Superstitious Learning in Corporate Acquisitions

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Abstract

In this paper, we study some of the conditions under which "superstitious learning" phenomena (Levitt and March, 1988) become problematic in organizations, and we identify a set of boundary conditions for these effects. In particular, we argue that the tacit accumulation of experience might exacerbate the problem, but that the heterogeneity in the stock of prior experience, as well as more deliberate learning processes in the form of knowledge articulation and codification, can be beneficial in reducing or even eliminating the effects of superstitious learning. We test these arguments in the context of corporate acquisitions, a challenging task from an organizational learning standpoint due to its high level of causal ambiguity. In a sample of US bank mergers, we find evidence that managers' self-attributions of success in previous acquisitions are negatively related to the performance of the focal merger. Consistent with the theoretical arguments developed, the results also underscore the importance of experience accumulation, experience heterogeneity and knowledge codification as contingencies shaping the consequences of superstitious learning.

"Experience enhances both competence and confidence in organizations. The problem is that the two develop asymmetrically over time."
Jim March[1]

INTRODUCTION

Superstitious learning has been defined as the phenomenon by which "the subjective experience of learning is compelling, but the connections between actions and outcomes are misspecified" (Levitt and March, 1988: 325). Different aspects of this problem have been studied in awcweL streams of research in organizational behavior, organizational theory, and strategy (see Miller, 1999 for a recent review). A more general depiction of the issue can be made by observing that the accumulation of experience potentially leads to two outcomes, the first being the well-known improvement in competence and the second being the development of confidence in one's own competence. Contrary to intuition, however, these two consequences of experience do not necessarily develop at the same time or rate.

If competence develops before confidence, we find ourselves in the world described by Polanyi (1966) in which people generally know more than they are actually aware of. This situation is reflected in an entire literature focusing on the challenge of dealing with tacit knowledge and its conversion into more explicit forms of knowledge (Nelson and Winter, 1982; Kogut and Zander, 1992; Nonaka, 1994; Zander and Kogut, 1995).

It can also be the case, however, that confidence develops before competence. In this situation, individuals or groups hold unfounded beliefs about their competencies, and their learning is only 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, 1984; Henry, 1995) and organizations (Herriott, Levinthal and March, 1985; Sitkin, 1992; Levinthal and March, 1993).

One issue that has been left unexplored, though, is the identification of the factors that might explain when competence and confidence diverge. This paper advances the notion that the nature of the task, and in particular the measurability of its performance outcomes and its degree of causal ambiguity, influence the likelihood of superstitious learning. Causal ambiguity complicates the inferences between prior experiences and perceptions of performance, resulting in false convictions of competence building based on accumulated experience. When causal ambiguity is low, by contrast, competence can develop more rapidly than confidence, leading to the well-known paradox that people know more than they are aware of (Polanyi, 1966).

After identifying some of the conditions under which superstitious learning can arise, we then consider several factors that might moderate the problem. In particular, we focus on our attention on the level and heterogeneity of accumulated experience, as well as the degree of investment in deliberate learning processes. The hypotheses we develop on these moderating influences are tested in the context of corporate acquisitions, a type of organizational task characterized by a high degree of causal ambiguity, therefore making the presence of superstitious learning more likely. The data analyzed not only confirm that superstitious learning is present in the context studied, but also present evidence in support of the moderating effects hypothesized.

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[1] Personal communication, Sept. 2002.

THE BOUNDARIES OF SUPERSTITIOUS LEARNING

Causes of the Problem

Before we can tackle the problem of defining the boundary conditions for the superstitious learning phenomenon, it is important to be clear about the specific reasons why it is believed to occur. The most important set of explanations has to do with motivational issues. Managers, and organizational members in general, may make erroneous (positively biased) attributions of their own capabilities, and of the resulting outcomes, for well-known reasons related to the social desirability of competence and of performance. Perceptions of past success encourage complacency, or satisfaction with the status quo, and therefore reduce search efforts (March and Simon, 1958; Nelson and Winter, 1982). To the extent that search does occur, it tends to be in the same domain, exacerbating the well-known problem of learning myopia (March and Levinthal, 1993). More broadly speaking, perceptions of past success strengthen agents' convictions in the quality of choices, the homogeneity of perspectives among organizational members, and the intolerance for novel views (e.g., Carroll, 1984; Tushman and Romanelli, 1985; Wiersema and Bantel, 1992; Keck and Tushman, 1993). From an attribution theory perspective, March and Levinthal (1981 and 1993) argue that an inherent psychological bias exists in the way managers attribute the responsibility of events depending on the quality of their outcomes: positive events tend to be attributed to their own actions, and negative ones to environmental conditions. Also, the self-attribution of risk-management capabilities in the face of increasing levels of experience has been shown to be at least in part due to superstition (March and Shapira, 1987).

Managers' motivational biases, however, might provide only partial explanations

for systematically erroneous attributions of competence and performance. There might be explanations of a more objective nature that have been under-represented in the theoretical treatments of superstitious learning. For instance, induction can be problematic simply because there is no objective way to measure the performance outcome of a certain task. This is often the case in managerial contexts where the nature of the task is vaguely specified and therefore the assessment of the outcomes is inherently subjective. The sheer number of decisions and actions that might potentially influence a final outcome, and the difficulty of measuring both decisions and outcomes, are additional barriers to effective induction. Under these conditions, managers will turn to proxies, such as the number of prior experiences, as an indicator of competence. However, to the extent that causal ambiguity is present, experience accumulation is increasingly less effective compared to other more deliberate forms of learning in developing competence (Zollo and Winter, 2002*)*.

We submit that, although the motivational aspects are important antecedents of superstitious learning, its fundamental cause might lie in measurability problems as well as in the causal ambiguity of the task to be learned. One might also argue that these measurability and causal ambiguity problems function as enablers of some of the motivational effects. In their absence, for example, agents will not be able to attribute failure to the environment and success to themselves.

As agents' assessments of competence and performance increase, there are several consequences that are worth noting: (1) the search for improvements to the status quo is correspondingly reduced (March and Simon, 1958; Nelson and Winter, 1982), (2) confidence in the soundness of one's own decisions increases, and (3) 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. For all these reasons, the presence of superstitious learning can be effectively assessed 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).

Key Contingencies

In order to understand the boundaries of the superstitious learning phenomenon, it is important to move beyond its root causes and inquire about 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, organization, and 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 Tuschman, 1993). Organizational traits, such as high tolerance for diversity and for risk as well as 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 & Lant, 1991), velocity in change dynamics (Brown & 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 strikes us that the factors closest to the problem of superstitious learning – those related to the learning process itself – have not been given research attention. In an attempt to fill this gap in our theoretical understanding of superstitious learning, we submit that two dimensions might be important: (1) the degree of intentionality in the learning process, and (2) the breadth of search as reflected in the heterogeneity in the stock of experience. The intentionality dimension can be studied by looking at two mechanisms: the amount of tacit experience accumulated and the degree of knowledge codification (Zollo and Winter, 2002). It is

worth noting that the first mechanism operates at low levels of intentionality, yet both learning processes can be simultaneously at work in any learning context. On the other hand, the breadth of search can be modeled by simply taking into account the degree of heterogeneity in the stock of experience accumulated at any given point in time.

So, how do these three mechanisms influence the severity of the superstitious learning problem? In synthesis, we argue that the accumulation of experience tends to worsen the problem, whereas deliberate learning investments and experience heterogeneity tend to act in the opposite direction. Below are the rationales for this argument.

Experience Accumulation. In order to see why the magnitude of experience can act in such a counter-intuitively negative way, recall the two conditions described above for the superstitious learning problem to occur. First, the possibility to objectively measure the outcomes (e.g. task performance) as well as the key inputs (e.g. competence) needs to be low. Second, the ability of agents to tease out the causal linkages between their actions and the consequent outcomes also needs to be limited; the task has to be characterized by significant levels of causal ambiguity. In these conditions, experience accumulation is likely to be among the few concrete measures available to infer one's own capability levels; the larger the number of prior experiences, the stronger the inference regarding one's own capability to handle the task. However, given the measurability and causal ambiguity problems, the actual development of competence through induction processes (development and testing of hypotheses about causalities) is significantly hampered Hence, superstitious learning is likely to become more problematic.

Deliberate Learning Processes. At the opposite extreme of the intentionality dimension, investing in deliberate learning processes can potentially act to counterbalance the negative effects of experience accumulation. Articulation and codification processes facilitate induction for a number of reasons. First, the measurement of both performance outcomes and decision/action inputs is improved. While there are inherent limitations to these improvements, their impact will be particularly strong given the poor initial 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, 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 two other contrasting factors: (1) the development of actual competence through improved induction processes, and (2) the reduction of "hubris" 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 of a negative one (e.g. higher cognitive burden in distilling generalizable rules of conduct). On balance, there seems to be stronger evidence for a positive effect on decision-makers' psychological biases, including those at the origins of superstitious learning effects.

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, 2001). 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 & Mezias, 1990; Levitt & March, 1988). Related research on group composition also emphasizes that heterogeneity is useful in contributing greater creativity despite lesser efficiency (Eisenhardt & Tabrizi, 1995; Hambrick, Cho, & Chen, 1996; Watson, Kumar, & Michaelson, 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 superstitious learning.

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 from the poor proposed solutions. Also, the "returns" to deliberate investments in knowledge articulation and codification will also decrease, enhancing the relative attraction of "learning-by-doing" processes.

In order to explore these issues empirically, we concentrate on a setting characterized by significant levels of causal ambiguity, where we 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

Niccolo' Macchiavelli, De Principatibus
Ch. III - De Principati Misti

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 has also received increased research attention over the last few years. The evidence is still very mixed, however. 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, Haleblian 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 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 its mere size. Haunschild and Beckman (2001), 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 predictor of success in the focal transaction. He finds a non-linear effect, 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. In other words, success might breed failure as opposed to additional success.

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, and therefore loses its identity from both an organizational, as well as an internal accounting, standpoint.

Beyond the measurement problem, acquisitions require an inordinate number of highly interdependent decisions to be made within a very short amount 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 space of time 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, with the complexity of the decision-making process results in enormous difficulties for acquirers to develop and refine causal theories about what makes sense to do under what conditions.

These arguments lead to the specification of the following hypothesis, which tests for the presence of superstitious learning in the M&A context:

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

The theoretical arguments presented earlier suggest that the firm's level of acquisition experience may lessen or worsen the effects of superstitious learning, depending upon the level of causal ambiguity involved. For relatively straightforward organizational activities, for instance, the accumulation of experience allows agents to develop progressively better inferences about the factors influencing performance and thereby manage future tasks more effectively. In organizational activities such as M&A, however, high levels of causal ambiguity make it very difficult for managers to grasp the fundamental causes of prior successes. Confidence derived from the accumulation of acquisition experience will therefore overcome the development of actual competence, defined as the increasing precision in the specification of the cause-effect relationships. Hence, we submit the following hypothesis for empirical testing.

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

Whereas the tacit accumulation of experience may exacerbate the superstitious learning problem for causally ambiguous tasks such as acquisitions, we expect that investments in deliberate learning processes will instead mitigate this problem. In the acquisition context, deliberate learning processes take the form of extracting the valuable lessons from prior experiences through post-mortem 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 the various stages of the acquisition process. Whereas the post-mortem audits are

designed specifically to uncover the causal linkages between actions and performance outcomes, the development of tools such as integration manuals has typically 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 one's 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 in the M&A context. 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 is the negative effect of success in prior acquisitions on the performance of the focal acquisition.

The final potential moderator we 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 among the most challenging contexts they face especially because of their perception of high heterogeneity,

almost "uniqueness", of challenges from acquisition to acquisition. In such contexts, however, decision-makers need to rely on significant variation in their experience base in order 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. We therefore predict:

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

METHODS

Sample

The hypotheses developed above were tested by investigating acquisitions taking place in the U.S. commercial banking industry. This industry setting was deemed attractive for the purposes of our study for several reasons. First, the commercial banking industry has undergone a period of significant consolidation, owing in part to regulatory changes that allow firms to cross state lines to become regional or national players. These developments have created attractive conditions for survey research as they have 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. Third, this industry has been the industry most active in acquisitions in the 1990s. Thus, although the generalizability of the

empirical evidence awaits extensions into other sectors, the results apply to a large and relevant portion of the M&A phenomenon in recent years.

The research design involved three phases. In the first phase, fieldwork was conducted at twelve 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 on the 250 largest bank holding companies in the U.S., which collectively represent over 95 percent of the industry's assets. The smallest institution in the target population had total assets of approximately $400 million, implying that further extensions of the survey frame to even smaller banks would have likely garnered sparse and less comparable observations. The final phase of the research design involved augmenting the dataset containing primary information on deal characteristics with archival data on financial performance.

The survey consisted of two main parts – an acquisition history profile and an acquiring bank questionnaire. The first portion of the survey listed all of the acquisitions conducted by the bank. Basic information about each acquisition was also gathered in the acquisition history profile, which summarized deals along dimensions such as size, the degree of market relatedness, pre-acquisition profitability, level of integration, and top management team replacement. The acquiring bank questionnaire provided more detailed information on characteristics of the acquisition process, including information on decision support tools such as integration manuals, systems conversion manuals, product mapping models, and training packages.

Of the 250 bank holding companies contacted, 70 did not experience an acquisition after 1985 and 16 were acquired. Of the remaining 164 banks, responses were obtained from 51 banks, corresponding to a 31.7 percent 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 pre-testing of the survey instrument (Fowler, 1993; Groves, Cialdini, & Couper, 1992). The survey was sent to the most knowledgeable respondent, who was identified through a round of phone calls that preceded the mailing. Specifically, the key informants included the manager responsible for corporate development or for the M&A group (25 cases), the coordinator of post-acquisition integration processes (this figure 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.

The 51 responding bank holding companies had completed 577 acquisitions, or 11.3 on average. Of these, 4 respondents had to be excluded from the analysis due to incomplete responses and 18 had to be excluded from the final analysis to construct our measures of past success or heterogeneity (see below). Standard mean comparison tests for non-response 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 ($p<0.05$).

Measures and Data

Dependent Variable. Acquisition financial performance was measured as the acquiring firm's cumulative abnormal returns (CARs) following the acquisition. Following Ikenberry, Lakonishok, and Vermaelen (1995), cumulative abnormal returns were calculated relative to a size and market-to-book (MTB) based benchmark. For comparison purposes, we used both three and four year windows. Acquisition financial performance is computed as the difference between the acquiring firm's stock return and the return in the equal-weighted size- and MTB-ranked portfolio to which the firm belongs. 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 multi-factor asset pricing models that incorporate 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 re-evaluated 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. 100 hundred benchmark portfolios were constructed based on the cross-product of ten size deciles and ten MTB deciles. Stock returns 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.

In order to calculate a measure of experience heterogeneity, we needed to classify prior acquisitions conducted by the firm to ascertain their similarities or differences as a collection. In order to do this, we 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. For instance, acquiring firms may access knowledge and resources from a target firm that is performing well, but the acquirer must be able to be humble and realistic enough to pursue such "inverse learning" in the integration process (Haspeslagh and Jemison, 1991). By contrast, if the quality of the acquired bank is poor, acquirers will tend to disrupt the target's organizational routines and introduce new operating discipline in an effort to improve the targets performance. 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 between all past acquisition events as follows:

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

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.

The last theoretical variable is the level of knowledge codification, which in contrast to experiential learning represents the more deliberate learning processes firms

use (e.g., Kogut & Zander, 1992; Nonaka, 1994). Our measure captures the degree of codification of knowledge specific to the acquisition process. In particular, *Codification* was measured as the number of acquisition-specific tools existing at the time of the focal transaction (e.g., documents and manuals including: due diligence checklist, due diligence manual, systems conversion manual, affiliation/integration manual, systems training manual, and products training manual; 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, we included 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. To capture target firm effects, we included a measure of the target's resource quality, as defined above.

At the transaction level, we 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 & 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, & 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.

We also included a variable to incorporate the way in which the target firm was integrated into the acquiring firm's operations. *Integration* was measured on a single scale from 0-3, 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 & 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, we included two controls 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 hypotheses developed earlier is as follows:

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

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 ten used to indicate multicollinearity problems (Neter, Wasserman, & Kutner, 1985).

RESULTS

Table 1 reports descriptive statistics and a correlation matrix for the variables used in this study. The performance variables correlate strongly and negatively with the measure of past success ($p < .001$), offering preliminary support for Hypothesis 1. Among the other controls, the quality of the resources in the acquired firm correlate negatively with performance ($p <. 001$). Also, the acquisitions completed in overlapping geographic areas perform significantly better than market entries ($p<.001$). In the post-acquisition phase, the degree to which the acquired bank is integrated within the acquirer is positively correlated with performance, especially in the longer period ($p<.05$ for d.v. at 3 years, $p<.001$ at 4 years).

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Insert Table 1 about here
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Table 2 presents the results of the multiple regression analyses. Models I-III rely upon three-year cumulative abnormal returns as the dependent variable, and Models IV-VI use four-year cumulative abnormal returns as a robustness check. Models I and IV are base-line specifications consisting of the control variables. Models II and V add the direct effects of the theoretical variables, and Models III and VI represent the full models incorporating the interaction effects with past success. All six models are significant at

the 0.001 level. Hierarchical F-tests revealed that the direct effect models improve upon the explanatory power of the baseline specifications (i.e., $F=7.24$, $p<0.001$ for Model II vs. Model I, and $F=8.69$, $p<0.001$ for Model V vs. Model IV), and similar tests also reveal that the interaction terms are jointly significant (i.e., $F=7.77$, $p<0.001$ for Model III vs. Model II, and $F=7.78$, $p<0.001$ for Model VI vs. Model V).

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Insert Table 2 about here
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The direct effect of past success is negative in Models II and VI ($p<0.001$), suggesting that the performance of the focal transaction is worse when the firm has enjoyed greater success in its prior transactions. Strong support is therefore evident for our first hypothesis. Deliberate learning in the form of knowledge codification positively influences acquisition performance ($p<0.05$ in Model II and $p<0.01$ in Model V), but there is no evidence that experience accumulation *per se* is beneficial to firms.

The three interaction terms explore contingencies shaping the relationship between past success and the performance of the focal acquisition. Consistent with the second hypothesis, the multivariate findings suggest that the effects of past success become even more negative when the firm has completed a large number of acquisitions in the past ($p<0.001$ in Models III and VI). Evidently firms with less M&A experience have not developed routines to an extent that generalization problems are significant, whereas firms with greater M&A experience are more likely to misapply experience obtained in prior successful deals.

By contrast, benefits are evident from deliberate learning in the form of knowledge codification. Consistent with hypothesis three, firms that have invested in

knowledge codification also do not experience the problems associated with past success ($p<0.01$ in Model III and $p<0.001$ in Model VI). By contrast, firms that have not undertaken such efforts to understand the mechanisms affecting M&A performance tend to experience greater problems when their prior acquisitions were successful. In addition, the relatively large size of the parameters (.19 in model III and .29 in model VI) indicates that firms with codification levels at least one standard deviation above the mean do not experience superstitious learning problems.

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 past success. Specifically, consistent with predictions, previous successes are not as problematic for firms that have heterogeneous experiences, but are particularly harmful for firms with homogeneous M&A experience ($p<0.05$ in Model III). This homogeneous experience has the effect of solidifying routines through standardization and exploitation, whereas more heterogeneous experience can be beneficial in encouraging the search for novel solutions.

Finally, the results for the control variables deserve some comment. Consistent with prior findings that acquiring firms may gain by redeploying resources to their acquired units rather than benefiting from the inverse flow of resources or learning (e.g., Haspeslagh & Jemison, 1991; Capron, 1999), the acquirer's performance is negatively related to the quality of the target's resources. Although market relatedness and integration have strong bivariate relationships with acquisition performance, their effects vanish once one accounts for the quality of acquired resources and controls for relative

and absolute size effects. Finally, there is some evidence that M&A performance tends to be better for smaller rather than larger banks.

DISCUSSION

This study has drawn on behavioral research on experiential learning as well as research on cognition in an attempt to examine the conditions under which superstitious learning emerges. Prior research has emphasized motivational factors that lead to biased views of past success (e.g., March and Levinthal, 1981, 1993), but we highlight the role of causal ambiguity as a key factor stimulating superstitious learning. Different streams of research in evolutionary economics and learning in groups and organizations have explored the implications of confidence developing before competence (e.g., Miner, 1984; Herriot et al. 1985; Levitt and March, 1988; Sitkin, 1992; Henry, 1995; Miller, 1999) and vice-versa (e.g., Polanyi, 196; Nelson and Winter, 1982; Kogut and Zander, 1992), but our focus has been on the identification of some of the key contingencies specific to a task that can result in false convictions of competence building. Specifically, we highlight the intentionality underlying learning processes as well as the breadth of search. In so doing, we emphasize the roles of tacit experience accumulation, deliberate learning in the form of knowledge codification, and experience heterogeneity versus homogeneity as characteristics of the learning process that can worsen or ameliorate the problem of superstitious learning. We argue that the presence of superstitious learning as well as the operation of these three mechanisms upon superstitious learning hinge upon the causal ambiguity of the organizational activity in question.

In our empirical context of corporate acquisitions, we show that superstitious learning is indeed manifest and that these three features of learning processes influence the problem. In fact, the moderating factors we underscore provide a substantial improvement in explanatory power of the M&A performance models. The findings indicate that the type and scope of learning have important implications for the elimination or deepening of the superstitious learning problem. Whereas tacit experience accumulation does not rectify the problem of superstitious learning and actually makes it worse, deliberate learning processes have the opposite effect. Moreover, not only does knowledge codification temper the effects of perceptions of past success in acquisitions, but such investments in deliberate learning can eliminate the problem. Regarding the scope of learning, the results indicate that homogeneous experience exacerbates the effects of superstitious learning, but experience that is more heterogeneous can be beneficial to acquirers.

By distinguishing more tacit and deliberate learning processes as well as by separating different types of experiences (e.g., perceived successes versus failures and homogeneous versus heterogeneous experiences), the findings can potentially explain why some of the results on experiential learning in the M&A literature are so mixed. In particular, these different learning processes and types of experience have distinct implications for acquisition performance, and their unique effects can be masked in more aggregate treatments of experience accumulation that are common in M&A studies. Deliberate and tacit learning mechanisms have the opposite effects, and the findings also show that the nature of previous experiences in the firm's experience base (i.e., in terms

of how homogeneous or heterogeneity prior deals are) matters above and beyond the mere number of previous acquisitions.

For managers involved in mergers and acquisitions, our results specifically indicate the relevance of investing in deliberate learning processes as well as obtaining heterogeneous experience with acquisitions in order to avoid problems associated with superstitious learning. The benefits of knowledge codification, however, lie not just in tangible outputs such as manuals and decision support tools, but in the higher cognitive demands placed on decision-makers and managers to articulate their logic, expose hidden assumptions to scrutiny, and clarify causal linkages in an explicit fashion. Prior research on top management team composition has pointed out the benefits of heterogeneity (e.g., Eisenhardt & Tabrizi, 1995; Hambrick, Cho, & Chen, 1996; Watson, Kumar, & Michaelson, 1993), including creativity and healthy skepticism and guarding against myopia and simplicity. Our findings suggest that heterogeneity in the task itself can provide additional benefits in mitigating the problem of superstitious learning.

Extensions to this study could further explore the relevance of superstitious learning in organizations in several ways. Although we have suggested that causal ambiguity is a key variable that provides the initial conditions for superstitious learning to arise and develop, future empirical studies might explicitly focus on this variable and examine its influence along with motivational factors that also can stimulate superstitious learning. Moreover, since we have focused on an empirical setting involving a high degree of causal ambiguity, extensions could also explore other organizational activities such as manufacturing processes or administrative operations that are subject to correspondingly lower levels of causal ambiguity. Other important tasks in the corporate

strategy realm with different characteristics and challenges might also be explored, including internal development efforts, strategic alliances, product-market or geographic diversification, and so forth. Such research could examine whether varying levels of causal ambiguity have implications for superstitious learning as well as specify more clearly the organizational activities to which our findings might be generalized. Even within the sphere of M&A activity, extensions to different industries and forms of acquisitions could prove valuable in addressing this issue.

Besides examining the relevance of superstitious learning in other organizational activities, empirical research is needed to investigate other contingencies that potentially have a bearing on this problem. Our study has focused on characteristics of the task itself, specifically features of the learning process, that may exacerbate or provide an antidote to superstitious learning, and there are many opportunities for future studies to examine other factors that might moderate the influence of perceptions of past success on the performance of a focal activity. Miller (1999), for instance, highlights environmental characteristics such as competition and uncertainty as well as organizational traits such as culture and structure that deserve attention in future work. Such research might also explore whether or how the effects of superstitious learning spill over into other organizational functions and units beyond the confines of the focal activity. Investigations into important boundary conditions such as these might provide a more complete picture of the conditions that foster superstitious learning or mitigate its development in organizations.

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TABLE 1
Descriptive Statistics and Correlation Matrix[a]

Variable	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Three-year CARs	-.13	.55	---									
2. Four-year CARs	-.15	.68	.93***	---								
3. Resource quality	1.96	1.09	-.33***	-.40***	---							
4. Market relatedness	.62	.49	.23***	.32***	-.22***	---						
5. Integration	2.64	.69	.13*	.24***	-.22***	.40***	---					
6. Acquirer's size	2.64	1.13	-.07	-.04	-.08	.25***	.15**	---				
7. Relative acquisition size	1.06	1.64	.13*	.07	.08†	-.17***	-.03	.02	---			
8. Past success	.48	.38	-.23***	-.25***	.02	-.03	-.14**	.19***	.00	---		
9. Acquisition experience	11.11	10.17	.03	.08	.04	.16***	.10*	.43***	.01	.04	---	
10. Codification	4.81	3.67	.04	.09	.20***	.01	.07	.43***	.08	.17***	.46***	---
11. Experience heterogeneity	.65	.66	.04	.06	-.04	.12*	.09†	.41***	.02	.47***	.22***	.22***

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

TABLE 2
Multiple Regression Estimates for Acquisition Performance[b]

Variable	Three-Year Cumulative Abnormal Returns			Four-Year Cumulative Abnormal Returns		
	I	II	III	IV	V	VI
Intercept	.30 (.19)	.61** (.20)	.46* (.19)	.14 (.28)	.60* (.28)	.47† (.26)
Resource quality	-.12*** (.03)	-.14*** (.03)	-.13*** (.03)	-.18*** (.05)	-.22*** (.04)	-.21*** (.04)
Market relatedness	.10 (.09)	.08 (.09)	.07 (.08)	.22† (.13)	.13 (.12)	.12 (.11)
Integration	-.02 (.06)	-.06 (.06)	-.07 (.06)	.03 (.09)	-.02 (.09)	-.05 (.08)
Acquirer's size	-.08* (.03)	-.12** (.04)	-.08* (.04)	-.05 (.04)	-.11* (.05)	-.07 (.04)
Relative acquisition size	.03 (.03)	.03 (.03)	.02 (.03)	-.00 (.04)	.00 (.04)	-.01 (.04)
Past success	---	-.21*** (.05)	-.14** (.05)	---	-.28*** (.06)	-.20** (.06)
Acquisition experience	---	.04 (.05)	.07† (.04)	---	.05 (.06)	.08 (.05)
Experience heterogeneity	---	.10* (.04)	-.05 (.07)	---	.09 (.06)	-.02 (.08)
Codification	---	.10* (.05)	.02 (.05)	---	.17** (.06)	.04 (.07)
Past success * Acquisition experience	---	---	-.18*** (.04)	---	---	-.22*** (.05)
Past success * Codification	---	---	.19** (.07)	---	---	.29*** (.09)
Past success * Experience heterogeneity	---	---	.14* (.06)	---	---	.09 (.08)
Model F	4.43***	5.46***	6.57***	5.92***	7.59***	8.57***
R-squared	.12	.24	.34	.19	.36	.46
N	167	167	167	134	134	134

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