributions

These results offer several contributions to research and practice on corporate governance and strategic investments. First, our findings highlight a negative effect of connectedness contingent

on environmental conditions: *better-connected boards fare worse in recessions, whilst their relatively isolated peers exhibit stronger financial performance*. Current evidence suggests that board interlocks improve access to market intelligence, with benefits for strategic decision-making (Withers et al., 2020). However, we show that connectedness negatively affects both near-term profitability—critical for firm survival during a recession—and long-run estimates of firm value. Our findings suggest that inter-industry interlocks, which provide access to broad environmental intelligence, are most detrimental for both aspects of performance. Conversely, an interlock network based on intra-industry ties, which has heterogeneous but generally negative effects on performance during economic expansion, appears to offer protection against isomorphic pressures and thus improve profitability and firm value during recessions. Consistent with prior research, we find that network centrality, capturing the overall degree to which a firm is exposed to information within board interlock networks, improves performance during expansions. In recessions, this effect is attenuated but remains positive for profitability; however, the marginal effect on firm value is negative. This is notable, as it implies that the near-term effects of connectedness (lack of benefit) may underestimate the long-term implications (causing harm). Furthermore, we observe the highest rates of firm failure among moderately well-connected firms, corroborating the perspective that both connectedness and isolation can be beneficial. This suggests the need for additional nuance in the study of interlock networks, with greater attention to the downsides of collective rationality in relation to common performance metrics. Our study demonstrates the validity of isomorphism as a theoretical lens in this context: previous research has tended to examine strategic imitation in a positive light (e.g., Beckman and Haunschild, 2002; Westphal et al., 2001), and this approach may facilitate further understanding of its negative effects.

Second, this study provides a substantive contribution to understanding how the backgrounds and experience of directors contribute to firm-level outcomes. *Firms with directors from multiple professional and educational backgrounds show improvements in firm value during recessions*, demonstrating that both forms of diversity are beneficial in the face of macroeconomic threats. Additionally, while educational diversity has equivocal effects on profitability during recessions, three quarters of firms experience a positive contingent effect of functional diversity. This extends recent research into the role of output-oriented board members, which has found effects on strategic outcomes related to demand generation and innovation (Whitler et al., 2020). However, limited evidence for their contribution to firm performance means that such directors are overlooked in recruitment, and thus remain a minority (Whitler et al., 2018). We present evidence for the role of output-oriented board experience in driving both proximal and financial outcomes. This finding therefore also provides insights for governance, highlighting a clear advantage from which shareholders and recruiters may advocate for appointment of directors with varied professional backgrounds: firms can increase cognitive scope in strategic decision-making and thus better prepare for recessions by buffering against isomorphic pressures.

Furthermore, we find wide variation in firm-specific effects of educational diversity on profitability, and differences in the contingent and marginal effects of both functional and educational diversity between models of near- and long-term performance. This indicates a complex relationship between directors' experience and firm outcomes that is contingent on firm-level factors. These findings present a challenge to widespread calls for greater diversity (see Zhu and Shen, 2016), in accordance with the literature demonstrating equivocal financial outcomes (Boivie et al., 2011; Johnson et al., 2013), suggesting the need for future research into

the forms of diversity that are most consequential for performance, the relevant metrics and time horizon for measuring their effects, and the firm-specific factors that affect this relationship (c.f. Almor et al., 2019).

Our examination of the cognitive attributes of directors also represents a contribution to the study of board interlock networks, which has focused on the structure of networks and the positions of firms within them at the expense of consideration of firm-level attributes, leading to an incomplete analysis of how agency operates within networks (Aalbers, 2020; Tasselli and Kilduff, 2020). This has clear implications for the understanding of strategic-decision making: as our results demonstrate, both network- and director-level variables have significant effects.

Third, we provide a substantive contribution to knowledge of the firm-specific factors that influence performance during recessions; an issue that has been overlooked in the empirical literature (Bamiatzi et al., 2016). *Whilst previous research has shown investments in marketing and R&D to be beneficial, our findings indicate that the decision to make such investments is influenced by the connectedness and diversity of directors,* with effects that align with our main analysis of financial performance. This suggests that the degree to which a firms' leaders are exposed to external intelligence and the lens through which this information is interpreted are both critical factors to understanding how firms come to resist the trend towards counter-cyclical investment and poor performance during recessions.

This has important practical implications for corporate governance in terms of the relative reliance on internal versus external information in different macroeconomic environments when considering investments marketing and R&D, for which the extant literature provides little guidance. No research to date has examined board-level influences on marketing resource allocation, instead focusing on the role of the CEO and other executives (Whitler et al., 2020).

Given the documented importance of counter-cyclical investments during recessions (Dekimpe and Deleersnyder, 2018) and current attention to understanding effective strategic responses to crises (Wenzel et al., 2020), our results thus offer a novel contribution to understanding board-level influences on such decisions.

Our Bayesian approach provides probabilistic estimates of the effects of these factors. In terms of the practical implications of our findings, this provides an advantage over analyses that report average effects, as decision-makers can more accurately assess the likely benefits or risks that firms can derive from board connectedness and diversity (c.f. Hansen et al., 2004; Mackey et al., 2017). The substantial extent of variance explained by the models presented here, evidenced in a strong correlation between the predictions obtained from our Bayesian estimation and the observed performance and resource investments of firms in our sample, indicates that board-level factors are an important influence on these firm-level outcomes. Consequently, these findings can offer guidance for corporate governance decisions during recessions, and open an avenue for further research into why most firms suffer whilst their "deviant peers" (DiMaggio and Powell, 1983, p. 154) survive and thrive.

Limitations and directions for future research

The implications of our findings point to one overarching direction for future research—the adoption of Bayesian methods to examine firm-specific variation in the effects of strategic variables—and two specific areas in which this may be beneficial: (1) clarifying the forms of director diversity that are most beneficial for different performance objectives and (2) further examination of how a minority of firms avoid collective rationality in adverse conditions.

A key limitation of our study suggests one way these issues could be examined. Specifically, we focus here on *detecting* rather than *explaining* the role of firm-specific factors in

determining the impact of board-level variables. However, our model can be extended to incorporate explanatory variables in estimating firm-specific effects, enabling future research to examine why we observe the distributions presented here. This would increase the managerial relevance of our results, providing additional insight into the variables that determine a firm's position in the distribution and thus facilitating understanding of the characteristics present at the tails—i.e., those firms likely to realize the largest gains (or most severe detriment) from changes to board composition or connectedness (c.f. Hahn and Doh, 2006).

A second limitation of this study provides further guidance on how this may be pursued. In line with prior research on board interlocks and director characteristics, we rely on secondary data. This provides advantages of scale and objectivity, but precludes study of the internal, firm-specific factors that may be most relevant to explaining differences between firms, such as organizational culture or the role of the CEO. The above questions may therefore be addressed by combining network and director data with surveys, observation, or interviews; for example, to elucidate the degree to which educational background is an important consideration in board composition. Utilizing data internal to the firm may also facilitate greater understanding of the role of board cognition in the effects we observe here. While our approach of using secondary data and performance outcomes is common in this research stream and allows inferences about cognitive processes, a direct examination of the theoretical mechanisms proposed in this study would require further in-depth, qualitative research (Kaplan, 2011; Mohammed et al., 2021).

Using secondary data also restricts observations to large U.S. firms. This is often justified as interlock networks are arguably most important in the U.S. corporate context (Withers et al., 2020). However, recessions affect the performance and survival of all firms and often have global impacts. Future research utilizing primary data could therefore also examine the

international generalizability of our findings, improving applicability across a range of contexts. Relatedly, in-depth data from a smaller number of firms may also provide greater temporal coverage than the databases from which our data is obtained, allowing investigation of the generalizability of these effects across a larger number of business cycles.

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TABLES AND FIGURES

TABLE 1 Variable Descriptions.

Variable	Description	Source
Profit	Net income in million USD	Compustat
Past performance	Net income in million USD in the previous year	Compustat
Centrality	Eigenvector centrality (EVC), calculated as the weighted centrality of the firm in the board interlock network where weights for each firm connected to the focal firm are determined by the EVC of the connected firm.	BoardEx
Inter-industry interlocks	Natural log of the number of connections between the focal firm and other firms in other 2-digit SIC codes.	BoardEx, Compustat
Intra-industry interlocks	Natural log of the number of connections between the focal firm and other firms in the same 2-digit SIC code.	BoardEx, Compustat
Functional diversity	Coefficient of variation of the number of functional areas represented in the employment history of directors, calculated as the standard deviation in the number of previous positions held by all directors across each area divided by the mean number of previous positions across directors	BoardEx
Educational diversity	Coefficient of variation of the number of qualifications (at undergraduate level or above) held by directors, calculated as the standard deviation in the number of qualifications across directors divided by the mean number of qualifications	BoardEx
Recession	Indicator taking the value of 1 if more than six of the months in the current year are classified as a recession, zero otherwise.	NBER
Firm age	Years elapsed since firm is first listed in database.	Compustat
Firm size	Natural log of total assets.	Compustat
Leverage	Debt to equity ratio.	Compustat
CEO duality	Indicator taking the value of 1 if the CEO also hold the position of board Chair, zero otherwise.	BoardEx
Internal leadership	Number of board members who also hold a position on the firm's top management team	BoardEx
Industry concentration	Hirschmann-Herfindahl Index (sum of squared market shares) in the focal firm's 2-digit SIC code	Compustat
Industry turbulence	Standard deviation of total industry revenues in the firm's 2-digit SIC code over the preceding three years, divided by mean industry revenues over those three years.	Compustat

TABLE 2 Descriptive Statistics and Correlations.

		Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1	Profit	246.886	1482.350	1.000										
2	Centrality	-23.057	4.463	.209	1.000									
3	Inter-industry interlocks	2.315	0.899	.206	.541	1.000								
4	Intra-industry interlocks	0.873	0.030	.046	.113	.123	1.000							
5	Functional diversity	-0.903	0.538	-.138	-.237	-.320	-.018	1.000						
6	Educational diversity	-0.760	0.340	.053	.027	.023	-.103	-.009	1.000					
7	Firm age	57.178	8.811	.056	.076	.001	-.115	-.084	.005	1.000				
8	Firm size	6.875	1.934	.315	.470	.565	.021	-.353	.091	.170	1.000			
9	Leverage	1.721	54.431	-.005	.008	.004	-.012	.001	.010	.001	.015	1.000		
10	Internal leadership	4.667	3.036	.104	.144	.114	-.043	-.112	.043	.111	.203	-.004	1.000	
11	Industry concentration	0.044	0.039	.005	-.014	.058	-.141	-.022	.074	.022	.085	.001	.009	1.000
12	Industry turbulence	0.055	0.037	-.034	-.090	.052	.019	.035	.015	-.102	.051	.001	-.039	.250

TABLE 3 Distribution of Firm-Specific Coefficients: Profitability.

Dependent variable: Profit	Mean	SD	MCSE	HPD 95% CI		% > 0
Main effects						
Centrality	14.633	2.378	0.024	10.072	19.263	100
Inter-industry interlocks	114.056	14.246	0.142	86.260	141.775	100
Intra-industry interlocks	-3.070	14.278	0.147	-31.284	24.420	42
Functional diversity	-89.021	22.212	0.219	-132.409	-45.130	0
Educational diversity	47.031	27.622	0.276	-7.030	100.681	96
Recession	-26.350	92.076	0.921	-208.841	155.291	38
Interactions						
Centrality x recession	-7.705	3.898	0.039	-15.420	-0.153	2
Inter-industry interlocks x recession	-140.395	28.135	0.281	-195.659	-84.958	0
Intra-industry interlocks x recession	65.229	32.615	0.326	1.137	128.456	97
Functional diversity x recession	34.677	48.081	0.481	-59.576	129.474	76
Educational diversity x recession	4.612	57.296	0.573	-106.152	116.927	53
Controls						
Past performance	0.635	0.010	0.002	0.610	0.651	100
Leverage	-0.088	0.197	0.002	-0.473	0.297	67
CEO duality	19.069	31.365	0.317	-43.137	79.824	72
Internal leadership	11.828	3.857	0.039	4.245	19.336	100
Industry concentration	-16.513	93.952	0.939	-198.718	170.544	43
Industry turbulence	99.338	94.910	0.949	-83.266	284.297	85
Constant	87.590	70.470	0.705	-48.973	224.396	88
Firm-specific variation effects						
Firm age	0.396	1.066	0.256	0.005	4.456	64
Firm size	0.017	0.009	0.002	0.005	0.044	97
Industry dummies			Included			
Correlation between actual and predicted dependent variable			.641			

TABLE 4 Distribution of Firm-Specific Coefficients: Counter-Cyclical Investments.

Dependent variable	Advertising expenditure						R&D expenditure					
	Mean	SD	MCSE	HPD 95% CI		% > 0	Mean	SD	MCSE	HPD 95% CI		% > 0
Main effects												
Centrality	4.683	1.492	0.253	2.257	7.919	100	5.645	1.042	0.030	3.648	7.694	100
Inter-industry interlocks	15.523	8.903	0.778	0.501	32.645	95	31.494	6.787	0.341	17.945	44.900	100
Intra-industry interlocks	14.532	6.795	0.439	1.320	27.820	98	20.756	5.606	0.197	9.938	32.036	100
Functional diversity	-84.418	38.381	9.139	-177.576	-29.882	1	-106.335	21.186	2.914	-146.539	-61.392	0
Educational diversity	-49.552	13.783	0.859	-76.850	-22.751	0	13.253	12.189	0.590	-10.514	37.268	86
Recession	14.418	63.461	1.275	-108.987	138.808	59	-66.014	58.465	0.775	-180.245	48.130	13
Interactions												
Centrality x recession	-0.641	1.996	0.042	-4.640	3.288	38	-3.831	1.791	0.022	-7.385	-0.329	1
Inter-industry interlocks x recession	-15.298	10.945	0.287	-37.045	5.973	10	-7.632	9.866	0.126	-26.747	11.831	21
Intra-industry interlocks x recession	-7.357	10.840	0.211	-28.380	13.884	25	-40.925	9.629	0.127	-59.469	-21.797	0
Functional diversity x recession	4.604	16.204	0.380	-26.781	36.356	62	9.193	14.742	0.193	-20.178	37.991	73
Educational diversity x recession	-9.647	21.077	0.594	-51.169	31.417	33	-20.890	18.613	0.253	-56.888	15.339	13
Controls												
Past performance	0.032	0.007	0.002	0.025	0.047	100	0.066	0.003	0.000	0.161	0.072	100
Leverage	-0.169	0.141	0.003	-0.448	0.098	12	0.037	0.050	0.001	-0.059	0.135	77
CEO duality	-44.105	38.668	5.394	-112.596	32.786	13	-18.846	32.452	3.671	-77.504	47.359	27
Internal leadership	25.231	11.020	2.457	13.773	45.560	98	11.920	4.823	0.824	2.646	20.909	100
Industry concentration	20.089	90.751	7.657	-160.111	200.715	58	-25.065	90.607	2.960	-203.952	155.147	39
Industry turbulence	-58.970	79.346	1.969	-214.618	96.373	23	-153.724	77.290	1.247	-304.948	-2.801	2
Constant	-45.292	50.814	6.222	-146.379	46.008	18	18.072	41.889	2.490	-62.947	101.014	66
Firm-specific variation effects												
Firm age	31.837	13.154	3.840	0.063	42.169	100	51.939	2.631	0.208	47.048	57.301	100
Firm size	0.051	0.064	0.018	0.003	0.240	78	0.038	0.045	0.012	0.005	0.181	79
Industry dummies	Included						Included					
Observations	4,145						7,636					
Average ESS	9,522						9,484					
Average $\hat{R}$	.952						.948					
Acceptance rate	.873						.895					
Correlation between actual and predicted dependent variable	.545						.576					

TABLE 5 Distribution of Firm-Specific Coefficients: Long-Term Performance.

Dependent variable: Firm value	Mean	SD	MCSE	HPD 95% CI		% > 0
Main effects						
Centrality	0.100	0.076	0.002	-0.049	0.249	90
Inter-industry interlocks	-0.287	0.416	0.013	-1.099	0.529	25
Intra-industry interlocks	-0.579	0.370	0.010	-1.292	0.150	6
Functional diversity	-1.013	0.724	0.028	-2.459	0.386	10
Educational diversity	-1.037	0.754	0.023	-2.526	0.423	10
Recession	-12.717	5.309	0.071	-23.157	-2.314	0
Interactions						
Centrality x recession	-0.285	0.161	0.002	-0.605	0.029	4
Inter-industry interlocks x recession	-1.129	0.806	0.010	-2.703	0.445	8
Intra-industry interlocks x recession	1.021	0.730	0.009	-0.384	2.456	91
Functional diversity x recession	3.367	1.154	0.014	-1.064	5.654	99
Educational diversity x recession	2.660	1.495	0.018	-0.307	5.576	96
Controls						
Past performance	0.936	0.017	0.004	0.915	0.982	100
Leverage	0.003	0.004	0.000	-0.005	0.011	77
CEO duality	0.111	1.051	0.045	-1.886	2.192	54
Internal leadership	0.036	0.130	0.005	-0.216	0.291	60
Industry concentration	16.738	8.377	0.295	-0.454	33.037	97
Industry turbulence	-17.135	7.186	0.190	-31.116	-3.113	0
Constant	7.136	2.659	0.074	1.939	12.420	100
Firm-specific variation effects						
Firm age	0.004	0.006	0.002	0.001	0.020	74
Firm size	2.074	0.743	0.209	0.018	2.664	100
Industry dummies			Included			
Correlation between actual and predicted dependent variable			.885			

TABLE 6 Cox Proportional Hazards Model: Firm Survival

Dependent variable	Firm failure*		
	Hazard ratio	Coefficient	*p*
Main effects			
Centrality	0.993	-0.007	.526
Inter-industry interlocks	0.925	-0.078	.135
Intra-industry interlocks	1.114	0.108	.016
Functional diversity	1.301	0.263	.000
Educational diversity	0.908	-0.096	.264
Recession	1.225	0.203	.863
Interactions			
Centrality x recession	0.996	-0.004	.891
Inter-industry interlocks x recession	0.951	-0.051	.758
Intra-industry interlocks x recession	0.808	-0.214	.189
Functional diversity x recession	1.207	0.188	.440
Educational diversity x recession	0.815	-0.204	.487
X^2	90.69		.000

*As we are relying on Compustat data, which draws primarily from SEC filings, these failure events may represent actual failure (i.e., a firm ceasing to exist) or delisting from public markets. This distinction is inconsequential for determining whether our main findings are affected by survivorship bias but should be considered in interpretating these results.

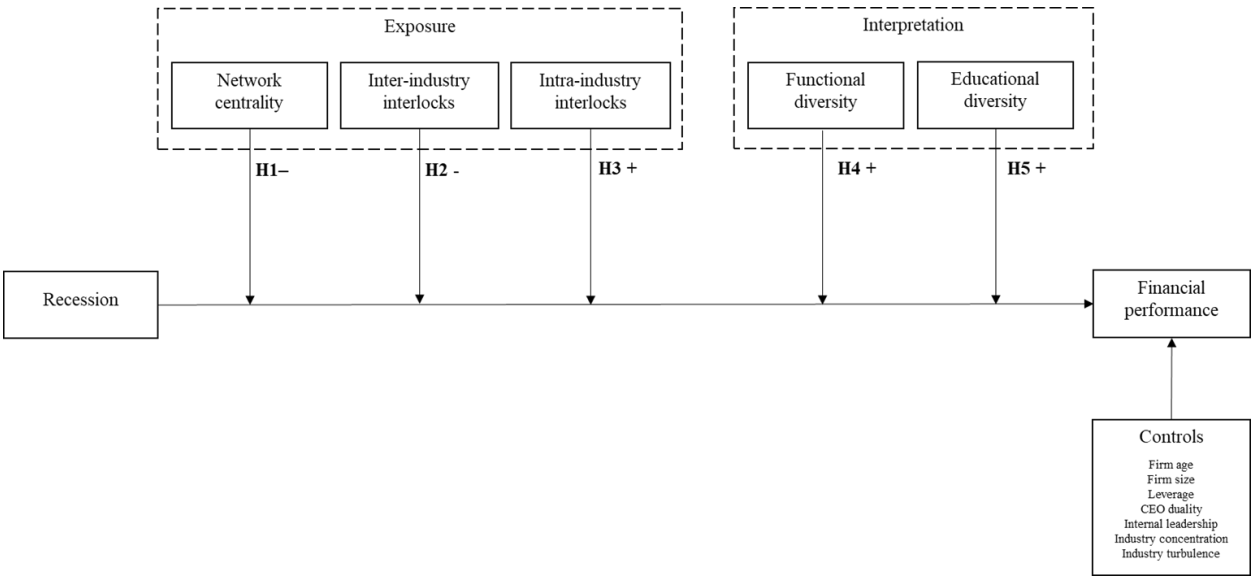

FIGURE 1 Hypothesized Relationships Between Information Exposure, Interpretation, and Firm Performance.

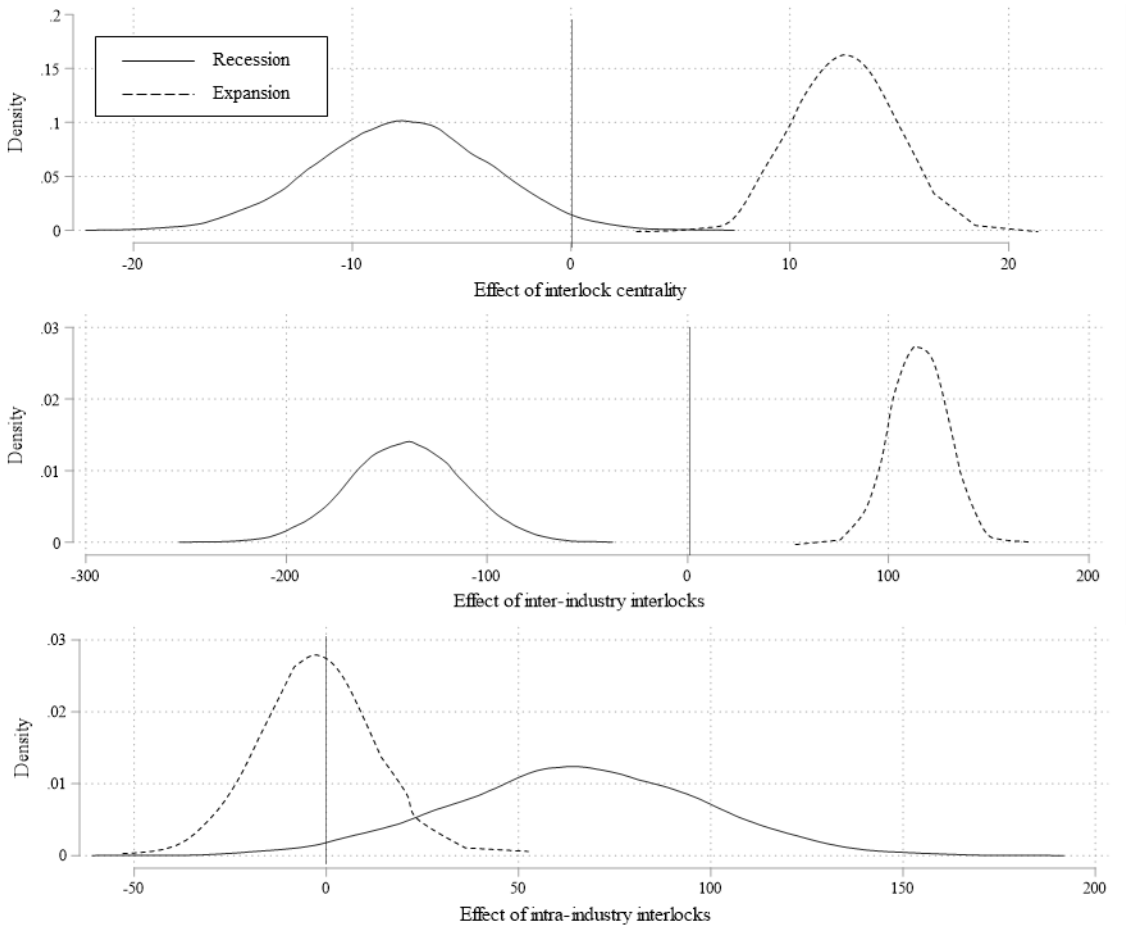

FIGURE 2 Distribution of Effects in Expansion and Recession: Network Variables.

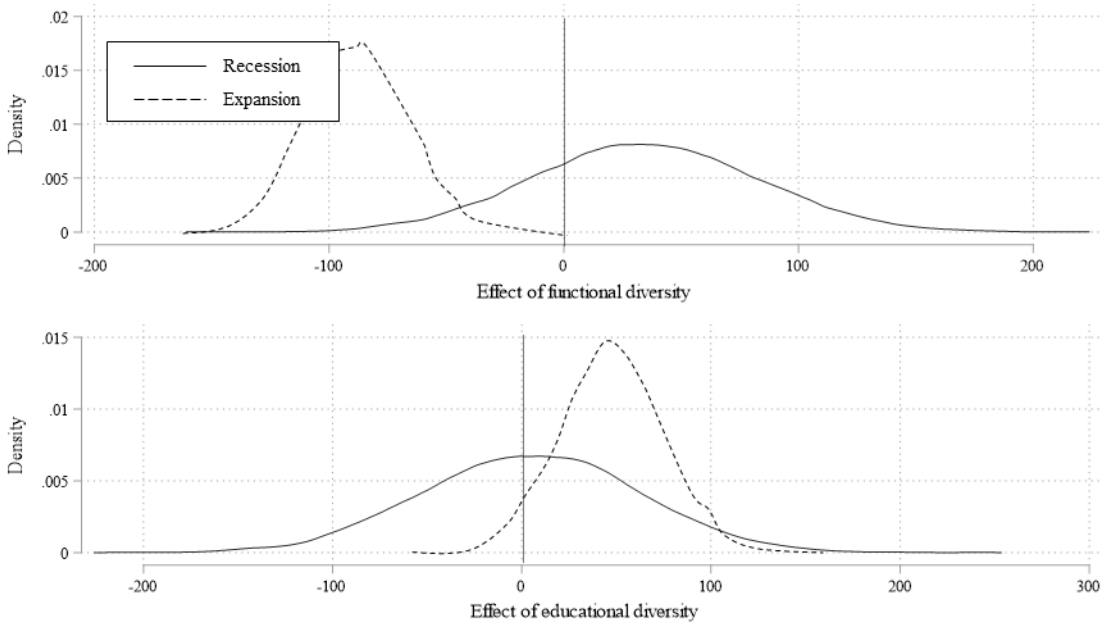

FIGURE 3 Distribution of Effects in Expansion and Recession: Director Variables.

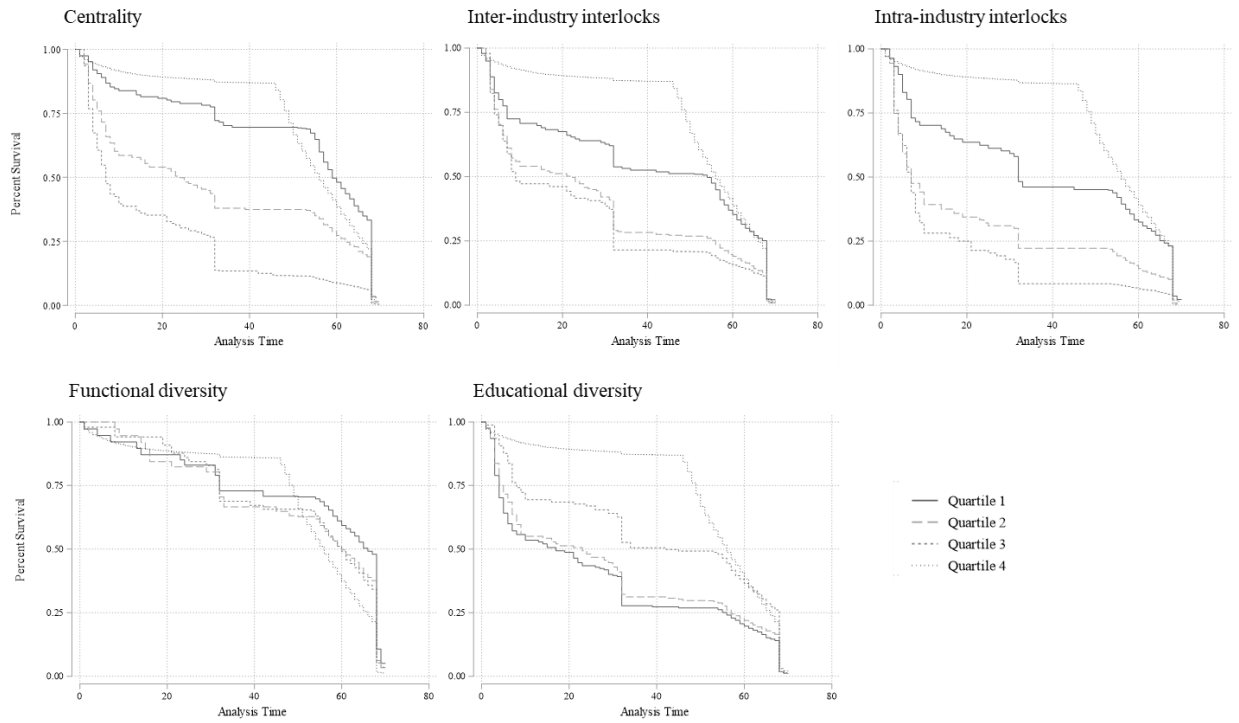

FIGURE 4 Kaplan-Meier Survival Curves.