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# Safe or Profitable? The Pursuit of Conflicting Goals

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**Abstract.** In this study, we examine how multiple and sometimes conflicting goals are prioritized and pursued in organizations. Theories of coalitions and political behavior address prioritization among goals and changes in goal emphasis over time but cannot accurately predict the behavior of organizations that pursue conflicting goals. By linking theories of performance feedback theory and variable risk preferences, we show that performance shortfalls relative to aspirations on multiple goals can trigger managerial concerns for organizational failure. In such situations, the goal perceived as more important for survival gets priority and triggers stronger reactions. Empirically, we examine how airlines' dual focus on safety and profitability affects decisions regarding fleet changes. In the airline industry, safety and profitability have clear conflicts (at least in the short term) owing to the costs of replacing aircraft models with poor safety records. We find evidence that airlines pursue fleet safety goals, but the nature and extent of that pursuit depend on whether the firm's profitability goals are being met. As predicted, the responsiveness to safety goals is strengthened by low profitability because safety is associated more closely with survival. The study augments existing research on multiple goals by emphasizing the nature of goal interdependencies and its implications for behavior in organizations.

**Keywords:** behavioral theory • performance feedback • goal conflict • safety • airline industry

## Introduction

Organizational attention to goals is an old insight in the behavioral theory of the firm (Cyert and March 1963). This research started with a focus on a single goal, usually overall firm profitability (Gavetti et al. 2012, Shinkle 2012), but has since moved on to examining organizational responses to multiple goals (Baum et al. 2005, Gaba and Joseph 2013). When organizations pursue multiple goals, an important research question is how these goals interact with each other to inform organizational responses. Research on this question has so far relied mainly on the assumption of sequential attention to goals (Cyert and March 1963), and it has produced evidence that low performance on a lower-priority goal spurs reactions only when performance on a higher-priority goal signals success (Greve 2008, Stevens et al. 2015, Rowley et al. 2017).

The theory of sequential attention to goals has an important underlying assumption that there is a clear priority ordering of the goals, and the theory will not apply if this assumption is not met (Greve 2008). Currently, there is no theory predicting firm reactions to multiple goals if these goals do not have a predetermined order of importance. This is problematic because organizational goals rarely have a clear hierarchy but rather are interdependent, with some compatible and some conflicting. As Cyert and March (1963, p. 41) note, "An organization has a complex of goals," and resolving conflicts among disparate goals is a major challenge for decision makers (Ethiraj and Levinthal 2009). As a result, it is crucial to examine whether there are multiple conflicting goals in organizations and, if so, how such conflicts are resolved.

We develop and test theory on how organizations change their reactions to feedback on one of multiple conflicting goals while maintaining attention to the others. This gives a more realistic model of the effects of goal interdependence by abandoning the restrictive assumption that organizations attend to only one goal at a time. We derive hypotheses using theory that either considers a goal on its own or takes into account goal interdependence, and we show that the evidence is consistent with the interdependence model.

Empirically, we examine the pursuit of safety and profitability in the global airline industry. The airline industry is an excellent context for analyzing the interdependence of conflicting goals because airplane models develop distinctive safety records that are well known in the industry, because accidents are required to be reported and analyzed. Although the accidents involve some element of bad luck and so are not completely indicative of design and quality differences, they are still a salient measure of an airline fleet's safety. Maintaining a fleet of aircraft containing models with a good safety record is an important goal for airlines.[1] By selling and buying airplanes, an airline can move to a safer set of models in its fleet. This approach is feasible because there are multiple alternatives for nearly any airline routing need (e.g., A330 versus Boeing 767), but it is difficult because aircraft transactions are very costly. We predict that safety goals are so important to airlines that top managers adjust their fleets based on the estimated accident risk and that these adjustments are done differently depending on their performance on the profitability goal.

Our main thesis is that performance below aspirations on multiple goals triggers survival concerns, leading decision makers to respond to goals differently. Managers will become more risk averse, seek to avoid actions that place firms in peril, and take actions aimed at improving survival. We further argue that, for organizations operating hazardous technologies, safety goals generate stronger reactions in organizations with low profitability because the pursuit of safety is associated closely with firm survival. Low safety means a risk of accidents, which could lead to organizational failure, so we build our arguments on theory of organizational survival as a reference point in risk-taking decisions (March and Shapira 1992). We extend variable risk preference theory (March and Shapira 1992) to the context of multiple goals and develop new arguments on how multiple high-priority goals with survival implications can affect organizational responses.

Our paper makes two main contributions. First, by showing how multiple interdependent goals serve as inputs to strategic decisions, we provide a more comprehensive conceptualization of goal prioritization in organizations. This extends the behavioral theory of the firm by examining how organizations exhibit adaptive behavior through performance feedback with respect to multiple goals. Central to this contribution is the idea that the performance feedback on one goal can alter the response to the performance feedback on another goal, and hence the interdependence is resolved through changes in the functional form of responses. Second, we extend March and Shapira's (1992) theory of variable risk preferences to incorporate responses to multiple goals. When multiple conflicting goals have similar priority, we argue and find that a focus on survival serves as an additional mechanism for resolving goal conflict within organizations. This is a natural theoretical and empirical extension of existing research on the trade-offs inherent in pursuing multiple organizational goals (e.g., Greve 2008, Ethiraj and Levinthal 2009) and gives predictions that are distinct from those of earlier theory.

## Multiple Organizational Goals

The notion of multiple organizational goals is central in organizational research, which has long noted both the usefulness of the concept of "organizational goal" and the problems inherent in the term (Simon 1964). At the organizational level, the goal of an action is not necessarily unitary but may emerge from a series of demands the actions must satisfy (Simon 1964). As a result, organizational goals are formed by multiple preferences within the firm and determine how the attention and energy of decision makers will be allocated based on those preferences. An important early insight from this research is that organizational goals are contested overall and in specific decisions, so political behaviors such as coalition building are important in the theory of goals (Cyert and March 1963). When multiple goals must be met simultaneously, there are implications for the relationship among organizational goals and organizational search and selection of solutions.

Recent behavioral research has begun to examine the influence of multiple goals, aspiration levels, and reference points on adaptive behavior (Greve and Gaba 2017). The research sees aspiration levels as the neutral point at which decision makers have satisficed on the goal variable, with performance below the aspiration level creating a problem to solve. The aspiration level is a reference point for assessing performance, and another reference point is the survival point, defined as the performance level that the organization cannot fall below without risk of (or actual) failure (March and Shapira 1992). This stream of research endeavors to capture the realism in decision making as described by Cyert and March (1963) and is gradually building up from the relatively simple issue of multiple aspiration levels to the more complex and important issue of multiple goals. This work pursues the idea that the responsiveness to performance feedback is affected not only by how decision makers choose what goals and reference points to emphasize but also by the interdependencies among them.

The empirical research on adaptation to multiple goals has taken two approaches. The first, implicit approach has been to treat multiple goals as independent constraints on some outcome variable (Miller and Chen 2004, Baum et al. 2005, Gaba and Joseph 2013). For example, Gaba and Joseph (2013) examined how business unit activities are affected by profitability at both the corporate and business unit level. Baum et al. (2005) found that goals for market share and network status both affected the initiation of nonlocal syndication ties among Canadian investment banks. Gaba and Bhattacharya (2012) found that in the context of research and development externalization, firms pay closer attention to innovation than to financial performance goals. From a theoretical point of view, this research assumes that decision makers jointly consider multiple goals and make decisions as a sum of their respective influence. A few studies incorporate interactions among goal variables to see whether a shortfall in only one is enough to spur action or whether both are needed (Greve 1998, Baum et al. 2005, Audia and Brion 2007). However, none of the cited studies considered the relationships *among* multiple goals, despite their potential consequences for problem solving and search behaviors (but see Hu and Bettis 2018).

A second, more explicit approach to addressing multiple goals follows Cyert and March (1963), who argued that organizations pursue multiple goals sequentially so that secondary goals become activated only once the primary goals are fulfilled. This proposition was first tested by Greve (2008), who found that organizational size is a second-priority goal that firms pursue once their profitability is above aspiration levels. Similarly, Stevens et al. (2015) examined the chief executive officer's attention to multiple goals in the context of for-profit social enterprises and found that the firm's financial performance acts as a moderator in top management's attention to social goals. Taking economic goals as the primary goal, this work supports the sequential attention to goals argument.

Collectively, these studies are based on the strong assumption that managers and other decision-making groups do not *jointly* consider multiple goals, and that the goal prioritization is stable and uncontested. Even the recent research on multiple goals assumes that the goal fulfillment becomes interdependent because of technological interdependencies, not because the goals are interdependent in themselves (Hu and Bettis 2018). Furthermore, profitability (i.e., return on assets (ROA)) is usually seen as a dominant goal because of its strong effects on many organizational actions (Shinkle 2012). Despite these limitations, the work on multiple goals is important because it provides insights into how organizations adapt through the hierarchical arrangement of goals and top management focus. Yet it does not account for what happens when multiple goals signal conflicting courses of action. This theoretical gap means that predictions of organizational behavior in response to goal conflicts are incomplete. Indeed, the two approaches considering the effects of multiple goals on behavior make opposing assumptions about how interdependence is handled. The independent goals literature assumes that decision makers treat goals separately, whereas the sequential-attention literature assumes that goal prioritization is stable and uncontested, leading decision makers to exclusively focus on exactly one goal at a time. These assumptions overlook the possibility that performance on one goal can affect the reactions to the other goal while both remain active.

## Pursuing Conflicting Goals

Goal conflict was an important topic in the behavioral theory of the firm, which offers insights on how organizations pursue multiple and sometimes conflicting goals through coalitions among managers (Cyert and March 1963). The behavioral theory of the firm accommodates the idea that not only goal interdependencies and goal conflict exist within organizations but also behavior is shaped by perceptions of relative performance. However, its theoretical statements are so broad that they leave significant predictive power to unspecified political configurations regarding a specific decision. At the same time, the recent empirical research on performance feedback on multiple goals, although closer to the richer conceptual foundation of the behavioral theory of the firm, has not yet considered goals that have similar priority, so that sequential attention is not possible (Gavetti et al. 2012, Greve and Gaba 2017). New theory is required to predict organizational responses to performance relative to two goals with similar importance.

### Safety and Profitability Goals

Recent research highlights the importance of a heterogeneous array of organizational goals that go beyond profits including status (Baum et al. 2005), growth (Greve 2008), ownership control (Kotlar et al. 2014), and social mission (Ebrahim et al. 2014). Many of these goals coexist and sometime conflict with organization's profitability goals (Kotlar et al. 2018). Interdependent goals may be congruent and mutually reinforcing or, more commonly, in conflict, whereby the satisfaction of one goal comes at the expense of achieving one or more other goals (Cohen 1984). Consequently, multiple goals may make incompatible demands on the organization and complicate search efforts and decision making (March and Simon 1958, Cohen 1984). Thus, decision making may be conceived as an outcome determined by the motivational consequences of pursuing conflicting goals, as well as the variation of solutions emerging from the diversity of goals.

We examine safety and profitability as two highly valued organizational goals that are often in conflict with each other because many safety activities are costly beyond the potential for increased firm reputation and higher product price (Borenstein 1989, Maloney and Mulherin 2003). Arguably, keeping employees and customers safe is more profitable in the long term, but firms often ignore this. In 2014, General Motors recalled cars with faulty ignition switches that had been made from year 2003 onward; the faults and the dangers they posed were known *before* the eventual recall (Bennett 2014). The DC-10 airplane was designed with a cargo door that could blow out if not properly locked, a defect known to McDonnell Douglas *before* 346 passengers were killed in a single accident (Greve and Seidel 2014). A conflict between safety and profitability exists, and managers sometimes resolve it in favor of profitability. The single-minded pursuit of profits in industries such as the automotive, maritime transport, nuclear power, biotechnology, railroad, healthcare, and pharmaceuticals industries can be harmful for the safety of employees and customers. Similarly, the renewed attention given to pursuing safer practices by the banks following the 2008 financial crisis highlights the banking industry's pursuit of multiple goals (e.g., Demirgüç-Kunt et al. 2008).

Next, we develop specific hypotheses for behavior regarding the simultaneous pursuit of safety and profitability goals. We first develop hypotheses (Hypotheses 1a and 1b) that view safety as an independent goal, using the behavioral theory idea of search and decision making with reference to an aspiration level. We examine how failure to achieve aspirations on a nonfinancial goal triggers a problemistic search directed toward finding a solution to that problem. This allows us to first establish the decision-making consequence of pursuing nonfinancial goals. The next hypotheses (Hypotheses 2a and 2b) take into consideration that decision makers assess not only safety goal by itself but also in relation to profitability. We build theory to examine how organizational decisions are affected by simultaneous performance comparisons to safety and profitability goals. In doing so, we switch to theory that incorporates risk preferences into decision making and extend March and Shapira's (1992) theory of variable risk preferences to accommodate goal interdependence.

# Hypotheses

## Pursuing Safety

Safety is an important goal especially for organizations handling hazardous technologies because safety problems can have consequences that include reputational costs as well as the longer-term loss of customers. At the same time, many safety initiatives require significant investment of resources. Each airline takes part in legally mandated initiatives such as the reporting and analysis of incident and accident reports. The resources that airlines devote to this activity and its proven effect on safety (e.g., Haunschild and Sullivan 2002) together indicate that such reporting is a major part of their operations. These indicators of safety's importance as a goal suggest that it cannot readily be given second priority to profitability—but they do not indicate that it takes top priority either. It does suggest that organizations continually attend to safety goals.

As performance feedback theory specifies, decision makers attend to the performance on the safety goal relative to the aspiration level in order to simplify the task of interpreting their experience (Cyert and March 1963, Levinthal and March 1981) and to guide their actions (Greve 1998). In the context of our study, low performance on a goal of owning a fleet with safe aircraft models is a problem that triggers problemistic search, and the search has a proximate (to the problem) solution of replacing the low-safety aircraft models with safer ones.[2] This solution satisfies the condition of myopic search because it is a solution in the neighborhood of the problem (Cyert and March 1963). First, fleet safety is an executive-level problem that no lower-level employees can address. Second, better employee training and maintenance is not a solution to the fleet safety problem because having better-trained employees in a less safe aircraft still adds up to lower fleet safety. Hence, the solution lets top management directly influence the airline fleet safety through replacing its assets. Direct influence is important because top managers may suspect that safety procedures elsewhere in the organizations could be compromised especially when the profitability is low—a suspicion that would be true for airlines (Rose 1990, Madsen 2013). Because daily operational decisions made by lower-level managers entail trade-offs between multiple goals that top management cannot fully control, a fleet with aircraft models that have poor safety records can motivate top managers to take actions they control directly by selling and buying aircraft. The strong effect of performance–aspiration gaps on organizational action, when combined with the clear relevance of aircraft transactions to the problem of flying less safe aircraft models, leads us to predict that top decision makers are likely to change their fleets in response to a discrepancy between their aspirations and indicators of safety performance. Thus, we make the following hypotheses.

**Hypothesis 1a.** *Airlines that experience a reduction in their fleet safety relative to aspirations will sell more planes.*

**Hypothesis 1b.** *Airlines that experience a reduction in their fleet safety relative to aspirations will buy more planes.*

## Prioritizing Safety and Profitability

Next, we consider interdependence among multiple goals. The responsiveness to poor performance on nonfinancial goals such as safety is likely influenced by firm's profitability. Gaps between realized and aspiration levels of profitability or safety goals could "activate" either one—or both, if the organization falls short on both counts. Because performance feedback on multiple conflicting goals may not provide a definitive assessment of whether action is needed (and, if so, which action), decision makers must engage in interpretation *before* they engage in problem-solving activities. The interpretation provides decision makers with useful diagnostic information and aids in assessing risk of how the pursuit of one goal will affect achievement of the other.

For airlines, maintaining a fleet of aircraft with a good safety records is a goal that is easily (and expensively) achieved by selling and buying airplanes. However, if the feedback on the profitability goal or on both goals indicates poor performance, then decision makers may reduce their investment in safety and trade off the increased risk of a costly accident with the certainty of an immediate profitability improvement. Current research shows that investments are unlikely when the profitability is below aspiration levels because organizations reduce risk by avoiding new activities and conserving resources (Kuusela et al. 2017). This holds true when decision makers focus on one goal and one type of risk, the variability in profitability.

We build on this insight but conceptualize risk effects differently in the presence of multiple goals. Extending March and Shapira's (1992) theory of variable risk preferences, we posit that for firms performing below aspirations on multiple goals, decision makers attend more closely to the safety goal to ensure survival. This change occurs because low performance on multiple important goals is a similar survival threat as severe underperformance on a single important goal. This should hold true regardless of which goals the organization underperforms on and as long as these goals are sufficiently important to affect its survival chances. Safety and profitability are high-priority goals and qualitatively different, and both have greater implications for the survival of airlines than any other goal. March and Shapira (1992, p. 175) assume the decision maker "attends either to the aspiration level or to the survival point but not to both." Thus, threat of failure can lead decision makers to avoid placing their firms in peril (March and Shapira 1987) and take actions aimed at increasing the likelihood of survival.

The presence of multiple goals with potential survival consequences complicates decision making. A fully rational decision maker would be able to integrate these into a single risk/return relation and find the optimal blend, but the difficulty of this task suggests that boundedly rational decision makers instead make risk-taking on even a single economic goal complicated when performance is low and survival is threatened. On the one hand, as they fall farther below aspirations, they take on greater risk to increase the chance of achieving the aspirations (aspiration-level focus). On the other hand, as they come closer to the survival point, they become more risk averse, taking actions aimed at mitigating and avoiding risk (survival-level focus). The effect on risk-taking depends on whether the decision makers focus their attention on their hopes (aspiration-level focus) or their fears (survival-level focus). When a boundedly rational decision maker makes decisions on any one goal dimension, the aspiration level focus is relatively easy because the aspiration level on one goal does not depend on the aspiration level on another. The complication is with the survival function, because the survival of the organization depends on performance relative to both goals, even when decisions are made with respect to one goal only. This is where our assumption that performance on one goal can shift the survival point on the other goal is an important new theory development.

We illustrate the effect of shifting survival points through Figure 1, which is based on March and Shapira (1992). Figure 1 plots safety performance on the horizontal axis and shows how risk-taking changes with safety under both aspiration-level focus and survival-level focus. The top panel pertains to high-profitability firms and the bottom panel to low-profitability firms, so the comparison of the two panels captures the difference in risk-taking in response to safety between these classes of firms.

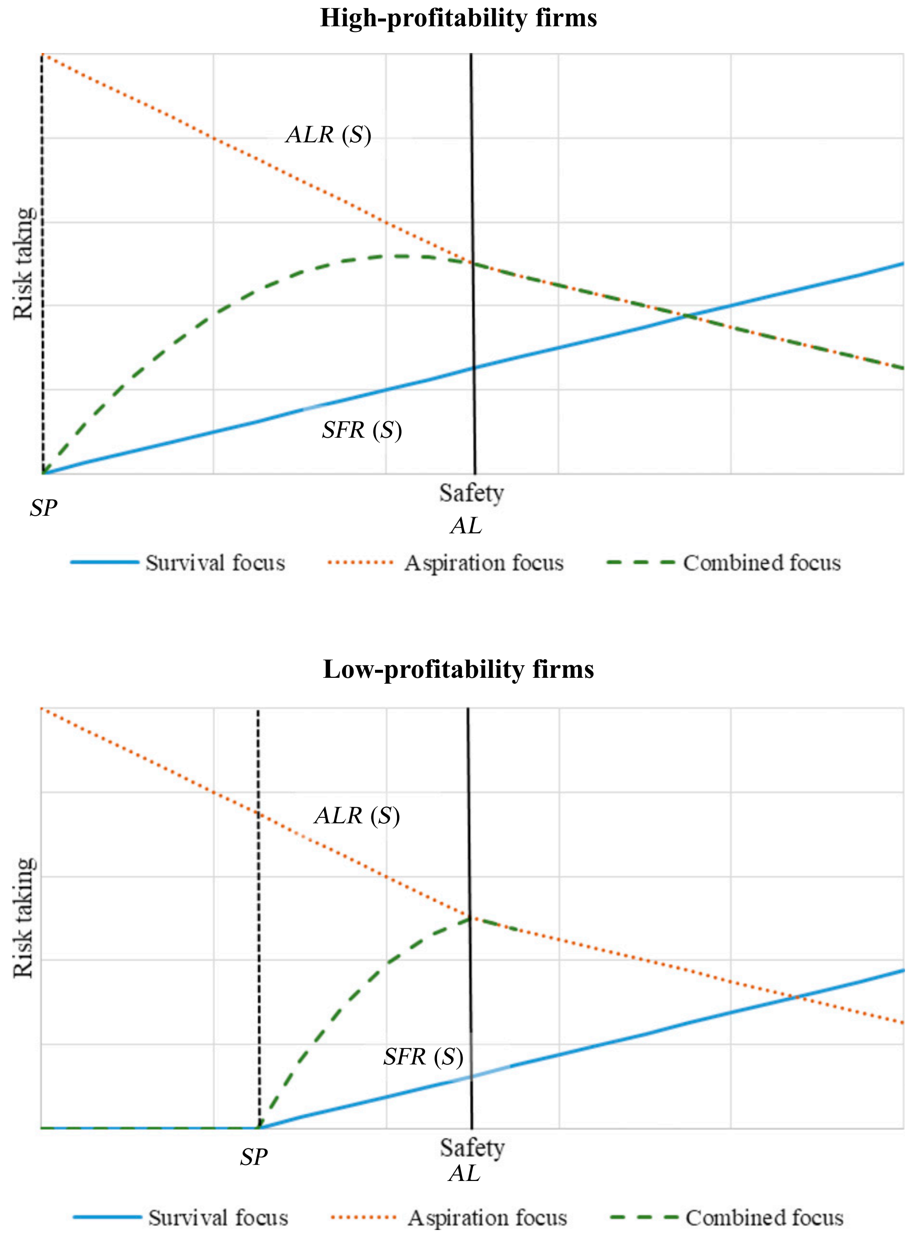
In both the top and bottom panels of the Figure 1, as in March and Shapira (1992), the risk-taking under the survival focus steadily declines as the firm gets closer to the survival point (vertical dotted line). Risk-taking under the aspiration focus increases as the firm goes further below the aspiration level (vertical solid line), driven by the aspiration level as a goal combined with accommodation to the actual risk, as indicated by the current safety level. Similarly, risk-taking decreases as the firm goes further above the aspiration level but at a diminishing rate (the slope is less steep above compared with below the aspiration level) because the aspiration level has been exceeded.[3]

As in March and Shapira (1992), we create a combined focus that relates risk-taking to safety as a weighted average of the aspiration and survival focus. The combined focus is calculated as the weighted average of the nearest focal points, with the weight proportional to the proximity to each point. More precisely, for a safety $S$ between the survival point ($SP$) and the aspiration level ($AL$), the risk preference $R$ is the weighted sum of the survival focus risk preference ($SFR$) and the aspiration-level risk preference ($ALR$):

$$R = SFR(S - SP)/(AL - SP) + ALR(AL - S)/(AL - SP).$$

Next, we introduce multiple goals, with the profitability goal manifesting itself as heterogeneous survival points for high- versus low-profitability firms.

**Figure 1.** (Color online) Risk Preference as a Function of Fleet Safety




The two panels differ in whether the profitability is high (top) or low (bottom) and hence in the potential for an accident in combination with profitability to cause firm failure. In this way, the performance from the two goals is integrated to form a firm survival point. In the top panel of Figure 1, a low survival point, as would result from high profitability, means that the survival point affects behavior later when safety decreases. Because of the influence of the aspiration level, the risk-taking increases briefly as the safety declines below the aspiration level, until the survival focus becomes more influential, and this eventually drives down risk-taking. The sum of these influences is that the reduced safety can either increase, decrease, or have no effect on risk-taking, depending on how close the firm is to the aspiration level.[4]

In the bottom panel, low profitability translates into a higher survival point, which means that the survival point affects behavior much earlier and more strongly. In this panel the risk-taking immediately decreases as the safety declines below the aspiration level, and the decrease is sharp. Notice that in both panels, the aspiration focus predicts high risk-taking for low-performing firms, opposite of Hypothesis 1, and the combined focus is consistent with Hypothesis 1 in the bottom panel only (the nonmonotonic relation in the top panel gives no prediction). Thus, the combined focus is different from both Cyert and March (1963) and March and Shapira (1992) because it incorporates interdependence of the two goals. This in turn implies that the reaction to a given level of safety depends on the profitability because of the changed survival point. The specific curves will differ depending on the survival point location and weighting of the two goals, but low-profitability firms will always become risk averse faster than high-profitability firms. Overall, underperformance on the financial goal implies proximity to failure for such firms, leading to a greater weight on the survival focus relative to the aspiration focus, eliciting a sharper decline in risk-taking for an equivalent reduction in safety.

The figure highlights how poor safety can be viewed as a threat to survival, especially in combination with poor profitability, and especially for organizations operating hazardous technologies. Airline passengers, employees, and insurance companies all react to airline accidents and penalize airlines that experience them. Top managers may fear that further decline in safety can trigger accidents that in turn create a negative spiral of revenue shortfalls and cost increases, making the airline financially unviable. Inaction on fleet safety can also increase the perceived risk of organizational failure because an accident with significant press coverage (or, even worse, multiple accidents) can have dire outcomes for an airline's reputation. Even if no accident occurs, taking visible and conservative actions such as replacing airplanes, consistent with a decline in preferences toward risk-taking, may help regain trust in the airline. Thus, paradoxically, the priority of safety as a survival-related goal should mean that an airline with profitability so low that survival is threatened will become risk averse and react more strongly to the safety goal. Thus, the goal interdependence implies the following hypotheses.

**Hypothesis 2a.** *The relation between an airline's selling of airplanes and its fleet safety is stronger when profitability is low.*

**Hypothesis 2b.** *The relation between an airline's buying of airplanes and its fleet safety is stronger when profitability is low.*

## Data and Methodology

The airline industry is a suitable test for our hypotheses because it is an industry operating an unsafe technology, as airplanes can have accidents leading to substantial loss of lives, and to avoid such outcomes, it places significant focus on safety as a goal and as a routine activity. Fleet safety can be managed separately from other safety procedures such as training, and the foundation of this management is that aircraft model accident statistics lead to an industry estimate of the model safety. This estimated model safety means that aircraft fleet risks are close equivalents to the overall risk-taking modeled by March and Shapira (1992). The decision maker's risk can be smoothly adjusted up and down simply by buying and selling aircraft at different risk levels, just as the decision maker in the March and Shapira (1992) model smoothly adjusts overall risk.

### Sample and Data

Our aircraft ownership, sale, and ending (destruction or storage) data are downloaded from the website http://www.airfleets.net, which on December 7, 2011, contained 21,432 aircraft owned by 2,790 airlines, of which 2,313 were registered as currently owning aircraft and hence were either operational or not entirely liquidated. We have full data on passenger aircraft for all airlines in the world and for the entire time period during which our accounting data are available. Our data cover the models constituting the bulk of fleets of the large airlines we study, with listed prices for new aircraft starting at \$20 million and with safety records that are (on average) much better than smaller aircraft models. They omit turboprop models and the small twin-jet models used as business aircraft. Our sample of airlines is limited to those that are found in the U.S. and global Compustat data, so all sampled airlines are medium or large and report profitability to shareholders. This sample is necessary to obtain profitability data, and it is also consistent with past work on performance effects on airline decisions (Madsen 2013). All aircraft contribute to the calculation of respective models' safety records.

We supplemented these data with aircraft accident data from the same website. There are many kinds of accidents and incidents with varying consequences for passengers and the airline, and the responsibility attributed to the aircraft's safety versus the crew's training also varies widely, so we performed additional coding based on the website's source data. First, we coded only "hull loss" accidents—that is, accidents after which the aircraft cannot be repaired. Hull loss does not imply full destruction, but the implication is that it would be either uneconomical or unsafe to attempt repairs. Hull loss accidents are the best known and most important for assessing the safety of an aircraft and have no underreporting because a hull loss makes the airplane unserviceable. This is important for a study of the global airline industry, as standards for reporting airline accidents, and compliance with standards, vary significantly across nations. Second, we coded whether the accident report referred to technical problems contributing to the accident. Limiting the analysis to such accidents is potentially an error because aircraft can be designed in ways that make human error more or less likely, and we indeed found that we obtained the same results when using all accidents and only accidents with a technical attribution. We report the results using all accidents.

We also collected data on the subjective safety assessments of all the aircraft models in our data. These include articles from a set of general and airline industry publications: the *Economist*, the *Financial Times*, *Forbes*, the *New York Times*, *USA Today*, and the *Wall Street Journal* (general category) and *Aircraft News*, *Aviation Week*, and *Flight International* (airline industry category). We downloaded the articles by searching for the aircraft model (e.g., A320) and any of the keywords "accident," "damage," "fatalities," and "incident" for the time period of our study.

### Dependent Variable

Our dependent variable is airline fleet changes as measured via *Airplane sales* and *Airplane buys*, where each of these is a count of the aircraft sold (or bought) in the focal year. The bought aircraft can be purchased either new directly from the manufacturer or used on the preowned aircraft market. Airplanes can be leased, but regular leases are uneconomical and rarely used by established airlines such as those in our data, and lease-to-buy is a financing approach rather than a regular lease.

### Independent Variables

**Safety Goal Variables.** Given the complexity of assessing firm responsiveness to safety, we include both objective and subjective measures of safety goal variables. Objective accident records of aircraft models can be supplemented with analysis, discussion, and interpretation in both the industry press and the popular press. Press reports usually start by noting the published accident records but add knowledge gained from comparable cases, technical characteristics, and product history to seek to reach a more informed conclusion. However, the interpretation can also exhibit bias. The public relations efforts to present Boeing 787 as an innovative aircraft because of its composite hull drew a lot of press attention but also a greater backlash when battery fires occurred, even though the battery fires were unrelated to the composite hull and to safety while flying. Thus, decision makers monitoring safety goals seek to counteract potential biases by using multiple related indicators.

**Fleet Accident Rate (Objective Indicator).** The fleet safety variable is airline specific and is constructed from the existing fleet of aircraft models and the hull-loss rate of each aircraft model. We first construct a time-varying hull-loss rate of every aircraft model as the sum of hull-loss accidents divided by the total aircraft-years of operation since that model's first flight (including test flights). The hull-loss rate by aircraft model is thus an all-industry cumulative measure updated annually. Next, we calculate airline fleet accident rate as a weighted average of the aircraft model hull-loss rates, where the weights are the proportion of aircraft of each model in the airlines' fleet. This variable represents the average hull-loss risk of all aircraft in the focal airline's fleet that year. Airlines have different fleet accident rates because their mix of aircraft is different, and a fleet has a high accident rate if many of its aircraft are of models with high accident rates. Examination of the data show that there are no systematic differences related to the aircraft size (small aircraft are accident-prone but are not in our data), but within each size and range class, airlines can choose from models with different accident rates, as a result of inherent model safety, model age, life-cycle changes in accident rates, or spikes in the accident rate.

There are numerous advantages to using this measure. First, feedback and response are tightly coupled—an airline can improve its fleet safety by selling aircraft models with higher hull-loss rates and replacing them with aircraft models with lower hull-loss rates. Second, this variable is determined mainly by hull loss events outside the focal firm, and hence it is exogenous. The existing fleet of the airline at the same time is a predetermined variable. This implies that we avoid endogeneity concerns when using the fleet accident rate in identifying our effects. For valid inferences, the key identifying assumption is that performance as measured by the fleet accident rate may be taken as exogenous (or as good as randomly assigned) once a sufficient set of factors have been controlled for. Such a "conditional on observables" argument requires knowing and including a comprehensive set of controls. However, because industry-wide changes in aircraft model hull-loss rates are driven by exogenous factors rather than by variables within the firm's control, we need to condition on fewer observables. By contrast, if we had based our goal variable on airline-specific accident rate (accidents experienced by the airline), then valid inference necessitates a more comprehensive set of controls that affect both accidents experienced by the focal airline and its decision to buy and sell aircraft. For instance, it is very likely that a firm may respond to an increase in its own accidents with actions such as investments in maintenance, crew training, changing organizational culture, and other safety measures, for most of which data are unavailable. Conversely, with fleet accident rates, inferences continue to be valid even if we fail to include such internal variables as controls, as they would be subsumed in the error term, and the identifying assumption that the covariance between our fleet accident rate and the error term is zero is very plausible, given the way our fleet accident rate is constructed. Naturally, there may be heterogeneity in airlines' reactions to changes in fleet accident rates that are conditional on these variables, but heterogeneity does not prevent valid identification of main effects.

We use an aspiration level to adjust this measure of fleet safety. There is an extensive literature on estimating aspiration levels that follows the original Cyert and March (1963) formulation of social (other firms) and historical (own past record) sources of aspirations (e.g., Bromiley and Harris 2014). We follow the simple approach of adjusting only the "social aspiration level," which we define as the average fleet accident rate of the firms in our data set. This approach is parsimonious and corrects for industry safety, an intrinsic dimension on which customers compare airlines;[5] airline managers similarly compare the safety of their own fleets with those of other airlines. Setting an aspiration level equal to the industry average may sound callous for a safety goal, but averages have powerful effects on decision-maker cognition. By contrast, the "natural" aspiration level of a zero accident rate is recognizably artificial in the airline industry. Zero accidents are found in some (not all) airplane types with very short service records. Currently, an airline seeking a zero accident rate fleet would need to buy only the A380 superjumbo and the A350 or 787 wide-body models.

**Media Tenor (Subjective Indicator).** We coded all the downloaded articles from the general and the airlines industry publications for negative and positive tenor using the Linguistic Inquiry and Word Count text analysis software (Pennebaker et al. 2001), consistent with earlier work on tenor analysis (e.g., Zavyalova et al. 2012, Bednar et al. 2013). We aggregated these coded assessments to annual values by taking the mean across publications, after which we calculated the net tenor by subtracting negative from positive tenor. We take this net media tenor as representing the degree to which the focal aircraft is perceived positively. The media tenor of each aircraft model is an all-industry single-year measure. The tenor is mapped to the airline level by multiplying each aircraft model's average media tenor by the proportion of that model in the airline's fleet. The media tenor variable also has a social aspiration level defined as the industry mean. As with the fleet accident rate, media tenor is mainly determined by external press coverage and is plausibly exogenous to the airlines' choices, again permitting robust inferences.

**Profitability Goal Variable.** To calculate the direct effect of performance feedback of profitability goals on airplane buys and sells, we employ the most commonly used metric: return on assets (ROA; Greve 2003, Shinkle 2012). Following Cyert and March (1963), we generate ROA relative to an aspiration level calculated as the weighted average of a social aspiration level (industry mean) and a historical aspiration level (exponentially discounted past ROA). By iterating through the different possible parameters at 0.1 intervals and selecting the best-fitting model, we assigned a weight of 0.3 to the social aspiration level and a discount factor of 0.6 to the historical aspiration level. Other research has followed the approach pioneered by Greve (1998) of using ROA minus social aspiration and ROA minus historical aspiration separately (see Bromiley and Harris (2014)), but the data used here have insufficient observations to estimate the extra variables needed for this approach without introducing potential collinearity problems. Hence, we choose the parsimonious single-aspiration specification.

The main purpose of the profitability goal variable is to distinguish firms with high and low profitability to test Hypotheses 2a and 2b. The findings on this variable will also indicate which of the two risks faced by the firm has greatest effect on their actions, as a greater focus on economic risk will lead to a declining relation between ROA relative to aspirations and airplane buying and selling if profitability is an overriding goal, but it will fail to show an effect if the accident risk is the most important goal when deciding airplane transactions. Naturally, ROA can still be the most important goal for the firm overall even if it does not affect airplane transactions, because having null findings for ROA on transactions simply means that the broad profitability goal does not interfere in the myopic search for solutions to safety problems. It does not mean that firms ignore ROA, because they may address low ROA through a range of other actions.

All three variables—fleet accident rate, media tenor, and ROA—are expressed relative to aspirations and are split (using a spline specification) at 0 in order to enable estimation of different effect sizes both below and above the aspiration level, as many studies have shown (Shinkle 2012). To test Hypotheses 2a and 2b, we interact the splined variables for fleet accident rate and media tenor variables with an indicator variable set to 1 if the airline's ROA is below aspirations and to 0 otherwise.

### Control Variables

With both fleet accident rate and media tenor as plausibly exogenous, we included control variables for airlines that could potentially affect both return on assets and firm purchase/sale decisions; the first is *Public status*, an indicator variable for whether the focal airline had undertaken an initial public offering (IPO). Some airlines have never had an IPO event, either because they are nationally owned or because their equity was not issued as a public offering. In either case, these airlines may have access to differential financial resources or may be more immune to performance pressures. We include airline size expressed as the logarithm of assets and airplane count (ln(*Assets*)). Again, larger airlines operating older fleets for longer periods of time may be less susceptible to performance pressures and exhibit different sales/purchase behavior. We control for *Revenue growth* measured as the ratio of revenue in the current and past year to account for its effect on the profitability of the firm as well as on the sales/purchase behavior. *Fleet age* is measured as the average age of aircraft in an airline's fleet. We include a *Flag carrier* indicator variable because many current and former state-owned airlines are privileged in their airport landing-slot allocations and in state financial support.

Because airplane sales and purchases can be for financial reasons, for each airline we calculated its *Available slack*, *Absorbed slack*, and *Potential slack* (Bromiley 1991). *Available slack* is defined as current assets divided by current liabilities; *Absorbed slack* is calculated as the sum of selling, general, and administrative expenses divided by sales; and *Potential slack* is calculated as debt divided by equity. We also include an indicator variable for *Bankruptcy*, set equal to 1 only if the focal airline is currently bankrupt. A bankrupt airline can continue to operate, but it is under court supervision that may place constraints on its sales/purchase decisions.

We control for effects of recent accidents by calculating the ratio of previous-year accidents to airplanes of each type. This ratio is aggregated as the *Recent accidents* of the aircraft models held by the focal airline after first weighting each aircraft accident rate by the proportion of that aircraft in the airline's fleet, and it indicates whether an airline's fleet had disproportionately many aircraft types involved in recent accidents. All the explanatory and control variables are lagged by one year.

Finally, there may be a variety of other reasons to undertake aircraft transactions, and not merely safety improvements. An airline may buy more planes to enter new routes, add capacity on existing routes, build market share, and improve customer flying experience. Omitting these variables as controls does not bias our estimates because these are orthogonal to our fleet accident and media tenor measures. They would improve model fit, but we are concerned with valid inferences instead of maximizing model fit.

### Model Specification

Both of our dependent variables (*Airplane buys* and *Airplane sales*) are count variables that take nonnegative integer values, so we use Poisson models. We use year fixed effects to account for common global and industry time effects, and we use country fixed effects to capture any cross-country differences among the airlines. Because aircraft model replacements are gradual, firm fixed effects would introduce multicollinearity.[6] Although firm change in fleet safety is gradual in nature, the fixed effects for time and environment (nation) variation gives comparability of observations. Nation and year differences had small estimated effects, but they have significant face value and are thus still reasonable to include. We do not use the alternative negative binomial model, which has an overdispersion parameter that allows the variance to exceed the mean, because it does not have a true conditional fixed effect specification and is vulnerable to the incidental parameters problem when using indicator variables for fixed effects (Allison and Waterman 2002).

## Results

The final data contain 807 firm-year observations from 118 firms, of which 47% are in the United States and the rest are dispersed across the world, with most nations contributing one airline. The fixed-effects Poisson models drop additional observations for nations with no sales or buys of airplanes during the observation period. Some airlines (e.g., Southwest) have only a single model for strategic reasons. We retain these in our analysis even though they will never sell or buy an aircraft for safety reasons and hence work against our hypotheses. Table 1 shows descriptive statistics and correlation coefficients for the data set. The correlations are generally low. We show estimates with the objective fleet accident rate variables and the media tenor variables separately, followed by the full model; our results are quite consistent across these specifications. We also estimated models without the interaction variables (not included, to save space) and found the results to be consistent with the models that included interactions.

Table 2 shows the models for airplane sales. Airlines prefer their fleets to have low accident rates and high net media tenor—hence, in line with our hypotheses—so we expect the variables for hull loss and media tenor to have the opposite sign. Model 1 shows a positive and significant coefficient on hull loss below aspirations as well as a positive and significant coefficient on this variable interacted with a dummy if ROA is also below aspirations. This implies that as the fleet accident rate increases, airlines with a lower than average accident rate (relatively safe airlines) respond by selling more aircraft. The significant interaction term implies that this effect is stronger for firms underperforming on the profitability goal. Therefore, for airlines with a better than average safety record, we see support for both Hypothesis 1a

**Table 1.** Descriptive Statistics and Correlations

| Variable | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Airplane sales* | 2.542 | 6.186 | 1 | | | | | | | | | | | | | | |
| *Airplane buys* | 4.799 | 9.339 | 0.38 | 1 | | | | | | | | | | | | | |
| *Public status* | 0.379 | 0.485 | 0.02 | 0.16 | 1 | | | | | | | | | | | | |
| ln(*Assets*) | 7.998 | 2.681 | 0.22 | 0.24 | −0.04 | 1 | | | | | | | | | | | |
| ln(*Fleet*) | 3.844 | 1.265 | 0.27 | 0.30 | 0 | 0.55 | 1 | | | | | | | | | | |
| *Revenue Growth* | 1.224 | 23.415 | 0.02 | −0.01 | −0.03 | −0.00 | −0.05 | 1 | | | | | | | | | |
| *Fleet age* | 10.796 | 5.772 | −0.03 | −0.12 | 0.18 | −0.03 | 0.04 | 0.04 | 1 | | | | | | | | |
| *Flag carrier* | 0.19 | 0.393 | 0.21 | 0.11 | 0 | 0.35 | 0.15 | −0.02 | 0.16 | 1 | | | | | | | |
| *Available slack* | 1.082 | 0.661 | −0.03 | −0.03 | −0.02 | −0.27 | −0.09 | 0.06 | −0.09 | −0.08 | 1 | | | | | | |
| *Absorbed slack* | 8.209 | 227.26 | 0 | −0.01 | −0.02 | 0 | −0.02 | 0.08 | 0.04 | −0.01 | −0.05 | 1 | | | | | |
| *Potential slack* | 3.504 | 16.832 | 0.02 | 0 | 0.02 | 0.07 | 0.02 | −0.01 | 0 | 0.01 | −0.05 | −0.01 | 1 | | | | |
| *Bankruptcy* | 0.021 | 0.143 | 0.07 | −0.03 | −0.04 | 0.04 | 0.2 | −0.01 | 0.06 | −0.04 | −0.03 | 0 | −0.01 | 1 | | | |
| *Recent accidents* | 0.0002 | 0.0003 | 0.02 | −0.01 | −0.09 | −0.05 | −0.03 | 0.05 | −0.09 | −0.07 | 0 | 0.04 | −0.02 | 0 | 1 | | |
| *ROA − AL* | 0.037 | 0.226 | −0.01 | 0 | 0.05 | 0.02 | 0.03 | 0.13 | −0.02 | 0 | 0.07 | −0.31 | 0.02 | 0.21 | −0.03 | 1 | |
| *Hull loss − AL* | 0.0001 | 0.0004 | −0.01 | 0 | −0.1 | 0.13 | −0.09 | −0.01 | −0.23 | −0.01 | −0.18 | −0.01 | 0.02 | −0.04 | 0.38 | −0.06 | 1 |
| *Tenor − AL* | −0.061 | 0.496 | −0.01 | −0.04 | 0 | −0.09 | −0.01 | 0.01 | 0.04 | −0.03 | 0.03 | 0 | −0.01 | 0 | 0.14 | 0 | −0.09 |

*Notes.* Based on 807 observations; AL, aspiration level. All correlation coefficients greater than 0.07 are significant at the 5% level.

(plane sales increase with the accident rate) and for Hypothesis 2a (this relationship is stronger for firms with low profitability). By contrast, the coefficient on hull loss above aspirations is insignificant, whereas its interaction with the financially underperforming dummy (*ROA below AL*) is positive and marginally significant. This implies that as fleet accident rates increase for airlines with higher than average accident rates, then only a subset, the low-profitability firms, reacts by selling more planes. High-profit firms do not seem to react significantly to changes in fleet accident rates. Therefore, for airlines with a worse than average safety record, we see support for Hypothesis 2a—a stronger relationship between accident rate and aircraft sales when ROA is below the aspiration level. This indicates that the firm's attention is focused mainly on survival when both its profitability and its fleet's safety are below aspirations. In Model 3, which also includes the tenor variables, the findings are broadly similar—the only difference is that for airlines with a worse than average safety record (hull loss above aspirations), there is no significant finding in Model 3. Thus, the findings so far favor goal interdependence over safety as an independent goal.

Models 2 and 3 in Table 2 show a negative coefficient on media tenor above aspirations (sales decline with more positive media tenor), so we have support for Hypothesis 1a for firms whose media tenor is above the aspiration level. For these firms, the interaction between media tenor above aspirations and the dummy for ROA below aspirations is not significant so that the relationship holds regardless of profitability. Therefore, we do not see support for Hypothesis 2a. For media tenor below aspirations, we see varying effects for underperforming and outperforming firms on ROA. For outperforming firms, the positive and significant coefficient of tenor implies a surprising increase in sales as the media tenor becomes more positive. The negative coefficient of this variable interacted with the dummy for ROA below aspirations implies a reversal of this finding for low-profitability firms. For these firms, as tenor becomes more positive, we see the expected decline in sales. The shift in a firm's response to negative media tenor under low profitability is again consistent with the survival focus predicted by Hypothesis 2a. For high-profit firms, sales are at a maximum when the media tenor is exactly at the aspiration level, and they decrease above and below the aspiration level. Again, the findings below the aspiration level for safety suggest that the responsiveness to safety is influenced by the profitability, consistent with our integration of theory of problemistic search and survival focus.

A comparison of the models with objective accident rates and media tenor for the airplane types shows that the findings are significant in both cases, but likelihood ratio tests show that accident rates have much more explanatory power, and the effect strengths (see the vertical axis of Figure 2) confirm this. The results are largely the same when these variables are entered separately in Models 1 and 2 and jointly in Model 3. This argues against a model in which the press accounts mediate the effect of objective accident rates, suggesting that airlines are alert to both factors and view them either as providing distinct information or as reflecting distinct constituencies that should be considered.

The control variable of ROA relative to aspirations has significant effects in some models, and the signs of

**Table 2.** Poisson Models of Airplane Sales

| Variable | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Public status* | 0.615** | 0.318* | 0.561** |
| | (0.144) | (0.142) | (0.145) |
| ln(*Assets*) | −0.016 | −0.030 | −0.040 |
| | (0.033) | (0.032) | (0.034) |
| ln(*Planes*) | 0.993** | 0.908** | 0.999** |
| | (0.068) | (0.065) | (0.069) |
| *Revenue growth* | 0.010** | 0.009** | 0.010** |
| | (0.002) | (0.002) | (0.002) |
| *Fleet age* | −0.017 | −0.032** | −0.021$^{+}$ |
| | (0.011) | (0.010) | (0.011) |
| *Flag carrier* | −0.113 | 0.188$^{+}$ | −0.056 |
| | (0.113) | (0.106) | (0.114) |
| *Available slack* | 0.456** | 0.337** | 0.447** |
| | (0.075) | (0.072) | (0.075) |
| *Absorbed slack* | −0.371$^{+}$ | −0.420$^{+}$ | −0.455* |
| | (0.225) | (0.229) | (0.225) |
| *Potential slack* | 0.006** | 0.004* | 0.006** |
| | (0.002) | (0.002) | (0.002) |
| *Bankruptcy* | 0.181 | 0.088 | 0.110 |
| | (0.163) | (0.164) | (0.166) |
| *Recent accidents* | −890.607** | −495.386* | −1,001.492** |
| | (235.570) | (230.166) | (249.663) |
| *ROA − AL (below AL)* | 0.120 | −0.935* | 0.524 |
| | (0.467) | (0.467) | (0.513) |
| *ROA − AL (above AL)* | −2.102** | −1.406* | −1.695** |
| | (0.630) | (0.597) | (0.616) |
| *Hull loss − AL (below AL)* | 2,930.320** | | 2,554.891** |
| | (348.075) | | (357.581) |
| *Hull loss − AL (above AL)* | 136.072 | | 408.723 |
| | (287.949) | | (297.523) |
| *Hull loss − AL (below AL)* | 1,253.825* | | 1,805.734** |
| *— × ROA below AL* | (608.188) | | (681.711) |
| *Hull loss − AL (above AL)* | 720.654$^{+}$ | | 367.666 |
| *— × ROA below AL* | (375.726) | | (431.996) |
| *Tenor − AL (below AL)* | | 0.930** | 0.918** |
| | | (0.206) | (0.224) |
| *Tenor − AL (above AL)* | | −1.758** | −0.974* |
| | | (0.411) | (0.421) |
| *Tenor − AL (below AL)* | | −1.286** | −1.494** |
| *— × ROA below AL* | | (0.396) | (0.451) |
| *Tenor − AL (above AL)* | | −0.815 | −0.183 |
| *— × ROA below AL* | | (0.693) | (0.777) |
| Log likelihood | −1,469.32 | −1,508.07 | −1,455.44 |
| Likelihood-ratio test (d.f.) | 4,192.42** (42) | 4,114.92** (42) | 4,220.18** (46) |

*Notes.* Based on a total of 795 observations; all regressions include both year and nation fixed effects. Standard errors are reported in parentheses. AL, aspiration level.
$^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.10$.

these are consistent with expectations, but the effect size is weaker than the more relevant goal of fleet safety. The findings suggest some interference of the profitability goal on airplane transactions, but this effect does not overshadow the effect of the more relevant goal of safety.

Table 3 shows our analysis of airplane buys, which is broadly similar to that for airline sales, with respect to hull loss. As with airplane sales, airlines with below average accident rates respond to an increase in accidents by buying more planes (positive coefficient on hull loss below aspirations). Furthermore, the positive interaction of this variable with the dummy for ROA below aspirations shows that this relationship is stronger for low-profit firms. Therefore, we have support for both Hypothesis 1b and Hypothesis 2b for relatively safer

**Table 3.** Poisson Models of Airplane Buys

| Variable | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Public status* | 1.111** | 1.082** | 1.161** |
| | (0.091) | (0.088) | (0.092) |
| ln(*Assets*) | 0.128** | 0.161** | 0.137** |
| | (0.023) | (0.022) | (0.024) |
| ln(*Planes*) | 0.811** | 0.796** | 0.807** |
| | (0.039) | (0.037) | (0.039) |
| *Revenue growth* | 0.005** | 0.005** | 0.005** |
| | (0.002) | (0.002) | (0.002) |
| *Fleet age* | −0.057** | −0.063** | −0.056** |
| | (0.007) | (0.007) | (0.008) |
| *Flag carrier* | −0.411** | −0.250** | −0.442** |
| | (0.076) | (0.072) | (0.076) |
| *Available slack* | 0.440** | 0.410** | 0.452** |
| | (0.048) | (0.046) | (0.049) |
| *Absorbed slack* | −5.514** | −5.749** | −5.270** |
| | (0.453) | (0.461) | (0.448) |
| *Potential slack* | −0.002 | −0.002 | −0.002 |
| | (0.001) | (0.001) | (0.001) |
| *Bankruptcy* | −0.525** | −0.451* | −0.397* |
| | (0.187) | (0.189) | (0.189) |
| *Recent accidents* | −2,311.492** | −1,753.134** | −2,210.994** |
| | (182.029) | (173.741) | (187.163) |
| *ROA − AL (below AL)* | 2.479** | 0.554 | 2.226** |
| | (0.445) | (0.453) | (0.481) |
| *ROA − AL (above AL)* | −0.463 | −0.075 | −0.472 |
| | (0.340) | (0.305) | (0.335) |
| *Hull loss − AL (below AL)* | 3,080.963** | | 3,132.338** |
| | (241.757) | | (253.620) |
| *Hull loss − AL (above AL)* | −341.817$^+$ | | −439.833* |
| | (201.124) | | (208.032) |
| *Hull loss − AL (below AL) × ROA below AL* | 2,459.274** | | 3,154.194** |
| | (516.901) | | (581.205) |
| *Hull loss − AL (above AL) × ROA below AL* | 1,284.247** | | 1,124.342** |
| | (257.684) | | (296.530) |
| *Tenor − AL (below AL)* | | 0.225$^+$ | −0.127 |
| | | (0.131) | (0.146) |
| *Tenor − AL (above AL)* | | −1.138** | −0.391$^+$ |
| | | (0.247) | (0.230) |
| *Tenor − AL (below AL) × ROA below AL* | | 0.591$^+$ | 0.778* |
| | | (0.335) | (0.383) |
| *Tenor − AL (above AL) × ROA below AL* | | 1.786** | 2.481** |
| | | (0.414) | (0.495) |
| Log likelihood | −2,015.13 | −2,154.33 | −1,996.10 |
| Likelihood ratio test (d.f.) | 6,840.18** (42) | 6,561.78** (42) | 6,878.24** (46) |

*Notes.* Based on a total of 799 observations; all regressions include both year and nation fixed effects. Standard errors are reported in parentheses. AL, aspiration level.
**$p < 0.01$; *$p < 0.05$; $^+p < 0.10$.

airlines with below average accident rates. Hull loss above aspirations, by contrast, has a negative and significant coefficient and a positive sign on its interaction with ROA below aspirations. Therefore, Hypothesis 1b holds only for firms with low profitability. Next, coefficients for the interaction variables support Hypothesis 2b that the relationship is strengthened when the profitability is low, as shown by the coefficients that have the same sign as the main effect (below aspiration level) or have the opposite sign but much greater magnitude (above aspiration level). Again, the findings strongly suggest goal interdependence.

Support for our hypotheses is again weaker when we look at the effect of media tenor on airplane buys.

Model 2 in Table 3 shows that higher net media tenor reduces airplane buys only for high-ROA firms with media tenor above aspirations, in line with Hypothesis 1b that fewer buys will occur when the net tenor is high. The same is true when we include both hull loss and media tenor in Model 3. However, we fail to find support for Hypothesis 2b for underperforming firms; the sign is significant but positive for low-ROA firms.

Just as in the models of sales, the models of buys show that accident rates have much more explanatory power than media tenor. Here, too, the results are largely the same when these variables are entered separately (in Models 1 and 2) or jointly (in Model 3). Airline decisions are most strongly affected by the objective accident rates, but airline responses to the subjective tenor of press accounts suggest that the media are an additional influence on the decision making. The models do not support a mediation effect of press accounts.

The control variable of ROA relative to aspirations has only two cases of significant effects in some models, and the signs of these are inconsistent with expectations. Again, the findings suggest only minor interference of the profitability goal on airplane transactions; the overall findings clearly show that the safety goal influences airplane transactions with high or low profitability as a contingency rather than as a direct effect.

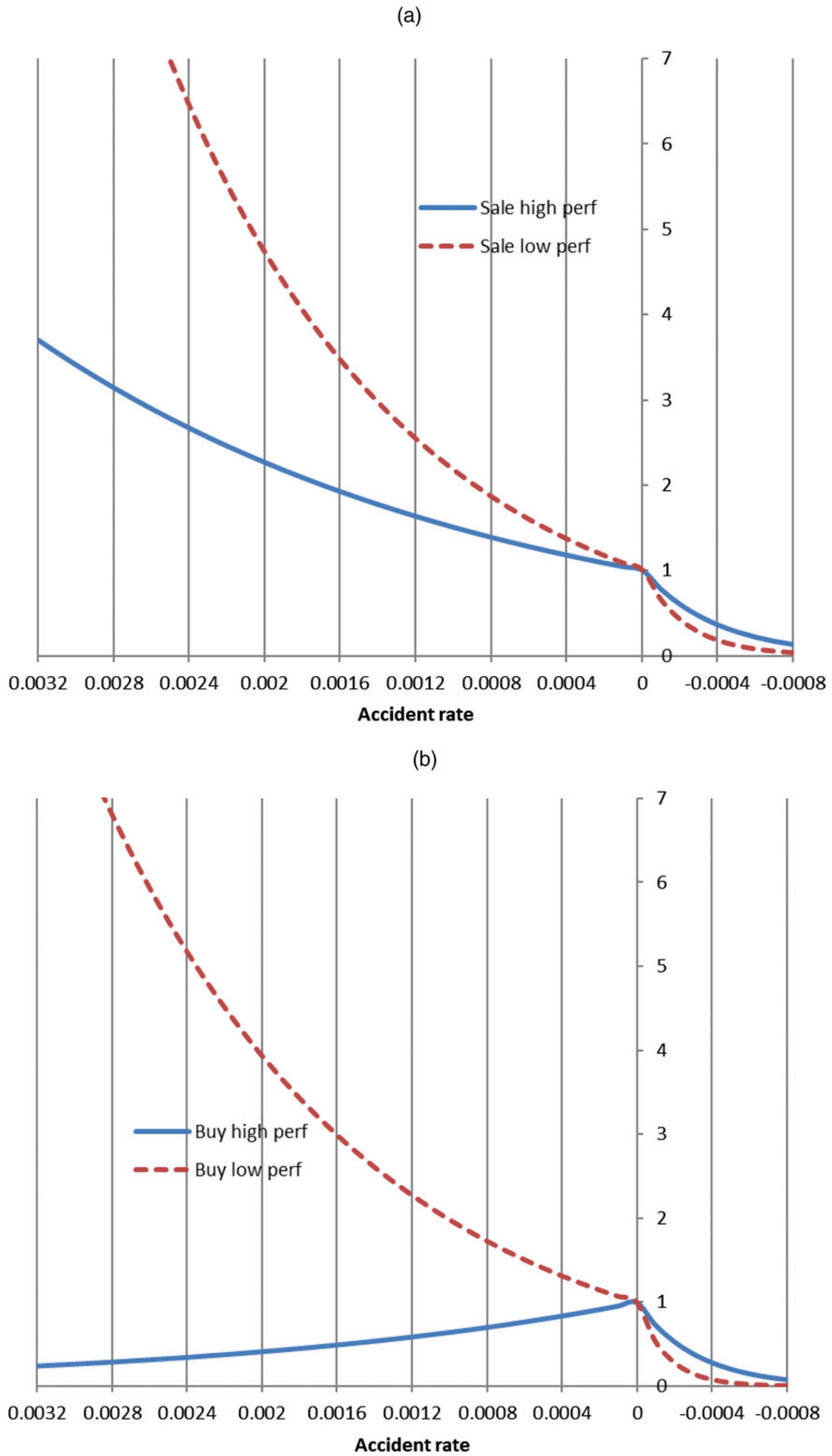
Plotting the estimated effects indicates the relations involved more clearly. Figure 2, (a) and (b) are multiplier graphs that show how the sell and buy rates, respectively, are influenced by the safety relative to the aspiration level. Multiplier graphs take advantage of the Poisson model being log linear, so the effect of each variable can be displayed as a graph of the extent to which it multiplies the function up (or down) from one. The plots are based on the coefficient estimates reported in Model 3 of (respectively) Table 2 and Table 3. To simplify interpretation of these two figures, each horizontal axis is reversed to give the usual relation of better results (lower accident rates and higher safety) on the right-hand side of the graph. The vertical axis is where the accident rate equals the aspiration level, and we plot separate curves for high- and low-profitability firms (ROA above and below the aspiration level). We can now see the similarity of our findings across sales and buys, which help in the interpretation. Airlines that *have* a good fleet safety will not engage in transactions unless they find themselves approaching an average fleet safety. The estimated increase in sales as fleet safety declines follows the prediction in Figure 1, keeping in mind that lower risk-taking implies more sales from a less safe fleet. The estimated effect is strong for firms with low profitability, consistent with the predicted relation in the bottom part of Figure 1. As the top part of Figure 1 shows, this prediction is weaker for firms far above the survival point, as the curve shows a brief increase in risk tolerance before the risk-taking decreases. Indeed, as the estimates in Figure 2, (a) and (b) show, the sales curve is less steep and the buy curve is practically horizontal for profitable firms. Low profitability, by contrast, makes airlines more safety conscious, strengthening the tendency to transact when the fleet safety is poor and to keep the fleet when the fleet safety is good. Thus, when both the profitability and fleet safety are below aspirations, the focus on firm survival directs the attention. Firms with low ROA risk failure at some future time, but an accident—especially when *combined* with low ROA—can induce failure rapidly. Thus, low ROA serves as a signal to ensure that the airline's fleet comprises safe models to avoid rapid failure, as predicted by our integrated model.

Figure 3, (a) and (b) display the same relations as just described but now for the tenor of press reports on the airplane models in each fleet. The "Sale" curve shows that profitable airlines sell the most when their performance equals the aspiration level, whereas a less profitable airline is most inclined to sell when the media tenor regarding its fleet is least favorable. However, it should be kept in mind that the curves relating to media tenor reveal a weaker result overall than the one we found for the objective accident record (comparing the vertical axis). The airplane "Buy" curve is different. A profitable airline is largely unresponsive to the media tenor on the models of its fleet, but low-profitability airlines buy *more* airplanes in response to a more positive media tenor for their fleet. It seems unusual that low-profitability airlines should see increased airplane purchases when their fleet's models are very highly regarded in the media. Inspection of the data revealed a concentration of recently founded airlines in this category, suggesting that the low ROA was perhaps influenced by start-up costs.

## Robustness Tests

We performed several robustness tests in addition to the main analysis (available from the authors). First, our reported analysis adjusted for the size differences of airlines by entering the logarithm of the fleet size. If the rate of selling and buying aircraft is proportional to the fleet size, the coefficient estimate will be one, but it was in fact lower than one (significantly lower for buys). This consistent with the size–inertia relationship (Hannan and Freeman 1984), but it is of interest to also examine models in which we set the relationship to be exactly proportional. We estimated such models using Poisson models with an exposure parameter, and we found results consistent with the reported tables but worse fit to the data.

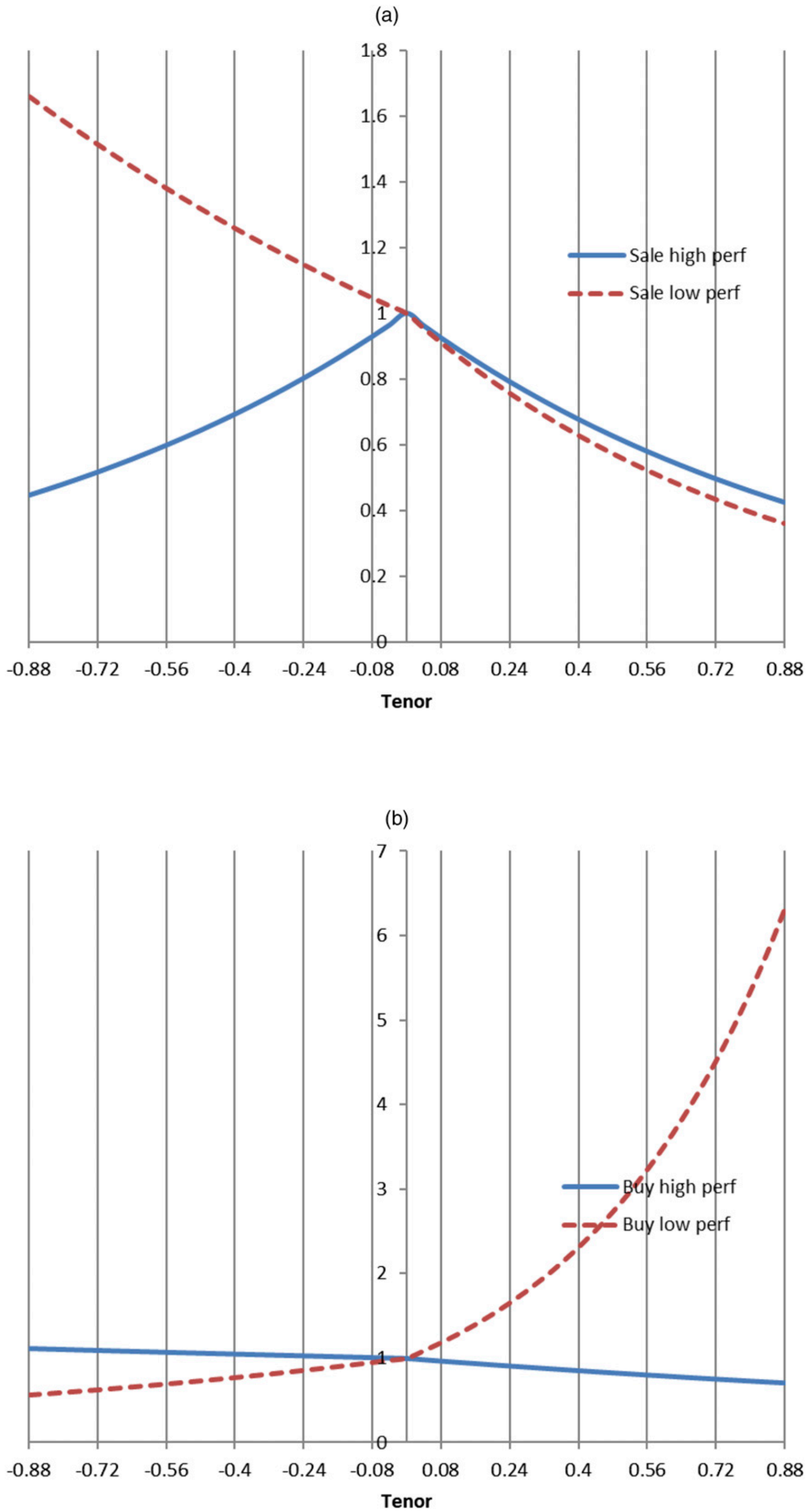
**Figure 2.** (Color online) (a) Fleet Safety and Airplane Sales and (b) Fleet Safety and Airplane Buys




*Note*. Reversed scale.

As noted earlier, we had the choice of using all accidents, accidents attributed to a technical cause, and accidents attributed to human error in our analysis. Comparison of these models showed significantly worse fit for models attributed to human errors, as one would expect because these are less inherent to

**Figure 3.** (Color online) (a) Media Tenor and Airplane Sales and (b) Media Tenor and Airplane Buys




the airplane model than either technical accidents or all accidents. They are not unrelated to the airline model, however, as model design can influence human error. Consistent with this observation, technical accidents had no better fit than all accidents for sales and had significantly worse fit for buys.

We used both industry periodicals and the general press as data sources for our measures of the media tenor. Such a mixed measure could be problematic because of a high influence of U.S. general press and/or industry inattention to the general press, so we also reestimated the models using only the industry press as a data source of the media tenor. This change did not influence the findings or model fit for airplane sales, but for airplane buys, the supplementary models with industry data only had findings more strongly supporting the hypotheses and greater fit than the models displayed.

Finally, multiple forms of aspiration levels have been used in earlier work. We do not have sufficient observations to rigorously test which are the best fit to the data, but we estimated models using either only social aspiration levels or only historical aspiration levels for profitability and found that both had worse fit to the data than the models displayed. We also tested models in which the highest-safety quartile of airlines had an aspiration level equal to their quartile, whereas the others had the industry mean as the aspiration level but found worse fit to the data. We believe that the simplest specifications of aspiration levels should be used unless the data are very rich, because otherwise, overfitting of the measures may occur, and hence we follow Cyert and March (1963).

## Additional Analysis

Although the analyses presented so far complete the hypothesis testing, they leave an interesting question unanswered: Does an airline buy and sell airplanes in such a way that its fleet safety improves? The question is complex because airplanes are long-lived assets, and a sale by one airline nearly always involves a purchase by another. Yet the aircraft can exit this data set when scrapped, an occurrence so rare that we treat it as a sale, sold to smaller airlines, or refitted to transport goods rather than passengers. The airlines in our data can sell "down the hierarchy" because they number 104 large firms out of more than 2,000 firms worldwide that own passenger aircraft. It is thus possible and interesting to test whether an airline's sales and buys improve its fleet safety, as one might expect when the fleet safety is below its safety goals.

Table 4 reports results from a regression of the change in hull-loss rate, which gives the most direct test of whether the actions undertaken in response to low performance on the fleet safety goal, actually increases safety. We calculate the change in fleet safety as the next year's fleet accident rate *minus* the current year's accident rate (again, higher numbers mean worse safety). The findings are easy to summarize. The greatest improvement in fleet safety occurs when it is at its lowest levels (i.e., when the accident rate is high relative to the aspiration level). Above the aspiration level, the fleet safety improves when the airline has better planes to begin with. Thus, it is the airlines whose planes have an *average* fleet safety that show the least improvement in safety from year to year. The tenor of press reports seems largely unrelated to changes in an airline's safety, but a separate analysis of the change in media tenor regarding fleets (not displayed) showed that the positive tenor increased more when it was less positive at the

**Table 4.** Linear Regression of Change in Fleet Accident Rate

| Variable | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Public status* | 0.016 | −0.046$^{+}$ | 0.015 |
| | (0.017) | (0.026) | (0.017) |
| ln(*Assets*) | 0.008 | −0.017* | 0.007 |
| | (0.006) | (0.008) | (0.006) |
| ln(*Planes*) | −0.027** | 0.004 | −0.025** |
| | (0.008) | (0.012) | (0.008) |
| *Revenue growth* | −0.000 | 0.000 | −0.000 |
| | (0.000) | (0.000) | (0.000) |
| *Fleet age* | 0.000 | −0.003$^{+}$ | 0.000 |
| | (0.001) | (0.002) | (0.001) |
| *Flag carrier* | −0.055* | −0.069$^{+}$ | −0.055* |
| | (0.025) | (0.037) | (0.025) |
| *Available slack* | 0.024* | 0.026$^{+}$ | 0.022* |
| | (0.010) | (0.015) | (0.010) |
| *Absorbed slack* | 0.001 | 0.004 | 0.002 |
| | (0.002) | (0.004) | (0.002) |
| *Potential slack* | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) |
| *Bankrupt* | −0.040 | 0.004 | −0.035 |
| | (0.039) | (0.058) | (0.039) |
| *Recent accidents* | −198.370** | −589.644** | −191.847** |
| | (25.244) | (31.207) | (25.464) |
| *ROA − AL (below AL)* | 0.080 | 0.041 | 0.084 |
| | (0.070) | (0.093) | (0.069) |
| *ROA − AL (above AL)* | −0.037 | −0.076 | −0.046 |
| | (0.051) | (0.075) | (0.051) |
| *Hull loss − AL (below AL)* | 304.935** | | 311.976** |
| | (38.742) | | (38.993) |
| *Hull loss − AL (above AL)* | −721.200** | | −726.339** |
| | (24.258) | | (24.395) |
| *Hull loss − AL (below AL) × ROA below AL* | −10.388 | | −86.574 |
| | (67.430) | | (80.727) |
| *Hull loss − AL (above AL) × ROA below AL* | 244.834** | | 307.212** |
| | (53.910) | | (58.344) |
| *Tenor − AL (below AL)* | | 0.013 | −0.030$^{+}$ |
| | | (0.024) | (0.016) |
| *Tenor − AL (above AL)* | | 0.067$^{+}$ | 0.036 |
| | | (0.036) | (0.024) |
| *Tenor − AL (below AL) × ROA below AL* | | 0.040 | 0.097** |
| | | (0.052) | (0.037) |
| *Tenor − AL (above AL) × ROA below AL* | | −0.057 | −0.123 |
| | | (0.111) | (0.089) |
| $R^2$ | 0.299 | 0.561 | 0.571 |

*Notes.* Based on a total of 807 observations; all regressions include both year and nation fixed effects. Standard errors are reported in parentheses. AL, aspiration level.
$^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.10$.

outset, and this relation was stronger in low-ROA airlines. These results were significant below and above the aspiration level, whereas the objective fleet safety had no significant effect on the change in the media tenor. Thus, the analysis reveals a more extreme match between the problem and its solution than we anticipated theoretically. We hypothesized that low safety as indicated through objective or subjective accounts would increase sales and buys and would result in improved safety. We did not expect improvements in the hull-loss rate to be mainly guided by a low hull-loss rate (and only a weak media effect) and improvements in the media tenor to be only guided by the media tenor (with no hull-loss effect). These findings suggest that, objectively, low safety and negative media tenor are separate problems solved through distinct sales and purchases.

## Discussion and Conclusion

Safe or profitable? A theoretically meaningful answer to such prioritization of goals should address organizational decision making and environmental influences. *A Behavioral Theory of the Firm* (Cyert and March 1963) proposed the answer that temporary coalitions might form in support of specific alternatives. What that theory did not address—and what remains to be given a definitive treatment—is how elements of the specific situation affect decisions concerning which goal has the highest priority. We approached this question through an integration with March and Shapira's (1992) model of variable risk preferences and focus of attention, which led us to empirically examine interactions between the profitability relative to aspiration levels and the safety goals (measured either by hull losses or by the press coverage of aircraft models). As expected, we found that safety goals were prominent when safety performance was low, as reflected in the buy/sell responses in that condition. This suggests that safety is a high priority in organizations, which serves as an important input to top managements' decisions to change their fleets. We also found strong indications that low-profitability firms are focused on survival, as reflected in their stronger buy/sell responses when safety was below aspirations. This is a theoretically important indication of interdependent organizational goals.

Interestingly, our analysis also seems to indicate that decision makers may be pursuing three goals rather than the two goals we assumed. Selling and buying of airplanes was influenced by profitability, hull-loss statistics, and media tenor—and most strongly by the objective safety measure of hull-loss statistics. Differences in the findings for responsiveness to objective (hull loss) and subjective (media tenor) indicators of safety performance—and especially the finding that reactions to each of them influenced only performance on the same goal, not the other—indicate a greater disconnect between the two than we anticipated. The findings suggest that decision makers may view objective indicators (hull-loss statistics) as the true safety measure and subjective assessments (media tenor) of its aircraft models as a separate public relations goal. This was against our expectations, but it amplifies our theoretical point that organizations manage multiple goals that may be either in direct conflict or in contestation for scarce resources.

The findings reported in this paper are based on goal conflict between profitability and a second goal whose reputational implications could affect the firm's very survival. Our results could be replicated in other contexts as well, but their generalizability is yet to be tested. What we have tested—and rejected—in additional analysis is the alternative hypothesis that low-profitability firms sold their safe models and kept the unsafe ones as a cost-savings strategy. Instead, we found the opposite: our models offer clear evidence that changes made in response to low fleet safety did, in fact, improve fleet safety.

Our findings reveal that airline executives use the model composition of their fleets—a variable that is clearly under their control—to manage safety exactly when the firm is suffering from low profits and so might well be looking for ways to cut costs. There is already good evidence that an airline's safety record will decline when its margins or profitability are low (Rose 1990, Madsen 2013). The behavioral mechanism that underlies this result is easy to understand: at multiple levels in the organization, decision makers seek to streamline operations to cut costs; some such actions can reduce safety, even if just marginally. The key difference is that these decision makers are neither fully aware of their actions' safety consequences nor responsible for the strategic concern of firm survival. Aircraft sales and buys are made at the top level of an organization and by executives who are well aware of their actions' safety consequences and the consequences of any accident. They may even suspect that cost cutting elsewhere endangers safety and therefore attempt to compensate for that possibility. Such concerns are consistent with the observation that organizations not only are recalcitrant tools that can be controlled to some degree but also have independent decision making at lower levels that may be misaligned with the priorities of the top leadership (Perrow 1984). Or the script schemas guiding decision making at the lower levels may simply preclude firm-level strategic considerations (Gioia 1992).

Our study advances recent work on the behavioral implications of multiple goals. Multiple goals have been shown to impact responsiveness to feedback (Baum et al. 2005, Greve 2008), yet goal conflict—and more broadly, the interdependencies among multiple goals of similar importance—has not, until now, been a consideration in this area of research. Our study extends past work by highlighting the behavioral implications of pursing conflicting goals and emphasizing survival as a mechanism for goal responsiveness. Survival considerations affecting goal interdependence is novel and important because it suggests managerial focus on survival rather than shifting attention among multiple goals as an approach for reconciliation of goal conflict. This point has been made already when examining the behavioral implications of performance close to a survival point (March and Shapira 1992), and our investigation indicates that it holds true also when low performance on multiple goals adds up to a survival threat. A closer examination of how organizations prioritize goals as a function of their importance and performance relative to the aspiration level is a valuable direction to pursue. Goal conflicts are—as emphasized in the early literature on organizational goals—ubiquitous in organizations of all types and as such should be central to organizational theory (Simon 1964). The key feature overlooked by the current literature on performance feedback is that goal conflicts are important not simply because they create doubts and conflict; they are important also because their *resolution* determines decisions. The change in response functions on one goal as a result of the performance on another goes beyond the shifting attention to goals theorized and found by Greve (2008), both theoretically through its integration of risk theory and problemistic search and empirically through the new predictions tested here.

One can easily find ways in which goal conflict speaks to prominent organizational research streams. Institutional theory started out with a concern for how organizations managed internal operations when under external pressure to adopt specific actions (Meyer and Rowan 1977). Much attention was given to the tension between the goal of maintaining the formal structure and practices (often in terms of myth and ceremony) and the goal of maintaining smooth internal operations, and decoupling was advanced as the resolution (Meyer and Rowan 1977). Yet decoupling consumes resources, and at the margin there will always be the question of whether to emphasize the operational or the institutional goal—or whether to satisfy both goals at the expense of increased costs. These considerations give ample reason to treat institutional pressures as externally imposed goals to which organizations react differently as a function of their other goals. However, even treatments that come close to a goal-based formulation of institutional pressure have not explored this conflict (but see Shipilov et al. 2010). We see much room for additional research along these lines (Greve and Teh 2018).

The phrase "externally imposed goals" points toward a second research stream that could benefit from closer analysis of goal conflicts. Resource dependence theory was formulated to examine which external actors had the power to impose their goals on an organization (Pfeffer and Salancik 1978) and was based on the tension between such externally imposed goals and the organization's own internal goals. The strength of resource dependence theory is its ability to specify which goals the organization will (perhaps reluctantly) adopt as a result of external pressure (e.g., Casciaro and Piskorski 2005, Wry et al. 2013), but the weakness of this theory is in assuming that the attention devoted to such external goals is stable over time. Our finding that even internal goals are allotted varying amounts of attention—as a function of *other* goals—is good reason to reopen investigations into resource dependence theory with additional hypotheses. Earlier work using similar ideas is promising (Boeker and Goodstein 1991), but follow-up work has been insufficient.

The theory and findings presented here answer a specific shortcoming in the current research on organizational goals, and they are central to the further development of such research in the behavioral theory of the firm (Gavetti et al. 2012, Shinkle 2012). Yet the implications of these results extend much further because the behavioral theory of the firm is fundamentally about firm decisions, which means that it treats behaviors that have also been examined by other theoretical perspectives. Both the narrow and the broad views of this research indicate that it has significant potential for follow-up work and for increasing our knowledge about a wide range of organizational behaviors.

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## Endnotes
[1] To illustrate typical variation in safety records among interchangeable airplane models, in the year 2010, Boeing 767 had nearly half the cumulated accident rate of Airbus 330, giving airlines with A330 planes a clear opportunity to improve fleet safety by replacing them with Boeing 767s.

[2] There is an important distinction between operational safety goals and behaviors and fleet safety goals and behaviors. Unsafe operational events lead to changes in the organizational routines, as when

airlines improve through learning from reported safety-related incidents (Haunschild and Sullivan 2002). By contrast, a relatively less safe aircraft fleet, as indicated by its overall model safety record, is matched with the solution of selling less safe models and buying models with better safety records.

[3] The descending curve above the aspiration level differs from that of March and Shapira (1992), who have an ascending curve, and is made because increasing risk-taking with respect to safety cannot be justified at any level of risk.

[4] Because most data will have few observations at the far-left tail and many near the aspiration level, the visual impression of overall decreased risk given by the downward slope at the far left cannot be translated into a prediction.

[5] For the intuition behind this statement, consider whether you are more likely to book a ticket with an airline claiming to be the *safest* or with one claiming to have the *most improved* safety? In the real world, safety is not a selling proposition for airlines because they prefer that customers *not* consider (much less dwell on) the issue; that being said, the first of these advertising appeals is more appealing.

[6] A regression with firm fixed effects yields four variables with variance inflation factors (VIFs) greater than 10, with the highest VIF equal to 63.7. A regression with nation fixed effects, by contrast, has no VIF over 10.

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