CAUSAL AMBIGUITY, MANAGEMENT PERCEPTION AND FIRM PERFORMANCE

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- Abstract -

This article integrates and extends research on causal ambiguity. Existing research construes causal ambiguity as either a property of firm competencies or of firm performance causal systems. However, there is little evidence that ambiguity of either type reduces rival imitation or contributes to the sustainability of advantages. We indicate the principal causal paths from ambiguity to performance and show why empirical studies are unlikely to produce findings consistent with resource-based expectations. We then propose a third construal, and a new direction for causal ambiguity research, exploring the linkage between causal ambiguity and management perception. Empirical findings in social psychology and behavioral decision-making suggest that subjects consistently overestimate their own competencies, and that these overestimates are magnified by competence ambiguity. We draw on this research to develop testable propositions linking ambiguity, perception and firm performance, integrate this research with existing studies of causal ambiguity, and suggest directions for future causal ambiguity research.

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The resource-based view of the firm emphasizes firm-specific competitive advantages (Barney, 1991, 1995; Peteraf, 1993; Mahoney, 1995). In historical retrospect, the resource-based view emerged from a series of economic events and theoretical developments beginning in the early 1950s. The insurgence of efficient Asian competitors into Western markets (Imai, 1986; Grayson & O'Dell, 1988), the rise of agency and transaction economics (Coase, 1952; Williamson, 1975), a renewed interest in firm growth and innovation (Schumpeter, 1950; Penrose, 1959), and empirical findings on comparative industry and firm-specific performance effects (Schmalansee, 1985; Wernerfelt & Montgomery, 1988; Rumelt, 1991) combined to stimulate new research on firm-specific resources (Wernerfelt, 1984; Rumelt, 1984; Barney, 1986a; Rumelt, 1987; Dierickx & Cool, 1989). From these early developments emerged new theory and empirical research on factor markets, firm heterogeneity, intangible assets and imperfect imitability, coalescing into the frameworks and vocabulary now associated the resource-based view of the firm (Lippman & Rumelt, 1982; Wernerfelt, 1984; Cool & Schendel, 1988; Barney, 1991; Teece, Pisano & Schuen, 1997).

From its inception the resource-based view stressed the importance of barriers to resource imitation and, in particular, of causal ambiguity (Lippman & Rumelt, 1982; Rumelt, 1984). Causal ambiguity is the condition under which neither the firm nor its rivals can determine the causes of firm performance. This may arise because a competence is complex, tacit, or firm-specific; or because the causal path from the competence to performance is impossible to specify; or because a large number of competencies interact in ways that resist precise articulation (Reed & DeFillippi, 1990; King & Zeithaml, 2001). The central causal

ambiguity hypothesis is that ambiguity impairs competitive imitation, thus enabling sustainable competitive advantage.

In recent years researchers have challenged this line of argument. It is observed, for example, that if rivals cannot determine the causes of a firm's performance, then it is unlikely that focal firm managers can leverage these causes, enhance their value, or extend their sustainability – the so-called "causal ambiguity paradox" (King & Zeithaml, 2001). Other researchers have noted, as an empirical matter, that causal ambiguity may stimulate rivals to forego imitation, and quicken innovations that render the firm's competencies ineffectual or obsolete – the "resource substitution paradox" (McEvily, Das & McCabe, 2000).

Moreover, the empirical evidence has lagged theoretical development. One virtue of traditional industrial organization theory was in showing the effects of unambiguous advantages like low costs, product quality, location, or firm size. Resource-based research has not shown that causally-ambiguous competencies perform better than these unambiguous advantages, and the longitudinal evidence tracing causal paths from ambiguity to inimitability to performance is generally meager and unconvincing (King & Zeithaml, 2003).

Finally, researchers have expressed reservations about the epistemological foundations of causal ambiguity (Mir & Watson, 2000; Priem & Butler, 2001; Powell, 2001, 2003). If a firm outperforms rivals but no one knows why, then it seems disingenuous to import "causally ambiguous resources" as the cause. We may legitimately claim that a competence is unobservable, but it is a different matter to assert unobservability itself as a performance cause (Godfrey & Hill, 1995; Powell, 2002).

This paper integrates and extends existing research on causal ambiguity. Causal ambiguity research defines ambiguity as either a property of competencies or of a causal system (e.g., a firm or industry), but the studies have not affirmed the empirical linkage between ambiguity

and performance. We summarize existing research in a series of figures that show the principal causal pathways, and explain why the ambiguity-performance connection is weaker than previously supposed. We also introduce the notion of *lexical ambiguity* as a potential confounding factor in the empirical measurement of competence ambiguity, and we use a simple mathematical model to classify the primary forms of causal ambiguity.

We then present a third construal of causal ambiguity: ambiguity as a property of management perception. It is well-established in behavioral decision research that management perception is subject to a variety of biases and distortions (Kahneman & Tversky, 2000; Bazerman, 1997), and that ambiguity magnifies some of these effects (Van Yperen, 1992; Dunning, Meyerowitz & Holzberg, 1989). There is also evidence that managers act on socially-constructed belief systems, and define organizational problems in relation to cognitive reference points (Porac, et al., 1995; Kahneman & Tversky, 1979; Fiegenbaum, Hart and Schendel, 1996). Epistemologically, firm attributes and causal paths are neither ambiguous nor unambiguous, but become so in the context of a manager's mental picture of firm performance.

Interpreted in the context of causal ambiguity research, these ideas suggest new theoretical connections and empirical possibilities. For example, experimental research on self-serving biases has shown that subjects systematically overestimate their own competencies, and that this effect increases with competence ambiguity (Farh & Dobbins, 1989; Felson, 1981). Under ambiguity, managers' beliefs about firm competencies or performance causation may be particularly distorted, or may depend on contexts of explanation, or managers may use ambiguity opportunistically. We develop a series of testable propositions, and combine this new perspective with existing work to produce an integrative framework of causal ambiguity and firm performance.

AMBIGUITY AND IMITATION

Ambiguity as a property of competencies

The term "causal ambiguity" was first used in Lippman and Rumelt's (1982) analysis of uncertain imitability and interfirm profitability differences. Under neoclassical free entry and atomistic price-taking, economic rents attract new entrants, and imitation eliminates firm heterogeneity. Lippman and Rumelt developed a model in which firm heterogeneity, positive economic rents and zero entry coexist with free entry and atomistic price-taking. The results followed crucially from the assumption that the production functions of incumbent firms were causally ambiguous, and thus uncertainly imitable.

Whereas Lippman and Rumelt's mathematical model dealt with uncertainty in a new entrant's self-assessed capacity to imitate the cost functions of incumbents, the authors' verbal account of ambiguity emphasized *incompleteness*: "We hold that it may never be possible to produce a finite, unambiguous list of the factors of production responsible for the success of firms." (p. 420) The authors also cited Polanyi's (1958) work on tacit knowledge: "Frequent transactions between people or between people and complex tools give rise to unique transaction-specific skills that are, to use Polanyi's word, unspecifiable." (p. 420)

Subsequent research broadened causal ambiguity to incorporate tacitness, complexity and specificity, and applied these criteria specifically to firm competencies (Reed & DiFillippi, 1990; McEvily & Chakravarthy, 2002). In this construal, causal ambiguity referred not to the uncertainty of potential entrants, or to the incompleteness of a causal system, but to the obscurities of internal firm competencies such as technology expertise, process skills, or management development. *Tacitness* referred to the inarticulability of skills and routines

learned by experience (Polanyi, 1967; Nelson & Winter, 1982); *complexity* referred to competence sophistication, variety and interdependence (Barney, 1985); and *specificity* referred to transaction-specific competencies not easily disentangled from a firm's complementary attributes, competitive context, or relationships (Williamson, 1985).

The notion that causal ambiguity is a property of internal competencies underpins resource-based studies of the performance consequences of competencies such as organization culture (Barney, 1986b), human resource management (Hansen & Wernerfelt, 1989), new product development (Leonard-Barton, 1992), alignment (Powell, 1992), trust (Barney & Hansen, 1994), values (Leonard-Barton, 1995) and technology (Powell & Dent-Micallef, 1997). King and Zeithaml (2001) referred to this form of ambiguity as *characteristic* ambiguity – ambiguity associated with internal firm characteristics.

Although empirical studies often find linkages between competencies and firm performance, effects specifically attributable to ambiguity are difficult to isolate. In one of the few studies attempting to do so, King and Zeithaml (2001) asked CEOs in nine textile firms and eight hospitals to identify the competencies most salient to performance, producing extensive lists for each industry – e.g., "knowledge and skills necessary to succeed in an environment of managed care," "managing a wide range of perspectives within the hospital," and "maintaining a corporate-wide 'sense of urgency'." The researchers then sent surveys to middle managers, asking them to evaluate their organizations on each competence, and to assess ambiguity on a four-item scale. Using factor analysis, the researchers reduced characteristic ambiguity to two factors (competence articulation and competence articulability), and correlated these factors with firm performance (ROA). The researchers reported positive, significant correlations for both factors.

This study broke important new ground, in two ways: by distinguishing characteristic ambiguity from linkage ambiguity (i.e., ambiguity in causal systems), and by isolating the performance effects of causal ambiguity. However, the results are preliminary, and as the authors point out (King & Zeithaml, 2001, 2003), require further development. Some of these developments will be empirical (e.g., corroborating the findings in other industries and larger samples), but it will also be important to integrate theory, measurement and empirical methodology. Specifically, if the findings rely on ambiguity research derived from management perceptions, it will be important to establish the accuracy of these perceptions, and whether ambiguity itself gives rise to judgmental biases or distortion. We take up these points later.

In another empirical study, McEvily and Chakravarthy (2002) investigated knowledge-based advantages in the adhesives industry, concluding that tacitness, complexity and specificity increased the performance persistence of major product innovations. Managers in 63 adhesives firms were asked to rate the tacitness, specificity and complexity of adhesive technologies, and to estimate both the degree of performance improvement these technologies conferred upon customers, and the persistence of those improvements. The results suggest a potential link with customer value-added, but do not link ambiguity directly with focal firm performance (i.e., do not assess revenues and innovation costs), and do not contrast the effects of unambiguous competencies (e.g., location, firm size, costs).

There is theoretical justification for remaining skeptical of the connection between causal ambiguity and performance. One reason is the "causal ambiguity paradox." If rivals cannot transfer a focal firm's ambiguous competence across organizational boundaries, the focal firm may find it equally difficult to articulate the competence internally, transfer it to new employees or other units, or leverage the competence to meet growth and profitability

objectives (Barney, 1991; King & Zeithaml, 2001). Intra-organizational knowledge and skill transfers are notoriously complex and problematic (Nelson & Winter, 1982; Winter, 1987), and the greater the competence ambiguity, the greater the complexity (Szulanski, 1996; Teece, 1977, 1998; Simonin, 1999; McEvily, Das & McCabe, 2000).

Figure 1 represents the countervailing performance effects of characteristic ambiguity:[1] a positive performance path as ambiguity impedes rival imitation, and a negative performance path as ambiguity impedes internal articulation and exploitation. The net effect is, ultimately, an empirical question, and the King and Zeithaml (2001) and McEvily and Chakravarthy (2002) papers are important early steps in examining that question.

- INSERT FIGURE 1 ABOUT HERE -

A second problem is the so-called "competence substitution dilemma" (McEvily, Das, & McCabe, 2000). If rivals cannot imitate an ambiguous competence, they may forego imitation and invest in competence substitution. Thus, for example, a firm that cannot imitate ambiguous distribution capabilities or retail relationships may develop alternative distribution channels (e.g., on-line, direct to customer); or a firm lacking new product development skills may focus on customer product education, or develop an in-house merger and acquisition capability. In some cases, the focal firm would have been better off encouraging imitation (Gallini, 1984). In any case, the more ambiguous the competence, the less likely is competitive imitation, and the more likely is competence substitution - which may in turn render the advantage superfluous.

The combined effects of competence substitution and the causal ambiguity paradox are depicted in Figure 2, which shows three causal paths: the positive and negative paths from

[1] We will use King & Zeithaml's "characteristic ambiguity" interchangably with "competence ambiguity."

Figure 1, and a negative path in which competence ambiguity stimulates rival substitution. Two of the three outcomes of competence ambiguity are negative, but again the net effects are unclear, both theoretically and empirically.

- INSERT FIGURE 2 ABOUT HERE -

A third, often overlooked problem of competence ambiguity is the conflation of competence ambiguity with *lexical* ambiguity.[2] For example, a technology may be causally ambiguous if it involves sophisticated components, complex interrelationships, and advanced scientific knowledge. But "technology" is also ambiguous in the sense that different managers interpret "technology" differently, depending on education, experience, expertise, purpose, context, etc. In the absence of further cues (e.g., an operational definition), "technology" may evoke for one manager a product technology, for another an information technology, and for a third a manufacturing process; or it may evoke biotechnology, aerospace technology, special effects technology, or telecommunications. "Technology" may suggest any arbitrary degree of specificity, or point in time, or degree of intensity. "Technology" is ambiguous not only because technologies are tacit, specific and complex, but because "technology" refers widely, and is susceptible to multiple interpretation.

Lexical ambiguity arises whenever a construct's *designative* definition (i.e., the characteristics that define the class) covers an extensive range of *denotative* definitions (i.e., the list of class members). In the context of resource-based research, lexical ambiguity is non-trivial, since all constructs proposed as causally-ambiguous are also lexically-ambiguous: knowledge, technology, culture, skills, values, leadership, etc. If researchers do not eliminate

[2] Dunning and colleagues refer to a similar notion as "trait breadth" (Dunning, Meyerowitz & Holzberg, 1989), but we prefer "lexical ambiguity," emphasizing its role as an alternative form of ambiguity.

lexical ambiguity in management surveys, then observed performance effects will be partially, or perhaps largely, attributable to lexical ambiguity, and causal inferences to construct ambiguity will be spurious.

For example, consider the lexical ambiguity of the term "culture" (Table 1). "Culture" may refer variously to an organization's shared values, communication, rituals, teamwork, trust, beliefs, etc. (Deal & Kennedy, 1982; Smircich, 1983; Fiol, 1991). In turn, most of these second-level expressions are also lexically-ambiguous, so that, for example, "teamwork" may be denoted by cooperation in meetings, common acceptance of groundrules, absence of political maneuvering, shared project skills, frequent informal coordination, and such. The expression "shared project skills" may, in turn, be denoted by shared past successes, project experience, project training, etc.

- INSERT TABLE 1 ABOUT HERE -

Survey questions using the term "culture" will certainly conflate lexical and competence ambiguity. Similarly, terms such as "skills" and knowledge" may prompt managers to evaluate these factors opportunistically, due largely to their lexical ambiguity. At a minimum, managers will use these terms idiosyncratically, and, as we show later, some opportunistic managers may use "lexical arbitrage" to rationalize, reframe or misrepresent the effects of ambiguous resource-based competencies. On the other hand, these examples show that the researcher can, at some level of operational specificity, attenuate lexical ambiguity and measure competence ambiguity. Thus, for example, the McEvily and Chakravarthy (2002) surveys evidently attenuated lexical ambiguity by defining "technology" in reference to specific design and process skills related to reactives, hot melts, and emulsion polymers.

In sum, the relationship between characteristic ambiguity and firm performance is itself ambiguous, and empirical testing is exceptionally challenging (King & Zeithaml, 2003). If resource-based propositions intend that ambiguous competencies enhance performance more than if the same competencies were unambiguous, then it is not clear that these propositions have empirical content. If they intend that ambiguous competencies enhance performance more than unambiguous competencies, then they are arguably false, and certainly open to objection: two of the three causal paths are known to be negative, lexical ambiguity probably accounts for a large proportion of observed effects, the research has not compared ambiguous competencies with the most salient unambiguous advantages, and the research has not addressed potential biases in managers' evaluations of ambiguity.

Ambiguity as a property of causal systems

The original notion of "incompleteness" raised by Lippman and Rumelt (1982) suggests that causal ambiguity resides not in competencies, but in the impossibility of either listing the competencies that contribute to performance, or of specifying the function by which these competencies produce performance. This definition differs from those considered above, but fits the Lippman-Rumelt thesis that imperfect imitability arises from uncertainty surrounding an incumbent's production function.

Subsequent researchers have found various ways of incorporating this systemic approach into the analysis of causal ambiguity. Mosakowski (1997), for example, defined causal ambiguity as the number of performance distributions that are not ruled out by a strategist's knowledge of the causal system and its inputs. In this stochastic approach, a strategist maintains a mental map of firm performance causation, and strategic decisions act as hypotheses to test and revise this map. Uncertainty may be present either in the inputs to the

system (as in competence ambiguity), or in the causal system itself, which is imperfectly unspecified, or unspecifiable at any reasonable cost.

As noted earlier, King and Zeithaml (2001) distinguished "characteristic" from "linkage" ambiguity, a useful distinction that separates competence ambiguity from causal system ambiguity. It is important to note, however, that their definition of linkage ambiguity - "ambiguity among decision-makers about the link between competency and competitive advantage" (p. 77) – differs from Mosakowski's "irreducible uncertainty in causal systems." In Mosakowski's framework, if a top manager has perfect insight into a firm's causal system, but other managers do not, the firm does not experience linkage ambiguity but "asymmetric causal ambiguity," driven by lack of managerial consensus rather than causal system uncertainty. In the King-Zeithaml framework this constitutes "linkage ambiguity," i.e., lack of consensus about the causal system. "Lack of management consensus" is, in fact, what King and Zeithaml measure in their empirical study, and they find a negative correlation between linkage ambiguity (so defined) and firm performance.

For consistency, we will use the term "linkage ambiguity" in broad reference to ambiguity stemming from causal system uncertainty, in contrast to the ambiguity (tacitness-complexity-specificity) of a competence. It is possible that this causal system uncertainty may be reflected in lack of management consensus, and we are sympathetic to the importance of management perception in attribution. On the other hand, "lack of management consensus" may, in some cases, have performance consequences independent of linkage ambiguity (Bourgeois, 1980; Dess, 1987; Dess & Origer, 1987). To avoid potential entanglements with measures of conflict or consensus, our construal of linkage ambiguity will be closer to the "irreducible uncertainty" of the Lippman-Rumelt and Mosakowski models than to King & Zeithaml's "lack of consensus" definition. Figure 3 integrates this construal with the earlier

figures to depict the combined effects of characteristic and linkage ambiguity on firm performance.

- INSERT FIGURE 3 ABOUT HERE -

Under linkage ambiguity, firm performance stems from the unspecifiability of a firm's causal system, i.e., the inability of focal firm or rival managers to produce a complete and accurate performance model. This might be the case if the system is stochastic, or if there are too many causes to list, or if the causes interact in complex, unspecifiable ways (Lippman & Rumelt, 1982; Rumelt, 1984). But previous research provides little guidance as to when these conditions will arise, or on whether linkage ambiguity is independent of characteristic ambiguity. It is not clear, for example, whether a causally-ambiguous competence can create advantages in an unambiguous causal system, or if unambiguous competencies can produce advantages in an ambiguous causal system. The first-level distinction between characteristic and linkage ambiguity is useful, but it is only a start. The next step requires researchers, within the characteristic-linkage distinction, to identify the main forms of causal ambiguity, and to show the conditions under which each form may produce performance advantages. In the remainder of this section we develop a simple mathematical model that shows the main forms of causal ambiguity, and we present two general causal ambiguity hypotheses.

To motivate the model we assume, as in the resource-based view, that a firm's single-period performance relative to competitors is a function of the firm's relative competencies. We are interested in whether ambiguity, as a trait of either competencies or causal systems, enables the firm to create and sustain performance advantages. To bring the issues into relief, we assume the existence of an unambiguous performance function, i.e., a specifiable, deterministic, and stable causal relation from known competencies to a universally-accepted,

error-free measure of firm performance. As such, assuming competencies A and B, we define a perfectly specifiable function P = f(A,B), in which P, A, and B are universally known and measurable, and A and B are implementable without error.

One way to conceptualize this function is to treat competencies A and B as inputs to a firm's performance production function, e.g., of the "Cobb-Douglas" form $P = cA^{\delta}B^{1-\delta}$ ($0 \leq \delta \leq 1$). In this function, P is not unit output but performance relative to competitors, and A and B are relative competencies. Concretely, if we define this function as $P = A^{.4}B^{.4}C^{.2}$, then P is relative one-period performance, A and B are endogenous competencies (i.e., the firm's relative mastery of competencies A and B), and C is all other performance causes (e.g, location, product features), which we would assume to be fixed, exogenous, and known.[3]

Such a function is obviously an empirical fiction, and in this sense actual firm performance is *always* casually-ambiguous – the question is not whether ambiguity is present, but to what extent, and of what type. We also note that competencies A and B cannot be treated as causally ambiguous if in fact they are lexically ambiguous. For example, if we define A as "culture," we might attenuate lexical ambiguity by defining $P = A_1^{.1}A_2^{.1}A_3^{.1}A_4^{.1}B^{.4}C^{.2}$, where A_i are lexically unambiguous denotations of culture.

We assume that A and B are not lexically ambiguous. If an actual or potential rival observes positive P, then incentives to imitation exist, and no impediments prevent the imitation of A or B.[4] The assertion that competence A is causally ambiguous (characteristic ambiguity) is equivalent to claiming that the replication of A is subject to error, either in

[3] In log-linear form, $\ln P = .4\ln A + .4\ln B + .2\ln C$. We assume that A, B, and C are known and perfectly observable, and that the function is known and temporally stable – there is no error in measuring any variable, and luck is not a factor.

[4] We assume that A and B are not otherwise tied to the firm, e.g., by social embeddedness; if they were, they would be part of C. We also note here that competence "specificity," which in existing research is associated with characteristic ambiguity, is more properly associated with linkage ambiguity (form 2, below). Specificity does not deal with the characteristic ambiguity of a competence, but with its interrelatedness with other competencies or firm-specific assets.

observability, measurement or execution. For example, if we define A as "information processing capabilities," then A is causally ambiguous if observers cannot determine, for whatever reason, how firms acquire such capabilities. In such cases, the potential imitator faces the following function (in log-linear form): $\ln P = .4\ln\phi(A) + .4\ln B + .2\ln C$, where $\phi(A) = A_0 + \varepsilon_A$. In our example, A_0 is the true (unobservable) value of informational processing capabilities, and ε_A is a disturbance term, which we may regard as a draw on a probability distribution with mean 0 and variance σ_A^2. Imitation may still be possible, but the greater the value of σ_A^2, the larger the error, and the greater the characteristic ambiguity of A.

Only uncertainty tied directly to a competence, represented here by ε_A, produces characteristic ambiguity. Under any additional assumptions, linkage ambiguity will also be present. For example, even if P is unchanged, there may be errors in measuring performance, or in determining the correct performance measure. In that case, potential imitators would face the function $\ln P = .4\ln\phi(A) + .4\ln B + .2\ln C + \varepsilon_P$, where ε_P is a disturbance term in measuring performance (with mean 0 and variance σ_P^2). Faced with this function, a potential imitator would not know whether to attribute errors to ε_A or ε_P, and would face both characteristic and linkage ambiguity, i.e., uncertainty in specifying the true performance function.

In the following analysis, we identify three forms of linkage ambiguity: (1) Measurement error; (2) Functional uncertainty; and (3) Incompleteness. The first form, as discussed above, can be restated as follows:

(1) $P = \pi[\phi(A), B, C, \varepsilon_P]$, where $\phi(A) = A_0 + \varepsilon_A$

In form (1) a potential imitator could not replicate the true underlying function (unless by accident), but significant imitation would still be possible. A rival facing this function would know which competencies to imitate, and would not be precluded from doing so – the uncertainty rests entirely on measurement error, with the degree of ambiguity depending on the magnitudes of ε_A and ε_P.

The second form of linkage ambiguity – functional uncertainty – derives from the suggestion by Mosakowski and others that, even if potential imitators know the relevant competencies, they may be unable to specify the form of the performance function, e.g., whether it is a power function, quadratic, cubic, or linear; or how the competencies interact with each other, or with other assets. This functional uncertainty would prevent rivals from estimating the true performance function, and is expressible as follows:

(2) $P = \pi(A,B,C)$, where the functional form of π is uncertain

The above would arise, for example, if rivals knew that a firm's information processing capabilities (A), product innovation skills (B), and location (C) were responsible for performance, and they could imitate these perfectly, but did not know the relevant functional form, or how the independent variables interacted to produce outcomes. A rival may not know, for example, whether the function is additive or multiplicative, or whether (or how) information processing skills interact with product innovation skills. Although (2) produces an ambiguous causal system, it does not preclude replication of A or B – this would also require characteristic ambiguity.

The third form of linkage ambiguity – incompleteness – follows the Lippman-Rumelt suggestion that potential imitators may be unable to list all the independent variables, or

even know how many variables would make up such a list. By implication, the functional form is also unknown, and thus:

(3) $P = \pi(A_1, A_2, \ldots, A_n, C_1, C_2, \ldots, C_n)$, where π and n are unknown

In this form, rivals can still identify some competencies, and imitation would be feasible if a large proportion of P variance could be explained by relatively few competencies (if, say, A_1 and A_2 account for 70% of performance variance). But if form (3) was compounded further by characteristic ambiguity in the known independent variables [i.e., $A_i = A_{0i} + \varepsilon_{Ai}$], and still further by errors in measuring P, then the imitator's problem would be acute, and, depending on the magnitudes of ε_P, ε_{Ai}, and n, potentially insurmountable. The latter scenario seems most consistent with the original Lippman-Rumelt formulation, which identifies tacitness (characteristic ambiguity), functional uncertainty, and incompleteness as the chief contributors to causal ambiguity.

It would be possible to identify further scenarios as special cases of (2) or (3). For example, in some firms (or industries), the performance function may be temporally unstable, with significant functional shifts from P_t to P_{t+1} to P_{t+2}, etc. In its effects, this reduces to (2), a temporal instance of functional uncertainty. It may also be the case, as in King and Zeithaml's analysis, that different managers formulate different performance functions. This, in the above models, would manifest itself as measurement error in estimating competencies or performance.

- INSERT TABLE 2 ABOUT HERE -

The three models of linkage ambiguity are summarized in Table 2, and we highlight the following points:

1. Firm performance is always causally ambiguous – it is only a matter of form and extent.

2. Existing research points to four forms of causal ambiguity – one form of characteristic ambiguity, and three forms of linkage ambiguity.

3. Characteristic ambiguity does not preclude imitation unless the disturbance term (ε_A) is large.

4. Linkage ambiguity forms 1 and 2 do not impede imitation unless both (a) the uncertainty effect sizes are large; and (b) characteristic ambiguity is present.

5. Linkage ambiguity form 3 may significantly impede imitation, but only if characteristic ambiguity is also present. The conditions most likely to preclude imitation are those raised in the original Lippman-Rumelt paper and elaborated above: the combination of characteristic ambiguity and linkage ambiguity, with large ε_P, ε_A, and n.

We integrate the considerations in this section with two general hypotheses:

Characteristic ambiguity hypothesis: Characteristic ambiguity with a significant disturbance term (ε_A) is a necessary condition for imperfect imitability. (It is not a sufficient condition, since ambiguity effects may be offset by the causal ambiguity paradox or competence substitution effects.)

Linkage ambiguity hypothesis: Linkage ambiguity is neither necessary nor sufficient for imperfect imitability. (To impair imitation, linkage ambiguity must be accompanied by characteristic ambiguity, the uncertainty effects must be large, and these effects must not be offset by the causal ambiguity paradox or competence substitution effects.)

AMBIGUITY AS A PROPERTY OF MANAGEMENT PERCEPTION

Some researchers have suggested that the resource-based view neglects the epistemological foundations of causal ambiguity (Priem & Butler, 2001; Mir & Watson, 2000). The resource-based view is an attempt to explain a dependent variable (relative firm performance) with independent variables (ambiguous competencies) that are, by the theory's own account, unobservable (Godfrey & Hill, 1995). Unobservability is not itself a problem, and also characterizes widely-accepted theories in the physical and biological sciences. But unobservability plays an unusually pernicious role in the resource-based view, having been

proposed not as an accompanying or incidental feature of the theory, but as the main engine of performance sustainability.

Some have argued that the theory's emphasis on unobservables is a thinly-veiled attempt to indemnify resource-based theory against falsification: if no performance causes are found, they are said to be "invisible" and "intangible"; if competencies are tangible but the causal path is not found, the path is "causally ambiguous." In this way, the proposition "Causal ambiguity causes performance" is consistent with any state of affairs, and is no more falsifiable than philosopher Anthony Flew's famous defense of the invisible gardener: "Invisible, intangible, a gardener who has no scent and makes no sound, a gardener who comes secretly to look after the garden he loves."[5] (Flew, 1955).

These concerns are still being debated, but whichever view we adopt it is clear that causal ambiguity propositions are largely analytic, or true by definition. As Powell (2001) points out, empirical work does not corroborate or falsify causal ambiguity propositions, but locates coincidences between observable facts and causal propositions that cannot be false. This does not invalidate resource-based propositions, but it does suggest the need for an alternative epistemological justification. Powell argues, for example, that resource-based propositions should be judged not by standards of Popperian falsification, but by an *instrumental* criterion, i.e., whether they help us solve firm performance puzzles better than competing theories. In principle, the resource-based view stands in a position analogous to quantum theory in physics, or natural selection in biology, which also incorporate analytic propositions and unobservables. If the resource-based view promotes innovative programs of firm performance research, and solves puzzles that competing theories cannot solve, then it does all we can ask of any theory.

[5] To which Flew's Skeptic replied: "But just how does what you call an invisible, intangible, eternally elusive gardener differ from an imaginary gardener, or even ***no gardener at all***?"

Obviously, some firm performance propositions are objectively falsifiable. It is possible, for example, to determine that a firm does not have an IT system, or that it has earned above-average ROA. However, as shown in the previous section, causal ambiguity raises empirical problems of a different order, involving lexical ambiguity, conflicting causal paths, and multiple sources of uncertainty. Whatever epistemology we adopt - realist, instrumentalist, constructivist or postmodern - it seems unlikely that causal ambiguity propositions, as currently framed, will ever be subject to direct Popperian falsification.

With this in mind, this section explores whether we might constructively regard causally-ambiguous competencies and causal systems not as hard realities or ultimate truths, but as forms of management perception. As in Powell (2001) and Mosakowski (1997) – and by analogy to Simmel's (1900) "a priori," Wittgenstein's (1953) "language games," or Goffman's (1974) "frames" – this section takes the perceiver, rather than the phenomenon, as its point of departure. From this perspective, competencies and causal systems are intrinsically neither ambiguous nor unambiguous, but simply *are*, and it is only in relation to an interested observer that they become ambiguous. More succinctly, it is the *people* who are uncertain, not the constructs.

The effects of management perception on performance attributions and decision processes have been established in a variety of contexts, and across a wide range of decision biases and heuristics (Kahneman & Tversky, 2000; Bazerman, 1997; Schwenk, 1984; Mezias & Starbuck, 2003; Winter, 2003). For present purposes, however, we are concerned specifically with the effects of causal ambiguity on managers' perceptions of organizational competencies and performance causal systems. The remainder of this section focuses on self-serving biases and their effects on perceived ambiguity and firm performance.

Ambiguity and self-serving bias

There is abundant evidence that people overestimate their abilities. In a study of driving ability, 93% of Americans rated themselves above-average (Svenson, 1981), and in a sample of college professors, 94% said their work was above-average (Cross, 1977). In a College Board sample of over a million American college students, 70% rated themselves above-average in leadership ability, and 2% rated themselves below-average; 60% rated themselves above-average on athletic ability, and 6% rated themselves below-average; 60% rated themselves in the top *decile* in their ability to get along with others, and 25% rated themselves in the top 1%. Comparable results have been obtained in studies of health (Larwood, 1978; Weinstein, 1987), ethics (Baumhart, 1968), managerial risk assessment (MacCrimmon & Wehrung, 1986), and general management skills (Larwood & Whittaker, 1977).

These self-serving attributions are surprisingly robust, resisting correction by clear and incontrovertible contrary evidence. For example, Preston & Harris (1965) compared two groups of 50 drivers, one group with good driving records, the second with poor driving records. Members of the second group not only had poor driving records, but had suffered traffic accidents serious enough to require hospitalization, in most cases due to their own negligence (some group members were still hospitalized at the time of the study). There were no significant differences in the self-attributions of the two groups, and both groups rated themselves "above average" in driving ability.

A number of theories have been proposed to explain the "above average effect," of which three have received broad support:

1. Motivational theory – Under this theory, self-confidence and self-esteem motivate successful action, and people maintain inflated self-estimates in order to protect and improve self-esteem (Bandura 1977; Greenwald, 1980; Felson 1984). Experimental

subjects do not deliberately overstate their abilities to researchers, but genuinely misperceive them.

2. Information processing theory – This theory argues that because people want to achieve goals, they make plans and exert efforts designed to succeed. They are keenly attentive to information about their own efforts and attributes, but less attentive to external information, objective data, or to the efforts and attributes of relevant others (Taylor & Brown, 1988; Kahneman & Lovallo, 1993; Lovallo & Kahneman, 2003). Under-attending to external cues, people overestimate their own relative efforts and abilities. As with motivational theory, inflated self-estimates are not a conscious deception but a genuine belief, however mistaken.

3. Self-presentation theory – This theory argues that people are proactive impression-managers. As such, they consciously manipulate attributions to create and project a positive image. *Ceteris paribus*, people will give inflated self-estimates, but this effect may be constrained by the need to sound plausible, or heightened by individual attributes such as need for achievement or self-efficacy (Tedeschi, 1981; Stajkovic & Sommer, 2000).

There is general agreement that none of these theories is universally valid, with their contributions contingent on contexts of attribution (Nisbet & Ross, 1980; Reiss, Rosenfeld, Melburg, & Tedeschi, 1981). For example, college students' survey attributions may be motivational or informational, whereas managers' attributions in firms' annual reports are primarily self-presentational (Bowman, 1978; Bettman and Weitz, 1983). In an empirical study, Reiss, et al. (1981) used "working" and "broken" lie detectors to separate the private component of attributions (motivational and informational) from the public component

(self-presentational), concluding that self-assessments and performance attributions have both private and public components.

Self-serving biases vary with the ambiguity of the trait being measured. For example, in a study of soccer ability, Van Yperen (1992) found that players rated themselves significantly higher on ambiguous dimensions (e.g., soccer ability) than on unambiguous dimensions (e.g., heading the ball). In a study of university students, Farh & Dobbins (1989) found that students' self-assessments were significantly higher than those of independent raters, and significantly higher for an ambiguous dimension (class participation) than an unambiguous dimension (attendance). In a study of football ability, Felson (1981) asked 72 college football players and their coaches to rate each player on two sets of football traits: ambiguous abilities (e.g., football sense, mental toughness), and unambiguous abilities (e.g., size, running speed, strength). Both players and coaches rated the players' abilities significantly higher on the ambiguous dimensions. On the ambiguous dimensions, the players rated themselves significantly higher than their coaches, but on the unambiguous dimensions the differences were either marginally significant ($p<.10$), non-significant, or in the wrong direction (e.g., player weight).

There is evidence that this "ambiguity effect" is driven, at least in part, by lexical ambiguity, or "trait breadth" (Dunning, Meyerowitz & Holzberg, 1989). For example, one interpretation of Felson's results is that, because "football ability" is lexically-ambiguous, respondents have the flexibility to make self-serving choices. If one player has good hand-eye coordination, and another is a fast runner, both may plausibly rate themselves above-average in "football ability," using a two-stage "lexical arbitrage": (a) self-servingly choosing a denotation that fits their own abilities, and then (b) rating themselves above-average in the original construct. In four studies of university students, Dunning, et al. (1989) asked

students to identify the most important criteria for evaluating "ability," and then to rate themselves on the criteria generated by all students. The students made idiosyncratic lists depending on their own abilities, and then rated themselves significantly higher on criteria taken from their own lists. As such, in the face of lexical ambiguity, subjects define competencies self-servingly, and then overattribute those competencies to themselves.

On the other hand, inflated self-estimates of ambiguous competencies pervade a variety of contexts, and certainly stem from factors beyond lexical ambiguity. For example, Perloff & Fetzer (1986) found that self-enhancement is greater in comparisons with ambiguous reference groups than with specific referents; Wells and Sweeney (1986) found that ambiguity-driven self-enhancement was moderated by the presence of prior self-esteem; Sherwood (1967) and Felson (1985) concluded that self-serving assessments are reinforced by ambiguous feedback, or by no feedback; several studies by Dunning and colleagues have found that, irrespective of lexical ambiguity, people tend to rate others' success using traits they themselves possess (Dunning, Perie & Story, 1991; Dunning & McElwee, 1995; Beauregard & Dunning, 2001); and numerous studies have found that self-enhancement is reduced if subjects believe their responses are verifiable, will be objectively verified, or if subjects are required to provide their own verification (e.g., Snyder, Stephan & Rosenfeld, 1976; Mabe & West, 1982; Bauman & Dent, 1982; Fahr, Werbel & Bedeian, 1988).

Evidence suggests that the ambiguity effect is particularly exacerbated by competition. Under competition, competence assessments necessarily entail comparisons against a reference group. Studies by Klar & Giladi (1999) and Kruger (1999) found that ambiguous relative judgments are strongly correlated with self-judgments, but not with judgments of others. In other words, in assessing their relative competencies, subjects tend to ignore competitors' competencies (see also Eiser, Pahl, & Prins, 2001; Epley & Dunning, 2000). In

competitive contexts, this plays a vital role in producing the above-average effect: if most people see themselves as "competent," and they neglect the self-assessments of relevant others, then when asked "How competent are you compared with relevant others?" more than 50% will rate themselves above-average.

More generally, decision-makers in competitive conditions tend to assign disproportionate value to a focal cause, actor, or hypothesis, while neglecting non-focal causes, actors, or hypotheses (Moore & Kim, 2003; Legrenzi, Girotto & Johnson-Laird, 1993; Schkade & Kahneman, 1998; Wilson et al., 2000). For example, in laboratory studies of market entry, Camerer and Lovallo (1999) found that MBA students ignored the quality of competitors and focused on their own skills when deciding whether to enter markets, resulting in excess entry. This tendency, which we refer to as *competition neglect*, is especially pertinent to managers' attributions of relative competencies under causal ambiguity.

The systematic misperception of one's own abilities (the "above-average effect"), and its magnification under ambiguity (the "ambiguity effect"), are well-documented in studies of individual subjects. It has also been established that managers misperceive even the most objective dimensions of their firms' environments, structures and strategies, due to judgmental biases, simplifying heuristics, perceptual blind spots, or wishful thinking (e.g., Tosi, Aldag, & Storey, 1973; Bateman & Zeithaml, 1989; Zajac & Bazerman, 1991; Starbuck & Milliken, 1988). However, there is little direct evidence that the "above average effect" or "ambiguity effect" operate in firms or, in particular, in managers' assessments of the relative competencies of their own firms. In one study, Larwood and Whittaker (1977) found that corporation presidents tended to make overoptimistic market forecasts, and to assess their own firms more optimistically than competitors. Also, in studies of corporate annual reports, Bowman (1978), Bettman & Weitz (1983) and Salancik & Meindl (1984) found a pervasive

pattern of egocentric attribution, consistent with findings in the larger performance-attribution literature (e.g., Miller & Ross, 1975; Bradley, 1978; Lau & Russell, 1980), i.e., attributing high performance to internal competencies (credit-taking), and low performance to external factors or bad luck (blame-avoidance). However, these studies did not measure the accuracy of competence attributions, or examine the ambiguity effect.

There is sociological evidence that managers act on socially-constructed belief systems, using cognitive taxonomies to make sense of complex competitive environments (White, 1981; Porac & Thomas, 1990), and institutionalizing these mental models through programs, processes, nomenclatures and rituals (Meyer & Rowan, 1977; DiMaggio & Powell, 1983). For example, managers develop cognitive taxonomies of industry competitors and strategic groups (Reger & Huff, 1994; Porac et al., 1995; Lant & Baum, 1995), and define organizational problems and solutions in comparison to these reference points (Kahneman & Tversky, 1979; Fiegenbaum, Hart & Schendel, 1996). Organizational actors also incorporate political, psychological and cultural logics in setting CEO compensation (Porac, Wade & Pollack, 1999), establishing organizational legitimacy (Elsbach, 1994), and making reputational judgments (Rao, 1994).

Studies suggest that these judgments are often self-serving, deriving from the need to make sense of external events, take credit (or avoid blame) for firm performance, or to justify previous or intended courses of action (Rao, 1994; Porac & Rosa, 1996; Gioia & Thomas, 1996). Although we have no direct evidence linking socially-constructed belief systems with causal ambiguity, such systems evidently provide highly-leveraged environments for exploiting self-serving biases. For example, rather than directly promoting a risky project, an executive may define the firm in reference to its most successful

competitors, exploiting the tendency to accept greater risk in relation to higher reference points (Kahneman & Tversky, 1979).

If causally-ambiguous competencies are difficult to observe, or are unobservable, then we would expect empirical research on causal ambiguity to rely heavily on managerial self-reports, as indeed it does. The above considerations imply that the causal paths presented in Figures 1-3 may be distorted in these self-reports, either by managers' overestimates of firm competencies, or by self-serving representations of causal linkages. These effects are depicted in Figure 4, integrating the above ideas with those presented in the earlier figures.

- INSERT FIGURE 4 ABOUT HERE -

Propositions and future research

If the "above average effect" and "ambiguity effect" are as prevalent as studies suggest, and if judgmental biases and misperceptions are widespread in organizations, then we believe the connection between management perception and causal ambiguity warrants empirical investigation. In our view, the existing research provides sufficient motivation for the following propositions:

Proposition 1 (The above-average effect): Managers systematically overestimate their own firms' competencies.

Proposition 2 (The ambiguity effect): Managers overestimate their own firms' ambiguous competencies to a greater extent than unambiguous competencies.

The studies cited earlier also suggest a broad framework of contingency propositions. For example, these studies have generally emphasized the contexts of *situation* and *verifiability* – i.e., that self-enhancement depends on the circumstances surrounding the attribution (e.g., the motivational context), and whether the attributor believes the attribution can be

independently verified. In a review of performance attribution in firms, Ford (1985) proposed that managers' performance attributions depend on three additional factors: attributes of the *performance* (whether it was positive or negative, expected or unexpected); attributes of the *attributor* (ego-involvement, self-efficacy, prior attributions); and attributes of the *firm* (reputation, past performance). Ford also suggested that managers' performance attributions had much greater impact on the firms' strategic actions than the actual underlying causal system – i.e., that managers' perceptions of performance causes, and not the causes themselves, determined firms' strategies.

From these suggestions, we propose the following contingency propositions for the above-average effect:

Proposition 1a: The above-average effect depends on *situation characteristics*. *Ceteris paribus* (assumed for all propositions), the more emotive the situation (e.g., an employee meeting vs. an SEC filing), the greater the above-average effect.

Proposition 1b: The above-average effect depends on the *verifiability* of the attribution. The less verifiable the attribution, the greater the above-average effect.

Proposition 1c: The above-average effect depends on the *true degree of the competence* being evaluated.[6] The greater the competence, the greater the above-average effect.

Proposition 1d: The above-average effect depends on *attributor characteristics*. The greater the attributor's achievement motivation and self-efficacy, the greater the above-average effect.

Proposition 1e: The above-average effect depends on *the firm and its reference group*. The greater the competition neglect, the greater the above-average effect.

These considerations also give rise to contingency propositions for the ambiguity effect, as follows:

[6] This is the manager's genuine perception of competencies, not an objective fact about a competence; under causal ambiguity, "actual" competencies are, by assumption, unobservable (see also proposition 2c).

Proposition 2a: The ambiguity effect depends on *situation characteristics*. The more emotive the situation, the greater the ambiguity effect.

Proposition 2b: The ambiguity effect depends on the *verifiability* of the attribution. The less verifiable the attribution, the greater the ambiguity effect.

Proposition 2c: The ambiguity effect depends on the *true degree of ambiguity* being evaluated. The greater the characteristic ambiguity, the greater the ambiguity effect. The greater the linkage ambiguity, the greater the ambiguity effect.

Proposition 2d: The ambiguity effect depends on *attributor characteristics*. The greater the attributor's achievement motivation and self-efficacy, the greater the ambiguity effect. The less informed the attributor (about firm competencies and performance), the greater the ambiguity effect.

Proposition 2e: The ambiguity effect depends on attributes of *the firm and its reference group*. The greater the competition neglect, the greater the ambiguity effect. The less the firm's relative competence on unambiguous attributes, the greater the ambiguity effect.

Of the above propositions, all but 2e are fairly straightforward extensions of previous findings applied to managers' attributions of firm competencies. 2e asserts that, if a firm lacks unambiguous competencies, its managers are more likely to look elsewhere in making self-serving assessments. For example, managers in a firm without scale, location, cost, or product advantages are less likely to inflate these (verifiable) competencies, but more likely to inflate unverifiable ones, i.e., lexically-ambiguous or characteristic-ambiguous competencies such as "people," "culture," or "knowledge."

Propositions 2 and 2a through 2e can also be replicated for the forms of linkage ambiguity developed in the earlier analysis (summarized in Table 2). In particular, we hypothesize that self-serving performance attributions depend on measurement error ambiguity, functional uncertainty ambiguity, and incompleteness ambiguity, with these forms giving rise to self-serving performance attributions moderated by situation characteristics, true degree of ambiguity, attributor characteristics and reference group effects. These arguments can easily be restated in propositional forms parallel to those above.

The management perception view of causal ambiguity, represented in these propositions, may have significant consequences for empirical research. The propositions suggest that managers' self-reports will systematically overstate firm competencies, and that the overstatements will increase in proportion to causal ambiguity. If a competence is lexically-ambiguous, managers will denote the construct self-servingly, overstate the competence, then disproportionately emphasize the competence in explaining firm performance. If researchers' statistical models regress objective measures of performance on survey measures of competencies, the output will systematically overstate the effects of ambiguous competencies. The inaccuracies will be exacerbated if the context is emotive, or if the attribution is unfalsifiable, or if managers neglect the competencies of rivals. And if characteristic ambiguity is a necessary condition for causal ambiguity (as proposed earlier), these overstatements will apply to all cases of causal ambiguity.

The overstatements depend on a host of situational factors, none of which has been studied in resource-based research. To the extent that managers' misperceptions reflect genuine misunderstandings (as in motivational and information processing theories), even well-intentioned managers will overestimate their firms' ambiguous attributes, and these effects will be magnified by personality factors such as self-efficacy. In presentational contexts, managers will deliberately "spin" performance explanations to serve strategic or egocentric purposes. As an anecdotal example, we recently observed an instance in which a business school dean came under pressure to improve his school's MBA recruiting competencies after two years of declining enrollments and SAT scores. That year, the state government instituted an interest-free scholarship scheme, upon which every business school in the state experienced 30% to 80% one-year enrollment increases. When asked to explain his school's sudden recruiting success (a 40% enrollment increase), the dean did not

mention the scholarship program (an unambiguous attribute), but instead cited the school's "much-improved recruiting capability."

In a climate characterized by such attributions, researchers should not be surprised if managers embrace performance theories emphasizing ambiguous causes and causal paths. Theories of ambiguous causation, including the resource-based view, are highly congenial to existing management biases. But the researchers themselves should maintain a more circumspect view. Even if researchers can overcome the challenges of measuring unobservables (see, for example, Henderson & Cockburn, 1994; King & Zeithaml, 2003), we should be mindful that powerful human perceptual biases favor the overstatement of ambiguous competencies.

We believe this perspective offers exciting new possibilities for empirical research. Of the twelve propositions in this section, most have strong empirical precedent, but none has been tested in the context of managers' attributions of firm competencies. In a partial test of propositions 1 and 2, Lovallo and Powell (2002) asked a group of independent assessors (MBA students) to rate the ambiguity of ten organizational traits, and then asked managers in 1,480 Canadian firms to rate their firms' competitive strengths on these ten attributes. The managers' rank-orderings correlated .94 with the independent assessors' ratings of competence ambiguity, and the managers' ratings of the perceived performance contributions of these competencies correlated .87 with competence ambiguity. These findings tend to support the above-average and ambiguity effects, but this study did not account for lexical ambiguity, did not show that the managers' perceptions were inaccurate or self-enhanced, and did not consider the contexts of attribution.

There are many opportunities for further work, both experimentally and in field research. Here, we mention a few areas for potential contribution:

- Empirically, the essential first step is to establish the above-average and ambiguity effects (propositions 1 and 2). Much of this work can be done experimentally, following methodologies parallel to those in studies cited earlier.

- The effects of lexical ambiguity have not been tested, and alone would constitute an extensive empirical agenda. For example, at present it is not clear whether "culture" is cited as a performance cause because it is valuable, because it is causally ambiguous, or because it is lexically ambiguous. Untangling these effects is an important potential contribution of this line of research.

- A priority is to establish the relative explanatory power of the motivational, information processing and self-presentational theories. This requires either devising alternative contexts of attribution experimentally, or studying these contexts in natural settings (e.g., internal memoranda, planning retreats, annual reports, board meetings, employee meetings, shareholder meetings).

- An enormous amount of work is needed on the contexts of competence attribution, and any proposition 1a to 1e, or 2a to 2e, forms the basis for an empirical study. An important theme underlying these propositions is that filling out surveys for researchers is only one of many attributional contexts, and that researchers cannot draw reliable conclusions without understanding contextual effects.

- Competition neglect poses intriguing research opportunities. For example, it would be possible to design experimental scenarios in which subjects invest in skill training, with ambiguity effects observed as subjects compete against increasingly skilled opponents. The above propositions suggest that subjects' competence self-attributions will (a) increase as attributes become more ambiguous, (b) increase as the subjects become more skilled (have greater investments in their own skill), and (c) neglect the fact that competitors are also becoming increasingly skilled.

- Many effects tested in the experimental work cited above would require independent corroboration in managerial contexts. For example, it would be important to know whether managers make more inflated competence reports in comparisons against ambiguous or specific competitors.

- It may be the case that causal ambiguity exacerbates a wide range of attribution errors. For example, Bertrand and Mullainathan (2001) found that CEOs are often compensated for luck (e.g. an exogenous shock in oil prices) rather than skill, either because CEOs control their boards of directors, or boards of directors commit attribution errors, or because boards believe shareholders will commit attribution errors. In any case, this resembles the MBA dean scenario discussed above, with causally ambiguous environments giving rise to self-serving attributions, despite the availability of unambiguous explanations. The effects of causal ambiguity on CEO compensation and corporate governance would merit further empirical investigation.

- One context not discussed above is the context of explaining past competencies, as when managers are asked by financial analysts to account for firm performance

retrospectively. This differs attributionally from asking a manager to make forecasts, or to explain in more general terms what factors are responsible for performance in a firm or industry. For past competencies, we would expect managers to make the usual overestimates, but we believe less verifiable contexts (e.g., forecasts) are more susceptible to above-average and ambiguity effects.

- In general, behavioral strategy holds tremendous promise for innovative contributions to strategy research. As in behavioral economics and behavioral finance, the intersection of economics and psychology offers experimental rigor and empirical richness that may serve as important complements to more traditional strategy research. As shown here, a perceptual approach to causal ambiguity presents many new research opportunities within the emerging domain of behavioral strategy.

SUMMARY

It is possible that causal ambiguity, broadly and objectively considered, has no net effect on firm performance. Our own review of the theory and evidence inclines us toward that conclusion, and has impressed us with the complexity of the problem. However, this does not mean that causal ambiguity is not a valuable construct, or that no important research can be done on causal ambiguity.

The next step forward in causal ambiguity research is to understand the forces that obstruct the paths from causal ambiguity to firm performance. Figures 1 though 3 are a start in this direction, and lead to the conclusion that the impediments to imitation (represented in the analysis by ε_A) must have sufficient magnitude to offset both the causal ambiguity paradox and the competence substitution effect. Table 2 expands on these conditions, both for characteristic and linkage ambiguity, and describes the forms under which each would produce performance advantages. For researchers interested in extending the current program of empirical research, these forms and analyses offer directions for modeling and testing the effects of causal ambiguity.

On the other hand, we are intrigued by Ford's (1985) assertion that firm strategies are determined more by managers' perceptions of performance causes than by the causes

themselves; and we suspect the same may be said of firm competencies. We also accept some of the epistemological reservations held by critics of the resource-based view, and we believe these severely constrain the existing empirical program of causal ambiguity research. These constraints may be surmountable (see, for example, King & Zeithaml, 2003), but in our view a more promising path, as a complement to existing research, is to investigate the role of management perception in assessments of causal ambiguity and its consequences. We believe the "ambiguity effect" leads to a number of exciting research opportunities, and we hope readers will be stimulated to investigate these opportunities for themselves.

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FIGURE 1: THE CAUSAL AMBIGUITY PARADOX

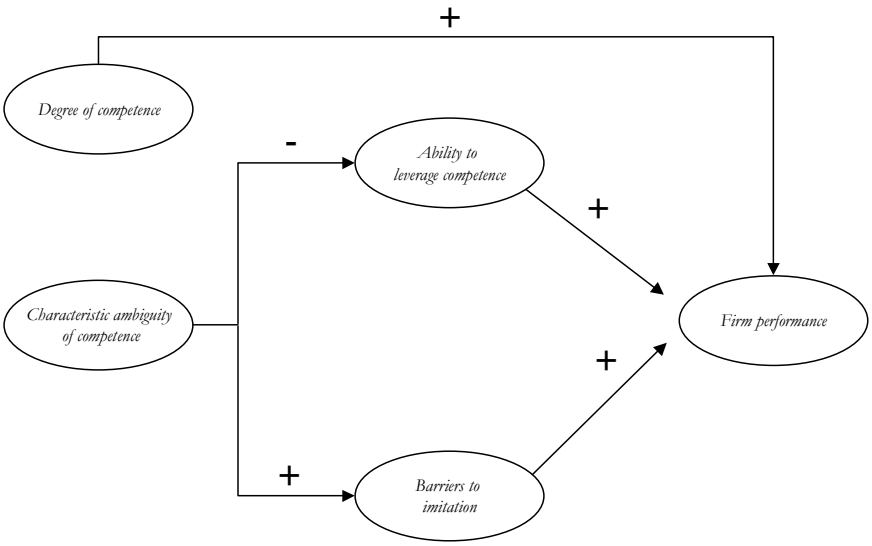

FIGURE 2: CAUSAL AMBIGUITY AND COMPETENCE SUBSTITUTION

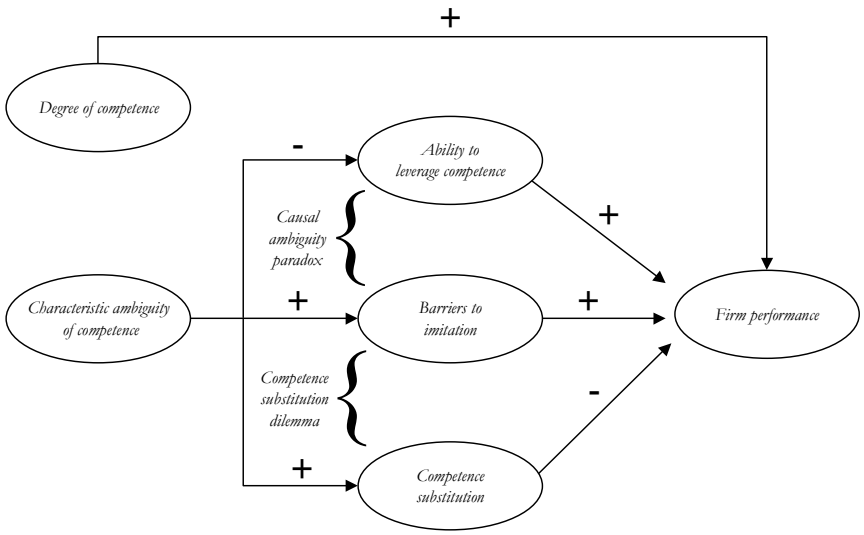

TABLE 1: THE LEXICAL AMBIGUITY OF CULTURE

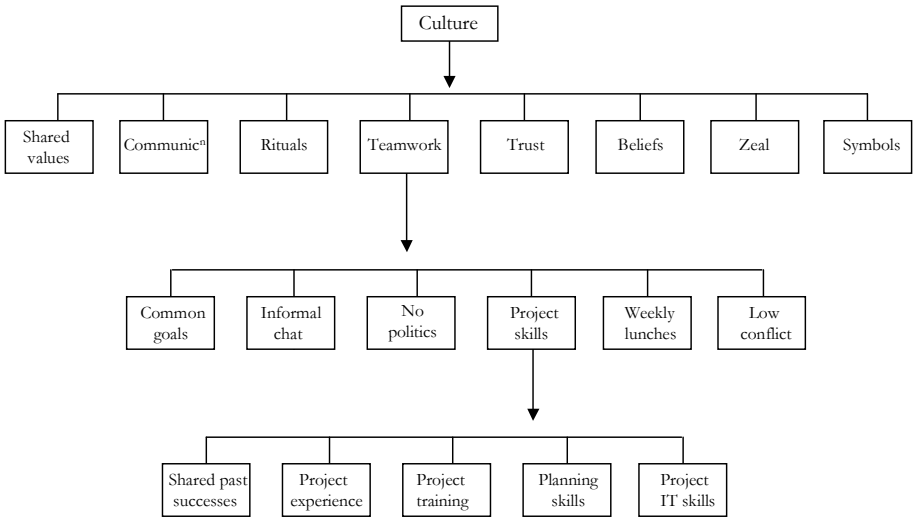

FIGURE 3: CHARACTERISTIC AND LINKAGE AMBIGUITY

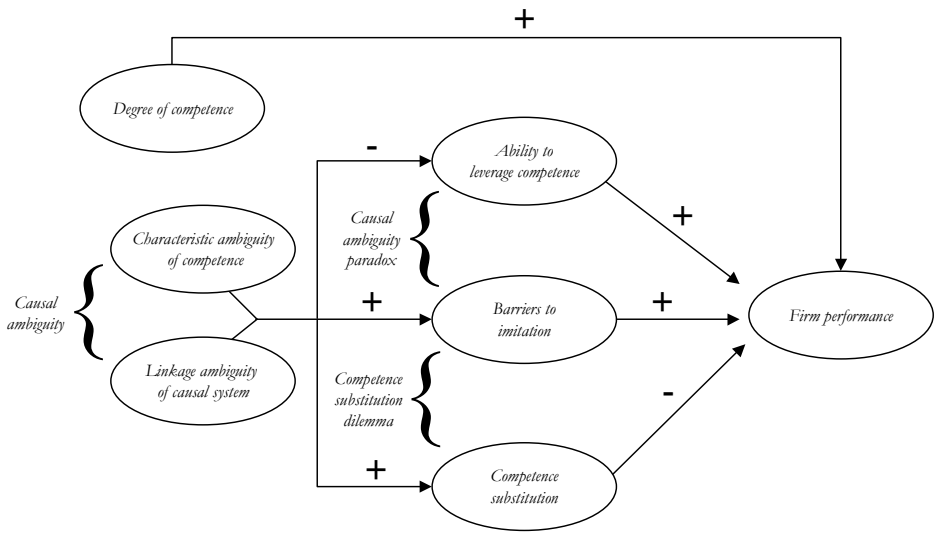

TABLE 2: THE FOUR FORMS OF CAUSAL AMBIGUITY

CHARACTERISTIC AMBIGUITY

Competence uncertainty

$P = \pi(A,B,C,\varepsilon_A)$, where the functional form of π is known

Uncertainty (error) in competence A

LINKAGE AMBIGUITY

First form: Measurement error

$P = \pi[\phi(A),B,C, \varepsilon_0]$, where the functional form of π is known, and $\phi(A) = A_0 + \varepsilon_A$

Uncertainty in competence A and performance

Second form: Functional uncertainty

$P = \pi(A,B,C)$, where the functional form of π is unknown

Uncertainty of functional form, including possible interactions among competencies (or with other assets C)

Third form: Incompleteness

$P = \pi(A_1, A_2, \ldots, A_n, C_1, C_2, \ldots, C_n)$, where π and n are unknown.

Uncertainty of functional form; uncertainty about which competencies, or how many, comprise the function

FIGURE 4: SELF-SERVING BIAS, CAUSAL AMBIGUITY AND FIRM PERFORMANCE