Take a Leaf out of Their Book:

Peer Influence and Corporate Risk-taking*

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ABSTRACT

This paper documents that corporate risk-taking is a response to peer influence. Firms take more risks if they encounter greater peer firms' risk-taking. We also find peer influence on corporate risk-taking across several risk aspects including financial risks, business risks, investment risks, and innovation risks, whilst these risk-taking decisions are interplayed with each other simultaneously. Furthermore, we document that firms with low-talented CEOs or low performance are more eager to learn from their peers, that firms under strong corporate governance are more likely to mimic their peers, and that firms in the competitive industry are more prone to follow their peers. Our conclusion is robust to alternative identification strategies such as network identification including endogenous selection of peers, traditional instrumental variable estimation, and quasi-natural experiment.

Keywords: Peer effects, Corporate risk-taking, Learning

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1. Introduction

Active corporate risk-taking would be irrelevant to firm value in the Modigliani–Miller world of perfect capital markets (Stiglitz, 1974). Yet, empirical research on corporate risk-taking has become increasingly important in the real world. Substantial empirical studies examine the determinants of corporate risk-taking such as corporate governance, managerial compensation, and personal experiences of top executives (John, et al., 2008; Hayes, et al., 2012; Gopalan, et al., 2021). Noticeably absent in this recent literature is the peer influence on corporate risk-taking. Survey evidence indicates that peer effects have significant influence on corporate financial policies. For example, Graham (2022) found that more than 10 percent of the firms with actual capital spending greater than their forecasts attribute their overspending to the effects of the actions of their competitors in 2019. About 27 percent of large firms in 2022 also regard the competitors' debt level as an important factor affecting their debt decisions. Since capital spending and debt policy are embedded in corporate risk-taking decisions (Coles, et al., 2006; Bernile, et al., 2017), it implies that peer influence has an important contribution to corporate risk-taking decisions. A growing body of literature also demonstrates the influence of peer effects in financial policies such as capital structure, dividend payout, and IPO (Leary and Roberts, 2014; Grennan, 2019; Aghamolla and Thakor, 2022). To our best knowledge, we are the first to comprehensively study corporate risk-taking as a response to peer influence.

In the real world, managers incorporate private information in making financial policy decisions. Nevertheless, their private information is usually imperfect and incomplete. As a result, managers are allured to consider either private investor information (Bakke and Whited, 2010), or financial policy decisions of their peers as supplementary information sources to form their own decisions. Leary and Roberts

(2014) show that managers take the leverage ratio and other characteristics of peer firms into consideration when they update their capital structure decisions. In this paper, we study the peer influence on corporate risk-taking. Specifically, we investigate whether corporate risk-taking decisions react to the risk-taking decisions of peer firms. Furthermore, we also seek to elucidate the channels through which peer influence on corporate risk-taking operates.

While the evidence of peer influence can be intuitively shown by theoretical models or field experiments, it is difficult to empirically identify the causal effect of peer firms' risk-taking on one's own because of the reflection problem (Manski, 1993). The two-way causality problem arises in modelling the financial policy of a focal firm that is interrelated to its peers' decisions. Recently, spatial econometrics has made progress in addressing the Manski reflection problem. It has developed easy-to-check network identification conditions and techniques to estimate the structural network parameters, including in the networks with endogenous selection of peers (Lee, 2007; Bramoullé et al., 2009; Jochmans, 2023). Recent application of spatial econometrics in corporate finance can be found in Grieser, et al. (2022), who identify the peer effects in capital structure policies. In this paper, we employ spatial econometrics techniques to identify the peer influence on corporate risk-taking. As a robustness check, we also employ traditional instrumental variable estimation and quasi-natural experiment to confirm our main findings.

We follow Leary and Roberts (2014) to define our peer reference groups based on industry, using the three-digit Standard Industrial Classification (SIC) code. This definition of peer groups completes our peer interaction network. We find that this network satisfies the identification conditions discussed in Bramoullé et al. (2009). In our baseline model, we obtain statistically significant and economically important estimates of peer effects in corporate risk-taking. The results indicate that firms' risk-

taking behaviors are sensitive to their peers' risk-taking strategies. To interpret the economic significance of our findings, we take one of our proxies for risk-taking (i.e., stock volatility) as an example. A one-standard-deviation increase in the average of peer firm risk-taking would initially elevate a focal firm's risk-taking by approximately 25.9%, *ceteris paribus*.

We further study the peer influence on corporate risk-taking across several risk aspects including financial risks, business risks, investment risks, and innovation risks. Bolton, et al (2011) establish a dynamic corporate risk management model capturing the interconnections among different risk aspects. Existing studies also empirically document the relationship between financial risks and investment risks (Lerner, 2006). Given the interplay among different risk aspects, we utilize the spatial simultaneous equation model to control the endogeneity issues. First, we find evidence of peer influence on risk-taking within the same risk aspect such as business risks, financial risks, and investment risks. However, we do not find that firms would follow their peers to increase the innovation risks. Second, we show that a firm's risk-taking in one risk aspect also takes cross-reference of peer firms' risk-taking in other risk aspects. For example, the innovation risks of a focal firm are responsive to peers' financial risks but not to their innovation risks.

Our results are also robust to alternative identification strategies. First, we follow Leary and Roberts (2014) and Grennan (2019) to use traditional instrumental variable estimation to address the Manski reflection problem. In the spirit of Foroughi, et al. (2022), we construct an instrumental variable for the endogenous variable of peers' risk-taking by the fraction of peer firms having universal demand (UD) law experiences. To alleviate the concerns that UD law can affect both focal firm and peer firms, we select a subsample of the firm-year observations of the focal firm in the year that its state-of-incorporation does not pass a UD law. We confirm our findings of peer effects in

corporate risk-taking. Second, we estimate the causal peer effects in corporate risk-taking by using state-by-state adoption of strong Poison Pill laws as a quasi-natural experiment (Tsang, et al., 2022). Following the analytical framework of the quasi-natural experiment developed by Huber (2018) and Berg, et al. (2021), we find that the impact of strong Poison Pill laws adoption is amplified by the fraction of adoption of peer firms. Specifically, we find that the peer effects are significant among focal firms that are not subject to the strong Poison Pill laws.

Our findings further provide interesting insights into three channels through which corporate risk-taking is a response to peer influence. The first channel is the learning motives. We find that peer influence is more pronounced for firms with low-talented CEOs and firms with low performance. These results are consistent with the literature on learning motives (Bikhchandani, et al., 1998; Ross, et al., 2003; Damodaran, 2010; Leary and Roberts, 2014). The second channel is corporate governance. Strong corporate governance leads to the high job security concerns of CEOs (Cornelli, et al., 2013). Given that managers' types can be inferred from their relative behaviors or performance under asymmetric information, managers have the desire to follow the financial policies of their peers to avoid dismissals under high job security concerns (Scharfstein and Stein, 1990; Zwiebel, 1995). We show that firms under strong corporate governance are more likely to mimic their peers' risk-taking behaviors since they want to minimize the discrepancy of their relative performance with their peers. The third channel is competition. To stay competitive, firms will take more risks to maintain being profitable relative to their rivals in order to survive (Aghion, et al., 2001; Gu, 2016). We find that firms respond to competitive pressure by following their peers to increase the risk-taking to survive in the business race. Taking together, the three channels we explored contribute to peer influence on corporate risk-taking.

In our final analyses, we conduct three robustness tests. The first robustness test is

to add state-by-year fixed effects and firm fixed effects to our baseline model. The second robustness test is a placebo test. It is designed to mitigate the effects of latent common factors attributable to the definition of peer groups. We replace all the peers with randomly selected firms from other industries rather than the same industry. We find insignificant peer effects for randomly chosen peer firms and therefore alleviate the concerns of other factors resulting in peer influence. In the third robustness test, we follow the methods proposed by Jochmans (2023) to deal with the problems of the endogenous network. In conclusion, we find that our findings are robust to all these robustness tests.

Our finding is related to the literature on corporate risk-taking. Recent literature investigates the determinants of corporate risk-taking such as managerial incentives (Malmendier and Tate, 2005; Kini and Williams, 2012; Bernile, et al., 2018; Gopalan, et al., 2021), corporate governance (John, et al., 2008; Faccio, et al., 2011; Gormley and Matsa, 2016; Bernile, et al., 2017), and managerial compensation (Coles, et al., 2006; Hayes, et al., 2012). The unique aspect of our paper is that we are the first to comprehensively document the importance of industry peer influence as a corporate risk-taking determinant.

Furthermore, our research contributes to the growing literature that investigates the peer effects in corporate finance, which finds firms' behaviors and decisions can be influenced by their peer firms in the same industry. There are peer influences on CEO compensation (Albuquerque, et al., 2013), financing decisions (Leary and Roberts, 2014; Aghamolla and Thakor, 2022), dividend payout (Grennan, 2019), corporate governance practices (Foroughi, et al., 2022). Instead of studying corporate activities, recent literature also documents that individual market participants' risk-taking behaviors can be affected by their peers (Bursztyn, et al., 2014; Ouimet and Tate, 2020). To the best knowledge, our study is the first to comprehensively study the peer influence

on corporate risk-taking. We also study the peer influence on corporate risk-taking among different risk aspects and find that a firm's risk-taking in one risk aspect also takes cross-reference of peer firms' risk-taking in other risk aspects.

Our results also contribute to a small but growing line of research on how peer influence operates. First, we add to the literature studying the learning channel of peer effects that firms are more likely to learn the financial policy decisions from their industry leader for survival purposes (Bikhchandani, et al., 1998; Ross, et al., 2003; Damodaran, 2010). We show that firms with low-talented CEOs or low performance are more eager to learn from their peers' risk-taking decisions.

We contribute to the studies on the corporate governance channel of peer influence. Since the investors can infer the types of managers from either their relative decisions or relative performance under asymmetric information, managers exhibit mimicking behaviors because of their serious job security concerns and reputational pressure under the strong corporate governance environment (Albuquerque, et al. 2013; Cornelli, et al., 2013; Scharfstein and Stein, 1990; Zwiebel, 1995). We extend the channels of corporate governance in this literature by studying peer effects in risk-taking decisions. Our findings show that the mimicking behaviors of corporate risk-taking are more pronounced in firms under strong corporate governance.

Our study adds to the literature on the competition channel of peer influence. Aghamolla and Thakor (2022) shows that firms faced with more intensified competition will increase their propensity of going public to stay competitive if they observe a direct competitor undertook an IPO. We complement this literature and find that firms in a competitive industry are prone to follow their peers' risk-taking decisions.

The paper proceeds as follows. Section 2 discusses the sample construction, define the variables and peer groups, and present the summary statistics. Section 3 develops the hypothesis, introduces the identification strategy, and provides the empirical results.

Section 4 examines four channels through which corporate risk-taking is a response to peer influence. Section 5 conducts three robustness tests. Finally, Section 6 concludes.

2. Data and variables

This section provides details about how to construct our sample, define the peer groups and all the main variables.

2.1. Sample construction

The stock price data are from the Center for Research in Security Prices (CRSP) daily stock price database. The accounting data are from the merged CRSP-Compustat database. In addition, board-related variables such as board size and the average age of the board of directors are mainly constructed from Boardex and are supplemented by Execucomp and Institutional Shareholder Services (formerly RiskMetrics). To minimize the regulatory influence on corporate risk-taking, we exclude financial firms (SIC 6000-6999), and utilities (SIC 4900-4999), as well as government entities (9000-9999). We choose the sample period from 1994 to 2022 subject to the data availability. We keep all the non-missing values for all the variables and our final sample consists of 63,956 firm-year observations with 7,297 unique firms. We winsorize all the variables at both the 1^{st} and 99^{th} percentiles to minimize the effect of outliers.

The definition of all the variables is reported in Table 1.

[Insert Table 1 here]

2.2. Corporate risk-taking and peer definition

Following Favara et al. (2017) and Gopalan et al. (2021), we measure overall corporate risk-taking by three alternative proxies: stock volatility, expected default frequency and ROA volatility. Stock volatility is calculated by the square root of 252 multiplied by the standard deviation of daily stock returns. Expected default frequency measures the probability that the firm will default in the year based on the distance-to-default constructed by Bharath and Shumway (2008). ROA volatility is the volatility of the ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to assets over 8 years, between years t and t – 7. Furthermore, we examine the peer influence of corporate risk-taking across four specific categories of risks related to financial risks, business risks, investment risks, and innovation risk in a simultaneous decisions framework.

We follow Leary and Roberts (2014) to define our peer reference groups based on industry, using the three-digit Standard Industrial Classification (SIC) code. This is because competition for capital, labor, and customers is usually more severe among the firms within the same industry.

2.3. Control variables

Following Bernile, et al. (2018), we employ control variables consist of firm characteristics, board characteristics, and macroeconomic factors. Firm characteristics include firm size, market-to-book ratio, ROA, tangibility, dividend payout and firm age. Board characteristics include board size, the average age of the board of directors, CEO tenure, and whether the CEO is both chair and president, which accounts for management's appetite for corporate risk-taking. The macroeconomic factors are

controlled by industry, state, and year fixed effects.

Table 2 provides the summary statistics of all the variables.

[Insert Table 2 here]

3. Corporate risk-taking as a response to peer influence: The baseline model

Our main conjecture is that corporate risk-taking is responsive to peer influence. Banerjee (1992) finds theoretically that managers may weigh more on the decisions of their peers than their information when their signal is noisy, and optimization is costly or time-consuming. Similarly, Trueman (1994) also finds that firms update the priors when the observed actions of other firms. Motivated by these theoretical findings, we hypothesize that the firm has the motives to pull their corporate risk-taking behaviors towards their peers' risk-taking behaviors.

Our empirical model to study the peer effects in corporate risk-taking is as follows:

$$y_{i,j,s,t} = \beta \bar{y}_{i,j,s,t} + \theta' X_{i,j,s,t-1} + \eta' \bar{X}_{i,j,s,t-1} + u_j + \nu_s + \delta_t + \epsilon_{i,j,s,t} \qquad (1)$$

where the indices i, j, s and t correspond to firm, industry, state, and year, respectively. The dependent variable, $y_{i,j,s,t}$, is the corporate risk-taking proxy of firm i. The endogenous variable $\bar{y}_{i,j,s,t}$ is defined as the average of peer firm risk-taking (excluding firm i). $X_{i,j,s,t-1}$ contain both firm and board characteristics controls. The firm characteristics include firm size, market-to-book ratio, ROA, tangibility, dividend payout, and firm age. The board characteristics include board size, average age of the board of directors, CEO tenure, and whether the CEO is both chair and president. $\bar{X}_{i,j,s,t-1}$ include all the peer firm average characteristics and peer board average characteristics, which controls for the homophily (i.e., birds of a feather flock together; see Aral, et al., 2009). Industry, state, and year fixed effects are represented by u_j, ν_s and δ_t, respectively. $\epsilon_{i,j,s,t}$ is the unobservable error component.

However, Manski (1993) points out that the identification of peer effects (β) in eq. (1) is empirically difficult owing to the reflection problem. To address this identification problem, we follow Grieser, et al. (2022) to rewrite eq. (1) into the following spatial econometrics specification in matrix format:

$$\boldsymbol{y_t} = \beta \boldsymbol{W_t y_t} + \boldsymbol{\theta' X_{t-1}} + \boldsymbol{\eta' W_t X_{t-1}} + \boldsymbol{Z_t} + \boldsymbol{\epsilon_t} \quad (2)$$

where $\boldsymbol{y_t}$ is a vector of firm-level corporate risk-taking proxy at time t. $\boldsymbol{X_{t-1}}$ is a matrix of both firm and board characteristics controls at time $t-1$. $\boldsymbol{W_t}$ is a peer-network weighting matrix described earlier characterizing the peer interaction at time t. All peer firms have equal weights in affecting a focal firm's risk-taking. Diagonal elements of $\boldsymbol{W_t}$ are zeros and the sum of each row in $\boldsymbol{W_t}$ is equal to 1. This defines that $\boldsymbol{W_t y_t}$ is the average of peer firm risk-taking and that the coefficient β captures the peer effects. This also defines that $\boldsymbol{W_t X_{t-1}}$ is a matrix of the average peer firm and average peer board characteristics at time $t-1$. $\boldsymbol{Z_t}$ is a matrix of industry, state, and year fixed effects. $\boldsymbol{\epsilon_t}$ is the error term.

We find that our peer-network weighting matrix $\boldsymbol{W_t}$ satisfies the identification condition laid out by Bramoullé et al. (2009). That is, $\boldsymbol{I}$, $\boldsymbol{W_t}$, $\boldsymbol{W_t^2}$, and $\boldsymbol{W_t^3}$ are linearly independent for any year *t*, where $\boldsymbol{I}$ is an identity matrix. This enables us to estimate eq. (2) by applying the generalized spatial two-stage least-squares (GS2SLS) procedure developed by Kelejian and Prucha (2010) to obtain the estimate of peer effects (β). The instruments for the endogenous variable of the average peer risk-taking $\boldsymbol{W_t y_t}$ are spatial lags of the exogenous variables, i.e., $\boldsymbol{W_t^2 X_{t-1}}$ and $\boldsymbol{W_t Z_t}$.

The estimation results are shown in Table 3.

[Insert Table 3 here]

For all the three proxies for corporate risk-taking with respect to overall risks, we find that the average peer firm risk-taking coefficients β are always positive and significant at the 1% significance level, which provides strong evidence of peer effects

in corporate risk-taking. In Column 1, we find that a one-standard-deviation increase in the average of peer firm stock volatility (0.227) will result in an initial increase in a focal firm's stock volatility of 0.670 × 0.227 = 0.152, *ceteris paribus*. In other words, given the sample mean of stock volatility of 0.587, the level of corporate risk-taking of a focal firm is increased by 0.670 × 0.227 / 0.587 = 25.9%. The magnitude of the impact suggests that peer influence plays an economically significant role in determining the individual firm's corporate risk-taking.

In Column 2, we use the *Expected default frequency* as the dependent variable to measure the propensity that the firm will default in the year based on Merton's distance-to-default constructed by Bharath and Shumway (2008). The firm's expected default frequency would initially increase by 0.620 × 0.105 = 0.065 following one-standard-deviation increase in the average of peer firm expected default frequency (0.105). We next analyze *ROA volatility* in Column 3. A one-standard-deviation increase in the average of peer firm ROA volatility (0.073) results in an initial increase in the risk-taking of 0.794 × 0.073 = 0.058 ROA volatility.

4. Peer influence on corporate risk-taking among different risk aspects

As shown in the previous section, we find a significant peer influence on corporate risk-taking with respect to overall risks. In this section, we further investigate the peer influence on corporate risk-taking among four different risk aspects including business risks, financial risks, investment risks, and innovation risks.

In the real world, different risks are closely interconnected with each other. For example, Lerner (2006) provides evidence that less leveraged firms are more innovative in the region with more financial innovations. By bringing investment, financing, and risk management decisions into a unified framework, Bolton, et al. (2011) formalize

the theoretical model of interconnections among different aspects of risks. Moreover, Grieser and Liu (2019) consider the effect of the financial risks of competitors on corporate investment. They show that firms increase investment expenditure and innovation activities when their competitors encounter cash shortages.

To control for the endogeneity attributable to the interconnection among different risk aspects in the focal firm and peer firms, we use the spatial simultaneous model introduced by Kelejian and Prucha (2004), in which different risk aspects are simultaneously estimated. For example, in the model of corporate risk-taking in the aspects of financial risks, a focal firm's financial risks are mainly determined by its own business risks, investment risks, and innovation risks, as well as the four aspects of risks in peer firms. We define four proxies for corporate risk-taking in these four risk aspects respectively: market leverage for financial risks, cash flow volatility for business risks, CAPEX for investment risks, and the fraction of R&D to assets for innovation risks. The estimation results are presented in Table 4.

[Insert Table 4 here]

Columns 1-4 present regression results from the simultaneous spatial system of determinants of market leverage, cash flow volatility, CAPEX, and the fraction of R&D to assets. The dependent variable in column 1 is market leverage for financial risks. We find significant peer influence on financial risks. The coefficient of the average of peer firm market leverage is 0.543 and is positively significant at the 1% significance level. In terms of economic significance, a one-standard-deviation increase in the average of peer market leverage (0.137) will result in an initial increase in a firm's market leverage of around 0.543 × 0.137 = 0.074, *ceteris paribus*. In other words, given the sample mean of market leverage of 0.203, a focal firm's financial risks are increased by 0.543 × 0.137 / 0.203 = 36.6%.

Furthermore, we find evidence that a focal firm's risk-taking in the aspect of

financial risks takes the cross-references of peer's risk-taking in other risk aspects. The coefficient on the *Avg. peer firm Cash flow volatility* (business risks) is significantly negative at the 5% significance level with a coefficient of -0.391, whereas the coefficient on the *Avg. peer firm R&D/assets* is significantly positive at the 1% significance level with a coefficient of 0.650. These results indicate that focal firm would increase financial risks when peer firms decrease business risks and increase innovation risks.

Finally, within a focal firm, we also document that risk-taking decisions across different aspects are interplayed with each other simultaneously. We find negatively significant coefficients of *CAPEX* (-1.153) and *R&D/assets* (-0.530), which indicates that a focal firm reduces its financial risks when it increases its own investment risks and innovation risks.

In column 2, we find evidence of peer influence in business risks. The coefficient of *Avg. peer firm Cash flow volatility* is positively significant at the 5% significance level. A focal firm's risk-taking in the aspects of business risks also takes the cross-reference of peer firms' investment risks. The focal firm would decrease the business risks if peer firms' investment risks is increased. We also find that both investment risks and innovation risks of a focal firm negatively affect its investment risks.

In column 3, we find peer effects in investment risks. However, we do not find that a focal firm's investment risks are influenced by peer firms' other risks. Regarding its own risk-taking in different aspects within a focal firm, we find a negative relationship between financial risks and investment risks. There is also a positive relationship between business risks and investment risks.

Finally, we do not find that a focal firm's innovation risks are influenced by peer firms' innovation risks in Column 4. The coefficient of *Avg. peer firm R&D/assets* is statistically insignificant. However, the coefficient of *Avg. peer firm Mkt. lev* is 0.100

and is significantly positive at the 1% significance level. This implies that a focal firm's innovation risks are positively correlated with peers' financial risks, although the focal firm is insensitive to the peers' innovation risks. Within a focal firm, we find its financial risks are negatively correlated with its own innovation risks, whereas business risks are positively correlated with innovation risks.

In summary, we document evidence that a firm's risk-taking in one risk aspect is sensitive to peers' risk-taking in the same aspect. Furthermore, it also takes cross-reference of peers' risk-taking in other aspects.

5. Alternative identification methods

5.1. Instrumental variable analysis: Universal Demand (UD) laws

In this section, we follow the spirit of Leary and Roberts (2014) to use the traditional instrumental variable analysis to identify and estimate the causal peer effects in corporate risk-taking. This approach can address the Manski reflection problem. Following Foroughi, et al. (2022), we use the staggered adoption of universal demand laws across states to construct an instrument for the average of peer firm risk-taking. The instrument *Fraction of UD law peers* is constructed as the fraction of peer firms having UD law experiences. We examine whether focal firms that are not subject to the universal demand law would adjust the level of risk-taking when their peers experience the legislation change.

Shareholders usually sue the firm's management through derivative lawsuits that force the managers to compensate for the damage that they caused due to inappropriate management decisions. The derivative lawsuit can discipline managers for wrongdoings (Bourveau, et al. , 2018; Appel, 2019). However, universal demand (UD)

laws require the shareholders to send the demand to the board of directors before filing a derivative lawsuit. As a result, most of these requests would be refused since most of the directors are defendants in the lawsuit. The decrease in the threat of derivative lawsuits increases corporate risk-taking. Extant literature shows that firms increase innovation activities after the staggered adoption of the universal demand law (Lin et al., 2021). Therefore, our instrument, i.e., the fraction of peer firms having UD law experience, is positively correlated with the average of peer firm risk-taking. The instrument meets the relevance condition. The IV estimation specification is

$$Stock\ volatility_{i,j,s,t} = \beta Avg.peer\ stock\ volatility_{i,j,s,t} + \theta' X_{i,j,s,t-1} + \eta' \bar{X}_{i,j,s,t-1} + u_j + \nu_s + \delta_t + \epsilon_{i,j,s,t} \quad (3)$$

where the indices i, j, s and t correspond to firm, industry, state and year, respectively. The dependent variable, $Stock\ volatility_{i,j,s,t}$, is the stock volatility of firm i. The endogenous variable $Avg.peer\ stock\ volatility_{i,j,s,t}$ is defined as the average of peer firm stock volatility (excluding firm i) and is instrumented by the fraction of peer firms having UD law experience (*Fraction of UD law peers*). All other variables are defined in eq. (1).

To eliminate the concerns that UD law could affect both the focal and peer firms, we select the firm-year observations of the focal firm in the year that its state-of-incorporation does not pass a UD law. Table 5 displays the instrumental variables estimation results of eq. (3). Column 1 does not include firm and board characteristics, peer firm average characteristics and peer board average characteristics while Column 2 does.

[Insert Table 5 here]

To test the validity of our instruments, we report the coefficients and the t-statistic

on the instrument and the F-statistic of the weak instrument test from the first-stage regression (Sanderson and Windmeijer, 2016) at the bottom of Table 5. The coefficients of *Fraction of UD law peers* in the first-stage regression are positively significant at the 1% significance level, which indicates that the fraction of peer firms having UD law experience is strongly positively correlated with the average of peer firm stock volatility. The first-stage F-statistics of excluded instrument in both columns reject the null hypothesis that our instrument is a weak instrument at the 1% significance level. Taken together, it shows that our instrument passes various instrumental variable tests and that our instrumental strategy is sound and valid.

In the second-stage regression results, we consistently find that corporate risk-taking is responsive to peer influence. The coefficients of *Avg. peer stock volatility* are positively and statistically significant at the 5% significance level in both specifications. To appreciate the economic significance of our findings, consider the coefficient of *Avg. peer stock volatility* under column 2 as an example. The estimate implies that a one-standard-deviation increase in the average of peer firm stock volatility (0.227) leads to an increase in corporate stock volatility of $0.729 \times 0.227 = 0.165$, *ceteris paribus*. In other words, given the sample mean of stock volatility 0.587, the level of corporate risk-taking is increased by $0.729 \times 0.227 / 0.587 = 28.2\%$. The magnitude of the impact suggests that peer influence plays an economically significant role in determining the individual firm's corporate risk-taking.

In conclusion, the instrumental variable estimation results confirm our main findings that the peer influence is significant in corporate risk-taking.

5.2. Quasi-natural experiment: Strong Poison Pill (PP) laws

As an alternative identification strategy to estimate the causal peer effects, we exploit an exogenous source of variation of peers' risk-taking by using state-by-state adoption of strong Poison Pill (PP) statutes and cases. Following Tsang, et al. (2022), the adoption of strong poison pill statutes mean that a board can adopt dead-hand or no-hand poison pills to make them immune to a hostile takeover. It means that the poison pill can survive for a certain period even the adopting directors are voted off the board. Low (2009) finds that an increase in takeover protection provides the managers with greater incentives for risk-taking. This implies that peers will increase their risk-taking after the states they incorporated introduce the strong Poison Pill law. If there is peer influence, the focal firm will follow suit to increase its risk-taking as well.

To study the peer influence of strong PP law on corporate risk-taking, we estimate the following eq. (4) developed by Huber (2018). A significant β in the following equation indicates the peer influence on corporate risk-taking.

$$Stock\ volatility_{i,j,s,t} = \beta Fraction\ of\ Strong\ PP\ law\ peers + \gamma Strong\ PP\ law_{i,j,s,t} + \theta' X_{i,j,s,t-1} + \eta' \bar{X}_{i,j,s,t-1} + u_j + \nu_s + \delta_t + \epsilon_{i,j,s,t} \quad (4)$$

where $Strong\ PP\ law_{i,j,s,t}$ is the indicator that equals one if the state in which the firm is headquartered has adopted strong PP statutes or cases within 3 years, and zero otherwise. $Fraction\ of\ Strong\ PP\ law\ peers$ is the fraction of the peer firms having strong PP statutes or cases experiences within 3 years. All other variables are defined in eq. (1).

Berg, et al. (2021) further extend the specification of Huber (2018) to a heterogeneous spillover model. The coefficient (β) in Huber's model is differentiated

by firms in the treated group (β_T) and the control group (β_c). The treated group is the firms located in the states that adopted strong Poison Pill (PP) statutes and cases. The rest firms are in the control group.

In this paper, we also apply the model of Berg, et al. (2021) to estimate the heterogenous peer effects in corporate risk-taking for the firms in the treated group and the control group. The full spillover model for corporate risk-taking is as follows:

$$\begin{aligned} Stock\ volatility_{i,j,s,t} &= \beta_T Fraction\ of\ Strong\ PP\ law\ peers \times Strong\ PP\ law_{i,j,s,t} \\ &+ \beta_c Fraction\ of\ Strong\ PP\ law\ peers \times (1 - Srong\ PP\ law_{i,j,s,t}) \\ &+ \gamma Strong\ PP\ law_{i,j,s,t} + \theta' X_{i,j,s,t-1} + \eta' \bar{X}_{i,j,s,t-1} + u_j + v_s + \delta_t \\ &+ \epsilon_{i,j,s,t} \end{aligned} \quad (5)$$

Table 6 displays the estimation results. Columns 1 and 2 report the estimated results based on the model from Huber (2018) and columns 3 and 4 report the estimated results based on the model from Berg, et al. (2021). Columns 1 and 3 do not include peer firm average characteristics and peer board average characteristics while columns 2 and 4 do.

[Insert Table 6 here]

In columns 1 and 2, the coefficients of *strong PP law* are positively significant at either the 1% or 5% significance level. Using the estimates from column 2, these results imply that the firm in a state that adopts strong PP statutes and cases within three years increases the risk-taking level by 0.033 stock volatility. The coefficients of *Fraction of strong PP law peers* are also positively significant at the 1% significance level. The results indicate that the impact of the strong PP statutes and cases adoption is amplified by the fraction of adoption of peer firms. Consider the coefficient of *Fraction of strong PP law peers* under column 2 as an example, if all the states incorporated by peer firms

switched from no strong PP laws to the adoption of strong PP laws, the focal firm would increase the risk-taking by (1-0) × 0.113 = 0.113 stock volatility. Given the sample mean of stock volatility 0.587, this implies a (1-0) × 0.113 / 0.587 = 19.3% initial increase in the stock volatility of the focal firm.

In columns 3 and 4, we also find the positively significant coefficients of *strong PP law* at either the 1% or 5% significance level, which indicates that the firms in a state adopting strong PP laws would increase corporate risk-taking. Moreover, we find that peer effects in corporate risk-taking are significant among the focal firms that are not subject to the strong PP laws. The coefficients of *Fraction of strong PP law peers × (1-strong PP law)* are positively significant at either the 1% or 5% significance level. The estimate in column 4 implies that the focal firm incorporated in a state with no strong PP laws would increase the risk-taking by (1-0) × 0.133 = 0.133 stock volatility if all the states incorporated by peer firms switch from no strong PP laws to the adoption of strong PP laws.

In conclusion, the results from our quasi-natural experiment confirm our main findings that the peer influence is significant in corporate risk-taking.

6. Channels of peer influence

In this section, we investigate the channels through which corporate risk-taking is responsive to peer influence. Given the statistical significance and economic importance of peer effects in corporate risk-taking, our goal is to shed light on the channels through which the peer effect on corporate risk-taking can be exacerbated or mitigated. The intuition is that the effect of peer influence on firm's risk-taking can be accentuated in situations where the deviation from mimicking peers' risk-taking decisions is more likely to result in the increase of survival concerns either for firms or

for CEOs. Conversely, the effect can be weakened by channels that help to reduce the survival concerns encountered by firms or CEOs. We propose to test the following three different channels: learning motives, corporate governance, and competition.

In each subsection, we begin with the introduction of theoretical motivation and development of the hypothesis, and then we use several proxies for each channel to present the empirical results.

6.1. Learning motives

6.1.1. Theoretical motivation and hypothesis development

The first channel is learning motives (Leary and Roberts, 2014). Existing literature and popular textbooks state the firm's desire for learning from peers. Bikhchandani, et al. (1998) finds that firms have desire to learn from their peers with greater expertise. Ross, et al. (2003, p.452) suggests that a firm should pay more attention to the existing firms because they are the survivors. Damodaran (2010, p.443) also mentions that firms are prone to follow the leaders because they want to imitate their success. Firms with weak performance have severe pressure to survive in the industry. Therefore, we expect that firms with low performance or low-talented CEOs are more eager to learn from their peer firms' risk-taking behaviors than their counterparts

6.1.2. Proxies to weak firms

The definition of weak firms includes either firms with low-talented CEOs or firms with low performance. We use three alternative measures to capture firms with low-talented CEOs based on Albuquerque, et al. (2013): Low abnormal performance, the small size of the firms the CEO has managed, and low CEO pay. Less talented CEO has a lower abnormal performance, manages a smaller sized firm, or takes a lower

compensation package (Fee and Hadlock, 2003; Rajgopal, et al., 2006; Gabaix and Landier, 2008). We construct three indicators to capture these three proxies: *Low CEO abn ROA* is an indicator that equals one if the average of the firm's stock return relative to industry ROA over the last three years is below the lower tercile of the within-industry-year distribution and zero otherwise; *Low CEO log market cap* is an indicator that equals one if the logarithm of the average market capitalization of the firm that the CEO worked for over the last three years is below the lower tercile of the within-industry-year distribution and zero otherwise, *Low CEO pay* is an indicator that equals one if the CEO pay over the last three years is below the lower tercile of the within-industry-year distribution and zero otherwise.

There are also three proxies for firms with low performance from Leary and Roberts (2014): Low profit, low market-to-book ratio, and low dividend payout ratio. *Low profit* is an indicator that equals one if the profitability of the firms is below the lower tercile of the within-industry-year distribution and zero otherwise; *Low M/B* is an indicator that equals one if the market-to-book ratio of the firms is below the lower tercile of the within-industry-year distribution and zero otherwise; *Low dividend payout ratio* is an indicator that equals one if the ratio of dividend to assets of the firms is below the lower tercile of the within-industry-year distribution and zero otherwise

6.1.3. Empirical results

To investigate whether weak firms are more prone to learn from their peers, we include the dummy variable for firms with learning motives and its interaction with the average of peer firm stock volatility in our baseline model eq. (2). Table 7 presents the generalized spatial two-stage least squares (GS2SLS, Kelejian and Prucha, 2010) estimation results of the learning motives channel. Columns 1 to 3 present the results of three proxies for firms with low-talented CEOs and columns 4 to 6 present the results

of three proxies for firms with low performance.

[Insert Table 7 here]

Table 7 confirms our previous baseline results that peer firm average stock volatility exerts a significant impact on the stock volatility for all the specifications. It indicates that there is peer influence on corporate risk-taking. Furthermore, columns 1 and 2 shows that firms with low-talented CEO, i.e., those CEOs with low abnormal returns and low market capitalization, have a significant initial increase in risk-taking motivated by learning from their peers. In column 1, given a one-standard-deviation increase in the average of peer firm stock volatility, firms with low abnormal return additionally have an initial increase in the firm's risk-taking of $0.132 \times 0.227 = 0.030$ stock volatility compared to those firms with high abnormal return. Given the sample mean of stock volatility 0.587, this implies a $0.132 \times 0.227 / 0.587 = 5.1\%$ initial increase in an individual firm's stock volatility for firms with low abnormal returns.

In columns 4 and 5 of Table 7, the coefficients of the interaction terms between peer firm average stock volatility and both the low-profit indicator and the low dividend payout ratio indicator are positively significant at the 5% level respectively. These results show that the low-profit and the low dividend-paying firms are more sensitive to their peer firms' corporate risk-taking than the high-performance firms. Specifically, column 4 shows that firms with low profitability have an additional $0.395 \times 0.227 = 0.090$ stock volatility initial increase in comparison to a high-profit firm if there is a one-standard-deviation in the average of peer risk-taking. The result represents a $0.395 \times 0.227 / 0.587 = 15.3\%$ initial increase of the firm's stock volatility.

To conclude, these results are consistent with our hypothesis that the firms with low-talented CEO or low performance exhibit stronger learning behavior and are more sensitive to the peers' risk-taking decisions than their counterparts with high-talented CEO or high performance. It shows that learning is an important channel of peer effects

in corporate risk-taking.

6.2. Corporate governance

6.2.1. Theoretical motivation and hypothesis development

The second channel is corporate governance. Cornelli, et al. (2013) shows that governance reforms lead to forced CEO turnover and boards fire the CEO when they raise concerns about CEO's ability from CEO's behaviors and future performance. Therefore, CEOs in a firm with strong corporate governance encounter high job security concerns.

Under high risk of dismissal, CEOs value their reputation from which investors can infer their types. One situation is that reputation depends on the relative behaviors from which the manager's type can be inferred. Scharfstein and Stein (1990) develop a theoretical model and find that managers who are concerned about their reputations are more likely to mimic the corporate risk-taking behaviors of their peers to increase their perceived type.

The second situation is that reputation depends on relative performance and the manager's type can be inferred from their risk-taking outcomes. Zwiebel (1995) presents a model of managerial reputation building and demonstrates that managers with reputational concerns also prefer to mimic the corporate risk-taking behaviors of their peers to minimize the discrepancy of relative risk-taking outcomes.

Both situations arise from asymmetric information in that managers have private information about their true types. Managers know that investors can infer their types from their risk-taking outcomes. Therefore, we hypothesize that managers have the incentive to mimic the risk-taking decisions of their peers to minimize the discrepancy of their risk-taking outcomes if the corporate governance is strong.

6.2.2. Proxies to corporate governance

We use two proxies for corporate governance from Albuquerque, et al. (2013). The first proxy indicates internal monitoring. *Number of other boards* is measured by the number of other boards on which firm directors serve. The greater number of other boards firm directors serve, the weaker internal monitoring the firm has (Fich and Shivdasani, 2006). As a second proxy for corporate governance, we use the entrenchment index (*Eindex*) from Bebchuk, et al. (2009) to proxy external shareholder rights. External shareholder rights become weaker if the entrenchment index increases. In terms of our indicator *Eindex*, a lower value indicates a stronger corporate governance of the firm. We also decompose *Eindex* into its six components: Limitation on amending the charter (*Lachtr*), supermajority to approve a merger (*Supermajor*), golden parachute (*Gparachute*), staggered board (*Cboard*), limitation on amending bylaws (*Labylw*), and poison pill (*Ppill*).

6.2.3. Empirical results

We test our hypothesis by including the measure for corporate governance and its interaction with the average of peer firm stock volatility in our baseline model eq. (2). Table 8 presents the results for the channel of corporate governance. Column 1 shows the effect of internal monitoring on peer effects and column 2 shows the effect of external shareholder rights on peer effects.

[Insert Table 8 here]

The coefficients of *Number of other boards* and *Eindex* are positively significant at the 5% level. The results echo the findings of Duchin, et al. (2017) that strong governed firms are less risk-taking by investing less in risky financial assets and reducing acquisitions.

Peers influence matters in all the specifications and is affected by the corporate governance. Column 1 provides evidence that the effect of internal monitoring on peers influence is significant at the 1% level. Given a one-standard-deviation increase in the average of peer firm stock volatility, the manager in the firm under strong internal monitoring, in which the firm directors serve one lower number of other boards, has higher job security concerns and reputational pressure to reduce the dismissal risk, and thereby initially intensifies the mimicking behavior by taking additional risks of (-0.006) × (-1) × 0.227 = 0.001 stock volatility than a firm with weak internal monitoring. This implies an extra (-0.006) × (-1) × 0.227 / 0.587 = 0.2% initial increase in stock volatility.

External shareholder rights also play an important role in peer effects. Column 2 shows that the interaction term is negatively significant at the 1% level. The estimate implies that increasing the average of peer firm stock volatility by one standard deviation initially increases the stock volatility by extra (-0.042) × (-1) × 0.227 = 0.010 for the firms with stronger external shareholder rights represented by one lower E-index. In other words, under the pressure of high shareholder rights, the firm's stock volatility initially increases by extra (-0.042) × (-1) × 0.227 / 0.587 = 1.6% in comparison with a firm with one higher E-index if there is a one standard deviation increase in peers risk-taking.

Furthermore, we decompose the entrenchment index (*Eindex*) into its six components and rerun the regression on each component step by step. The results are robust. Specifically, we find negatively significant coefficients in the three interaction terms of the average peer firm stock volatility with limitation on amending the charter (*Lachtr*), supermajority to approve a merger (*Supermajor*), and staggered board (*Cboard*), respectively.

In conclusion, all these results are consistent with our hypothesis that firms with strong corporate governance are more likely to mimic their peers' risk-taking behaviors

to minimize the discrepancy of relative risk-taking outcomes since CEOs have higher job security concerns and reputational concerns than firms with weak corporate governance. Therefore, we document evidence that corporate governance is an important channel of peer effects in corporate risk-taking.

6.3. Competition

6.3.1. Theoretical motivation and hypothesis development

The third channel is competition. In an industry with high competition, firms are struggling to make profits to survive. They know that they can make profits relative to their rivals if they can outperform in the industry (Aghion, et al., 2001). To earn higher expected returns, they tend to take higher risks in the business race (Gu, 2016). As a result, we hypothesize that the managers will follow their peers to increase the risk-taking to ensure that they are not be left behind.

6.3.2. Proxies to competition

Similar to Aghamolla and Thakor (2022), we use three proxies to measure the degree of competition. The first measure is the Herfindahl-Hirschman Index (*HHI*) at the three-digit SIC code industry level. The second measure is based on another calculation for Herfindahl-Hirschman Index. *HHI past 5* is calculated by the sum of squared average market shares in the past five years at the three-digit SIC code industry level. The third measure is the concentration index (*C4 index*) which is calculated by the sum of the market shares of the four largest firms in an industry.

6.3.3. Empirical results

To investigate whether the competition has an impact on the peer effects in

corporate risk-taking, we augment our baseline model eq. (2) to include the proxies for competition and their interactions with the average of peer firm stock volatility. Table 9 provides our estimation results related to the competition channel.

[Insert Table 9 here]

For the peer effects, our main findings of the peers' influence on corporate risk-taking remain economically and statistically strong in all specifications. For the competition effect, we find that the coefficients of all the proxies for the competition are positively significant at either the 1% or 5% significance level, indicating that the firm in an industry with more competition, *ceteris paribus*, will take fewer risks.

The interaction of peer firm average stock volatility and market competition is positively significant at either the 1% or 5% level across columns 1 to 3. This implies that firms encountering more fierce competition are more prone to follow their peers' risk-taking behaviors. Interestingly, this implies the peer effect weakens the negative association between the competition and risk-taking for firms under the peer influence. The interaction coefficient -0.190 reported in column 1 is interpreted as follows. *Ceteris paribus*, a one-standard-deviation increase in the average of peer firm stock volatility is associated with an additional initial increase in stock volatility of (-0.190) × (-0.181) × 0.227 = 0.008 for the firm in a strong competition environment, i.e., the firm in the industry with the HHI that is one standard deviation below the mean. In other words, given the sample mean of stock volatility 0.587, the firm in a more competitive industry initially increases the stock volatility by additional (-0.190) × (-0.181) × 0.227 / 0.587 = 1.3% relative to a firm in a less competitive industry.

In summary, we confirm our hypothesis that firms in a more competitive industry are prone to follow their peer's risk-taking decisions.

7. Robustness check

7.1. High-dimensional fixed effects and firm fixed effects

There is a concern to our previous findings that even though peer firms' risk-taking decisions are invariant, a focal firm's risk-taking decisions would be influenced by some unobserved time-varying state-level factors or unobserved firm determinants. If such factors can determine the risk-taking behaviors, then the omitted variables problem remains. To address these concerns, we add state-by-year fixed effects first and then further add firm fixed effects to our baseline model.

Table 10 reports the regression results.

[Insert Table 10 here]

Our results are robust after controlling industry fixed effects and state-by-year fixed effects in column 1. In column 2, we find a statistically significant coefficient of average peer influence after controlling firm fixed effects and state-by-year fixed effects. Therefore, we can alleviate the concerns of omitted variables bias attributable to some unobserved time-varying state-level factors or unobserved firm determinants.

7.2. Placebo test

To mitigate the effects of other factors owing to the definition of peer groups, we implement a placebo test. The objective of the placebo test is to study whether peer effects generated from the randomly selected peer groups can be found. If other unobservable factors can be attributed to peer influence results, there are peer effects no matter what the definition of peer groups is. Following Grennan (2019), we replace the peer firms with randomly chosen firms in other industries instead of the firms in the same industry. We then re-construct the peer network based on the randomly chosen

peer groups. The estimation results for the placebo test are shown in Table 11.

[Insert Table 11 here]

We find insignificant results for peer effects in all specifications since the coefficient of average peer influence is not significant at the 10% significance level. These results indicate that the definition of peer groups based on the three-digit SIC code is appropriate for studying peer effects in corporate risk-taking. We also alleviate the concerns of other factors leading to the results of peer influence.

7.3 Endogenous network formation approach

We have identified the peer effects by using the spatial network approach when peer groups are exogenously formed. However, an endogeneity problem appears when firms may self-select their peers based on unobservable factors. In this section, we adopt the instrumental estimation method of Jochmans (2023) to deal with the endogeneity of the network formation. The approach of Jochmans (2023) is that the formation of self-selection of peers can be predicted by the leave-own-out subnetworks. This means that to estimate the baseline model in eq.(2), the instruments for the endogenous variables of both the average peer risk-taking $\boldsymbol{W_t y_t}$ and the average peer characteristics $\boldsymbol{W_t X_{t-1}}$ are constructed by $\boldsymbol{Q_{1t} X_{t-1}}$, $\boldsymbol{Q_{2t} X_{t-1}}$, $\boldsymbol{Q_{1t} Z_t}$, and $\boldsymbol{Q_{2t} Z_t}$. The $\boldsymbol{Q_{1t}}$ and $\boldsymbol{Q_{2t}}$ are matrices constructed from the leave-own-out subnetworks in one step and two steps, respectively (for details, see Jochmans, 2023).

The estimation results of the endogenous network are shown in Table 12.

[Insert Table 12 here]

The peer-effect coefficient β is positive and significant at the 1% significance level in all specifications. For example, a one-standard-deviation increase in the average of peer firm stock volatility will result in an initial increase in a firm's risk-taking of

$0.990 \times 0.227 = 0.225$ stock volatility if peer relationships are endogenous.

8. Conclusion

In this paper, we document that corporate risk-taking is responsive to peer influence. Peer firms' risk-taking has a robust and statistically significant impact on corporate risk-taking. Moreover, peer effects also have economic importance. *Ceteris paribus*, a one-standard-deviation increase in the average of peer firm risk-taking initially increases corporate risk-taking by 25.9%.

To further study the peer influence on corporate risk-taking among different risk aspects such as business risks, financial risks, investment risks, and innovation risks, we employ a simultaneous spatial model to address the endogeneity issue. We find evidence that firms would increase the risk-taking in the risk aspect of financial, business, and investment risks as a response to the increase of peers' risk-taking in the same risk aspect respectively. Furthermore, we find that a firm's risk-taking in one risk aspect also takes cross-reference of peer firms' risk-taking in other risk aspects. For example, a focal firm would increase financial risks when peer firms decrease business risks and increase innovation risks. A focal firm also decreases its business risks in response to the increase in investment risks by peer firms. Moreover, a focal firm will enhance its innovation risks if peers increase their financial risks. To our best knowledge, we are the first to comprehensively provide evidence that peer firms' risk-taking is an important determinant of corporate risk-taking.

Our results also shed light on the channels through which firms are more prone to follow the risk-taking decisions of their peers. First, firms with low-talented CEOs or with low performance have more learning motives and therefore are allured to take additional risks to survive if their peers increase their risk-taking. Second, firms under

strong corporate governance will encounter more reputation pressure and thus are more sensitive to their peers' risk-taking decisions to minimize the discrepancy of relative outcomes. Finally, firms in a more competitive industry are more likely to take additional risks if their peers undertake more risk-taking projects.

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Table 1
Definition of Variables

Variable Names	Variable Definitions
Dependent variables	
Stock volatility	Square root of 252 multiplied by the standard deviation of daily stock returns.
Expected default frequency (EDF)	Default probability estimate, using Bharath and Shumway's (2008) approximation of the Merton Distance-to-Default (DD) model. EDF = N(−DD) where N refers to the standard normal distribution. We follow Bharath and Shumway (2008) to create a measure for DD as $DD = \frac{\frac{\ln[E+F]}{F} + (r_{i,t-1} - 0.5\sigma_v^2)T}{\sigma_V\sqrt{T}}$ where E is the market value of equity, F book value of debt, r stock return, and $\sigma_V = \frac{E}{E+F}\sigma_E + \frac{E}{E+F}(0.05 + 0.25\sigma_E)$.
ROA volatility	Volatility of the ratio of Earnings before interest, taxes, depreciation, and amortization (EBITDA) to book assets over 8 years, between years t and t – 7.
Dependent variables of different risk aspects	
Mkt. lev	Sum of long-term debt and current liabilities divided by the sum of market equity and book debt.
Cash flow volatility	Annual standard deviation of firms' quarterly ratio of cash flow to book assets.
CAPEX	Ratio of net capital expenditure to book assets.
R&D/assets	R&D expense (set to 0 if missing) divided by book assets.
Firm characteristic variables	
Ln(Asset)	Natural log of book assets.
M/B	Market equity/book equity.
ROA	Net income divided by book equity.
Tangibility	Sum of investments and net Property, Plant, and Equipment (PP&E) divided by book assets.
Dividend dummy	Indicator equal to one if the firm pays dividends in the current year, and zero otherwise.
Ln(Firm age)	Natural log of the number of years a firm has been in Compustat.
Board characteristic variables	
Ln(Board size)	Natural log of the number of board of directors for the firm in the current year.
Ln(Average board age)	Natural log of the average age of the board of directors for the firm in the current year.
Ln(CEO tenure)	Natural log of the number of years since the current CEO's starting date.
CEO is chair and president	Indicator equals to one if the CEO is both the chair and president of the board of directors.
Law shock variables	
Fraction of UD law peers	Fraction of the peer firms having UD law experiences.
Strong PP law	Indicator that equals one if the state in which the firm is headquartered has adopted strong PP statutes or cases within 3 years, and zero otherwise.
Fraction of strong PP law peers	Fraction of the peer firms having strong PP statutes or cases experiences within 3 years.

(continued)

Table 1 (continued)

Variable Names	Variable Definitions
Channel 1 – Learning motives	
Low CEO abn ROA	Indicator equals one if the average of the firm's stock return relative to industry ROA over years $t-3$ to $t-1$ is below the lower tercile of the within-industry-year distribution and zero otherwise.
Low CEO log market cap	Indicator equals one if the logarithm of average market value of equity of the firm that the CEO worked for over years $t-3$ to $t-1$ is below the lower tercile of the within-industry-year distribution and zero otherwise.
Low CEO pay	Indicator equals one if the CEO pay over years $t-3$ to $t-1$ is below the lower tercile of the within-industry-year distribution and zero otherwise.
Low profit	Indicator equals one if the profitability of the firm is below the lower tercile of the within-industry-year distribution and zero otherwise.
Low M/B	Indicator that equals one if the market-to-book ratio of the firm is below the lower tercile of the within-industry-year distribution and zero otherwise.
Low dividend payout ratio	Indicator that equals one if the ratio of dividend to book assets of the firm is below the lower tercile of the within-industry-year distribution and zero otherwise.
Channel 2: Corporate governance	
Number of other boards	Number of other boards on which firm directors serve.
Eindex	Entrenchment index from Bebchuk, et al. (2009). Entrenchment index is based on the following six provisions.
Lachtr	Limitation on amending the charter, an indicator equals one if the firm has a provision limiting shareholders' ability through majority vote to amend the corporate charter and zero otherwise.
Supermajor	Supermajority to approve a merger, an indicator equals one if the firm has a requirement that requires more than a majority of shareholders to approve a merger and zero otherwise.
Gparachute	Golden parachute, an indicator equals one if the firm has a severance agreement that provides benefits to management/board members in the event of firing, demotion, or resignation following a change in control and zero otherwise.
Cboard	Staggered board, an indicator equals one if the firm has a board in which directors are divided into separate classes (typically three) with each class being elected to overlapping terms and zero otherwise.
Labylw	Limitation on amending bylaws, an indicator equals one if the firm has a provision limiting shareholders' ability through majority vote to amend the corporate bylaws and zero otherwise.
Ppill	Poison pill, an indicator equals one if the firm has a shareholder right that is triggered in the event of an unauthorized change in control that typically renders the target company financially unattractive or dilutes the voting power of the acquirer and zero otherwise.
Channel 3: Competition	
HHI	Herfindahl-Hirschman Index at the three-digit SIC code industry level. It is defined as the sum of squared market shares. Market shares are computed using firms' sales. Lower values indicate a strong competition industry.
HHI past 5	Herfindahl-Hirschman Index defined as the sum of squared average market shares in the past five years at the three-digit SIC code industry level. Lower values indicate a strong competition industry.
C4 index	Sum of the market shares of the four largest firms in an industry. Lower values indicate a strong competition industry.

Table 2
Summary statistics

The table reports summary statistics for all the variables. Our final sample has 63,956 firm-year observations from 1994 to 2022. It presents the number of firms (# of Firms), the number of observations (N), mean, standard deviation (Std. dev), minimum, the first quartile (Q1), median, the third quartile (Q3), and maximum for all the variables. All variables, excluding the dependent variables, are lagged one year. Definitions of all the variables are in Table 1.

Variable Names	# of Firms	N	Mean	Std. dev	Min	Q1	Median	Q3	Max
Dependent variables									
Stock volatility	7,297	63,956	0.587	0.404	0.154	0.337	0.483	0.708	3.052
Expected default frequency	6,478	57,978	0.075	0.209	0.000	0.000	0.000	0.004	0.987
ROA volatility	7,060	60,722	0.092	0.140	0.005	0.025	0.046	0.095	0.939
Dependent variables of different risk aspects									
Mkt. lev	6,547	53,577	0.203	0.221	0.000	0.012	0.133	0.314	0.912
Cash flow volatility	6,547	53,577	0.081	0.092	0.006	0.030	0.052	0.095	0.643
CAPEX	6,547	53,577	0.045	0.054	-0.020	0.013	0.028	0.057	0.353
R&D/assets	6,547	53,577	0.072	0.145	0.000	0.000	0.007	0.077	0.824
Peer firm average risk-taking									
Dependent variables									
Stock volatility	7,297	63,956	0.580	0.227	0.000	0.435	0.538	0.711	3.052
Expected default frequency	6,478	57,978	0.074	0.105	0.000	0.006	0.036	0.097	0.987
ROA volatility	7,060	60,722	0.092	0.073	0.000	0.041	0.070	0.110	0.529
Dependent variables of different risk aspects									
Mkt. lev	6,547	53,577	0.197	0.137	0.000	0.096	0.156	0.271	0.912
Cash flow volatility	6,547	53,577	0.079	0.040	0.000	0.055	0.072	0.096	0.643
CAPEX	6,547	53,577	0.044	0.036	-0.020	0.023	0.032	0.051	0.353
R&D/assets	6,547	53,577	0.072	0.100	0.000	0.000	0.022	0.101	0.824
Firm characteristic variables									
Ln(Asset)	7,297	63,956	6.281	1.985	1.165	4.899	6.283	7.631	10.717
M/B	7,297	63,956	1.904	1.747	0.298	0.881	1.326	2.220	11.317
ROA	7,297	63,956	0.032	0.275	-1.477	0.023	0.105	0.162	0.398
Tangibility	7,297	63,956	0.251	0.235	0.001	0.068	0.170	0.367	0.903
Dividend dummy	7,297	63,956	0.351	0.477	0	0	0	1	1
Ln(Firm age)	7,297	63,956	2.164	0.869	0.000	1.609	2.398	2.833	3.401
Board characteristic variables									
Ln(Board size)	7,297	63,956	2.014	0.284	1.099	1.792	2.079	2.197	2.639
Ln(Average board age)	7,297	63,956	4.087	0.098	3.780	4.033	4.099	4.154	4.288
Ln(CEO tenure)	7,297	63,956	1.863	0.919	0.000	1.163	1.872	2.557	3.711
CEO is chair and president	7,297	63,956	0.220	0.414	0	0	0	0	1

(continued)

Table 2 (continued)

Variable Names	# of Firms	N	Mean	Std. dev	Min	Q1	Median	Q3	Max
Peer firm average characteristics									
Ln(Asset)	7,297	63,956	6.172	1.329	0.000	5.365	6.228	6.981	10.717
M/B	7,297	63,956	1.881	0.883	0.000	1.219	1.698	2.419	11.317
ROA	7,297	63,956	0.030	0.163	-1.477	0.002	0.073	0.133	0.398
Tangibility	7,297	63,956	0.247	0.197	0.000	0.100	0.174	0.333	0.903
Dividend dummy	7,297	63,956	0.342	0.270	0.000	0.121	0.286	0.500	1.000
Ln(Firm age)	7,297	63,956	2.129	0.525	0.000	1.898	2.162	2.464	3.401
Peer board average characteristics									
Ln(Board size)	7,297	63,956	1.982	0.286	0.000	1.946	1.994	2.084	2.639
Ln(Average board age)	7,297	63,956	4.022	0.516	0.000	4.060	4.097	4.126	4.288
Ln(CEO tenure)	7,297	63,956	1.832	0.431	0.000	1.631	1.878	2.041	3.711
CEO is chair and president	7,297	63,956	0.217	0.147	0.000	0.138	0.211	0.276	1.000
Law shock variables									
Fraction of UD law peers	4,493	36,390	0.380	0.170	0.000	0.286	0.388	0.456	1.000
Strong PP law	7,297	63,956	0.009	0.094	0	0	0	0	1
Fraction of Strong PP law peers	7,297	63,956	0.009	0.035	0.000	0.000	0.000	0.000	1.000
Channel 1 : Learning motives									
Low CEO abn ROA	5,290	49,255	0.284	0.451	0	0	0	1	1
Low CEO log market cap	5,737	52,938	0.222	0.416	0	0	0	0	1
Low CEO pay	3,192	37,020	0.242	0.429	0	0	0	0	1
Low profit	7,297	63,956	0.249	0.433	0	0	0	0	1
Low M/B	7,297	63,956	0.266	0.442	0	0	0	1	1
Low dividend payout ratio	2,462	22,347	0.278	0.448	0	0	0	1	1
Channel 2: Corporate governance									
Number of other boards	6,943	58,095	14.112	7.753	0	9	13	18	86
Eindex	2,547	23,669	3.099	1.603	0	2	3	4	6
Lachtr	2,547	23,669	0.577	0.494	0	0	1	1	1
Supermajor	2,547	23,669	0.637	0.481	0	0	1	1	1
Gparachute	2,547	23,669	0.459	0.498	0	0	0	1	1
Cboard	2,547	23,669	0.485	0.500	0.000	0.000	0.000	1.000	1.000
Labylw	2,547	23,669	0.627	0.484	0.000	0.000	1.000	1.000	1.000
Ppill	2,547	23,669	0.315	0.464	0.000	0.000	0.000	1.000	1.000
Channel 3: Competition									
HHI	7,297	63,956	0.216	0.181	0.056	0.090	0.159	0.275	0.942
HHI past 5	7,095	60,294	0.192	0.162	0.032	0.087	0.128	0.239	0.864
C4 index	7,297	63,956	0.347	0.392	0.000	0.000	0.000	0.743	1.000

(continued)

Table 3
Peer influence on corporate risk-taking: Baseline GS2SLS estimation

This table reports the GS2SLS (generalized spatial two-stage least squares) estimation results of the peer influence on corporate risk-taking. In column 1, the dependent variable is *Stock volatility*, which is calculated by the square root of 252 multiplied by the standard deviation of daily stock returns over the year. In column 2, the dependent variable is *Expected default frequency*, which measures the probability that the firm will default in the year based on distance to default constructed by Bharath and Shumway (2008). In column 3, the dependent variable is *ROA volatility*, which is the volatility of the ratio of Earnings before interest, taxes, depreciation, and amortization (EBITDA) to book assets over 8 years, between years t and t – 7. The endogenous variable *Avg. peer influence* is the average peer firm risk-taking corresponding to the dependent variable in a three-digit SIC industry. The instruments include spatial lags of all the exogenous variables. *Peer averages* contains the average peer firm characteristic variables and average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding *Avg. peer influence*, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Stock volatility (1)	Expected default frequency (2)	ROA volatility (3)
Avg. peer influence	0.670***	0.620***	0.794***
	(18.32)	(11.01)	(11.91)
Ln(Asset)	-0.048***	0.002	-0.014***
	(-18.66)	(1.53)	(-17.22)
M/B	-0.017***	-0.020***	0.011***
	(-3.78)	(-9.45)	(7.43)
ROA	-0.493***	-0.138***	-0.258***
	(-18.36)	(-8.54)	(-29.67)
Tangibility	0.129***	0.131***	-0.022***
	(5.57)	(5.96)	(-3.07)
Dividend dummy	-0.082***	-0.041***	0.001
	(-13.28)	(-8.33)	(0.26)
Ln(Firm age)	-0.006	-0.010***	0.018***
	(-1.36)	(-4.60)	(9.80)
Ln(Board size)	-0.028***	-0.008	-0.007
	(-2.86)	(-1.03)	(-1.46)
Ln(Average board age)	-0.228***	-0.102***	-0.029*
	(-8.50)	(-5.91)	(-1.91)
Ln(CEO tenure)	-0.013***	-0.003**	-0.007***
	(-5.79)	(-2.24)	(-6.87)
CEO is chair and president	-0.000	0.000	0.002
	(-0.10)	(0.04)	(0.81)
Peer averages			
Ln(Asset)	0.023***	0.000	0.003**
	(5.97)	(0.14)	(2.28)
M/B	0.008	0.011***	-0.010***
	(1.54)	(2.82)	(-6.51)
ROA	0.372***	0.068***	0.189***
	(10.03)	(3.19)	(10.26)
Tangibility	0.011	-0.009	0.001
	(0.33)	(-0.45)	(0.10)
Dividend dummy	0.051***	0.045***	0.001
	(3.83)	(4.44)	(0.33)
Ln(Firm age)	-0.005	-0.002	-0.005*
	(-0.91)	(-0.35)	(-1.98)
Ln(Board size)	0.034**	-0.001	-0.003
	(2.17)	(-0.11)	(-0.81)
Ln(Average board age)	-0.165***	-0.023***	-0.014***
	(-12.05)	(-3.29)	(-4.19)
Ln(CEO tenure)	0.020***	0.001	0.003**
	(3.26)	(0.19)	(2.61)
CEO is chair and president	0.006	0.008	0.003
	(0.72)	(1.17)	(1.22)
Industry fixed effects	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	63,956	57,978	60,722
Number of Firms	7,297	6,478	7,060
Adjusted R-squared	0.261	0.077	0.344

Table 4
Peer influence on corporate risk-taking among different risk aspects: Spatial simultaneous equation model

This table reports the spatial simultaneous equation model results of the peer influence on corporate risk-taking among different risk aspects. The estimation method is based on Kelejian and Prucha (2004). In column 1, the dependent variable *Mkt. lev* is the market leverage, which is a proxy for corporate risk-taking in the aspect of financial risks and is calculated by the sum of long-term debt and current liabilities divided by the sum of market equity and book debt. In column 2, the dependent variable is *Cash flow volatility*, which is a proxy for corporate risk-taking in the aspect of business risks and is calculated by the annual standard deviation of firms' quarterly ratio of cash flow to book assets. In column 3, the dependent variable is *CAPEX*, which is a proxy for corporate risk-taking in the aspect of investment risks and is calculated by the ratio of net capital expenditure to book assets. In column 4, the dependent variable is *R&D/assets*, which is a proxy for corporate risk-taking in the aspect of innovation risks and is defined as the ratio of R&D expense to total assets. *Avg. peer firm Mkt. lev* is the average peer firm market leverage in a three-digit SIC industry. *Avg. peer firm Cash flow volatility* is the average peer firm cash flow volatility in a three-digit SIC industry. *Avg. peer firm CAPEX* is the average peer firm CAPEX in a three-digit SIC industry. *Avg. peer firm R&D/assets* is the average peer firm R&D to book assets ratio in a three-digit SIC industry. The instruments include spatial lags of all the exogenous variables. *Peer firm average characteristics* include all the average peer firm characteristic variables based on a three-digit SIC industry. *Peer board average characteristics* include all the average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding the endogenous variable, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Mkt. lev	Cash flow volatility	CAPEX	R&D/assets
	(1)	(2)	(3)	(4)
Risk aspects	Financial	Business	Investment	Innovation
Avg. peer firm Mkt. lev	0.543***	-0.010	0.015	0.100***
	(11.27)	(-0.54)	(1.53)	(5.14)
Avg. peer firm Cash flow volatility	-0.391**	0.238***	-0.049	-0.173*
	(-2.35)	(3.78)	(-1.53)	(-1.93)
Avg. peer firm CAPEX	0.178	-0.168**	0.727***	-0.109
	(0.63)	(-2.07)	(11.18)	(-1.26)
Avg. peer firm R&D/assets	0.650***	0.034	-0.039	0.161
	(3.96)	(0.51)	(-1.23)	(1.35)
Mkt. lev		0.018	-0.044***	-0.110***
		(1.04)	(-5.04)	(-6.05)
Cash flow volatility	0.154		0.115***	0.371***
	(0.97)		(4.50)	(3.84)
CAPEX	-1.153***	0.358***		0.139
	(-4.97)	(3.82)		(1.53)
R&D/assets	-0.530***	0.212***	0.026	
	(-5.24)	(4.48)	(0.99)	
Firm characteristics	Yes	Yes	Yes	Yes
Board characteristics	Yes	Yes	Yes	Yes
Peer firm average characteristics	Yes	Yes	Yes	Yes
Peer board average characteristics	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	53,577	53,577	53,577	53,577
Number of Firms	6,547	6,547	6,547	6,547
Adjusted R-squared	0.058	0.121	0.092	0.203

Table 5
Peer influence on corporate risk-taking: Instrumental variables (IV) estimation

This table reports the instrumental variables estimation results using two-stage least squares (2SLS). The dependent variable *Stock volatility* is the square root of 252 multiplied by the standard deviation of daily stock returns over the year. The endogenous variable *Avg. peer stock volatility* is the average peer firm stock volatility in a three-digit SIC industry. It is instrumented by *Fraction of UD law peers* which is defined as the fraction of the peer firms having UD law experiences. *Peer firm average characteristics* include all the average peer firm characteristic variables based on a three-digit SIC industry. *Peer board average characteristics* include all the average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding *Avg. peer stock volatility* and the instrument, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. *First-stage F-statistic of excluded instrument* relates to the Sanderson-Windmeijer (2016) first-stage F-statistic. *First-stage t-statistic on instrument* reports the t-statistic of the instrument in the first-stage regression. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable = Stock volatility	
	(1)	(2)
Avg. peer stock volatility	0.418**	0.729**
	(2.53)	(2.65)
Firm characteristics	No	Yes
Board characteristics	No	Yes
Peer firm average characteristics	No	Yes
Peer board average characteristics	No	Yes
Industry fixed effects	Yes	Yes
State fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
First-stage t-statistic on instrument	5.99***	3.13***
First-stage F-statistic of excluded instrument	35.90***	9.82***
Observations	36,388	36,388
Number of Firms	4,491	4,491
Adjusted R-squared	0.264	0.259

Table 6
Quasi-natural experiment: Strong poison pill (PP) laws

This table reports the OLS regression results of spillover models from Huber (2018) and Berg, et al. (2021) to examine the peer effects of strong PP laws on corporate risk-taking. The dependent variable *Stock volatility* is the square root of 252 multiplied by the standard deviation of daily stock returns over the year. The independent variable *Avg. peer stock volatility* is the average peer firm stock volatility in a three-digit SIC industry. *Strong PP law* is an indicator that equals one if the state in which the firm is headquartered has adopted strong PP statutes or cases within 3 years, and zero otherwise. *Fraction of strong PP law peers* is defined as the fraction of the peer firms having strong PP statutes or cases experiences within 3 years. *Peer firm average characteristics* include all the average peer firm characteristic variables based on a three-digit SIC industry. *Peer board average characteristics* include all the average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding *Avg. peer stock volatility* and the instrument, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	Dependent variable = Stock volatility			
	(1)	(2)	(3)	(4)
Strong PP law	0.041***	0.033**	0.054***	0.039**
	(2.96)	(2.25)	(3.27)	(2.27)
Fraction of strong PP law peers	0.159***	0.113***		
	(3.46)	(2.83)		
Fraction of strong PP law peers ×Strong PP law			0.031	0.049
			(0.40)	(0.64)
Fraction of strong PP law peers × (1- Strong PP law)			0.198***	0.133**
			(3.35)	(2.68)
Firm characteristics	Yes	Yes	Yes	Yes
Board characteristics	Yes	Yes	Yes	Yes
Peer firm average characteristics	No	Yes	No	Yes
Peer board average characteristics	No	Yes	No	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	63,956	63,956	63,956	63,956
Number of Firms	7,297	7,297	7,297	7,297
Adjusted R-squared	0.207	0.354	0.207	0.354

Table 7
Channel for peer influence on corporate risk-taking: Learning motives

This table reports the GS2SLS (generalized spatial two-stage least squares) estimation results of the learning motives channel. The dependent variable *Stock volatility* is the square root of 252 multiplied by the standard deviation of daily stock returns over the year. The endogenous variable *Avg. peer firm stock volatility* is the average peer firm stock volatility in a three-digit SIC industry. The instruments include spatial lags of all the exogenous variables. There are three proxies for firms with low-talented CEOs: *Low CEO abn ROA* is an indicator that equals one if the average of the firm's stock return relative to industry ROA over the last three years is below the lower tercile of the within-industry-year distribution and zero otherwise; *Low CEO log market cap* is an indicator that equals one if the logarithm of the average market capitalization of the firm that the CEO worked for over the last three years is below the lower tercile of the within-industry-year distribution and zero otherwise; *Low CEO pay* is an indicator that equals one if the CEO pay over the last three years is below the lower tercile of the within-industry-year distribution and zero otherwise. There are also three proxies for firms with low performance: *Low profit* is an indicator that equals one if the profitability of the firms is below the lower tercile of the within-industry-year distribution and zero otherwise; *Low M/B* is an indicator that equals one if the market-to-book ratio of the firms is below the lower tercile of the within-industry-year distribution and zero otherwise; *Low dividend payout ratio* is an indicator that equals one if the ratio of dividend to book assets of the firms is below the lower tercile of the within-industry-year distribution and zero otherwise. *Firm characteristics* include all the firm characteristic control variables. *Board characteristics* include all the board characteristic control variables. *Peer firm average characteristics* include all the average peer firm characteristic variables based on a three-digit SIC industry. *Peer board average characteristics* include all the average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding the endogenous variable, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

(continued)

Table 7 (continued)

	Dependent variable: Stock volatility					
	Low-talented CEOs			Low performance		
	(1)	(2)	(3)	(4)	(5)	(6)
Avg. peer firm stock volatility	0.595***	0.682***	0.693***	0.643***	0.683***	0.364***
	(14.10)	(18.10)	(25.35)	(21.86)	(26.21)	(7.44)
Low CEO abn ROA	-0.012					
	(-0.70)					
Avg. peer firm stock volatility× Low CEO abn ROA	0.132***					
	(4.22)					
Low CEO log market cap		-0.046*				
		(-1.90)				
Avg. peer firm stock volatility× Low CEO log market cap		0.185***				
		(4.47)				
Low CEO pay			-0.025			
			(-1.41)			
Avg. peer firm stock volatility× Low CEO pay			0.064*			
			(1.77)			
Low profit				-0.057**		
				(-2.21)		
Avg. peer firm stock volatility× Low profit				0.395***		
				(7.76)		
Low M/B					-0.059***	
					(-3.49)	
Avg. peer firm stock volatility× Low M/B					0.231***	
					(6.81)	
Low dividend payout ratio						0.005
						(0.27)
Avg. peer firm stock volatility× Low dividend payout ratio						0.076
						(1.52)
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Board characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Peer firm average characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Peer board average characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.265	0.259	0.169	0.229	0.263	0.104
Number of Firms	5,290	5,737	3,192	7,297	7,297	2462
Observations	49,255	52,938	37,020	63,956	63,956	22,347

Table 8

Channel for peer influence on corporate risk-taking: Corporate governance

This table reports the GS2SLS estimation results of the learning motives channel. The dependent variable *Stock volatility* is the square root of 252 multiplied by the standard deviation of daily stock returns over the year. The endogenous variable *Avg. peer firm stock volatility* is the average peer firm stock volatility in a three-digit SIC industry. The instruments include spatial lags of all the exogenous variables. *Number of other boards* indicates the number of other boards on which firm directors serve. *Eindex* is the entrenchment index from Bebchuk, et al. (2009). *Lachtr* is the indicator equals one if the firm has a provision limiting shareholders' ability through majority vote to amend the corporate charter and zero otherwise. *Supermajor* is the indicator equals one if the firm has a requirement that requires more than a majority of shareholders to approve a merger and zero otherwise. *Gparachute* is the indicator equals one if the firm has a severance agreement that provides benefits to management/board members in the event of firing, demotion, or resignation following a change in control and zero otherwise. *Cboard* is the indicator equals one if the firm has a board in which directors are divided into separate classes (typically three) with each class being elected to overlapping terms and zero otherwise. *Labylw* is the indicator equals one if the firm has a provision limiting shareholders' ability through majority vote to amend the corporate bylaws and zero otherwise. *Ppill* is the indicator equals one if the firm has a shareholder right that is triggered in the event of an unauthorized change in control that typically renders the target company financially unattractive or dilutes the voting power of the acquirer and zero otherwise. *Firm characteristics* include all the firm characteristic control variables. *Board characteristics* include all the board characteristic control variables. *Peer firm average characteristics* include all the average peer firm characteristic variables based on a three-digit SIC industry. *Peer board average characteristics* include all the average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding *Avg. peer firm stock volatility*, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

(continued)

Table 8 (continued)

	Dependent variable= Stock volatility							
	Insider monitoring	Outside shareholder rights						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Avg. peer firm stock volatility	0.792***	0.683***	0.656***	0.663***	0.628***	0.611***	0.629***	0.568***
	(20.32)	(13.15)	(18.79)	(15.87)	(16.57)	(12.24)	(16.98)	(11.11)
Number of other boards	0.005***							
	(4.16)							
Avg. peer firm stock volatility×Number of other boards	-0.006***							
	(-3.50)							
Eindex		0.012**						
		(2.39)						
Avg. peer firm stock volatility×Eindex		-0.042***						
		(-3.67)						
Lachtr			0.027					
			(1.42)					
Avg. peer firm stock volatility×Lachtr			-0.095**					
			(-2.08)					
Supermajor				0.024				
				(1.45)				
Avg. peer firm stock volatility×Supermajor				-0.099**				
				(-2.43)				
Gparachute					0.028*			
					(1.90)			
Avg. peer firm stock volatility×Gparachute					-0.027			
					(-0.79)			
Cboard						0.032*		
						(1.85)		
Avg. peer firm stock volatility×Cboard						-0.124***		
						(-3.07)		
Labylw							0.019	
							(1.16)	
Avg. peer firm stock volatility×Labylw							-0.055	
							(-1.51)	
Ppill								0.012
								(0.75)
Avg. peer firm stock volatility×Ppill								-0.027
								(-0.70)
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Board characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Peer firm average characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Peer board average characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.264	0.136	0.127	0.129	0.126	0.138	0.129	0.134
Number of Firms	6,943	2,547	2,547	2,547	2,547	2,547	2,547	2,547
Observations	58,095	23,669	23,669	23,669	23,669	23,669	23,669	23,669

Table 9
Channel for peer influence on corporate risk-taking: Competition

This table reports the GS2SLS estimation results of the learning motives channel. The dependent variable *Stock volatility* is the stock volatility calculated by the square root of 252 multiplied by the standard deviation of daily stock returns over the year. The endogenous variable *Avg. peer firm stock volatility* is the average peer firm stock volatility in a three-digit SIC industry. The instruments include spatial lags of all the exogenous variables. *HHI* is the Herfindahl-Hirschman Index at the three-digit SIC industry level. *HHI past 5* is the Herfindahl-Hirschman Index defined as the sum of squared average market shares in the past five years at the three-digit SIC industry level. *C4 index* is calculated by the sum of the market shares of the four largest firms in an industry. *Firm characteristics* include all the firm characteristic control variables. *Board characteristics* include all the board characteristic control variables. *Peer firm average characteristics* include all the average peer firm characteristic variables based on a three-digit SIC industry. *Peer board average characteristics* include all the average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding the endogenous variable, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable=Stock volatility		
	(1)	(2)	(3)
Avg. stock volatility	0.824***	0.793***	0.795***
	(29.78)	(27.23)	(29.77)
HHI	0.113***		
	(4.08)		
Avg. stock volatility × HHI	-0.190***		
	(-3.67)		
HHI past 5		0.097***	
		(3.46)	
Avg. stock volatility × HHI past 5		-0.177***	
		(-3.58)	
C4 index			0.045**
			(2.22)
Avg. stock volatility × C4 index			-0.084**
			(-2.24)
Firm characteristics	Yes	Yes	Yes
Board characteristics	Yes	Yes	Yes
Peer firm average characteristics	Yes	Yes	Yes
Peer board average characteristics	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R-squared	0.257	0.261	0.258
Number of Firms	7,297	7,095	7,297
Observations	63,956	60,294	63,956

Table 10
Robustness check: High-dimensional fixed effects and firm fixed effects

This table reports the GS2SLS estimation results of the peer influence on corporate risk-taking by adding more fixed effects to the baseline model. In column 1, we add state-by-year fixed effects. In column 2, we further add firm fixed effects. The dependent variable *Stock volatility* is the square root of 252 multiplied by the standard deviation of daily stock returns over the year. The endogenous variable *Avg. peer stock volatility* is the average peer firm stock volatility in a three-digit SIC industry. The instruments include spatial lags of all the exogenous variables. *Peer firm average characteristics* include all the average peer firm characteristic variables based on a three-digit SIC industry. *Peer board average characteristics* include all the average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding *Avg. peer stock volatility*, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable=Stock volatility	
	(1)	(2)
Avg. peer stock volatility	0.667***	0.594***
	(24.96)	(20.96)
Ln(Asset)	-0.048***	-0.061***
	(-19.08)	(-10.07)
M/B	-0.018***	-0.010**
	(-3.98)	(-2.60)
ROA	-0.495***	-0.356***
	(-18.44)	(-13.77)
Tangibility	0.122***	0.190***
	(5.39)	(4.69)
Dividend dummy	-0.081***	-0.050***
	(-13.34)	(-7.42)
Ln(Firm age)	-0.005	0.064***
	(-1.39)	(6.80)
Ln(Board size)	-0.028***	-0.023*
	(-2.97)	(-1.99)
Ln(Average board age)	-0.229***	-0.112***
	(-8.66)	(-3.46)
Ln(CEO tenure)	-0.013***	-0.007***
	(-5.75)	(-2.87)
CEO is chair and president	-0.000	0.000
	(-0.00)	(0.09)
Peer firm average characteristics	Yes	Yes
Peer board average characteristics	Yes	Yes
State×Year fixed effects	Yes	Yes
Firm fixed effects	No	Yes
Industry fixed effects	Yes	No
State fixed effects	No	No
Year fixed effects	No	No
Observations	63,806	62,945
Number of Firms	7,286	6428
Adjusted R-squared	0.257	0.071

Table 11

Placebo tests: Randomly selected peer groups

This table reports the GS2SLS estimation results of the peer influence on corporate risk-taking by the placebo tests based on randomly selected peer groups. In column 1, the dependent variable is *Stock volatility*, which is calculated by the square root of 252 multiplied by the standard deviation of daily stock returns over the year. In column 2, the dependent variable is *Expected default frequency*, which measures the probability that the firm will default in the year based on distance to default constructed by Bharath and Shumway (2008). In column 3, the dependent variable is *ROA volatility*, which is the volatility of the ratio of Earnings before interest, taxes, depreciation, and amortization (EBITDA) to book assets over 8 years, between years t and t – 7. The endogenous variable *Avg. peer influence* is the average peer firm risk-taking corresponding to the dependent variable in a three-digit SIC industry based on a randomly selected peer group of firms. The instruments include spatial lags of all the exogenous variables. *Peer firm average characteristics* include all the peer firm average characteristic variables based on a randomly selected group of firms. *Peer board average characteristics* include all the peer board average characteristic variables based on a randomly selected peer group of firms. All independent variables, excluding the endogenous variable, are lagged one year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and state. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Stock volatility	Expected default frequency	ROA volatility
	(1)	(3)	(4)
Avg. peer stock volatility	-0.048	-0.029	-0.030
	(-1.31)	(-0.74)	(-1.25)
Ln(Asset)	-0.048***	0.002	-0.014***
	(-16.81)	(1.70)	(-16.59)
M/B	-0.017***	-0.021***	0.011***
	(-3.18)	(-10.02)	(7.23)
ROA	-0.491***	-0.144***	-0.259***
	(-17.23)	(-8.39)	(-31.47)
Tangibility	0.142***	0.139***	-0.021***
	(5.73)	(6.20)	(-2.84)
Dividend dummy	-0.086***	-0.040***	0.000
	(-12.97)	(-8.01)	(0.05)
Ln(Firm age)	-0.008*	-0.011***	0.017***
	(-1.71)	(-4.39)	(9.51)
Ln(Board size)	-0.019	-0.006	-0.006
	(-1.61)	(-0.82)	(-1.43)
Ln(Average board age)	-0.243***	-0.100***	-0.030*
	(-8.17)	(-5.97)	(-1.94)
Ln(CEO tenure)	-0.012***	-0.004**	-0.007***
	(-5.09)	(-2.53)	(-6.88)
CEO is chair and president	0.000	0.000	0.001
	(0.10)	(0.19)	(0.78)
Peer firm average characteristics	Yes	Yes	Yes
Peer board average characteristics	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	63,956	57,978	60,722
Number of Firms	7,297	6,478	7,060
Adjusted R-squared	0.258	0.066	0.345

Table 12

Robustness check: Endogenous network approach

This table reports the GS2SLS estimation results of the peer influence on corporate risk-taking that address the issue of endogenous selection of peers. This means that all the peer characteristics variables are endogenous. Instrumental variables are constructed from leave-own-out networks following Jochmans (2023). In column 1, the dependent variable is *Stock volatility*, which is calculated by the square root of 252 multiplied by the standard deviation of daily stock returns over the year. In column 2, the dependent variable is *Expected default frequency*, which measures the probability that the firm will default in the year based on distance to default constructed by Bharath and Shumway (2008). In column 3, the dependent variable is *ROA volatility*, which is the volatility of the ratio of Earnings before interest, taxes, depreciation, and amortization (EBITDA) to book assets over 8 years, between years t and t – 7. The endogenous variable *Avg. peer influence* is the average peer firm risk-taking corresponding to the dependent variable in a three-digit SIC industry. *Peer firm average characteristics* include all the average peer firm characteristic variables based on a three-digit SIC industry. *Peer board average characteristics* include all the average peer board characteristic variables based on a three-digit SIC industry. All independent variables, excluding *Avg. peer influence*, are lagged 1 year. The sample period is from 1994 to 2022. Definitions of all other control variables are in Table 1. The t-statistics in parentheses are calculated from the heteroskedasticity robust standard errors double clustered by firm and year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Stock volatility	Expected default frequency	ROA volatility
	(1)	(3)	(4)
Avg. peer stock volatility	0.990***	0.908***	0.903***
	(24.59)	(16.18)	(12.69)
Ln(Asset)	-0.048***	0.002	-0.014***
	(-19.46)	(1.47)	(-17.16)
M/B	-0.018***	-0.020***	0.011***
	(-3.96)	(-9.17)	(7.37)
ROA	-0.494***	-0.136***	-0.259***
	(-18.48)	(-8.49)	(-29.64)
Tangibility	0.119***	0.124***	-0.023***
	(5.30)	(5.80)	(-3.14)
Dividend dummy	-0.080***	-0.042***	0.001
	(-12.63)	(-8.29)	(0.29)
Ln(Firm age)	-0.005	-0.009***	0.018***
	(-1.20)	(-4.75)	(9.86)
Ln(Board size)	-0.030***	-0.008	-0.007
	(-3.22)	(-1.20)	(-1.44)
Ln(Average board age)	-0.220***	-0.100***	-0.028*
	(-8.18)	(-5.56)	(-1.86)
Ln(CEO tenure)	-0.014***	-0.003**	-0.007***
	(-5.85)	(-2.05)	(-6.82)
CEO is chair and president	-0.001	-0.000	0.001
	(-0.17)	(-0.03)	(0.72)
Peer firm average characteristics	Yes	Yes	Yes
Peer board average characteristics	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	62,934	56,900	59,665
Number of Firms	7,254	6,427	7,012
Adjusted R-squared	0.237	0.040	0.341