

Causality Rules: Performance Feedback on Hierarchically Related Goals and Capital Investment Variability

Ambra Mazzelli^{a,b}, Robert S. Nason^c, Alfredo De Massis^{d,e} and Josip Kotlar^f

^a*Massachusetts Institute of Technology*; ^b*Asia School of Business*; ^c*Concordia University*; ^d*Free University of Bozen-Bolzano*; ^e*Lancaster University Management School*; ^f*School of Management Politecnico di Milano*

ABSTRACT We extend March and Simon's (1958) analysis of strategic decisions by distinguishing between two rules for allocating attention – priority versus causality. We develop theory concerning causality rules which have been largely overlooked in prior literature. Specifically, we examine how performance feedback on the intermediate productivity goal and the higher-order profitability goal independently and jointly influence the variability of firm capital investments. Panel analysis of 2,477 Spanish manufacturing firms reveals that these goals jointly affect the variability of capital investments through both priority and causality attention rules. Our study provides new insights on how firms handle multiple goals, deconstruct performance feedback, and cope with the attentional constraints of bounded rationality.

Keywords: attention rules, capital investment variability, organizational goals, performance feedback

INTRODUCTION

March and Simon's (1958) *Organizations* has fuelled a vibrant research stream on organizations' responses to problems. Central to *Organizations* is the concept of managerial attention. 'Understanding the ways in which attention is allocated is critical to understanding decisions. As a result, much of the book is devoted to theories of search: to examine when, where, and how organizations search for information about urgent problems, alternatives, and their consequences' (March and Simon, 1958, p. 4). Subsequent

Address for correspondence: Alfredo De Massis, Free University of Bozen-Bolzano, Bolzano, 39100, Italy and Lancaster University Management School, Lancaster, LA1 4YX, UK (alfredo.demassis@unibz.it, a.demassis@lancaster.ac.uk)

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empirical studies provide consistent evidence that organizations are unlikely to consider alternatives to the present course of action unless they face organizational problems (Gavetti et al., 2012). The behavioural approach emanating from March and Simon (1958) has become dominant in strategy and organizational research (Weick, 2019). However, there remain concepts in their 1958 book that lie dormant and insufficiently expounded in the literature.

First, while studies analyse how performance feedback influences absolute levels of resource investment or strategic activity (e.g., Audia and Greve, 2006; Desai, 2008; Greve, 2003b, 2003c), March and Simon's theory focuses more on organizational response variability. They describe how decision-makers tend to rely on learned patterns of behaviours, but are provoked into deviating from such patterns when facing organizational problems. Across organizations, variability emerges due to heterogeneity in how organizations structure attention by decomposing problems into *sub-goals*. Thus, how performance feedback induces variability in response patterns deserves further investigation (Gilbert, 2005; Maritan, 2001).

Second, although March and Simon observe that organizations pursue multiple goals, studies have largely concentrated on a single performance goal: firm profitability (Shinkle, 2012). Those that consider multiple goals assume that firms shift their attention as goals become more salient based on a priority rule (Cyert and March, 1963; Greve, 2008; March and Shapira, 1992). Yet, March and Simon (1958) suggest that firms structure goals hierarchically to support the ultimate goal of profit maximization. Specifically, firms use means-end relations to guide members' attention – a mechanism we refer to as *causality-based attention*. When problem symptoms do not provide a measuring rod to compare alternative courses of actions, sub-goals replace higher-level goals and guide action (March and Simon, 1958, p. 177). Unfortunately, we still lack evidence about causality rules in decision making.

In this study, we seek to revitalize these critical but largely untapped ideas in *Organizations*. Building on March and Simon's analysis of attention and their notion of interlinked sub-goals, we examine how feedback on profitability and productivity influence capital investment *variability*. Using a sample of Spanish manufacturing firms, we find that deviations from profitability and productivity aspirations increase capital investment variability, interacting through priority and causality attention rules. Thus, we seek to revitalize the powerful but largely dormant ideas in March and Simon (1958). First, we reorient research on organizational responses to performance feedback towards March and Simon's view of organizational goals as multiple and hierarchically related. As such, goal interactions are a key factor explaining heterogeneous strategic decisions across firms. Second, we shed new light on the nature of March and Simon's (1958) conceptualization of bounded rationality. In particular, organizational attention is distributed according to distinct rules, each manifesting under different performance conditions. Finally, drawing on March and Simon's (1958) conceptualization of organizational responses characterized by the two steps of *evocation* and *execution*, we highlight the role that different goals play therein. In so doing, we demonstrate the utility of March and Simon's insights for analysing the drivers of capital investment decisions (Sengul et al., 2019).

THEORETICAL DEVELOPMENT AND HYPOTHESES

March and Simon (1958) emphasize decision makers' bounded rationality, or their limited processing capacity to attend, interpret, and process information. Thus, 'we can only speak of rationality relative to a frame of reference; and this frame of reference will be determined by the limitations of the rational man's knowledge' (March and Simon, 1958, pp. 159–60). Bounded rationality implies that choice is always exercised with respect to a simplified 'model' of the real situation. At the organizational level, frames of reference give rise to aspiration levels, which are minimal outcomes deemed satisfactory for a goal variable (Cyert and March, 1963). Decision makers use aspiration levels to evaluate performance outcomes on organizational goals based on historical or social performance comparisons. When aspiration levels are not met, attention is triggered and strategic responses are induced to fix the problem. These assumptions suggest a relatively straightforward model guiding organizations' decisions. Specifically, a stimulus manifests when performance deviates from aspiration levels, decision makers link the performance-aspiration discrepancy to a problem, and, without further cognitive intervention, invoke a response. An *execution* step follows: a sequence of activities is performed to reach the goal associated with the evoked response (March and Simon, 1958, p. 170).

However, such response is not necessarily fixed, rather it 'is adaptive to a large number of characteristics of the stimulus that initiates it' (March and Simon, 1958, p. 163). First, broader goals leave organizational members with greater discretion to provide means-end connections, specific activities, and pacing rules in the execution phase (Feldman and Pentland, 2003). Second, attention rules enable focusing on one or few goals perceived as relevant to the current situation, ignoring those that are not (March and Simon, 1958; Ocasio, 2011). This is the case when an organization is unfamiliar with a stimulus and fixed responses are not available in its repertoire. At the broadest level, we differentiate between two main attention rules guiding selective attention: priority and causality rules (see Table I).

Priority vs. Causality Rules

According to a priority rule, decision-makers pay attention to goals in order of importance. The goal variable deemed more important receives attention, while scant attention is paid to secondary goals in the first hand (Cyert and March, 1963; Greve, 2003). Relatedly, Greve (2008) investigates firm growth relative to feedback on size and performance, finding that decision-makers pay less attention to size goals when performance is low. Decision-makers' attending to survival risk before profitability aspirations is another example of this rule (e.g., March and Shapira, 1992; Miller and Chen, 2004). Different mechanisms are used to establish priority, including proximity between goals and their respective aspiration levels (Chen and Miller, 2007), fire alarm rules (Greve, 2003), and norms reflecting the interests of evaluating audiences (Nason et al., 2018).

The priority rule has received considerable attention and empirical support (e.g., Chen and Miller, 2007; Greve, 2008), but largely overlooks the role of hierarchical relationships among goals (Joseph and Wilson, 2018). In this respect, March and Simon state that goals can trigger action only if 'there are some means, valid or illusory, for determining

Table I. Attention rules to multiple organizational goals

<i>Attention Rule</i>	<i>Domain of application</i>	<i>Type</i>	<i>Description</i>	<i>Aim</i>	<i>Example studies</i>
<i>Priority</i> Decision-makers prioritize the goal variable deemed more relevant in the eyes of the dominant coalition	Competing goals	Politically-driven	Decision-makers focus on the goal variable deemed more relevant in the eyes of the firm dominant coalition	Conflict avoidance/resolution	Cyert and March, 1963 [†] ; Greve and Zhang, 2017; Maritan, 2001*
		Self-enhancing	Decision-makers focus on the goal variable with the best performance	Self-enhancement	Audia and Brion, 2007; Jordan and Audia, 2012 [†]
		Proximity-based	Decision-makers focus on the goal variable whose performance is the closest to the aspiration level	Effort minimization	March and Shapira, 1992; Chen and Miller, 2007; Iyer and Miller, 2008
		Fire alarm	Decision-makers focus on the goal variable indicating a more urgent problem	Urgency reduction	Cyert and March, 1963 [†] ; Greve, 2003 [†] ; Greve, 2008
<i>Causality</i> Decision-makers focus on a specific sub-goal as they view its fulfilment instrumental to the fulfilment of a higher-level goal	Hierarchical goals	Norm-driven	Decision-makers focus on the goal variable which better serves the interests of evaluating audiences	Gaining/maintaining socio-political legitimacy	Greve and Teh, 2018 [†] ; Nason et al., 2018 [†]
		Schema-based	Sub-goals are selected based on past experience and encoded knowledge in relation to means-end relationships	Root cause detection and elimination	Greve, 2008; Joseph and Wilson, 2018*; March and Simon, 1958 [†]
		Architecture-based	Sub-goals are selected based on the organization structure	Efficiency	Joseph and Wilson, 2018*; March and Simon, 1958 [†] ;

[†]Theoretical or empirical studies that discuss the rule but do not provide empirical evidence.

*Qualitative studies.

connections between alternative actions and goal satisfaction' (1958, p. 177). Therefore, broad goals are factored into a number of nearly independent sub-goals. These can be accomplished through local responses, substituting the complex reality with a model of reality that is sufficiently simple to handle (March and Simon, 1958, p. 173). Decision-makers decompose a higher-level goal through a means-end analysis and assign sub-goals to individual organizational units. Under such circumstances, attention is driven by a *causality rule*: sub-goals gain attention when decision-makers see their attainment as a means to accomplish a higher-level goal (Greve, 2008).¹

Causality Rules and Capital Investment Decisions

Capital investment decisions offer a privileged opportunity to explore the causality rules in action, as we illustrate in Figure 1. The flow of capital to a particular investment is the result of a complex structure of interrelated decisions (see Figure 1). Feedback on a higher-level goal (e.g., profitability) may act as a stimulus to direct attention toward a set of sub-goals, and search and action loci (e.g., sales or production department). The stimuli originating from feedback on sub-goals may serve to establish the scope of action. For instance, such feedback can affect decision-makers' judgments on whether an investment project should preserve the quantity of a capability, increase it, or build a new capability. This, in turn, influences proposal selection and thus capital investment (Maritan, 2001). In the next section, we apply this logic to explain capital investment variability in response to feedback on two hierarchically related goals: profitability and productivity.

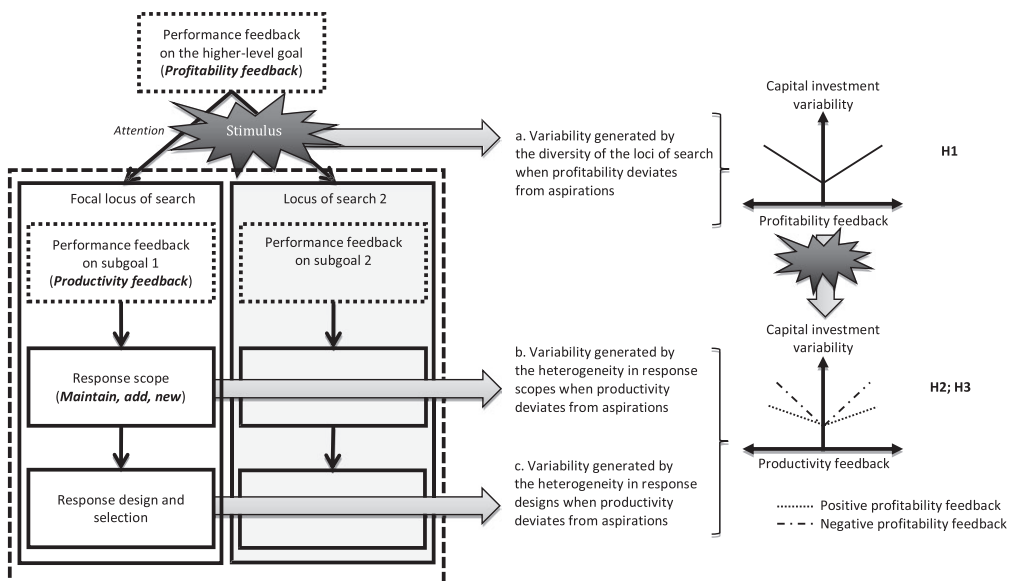


Figure 1. Causality rule, response components, and capital investment variability

Effects of Profitability and Productivity Goals on Capital Investment Variability

A large body of research has acknowledged the means-end relationship between firm productivity and profitability. While profitability captures the final result of a firm's operations, productivity measures the efficiency of operations and the ability to create goods and services by employing capital and labour (Lieberman and Kang, 2008). March and Simon (1958, p. 214) recognize the productivity goal as a means to solve problems related to the more general profit maximization goal. As we explain next, there are a number of reasons to posit that positive and negative deviations from productivity and profitability aspiration levels will induce variable responses.

Profitability feedback and capital investment variability. When decision-makers receive profitability feedback, they must judge the relative merit of invoking different kinds of responses (March and Simon, 1958). We expect that negative feedback will increase the heterogeneity of beliefs about the set of responses and level of investment to undertake. This, in turn, will increase the variability of capital investments across firms (Hambrick and D'Aveni, 1988).

More specifically, as profitability decreases below the aspiration level, some organizations will be increasingly willing to deviate from current activities and experiment with other viewpoints. For instance, Miller and Chen (1996) show that organizations experiencing poor profitability feedback tend to increase the range of response repertoires. Furthermore, negative profitability feedback may instil an optimal level of stress that motivates decision-makers to undertake large investments in their search for new ways of operating (Greve, 2003). For instance, Audia and Greve (2006) demonstrate that negative profitability fosters factory expansion in the shipbuilding industry. Similarly, Desai (2008) find a positive relationship between profitability below aspirations and capacity expansions in U.S. railroad firms. Conversely, some organizations might exhibit tendencies to restrict budgets and allocate progressively fewer resources due to excessive levels of stress, anxiety, and arousal (Ocasio, 1995). Under such circumstances, decision-makers may try to offset performance shortfalls by reducing or delaying capital investments (Bromiley, 1986). Souder and Bromiley (2012, p. 554) posit that 'capital expenditures replace equipment and facilities that still function, so delaying an investment simply means operating longer with current equipment and facilities'.

Symmetrically, as profitability increases above aspiration levels, some organizations may become more complacent and thus increasingly reluctant to change their current resource investment patterns (Gilbert, 2005). Yet, others may increase resource commitment and investment due to resource availability (Baum et al., 2005). In particular, 'When a firm performs above its aspirations, it generates incremental resources not covered by prior agreements and formalized in its budget. Such new resources provide flexibility to upgrade equipment or expand infrastructure more aggressively' (Souder and Bromiley, 2012, p. 554). Juxtaposing the above arguments suggests the following hypothesis:

Hypothesis 1: Capital investment variability increases when profitability departs, either positively or negatively, from the aspiration level.

Productivity feedback and capital investment variability. Decision-makers have substantial discretion over the scope and timing of capital investments (Bromiley, 1986). Hence, the level of capital investment can vary based on the type of investment project that decision-makers select, and on the temporal distribution of the investment (Sanders and Hambrick, 2007). For example, the investment required to introduce a new manufacturing technology rather than upgrade existing equipment, or build a new plant rather than renew machinery, differs greatly. Langley and Truax (1994) show that even when organizations commit to a new technology, the level of commitment fluctuates over time and affects the type of technology adopted.

Productivity close to aspiration levels is likely to motivate decision-makers to maintain the stock of existing organizational capabilities. In contrast, productivity deviations from aspiration levels will spur capital investments aimed at improving or enriching the stock of current operating-level capabilities. This can lead decision-makers to envision and select from among a wider variety of investment projects, thereby increasing the variability of capital investments. Moreover, 'related to these changes in capability stock are differences in uncertainty concerning the production function' (Maritan, 2001, p. 515). In conditions of uncertainty, decision-makers with a direct perception of production processes (e.g., production managers) can become an important source of informational premises for action. They can help determine the technical and economic content of investment proposals (March and Simon, 1958). Hence, we expect that differences in individual biases and risk preferences across production managers will engender further heterogeneity in investment decisions (Bower, 1970).

As productivity falls below the aspiration level, some production managers may become increasingly willing to develop investment projects involving bold actions to add to the stock of existing capabilities. For instance, General Motors' production managers in the late 1980s responded to poor productivity performance with a long-term project involving heavy investments in capacity expansion (Alden et al., 2006). On the other hand, as production managers are often evaluated based on productivity, they tend to 'concentrate on the incremental adverse effect of an individual investment' (Maritan, 2001, p. 523). Consequently, production managers may be increasingly reluctant to consider investment opportunities outside their current experience (Souder and Bromiley, 2012).

In parallel, productivity increases above the aspiration level may instil concerns related to limiting productivity disruptions. Therefore, production managers will avoid radical projects that may be more likely to falter during implementation (Aiman-Smith and Green, 1986). Positive productivity feedback may also reinforce beliefs that current production equipment and facilities are appropriate, thereby reducing decision-makers' sense of urgency to renew production assets. Furthermore, increasing productivity leads to higher expectations, which by definition are more difficult to meet. The heightened risk of not meeting performance targets will lead decision-makers to exercise caution in their investment decisions. However, some production managers may view high productivity as an opportunity, instigating the relatively open pursuit of risky projects and perceived flexibility to expand the infrastructure more aggressively (Joseph and Wilson, 2018; Souder and Bromiley, 2012). These opposing tendencies are likely to increase the variability of capital investments. Formally stated:

Hypothesis 2: Capital investment variability increases when productivity departs, either positively or negatively, from the aspiration level.

Causality-based attention allocation and capital investment variability. By virtue of the means-end productivity and profitability relationship, negative profitability feedback is likely to ‘amplify’ attention to productivity as a means to mend the profitability shortfall.

Under such circumstance, corporate managers amplify the attention of divisional managers by ensuring access to resources and information (Sengul et al., 2019). For example, Joseph and Wilson (2018) highlight that attentional integration between the corporate office and divisional managers was critical to amplifying the attention patterns of Motorola’s managers. To develop a more sophisticated switching network, Motorola amplified attention to product innovation goals, granting divisional managers latitude to devise the solutions to achieve these goals. Similarly, negative profitability feedback may provide production managers with additional discretion, exacerbating deviation and variability in how they respond to productivity feedback. In contrast, when profitability exceeds aspirations, organizations will be less motivated to search for root causes, and will thus pay less attention to particular sub-goals. In some instances, profitability above the aspiration level could even stabilize decisions in response to productivity feedback in terms of investment scope and design. Hence, we expect that the investment variability unleashed by productivity feedback will be less affected in gain situations than in loss situations. These ideas support the following hypothesis:

Hypothesis 3: Productivity departing from the aspiration level will increase capital investment variability more when the firm is below the profitability aspiration level than when above the profitability aspiration level.

METHODS

Data and Sample

Our data – covering the period 1998 to 2012 – derive from the Spanish database *Encuesta sobre Estrategias Empresariales* (Survey on Business Strategies, ESEE). This is an annual survey of the activities of Spanish manufacturing firms that the Fundacion Empresa Publica conducts with the support of the Spanish Ministry of Industry (e.g., Delgado et al., 2002; Greenwood et al., 2010). The reference population is composed of Spanish firms with 10 or more employees in one of the two-digit manufacturing subsectors in NACE Rev. 2 (European industrial classification scheme). Manufacturing industries are a particularly appropriate context for the investigation of productivity and capital investments (Delgado et al., 2002). Firms in ESEE were initially selected combining census (for firms with more than 200 employees) and random sampling (for firms with 10 to 200 employees) schemes. The rate of participation reached approximately 70 per cent of the population firms within the large-size category, and 5 per cent within the

small-size category. To minimize attrition and ensure representativeness over time, the database includes new firms each year with the same sampling criteria as the base year. Hence, dataset coverage varies depending on firm size group (large vs. small). Due to entry and exit, the dataset is an unbalanced panel. The unbalanced panel used in this study included 2,477 Spanish manufacturing firms with a total 13,620 firm-year observations (3,666 from large firms; 9,954 from small firms). Given the sampling properties of our dataset, we report separate statistics and regressions for the two size categories.

Dependent Variable

Production asset variability. Building on prior studies, we used the logarithm of the value of firm total tangible assets to account for decisions on capital investments (Audia and Greve, 2006; Desai, 2008; Greve, 2003). This measure includes machinery and other fixed assets, but excludes financial assets. ‘Because machinery and other tangible assets in the manufacturing industry are highly specialized and immobile, it represents a direct measure of hard-to-recover assets devoted to production’ (Greve, 2003, p. 1060). To measure variability, we used a multiplicative heteroscedasticity approach, which allows us to simultaneously estimate the effects of covariates on the mean and variance of production assets (see Chrisman and Patel, 2012; Sorenson and Sørensen, 2001). This model parametrizes the error term $\epsilon_{i,t+1}$ of the estimated mean of production assets² as a function of a vector of covariates X_{it} , which includes the same factors used to estimate the mean, and a random term $u_{i,t+1}$.

$$\epsilon_{i,t+1} = e^{X_{it}\Gamma} u_{i,t+1}$$

The Γ parameter captures the effects of X_{it} on the logarithm of the variance of production assets. Factors that increase the variability of production assets should have $\Gamma > 0$, while those that reduce it $\Gamma < 0$. The specification leads to a linear model for the mean and a log-linear model for the variance of the dependent variable estimated simultaneously using maximum likelihood methods (Greene, 1993).

Independent Variables

Profitability below/above aspiration. We measured this variable as the discrepancy between a firm’s return on assets (ROA) in year t-1 and the firm’s ROA in year t-2. We used ROA as the profitability indicator, since it is relatively insensitive to capital structure heterogeneity across firms. We entered the aspiration performance measure as a spline specification using two continuous but censored variables to control for the behaviour of underperforming and outperforming firms (e.g., Baum et al., 2005; Greve, 2008).

Productivity below/above aspiration. We measured productivity aspiration discrepancy as the change in multi-factor productivity between t-2 and t-1 (Lieberman et al., 1990). Multi-factor productivity is a weighted average of labour and capital productivity, where the former corresponds to value-added per worker-hour and the latter captures value-added per unit of capital stock (Lieberman and Kang, 2008). Specifically, we used the following formula to compute changes in multi-factor productivity:

$$\Delta MFP_{it} = [\ln VA_{i,t-1} - \ln VA_{i,t-2}] - (1 - s_{i,t-1}) [\ln K_{i,t-1} - \ln K_{i,t-2}] - s_{i,t-1} [\ln L_{i,t-1} - \ln L_{i,t-2}]$$

where VA_i is the firm's value added in a given year, K_i is the capital stock, and L_i is the labour input (in hours). s_i is the fraction of value added paid to employees, $(1 - s_i)$ is the fraction that implicitly goes as a payment to capital. A similar measure reflects the total economic value created by capital and labour employed within the enterprise. To estimate the firm's capital stock K_i , we used the 'perpetual inventory method' (see Lieberman et al., 1990) as follows:

$$K_{i,t-1} = (1 - d) K_{i,t-1} + I_{i,t}$$

where d is the annual rate of economic depreciation and I_t is the firm's gross investment in year t . We assumed that d is equal to 11%.³ We entered each aspiration performance measure as a spline specification.

Control Variables

Following prior literature, we included a number of firm- and industry-level variables to control for alternative explanations for changes in capital investment. Control variables were lagged one year to mitigate reverse causality concerns and avoid simultaneity. At the firm level, to control for *firm size*, we used the log of total revenues. As firms close to bankruptcy may be risk-averse and interpret a given situation as a threat, we included Altman's Z-score as a measure of *distance from bankruptcy*. A lower Z value means a higher likelihood of bankruptcy. To control for organizational slack, we used the *slack composite index* based on the standardized mean of absorbed, unabsorbed, and potential slack. As *R&D intensity* represents an alternative use of firm resources, we included R&D expenditure divided by revenues as a control. We also controlled for firm *geographic and market dispersion*, *related and unrelated product diversification*, *age*, and *debt to equity ratio* to gauge the firm's financial leverage. At the industry level, we included time-varying *industry growth* to control for industry demand prospects, which could influence managers' decisions to engage in capital investments, and *concentration ratio*. Finally, we included *year dummies* to control for unobserved systematic period effects.

Testing Strategy

To test our hypotheses, we used hierarchical regression analysis with both unstandardized and standardized coefficients. We compared the coefficient estimates within and across models using t-tests for the significance of individual coefficients and χ^2 -tests of coefficient equality. First, if profitability and productivity goals are hierarchically related, we expect *profitability below/above aspiration* will have a greater effect on production asset variability than the corresponding productivity feedback variables. Hence, to test effect size differences between profitability and productivity feedback, we compared the 95 per cent confidence intervals of the corresponding standardized beta weights. When confidence intervals overlap by less than 50 per cent, the beta weights are considered

significantly different ($p < 0.05$; Cumming, 2009). Second, if the productivity goal is mainly activated by profitability considerations, the effect size of productivity feedback on production asset variability will decrease when including both profitability and productivity feedback in the regression models. In contrast, we expect no significant decrease in the effect size of profitability below/above aspirations when adding the productivity variables to the regressions.

To test Hypothesis 3, we formed interaction variables between *productivity below/above aspiration* and a dummy indicator variable *negative profitability* – set to 1 when *profitability below aspiration* is positive, 0 otherwise. If negative profitability amplifies attention to productivity goals, as Hypothesis 3 specifies, then the interaction variables will have signs as the main effects of negative/positive productivity feedback. The use of a dummy variable for profitability reflects the idea that negative profitability acts as a stimulus that activates and/or emphasizes attention to productivity. Furthermore, it helps to ‘rule out’ reverse ordering between productivity and profitability in the goal hierarchy (Greve, 2008).

RESULTS

Tables II and III provide the summary statistics and correlation matrixes for small and large firms. Correlations between relevant variables are all quite low, suggesting that multicollinearity is not a concern. The highest variance inflation factors (VIFs) for independent variables in model 4 are all well below the reference threshold of 10, ranging from 1.05 to 1.79 for small firms and 1.12 to 1.59 for large firms.⁴

Table IV reports the estimates of production asset variability (log variance).⁵ Model 1 introduces a baseline model including only the control variables, while we added the main research variables to models 2 and 3. In model 4, profitability feedback and productivity feedback are entered simultaneously. Finally, model 5 adds the interactions between *productivity below/above aspiration* and *negative profitability*.

In support of Hypothesis 1, the coefficients for *profitability below/above aspiration* in model 2 are positive and statistically significant for both small (*profitability below aspiration*: $\beta = 0.42$, $p < 0.001$; *profitability above aspiration*: $\beta = 0.33$, $p < 0.001$) and large firms (*profitability below aspiration*: $\beta = 1.05$, $p < 0.001$; *profitability above aspiration*: $\beta = 0.91$, $p < 0.001$). Increasing the distance of profitability below (above) the aspiration level by one standard deviation generates an increase in production asset variance of approximately 12 per cent (9 per cent) for small firms and 16 per cent (14 per cent) for large firms.⁶ Similarly, the coefficients for *productivity below/above aspiration* in model 3 indicate a positive relationship between productivity distance from the aspiration level and capital investment variability. A one unit drop in productivity below the historical aspiration level leads to a 12.7 per cent increase in the variance of production assets for small firms ($\beta = 0.12$, $p < 0.001$), with 8.3 per cent and 11.7 per cent representing a plausible range (95 per cent CI = [0.080 0.159]). Instead, it leads to a 20 per cent increase in the variance of production assets for large firms ($\beta = 0.18$, $p < 0.001$), with 8.6 per cent to 24.1 per cent representing a plausible range (95 per cent CI = [0.083 0.216]). Symmetrically, a one unit increase in productivity distance above the aspiration level leads to increased production

Table II. Summary statistics and correlations for small firms

<i>Variable</i>	<i>Mean</i>	<i>s. d.</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>15</i>	<i>16</i>	<i>17</i>
1 Production assets _t	14.63	1.53	1.00																
2 Size	15.07	1.39	0.90	1.00															
3 Distance from bankruptcy	3.63	3.27	-0.17	-0.01	1.00														
4 Slack composite index	0.07	1.84	0.06	-0.08	-0.09	1.00													
5 Geographical dispersion	0.02	0.12	0.13	0.13	-0.01	0.00	1.00												
6 R&D intensity	0.00	0.02	0.14	0.11	-0.06	-0.01	0.00	1.00											
7 Related diversification	0.05	0.23	0.07	0.08	-0.01	-0.01	0.03	0.03	1.00										
8 Unrelated diversification	0.07	0.26	0.02	0.02	-0.00	-0.02	0.01	0.01	-0.07	1.00									
9 Age	26.09	18.78	0.28	0.27	-0.04	0.06	0.01	0.05	0.06	-0.02	1.00								
10 Debt to equity ratio	3.62	21.62	-0.02	-0.01	-0.05	0.32	-0.01	-0.01	0.01	-0.01	-0.04	1.00							
11 Market dispersion	1.98	1.15	0.17	0.17	-0.03	-0.02	0.05	0.05	0.06	0.04	0.11	-0.01	1.00						
12 Concentration ratio	20.18	31.04	0.28	0.27	-0.03	0.02	0.08	0.07	0.08	0.02	0.12	-0.02	0.11	1.00					
13 Industry growth _t	-0.03	0.14	0.03	-0.00	-0.02	-0.01	0.01	0.03	-0.00	-0.02	-0.01	0.01	0.02	0.03	1.00				
14 Productivity below aspiration	0.23	0.52	-0.02	-0.04	-0.06	0.02	0.03	0.01	0.00	0.00	-0.07	0.03	-0.03	-0.02	0.01	1.00			
15 Productivity above aspiration	0.20	0.68	-0.02	-0.00	0.03	0.01	-0.00	-0.01	-0.00	-0.01	0.00	0.04	-0.01	0.00	-0.01	-0.13	1.00		
16 Profitability below aspiration	0.10	0.27	-0.11	-0.09	-0.00	-0.02	-0.02	0.01	-0.00	-0.02	-0.05	-0.00	-0.02	-0.03	0.03	0.20	-0.05	1.00	
17 Profitability above aspiration	0.08	0.26	-0.09	-0.02	0.63	-0.06	-0.01	-0.02	-0.01	-0.01	-0.03	0.04	-0.01	-0.01	-0.04	-0.07	0.14	-0.12	1.00

N = 9,954.

Table III. Summary statistics and correlations for large firms

<i>Variable</i>	<i>Mean</i>	<i>s. d.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Production assets _t	18.11	1.20	1.00																
2 Size	18.46	1.12	0.84	1.00															
3 Distance from bankruptcy	3.33	2.28	-0.12	0.13	1.00														
4 Slack composite index	-0.19	1.46	0.05	-0.08	-0.11	1.00													
5 Geographical dispersion	0.23	0.45	0.39	0.39	-0.02	0.01	1.00												
6 R&D intensity	0.01	0.03	0.11	0.04	-0.08	0.01	-0.05	1.00											
7 Related diversification	0.07	0.26	0.09	0.14	0.03	-0.02	0.04	-0.04	1.00										
8 Unrelated diversification	0.08	0.27	0.00	-0.01	0.02	0.01	-0.00	0.00	-0.08	1.00									
9 Age	38.83	24.40	0.21	0.16	-0.01	0.03	0.12	0.04	0.01	0.00	1.00								
10 Debt to equity ratio	4.72	95.46	0.03	0.02	-0.02	0.62	0.03	-0.01	0.00	-0.01	0.01	1.00							
11 Market dispersion	2.32	1.29	0.11	0.09	-0.05	-0.02	0.06	0.02	0.03	0.08	0.01	-0.02	1.00						
12 Concentration ratio	35.60	33.51	0.08	0.07	0.01	0.01	0.05	-0.01	0.01	0.02	0.04	0.00	0.05	1.00					
13 Industry growth _t	-0.02	0.14	0.05	-0.05	-0.09	0.01	-0.02	-0.01	-0.01	-0.02	-0.03	-0.00	0.04	0.06	1.00				
14 Productivity below aspiration	0.17	0.39	0.05	0.04	-0.07	0.00	0.05	0.01	0.00	-0.01	-0.02	0.00	0.00	-0.02	-0.01	1.00			
15 Productivity above aspiration	0.14	0.34	0.09	0.09	0.03	0.01	0.02	0.01	0.02	-0.02	0.02	-0.00	0.01	-0.01	0.03	-0.17	1.00		
16 Profitability below aspiration	0.07	0.14	-0.06	-0.05	-0.00	-0.01	-0.04	0.02	-0.02	0.02	-0.02	-0.00	-0.03	0.00	0.04	0.27	-0.13	1.00	
17 Profitability above aspiration	0.06	0.14	-0.08	0.01	0.51	-0.07	-0.03	-0.02	0.02	-0.01	0.00	-0.01	-0.03	-0.03	-0.03	-0.10	0.27	-0.19	1.00

N = 3,666. Coefficients greater in magnitude than 0.02 are significant at the 0.05 level.

Table IV. Multiplicative heteroscedasticity models of production asset investment variability^{a,b}

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms
<i>Effects on log variance</i>										
Size	-0.05 (0.00)***	-0.01 (0.01)	-0.05 (0.00)***	-0.02 (0.01)†	-0.05 (0.00)***	0.01 (0.01)	-0.05 (0.00)***	0.01 (0.01)	-0.05 (0.00)***	-0.00 (0.01)
	[-0.06 -0.04]	[-0.03 0.01]	[-0.06 -0.04]	[-0.04 0.00]	[-0.06 -0.04]	[-0.01 0.04]	[-0.06 -0.04]	[-0.02 0.03]	[-0.06 -0.04]	[-0.03 0.02]
Distance from bankruptcy	0.04 (0.00)***	0.02 (0.00)***	0.04 (0.00)***	0.02 (0.00)***	0.03 (0.00)***	-0.00 (0.01)	0.03 (0.00)***	0.00 (0.00)	0.03 (0.00)***	0.00 (0.00)
	[0.03 0.04]	[0.01 0.03]	[0.03 0.04]	[0.01 0.03]	[0.02 0.03]	[-0.01 0.01]	[0.02 0.03]	[-0.01 0.01]	[0.02 0.03]	[-0.01 0.01]
Slack composite index	-0.02 (0.00)***	-0.01 (0.01)	-0.02 (0.00)***	-0.01 (0.01)	-0.01 (0.00)***	-0.01 (0.01)	-0.01 (0.00)***	-0.01 (0.01)	-0.01 (0.00)***	-0.02 (0.01)*
	[-0.03 -0.01]	[-0.03 0.00]	[-0.03 -0.01]	[-0.03 0.00]	[-0.02 -0.01]	[-0.03 0.01]	[-0.02 -0.01]	[-0.03 0.00]	[-0.02 -0.01]	[-0.04 -0.00]
Geographical dispersion	-0.01 (0.05)	0.29 (0.03)***	0.01(0.05)	0.32 (0.03)***	0.03 (0.05)	0.30 (0.03)***	0.04 (0.05)	0.32 (0.03)***	0.03 (0.05)	0.33 (0.03)***
	[-0.11 0.10]	[0.23 0.35]	[-0.09 0.12]	[0.26 0.38]	[-0.07 0.14]	[0.24 0.36]	[-0.07 0.15]	[0.26 0.38]	[-0.07 0.14]	[0.27 0.39]
R&D intensity	-0.23 (0.34)	-0.01 (0.47)	-0.39 (0.34)	-0.34 (0.47)	-0.26 (0.35)	-0.52 (0.48)	-0.31 (0.35)	-0.74 (0.47)	-0.28 (0.35)	-1.14 (0.46)*
	[-0.91 0.45]	[-0.94 0.92]	[-1.06 0.28]	[-1.26 0.58]	[-0.95 0.42]	[-1.46 0.41]	[-0.99 0.37]	[-1.67 0.18]	[-0.97 0.40]	[-2.04 -0.25]
Related diversification	-0.06 (0.03)*	-0.26 (0.05)***	-0.06 (0.03)†	-0.23 (0.05)***	-0.02 (0.03)	-0.28 (0.05)***	-0.02 (0.03)	-0.26 (0.05)***	-0.02 (0.03)	-0.23 (0.05)***
	[-0.12 -0.00]	[-0.34 -0.16]	[-0.11 -0.00]	[-0.32 -0.14]	[-0.08 0.03]	[-0.37 -0.19]	[-0.08 0.03]	[-0.36 -0.17]	[-0.08 0.04]	[-0.33 -0.14]

Table IV. Continued

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms
Unrelated diversification	-0.05 (0.03) [†]	-0.15 (0.05)**	-0.05 (0.03) [†]	-0.15 (0.05)**	-0.01 (0.03)	-0.13 (0.05)**	-0.01 (0.03)	-0.14 (0.05)**	-0.01 (0.03)	-0.14 (0.05)**
	[-0.10 0.00]	[-0.24 -0.05]	[-0.10 0.00]	[-0.24 -0.06]	[-0.08 0.03]	[-0.23 -0.04]	[-0.06 0.05]	[-0.24 -0.05]	[-0.06 0.04]	[-0.23 -0.05]
Age	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)*	-0.00 (0.00)*	-0.00 (0.00)	-0.00 (0.00)*	-0.00 (0.00)	-0.00 (0.00)*	-0.00 (0.00) [†]
	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]	[-0.00 -0.00]	[-0.00 -0.00]	[-0.00 0.00]	[-0.00 -0.00]	[-0.00 0.00]	[-0.00 -0.00]	[-0.00 0.00]
Debt to equity ratio	0.00 (0.00)***	0.01 (0.00)***	0.00 (0.00)***	0.01 (0.00)**	0.00 (0.00)***	0.00 (0.00)	0.00 (0.00)***	0.00 (0.00)	0.00 (0.00)***	0.00 (0.00)
	[0.00 0.00]	[0.00 0.01]	[0.00 0.00]	[0.00 0.01]	[0.00 0.00]	[-0.00 0.00]	[0.00 0.00]	[-0.00 0.00]	[0.00 0.00]	[-0.00 0.00]
Market dispersion	-0.02 (0.01)***	-0.07 (0.01)***	-0.02 (0.01)***	-0.07 (0.01)***	-0.02 (0.01)**	-0.06 (0.01)***	-0.02 (0.01)**	-0.06 (0.01)**	-0.02 (0.01)**	-0.06 (0.01)***
	[-0.04 -0.01]	[-0.09 -0.05]	[-0.04 -0.01]	[-0.09 -0.06]	[-0.03 -0.01]	[-0.08 -0.04]	[-0.03 -0.01]	[-0.08 -0.04]	[-0.03 -0.01]	[-0.08 -0.04]
Concentration ratio	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]	[-0.00 0.00]
Industry growth	0.04 (0.09)	0.18 (0.14)	0.04 (0.09)	0.24 (0.14) [†]	0.04 (0.09)	0.28 (0.15) [†]	0.03 (0.09)	0.33 (0.15) [†]	0.02 (0.09)	0.23 (0.15)
	[-0.13 0.21]	[-0.10 0.46]	[-0.13 0.21]	[-0.04 0.52]	[-0.13 0.21]	[-0.00 0.57]	[-0.13 0.20]	[-0.05 0.62]	[-0.15 0.19]	[-0.05 0.52]
Profitability below aspiration (Hypothesis 1)										
			0.42 (0.03)***	1.05 (0.10)***	0.39 (0.03)***	1.06 (0.10)***	0.40 (0.04)***	1.39 (0.12)***	0.40 (0.04)***	1.39 (0.12)***
			[0.35 0.48]	[0.85 1.24]	[0.32 0.46]	[0.86 1.26]	[0.33 0.48]	[1.16 1.62]	[0.33 0.48]	[1.16 1.62]

Table IV. *Continued*

<i>Variable</i>	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>		<i>Model 4</i>		<i>Model 5</i>	
	<i>Small firms</i>	<i>Large firms</i>	<i>Small firms</i>	<i>Large firms</i>	<i>Small firms</i>	<i>Large firms</i>	<i>Small firms</i>	<i>Large firms</i>	<i>Small firms</i>	<i>Large firms</i>
Profitability above aspiration (<i>Hypothesis 1</i>)			0.33 (0.04)*** [0.25 0.41]	0.91 (0.10)*** [0.71 1.11]			0.33 (0.04)*** [0.25 0.41]	0.78 (0.11)*** [0.57 0.99]	0.34 (0.04)*** [0.26 0.42]	0.86 (0.12)*** [0.63 1.10]
Productivity below aspiration (<i>Hypothesis 2</i>)					0.12 (0.02)*** [0.08 0.16]	0.18 (0.04)*** [0.10 0.26]	0.05 (0.02)* [0.01 0.08]	0.07 (0.04) [†] [−0.01 0.16]	0.19 (0.06)** [0.08 0.31]	0.48 (0.08)*** [0.32 0.64]
Productivity above aspiration (<i>Hypothesis 2</i>)					0.03 (0.01)* [0.00 0.05]	0.21 (0.04)*** [0.13 0.29]	0.01 (0.01) [−0.01 0.04]	0.17 (0.04)*** [0.09 0.25]	−0.02 (0.02) [−0.06 0.02]	0.06 (0.06) [−0.06 0.18]
Productivity below aspiration x Negative profitability (<i>Hypothesis 3</i>)									−0.16 (0.06)** [−0.28 −0.04]	−0.64 (0.09)*** [−0.82 −0.46]
Productivity above aspiration x Negative profitability (<i>Hypothesis 3</i>)									0.05 (0.03)* [0.00 0.10]	0.24 (0.08)** [0.08 0.40]
N	9954	3666	9954	3666	9954	3666	9954	3666	9954	3666
Adjusted R ²	0.86	0.90	0.87	0.90	0.86	0.90	0.86	0.90	0.86	0.90
Log likelihood	−4465.12	−1391.22	−4437.54	−1366.86	−4313.06	−1294.98	−4304.98	−1282.69	−4298.35	−1246.69

^aUnstandardized coefficients are reported.^bStandard errors in parentheses, 95%, confidence intervals in square brackets.[†]p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001.

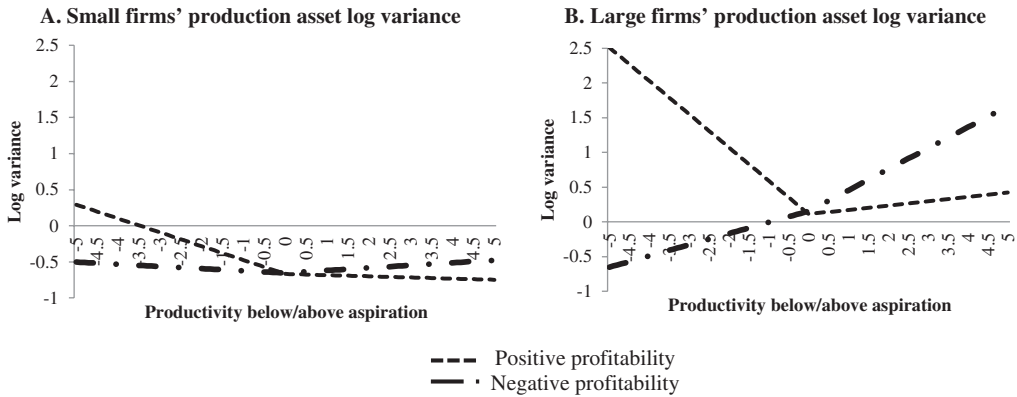


Figure 2. Moderating Effect of profitability on the relationship between productivity feedback and production asset log variance

asset variance ranging between 0.2 per cent and 5.4 per cent for small firms (95 per cent CI = [0.002 0.053]) and 11.5 per cent and 26.6 per cent for large firms (95 per cent CI = [0.108 0.236]). Taken together, these results provide support for Hypothesis 2.

We used the standardized coefficient estimates⁷ from model 4 to test whether the effects of profitability and productivity feedback were statistically different. No overlap was detected between the confidence intervals of the variables *profitability below aspiration* (small firms: $\beta = 0.11$, 95% CI = [0.089 0.127]; large firms: $\beta = 0.15$, 95% CI = [0.119 0.176]) and *productivity above aspiration* (small firms: $\beta = 0.02$, 95 per cent CI = [0.004 0.044]; large firms: $\beta = 0.03$, 95 per cent CI = [-0.003 0.060]). The result of an χ^2 -test for equality of coefficients corroborates our prediction that the effect on production asset variability of *profitability below aspiration* is statistically significantly greater than the effect of *productivity below aspiration* (small firms: $\chi^2 = 3.50$, $p > 0.05$; large firms: $\chi^2 = 3.05$, $p > 0.05$). As the beta weight confidence intervals for *profitability above aspiration* and *productivity above aspiration* overlap in the sample of large firms, to test for differences in the effect sizes, we calculated half of the average of the overlapping confidence intervals (0.014). Hence, we added this value to the lower bound estimate of the beta weight for *profitability above aspiration* (0.083), which yielded 0.097. As the *productivity above aspiration* upper bound estimate (0.085) was below the critical threshold of 0.097, the difference between the effects of *profitability above aspiration* and *productivity above aspiration* was considered statistically significant ($p < 0.05$, Cumming, 2009). Overall, these results corroborate the idea that profitability occupies a higher position than productivity in the goal hierarchy. Additionally, we do not observe statistically significant decreases in coefficient magnitudes for *productivity above aspiration* across small and large firms. However, the effect size of *productivity below aspirations* meaningfully decreases⁸ from model 3 to model 4, in line with our expectations.

Model 5 adds the interaction variables testing Hypothesis 3 stating that productivity goals are activated when profitability is below the aspiration level. Our results provide mixed support for this hypothesis. Figure 2 graphically presents the effects of the interactions between productivity feedback and the negative profitability dummy variable for the

group of small (Panel A) and large (Panel B) firms using the estimates from model 5. The positive and statistically significant coefficient for the interaction between *productivity above aspiration* and the *negative profitability dummy* (small firms: $\beta = 0.05$; large firms $\beta = 0.23$) is in line with the hypothesized relationship. However, poor profitability significantly weakens the positive effect of productivity below the aspiration level on production asset variance (for small firms: $\beta = -0.16$, $p = .007$; for large firms $\beta = -0.64$, $p < 0.001$). This result could indicate that rather than using a causality rule, organizations use a priority rule when facing negative feedback on multiple goals, even when these goals are hierarchically related. In particular, when facing negative feedback for both profitability and productivity, the corporate office may be more reluctant to grant divisional managers the discretion to devise capital investment projects (Maritan, 2001). Senior managers could instead try to stabilize the attention of divisional managers by orienting them toward particular investment projects perceived as facilitating performance recovery.

Robustness Checks and Further Empirical Investigation of our Theory

We performed several robustness checks to examine the sensitivity of our results. Alternative specifications did not affect our main findings. We grouped the robustness checks into four categories: (1) alternative courses of action in response to productivity and profitability feedback, (2) alternative measurements of performance feedback, (3) profitability-productivity relationship defined *ex ante* vs. *ex post*, and (4) endogeneity issues.

Alternative courses of action in response to productivity and profitability feedback. Capital investments may not be the only response evoked by productivity feedback. March and Simon (1958) associate the performance of manufacturing firms with both machine and human productivity. Hence, we tested our hypotheses using variability of investments in technical training as the dependent variable. The results indicate a negative effect of *productivity below/above aspiration* on the variability of training expenditure. This suggests that investments in technical training become less heterogeneous across organizations as productivity deviates from aspirations. The explanation of this effect may reside in the fact that in contrast to capital investment decisions, training decisions are less ‘discretionary’ (March and Simon, 1958). Under normal circumstances, training needs tend to be included in the firm’s periodical planning and budgeting cycles. Productivity below/above aspiration levels may cause the continuation of such initiatives, thereby reducing variability. Importantly, we found that among large firms, negative profitability reinforces the effect of productivity above aspirations on the variability of training investments, and weakens that of productivity below aspirations.

Alternative measurements of performance feedback. We also examined performance feedback based on social aspirations. In this analysis, we measured productivity social aspiration as the change in multifactor productivity. We compared the focal firm’s capital and labour productivity with the average capital and labour productivity for all other firms in the manufacturing subsector at $t-2$. We then measured profitability aspiration as the difference between the focal firm’s ROA in year $t-1$ and the mean ROA of peers

in the manufacturing subsector at t-2. While we found our results supported for the small size category, the effect of the interaction between *productivity above aspiration* and *negative profitability* was not statistically significant for large firms when adopting social aspiration levels.

Ex ante vs. ex post definition of profitability-productivity relationship. Due to bounded rationality, existing cognitive schemes and division of labour play an important role in eliciting particular *ex ante* associations between goals, restricting the set of sub-goal variables considered. However, it is reasonable to expect that some adjustments may occur within the goal hierarchy when receiving performance feedback. Failure to fulfil a profitability goal might lead decision-makers to consider performance feedback along a series of sub-goal variables, validating the means-end assumptions based on concordance between profitability and sub-goals feedback. When both profitability and productivity are below aspiration levels, decision-makers may identify 'the production function' as the locus of the problem. They might thus be less willing to consider and evoke responses that do not affect production processes and activities. In contrast, when profitability is above aspirations, search for root causes and attention to sub-goals will diminish, with decision-makers paying scant attention to productivity. To test this mechanism, we created a dummy indicator variable, *negative productivity*, which we interacted with the *profitability below/above aspiration* variables. If causality between profitability and productivity is established *ex post*, then the interaction variable between *negative productivity* and *profitability below aspiration* will have a negative sign. Instead, the interaction variable between *negative productivity* and *profitability above aspiration* will have a negligible magnitude.

We found negative and statistically significant coefficients for the interaction between *negative productivity* and *profitability below aspiration* (small firms: $\beta = -0.52$, $p < 0.001$; large firms $\beta = -1.01$, $p < 0.001$). The coefficients for the interactions between *negative productivity* and *profitability above aspiration* were relatively small across the two samples, and not statistically significant in the large firm sample (small firms: $\beta = 0.26$, $p < 0.01$; large firms $\beta = 0.13$, $p > 0.10$). Overall, these results corroborate the idea that the construction of hierarchies among goals comprises both *ex ante* and *ex post* considerations. However, the effect of *negative productivity* on the relationship between profitability above aspiration and capital investment variability among small firms was positive and statistically significant. This unexpected result indicates that interactions between goals may be more complex than hypothesized.

Endogeneity issues. While lagged covariates should alleviate most endogeneity concerns (Wooldridge, 2002), we used a two-stage approach to address the potential endogeneity of profitability and productivity feedback. In the first equation, each endogenous variable was regressed on covariates and on a series of variables exogenous to the study context. We then used the residuals from this equation and the endogenous variables in the second-stage. For the first-stage equations' exogenous variables, we used *change in energy*, *raw materials*, and *services prices* at t-2. Results were consistent with our main analysis.

DISCUSSION

March and Simon's (1958) *Organizations* has catalysed a burgeoning stream of behavioural strategy research. Despite the germaneness of the book, research has failed to recognize the conceptual power and contemporary relevance of some of its core concepts. This paper has unearthed core features of hierarchically related goals, causality rules, and strategic variability, seeking to reinstate their rightful place in contemporary behavioural theory discourse.

First, we reorient research towards March and Simon's (1958) fundamental premise that organizations have multiple goals and array sub-goals by means-end linkages to support profit maximization. The original view of decision making as 'reflecting limits of rationality and an orderly pattern of attention-constrained action and search' (p. 4) translates into the intervention of sub-goals as a means to achieve general, higher-level goals. This conceptual foundation has been supplanted by a strong focus on profitability as the most salient goal (Shinkle, 2012), or at best, the analysis of sequential attention to goals (Cyert and March, 1963; Ethiraj and Levinthal, 2009). While research has begun to examine simultaneous feedback from multiple referents on the same goal (Washburn and Bromiley, 2012), we deconstruct performance feedback by goal variable. Hence, we demonstrate that productivity and profitability outcomes both independently and jointly inform organizations' responses.

Second, we extend those few studies that examine the effects of sub-goals on organizational response patterns (e.g., Gaba and Joseph, 2013; Massini et al., 2005; Rhee, 2009). In this approach, the role of productivity aspirations in influencing organizational decision-making has been largely neglected. This is surprising, as *Organizations* (March and Simon, 1958) refers to productivity as a core and active goal. Indeed, our results show that productivity feedback has an important effect on capital investment variability, indicating that outcomes on lower-level goals may help explain heterogeneity among organizational response patterns. This finding also raises the question of whether the restricted focus on profitability in prior studies is due to non-reporting null results or 'actual' negligence of sub-goal variables.

Third, by revisiting the close connection between attention and choice (Weick, 2019), we advance theory and evidence on the means-end logic embedded in *Organizations* (1958). We distinguish between *priority rules* and *causality rules*, focusing on the latter due to their greater alignment with the means-end relationships between goals that March and Simon (1958) conceptualized. Our study thereby attempts to provide a meaningful test of a causality rule. As such, it responds to calls to empirically examine rules that 'structure attention in organizations by generating a set of values that order the legitimacy, importance, and relevance of issues and answers' (Ocasio, 1997, p. 196). In particular, our results support the view that rules represent assumptions on appropriate behaviour, whether schema/architecture-driven (top down) or stimulus-driven (bottom up), thus highly situationally dependent (Joseph and Wilson, 2018). Our findings show that when responding to multiple sources of feedback, decision-makers' distribution of attention may be governed by top down causality rules. However, causality judgments are adjusted when performance goals are evaluated based on the consistency between

performance feedback on higher-level goal and sub-goals, in a bottom up fashion. These results provide a starting point to delve deeper into the multifaceted nature of organizational responses to performance feedback. For example, managers might misinterpret causal linkages between goals, resulting in the use of attention rules that do not match goal relationships.

Fourth, we draw attention to the importance of investigating the variability of firm investments, in addition to their absolute levels. According to March and Simon, decision-makers tend to rely on learned patterns of behaviour, but may deviate from such patterns when facing conditions that differ from what is deemed 'normal'. Hence, we seek to empirically test how performance feedback induces variability in capital investments across organizations (Maritan, 2001). We identify a possible source of heterogeneity in the diverse processes through which decision-makers *evoke* and *execute* responses. We then theorize the role of different goals in affecting response *evocation* and *execution*. Analysing the effects of profitability and productivity on capital investment variability, our results highlight that firms are more likely to exhibit extreme resource allocation choices when performance deviates from aspiration levels. Our findings also provide insights for future research seeking to reconcile mixed evidence on failure-induced change or threat-rigidity in the face of underperformance (e.g., Audia and Greve, 2006).

Limitations and Future Research

Our analysis is not exempt from limitations, many of which offer promising opportunities for future inquiry. First, we draw on a database that is nested in time and place. Spain went into recession in 2008 and is just beginning to return to pre-recession economic conditions (Buck, 2017). Economic recessions affect firms' willingness to make potentially irreversible capital outlays (Nason and Patel, 2016), and may thus induce idiosyncratic capital investment decisions. In addition, Spanish manufacturing firms face particular regulations that are likely to affect their capital expenditure (Greenwood et al., 2010). We sought to mitigate this influence by controlling for year and geographic dispersion, but future analyses would be beneficial to ensure generalizability.

Second, we focus on productivity and profitability as a set of hierarchically related goals without data on organizational hierarchy or divisional interdependencies. Future research could test our framework using organizational structure arguments to identify different goals, and a microfoundational lens to examine the rules managers use to allocate attention (Felin et al., 2015; Gavetti, 2005).

Also worth noting is that we find similar patterns of results in large and small firms. Prior research identifies firm size as an important factor influencing responses to performance feedback (Audia and Greve, 2006). One might expect stronger evidence of causality-based attention in large firms where 'departmentalization' is easier to accomplish due to a more formalized organizational structure. On the other hand, hierarchy may constrain the resources and autonomy of lower level managers to conduct search (Sengul et al., 2019). Future research could thus further investigate the role of size in determining how firms allocate attention and respond to unmet goals (Joseph and Wilson, 2018).

Third, we draw on arguments concerning the diversity of search loci, response scopes, and response designs (Figure 1) to explain variation in capital investments across firms.

These arguments largely draw on qualitative field studies of capital allocation processes. Although this approach is common in variance theory where processes and mechanisms are not explicitly tested (Langley, 1999), we encourage scholars to investigate such mechanisms more explicitly. For instance, researchers could examine firm capital investment decisions vis-à-vis other investment strategies, such as R&D or marketing and advertising (e.g., Vissa et al., 2010).

Fourth, in line with most behavioural theory research, we focus on internal benchmarks. However, firms also use external benchmarks, such as stakeholder expectations, to orient decision making (Greve and Teh, 2018; Nason et al., 2018). The interplay of internal benchmarks with the unique socio-political and managerial self-interest of external benchmarks is worthy of future investigation. Additionally, our arguments would benefit from further investigating intra-organizational political processes. Concepts of political problem solving and coalition formation are likely to be fruitful in explaining how organizational decision-makers manoeuvre and negotiate around responses to multiple goals (e.g., Zhang and Greve, 2019).

In conclusion, this study provides insights into organizations' allocation of attention to hierarchically related goals and the implications for organizational responses. We find evidence that organizations react to performance feedback on both productivity and profitability, and that causality rules do play a role in regulating attention. Taken together, these findings revitalize some crucial yet largely untapped ideas in March and Simon's (1958) *Organizations*. We hope to inspire future research to further explore the complex ways firms handle multiple goals, deconstruct performance feedback, and cope with attentional constraints.

NOTES

- [1] While March and Simon (1958) recognize that means-end relationships between goals can be either cognitively produced based on past experience or socially conditioned based on the existing organizational division of labour, they also state that, either way, it may make very little difference in the long term.
- [2] We estimated the mean of production assets using Gibrat's model that assumes that firms grow at a rate proportional to their asset base (Greve, 2008; Sorenson and Sørensen, 2001), according to the equation $\ln(S_{i,t+1}) = \alpha \ln(S_{i,t}) + X_{i,t}B + \varepsilon_{i,t+1}$, where $X_{i,t}$ is the vector of explanatory variables with B parameter, and $\varepsilon_{i,t+1}$ the error term (i.e., our dependent variable).
- [3] We considered 11 per cent reasonable given the composition of the gross capital stock and the rates of economic depreciation estimated in prior studies.
- [4] It is remarkable that the correlations between the two above (productivity and profitability) and the two below aspiration variables (productivity and profitability) are both approximately 0.27 in large firms (0.2741 and 0.2696, respectively). However, we believe that this further corroborates the idea that strong associations exist between productivity and profitability.
- [5] We have omitted estimates from the multiplicative heteroscedasticity models of production asset mean. The coefficient of *profitability below aspiration* is positive and statistically significant for both small ($\beta = 0.06$, $p < .001$) and large ($\beta = 0.11$, $p = .006$) firms. The effect of *profitability above aspiration* is statistically significant and positive only for large firms ($\beta = 0.12$, $p = .011$). We find a positive and statistically significant but small size effect of productivity distance below the aspiration level on production asset growth for small firms ($\beta = 0.02$, $p = .035$). The negative effect of productivity above the aspiration level on small firms' production asset growth is likewise small ($\beta = -0.01$, $p = .056$).

- [6] The variance of production assets represents the variance of the logarithm of the firm's total tangible assets. For small firms $1.12 = \exp(0.42 \times 0.27)$ and $1.09 = \exp(0.33 \times 0.26)$; for large firms $1.16 = \exp(1.05 \times 0.14)$ and $1.14 = \exp(0.91 \times 0.14)$.
- [7] Standardized beta weights for small firms: *profitability below aspirations*: $\beta = 0.11$, $p < .001$, 95 per cent CI = $[0.089 \ 0.127]$; *profitability above aspirations*: $\beta = 0.09$, $p < .001$, 95 per cent CI = $[0.066 \ 0.106]$; *productivity below aspirations*: $\beta = 0.02$, $p < .05$, 95 per cent CI = $[0.004 \ 0.044]$; *productivity above aspirations*: $\beta = 0.01$, $p < .001$, 95 per cent CI = $[-0.006 \ 0.026]$. Standardized beta weights for large firms: *profitability below aspirations*: $\beta = 0.15$, $p < .001$, 95 per cent CI = $[0.119 \ 0.176]$; *profitability above aspirations*: $\beta = 0.11$, $p < .001$, 95 per cent CI = $[0.080 \ 0.142]$; *productivity below aspirations*: $\beta = 0.03$, $p < .10$, 95% CI = $[-0.003 \ 0.060]$; *productivity above aspirations*: $\beta = 0.06$, $p < .001$, 95 per cent CI = $[0.032 \ 0.085]$.
- [8] Differences in standardized betas of *productivity below aspiration* between model 3 and model 4 across small and large firms are above the rule of thumb effect size for small but meaningful differences (0.05).

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