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## **WORKING PAPER**

**THE FRUITS OF ITERATIVE LEARNING AND NEGATIVE PERFORMANCE FEEDBACKS:  
EVIDENCE FROM PRIVATE EQUITY BACKED BUYOUTS**

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**Abstract**

We open up the black box of learning from experience by building upon the emerging stream of research on learning from performance feedbacks. We go beyond prior research that has regarded experience as a homogenous construct by introducing and theorizing three specific attributes of experience: the quantity of performance feedbacks, the incompleteness of performance feedbacks and the proportion of negative performance feedbacks. We test specific hypotheses regarding the joint impact of these three factors on performance using a novel, proprietary dataset relating to the private equity industry. Largely in line with our expectations, we find that performance feedbacks quantity and incompleteness have a negative impact on performance, and that these negative impacts are alleviated by the proportion of negative performance feedbacks received.

## INTRODUCTION

A considerable body of research has produced largely consistent evidence of learning curves in operating settings due to the accumulation of organizational experience (Dutton *et al.*, 1984; Yelle, 1979). The accumulation of knowledge based on experience and observation is a fundamental antecedent to capability development and a key determinant of organizational performance (Argote, 1999). Although, experience accumulation is incontestably considered a positive learning factor in the context of operational tasks, this might not be true in the context of complex strategic decisions. Indeed, findings from the growing literature on organizational learning from experience in strategic contexts are decidedly mixed. For example, with respect to acquisitions that account for most of the research conducted in this field, some scholars have found a positive relationship between experience and performance. Others, however, have found non-significant or U-shape relationships (Barkema *et al.*, 2008).

These inconsistent results can be attributed to the tendency of the learning literature to treat experience as a homogenous construct. More recent research has started to open up the black box of experience and study the effects of a variety of more specific types of experience on performance in strategic settings. In this respect, recent developments in the behavioral literature have proposed that learning from experience is particularly challenging in the context of strategic tasks due to the high degree of outcome ambiguity, defined as *the degree of uncertainty related to the assessment of the outcomes consequent to a given decision or to the execution of a given task* (Zollo, 2009). The problem of outcome ambiguity is particularly salient in the context of strategic tasks for two reasons. First, strategic tasks are less frequent than operational tasks and therefore it is less likely to observe their performance

outcome. Second, and more importantly, strategic tasks tend to be characterized by fairly fuzzy performance outcomes which can only be accurately assessed after some time, if ever.

We extend previous work on the problems of outcome ambiguity in the context of strategic tasks by advancing our understanding of how organizations learn from performance feedbacks from strategic tasks. Simply speaking, we expect the quality of learning (and hence subsequent performance) to be greater, the more frequently an organization received feedback about its actions and decisions in a certain situation, but that this quality of learning is blurred by the presence of many experiences with unclear outcomes.

This intuition translates into two fundamental mechanisms regarding the development of learning from performance feedbacks. From the education literature, one is led to expect that the accumulation of performance feedbacks (i.e.: the quantity aspect) should have a positive impact on performance, due to a process referred to as iterative learning. *Iterative learning comprises a recursive learning process that utilizes the observation of performance feedbacks to improve the quality of current understanding of causal-effect linkages.* In turn, improved understanding of the causal-effect linkages should result in a higher level of organizational learning and in a more effective use of lessons learned from past experience. The second mechanism is *performance feedback incompleteness defined as the percentage of past strategic decisions that have not received a performance feedback.* We expect that the higher is the portion of past experience without a performance feedback, the lower is the quality of organizational learning.

To pinpoint the factors that might strengthen or weaken the impact of performance feedbacks quantity and incompleteness on performance, we focus on how negative returns moderate this relationship. First, we propose that negative returns should have a positive direct impact on performance, since they foster the tendency of organizations to seek mend to

performance shortfalls. Second, we propose that negative returns should amplify the positive impact of performance feedbacks quantity and decrease the negative impact of performance feedbacks incompleteness.

We study our conceptual arguments in an empirical context that is particularly well suited for the task: private equity investments (Kaplan et al., 2005). We draw on a novel proprietary dataset involving a sample of 5006 investments by 101 private equity firms between 1981-2009. This setting allows us to overcome measurement problems that have made performance feedbacks research problematic. Our setting provides objective ways to assess (a) the number of performance feedbacks received at any point in time, and (b) the performance of each completed strategic task (the financial return on each investment when sold). Using these data we find that both performance feedbacks quantity and incompleteness have a negative impact on performance. However, their negative impacts on performance are alleviated by negative returns that, at the same time, have a direct positive impact on performance.

We make several contributions to the literature. First, we build upon and extend the emerging stream of research on learning from performance feedbacks and to the insistent but unfulfilled call for further research analyzing the impact of negative feedbacks on the quality of organizational learning in the context of strategic tasks. In particular, we go beyond prior research that has regarded experience as a homogenous construct by theorizing two different types of experience, performance feedbacks quantity and incompleteness, and arguing that the nature of returns moderates their influence upon performance. Second, and more specifically, we contribute to the literature on private equity by extending conceptual and empirical understanding of the effects of learning from experience. We build on studies that examine the relationship between the extent of private equity firm experience through deals

done and the number of exits to provide more fine-grained insights reflecting a more realistic view of the behavior of private equity firms. We incorporate dimensions of performance feedback that reflect aspects that are especially pertinent to learning in an industry where a portfolio of investments is held for a limited period and divested piecemeal, and where the need to periodically raise further funds for investment before the current fund is fully realized may mean that performance feedbacks during the funds life are especially pertinent to the adaptation of private equity firm's involvement in portfolio companies.

## **THEORETICAL BACKGROUND**

The problem of outcome ambiguity and performance fuzziness is of paramount importance in the context of strategic tasks. Recent research work has for instance outlined the problems generated by it in the context of mergers and acquisitions (Zollo *et al.*, 2008). Labeling an acquisition as a “success” or a “failure” can be fairly difficult, given the various dimensions on which the outcome must be evaluated. Acquisition performance can be measured at least along three different dimensions. The first dimension is from subjective (e.g., qualitative assessments of degrees of synergy realization, of integration process efficacy, and of strategic gap reduction) to objective measurement methodologies (e.g., financial and accounting figures). The second dimension runs from a short-term (e.g., a few days before and after the acquisition announcement) to long term (up to five years after the closing) time horizon. The third involves an organizational level of analysis (e.g., improvement of firm performance or competitive position) to a process or transaction level (e.g., quality of execution of the post-acquisition plans, magnitude of premium paid, etc.). Therefore, organizations are typically blocked in their learning efforts in acquisitions due to the fuzziness of the performance metrics (i.e.: outcome ambiguity).

Although the problem of outcome ambiguity is pervasive in the organizational context and in particular in tasks of strategic relevance, its impact has been studied primarily at the individual level of analysis, for instance in decision sciences and education literature. The decision science literature has shown that professions with extremely frequent and precise performance feedback mechanisms, like weather forecasters and bookmakers (Ronis and Yates, 1987), are characterized by high levels of judgment accuracy. Similarly, the education literature has shown that it is not sufficient to have an experience in order to learn. It is necessary to reflect on the experience to make generalizations and formulate concepts which can then be applied to new situations. A necessary condition to reflect on the experience is the presence of a performance feedback that informs the learner about the quality and the correctness of a previous decision. The learning resulting from performance feedback is then tested out in subsequent situations (Kolb, 1984; McGill *et al.*, 2001).

The precursors of performance feedback theory have examined primarily the individual level of analysis. Research findings at this level of analysis are consistent in studies adopting many different methods and in many different contexts. Following this research trajectory and, more importantly, building on the pioneering works at the organizational level (Greve, 2003), we advance our understanding of whether and how organizations learn from performance feedbacks and the conditions that sustain this learning process. Our conceptual model is outlined in Figure 1, showing that performance is determined by iterative learning from the quantity of performance feedbacks, the completeness of feedbacks, negative performance feedbacks and the interaction between iterative learning and negative performance feedbacks. The hypotheses we test are developed below.

## **ITERATIVE LEARNING IN STRATEGIC DECISIONS**

### **Performance feedbacks quantity**

Researchers' interest in how organizations learn from performance feedback can be traced back to the behavioral theory of the firm (Cyert *et al.*, 1963; March *et al.*, 1958). Building on these foundational works, the organizational learning literature has contributed to explaining how organizations react to performance feedbacks. The fundamental intuition is that performance feedback is a diagnostic tool used to discover problems which results in a search that leads to organizational change. As a result, organizational change is more likely to occur when the firm performs below the level considered acceptable (Greve, 2003).

This stream of research has offered an extensive and in depth understanding of the impact of performance feedbacks on the likelihood and type of organizational changes, but it has offered only limited evidence on how the accumulation of performance feedbacks affects the quality of learning and, therefore, subsequent performance.

The role played by performance feedbacks is particular salient in the context of strategic tasks, for three related reasons. First, strategic decisions are less frequent than operational ones and therefore there are fewer opportunities for managers to observe the performance outcome. Second, strategic decisions differ significantly from one another on critical dimensions, even when these decisions fall into the same general category. Therefore, inferences about the performance effects of particular past decisions might only partially apply to the focal decisions. Third, due to the complexity of strategic decisions, it is very hard to tease out which decision or action caused which outcome, therefore resulting in causal ambiguity.

We propose that this last characteristic of strategic tasks is most important since it advances our understanding of the different roles played by outcome (Zollo, 2009) and causal



ambiguity (Levitt *et al.*, 1988) in this context. Even if the output of a strategic decision is not characterized by outcome ambiguity, because the organization has received an objective performance feedback, this does not necessarily reduce the problems originating from causal ambiguity. We propose, therefore, that the reduction of outcome ambiguity does not necessarily eliminate causal ambiguity and does not automatically increase the ability of the organization to correctly specify the cause-effect linkages.

The absence of outcome ambiguity may reduce the quality of organizational learning. For instance, an organization may develop incorrect conclusions about cause-effect linkages from the analysis of a performance outcome and as a result develop inappropriate lessons to handle future experiences. Here, the absence of outcome ambiguity may exacerbate the causal ambiguity problem by reinforcing the conviction about the accuracy of wrongly specified causal-effect linkages. Consequently, the incorrect specification of causal-effect linkages might even reduce, rather than increase, the quality of learning, hurting the performance of future strategic decisions.

However, the potential negative effects of performance feedbacks should disappear as their number increases and, more importantly, not outweigh the positive ones. We propose that the accumulation of performance feedbacks should have a positive impact on performance, due to the iterative learning process. The key idea behind iterative learning is to iteratively adjust the understanding of causal-effect linkages as a result of feedback received such that the output of the following decision is as close as possible to the expected performance outcome.

To illustrate our argument, consider an organization that takes the focal strategic decision based on the current understanding of causal-effect linkages, developed thanks to the observation of past performance feedbacks. After the performance output of the current

decision is observed, the organization compares it with the expected performance outcome: the observed output can be both higher or lower than the expected performance feedback (i.e.: positive or negative deviation). Regardless the sign, the more the observed outcome deviates from the expected level of performance, the more the organization calls its current understanding of causal-effect linkages into question. In this way, a deviation triggers the formation of a new understanding of the causal-effect linkages to be applied to subsequent decisions, closing the “learning loop”. This new understanding will be again submitted to the iterative learning process whenever the performance feedback received deviates from expectation. Through the repetition of this iterative process, the organization progressively increases the quality of its causal-effect understanding.

In summary, we expect that the accumulation of experience with a performance feedback (i.e.: the quantity aspect) reduces outcome ambiguity and performance fuzziness, facilitating the correct understanding of the causal-effect linkages and decreasing the problem of causal ambiguity. Specifically:

**H1: The higher the number of performance feedbacks, the higher the performance of the focal strategic decision.**

### **Performance feedback incompleteness**

We aim to contribute to an increased understanding of iterative learning in the context of strategic tasks by going beyond the simple consideration of the quantity aspect of performance feedbacks. We bring to this conceptualization of the phenomenon of iterative learning the additional and complementary conceptualization of feedback incompleteness

(i.e.: the quality aspect), that accounts for the percentage of past strategic decisions that have not received a performance feedback.

To be informative of an organization's capability, performance feedbacks should involve a significant portion of organizational experiences accumulated up to the time of the focal decision. In fact, the higher the level of performance feedback incompleteness, the less the outcomes received are informative of the objective quality of the entire range of past decisions. Therefore, formation of causal-effect linkages based only on a small portion of past decisions may be biased, because they are not representative of the entire decisions track record.

It is worth noting that feedback incompleteness tends to be higher in strategic tasks, than in operational ones. Strategic decisions tend to be characterized by a significant performance feedback delay as the objective assessment of the decision can only be measured some considerable time after the decision has been taken. This time lag between the decision and its output creates several challenges for organizational learning. First, it may foster the adoption of inadequate or even erroneous causal-and-effect relationships when these are derived from a large array of past decisions without objective performance feedback. Second, prior literature in cognitive psychology and decision making has shown that decision makers are systematically overconfident about the performance of future events (Soll *et al.*, 2004). Further, the risk of overconfidence seems to depend very much on the difficulty of the focal decision, in the sense that overconfidence seems to disappear with easy tasks while it is exacerbated with complex tasks (Griffin *et al.*, 1992). Decision makers appear to be overconfident in the knowledge domains in which they are experts (Heath *et al.*, 1991) and climb steadily as more experience is obtained (Oskamp, 1965).

In sum, the perils of overconfidence should be particularly acute in the context of strategic tasks and therefore the presence of objective performance feedbacks on a significant portion of past decisions should increase the quality of future decision making. Specifically:

**H2: The higher the percentage of past decisions without performance feedbacks, the lower the performance of the focal strategic decision.**

## **THE FRUITS OF NEGATIVE PERFORMANCE FEEDBACKS**

The literature on learning has studied how organizations react to performance feedbacks (Greve, 2003; Greve, 2008). This literature has proposed a theory of experiential learning whereby firms collect information about their performance, create aspirations levels based on their own past performance or that of other organizations, and change activities if the performance is lower than the aspiration level. As a result, adversity may spur higher rates of strategic change, R&D expenditure, innovation, and investment.

All these changes are produced by the “problematic search” that occurs as a response to an organizational problem and is aimed at seeking mend to performance shortfalls. However, the intensity of problematic search is highly variable since it is governed by the negativity of performance feedback. The intensity of problematic search should be more intense for organizations that experience negative performance feedbacks on a large array of past decisions.

To illustrate, regular examples of problematic searches are ad hoc research initiatives, task forces, and staff brainstorming sessions. Managers initiate these activates by diverting resources from routine production to search. Thus the organization will only perform

problematic search if managers have judged that the organization faces a problem that is so important that resources are best spent searching for solutions. For example, when the organization faces low sales and idle production capacity, it is forced to engage itself in problematic search because the resources spent to initiate this process may not have high-value alternative uses.

Therefore, problematic search should become particularly intense when a large percentage of past strategic decisions have received a negative performance feedback. In this case, problematic search should become not only more intense but also conducted at a distance from current activities (Cyert *et al.*, 1963). Problematic search should stop when a solution is found and can be restarted if failure continues after a solution has been found.

Based on this understanding, we propose that the intensity of problematic search increases positively with the level of negative returns and therefore spurs a learning cycle that positively affects the quality of subsequent decisions. Specifically:

**H3a: There is positive relationship between the percentage of past decisions on which the organization has received a negative return and the performance of the focal strategic decision.**

Organizational learning from performance feedbacks has contributed to understanding of how the methods used by organizations to cope with adversity influence change and survival prospects but identification of the conditions under which negative performance feedbacks might promote maladaptive or pathological change behaviors is lacking. We propose that problematic search can be reduced above certain thresholds of negative returns.

Organizations may behave rigidly in threatening situations, for three reasons (Staw *et al.*, 1981). First, a threat might result in restriction of information processing, such as narrowing in the field of attention, a simplification in information codes or a reduction in the number of channels used. Second, when a threat occurs, there may be a constriction in control, such that power and influence become more concentrated or placed in higher levels of hierarchy. Thus, threats above a certain level may result in changes in both the information and control processes of an organization, and, because of these changes, an organization's behavior becomes less varied and flexible. Finally, with an insufficient number of positive feedbacks, organizations may simply be unable to perform the process of triangulation, i.e. the comparing and contrasting of positive and negative past experiences to develop accurate heuristics regarding what works and what does not. Therefore, too high levels of negative performance feedbacks might result in organizational paralysis in the face of a threat. Based on this understanding, we hypothesize the following:

**H3b: There is an inverted-U shaped relationship between the percentage of past decisions on which the organization has received a negative return and the performance of the focal strategic decision.**

## **ITERATIVE LEARNING AND THE FRUITS OF NEGATIVE PERFORMANCE FEEDBACKS**

The iterative learning process assumes that organizations utilize the observation of performance feedbacks to improve the quality of the current understanding of causal-effect linkages. However, organizations may differ significantly in their ability to learn from the stock of performance feedbacks. More specifically, the ability of the organization to correctly

specify the causal-effect linkages and therefore to reduce the perils of causal ambiguity should be higher for those firms who experience negative returns on a significant portion of past decisions, for two related reasons.

First, the higher the percentage of past decisions on which the organization experience negative returns, the lower should be the probability of developing inappropriate lessons about casual-effect linkages. In fact, negative returns should reduce overconfidence about the accuracy of wrongly specified causal-effect linkages. In other words, organizations who have suffered low performance on past decisions should be more hesitant to blindly trust the conclusions they previously reached on causal-effect linkages. Organizations refraining from becoming too confident in the specified causal-effect linkages are less likely to become overconfident in their early, and potentially incorrect, learning (Dunning *et al.*, 1990). As a result, these organizations should more likely engage in disconfirmation processes aimed at gathering evidence and information that disconfirm their existing positions. This process places the correctness of the specified causal-effect linkages under scrutiny, favoring the individuation of less biased conclusions.

Second, the literature on performance feedbacks implicitly assumes that the lessons learned through iterative learning and the accumulation of performance feedbacks translate automatically into actual performance, that is organizations properly apply what they know to the focal decision. We relax this assumption as organizations may vary in the extent to which they properly apply lessons learned from performance feedbacks to the focal decision. The fundamental theoretical intuition is that without the proper application of lessons learned to the focal decision performance does not follow, irrespective of the quality of lessons learned.

To this end, we propose that the level of negative returns enhances the ability of the firm to properly apply lessons learned from the past. Organizations experiencing negative

returns should be more aware of the benefits of applying the lessons learned to solve the challenges of the focal strategic decision (Schwenk, 1984). In addition, the level of negative returns experienced in the past should reduce the tendency to retrieve information inconsistent with, or even harmful to, the focal strategic activity being considered. Therefore, organizations that experience negative returns should be less likely to apply past lessons learned when they are not useful in addressing the challenges of the focal decision (Gavetti *et al.*, 2005).

For these reasons, we would expect that the positive impact of performance feedbacks becomes more positive if the organization has received negative feedbacks on a large array of past decisions. Hence:

**H4a: The higher the percentage of negative returns, the higher the positive impact of the number of performance feedbacks on the focal strategic decision.**

The basic premise of the iterative learning process is that organizations utilize the observation of performance feedbacks to iteratively improve the quality of current understanding of causal-effect linkages. However, for this process to be correct it should be based on performance feedbacks from a large array of past strategic decisions. The formation of causal-effect linkages based only on a small portion of decisions that are not representative of the entire decisions taken in the past may generate aberrant learning.

However, with a certain level of performance incompleteness, organizations that have experienced a higher level of negative returns should be less prone to wrongly infer causal-effect linkages. Negative returns should reduce the perils of overconfidence generated by the tendency to systematically overestimate the performance of strategic decisions that have not



yet received a performance feedback (Malmendier *et al.*, 2005a, 2005b). This is because negative performance feedbacks should reduce the tendency to overestimate future returns, so reducing the perils of inferring causal-effect linkages based on performance expectations that are incorrect. In contrast, decision makers more likely develop overconfidence after high returns (Ben-David *et al.*, 2007). This problem arises due to the tendency of managers to make inferences about the distribution of unknown future outcomes from a few known cases, such as past returns (Soll *et al.*, 2004). Moreover, overconfidence effects do not disappear with the passing of time but persist into the long run.

For these reasons, the percentage of past negative returns, in conjunction with a low level of feedback incompleteness, should play a dual role. First, the percentage of past negative returns should reduce the extent to which managers overestimate future returns to strategic decisions that have not yet received a performance outcome. Second, a low level of feedback incompleteness, by reducing the number of past decisions without an objective outcome, should reduce the occasions when decisions makers overestimate the performance of future events. Taken together, these two effects should increase the quality of decision making and therefore the performance of future decisions. Specifically:

**H4b: The higher the percentage of negative returns, the higher the positive impact of the percentage of past experiences with a performance feedbacks on the focal strategic decision.**

## RESEARCH DESIGN

### Research Setting

The proposed hypotheses are tested using data from private equity investments, so called buyouts. Private equity (PE) has become a global phenomenon in recent decades as it injected liquidity and fueled the M&A wave in the US and Europe. Stromberg (2007) estimates that by 2007, PE firms worldwide had acquired almost 14,000 companies worth nearly \$3.6 trillion. Notwithstanding the impact and the role played by PE firms in the global economy, the strategy literature has offered only limited evidence of its impact, mainly due to the difficulty in accessing data (Singh, 1990; Wiersema *et al.*, 1995).

Buyouts are standalone, controlling-stake acquisitions of a company (or a division) from its owners, usually with a limited time horizon, financed through a combination of equity and debt, and with strong involvement from specialized financial investment companies, called GP for General Partners. (Berg *et al.*, 2005; Wright *et al.*, 1994). Buyout investors seek to build value by improving the cost structure of the firm, tightening the controls on corporate spending, initiating cost-reduction programs, increasing plant productivity, lowering labor costs, and reducing working capital requirements. Post-acquisition activities often involve selling or shutting down less efficient units or projects, improving the quality of the management team, and improving corporate governance in order to better align management incentives with those of shareholders (Pe'Er *et al.*, 2011).

Private equity is a suitable empirical context to study the effect of performance feedbacks and negative returns in the context of strategic tasks for two reasons. First, buyouts remain in the portfolio of the private equity firm only for a limited time and are handled completely independently from each other. Companies acquired during buyouts remain totally separate legal and financial entities, operating as stand-alone firms with no cross

subsidies or forced inter-firm sales. As a result, the value-creation strategy used by private equity firms differs from, for instance, that used by industrial players or conglomerates, which tend to manage their acquisitions with the aim of creating inter-firm synergies. Therefore, the specificity of the value-creation strategy in buyouts makes it possible to measure the performance of each single investment independently from the performance of other investments in the portfolio - in other words, without confounding factors. In addition, the specificity of this industry allows us to directly and objectively measure performance feedbacks and negative returns throughout a firm's history (Baker *et al.*, 1998).

Second, the private equity setting also offers a suitable empirical context in which to test decisions of strategic relevance, which are, when compared to operational tasks, characterized by low frequency, high heterogeneity, high causal ambiguity and high economic impact (Zollo, 2009). Private equity investments possess all four of these characteristics. First, private equity investments happen with low frequency: they are neither rare decisions (like acquisitions for industry players) nor highly frequent decisions (like operational tasks). Second, private equity investments are highly variable: while they take place in the same sector (e.g., country), their complexity means no two experiences are identical. Third, they have high casual ambiguity: it is difficult to tease out the connections between actions and outcomes. Fourth, they have high economic relevance: each buyout has a significant marginal impact on the overall performance of the private equity firm.

## **Sample**

The data were collected from fundraising prospectuses (i.e., private placement memoranda, PPM) from various investment firms operating in Europe and U.S. Our primary data source consists of hand-collected audited track records of private equity firms reported

in PPMs. Our collaborating investors are based in both Europe and the US and gave us PPMs irrespective of their final investment decisions. We often received information on the same GP from different sources and combined them to obtain the maximum information possible.

Our dataset is a unique and proprietary collection of 5006 investments made by 101 buyout firms between 1981 and 2009 for an equity value of \$338 Billion (total equity paid for the investment expressed in 2006 USD). Our collection period of the PPMs started in 2001 and ended in 2011. In the PPMs, we observe the list of the investments made by each buyout firm and its performance outcome<sup>1</sup>. Our performance data have the advantage of being audited rather than self-reported. Moreover, buyout firms need to disclose all the investments they made including the bad ones in PPMs.

This database is likely representative of the universe of private equity investments not only due to its size but also because data come from a number of limited partners (i.e., investors in private equity firms), and include information about both private equity firms in which they decided to invest and firms in which they decided not to invest.

## **Measures**

### ***Dependent variables***

We use an investment's Alpha as our dependent variable, an advanced measure of investment performance used in the private equity industry. It measures the outperformance of an investment relative to an equally risky and timing-matched investment in the public stock market. Specifically, we operationalize Alpha as the difference between the modified internal rate of return (M-IRR) of the cash flows from the focal buyout and the M-IRR from a

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<sup>1</sup> As required by the confidentiality agreements that govern our data collection, we replaced all names of private equity firms and PCs by alphanumeric codes and removed the actual names at the end of the data gathering process.

‘public-market-equivalent’ investment that replicates the buyout cash flows as trades in the stock market, trading shares in companies that match the buyout in terms of its industry sector and using borrowing and lending to capture the difference in financial leverage between the buyout and the publicly traded peer companies.

### ***Independent variables***

*Performance feedback (quantity)* measures the number of performance feedbacks that the private equity firm has received prior to the acquisition of the focal buyout. This measure counts the number of buyouts completely sold by the private equity firm prior to the starting date of the focal investment (i.e. realized investments) and therefore the investments for which the private equity firm could observe an objective performance feedback. Realized investments, therefore, are characterized by the absence of outcome ambiguity. Moreover, we exclude from this counting measure unrealized investments because they are characterized by the absence of an objective performance feedback since they have not been sold and their performance can only be estimated.

*Performance incompleteness* measures the percentage of prior investments that have been completely realized. This measure is computed as the ratio between the count of realized investments and the count of total investments realized prior to the beginning of the focal investment.

*Negative returns* measure the percentage of realized investments belonging to the lowest performance quartile, which is a standard measure of performance dispersion on the private equity industry. The calculation of this measure involves the following steps. First, we assign each realized investment to a quartile, based on its performance relative to the returns distribution obtained by all the buyouts exited during that year. The returns

distribution is computed based on all the investments in our sample exited during the focal year. Second, by private equity firm, we count the number of previous realized buyouts that were in the lowest quartile. Third, we divide the number of realized buyouts in the lowest quartile by the total number of realized buyouts.

### ***Control variables***

Based on a systematic review of prior empirical studies on buyouts (Barber *et al.*, 2007; Kaplan *et al.*, 2005; Kaplan *et al.*, 2009; Kreuter *et al.*, 2005; Phalippou *et al.*, 2009) and corporate acquisitions (Kim *et al.*, 2009), we have employed an extensive set of variables to control for potentially confounding factors that might influence buyout performance.

The first set of controls accounts for various characteristics of the acquiring private equity firm that might affect our independent variables (Wright *et al.*, 2009). Older and larger firms often have more resources, management skills, reputation, and legitimacy, which are helpful in executing a successful buyout (Folta *et al.*, 2004). For this reason, we included two variables: *private equity firm age*, measured as the number of years since the foundation of the first private equity firm (Seppa *et al.*, 2001) and the *deal size focus* of the private equity firm, which may have a direct impact on experience and performance feedbacks that we need to control for. To capture the buyout *market segment* targeted by the private equity firm, we use a dummy variable (i.e., large versus mid-small market). We expect that private equity firms focused on the large end of the market may be more involved in public auctions, in public to private transactions and in more leveraged transactions (i.e.: leveraged buyouts).

We use further control variables to control for *industry specialization*, i.e. we include for each industry category one measures for the the percentage of previous buyouts realized by the private equity firm in the sector of the focal buyout. We expect that private equity

firms with more relative experience in the industry of the focal buyout will develop more specialized competences that can be more easily leveraged in the focal deal (Cressy et al., 2007). Our industry classification is based on the Global Industry Classification Standard (GICS). This is an industry taxonomy developed by MSCI and Standard & Poor's (S&P) for use by the global financial community and compatible with the one used to classify the industry focus of private equity firms. The GICS structure consists of 10 sectors: Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Information Technology, Materials, Telecommunication Services, and Utilities.

In addition, we control for the *variability of returns* defined as the standard deviation of the alphas obtained by the realized buyouts. A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data points are spread out over a large range of values.

The final private equity firm control variable is for prior performance, calculated by averaging the alpha of all realized investments done by the private equity firm prior to the focal investment (Kaplan *et al.*, 2005). We weight alphas for the duration of their investment and their size. In addition, we included *private equity firm fixed effects* because a number of unobservable characteristics might be related to our independent variables.

The second set of controls accounts for various characteristics of the focal buyout. Buyout performance can be influenced by the duration of the focal investment – the *holding period* in days -- and by the amount of equity invested in the company – the *transaction size* (in 2006 US\$). We use also dummy variables to control for the *type of the focal deal*: buyout or venture deal. In fact, whereas all the private equity firms included in this database operate in the buyout space (i.e.: mature firms), they might occasionally be involved in venture

capital deals (i.e.: start-ups) (Gilligan *et al.*, 2010). In addition, we use dummy variables to control for the *status* of the focal buyout (i.e.: unrealized, partially realized or realized).

We also included *time fixed effects* at the time of entry into the focal investment to capture a number of important drivers of performance (e.g., the supply of debt financing). In addition, we used *geographic area* (i.e. Asia, Europe, North America, Rest of the world) and *industry fixed effects* (again based on the 10 GICS sectors) to control for country and industry unobserved heterogeneity, respectively.

Finally, we consider that whereas all private equity firms are focused on a market segment (i.e.: top versus mid-small) by mission, they opportunistically pursue opportunities that arise in the market. For instance, private equity firms that target the large end of the market could be involved in deals in the mid market that they consider attractive. To this end, we use dummy variables to control for the specific market segment of the focal buyout: small, lowed-mid, upper-mid, large/mega caps.

### **Model specification**

As previously specified, our data include 5006 buyouts realized by 101 private equity firms. Pooling repeated observations on the same private equity firm violated the assumption of independence of residuals within each firm required for ordinary least square (OLS) regressions. Therefore, we addressed this issue using a within-group fixed-effects model (Cameron *et al.*, 2009). This model also allows us to control for time-invariant heterogeneity across private equity firms that might be correlated with our independent variables. However, another important assumption of the fixed-effects model is that time-invariant characteristics are unique to the private equity firm and should not be correlated with other organizational characteristics. If this assumption is not true, a random-effects model would be more



appropriate. A Hausman test (Hausman, 1989) confirmed that a fixed-effects model is appropriate in our setting.

Performance feedbacks quantity, incompleteness and negative returns enter the models multiple times as both direct effects and as interaction terms. We used mean-centered values of these predictors in all the regression models to minimize multicollinearity problems and to ease the interpretation of non-product terms (Aiken *et al.*, 1991). After this transformation, the maximum variance inflation factor (VIF) for all of the variables in the estimated models is below 10, the rule-of-thumb cutoff for multicollinearity (Neter *et al.*, 1985).

## RESULTS

*Insert Tables 1 and 2*

Models 1, 2 and 3 include the direct effects of performance feedbacks quantity, incompleteness and negative returns, respectively. Model 4 includes the interaction between performance feedbacks quantity and negative returns. Model 5 includes the interaction between performance feedbacks incompleteness and negative returns.

Model 1 shows that performance feedbacks quantity has a significant negative impact on performance, which **does not support H1**. This finding seems to indicate that the absence of outcome ambiguity does not necessarily reduce the problems deriving from causal ambiguity. Further, performance feedbacks might even cause negative effects presumably due to the incorrect specification of the causal-effect linkages in the context of highly complex strategic tasks. Model 2 shows that performance feedbacks incompleteness has a negative significant impact on performance, which **supports H2**. This adds further support for the argument that the formation of causal-effect linkages developed on a partial

representation of past events can be harmful. Model 3 shows that a higher percentage of negative returns have a positive significant impact on performance, which **supports H3a**.

Model 4 shows that the interaction between performance feedbacks quantity and negative returns is positive, which **supports H4a**. Model 5 shows that the interaction between performance feedbacks and negative returns is not significant, which **does not support H4b**. This non-finding might be interpreted as a further sign in support of the seriousness of the problems generated by the formation of causal-effect linkages based on a limited amount of past feedbacks whose negative effects cannot be overcome even where the firm has gained knowledge from generating negative returns.

### **Robustness checks**

As a robustness check, the analysis was repeated substituting the dependent variable (Alpha) with the modified internal rate of return (MIRR). As our data includes significant outliers (e.g., one valuation in our sample is 50,714% the median), we Winsorized the dependent variable (IRR) at the 95<sup>th</sup> percentile (i.e., 119%). The Winsorized median IRR is still 850%. There are two reasons for this choice. First, outliers could significantly change regression results, affecting the sign and the significance of the slope (Hamilton, 2009). Second, an independent variable, mean IRR, is used to measure past performance. Phalippou (2009) demonstrates that the average of simple IRRs is significantly positively biased and this might in its turn cause a problem of regression to the mean. Using winsorized MIRR reduces this problem. The results of these robustness tests are identical to the results reported in the previous section.

## Discussion and Conclusions

In this paper, we propose that findings from the growing literature on organization learning from experience in the context of strategic decisions are decidedly mixed due to the tendency to treat experience as a homogenous construct. We contribute to opening up the black box of experience by theorizing that two different types of experience, namely performance feedbacks quantity and incompleteness, are of paramount importance to understand when organizations learn from their experience. We hypothesized that performance feedbacks quantity and incompleteness have respectively a positive and negative impact on performance. Furthermore, we argued that negative returns should amplify the positive impact of performance feedbacks quantity and reduce the negative impact of incompleteness. We tested our hypotheses in the context of private equity investments and found a number of interesting results.

The results of our analysis are broadly supportive of our hypothesized relationships, but with some unexpected findings that enhance their interest for future scholars. First, we found that the accumulation of performance feedbacks (i.e., the quantity aspect) exerts a negative effect on the focal decision performance. Though this finding might at first appear counterintuitive, it contributes to illuminating our understanding of the role of performance feedbacks in the context of strategic tasks, in particular regarding the differences to the findings in the context of operating tasks. Performance feedbacks accumulation, used as a diagnostic tool to discover problems in decisions making patterns and initiate search activities, reduces outcome ambiguity. However, these positive effects might be outweighed by negative ones resulting from overconfidence about the accuracy of the specified causal-effect linkages and by the overestimation of their applicability in the context of the focal

decision (Soll *et al.*, 2004). This result calls into question the assumption that the absence of outcome ambiguity automatically reduces causal ambiguity (Zollo, 2009) and that negative experience transfer diminishes as the firm gains experience (Haleblian *et al.*, 1999). This insight finds support for instance in some recent developments (Heimeriks *et al.*, 2012) showing that formalization of knowledge in codified tools increases the likelihood of negative experience transfer, unless the organization engages in ad-hoc search processes aimed at preventing misapplication of codified knowledge.

The juxtaposition of this finding with that relating to the negative role of performance feedbacks incompleteness seems to close the loop by indicating that learning does not derive from the accumulation of performance feedbacks, that can be even harmful, but from the availability of objective performance feedbacks on a significant array of past decisions. In other words, expertness might be linked more to the completeness aspect of performance feedback than to its frequency aspect. This finding, new for the organizational learning literature, is consistent with the educational literature (Black *et al.*, 2006) that shows that learning is spurred not by the quality of the feedback message provided by the teacher, but by the extent to which the feedback received by the student can be used for self-assessment. In this view, the external feedback is only the starting point for the learning cycle, that is closed, converting in subsequent action, only when the student develops an ability to self-monitor and assess his own work. This ability is strictly related to the completeness of the feedback received and not to its frequency (Knight *et al.*, 2003).

Second, the results about the positive impact of negative returns support the expectation that learning is fostered as a response to performance shortfalls. This result is consistent with prior performance feedbacks theory (Greve, 2003) that emphasizes the importance of problematic search as a response to organizational problem. This finding sheds

new light on the behavioral theory of the firm by showing that the intensity of problematic search increases with the frequency of negative returns. In contrast to prior work that found that low levels of recovery experience can generate harmful learning outcomes due to flawed inferences based on a small number of extreme performance outcomes (Kim *et al.*, 2009), we find evidence of only a positive impact of negative returns. Finally, our results contrast with Staw *et al.* (1981) who proposed that too high levels of negative performance feedbacks might result in organizational paralysis in the face of a threat. These discrepancies might have arisen from the differences between tasks and the degree of their strategic complexity. This is an important issue that deserves further attention.

Third, our analysis supports the theoretical prediction that negative returns increase learning from performance feedbacks but not the one that decreases the negative impact of performance incompleteness. Taken together, these two findings show that negative returns reduce the tendency to have negative experience transfer but do not avoid the risk of “rush to judgment” when causal-effect inferences are done on a small array of past decisions. This last finding further highlights the importance of performance feedbacks completeness whose negative effects are not counterbalanced by the “wisdom” that negative returns produce on organizational learning. On the contrary, our results indicate that negative returns are, at least in this context characterized by high complexity, a remedy to the problem of negative experience transfer (Haleblian *et al.*, 1999) by reducing the tendency to apply lessons learned when they are not useful in addressing the challenges of the focal decision (Gavetti *et al.*, 2005). Although this finding cannot offer a conclusive response to a longstanding debate, it offers new evidence in support of the recent literature advancements focused on the factors that reduce the inertia generated by experience accumulation (Heimeriks *et al.*, 2012).

Finally, the positive impact of negative returns on the performance of the focal decisions challenges previous works that have used past performance as a proxy of organizational competences. This finding sheds new light on recent advancements showing that exceptional performance is only a weak signal of skill (due to chance events and noise) and that moderately high performers are expected to have the highest ability (Denrell *et al.*, Forthcoming). In other words, our findings contribute to the theory on the origins of organizational capabilities by showing that firms develop capabilities thanks to the search processes triggered by unsatisfactory performance outcomes. Pushing this line of reasoning to its extreme consequences, we might conclude that organizations learn faster from their own failures than from their own successes. The causes of this finding deserve further attention by the strategic management literature given the emphasis commonly put on the concept of sustainable competitive advantage and perpetuation of organizational success. In this respect, our findings open new interesting research trajectories.

### Managerial implications

Our study also has specific implications for the private equity industry. The importance of performance completeness and the interaction with feedback of negative returns is especially important in a sector involving closed end private equity funds that need to liquidate their portfolio of investments by the end of the fund's limited life but where there is a need to demonstrate a good track record to be able to raise further funds. This evidence provides more fine-grained insight than previous research that has emphasized the importance of the amount of prior experience (either through the number of investments in a sector or the number of IPO exits). The findings suggest that private equity firms need to monitor negative

returns in a timely manner and actively adapt their expertise to be able to identify and invest in more promising subsequent transactions.

### Limitations

As all studies, ours has several limitations that provide opportunities for further research. First, although the private equity industry provided an appropriate context in which to test our hypotheses, it is not clear to what extent our findings are generalizable to other sectors. Further research is needed that examines heterogeneity of learning in different sectors and contexts. Second, our data relate primarily to European and US private equity firms. While the private equity market is dominated by these regions, private equity is also developing in Asia. Growing recognition of the importance of institutional context for firm behavior suggests that a fruitful area for further research may be to explore the heterogeneity of learning in different regional contexts. Third, we were unable to control for whether the financing of deals involved syndicates of private equity firms and whether a particular firm was a lead in the syndicate. While all investors will have the same information on the returns from a successful or unsuccessful realization, lead investors in a syndicate typically have closer involvement in a portfolio company, affording greater learning (Wright *et al.*, 2003). Further analysis might usefully explore the differences in learning between lead and non-lead investors.

**Table 1 - Descriptive Statistics and Correlation Matrix**

		Mean	SD	Correlation										
				1	2	3	4	5	6	7	8	9	10	11
1)	Alpha	0.127	0.504	1.000										
2)	Variability of Returns	1.750	3.095	0.039	1.000									
3)	Deal Size (ml)	53.300	123.000	-0.029	-0.115	1.000								
4)	Holding Period	4.209	3.042	-0.072	-0.090	-0.050	1.000							
5)	Dummy for Management Buyout	0.944	0.230	0.035	0.034	0.068	-0.014	1.000						
6)	Industry Specialization	0.260	0.246	0.027	0.044	0.006	-0.024	0.015	1.000					
7)	Large Market	0.066	0.249	0.002	-0.093	0.488	-0.130	0.066	-0.004	1.000				
8)	Private Equity Age	8.893	6.400	0.010	-0.150	0.291	-0.227	0.070	0.038	0.268	1.000			
9)	Past Performance	0.173	0.306	0.050	0.050	-0.020	0.077	-0.007	0.011	-0.003	-0.167	1.000		
10)	Performance feedbacks quantity (PFQ)	37.166	65.502	0.017	-0.045	0.043	-0.081	0.096	0.038	0.056	0.593	-0.061	1.000	
11)	Performance feedbacks incompleteness (PFI)	0.660	0.248	-0.010	0.192	-0.206	0.275	-0.057	-0.113	-0.199	-0.728	0.215	-0.564	1.000
12)	Negative Returns	0.184	0.166	-0.068	0.004	0.002	-0.109	-0.022	0.011	0.019	0.182	-0.539	0.122	-0.252

Note: correlations greater than 0.028 are significant at  $p < 0.05$  or better.



**Table 2 - Results of the fixed effects estimation: baseline model**

	Alpha				
	Model 1	Model 2	Model 3	Model 4	Model 5
Variability of Returns	0.017 (0.52)	0.020 (0.62)	0.020 (0.61)	0.030 (0.93)	0.027 (0.84)
Deal Size	-0.063*** (-4.31)	-0.063*** (-4.33)	-0.063*** (-4.33)	-0.065*** (-4.47)	-0.065*** (-4.45)
Holding Period	-0.043*** (-3.66)	-0.044*** (-3.81)	-0.045*** (-3.81)	-0.041*** (-3.52)	-0.041*** (-3.55)
Dummy for Management Buyout	0.006 (0.10)	-0.003 (-0.05)	-0.004 (-0.07)	0.043 (0.74)	0.043 (0.74)
Industry Specialization	0.001 (0.11)	0.000 (0.03)	0.001 (0.06)	0.000 (0.04)	0.001 (0.08)
Large Market	0.062 (1.84)	0.058 (1.73)	0.058 (1.73)	0.057 (1.71)	0.057 (1.71)
Private Equity Age	0.005 (0.51)	-0.003 (-0.25)	-0.003 (-0.25)	-0.005 (-0.44)	-0.002 (-0.22)
Past Performance	-0.010 (-1.02)	-0.009 (-0.95)	-0.010 (-0.97)	-0.027* (-2.39)	-0.028* (-2.43)
Perf. Feed. Quantity (PFQ)	-0.052*** (-3.97)	-0.060*** (-4.55)	-0.060*** (-4.56)	-0.045*** (-3.31)	-0.043** (-3.11)
Perf. feedbacks Incompleteness (PFI)		-0.056** (-2.75)	-0.056** (-2.77)	-0.058** (-2.87)	-0.056** (-2.76)
Negative Returns			-0.004 (-0.28)	0.049** (2.74)	0.081** (3.10)
PFQ * Negative Returns				0.107*** (5.26)	0.079** (3.23)
PFI * Negative Returns					-0.030 (-1.78)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Geographic Area Fixed Effects	Yes	Yes	Yes	Yes	Yes
Constant	-0.697 (-1.37)	-0.545 (-1.02)	-0.538 (-1.00)	-0.243 (-0.47)	-0.106 (-0.20)
R2	0.132	0.133	0.133	0.138	0.139
N	5006	5006	5006	5006	5006

Statistic      significance:      \*p<0.05;      \*\*p<0.01;      \*\*\*p<0.001.      Dependent      variable:      Alpha      of      the      buyout.

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