

**Superstitious Learning Revisited: Outcome  
Ambiguity and Confidence Traps in Corporate  
Acquisitions**

by

**Maurizio Zollo**

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# **SUPERSTITIOUS LEARNING REVISITED: OUTCOME AMBIGUITY AND CONFIDENCE TRAPS IN CORPORATE ACQUISITIONS**

Maurizio Zollo  
The Shell Fellow in Business and the Environment  
Associate Professor of Strategy  
INSEAD  
Boulevard de Constance  
77305 Fontainebleau, France  
Tel.: 33(0)1 60 72 44 74  
Mobile : 33(0)6 08 87 66 53  
E-mail: [maurizio.zollo@insead.edu](mailto:maurizio.zollo@insead.edu)

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# **Superstitious Learning Revisited: Outcome Ambiguity and Confidence Traps in Corporate Acquisitions**

## **Abstract**

In this paper, superstitious learning is conceptualized as a phenomenon related to the dual effect of experience accumulation: the development of competence and the development of confidence in one's competence. When confidence develops more rapidly than competence as experience accumulates, learning is superstitious and firms fall in what I label "confidence traps". I argue that this problem is rooted in fundamental ambiguity on the performance outcomes of organizational tasks, even before the problem of causal ambiguity emerges, and develop a dual test for detecting the presence of confidence traps in the context of corporate acquisitions. The conditions defining the boundaries of the phenomenon are then considered: two mitigating factors are identified in the heterogeneity of the stock of accumulated experience and in deliberate learning processes. I test these arguments with a sample of US bank mergers and find evidence that managers' self-attributions of success in previous acquisitions are negatively related to the actual performance of the focal merger, and that this effect *increases* as they accumulate experience. Consistent with the theoretical arguments developed, the effect is significantly reduced as the stock of experience becomes more heterogeneous and knowledge is systematically articulated and codified.

**Keywords:** Organizational learning, Superstitious learning, Learning curves, M&A, Mergers, Acquisitions, Knowledge codification, Experience heterogeneity, Banking

*“Experience enhances both competence and confidence in organizations.  
The problem is that the two develop asymmetrically over time.”  
Jim March<sup>1</sup>*

## INTRODUCTION

Superstitious learning was introduced as an organizational level phenomenon by Levitt and March (1988), who defined it as a situation in which “the subjective experience of learning is compelling, but the connections between actions and outcomes are misspecified” (Levitt and March, 1988: 325). The notion is itself rooted in a long research tradition in psychology, dating back to the first experiments B.F. Skinner (1948) conducted with pigeons. The startling result of that early study was that, as food was dropped in the cage at regular time intervals, the animals started to develop patterns of behavior connected to whatever they were doing before the first few times the food appeared. Apparently, they were connecting their behavior (e.g., pecking in a certain part of the cage or walking in circles) to the desired outcome of receiving food. These experiments were repeated with human subjects (Ono, 1987), partially confirming the result<sup>2</sup>; routine behavior in individuals can arise from the false perception of causal links between decisions and outcomes.

This phenomenon is of concern for scholars of organizational learning, of organizational evolution and of strategic management for several reasons. First, if the superstitious learning phenomenon were generalized, the inappropriate inferences might be *at the origin* of routinized behavior, rather than among its consequences, as it is usually perceived. Organizational routines

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<sup>1</sup> Personal communication, September 2002.

<sup>2</sup> Whereas pigeons were subject to a significant survival threat (a 25% weight loss) in Skinner’s experiment, this was obviously not replicated in human subjects. The difference might partially explain the weaker results obtained with human subjects. See also recent theoretical work by Denrell (2003) on the “rationality” of superstitious behavior

might in this case need to be revisited as potential evidence of behavioral pathologies as opposed to engines of collective evolution (March and Simon, 1958; Cyert & March, 1963; Nelson & Winter, 1982), above and beyond their known inertial effects (Leonard-Barton, 1992). Second, there is the possibility that experience might actually aggravate the problem instead of alleviating it, since the repetition of the activity increases the probability that the positive outcome will appear associated with the repeated behavior. Experience accumulation, under these circumstances, might generate a vicious rather than the usual virtuous cycle, resulting in stable and sub-optimal behavior. Third, strategic management scholars might need to revisit some of their tenets regarding the sustainability of competitive advantage derived from the presence of core competencies, as perceived by organizational members (managers or not). The “subjective experience of learning”, in fact, might be compelling, but the action-performance linkages in managers’ brains significantly mis-specified.

Despite the potential seriousness of the phenomenon for our organizational learning and evolution models, we currently do not have a real theory on it. We are currently missing: (a) a generalizable and researchable conceptualization of the phenomenon, since the current definition might exclude important aspects of the problem (see below); (b) a description of the mechanisms underlying it, its possible antecedents and consequences; (c) any clear guidance on how to operationalize the construct. In particular, we do not have a test for the presence of superstitious learning in organizational contexts, which can control for possible competing explanations. Finally, we are missing (d) an appreciation of the boundaries of the phenomenon, that is an identification of the factors that might exacerbate or reduce the likelihood of its occurrence and/or its effects.

In this paper, I attempt to contribute to our current understanding of superstitious learning

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under severe survival threats.

in different ways. First, by adding to the current conceptualization of the phenomenon, based on causal ambiguity an additional, complementary, one based on overconfidence in one's own competence, caused by *outcome* ambiguity. Second, by developing a model of the conditions under which one would expect the overconfidence problem to be more or less severe, from which a set of testable hypotheses are derived. Third, by offering a first empirical test of the model in the context of a particularly complex organizational task, such as the management of corporate acquisitions.

The paper will be organized as follows. In the next section, the new conceptualization of superstitious learning is provided and the tests to detect the presence as well as the boundaries of the phenomenon developed. The following section will then apply the theory in the context of corporate acquisition and submits testable hypotheses for the empirical inquiry. The methodology and the analysis sections follow in customary fashion, with the last section drawing some conclusions from the implications of the evidence unearthed for the study of organizational learning, organizational evolution and strategic management.

## **A CONFIDENCE-BASED PERSPECTIVE ON SUPERSTITIOUS LEARNING**

The theoretical perspective advanced in this paper is premised on the observation that the accumulation of experience potentially leads to two outcomes; the first being the well-known (potential) improvement in competence, and the second being the development of confidence in one's own competence. Competence is defined here in terms of causal, rather than procedural or declarative knowledge. A firm becomes more competent as it enhances its understanding of the causal linkages between its decisions/actions and performance outcomes<sup>3</sup>.

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<sup>3</sup> By contrast, defining learning in procedural knowledge terms would imply a simpler test, that is being capable of executing "well" a task. As we will see below, this distinction is crucial to the objectives in this paper because

As experience with a given task grows, managers not only (potentially) grasp novel insights as to why certain decisions or actions result in certain outcomes, but they will also tend to feel increasingly confident about one's own competencies. If competence and confidence develop symmetrically, there is no discrepancy between the cognitive representation of the firm's competence in a given task and its real competence; all is fine. The problem is that the two consequences of experience accumulation are likely to develop in asymmetric ways: either competence overtaking confidence development in its speed of growth, or vice versa. Both cases are problematic, although for very different reasons.

If competence develops faster than confidence as experience accumulates, we find ourselves in a world in which people generally know (in a causal sense) more than they are actually aware of, and therefore, more than they can be confident about. For lack of a better label, I will call this type of learning process "humble learning", since it is characterized by low confidence levels despite higher actual clarity over the action/performance linkages. Note that humble learning can co-exist with very high levels of actual (procedural) competence in executing the task which is subject to the learning process. An extreme illustrative example is provided by Intel's "copy exact" practice in the construction and design of semiconductors' manufacturing plants (so-called "fabs"). Intel managers are not sure that they really know what allows their plants to achieve the high yields at which they are accustomed, and are careful not to take chances: they basically copy every aspect of the existing plants, down to the color of the walls and the size of the screws. An obviously advanced competence in building fabs is not matched by similarly advanced confidence in one's own competences. Crucially, this phenomenon builds on the tacitness of knowledge (Polanyi, 1966) and the consequences

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experience accumulation acts differently on the two learning processes. It can, in fact, enhance procedural knowledge via repetition and trial and error processes but have virtually no effect on understanding *why* a certain

described in the literature on organizational capabilities (Winter, 1987; Kogut and Zander, 1992; Grant, 1996), but it adds an important cognitive dimension in noting the potential discrepancy between what is actually being learned and what managers *think* they have learned.

It can also be the case, however, that confidence develops faster than competence, as experience accumulates. In this situation, individuals or groups hold at least partially unfounded beliefs about their competencies, and their learning can be seen as merely superstitious. This second scenario has received comparatively less attention from scholars, but it has been touched upon in different streams of the literature on learning in groups (Miner, 1994) and organizations (Herriott, Levinthal and March, 1985; Sitkin, 1992; March and Levinthal, 1993). An example of this situation was described in Szulanski (2001)'s account of Banc One's failure in converting the IT systems of a newly acquired subsidiary in Colorado. Banc One had accumulated an enviable stock of experience in post-acquisition systems' conversion processes, but the attempt to execute simultaneously the migration to new systems already initiated by the subsidiary before its acquisition and the conversion to Banc One's systems resulted in a long period of instability and inefficiency at the bank. One explanation for this result lies in the overconfidence with which Banc One approached the integration challenge relying on established routines, considered proxies for competence, to tackle the task. The lack of clarity on the factors that might generate a successful system conversion (Winter and Szulanski, 2001), as well as on the measurement of performance in system conversion processes, produced a mix of high confidence levels in the bank's general conversion capability, coupled with relatively lower levels of "actual" competence, defined in terms of clarity of action/outcome linkages.

In slightly more formal terms, consider the two ratios characterizing the variation of competence and of confidence consequent to the increase of a unit of experience level. When the

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performance is achieved and what to do to improve it.



dCompetence/dExperience ratio is larger than the dConfidence/dExperience one, the learning process can be defined as “humble”, in the sense that agents will perceive their own competence levels to be lower than it actually is. In the opposite case, when the dCompetence/dExperience ratio is *smaller* than the dConfidence/dExperience one, the learning process can be defined as “superstitious”, but in a different way with respect to Levitt and March (1988)’s definition.

The characterization of superstitious learning based on excessive amount of confidence in one’s capacities relative to the “actual” capacities does not exclude, but needs to be distinguished from, the presence of superstitious learning related to the mis-specification problem identified by Skinner (1948) and Levitt and March (1988). The two approaches are fundamentally premised on different kinds of ambiguities: one based on the causal linkages between action and performance (Levitt and March, 1988) and the other based on the assessment of the outcome measure, which one can refer to as *outcome ambiguity*. The more uncertain is the measurement of the performance variable, the more likely it will be that actors will adopt the stock of experience accumulated as a proxy for their competence level. Because it might be difficult to tell whether past experiences have performed well or not, managers can resolve to use the stock of accumulated experience as an approximation of their competence levels.

To make this key theoretical distinction clear, I will refer in the remaining part of the paper to this particular type of superstitious learning with the notion of “confidence trap”, in reference to the other (well established) negative effect of experience known as competence traps (Levitt & March, 1988; March and Levinthal, 1993). Confidence traps are therefore conceptualized as a particular case of superstitious learning, and can be defined as follow:.

**Definition.** *Confidence traps occur when the confidence in one’s competence consequent to experience accumulation develops before or faster than competence itself.*

Figure 1 attempts to capture the intuition.

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Insert Figure 1 about here  
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As the stock of experience grows, both the level of competence and the degree of confidence in one's competencies grow (at decreasing marginal rates). The "equilibrium learning path" characterizes those situations in which confidence and competence grow at similar rates, as experience accumulates. The points "below and before" the equilibrium path in the tri-dimensional representation are characterized by more rapid development of competence, compared to the development of confidence, what we have termed above as "humble learning". The space "above and beyond" the equilibrium curve is formed by the points with a higher level of confidence related to competence, at any given stock of experience, what we termed "confidence traps" to indicate the particular notion of superstitious learning which is being studied in this paper.

It is worth noting that this notion of superstitious learning based on excessive confidence in one's own capacities links the literature on organizational learning with the one on decision-making biases, where overconfidence effects have been studied for a long time (Tversky and Kahneman, 1974; Kahneman, Slovic and Tversky, 1982; Klayman et al., 1999; Kahneman and Tversky, 2000; Soll and Klayman, 2004). Little is known in both literatures, however, on the joint effect of experience accumulation and confidence development on task performance. Just like experience accumulation has not been seen so far in the organizational learning literature as a process potentially producing excessive confidence in one's own competencies, so have the link been missed so far in the extensive literature on the causes of overconfidence.

## **A test of Superstitious Learning and Confidence Traps in Organizations**

With this picture of superstitious learning and of the special case of confidence traps in mind, let us now shift to the problem of identifying the salience of the phenomenon. How do we know when superstitious learning, of the type described above, occurs in organizations? What conditions need to be met, in other words, to be able to say that experience accumulation is causing excessive levels of confidence in organizational competencies?

As agents' assessments of their own performance in past experiences increase, there are several consequences that are worth noting. First, the search for improvements to the status quo is correspondingly reduced (March and Simon, 1958; Nelson and Winter, 1982). More importantly, the confidence in the soundness of one's own decisions increases. In particular, the generalization from past experiences to the current task is more likely to occur with lower levels of effort to discriminate the applicability of past experience. If this is the case, then one would expect that at increasing levels of perceived performance in past executions of a given task, the quality of the actual performance of the current task worsens.

Therefore, the presence of confidence traps, as defined above, could be gauged, as an initial approximation, by studying the correlation between the performance assessments of past experiences and the actual performance outcomes of the focal task. If this relationship is negative, there are reasons to believe that confidence levels in the competence of one's group or organization exceed actual competence levels, and at least part of the learning that has been deemed to have occurred is of the superstitious kind (Miller, 1999).

As a first approximation, therefore, I advance the following test for an empirical validation of the presence of confidence traps in an organizational context.

**Test 1.** The presence of confidence traps is revealed by the presence of a negative correlation between perceptions of performance in past experiences and actual performance in the focal task.

However, though a test based on the negative correlation between perceptions of performance in past experiences and actual performance of the current task, indicating a discrepancy between perceptions of one's competence and actual competence, might be an adequate initial approximation, it is likely to be an overall poor indicator of the presence of superstitious learning. Two competing explanations might in fact complicate the interpretation of this type of evidence. First, the effect could be, at least in part, explained by regression to the mean processes (Greve, 1999 and 2003). The more past experience is positive (negative), the higher the likelihood that the current one will score closer to the mean, that is, lower (higher) than prior performance. Second, better performance in the current task following a poor assessment of past experiences can be simply explained by problem-driven search. While this explanation cannot account for the opposite case of strong prior performance assessments coupled with poor current task performance, the interpretation of the negative correlation as evidence of superstitious learning would still be affected.

A stronger test to detect the presence of confidence traps according to the proposed definition can be constructed, however, by considering the effect of experience accumulation on the erroneous assessment of one's competence. The interaction of experience accumulation with the correlation between perceptions of past performance and current (actual) performance might reveal the presence of superstition when experience *increases*, rather than reducing, the misjudgment of competence. If, in other words, not only there is a systematic negative bias in the assessment of one's capabilities, with negative consequences for the performance of the current task, but the assessments become *increasingly* poor (and the actual performance levels of the focal task correspondingly low) as experience accumulates, then one has reason to believe that the accumulation of experience is producing confidence effects of stronger magnitude compared

to the competence ones, that is that superstitious learning due to confidence traps is present. The second test proposed can, therefore, be described as follows:

**Test 2.** The presence of superstitious learning is revealed by the increasing magnitude of the negative correlation between perceptions of performance in past experiences and actual performance in the focal task, as experience levels increase.

I therefore propose the combination of the two tests described above, a weaker (Test 1) and a stronger (Test 2) form, to be an adequate signal to detect the presence of superstitious learning in organizations in an empirical analysis.

### **Boundaries of Superstitious Learning**

The next challenge is to inquire about the boundaries of the confidence traps phenomenon, that is to identify some of the factors that can affect its salience. A number of such contingencies have been described in prior literature and related to the characteristics of the management team, the organization and the environment in which the organization operates. The degree to which managers adopt a participative and open style, for example, should mitigate the tendency to self-attribute successes or superior competence levels (Wiersema and Bantel, 1992; Keck and Tushman, 1993). Organizational traits, such as high tolerance for diversity and risk and low centralization of authority, will in general, attenuate the negative effects of increasing confidence levels (Sitkin, 1992; Miller, 1993; Ocasio, 1995). Finally, environmental conditions characterized by higher degrees of uncertainty (Milliken and Lant, 1991), velocity in change dynamics (Brown and Eisenhardt, 1997) and heterogeneity in rivals' competitive profiles (Miller and Chen, 1994 and 1996) might facilitate multiple points of view and avoid biases in attributions of competence and success.

Although these arguments are compelling, it is interesting to observe that the factors closest to the problem — those related to the learning process itself — have not been given research attention. In an attempt to fill this gap, I submit that two factors might be important moderators of the link between perceptions of past performance and the actual task performance: (1) the degree of intentionality in the learning process; and (2) the breadth of search as reflected by the heterogeneity in the stock of experience.

The intentionality dimension can be assessed by studying the degree to which firms invest in the articulation and codification of their understanding of how to manage the task at hand. Deliberate learning processes can, and normally do, operate simultaneously with learning-by-

doing processes, and it is inherently interesting to test for the relative efficacy of these mechanisms in different learning contexts (Zollo and Winter, 2002).

The second potential moderating factor — the breadth of experiential search — can be modeled by taking into account the degree of heterogeneity in the stock of experience accumulated at any given point in time. In synthesis, one could argue that both deliberate learning investments and experience heterogeneity tend to counteract the negative consequences of experience accumulation, described above as confidence traps. The rationale for this argument is as follows.

**Deliberate Learning Processes.** Investing in deliberate learning processes can potentially counterbalance the negative effects of experience accumulation. Articulation and codification processes facilitate inference for a number of reasons. First, the measurement of both performance outcomes and decision/action inputs is improved. Because of the need to develop a collective articulation, and eventually, a codified view of the process, agents will have to share their own segmented experiences, contributing to the development of better assessments of both activities and results. While there are inherent limitations to these measurement improvements, their impact will be particularly strong given the initially poor representation of these causal linkages. Second, the development, refinement and transfer (Kogut and Zander, 1995) of “theories” on causal linkages (what works, what fails, under what conditions and why) is sometimes explicitly stated as the objective of post-event debriefing sessions or more formal internal auditing processes. More often, these objectives are not explicitly stated but are implicitly achieved. As managers share the nature of the problems they had to tackle and how they went about doing so, the collective appreciation of what needs to be done in future repetitions of the task to avoid either the occurrence of the problem or mistakes in its handling,

grows. Winter and Szulanski (2001) make a similar argument with respect to the progressive discovery of the “Arrow core” (i.e., tacit know-how of strategic relevance) in routine replication processes, although they focus on procedural, rather than causal, knowledge.

While these processes can also potentially increase the level of confidence in one’s own capabilities, the gap between actual and perceived competence should decrease due to the combination of improved induction processes and the reduction of hubris resulting from the collective sharing of errors and poor outcomes.

**Experience heterogeneity.** The breadth of scope in search processes generates a wide variety of implications, some of a positive nature (e.g., enhanced variation processes, higher creativity levels due to exposure to diverse contexts, etc.) and others negative (e.g., higher cognitive burden in distilling generalizable rules of conduct). There is currently little consensus on the sign and magnitude of the net effect. On balance, however, the limited literature available seems to point to evidence of a positive effect on decision-makers’ psychological biases, including those at the origins of confidence traps.

Whereas homogeneous experience tends to promote myopia, complacency and simplicity (Miller and Chen, 1996; Miller, 1999), heterogeneity can be beneficial in presenting managers with a variety of potential solutions (Haunschild and Ni, 2002). Heterogeneity in the stock of experience reduces the redundancy in experiences obtained by the firm and also serves as an antidote to competency traps (Lant and Mezias, 1990; Levitt and March, 1988). Related research on group composition also emphasizes that heterogeneity is useful in contributing greater creativity despite decreased efficiency (Eisenhardt and Tabrizi, 1995; Hambrick, Cho and Chen, 1996; Watson, Kumar and Michaelsen, 1993). This stream of research also indicates that heterogeneity promotes healthy skepticism (Wiersema and Bantel, 1992; Keck and Tushman,



1993), which can mitigate the development of confidence ahead of competence, thereby curbing the probability of confidence traps.

In the context of high causal ambiguity and poor measurability of inputs and outputs, however, higher levels of heterogeneity in the stock of accumulated experience might generate a beneficial net effect on the gap between perceived and actual competence levels. This is because inferences made on the basis of wider breadth of expertise will be more likely to generate different viewpoints in framing the issues, a wider variety of potential solutions to identified problems, and more powerful tests of the causalities between decisions/actions and performance outcomes.

An important observation is that the arguments made might work with inverse effects under the context of lower causal ambiguity and better measurability of inputs and outputs. For example, in these conditions experience heterogeneity might generate excessive levels of variation and therefore harm the selection process, making it harder to distinguish the good proposed solutions from the poor ones. Also, the returns to deliberate investments in knowledge articulation and codification will decrease, enhancing the relative attraction of learning-by-doing processes.

In order to explore these issues empirically, I concentrate on a setting characterized by significant levels of causal ambiguity, in which I expect to find superstitious learning effects to be important: corporate acquisitions.

## LEARNING IN CORPORATE ACQUISITIONS

*The desire to acquire is a very common and natural thing; and when a man who is capable of doing it makes the attempt, he will generally be praised, or at least not blamed; error and blame arise when a man lacks the necessary ability and still wants to make the attempt at all costs.*

Niccolò Machiavelli, *The Prince*  
Chapter 3, Mixed Principalities

The question of whether or not firms learn from their acquisition experience has been the subject of interest in a relatively small number of prior studies, but it has received increased research attention over the last few years. The evidence is still very mixed. An early study by Kusewitt (1985), for example, reported a significant negative relationship between the acquisition rate and the long-term financial performance of acquiring firms. This result was interpreted in terms of post-merger integration costs stemming from unjustifiable M&A fever. Subsequent studies, however, supported a positive relationship between an acquirer's experience and its acquisition performance (e.g., Fowler and Schmidt, 1989; Bruton, Oviatt and White, 1994). More recently, Halebian and Finkelstein (1999) relied on a behavioral learning perspective, and their results indicated a U-shaped relationship between acquisition experience and performance. They interpreted this finding as evidence that acquirers initially apply prior experience to acquisitions that appear to be similar to, yet are inherently different from, previous deals, and only after a threshold level of experience is attained do firms start to appropriately discriminate between, and generalize across, deals thereby realizing positive experience effects.

In more recent years, the literature has moved beyond the testing of simple learning curve effects and started to consider the characteristics of the stock of experience, in addition to its mere size. Haunschild and Beckman (2002), for example, consider the heterogeneity in the

experience of acquisition counterparts and find that it is useful to mitigate overbidding hazards. Close to our own analysis, Hayward (2002) studies the performance of prior acquisitions as a predictor of success in the focal transaction. He tests Sitkin's (1992) theory on learning from small mistakes and finds support for it, as the presence of small losses in the firm's stock of M&A experience leads to better performance for the focal acquisition, compared to gains in prior acquisitions.

The theoretical arguments made in the prior section are particularly relevant in the mergers and acquisitions context. Motivational issues biasing managers' self-perceptions of success are highly likely because of the sheer economic relevance of these types of resource commitments. Moreover, performance measures are notoriously difficult to monitor after the acquired firm is integrated within the acquirer losing its identity from both an organizational and an internal accounting standpoint.

Beyond the measurement problem, acquisitions require an inordinate number of highly interdependent decisions to be made within a very short period of time. From a process perspective, in fact, managers are supposed to decide on the degree to which the activities of the acquired firm across all organizational functions and product divisions, should be aligned with those of the acquirer (Haspeslagh and Jemison, 1991). In addition, a large number of strategically relevant decisions need to be made in a relatively limited period to set up a new organizational structure and specify leadership and reporting relationships in the combined entity. The combination of the limitations inherent to the measurement of performance in the acquired and integrated firm and the complexity of the decision-making process makes it enormously difficult for acquirers to develop and refine causal theories about what it makes sense to do under what conditions.

These arguments lead to the following hypothesis, which constitutes the empirical requirements for the first (and weaker) of the two tests proposed above for the presence of superstitious learning in the M&A context (Test 1):

**H1: Perceptions of success in prior acquisitions will negatively influence the performance of the focal acquisition.**

The stronger form of test advanced in the prior section suggests that the firm's inability to make correct inferences of one's competencies should worsen with the accumulation of experience. In organizational activities such as M&A, the confidence derived from the accumulation of acquisition experience can therefore negatively influence the precision with which the acquirer specifies the nature and magnitude of cause-effect relationships. In the example of Banc One's failure in the integration of the Colorado bank (Szulanski, 2001), the magnitude of the stock of prior experience in managing post-acquisition, and in particular IT system conversion, processes that might have explained the poor judgment exhibited in planning and executing the conversion. Hence, I submit the following hypothesis for empirical testing:

**H2: The greater the firm's acquisition experience, the stronger the negative effect of perceptions of success in prior acquisitions is on the performance of the focal acquisition.**

Whereas the tacit accumulation of experience may exacerbate the occurrence of confidence traps for tasks suffering from both causal and outcome ambiguity such as acquisitions, I expect that investments in deliberate learning processes will mitigate this problem. In the acquisitions context, deliberate learning processes take the form of extracting valuable lessons from prior experiences through postmortem reports, as well as developing and frequently updating manuals, decision-support software and project-management software. These documents are important tools supporting and facilitating the

decision-making and execution activities during the various stages of the acquisition process. Activities such as post-mortem audits are in fact designed specifically to obtain an assessment of the performance of past acquisitions as precise as possible; moreover, in the best examples of post-mortem audit reports, one can expect them to uncover the causal linkages between actions and performance outcomes. Finally, the development of tools such as integration manuals typically has unintentional, yet powerful, learning implications. The production of guidelines related to the management of integration processes, in fact, requires managers to clarify causal relationships between actions and performance outcomes. In this respect, the codification of knowledge can be viewed in part as retrospective sense-making (Weick, 1979, 1995). In both cases, agents are forced to expose the logical steps in an argument, unearth any hidden assumptions and make causal linkages explicit. These requirements of the knowledge codification process serve to mitigate the effects of superstitious learning, of both causal and outcome ambiguity nature, in the M&A context. Although both types of superstitious learning are expected to be moderated by the investment in deliberate learning processes, it needs to be noted that the reduction of outcome ambiguity, related to a better understanding of the performance implications of a given completed acquisition, is significantly more frequent and, overall, more easily attainable compared to the reduction of causal ambiguity.

Finally, although the costs of these activities can be significantly higher than tacit experience accumulation, the benefits of these efforts will also be higher under conditions of causal ambiguity (Zollo and Winter, 2002). These considerations lead us to specify the following hypothesis:

**H3: The greater the firm's investment in deliberate learning processes, the weaker the negative effect of success in prior acquisitions is on the performance of the focal acquisition.**

The final potential moderator I wish to examine is the degree of heterogeneity in the stock of prior experience. As the theoretical discussion in the prior section pointed out, experience heterogeneity is likely to be useful to decision-makers dealing with highly causally ambiguous activities, such as acquisitions. Practitioners tend to cite acquisitions as being among the most challenging contexts they face, especially because of their perception of high heterogeneity, almost uniqueness, in their acquisition experiences. In such contexts, decision-makers need to rely on significant variation in their experience base to develop and refine their causal inferences. Also, the poor quality of the performance measures in the context of acquisitions implies that managers will tend to fall back on replicating decisions made in past acquisitions, assuming that performance was acceptable. High task heterogeneity will limit this problem by increasing the salience of individual acquisitions and discouraging generalization efforts from prior experiences. I therefore submit the following hypothesis to empirical investigation:

**H4: The greater the heterogeneity of the firm's acquisition experience, the weaker the negative effect of success in prior acquisitions is on the performance of the focal acquisition.**

Figure 2 summarizes the causal linkages submitted for empirical testing.

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Insert Figure 2 about here  
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## METHODS

### Sample

The hypotheses developed above were tested by investigating acquisitions taking place in the US commercial banking industry between 1985 and 1995. This industry setting was deemed attractive for the purposes of our study for several reasons. First, the commercial banking industry underwent a period of significant consolidation during that decade, owing in part to regulatory changes that allowed firms to cross state lines to become regional or national players. These developments created attractive conditions for survey research, as they brought about a sufficiently large population of observations in a relatively compact time frame. Second, the relevance of acquisitive growth in the commercial banking industry facilitated fieldwork and survey participation, since the principal decision-makers were interested in collaborating with academia to learn how to improve their chances of success. Third, this industry was among the most active in acquisitions during that decade in the US, allowing for the conditions for experiential learning, as well as deliberate learning investments, to occur and eventually to display their effects on performance outcomes.

The research design involved three phases. In the first phase, fieldwork was conducted at 12 banks that were active acquirers in order to develop a greater understanding of acquisition practices in the commercial banking industry. Based on interviews of 45 decision-makers during this first stage, a questionnaire-based survey was developed and fine-tuned to ensure measurability and clarity. The survey was conducted in 1996 on the 250 largest bank holding companies in the US, which collectively represent over 95 percent of the industry's assets. The smallest institution in the target population had total assets of approximately US\$400 million,

implying that further extensions of the survey frame to even smaller banks would likely have garnered sparse and less comparable observations. The final phase of the research design involved collecting more detailed questionnaire data on a subset of the acquisitions surveyed for construct validity purpose and collecting archival data on firm size and financial performance.

The survey consisted of two main parts: an acquisition history profile and an acquiring bank questionnaire. The first portion of the survey requested respondents to list all the acquisitions conducted by the bank and collected basic information about each acquisition, such as asset size, the degree of market relatedness, pre-acquisition profitability, level of integration and top management team replacement. The acquiring bank questionnaire provided information on the acquiring firm's structural arrangements for the management of the acquisition process, including information on ad-hoc tools developed, such as integration manuals, due diligence checklists, systems conversion manuals, product mapping models, branch staffing models and training packages.

Of the 250 bank holding companies contacted, 70 did not experience an acquisition after 1985, and 16 were acquired during the invitation period. Of the remaining 164 banks, responses were obtained from 51 banks, corresponding to a 31.7% response rate. This response rate was considered satisfactory given the seniority of respondents and the complexity of the survey, and was attributable in part to the salience of the topic to industry participants in addition to the in-depth pretesting of the survey instrument (Fowler, 1993; Groves, Cialdini and Couper, 1992). The survey was sent to the most knowledgeable respondent at each bank, who was identified through a round of phone calls that preceded the mailing. Specifically, the key informants were the managers responsible for corporate development or for the M&A group (25 cases), the coordinator of post-acquisition integration processes (this position existed in 14 of the institutions



surveyed), the CFO (9 cases), or the CEO (3 cases). Respondents were motivated to complete the questionnaire by the opportunity to benchmark their acquisition practices with those of other firms in the industry as well as by assurances that their individual responses would be kept confidential.

Of the 51 bank holding companies responding to the survey, four had to be excluded from the analysis due to incomplete responses and 18 more had to be excluded from the final analysis to construct our measures of experience heterogeneity, which required a minimum of 5 completed acquisitions to be measured (see below). Standard mean comparison tests for nonresponse bias indicated that responding organizations were not different from the original set of 250 bank holding companies in terms of return on assets, return on equity or efficiency ratios, yet responding firms tended to be larger in terms of total assets ( $p < 0.05$ ). In terms of number of observations, the relevant unit of analysis for the study, the 29 acquiring banks completed 167 observations during the period under observation: 1986<sup>4</sup> to 1995.

## Measures and Data

**Dependent Variable.** Acquisition financial performance was measured as the acquiring firm's cumulative abnormal returns (CARs) following the acquisition. A stock market return measure has been preferred to accounting measures because of the higher precision of monthly (rather than yearly) clocks, as well as because of new advancements in the measurement of long term event studies. Following Ikenberry, Lakonishok and Vermaelen (1995), cumulative abnormal returns were calculated relative to a size- and market-to-book (MTB)-based benchmark. The variable is computed as the cumulative difference between the acquiring firm's monthly stock return and the return in the equal-weighted size- and MTB-ranked portfolio to

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<sup>4</sup> Note that, due to the construction of the depen

which the firm belongs, over a period of 36 months<sup>5</sup>. An alternative computation method was adopted following a “buy & hold” assumption throughout the period for both the acquiring bank’s stock and the benchmark portfolio, with results that are virtually identical to those using CARs and which will be therefore omitted given the stronger behavioral assumptions required on the part of the investors<sup>6</sup>.

The use of the firm size and market-to-book criteria is based on recent asset pricing research by Fama and French (1992, 1993, 1996) that highlights the value of multifactor asset pricing models incorporating these two criteria rather than just the market return variable appearing in the traditional capital asset pricing model. Every month this portfolio is rebalanced, and the classification of each bank in the (Size x MTB) matrix is reevaluated using data on all companies that are traded on the New York Stock Exchange and the American Stock Exchange and that have accounting data available in Compustat. One hundred benchmark portfolios were constructed based on the cross-product of 10 size deciles and 10 MTB deciles. Stock return data for these performance measures were obtained from the universe of firms in the Center for Research in Security Prices (CRSP) data files.

**Explanatory Variables.** Respondents were asked to assess the degree to which past acquisitions conducted by the firm were successful. Specifically, past acquisitions were coded along the following scale: -2 for “many problems,” -1 for “some problems,” 0 for “average,” 1 for “OK,” and 2 for “great.” Acquisitions that were evaluated as 1 or 2 were considered to be successful, and the measure *Past Success* was then defined to be the proportion of the firm’s prior acquisitions deemed to be successful. The firm’s *Acquisition Experience* was computed as simply the number of acquisitions completed by the acquirer prior to the focal acquisition.

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<sup>5</sup> The analysis has been replicated with a 48 month window without significant variations in the results (see below)

<sup>6</sup> The results of the estimated models with the “buy & hold” measure of the dep. var. are available from the author

In order to calculate a measure of experience heterogeneity, I needed to classify prior acquisitions conducted by the firm to ascertain their similarities or differences as a collection. In order to do this, I asked respondents to judge the pre-acquisition quality of the acquired firm, since prior research has established that the target's quality is likely to influence the way the acquisition is managed as well as the performance of the acquisition itself (Capron, 1999). For instance, acquiring firms may manage the integration of a well-performing firm by accessing and leveraging its knowledge assets and routines, although these inverse knowledge redeployment processes are fraught with motivational and behavioral hurdles on the part of both firms (Haspeslagh and Jemison, 1991; Capron, 1999). By contrast, if the quality of the acquired bank is poor, acquirers will tend to replace the existing organizational routines and redeploy their own resources and procedures in an effort to improve the acquired firm's performance. This shift in mindset necessary to plan and execute the appropriate transfers of procedures and redeployment of resources is likely to require significant cognitive investments and is therefore a suitable candidate for testing the moderating effect experience heterogeneity is supposed to have according to hypothesis 4. Bank quality was measured using an assessment of the pre-acquisition profitability of the target, which is coded on a five-point scale for each acquisition (Shanley, 1994). *Experience Heterogeneity* was then defined as the average difference among all past acquisition events as follows:

$$(1) \text{ Experience Heterogeneity} = \frac{1}{\binom{n}{2}} \sum_{i \neq j} |\text{Quality}_i - \text{Quality}_j|,$$

where  $i$  and  $j$  are two acquisitions in the firm's experience stock and  $\binom{n}{2}$  is the total number of combinations of acquisitions to compare in terms of quality. In order to compute this variable, all

acquisitions with fewer than four prior observations by the same acquiring bank had to be excluded from the analysis.

The last theoretical variable is the level of codification of acquisition-specific knowledge that the acquiring firm has reached at the time of the focal acquisition. *Codification* was measured as the number of tools specific to the management of the acquisition process that the acquirer had developed at the time of the focal transaction (e.g., documents, models and manuals, including due diligence checklist, due diligence manual, systems conversion manual, affiliation/integration manual, systems training manual and products training manual; and quantitative models, including financial evaluation, staffing models, product mapping, training/self-training packages and project management tools).

**Control Variables.** To account for heterogeneity in acquiring banks and their performance, a number of control variables that are likely to have some bearing on acquiring firms' performance levels and also may relate to the theoretical variables of interest were included in the model.

To capture target firm effects, I included a measure of the target's resource quality, as defined above. I also incorporated a control for the relatedness between the acquirer and the target firm's resources. This variable has been viewed as a key antecedent to acquisition performance, yet empirical evidence on the relatedness-performance relationship has been mixed (Chatterjee, 1986; Lubatkin, 1987; Singh and Montgomery, 1987; Seth, 1990). Given the importance of geographic location as a key competitive factor in this industry and given the rationalization of branch networks in the process of creating value through efficiency enhancement, it is important to control for the degree of geographic overlap as a proxy for resource relatedness (Healy, Palepu and Ruback, 1992). The sample consists of acquisitions that

are either perfectly horizontal (i.e., a bank buys a competitor located in the same geographic area, known as an “in-market” transaction in banking jargon) or market extension (“out-market”) transactions. *Market Relatedness* was thus measured as 1 for in-market transactions and 0 for out-market acquisitions.

A variable to incorporate the way in which the target firm was integrated into the acquiring firm’s operations was also deemed important to control for heterogeneity in the complexity of the task at hand. *Integration* was measured on a single scale from 0 to 3, where 0 corresponds to no integration, 1 to a minor degree of integration, 2 to a major degree of integration and 3 to complete integration of the acquired firm within the acquiring bank (Datta and Grant, 1990). The scale was the answer to a question on the degree to which procedures were aligned, information systems were converted and products were standardized.

Finally, two controls were added to capture the effects of the size of acquiring and target firms. *Acquirer Size* was measured as the acquirer’s total assets in billions of dollars for the year before the acquisition. *Relative Acquisition Size* was measured as the size of the acquired firm relative to the size of the acquiring bank, stated as a percentage based on total assets (Datta, 1991). This variable was incorporated as a control since comparatively small acquisitions are easier to integrate, yet also are less likely to have a material affect on acquirers’ market valuations.

### **Model Specification**

The model specification used to test the hypotheses developed earlier is the following:

$$(2) \text{ Acquisition Performance} = \alpha_0 + \beta_1 \text{ Past Success} + \beta_2 \text{ Past Success*Acquisition Experience} + \beta_3 \text{ Past Success*Codification} + \beta_4 \text{ Past Success*Experience Heterogeneity} + \text{controls} + \varepsilon.$$

Because acquisition experience-related attributes (i.e., experience, past success and experience heterogeneity) enter the model multiple times as direct effects and interaction terms, z-scores for these variables were used to mitigate multicollinearity. After these transformations, the maximum variance inflation factor (VIF) for all of the variables for the estimated models is 1.97, which is substantially below the rule of thumb cutoff of 10 used to indicate multicollinearity problems (Neter, Wasserman, and Kutner, 1985)<sup>7</sup>.

## RESULTS

The first and simplest indication of a disconnect between the perceptions of acquisition performance comes from the simple correlation between the ex-post qualitative assessments made by respondents and the measure of firm performance adopted to proxy the 3-year post-acquisition stock returns. The correlation is 0.063, largely non-significant. Even poorer results are obtained if the proxy for the “objective” post-acquisition performance is computed with a “buy and hold” assumption (corr. = -.004).

Table 1 reports descriptive statistics and a correlation matrix for the variables used in this study. The performance variable correlates strongly and negatively with the measure of past success ( $p < .001$ ), offering preliminary support for hypothesis 1.

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Insert Table 1 about here

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<sup>7</sup> The other possible violation to the normal distribution assumption of the error terms in the OLS estimates was due to multiple observations (acquisitions) for respondent (acquiring bank). The introduction of dummy variables to control for firm effects in the cases with most frequent acquisition activity does not change substantially the results reported below. The use of dummy variables for the purpose of this study is, however, problematic since the core theoretical variables (experience, knowledge codification, avg. perception of past success) are all firm-level effects as well. Thus, part of the fixed effects might actually capture measurement error from the theoretical variables. I thus report the results of the models run without dummies. Results for the complete models are available from the author.

Table 2 presents the results of the multiple regression analyses. Model I is the baseline specification consisting of the control variables. Model II adds the direct effects of the theoretical variables: perceptions of past success, acquisition experience, experience heterogeneity and the degree of deliberate learning through knowledge codification. Finally, model III represents the full model incorporating the interaction effects of the learning variables with past success. All models are significant at the 0.001 level. Hierarchical F-tests revealed that the direct effect models improve on the explanatory power of the baseline specifications (i.e.,  $F=7.24$ ,  $p<0.001$  for Model II vs. Model I), and similar tests reveal that the interaction terms are jointly significant (i.e.,  $F=7.77$ ,  $p<0.001$  for Model III vs. Model II). Another indication of good descriptive power of the models comes from R-squared coefficient, rising from 12% to 24% from the baseline to Model II, and reaching 34% for the full model.

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Insert Table 2 about here  
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Regarding the formal test of the hypotheses advanced in the theory section, the direct effect of past success is negative in Model II ( $p<0.001$ ), suggesting that acquiring firms' perception of their past performance is systematically and inversely correlated with the performance in the focal acquisition. Strong support is therefore evident for the first hypothesis. However, this effect could be confounded by regression to the mean processes or simple problemistic search in the case of perceived low performance in past acquisitions. The stronger test advanced in the theory section calls for a negative coefficient in the interaction term between experience accumulation and the measure of past success. Model III shows a significant and negative coefficient ( $p<.001$ ) of that interaction term, supporting the second hypothesis advanced in the theory development section. To the extent that the two tests are credible indicators of

superstitious learning from confidence traps, that is due to fundamental outcome ambiguity in the measurement of acquisition performance, the data seem to reveal evidence of this problem in the context observed.

In addition to the presence of superstitious learning, though, I was interested in testing the relative efficacy of moderating variables related to the learning process itself. In terms of main effects, deliberate learning in the form of knowledge codification positively influences acquisition performance ( $p < 0.05$  in Model II), but there is no evidence of learning curves from experience accumulation. The degree of heterogeneity in the stock of experience, instead, shows evidence of a positive direct impact ( $p < .05$  in Model II).

Hypotheses 3 and 4 are testable with the interaction effects of deliberate learning and experience heterogeneity with the perception of past success. The two interaction terms explore, in fact, contingencies shaping the relationship between self-assessments of acquisition performance and the actual performance of the focal acquisition. Consistent with hypothesis 3, firms that have invested in deliberate learning processes through knowledge codification can mitigate the negative effect of perceptions of past success on current acquisition performance ( $p < 0.01$  in Model III). By contrast, firms that have not undertaken such efforts to identify and evaluate the factors affecting M&A performance tend to experience greater problems the more they believe that their prior acquisitions were successful. In addition, the magnitude of this effect is empirically and practically relevant. The relatively large size of the parameters (.19 standardized coefficient in Model III) indicates that firms with knowledge codification levels one standard deviation above the mean do not experience superstitious learning problems, in the sense that the negative impact of the perceptions of past success is fully counterbalanced.



Just as deliberate learning processes in the form of knowledge codification appear to mitigate the effects of superstitious learning, more heterogeneous experience also appears to temper the adverse effects of superstitious learning through confidence traps. Specifically, consistent with predictions (H4), previous successes are not as prone to engender inappropriate confidence in firm capacity to manage acquisitions for firms that have heterogeneous experiences, but are particularly harmful for firms with homogeneous M&A experience ( $p < 0.05$  in Model III). Heterogeneous experience reduces, or slows down, the routinization process and offers contrasting evidence to test implicit or explicit theories on how acquisitions should be managed.

## **DISCUSSION**

This study set out to further develop the conceptualization of superstitious learning from pioneering work in psychology (Skinner, 1948) and economic sociology (Levitt and March, 1988), and to examine the conditions under which it emerges in organizations. In doing so, it departs from the received literature in several ways. First, the definition and conceptualization of the construct is now based on the distinction between (a) competence and confidence effects of experience accumulation, as well as (b) causal and outcome ambiguity. Second, the attention was focused on the specific case of confidence traps generated by the faster development of confidence in the firm's competences, compared to the actual competence development. Third, a more complete categorization of the causes of the problem of over-confidence caused by perceptions of past success, adding cognitive processes to motivational biases. Fourth, the development of a double test for the presence of confidence traps that controls for several confounding effects. Finally, the development of a theoretical understanding of the boundaries of the phenomenon, with the identification of contingent factors potentially influencing its expected

salience. Moreover, this paper offers the first empirical validation for the presence of superstitious learning, in the form of confidence traps, in an organizational context and for the moderating role played by deliberate learning processes and experience heterogeneity to counter the negative implications of confidence traps.

The data analyzed, drawn from an extensive survey of acquisition processes in the US banking industry, shows evidence of the presence of confidence traps as defined in the theory section of the paper. In addition, both moderating factors act in a significant way to reduce the negative consequences of experience-driven confidence, although deliberate learning seems to be somewhat more powerful than experience heterogeneity in this respect. The impact of investments in deliberate learning is in fact so strong as to eliminate the superstitious learning problem in all cases with a level of investment larger than one standard deviation above the mean.

The combination of the theoretical discourse developed and the empirical evidence unearthed can potentially contribute to the current debates in a number of domains. The organizational learning literature could benefit from the characterization of experience accumulation processes as both competence and confidence development mechanisms. Further, the refinement of the concept of one of the major barriers to effective learning, according to Levitt and March (1988), is important in that it allows more precise theoretical discourse based on both causal and outcome ambiguity. Empirically, the simple fact that the presence of superstitious learning has been detected in a large-scale empirical study of a complex organizational endeavor is, in and of itself, a step forward.

For the literature in evolutionary economics, the theoretical and empirical contributions of this paper could represent an important, and somewhat challenging, opening of new avenues for

further research. To begin with, the notion that routines can be *generated* by aberrant learning behavior, rather than, or in addition to, the well-known inertial consequences of routinization, has to be taken seriously. The current articulation of the theory, in fact, is premised on the virtuous role of routinization processes as producers of continuous learning. On the positive side, though, this study highlights the virtuous role of deliberate learning processes and of heterogeneous stocks of experience in reducing the hazards of excessive confidence. More generally, the conceptualization of experience accumulation as both a competence- and confidence-building process deserves attention to the extent that it might map the boundaries of the applicability of the theory, at least in its current formulation. The assumption, based on Polanyi's work, that the fundamental problem in competence building consists in the fact that firms are not aware of what they know (Winter, 1987; Kogut and Zander, 1992; Nonaka, 1994) might be seriously challenged if it turned out that there are important instances where the problem is the inverse, i.e., firms do not really know what they *think* they know. Understanding when each of the two conditions applies seems to be a crucial (missing) piece in the complex puzzle of organizational capability building for both evolutionary economists and strategy scholars.

Another area where the present study might contribute is, of course, the literature on mergers and acquisitions. First of all, by distinguishing between "automatic" and deliberate learning processes as well as between different dimensions of experiences (e.g., perceived successes versus failures and homogeneous experiences versus heterogeneous ones), the findings can potentially explain why some of the results on experiential learning in the M&A literature are so mixed. The reason might be that these different dimensions of the learning process could have distinct implications for acquisition performance, and their unique effects can be masked in the more aggregate treatments of experiential learning that are common in M&A studies. Deliberate

and tacit learning mechanisms exhibit very different effects in the data analyzed, and the findings also show that the nature of previous experiences in the firm's experience base (both in terms of its heterogeneity and of its perceived quality) matters above and beyond the mere number of previous acquisitions. More broadly, the presence of superstitious learning might be a novel explanation for the high failure rate in these types of business endeavors, but even more importantly an explanation of the persistence of these failure rates over time and across regions and industries. Finally, a methodological point: the presence of superstitious learning processes calls for serious caution in the use of perceptual measures to proxy performance in corporate activities characterized by high levels of causal ambiguity and poor (if any) ad-hoc performance metrics. The confidence trap problem, and the implication it has for the reliability of subjective performance assessments, might in fact help explaining why the literature finds it hard to converge on generally accepted results, even after decades of replicated work.

For managers involved in mergers and acquisitions, the results of this paper should offer opportunities for reflection on the way these important activities are tackled. First of all, the notion that M&A is "an art" that can be mastered only through the accumulation of experience is in contrast with the data collected. The magnitude of experience not only does not help improve performance, but it can actually hurt the outcomes of future acquisitions! This is increasingly possible if the organization does not invest in deliberate efforts to extract the valuable lessons from the growing number of experiences accumulated. The boosting of self-confidence, unmatched by increasing levels of real competence<sup>8</sup>, can severely lessen the odds of success without much of an opportunity to root out the cause of the problem.

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<sup>8</sup> Recall that the direct effect of knowledge codification is positive and significant, whereas that of the stock of prior acquisition experience is nonsignificant.

But the chief ambition of this paper is to inform our collective thinking about how groups of individuals learn within organizations, and what are some of the cognitive limitations they face to pursue higher levels of understanding. In that sense, this study can only be viewed as exploration into the dark side of experiential learning, particularly in its potential effects on confidence levels. More, much more, needs to be understood about this confidence effect of experience: under what condition is it of more serious harm? What factors might be able to curb its negative consequences? What task and organizational characteristics can tame, or even eliminate, it? This and many other interesting questions can offer important advancements on our current understanding of these complex phenomena, and go beyond the limitations in the theoretical as well as empirical dimensions of the problem. Our hope is that in doing so, we will be able to reduce the asymmetry between the confidence and the competence effects of experience accumulation, and thus proceed towards more effective and real learning. For academics and managers alike.

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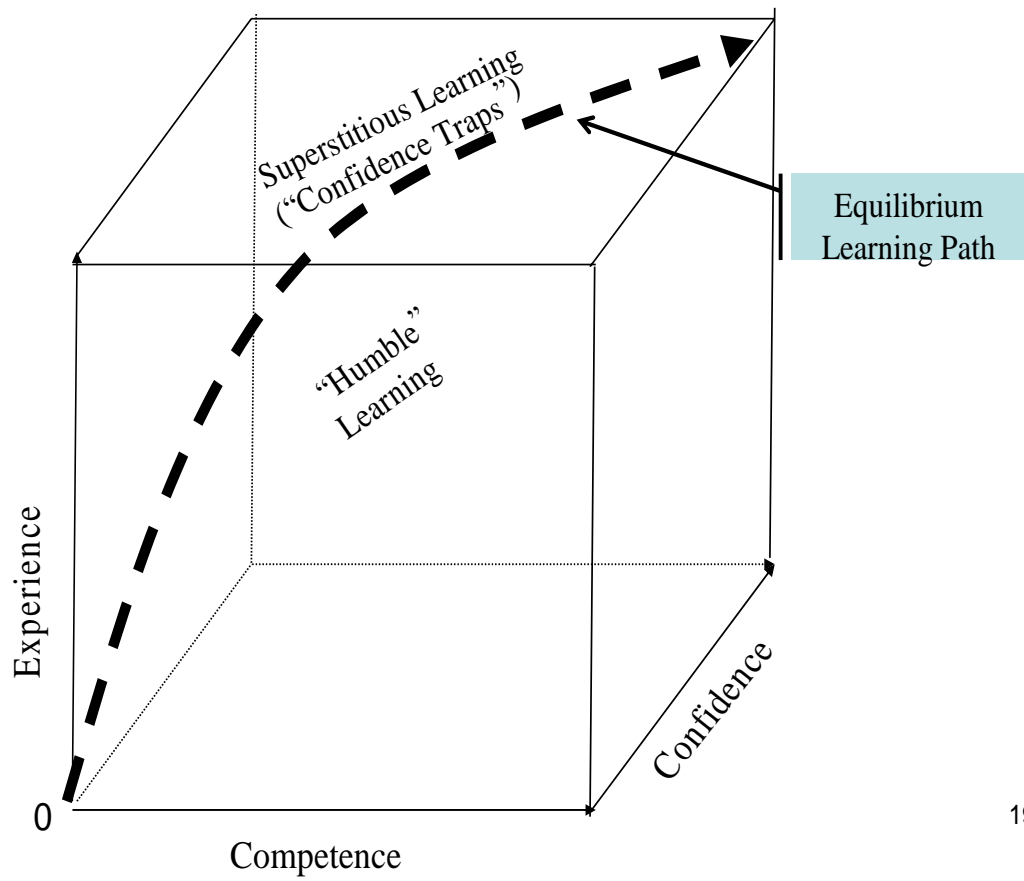
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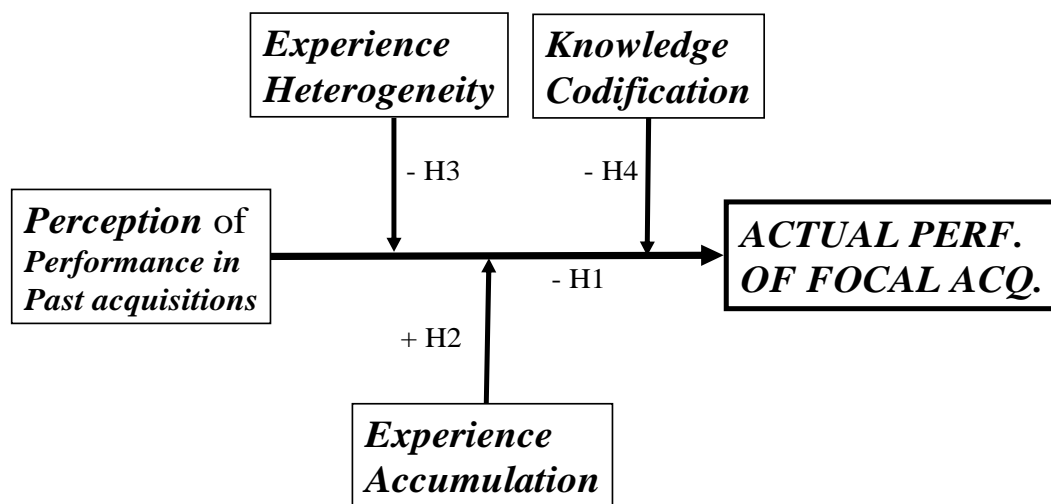
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Fig. 1 – The Competence/Confidence Model of Experiential Learning



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Fig. 2 - A Model of Superstitious Learning in Corporate Acquisitions



**TABLE 1**  
**Descriptive Statistics and Correlation Matrix<sup>a</sup>**

Variable	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Acquisition performance	-.13	.55	---								
2. Resource quality	1.96	1.09	-.33***	---							
3. Market relatedness	.62	.49	.23***	-.22***	---						
4. Integration	2.64	.69	.13*	-.22***	.40***	---					
5. Acquirer's size	2.64	1.13	-.07	-.08	.25***	.15**	---				
6. Relative acquisition size	1.06	1.64	.13*	.08 <sup>†</sup>	-.17***	-.03	.02	---			
7. Past success	.48	.38	-.23***	.02	-.03	-.14**	.19***	.00	---		
8. Acquisition experience	11.11	10.17	.03	.04	.16***	.10*	.43***	.01	.04	---	
9. Codification	4.81	3.67	.04	.20***	.01	.07	.43***	.08	.17***	.46***	---
10. Experience heterogeneity	.65	.66	.04	-.04	.12*	.09 <sup>†</sup>	.41***	.02	.47***	.22***	.22***

<sup>a</sup> Sample sizes in the cells range from 166 to 530. The variables *past success*, *acquisition experience*, *experience heterogeneity*, and *codification* appear in unstandardized form. <sup>†</sup> p<0.10; \* p<0.05; \*\* p<0.01; \*\*\* p<0.001.

**TABLE 2**  
**OLS Estimates for Acquisition Performance**  
**Performance: Benchmark Portfolio Adjusted Cumulative Abnormal Returns<sup>b</sup>**

Variable	Cumulative Abnormal Returns		
	I	II	III
Intercept	.30 (.19)	.61** (.20)	.46* (.19)
Resource quality	-.12*** (.03)	-.14*** (.03)	-.13*** (.03)
Market relatedness	.10 (.09)	.08 (.09)	.07 (.08)
Integration	-.02 (.06)	-.06 (.06)	-.07 (.06)
Acquirer's size	-.08* (.03)	-.12** (.04)	-.08* (.04)
Relative acquisition size	.03 (.03)	.03 (.03)	.02 (.03)
Past success	---	-.21*** (.05)	-.14** (.05)
Acquisition experience	---	.04 (.05)	.07 <sup>†</sup> (.04)
Experience heterogeneity	---	.10* (.04)	-.05 (.07)
Codification	---	.10* (.05)	.02 (.05)
Past success * Acquisition experience	---	---	-.18*** (.04)
Past success * Codification	---	---	.19** (.07)
Past success * Experience heterogeneity	---	---	.14* (.06)
Model F	4.43***	5.46***	6.57***
R-squared	.12	.24	.34
N	167	167	167

<sup>b</sup> All variables comprising the interaction effects were standardized prior to forming the multiplicative terms. Standard errors appear in parentheses. <sup>†</sup> p<0.10; \* p<0.05; \*\* p<0.01; \*\*\* p<0.001.