

Motivation and Ability: Unpacking Underperforming Firms' Risk-Taking

APPENDIX 1

In Experiment 1, detailed in the main manuscript, we aimed to test the effect of performance shortfalls on the motivation to take risks (H1). To achieve this objective, we established a specific amount of resource stock as the firm's aspiration level and then manipulated the degree of performance shortfalls. This manipulation was naturally confounded with the levels of remaining resource stocks (i.e., greater performance shortfalls led to lower amounts of remaining resource stocks). To ensure that the observed changes in risk-taking motivation were driven by the effect of performance shortfalls but not by the remaining resource stocks, we conducted two additional experiments. In Experiment S1, we sought to validate the effect of performance shortfall, as detected in Experiment 1, by keeping the remaining resource stock constant while varying the aspiration levels to manipulate the degrees of performance shortfalls. In Experiment S2, we introduced two different levels of resource stock orthogonally to two levels of performance shortfall to examine whether the level of resource stock also affects the motivation to take risks and/or whether it moderates the effect of performance shortfall on risk-taking motivation.

Additionally, as Experiment 1 employed a between-subject design, we conducted another experiment (Experiment S3) using a within-subject design to investigate individual-level risk-taking patterns. We also explored the moderating effect of prevention focus on risk-taking motivation, as an illustrative example of individual characteristics that may cause chronic concern for firm survival.

Notably, all three additional experiments involved participants with managerial experience, distinct from the management undergraduate students used in Experiment 1. These supplementary experiments were crucial in substantiating the generalizability of our findings and shedding further light on the relationship between performance shortfalls and risk-taking motivation.

Experiment S1

Sample. A total of 200 participants with management experience were recruited on the online platform Prolific Academic (100 male and 100 female, $M_{\text{age}} = 43.83$, $SD_{\text{age}} = 12.35$). The collected sample provided 80% power to detect an effect size of $d = 0.42$ in a one-tailed linear contrast with 80% power,

given $p = 0.05$ (G*Power calculator; Faul et al. 2007). The methods, hypotheses, and analysis plans of Experiment S1 were preregistered on the Open Science Framework, increasing the replicability of our research (Nosek et al. 2022).¹

Dependent Variable. The DV was the same as in Experiment 1.

Independent Variable. Participants were randomly assigned to one of the following performance shortfall conditions in a between-subject design: \$15K, \$100K, \$300K, and \$500K below the aspirational level of \$315K, \$400K, \$600K and \$800K, respectively. Throughout all performance shortfall conditions, the remaining resource stock was kept constant at \$300K.

Procedure. The procedure in this experiment was identical to that in Experiment 1 except for one modification. In all conditions, the stock was set at the level of \$300K. Accordingly, to manipulate the performance shortfall, the aspiration levels varied between \$315K, \$400K, \$600K, and \$800K, yielding four levels of performance shortfall: \$15K, \$100K, \$300K, and \$500K.

Results and Discussion. To test H1, we first ran a linear contrast comparing the proportion of resource stock allocated to the risky option across all four levels of performance shortfall: \$15K, \$100K, \$300K, and \$500K. In line with H1, this analysis revealed a significantly positive linear contrast between performance shortfall and risk-taking motivation, $t(196) = 5.48, p < 0.001$ (see Figure S1). Next, we ran a repeated contrast to perform planned pairwise comparisons between the adjacent levels of performance shortfall. These analyses showed that risk-taking motivation exhibits a positive monotonic relationship with performance shortfalls. Specifically, there was a significant increase in risk-taking motivation in the neighborhood of the aspiration level, i.e., between the first level (\$15K below aspiration) and the second level (\$100K below aspiration), $t(98) = 1.98, p = .051$. However, no significant difference was observed within the range of moderate performance shortfalls, i.e., between the second and the third levels (\$300K below aspiration), $t(98) = 1.35, p = .18$. Interestingly, there was once again a significant difference between the third and the fourth levels (\$500K below aspiration), $t(98) = 2.15, p = .035$, as firms

¹ https://osf.io/mz64v/?view_only=7182b6d9e57a47468507c6d55b89b9d0

approached the survival point. These findings are consistent with those observed in Experiment 1, providing further support for H1, while mitigating the concern that the change in risk-taking motivation is driven by variations in resource levels.

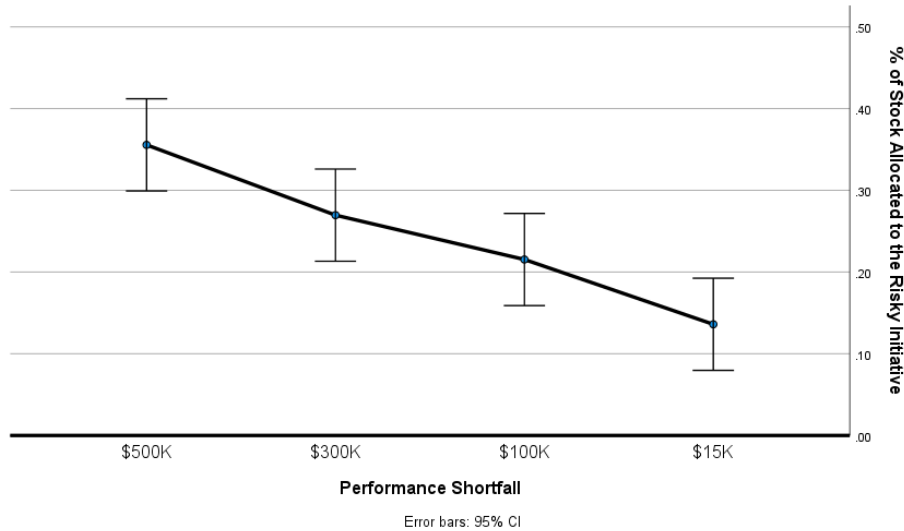


Figure S1. The effect of performance shortfall on risk-taking motivation (measured as the percentage of stock allocated to the risky initiative)

Experiment S2

The primary purpose of Experiment S2 was to examine more directly the possibility that the level of resource stock could affect the motivation to take risks. To this end, along with manipulating performance shortfalls, we also manipulated the level of the remaining stock by introducing two levels of resource stock. This also allowed us to explore the possible interaction between the two factors, namely, whether the stock of resources moderates the effect of performance shortfall on risk-taking motivation.

Sample. A total of 200 participants with management experience were recruited on the online platform Prolific Academic (102 males and 98 females, $M_{age} = 45.59$, $SD_{age} = 12.70$). The collected sample provided 80% power to detect an effect size of $d = 0.42$ in a one-tailed linear contrast with 80% power, given $p = 0.05$ (G*Power calculator; Faul et al. 2007). The methods, hypotheses, and analysis plans of

Experiment S2 were preregistered on the Open Science Framework, increasing the replicability of our research (Nosek et al. 2022).²

Dependent Variable. The DV was the same as in Experiment 1.

Independent Variable. Two factors were manipulated orthogonally: performance shortfall (low: 10% below aspiration vs. high: 50% below aspiration) × stock (small amount: \$180K vs. large amount: \$900K). The first factor was manipulated within participants, and the order of its presentation was counterbalanced. The second factor was manipulated between participants.

Procedure. The procedure in this experiment was identical to that in Experiment S1 except for the following changes. Participants were asked to make stock allocation decisions for two firms with different resource levels. Half of the participants were assigned firms with a relatively small amount of stock (i.e., \$180K), while the other half managed firms with a relatively large amount (i.e., \$900K). Additionally, half of the participants made stock allocation decisions for a firm with a small performance shortfall (i.e., 10% below aspiration) followed by decisions for a firm with a large performance shortfall (i.e., 50% below aspiration). The remaining half of the participants carried out the allocation decisions in the reverse order.

For participants handling firms with a relatively small amount of stock (i.e., \$180K), a small performance shortfall (i.e., 10% below aspiration) corresponded to being \$20K below the aspired \$200K, while a large performance shortfall (i.e., 50% below aspiration) indicated being \$180K below the aspired \$360K. In contrast, for participants managing firms with a relatively large amount of stock (i.e., \$900K), a small performance shortfall (i.e., 10% below aspiration) meant they were \$100K below the aspired \$1000K, and a large performance shortfall (i.e., 50% below aspiration) indicated being \$900K below the aspired \$1800K.

Results and Discussion. To test H1, we ran an ANOVA with repeated measures on performance shortfall (low vs. high) with the amount of stock (small vs. large) as a between participants' factor. The main effect

² https://osf.io/8q4vd/?view_only=83e94609710c475a961b4251a3985ef9

of performance shortfall was significant, $F(1, 196) = 30.02, p < .001, \eta_p^2 = .13$, indicating that participants allocated a higher proportion of stock to the risky option when the performance shortfall was high ($M = .36, SD = .31$) than when it was low ($M = .24, SD = .26$), consistent with H1. The main effect of resource stock was not significant, $F(1, 196) = 0.1, p = .920, \eta_p^2 < .01$, suggesting that the variation in risk-taking motivation was not driven by the levels of remaining resources, thereby validating the effect of performance shortfalls observed in Experiment 1. Interestingly, the interaction effect was significant, $F(1, 196) = 3.81, p = .053, \eta_p^2 = .02$, suggesting that the performance shortfall effect is greater for a larger amount of stock ($M = .37, SD = .30$ vs. $M = .22, SD = .23, t(99) = 5.02, p < .001$) than for a smaller one ($M = .34, SD = .32$ vs. $M = .26, SD = .29, t(99) = 2.65, p = .009$) (refer to Figure S1). These findings indicate that while the level of stock alone does not directly influence motivation to take risks (as evidenced by the insignificant main effect), it does interact with performance shortfalls to shape risk-taking motivation (as indicated by the significant interaction effect).

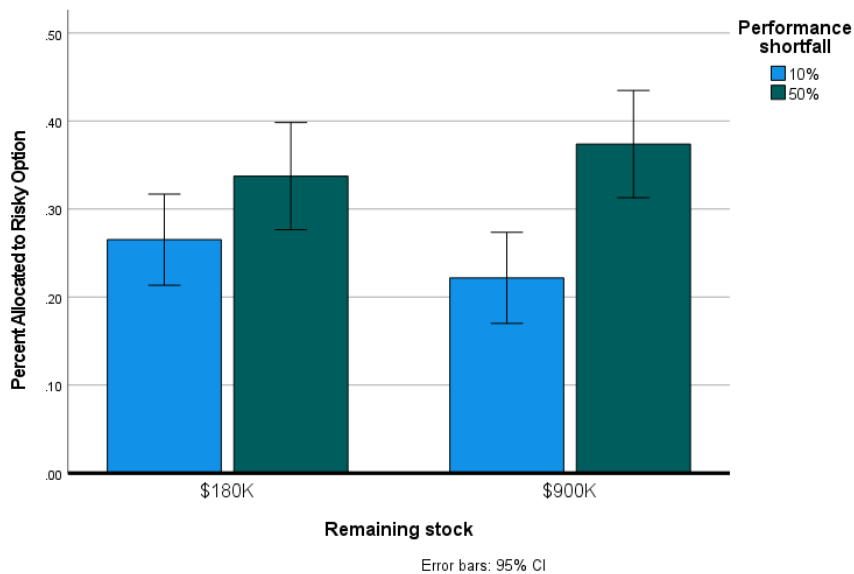


Figure S2. The effects of performance shortfalls and remaining stock on risk-taking motivation (measured as the percentage of stock allocated to the risky initiative)

Experiment S3

This experiment aims to address two main objectives. First, to complement Experiment 1, which utilized a between-subject design, we adopted a within-subject design in this experiment to further investigate the

effect of performance shortfalls on risk-taking motivation. By manipulating performance shortfalls within participants, we were able to analyze individual-level patterns of risk-taking.

Second, in Experiment 2, detailed in the main manuscript, we sought to explore how managers' concern for survival influences the relationship between performance shortfalls and risk-taking motivation. To manipulate participants' concern for firm survival, we provided direct instructions during the experiment. In the current experiment, we aimed to explore *prevention regulatory focus* as an illustrative example of individual characteristics that might increase managers' concern for firm survival and thereby moderate the effect of performance shortfall on risk-taking motivation. As described by Higgins (1998), prevention focus refers to a psychological orientation or mindset characterized by an individual's tendency to concentrate on avoiding negative outcomes and maintaining security. This mindset is associated with risk avoidance. Consequently, individuals with a higher prevention orientation are more likely to exhibit a heightened concern for survival, leading them to prioritize strategies and decisions that minimize risk, ensure survival, and maintain stability. In short, our second objective in this experiment is to examine whether a decision maker's prevention regulatory focus moderates the effect of performance shortfalls on the motivation to take risks.

Sample. A total of 289 participants with management experience were recruited on the online platform Prolific Academic (147 males and 142 females, $M_{\text{age}} = 44.38$, $SD_{\text{age}} = 12.10$). The collected sample provided 80% power to detect an effect size of $\beta = 0.16$ in an interaction with 80% power, given $p = 0.05$ (G*Power calculator; Faul et al. 2007).

Dependent Variable. A firm's motivation to take risks was calculated the same as in Experiment 1.

Independent Variables. Performance shortfall level was manipulated within participants (\$50K vs. \$150K vs. \$300K vs. \$500K vs. \$585K below aspiration). The order of performance shortfall levels was counterbalanced by a Latin Square. In addition, we measured participants' prevention focus.

Procedure. Experiment S3 followed a similar procedure to Experiment 1 but with two major modifications. First, the levels of performance shortfall were manipulated within participants, involving resource allocation decisions for five different firms (A, B, C, D, and E) with varying magnitudes of

performance shortfalls (\$50K vs. \$150K vs. \$300K vs. \$500K vs. \$585K below aspiration). The firms were presented in five different orders according to a Latin Square. Manipulating performance shortfall within participants allowed us to analyze the patterns of risk-taking at an individual level. Second, after completing the resource allocation task, participants filled out a regulatory focus questionnaire (Higgins et al., 2001). Additionally, two minor modifications were made: 1) the first two levels of performance shortfall were adjusted to \$50K and \$150K below aspiration, and 2) the question about concern for survival was omitted.

Results and discussion. To test our predictions, we conducted an ANOVA with repeated measures on performance shortfall (\$50K vs. \$150K vs. \$300K vs. \$500K vs. \$585K below aspiration) and prevention focus (low vs. high) as a between participants' factor. Participants' mean prevention scores (*Cronbach's* $\alpha = .87$) were median split to either low or high ($Me = 5.11$). This analysis revealed a significant main effect of performance shortfalls, $F(4, 1148) = 18.41, p < .001$, indicating that as performance shortfalls increased, participants allocated a higher proportion of available resources to the risky option (see Figure S3). A linear contrast was positive and significant, $F(1, 287) = 32.79, p < .001$, supporting H1 on the positive monotonic relationship between risk-taking motivation and performance shortfalls. Furthermore, a repeated contrast showed a significant increase in the motivation to take risks between the first level (\$50K below aspiration) and the second one (\$150K below aspiration), $F(1, 287) = 14.11, p < .001$, and between the second level and the third level (\$300K below aspiration), $F(1, 287) = 27.38, p < .001$. This increase was then followed by a plateau between the third and the fourth levels (\$500K below aspiration), $F(1, 287) = 1.87, p = .173$, and another leveling off between the fourth and the fifth levels (\$585K below aspiration), $F(1, 287) = 0.64, p = .423$. This pattern of results is generally consistent with H1.

As expected, we found a significant main effect of prevention focus, $F(1, 287) = 4.00, p = .047$, suggesting that participants with higher prevention focus allocated a lower percentage of available resources to the risky option ($M = .32, SD = .02$) compared to participants with lower prevention focus ($M = .38, SD = .02$). More notably, the interaction between performance shortfall and prevention focus was significant, $F(4, 1148) = 2.65, p = .032$, revealing that higher levels of prevention focus can weaken

the positive monotonic relationship between performance shortfalls and risk-taking motivation (see Figure S3).

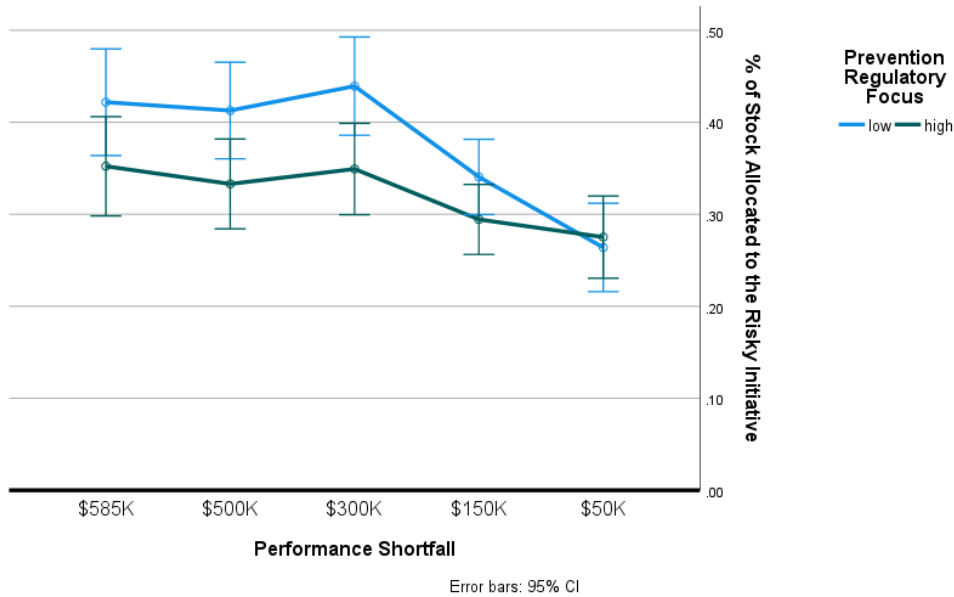


Figure S3. The effects of performance shortfall and prevention focus on risk-taking motivation (measured as the percentage of stock allocated to the risky initiative)

Furthermore, leveraging the within-subject design, we performed an ex-post analysis (cluster analysis) to identify the salient patterns among decision-makers. This analysis allowed us to gain deeper insights and extract valuable findings that enrich our understanding of managers’ risk-taking motivation. Our investigation first covered the broad spectrum of performance shortfalls, i.e., from the neighborhood of the aspiration level to substantial performance shortfalls, which corresponds to Zone 1 and Zone 2 in our theoretical framework in the main manuscript while excluding Zone 3, the extremely low performing situation. We identified four primary behavior patterns exhibited by decision-makers within this range of performance shortfalls. The first two patterns involve decision-makers who maintained a consistent focus on either the survival point or the aspiration level throughout this range of performance shortfalls.

Pattern 1 characterizes decision-makers who consistently focused on the survival point, leading to a decline in their motivation to take risks as performance shortfalls increased (consistent with Model 1 in March and Shapira 1992). This pattern was observed in around 8% of the sample, representing a relatively small group of decision-makers. **Pattern 2** pertains to decision-makers who consistently

focused on the aspiration level, resulting in an increase in their motivation to take risks as performance shortfalls grew (consistent with Model 2 in March and Shapira 1992). This pattern accounted for approximately 19% of the sample, representing a relatively larger group of decision-makers.

Pattern 3 was characterized by decision-makers who increased their motivation to take risks when facing slight performance shortfalls, indicating a focus on the aspiration level. However, as performance shortfalls increased, their motivation to take risks decreased, reflecting a shift in their focus to the survival point. (Pattern 3 is consistent with Model 3 in March and Shapira 1992). This resulted in an inverted U-shaped pattern between performance shortfalls and risk-taking motivation. Remarkably, this pattern was the most prevalent among the decision-makers, accounting for approximately 33% of the sample. In contrast, **Pattern 4** was characterized by decision-makers who decreased their motivation to take risks in the face of slight performance shortfalls, implying a focus on the survival point. However, as performance further declined, their motivation to take risks increased, reflecting a focus on the aspiration level. (Pattern 4 was not explicitly discussed in March and Shapira 1992). This resulted in a U-shaped pattern between performance shortfalls and risk-taking motivation. Pattern 4 was observed in about 15% of the sample. Taken together, these four patterns represent approximately 75% of our sample. A Chi-square test demonstrated that these patterns were not randomly distributed ($p < .001$), indicating meaningful and distinct behavioral clusters among decision-makers in response to performance shortfalls.

Regarding the situation of being in close proximity to the survival point, which corresponds to Zone 3 in our theoretical framework in the main manuscript, we observed diverse patterns of risk-taking motivation among managers. We discuss these patterns for each group identified above. Among decision-makers **in the first group (Pattern 1** in the previous analysis) who predominantly focused on the survival point over the broad spectrum of performance shortfalls, we observed that 41% of them increased their motivation to take risks, suggesting a shift in their focus toward the aspiration level. Meanwhile, only 18% of decision-makers decreased their motivation to take risks, indicating that they remained steadfast in their focus on the survival point. The remaining participants in this group did not show a notable increase or decrease in their risk-taking motivation.

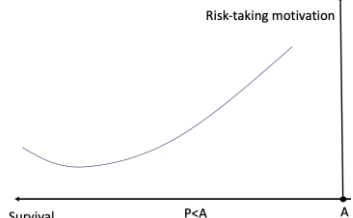
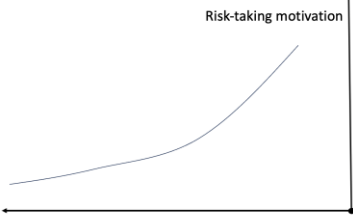
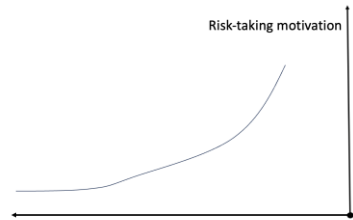
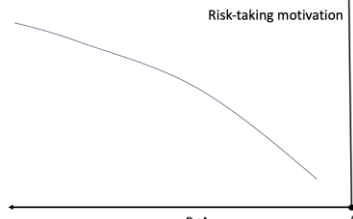
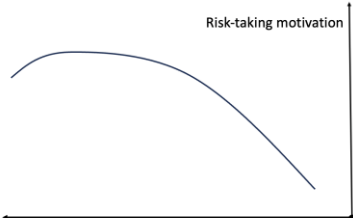
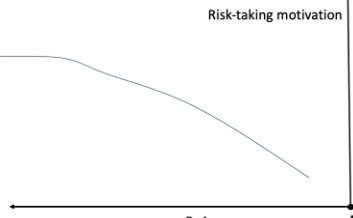
Among decision-makers **in the second group (Pattern 2** in the previous analysis) who primarily focused on the aspiration level over the major range of performance shortfalls, we found that a similar percentage of decision-makers (44%) either increased or decreased their motivation to take risks, implying that they maintained their focus on the aspiration level or shifted their attention to the survival point, respectively. The remaining participants did not exhibit significant changes in their motivation to take risks.

Among decision-makers **in the third group (Pattern 3** in the previous analysis) who shifted their focus from the aspiration level to the survival point over the major range of performance shortfalls, we found that a significant group of 54% increased their motivation to take risks, indicating that they shifted their attention back towards the aspiration level. Conversely, approximately 35% of decision-makers reduced their motivation to take risks, suggesting a continued focus on the survival point. The remaining participants in this group did not exhibit significant changes in their risk-taking motivation.

Finally, among decision-makers **in the fourth group (Pattern 4** in the previous analysis) who shifted their focus from the survival point to the aspiration level over the major range of performance shortfalls, approximately 29% increased their motivation to take risks, implying that they maintained their focus on the aspiration level. On the other hand, a larger group of 62% reduced their motivation to take risks, suggesting a shift in their focus back to the survival point.

These findings from the ex-post analysis, as summarized in Table S1, reveal a rich tapestry of risk-taking behaviors among managers in response to performance shortfalls. Our study serves as an initial step in developing a theory on risk-taking motivation, and we acknowledge that we have not fully theorized all the complexities of managerial risk-taking motivations revealed in the ex-post analysis. This highlights the potential for further research to delve deeper into this topic and explore the various nuances of managerial risk-taking behaviors.

Table S1: Diverse risk-taking motivation patterns discerned from Experiment S3

Zone 1 & Zone 2: From slight to substantial performance shortfalls	Zone 3: In proximity to the survival point	Conceptual patterns (Performance -P) (Aspiration -A)
<p align="center">Pattern 1 (8% of the sample): Decision-makers consistently focused on the survival point</p>	<p>41% increased their risk-taking motivation, indicating a shift of attention to the aspiration level</p>	 <p>A line graph with 'Risk-taking motivation' on the vertical axis and performance shortfalls on the horizontal axis. The horizontal axis is marked with 'Survival', 'P<A', and 'A'. The curve starts at a low level at 'Survival', dips slightly, and then rises steadily to a higher level at 'A'.</p>
	<p>18% decreased their risk-taking motivation, indicating a continued focus on the survival point</p>	 <p>A line graph with 'Risk-taking motivation' on the vertical axis and performance shortfalls on the horizontal axis. The horizontal axis is marked with 'Survival', 'P<A', and 'A'. The curve starts at a low level at 'Survival' and rises steadily to a higher level at 'A'.</p>
	<p>41% kept their risk-taking motivation relatively stable</p>	 <p>A line graph with 'Risk-taking motivation' on the vertical axis and performance shortfalls on the horizontal axis. The horizontal axis is marked with 'Survival', 'P<A', and 'A'. The curve starts at a low level at 'Survival' and rises to a higher level at 'A', with a relatively flat slope between 'Survival' and 'P<A'.</p>
<p align="center">Pattern 2 (19% of the sample): Decision-makers consistently focused on the aspiration level</p>	<p>44% increased their risk-taking motivation, indicating a continued focus on the aspiration level</p>	 <p>A line graph with 'Risk-taking motivation' on the vertical axis and performance shortfalls on the horizontal axis. The horizontal axis is marked with 'Survival', 'P<A', and 'A'. The curve starts at a high level at 'Survival' and decreases steadily to a lower level at 'A'.</p>
	<p>44% decreased their risk-taking motivation, indicating a shift of attention to the survival point</p>	 <p>A line graph with 'Risk-taking motivation' on the vertical axis and performance shortfalls on the horizontal axis. The horizontal axis is marked with 'Survival', 'P<A', and 'A'. The curve starts at a high level at 'Survival', peaks slightly, and then decreases steadily to a lower level at 'A'.</p>
	<p>12% kept their risk-taking motivation relatively stable</p>	 <p>A line graph with 'Risk-taking motivation' on the vertical axis and performance shortfalls on the horizontal axis. The horizontal axis is marked with 'Survival', 'P<A', and 'A'. The curve starts at a high level at 'Survival' and decreases to a lower level at 'A', with a relatively flat slope between 'Survival' and 'P<A'.</p>

<p>Pattern 3 (33% of the sample): Decision-makers initially focused on the aspiration level, then shifted focus to the survival point as performance shortfalls enlarged</p>	<p>54% increased their risk-taking motivation, indicating a shift of attention back to the aspiration level.</p>	<p>A line graph with 'Risk-taking motivation' on the vertical axis. The horizontal axis has three points: 'Survival', 'P<A', and 'A'. The curve starts at a low level at 'Survival', rises to a peak at 'P<A', and then declines towards 'A'.</p>
	<p>35% decreased their risk-taking motivation, indicating a continued focus on the survival point</p>	<p>A line graph with 'Risk-taking motivation' on the vertical axis. The horizontal axis has three points: 'Survival', 'P<A', and 'A'. The curve starts at a high level at 'Survival', drops to a low level at 'P<A', and then rises towards 'A'.</p>
	<p>11% kept their risk-taking motivation relatively stable</p>	<p>A line graph with 'Risk-taking motivation' on the vertical axis. The horizontal axis has three points: 'Survival', 'P<A', and 'A'. The curve shows a slight dip at 'P<A' but remains relatively flat across all three points.</p>
<p>Pattern 4 (15% of the sample): Decision-makers initially focused on the survival point, then shifted focus to the aspiration level as performance shortfalls enlarged</p>	<p>29% increased their risk-taking motivation indicating a continued focus on the aspiration level</p>	<p>A line graph with 'Risk-taking motivation' on the vertical axis. The horizontal axis has three points: 'Survival', 'P<A', and 'A'. The curve starts at a high level at 'Survival', drops to a low level at 'P<A', and then rises sharply towards 'A'.</p>
	<p>62% decreased their risk-taking motivation, indicating a shift of attention back to the survival point.</p>	<p>A line graph with 'Risk-taking motivation' on the vertical axis. The horizontal axis has three points: 'Survival', 'P<A', and 'A'. The curve starts at a low level at 'Survival', rises to a peak at 'P<A', and then drops sharply towards 'A'.</p>
	<p>9% kept their risk-taking motivation relatively stable</p>	<p>A line graph with 'Risk-taking motivation' on the vertical axis. The horizontal axis has three points: 'Survival', 'P<A', and 'A'. The curve shows a slight dip at 'P<A' but remains relatively flat across all three points.</p>

APPENDIX 2

This appendix presents the estimated coefficients from the Probit estimation from our main analyses.

Table S2: The estimated coefficients from the Probit model predicting risk-taking (i.e., the likelihood of new foreign market entry)

Independent Variables	
1. Performance below Aspiration _{<i>t-1</i>}	-2.633** (1.030)
2. (Performance below Aspiration _{<i>t-1</i>}) ²	-5.168** (2.242)
3. Performance above Aspiration _{<i>t-1</i>}	1.548*** (0.561)
4. (Performance above Aspiration _{<i>t-1</i>}) ²	-1.197* (0.686)
5. Size _{<i>t-1</i>} (in logarithmic form)	-0.135*** (0.028)
6. Age _{<i>t-1</i>} (in logarithmic form)	-0.149*** (0.048)
7. Available financial resources _{<i>t-1</i>}	0.015* (0.009)
8. Potential financial resources _{<i>t-1</i>}	0.001 (0.001)
9. Excess production capacity _{<i>t-1</i>}	0.331** (0.143)
10. R&D _{<i>t-1</i>}	-0.366* (0.194)
11. Foreign experience _{<i>t-1</i>}	0.119*** (0.017)
12. Product scope _{<i>t-1</i>}	-0.014 (0.036)
13. Industry concentration _{<i>t-1</i>}	-0.022 (0.086)
14. Performance below Aspiration _{<i>t-1</i>} * Industry concentration _{<i>t-1</i>} ¹	-0.592 (1.224)
15. (Performance below Aspiration _{<i>t-1</i>}) ² * Industry concentration _{<i>t-1</i>} ¹	2.231 (2.423)
16. Industry growth _{<i>t-1</i>}	-0.059 (0.159)
17. Constant	-1.732*** (0.195)
Number of observations	3,926
Wald chi ² (20)	135.89***

¹ These variables were added to the regression since in Appendix 3 we analyzed the moderating effect of industry concentration on the inverted U-shaped relationship between performance below aspiration and risk taking.

Notes. Standard errors are in parentheses. Period dummies are excluded for the space concern.

Performance below aspiration occurs only with negative values. The more negative the value, the larger the performance shortfall.

Two-tailed tests. *** statistically significant at 1%; ** statistically significant at 5%; * statistically significant at 10%.

APPENDIX 3

To further explore the critical implication of separately theorizing risk-taking motivation and ability, in this appendix, we take a step further to suggest that the inverted U-shaped relationship between firms' performance shortfalls and risk-taking can vary across contexts because contextual factors may alter firms' risk-taking motivation and ability. As an illustration, we discuss one contextual factor that has drawn significant attention from both the academic and practitioner-oriented literatures—namely, industry structure. The notion that industry structure affects firm behavior is deeply rooted in the industrial organization literature, where a central characteristic of an industry is its market concentration. Industry (market) concentration is a function of the number of firms and their shares of the total sales or production in a specific market. In concentrated markets, firms are few enough to recognize the impact of their actions on their rivals and, therefore, on the market as a whole (Yu and Ito 1988). Highly concentrated markets are generally less competitive and have higher profit margins than less concentrated markets (Grullon et al. 2019, Montgomery 1994). In essence, industry concentration affects managerial cognition about the environment (Nadkarni and Barr 2008), shaping firms' motivation and ability to take risks when facing performance shortfalls.

We argue that industry concentration elevates underperforming firms' risk-taking motivation because it can increase managerial confidence, which in turn reduces managers' concern for firm survival. First, the rich resources, strong market power, low competition intensity, and high profitability associated with concentrated industries (Grullon et al. 2019, Montgomery 1994) can enable firms to more readily absorb potential losses from risky actions, providing a buffer for managers from performance shortfalls and thereby increasing managerial confidence in decision making. Second, highly concentrated industries are generally characterized by highly developed rules and norms of interaction among competitors, which increase predictability and decrease uncertainties in managerial decision-making. Such increased managerial confidence, in turn, reduces the psychological stress and anxiety caused by performance shortfalls, lessening managers' concern for firm survival and elevating their risk-taking motivation. Thus,

ceteris paribus, managers in underperforming firms in highly concentrated industries are more motivated to take risks than those in less concentrated industries.

We also argue that industry concentration increases underperforming firms' risk-taking ability. Concentrated industries are characterized by a few large players with strong market power, as well as by relatively infrequent and predictable changes in products and technologies (Grullon et al. 2019, Montgomery 1994). Such market munificence can not only provide rich opportunities and resources, and thus high strategic degrees of freedom to managers when their firms experience performance shortfalls, but also absorb potential losses from risky actions and allow firms to secure a position of safety. By contrast, firms in industries with low concentration perceive intense rivalry and competitive threats, and also experience a high level of strain when making decisions (Grullon et al. 2019). Thus, ceteris paribus, underperforming firms in highly concentrated industries tend to have higher risk-taking ability than those in less concentrated industries.

As noted in the main manuscript, the mismatch between risk-taking motivation and ability leads to an inverted U-shaped relationship between performance shortfall and risk-taking, with the highest level of risk-taking occurring when firms have moderate performance shortfalls. Because underperforming firms in highly concentrated industries have higher risk-taking motivation and ability (i.e., moving up both the motivation and ability lines in Figure 1 in the main manuscript), we argue that *the peak level of risk-taking will be higher for underperforming firms in industries with a high (vs. low) concentration level* (H6a). Furthermore, as the concern for survival is lower for underperforming firms in industries with high (vs. low) concentration, ceteris paribus, these firms tend to shift their focus of attention from the aspiration level to the survival point at a lower performance level (i.e., shifting the turning point to the left in Figure 1). Thus, we predict that *the peak level of risk-taking will occur at a lower level of performance for underperforming firms in industries with a high (vs. low) concentration level* (H6b).

We used the same archival data on foreign market entry described in the main manuscript for these two additional hypotheses. Table S3 presents the predicted probabilities for firms operating in both more concentrated and less concentrated markets (columns 4–5 and 8–9). Figure S4 depicts these results

graphically. Combining Table S2 (columns 4 and 8) and Figure S4, we can tell that for firms operating in more concentrated markets, the apex of the risk-taking level reached a higher point and occurred at a lower performance level (i.e., the peak probability of entering new foreign markets = 0.182 occurring with *performance below aspiration* = -0.52) than the apex of the risk-taking level for firms operating in less concentrated markets (i.e., the peak probability of entering new foreign markets = 0.092 occurring with *performance below aspiration* = -0.22). The *p*-value from a test of the equality of heights between the two apexes was equal to 0.036, and the *p*-value from a test of the equality of distances from the aspiration point between the two apexes was equal to 0.074 (both *p*-values not shown in Table S3). These results supported H6a and H6b.

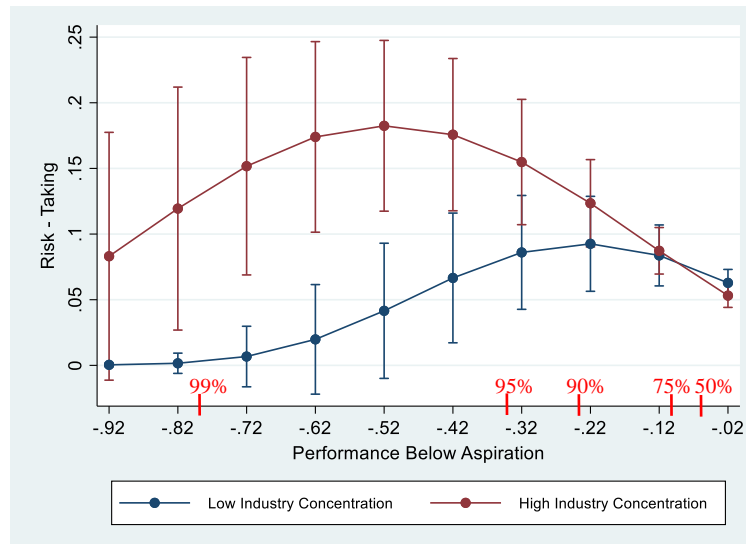
Furthermore, we compared firms' predicted probabilities of entering new foreign markets when operating in more concentrated versus less concentrated industries (column 4 versus column 8 in Table S3) throughout the range of *performance below aspiration*. With a slight performance shortfall (i.e., when *performance below aspiration* = -0.02, -0.12, and -0.22), there were no significant differences in the predicted probabilities between the two groups of firms. However, with a substantial performance shortfall (i.e., when *performance below aspiration* = -0.32, -0.42, -0.52, -0.62, -0.72, and -0.82), the predicted probabilities for firms operating in more concentrated industries were significantly higher than those for firms operating in less concentrated industries (with *p*-values from tests on the equality of predicted probabilities of 0.062, 0.013, 0.004, 0.002, 0.005, and 0.036, respectively). That is, industry concentration affects firms' risk-taking behavior more strongly when firms face substantial performance shortfalls than when they have slight performance shortfalls.

References not included in the main manuscript:

- Grullon G, Larkin Y, Michaely R (2019) Are US industries becoming more concentrated? *Rev. Financ.* 23(4):697–743.
- Montgomery CA (1994) Corporate diversification. *J. Econ. Perspect.* 8: 163–178.
- Nadkarni S, Barr, PS (2008) Environmental context, managerial cognition, and strategic action: An integrated view. *Strategic Management J.* 29(13):1395–1427.
- Yu C-MJ, Ito K (1988, Fall) Oligopolistic reaction and foreign direct investment: The case of the U.S. tire and textile industries. *J. Int. Bus. Stud.* 19: 449–60.

Table S3. Average marginal effects of performance below aspiration (i.e., performance shortfall) and predicted probabilities

1	High market concentration				Low market concentration			
	2	3	4	5	6	7	8	9
Performance below aspiration	Average marginal effect	p-value	Predicted probability	p-value	Average marginal effect	p-value	Predicted probability	p-value
-0.02	-0.309	0.000	0.053	0.000	-0.245	0.048	0.062	0.000
-0.12	-0.362	0.000	0.087	0.000	-0.158	0.170	0.083	0.000
-0.22	-0.349	0.001	0.123	0.000	-0.012	0.903	0.092	0.000
-0.33	-0.269	0.005	0.154	0.000	0.138	0.286	0.086	0.001
-0.42	-0.141	0.159	0.175	0.000	0.237	0.073	0.066	0.027
-0.52	0.008	0.946	0.182	0.000	0.247	0.007	0.041	0.184
-0.62	0.158	0.323	0.173	0.000	0.177	0.096	0.019	0.435
-0.72	0.281	0.087	0.151	0.003	0.085	0.464	0.006	0.631
-0.82	0.354	0.008	0.119	0.034	0.024	0.703	0.001	0.732
-0.92	0.360	0.000	0.083	0.147	0.003	0.821	0.000	0.625



Note: The percentages at the bottom of the figure indicate the cumulative percentage of observations. 90% confidence intervals. *Performance below aspiration* occurs only with negative values. The more negative the value, the larger the performance shortfall.

Figure S4. The moderating effect of industry concentration on the relationship between performance shortfalls and risk-taking (i.e., the likelihood of entering new foreign markets)