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Constructing useful models of firms' heterogeneities in implemented strategies and performance outcomes

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ABSTRACT

This study advances the proposition that applying core tenets of complexity theory is useful for solving the "crucial problem" in strategic management—describing, explaining, and predicting firm heterogeneity. The study describes the core tenets (e.g., the necessity of constructing models for cases with relationship reversals to a significant main effect—cases occur whereby both high and low scores of an antecedent condition indicate high scores in an outcome condition; asymmetric models are necessary because the causes of successful outcomes are not the mirror opposite of the causes of unsuccessful outcomes). Constructing "somewhat precise outcomes models" (SPOM) rather than null hypothesis statistical testing (NHST) is the principal analytic tool. The study describes asymmetric models of implemented strategy and competitive advantage for ROE, negation of ROE, and complex outcome statements for agribusiness firms ($n = 247$) across seven Latin America national as well as tests the predictive validities of models across specific nations for the models of sampled firms within Costa Rica, El Salvador, Guatemala, and Nicaragua. The findings support the propositions that constructing complex antecedent statements (i.e., algorithms/configurations/recipes/screens) are useful for indicating high performance or the negation of high performance consistently. Configural implemented strategy models have direct influences on both high and low performance outcomes, while competitive advantage models impact low, but not, high performance outcomes. Complex competitive advantage conditions contribute indirectly to high performance outcomes.

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> Strategy theory has converged on a view that the crucial problem in strategic management is firm heterogeneity—why firms adopt different strategies and structures, why heterogeneity persists, and why competitors perform differently.
>
> [(Powell, Lovallo, & Fox, 2011: 1370)]

1. Introduction: a seemingly subtle but radical paradigm shift

The following narrative illustrates a configuration of firm performance outcomes. At first blush 2014 was a great year for VW. Sales growth, net income growth, and earnings before interest, taxes, depreciation, and amortization (EBITDA) growth were all positive and substantially higher in comparison to 2013. But, "'The problem is that VW simply has far too many employees,' says [VW] research center director Ferdinand Dudenhöffer. But Winterkorn [VW CEO], standing next to the labor chief at a workforce assembly in Wolfsburg, swore he wouldn't cut jobs. Workers gave him a standing ovation" (Boston, 2014). Dudenhöffer assesses VW's recent performance to include a low ratio of EBITDA to number of employees–a metric indicating low marketing efficiency. Boston's (2014) VW report describes a configuration of firm performance outcomes representing a complex recipe of positive and negative ingredients.

The combination of a low EBITDA relative to the number of employees is representative of one metric for performance efficiency. The potential for creating very substantial numbers of antecedent resources and implement strategy recipes and configurational performance outcome recipes illustrate the theoretical problem of modeling the heterogeneity inherent in the discipline of strategic management. Expanding on Powell et al.'s (2011) perspective on the crucial problem in strategic management, achieving the dual objectives of model construction generalizing beyond anecdotal narratives at the level of individual firms and still capturing substantial firm-level heterogeneity is the prime conundrum of strategic management theory. Modeling to solve this prime

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conundrum includes construction of accurate models of complex outcome conditions rather than examining outcomes one at a time—thus, addressing the heterogeneity in performance outcomes recipes such as the high EBITDA coupling with high number of employees at VW.

Powell et al. (2011: 1371) define "behavioral strategy" as follows: "Behavioral strategy merges cognitive and social psychology with strategic management theory and practice. Behavioral strategy aims to bring realistic assumptions about human cognition, emotions, and social behavior to the strategic management of organizations and, thereby, to enrich strategy theory, empirical research, and real-world practice." "Merges" is the operative word for describing, understanding, predicting, and/or influencing behavioral strategy and its sub-fields including behavioral pricing. Powell et al.'s (2011) perspective serves to advance (Mintzberg's, 1978, p. 934) definition of a strategy as "a pattern in a stream of decisions"; a definition enabling research on strategy formation and implementation in a broad descriptive context. As Mintzberg (1978: 934) proposes, "Specifically we can study both strategies that were intended and those that were realized despite intentions." Alternative consistently, executed, realized strategies are useful (partial) definitions of specific firms; firms distinguish themselves by what they actually do—their signature performances. Teece's (2014: 14) proposals for a dynamic capabilities-based entrepreneurial theory of the multinational enterprise informs this signature performance proposition, "The (dynamic) capabilities framework is an entrepreneurial approach that emphasizes the importance of (signature) business processes, both inside the firm and also in linking the firm to external partners."

> Dynamic capabilities rely not just on best practices but on "signature" practices; not just on any resources but on VRIN [valuable, rare, inimitable, and non-substitutable] resources. They also require astute managerial orchestration guided by what Rumelt (2011) has called "good strategy".
>
> [(Teece, 2014: 20)]

Explicating signature practices indicating highly desirable versus undesirable performance outcomes would be helpful in moving strategic management research forward toward solving the discipline's "crucial problem" (Powell et al., 2011: 1370)—describing and explaining firm heterogeneity and the outcomes associated with alternative configurations of firm characteristics and actions. Useful examination of configurations of firms' characteristics (e.g., firm size, national headquarters, market orientation, and resources), actions, and performance outcomes is possible and necessary; the objective of such research is to accurately report on what specific configurations of firm characteristics and plans affect what specific configurations of firm actions that result in what specific configurations of firm performances—such research is capable of describing the nitty-gritty heterogeneous (signature) behaviors of individual firms while generalizing to (as much as possible) to describe and explain the implemented strategies indicating good versus bad strategy.

The claim here is that the substantial majority of perspectives and empirical studies in the strategic management literature fail to address the crucial problem adequately—reports on the impact of market orientation (e.g., Frösén, Luoma, Jaakkola, Tikkanen, & Aspara, 2016), the resource-based view (e.g., Peteraf, 1993; Wernerfelt, 1984, 1989), competitive advantage (e.g., Barney, 1991; Porter, 1985), "critical success factors" (e.g., Cooper & Kleinschmidt, 1995), and dynamics capabilities (Teece, 2014) on firm performances do not describe nor explain configurations of firms' implemented strategies and which of these configurations indicate good versus bad outcomes. Much like the examining of photographs and films of executions of American gridiron (football) by coaches and players, solving the crucial problem in strategy theory requires the study of implemented strategies during and after these strategy executions; such research needs to include, but go beyond, lengthy case study reports, to provide accurate predictive models of what configurations of firm characteristics-actions lead to good versus bad outcomes. The present study describes potentially useful advances in theory and empirical research for capturing firm heterogeneities in characteristics, implemented actions, and outcomes in models that are testable for their accuracy using additional samples of naturally identifiable firms.

The present study contributes unique perspectives of applying core tenets of complexity theory in examining the realized recipes in the use of firm resources, as well as the emergent firm stances in regards to competitors as antecedents of high (and low) complex recipes of firm performance efficiencies (i.e., performance outcome recipes). The theoretical stance and an empirical examination in the present study describe firm performance antecedents and firm efficiency outcomes by recipes (aka, configurations, see Fiss, 2011; Ordanini, Parasuraman, & Rubera, 2014) rather than linear, additive, symmetric models (e.g., Conant, Mokwa, & Varadarajan, 1990; Dean & Sharmand, 1996; Karna, Richter, & Riesenkampff, 2016; Poppo, Zhou, & Li, 2015). The present study also contributes by formally proposing core tenets of complexity theory as a foundational perspective useful for improving the behavioral theory of the firm. Complexity theory includes the proposition that nearly all simple antecedent conditions relate positively, negatively, and not at all to a desirable and undesirable outcome within the same set of data (cf. Fiss, 2007; Ordanini et al., 2014). Consequently, studies describing the net effects of antecedents on an outcome via regression analyses (i.e., the vast majority of strategic management studies)—the dominant logic today in data analysis in strategic management—provides rather shallow reporting that subtly reduces the usefulness of the core issues that strategic management research attempts to answer. Rather than focusing on net effects of variables' contributions to performance metrics, a more useful approach for advancing strategy theory includes asking what recipes of firm resources and implementation actions indicate firms with high-performance recipe outcomes as well as asking separately, what alternative strategies associate with low-performance receipt outcomes (cf. Fiss, 2007).

Also, the present study goes beyond tests of fit validity to formally test the predictive accuracy of recipe algorithms of performance outcomes via additional samples of firms (cf. Gigerenzer & Brighton, 2009). This recipe approach is also useful for accurately modeling the negation of high-performance recipe outcomes that follows from adopting the causal asymmetry tenet in strategy theory (Fiss, 2007, 2011), that is, the tenet that models of useful causal recipes for low-performance outcomes are unique and not symmetric to the causal recipes useful for describing high-performance outcomes. The modeling of complex outcomes advances from the conventional logic of modeling one outcome variable as a dependent variable (e.g., Fiss, 2011; Snow & Hambrick, 1980; Shan, 1990) to modeling outcome recipes implied in the VW good news, bad news, opening example.

The VW anecdotal case reports a high firm-performance in combination with too many firm employees; this combination is measurable by a configural high score for $(EBITDA_{2014} / EBITDA_{2013}) \cdot (VWemployees_{2014} / EBITA_{20014})$, with the mid-level dot ("·") indicating the logical "AND" combination. Using configural Boolean algebra, both terms in this expression include calibrated scores ranging from 0.00 to 1.00 (see Ragin, 2008). Presumably, each term has a high value—assuming that the first term (i.e., annual growth in EBITDA) equals 0.96 and the second term (VW employees as an index of $EBITA_{2014}$) equals 0.92, the combination score for this outcome recipe would equal 0.92, that is, the combination scores for a complex recipe of simple outcome conditions is equal to the lowest score among the simple outcome conditions—the same rule applies for calculating the score for complex antecedent conditions (i.e., recipes). Given executives in firms estimate multiple performance metrics and that the multiple outcomes for a given firm often includes a recipe of favorable and unfavorable conditions occurring together, strategic management theory can advance in usefulness by examining performance recipes of

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organizational strategies rather than single alternative performance metrics per model.

Following this introduction, section two describes theory and empirical research focusing on the use of recipes in strategic management, organizational psychology, and service research. Section three describes core tenets of complexity theory as a general foundation bases for configuration research. Section four applies complexity theory to offer a general theory of firm realized strategy configurations, competitive stance recipes, and firm outcome recipes; this general theory suggests using a configural perspective of firms' realized strategies and competitive marketing positions (Snow & Hambrick, 1980; Woodside, Sullivan, & Trappey, 1999), and proposes additional tenets to Fiss' (2007, 2011) perspective on building better causal theories in strategic management. Section five describes an empirical study that tests core propositions in the general theory and evidence that further supports the deep rich insights and predictive accuracy of configural models of firm outcomes. Section six concludes with a general discussion of case-based model building and testing, limitations of the empirical study, and suggestions for future research.

2. Theory and empirical research using recipes

Fiss (2011, p. 393) contributes to the theoretical perspective on "causal core and periphery, which is based on how dimensions of a configuration are connected to outcomes. Using data on high technology firms, I empirically investigate configurations based on the Miles and Snow (1978) typology using fuzzy set qualitative comparative analysis (fsQCA)." While not as theoretical developed as Fiss's (2011) configural treatise, earlier work by Conant et al. (1990) and Woodside et al. (1999) advance the same perspective by proposing and testing "relatively pure" types (firms exhibiting a single Miles and Snow's (1978) typology in both of two separate measurement scales). For example, Conant et al. (1990) apply the following firm screen: pure type firms were members within the same firm category (i.e., prospector, analyzer, defender, and reactor) of Miles and Snow's (1978) typologies for both of two separate survey instruments. Such configural screens decrease the number of cases in a membership category; the screen applied by Conant et al. resulted in a 56% convergence–a net of 83 of 148 firms made the cut into one of the four strategic types. Woodside et al. (1999) created similar relatively-pure firm types using a "strong plurality rule" whereby an executive's responses to the Conant et al. multi-item scale had to go beyond a simple majority in supporting one of the four strategic types. Woodside et al. (1999) also apply the additional screening step used by Conant et al. (1990) following the use of the strong plurality rule; a double screen beyond a simple majority rule resulted in the following reductions in the number-of-firms per strategic type: 21 → 15 → 6 prospectors; 19 → 14 → 4 analyzers; 31 → 25 → 5 defenders; and 15 → 11 → 6 reactors. Both Conant et al. (1990) and Woodside et al. (1999) report that the use of screens reduces noise in the data and increases information on how different firms' strategic types uniquely influence firm performances.

In the related field of organizational psychology, after describing the inadequacies of symmetric testing (multiple regression analysis), McClelland (1998) advances the use of configural screening steps to identify executives most likely to be highly competent in the future. While using but not referring directly to Boolean algebra, McClelland (1998) proposes using the following screening algorithm: an executive has to be in the top quintile on each of three separate antecedent conditions that predict high executive competence in order to achieve identification as a highly competent executive—a focus on creating an asymmetric algorithm screening metric. McClelland's (1998) method infers that while the main effect of any one simple antecedent condition may relate positively to an outcome condition, a high score in the single antecedent alone is insufficient for consistently indicating a high score for an outcome condition; however, a case in the data with high scores for 2+ identifiable antecedents may be sufficient for doing so. This screening procedure is an application of the logical "AND" operation in Boolean algebra. Such operations include the implications that achieving a top quintile score in any one or possibly two antecedent conditions are insufficient for classification in a high membership outcome category; and, the use of a compensatory, additive, rule for antecedent conditions fails to identify accurately an outcome of interest consistently. McClelland (1998) reports that unlike symmetric regression analysis, models of such algorithms consistently identify highly competent executives in additional (i.e., holdout) samples of executives. Thus, unlike the substantial majority of organizational studies using symmetric tests, McClelland (1998) tests the usefulness of screens for both fit and predictive validities. Unfortunately, most studies since McClelland (1998) in organizational research and strategic management ignore the informative and predictive usefulness of screening procedures. McClelland, Davis, Kalin, and Wanner (1972) also advance product consumption theory by using such screening procedures in consumer psychology.

Fiss (2007) explains that applications of configurational set-theoretic methods differ from conventional, variable-based approaches in that configural methods do not disaggregate cases into independent, analytically separate aspects, but, instead, treat configurations as different types of cases. Fiss (2007) goes on to explain the mismatch between configurational theory and variable-focused data analytics. Configural theory stresses nonlinearity, synergistic effects, and equifinality (reaching the same outcome from different antecedent routes) while empirical symmetric analysis (e.g., regression analysis) assume linearity, additive effects, and unifinality.

> This mismatch has caused a number of problems. For example, the classic linear regression model treats variables as competing in explaining variation in outcomes rather than showing how variables combine to create outcomes. By focusing on the relative importance of rival variables, a correlational approach has difficulty treating cases as configurations and examining combinations of variables. This becomes particularly evident in the fact that regression analysis focuses on the unique contribution of a variable while holding constant the values of all other variables in the equation.
>
> [(Fiss, 2007, p. 1181)]

Along with McClelland (1998), Gigerenzer and Brighton (2009) demonstrate the superiority of asymmetric versus symmetric tests' predictive abilities using additional samples. Gigerenzer and Brighton (2009, p. 118) confirm and expand on the point that achieving a good fit to observations (part of the dominant logic in strategic management) "does not necessarily mean we have found a good model, and choosing the model with the best fit is likely to result in poor predictions. Despite this, Roberts and Pashler (2000) estimated that, in psychology alone, the number of articles relying on good fit as the only indication of a good model runs into the thousands." Gigerenzer and Brighton (2009) do test the fit and predictive accuracies (validities) of symmetric multiple regression analysis (MRA) against asymmetric simple heuristics. MRA wins consistently for fit validity and the simple heuristics win consistently for predictive validity. "The point here is not that [simple heuristics such as] tallying leads to more accurate predictions than multiple regression. The real and new question is in which environments simple tallying is more accurate than multiple regression, and in which environments it is not. This is the question of the *ecological rationality* of tallying" (Gigerenzer and Brighton, 2009, pp. 111–112, italics in the original).

Ordanini et al. (2014) advance new theory in service innovation adoption by adopting a holistic framework positing that new service adoption does not depend on individual service attributes but on specific configurations of such attributes. Their study is revolutionary in service research in showing that equifinality (i.e., the same outcome is reachable from different configurations) can occur for different recipes which include a positive score for a given ingredient in one recipe and

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a negative score for the same ingredient in a second recipe. Ordanini et al. (2014, p. 135) point out, "A primary tenet in the product adoption literature is that the effects of a new offering's attributes on adoption intentions are additive, with each individual trait exerting an independent effect. This tenet assumes that potential adopters disentangle a new offering's elements, assess them separately, and then pool the assessments in deciding whether to adopt (Arts, Brumbach, & Bijmolt, 2011)." To create algorithms of recipes consistent in high accuracy in indicating service adoption, Ordanini et al. (2014) analyze survey data from 300 respondents on their willingness to adopt the use of a new service offering by a luxury hotel. They used a set-theoretic theory and software program, "fuzzy set qualitative comparative analysis" (fsQCA, see Fiss, 2007; Ragin, 2008). Ordanini et al.'s (2014) findings support the configural perspective that while adoption depends on four primary services attributes (relative advantage, complexity, meaningfulness, and novelty), only when customers perceive meaningful configurations of these attributes that, in turn, fit with coproduction requirements, is adoption likely to occur. Fiss (2007) and Ordanini et al. (2014) stress that fsQCA employs distinct assumptions such as complex causality, using case configurations instead of variables to establish relations, and addresses different research objectives than traditional symmetric-based regression analysis, namely, identifying configurations that constitute consistent sufficiency for the occurrence of an outcome of interest with no one configuration being necessary for this occurrence of the outcome.

QCA findings are "case" and not "variable" based (Ragin, 2000) in that each solution (empirical Boolean algebra model) reflects both a combination of variables scores (e.g., top quintile levels for 2+ variables) related to an outcome or outcome recipe and the group of respondents or firms associated with that combination. This case-based modeling approach to theory and practice is an important step forward in solving the conundrum of how to construct generalizations representing firm heterogeneity. As Gigerenzer and Brighton (2009, p. 133) explain, "Individual-level tests are essential because in virtually every task we find individual differences in strategies. This heterogeneity may be due to flat maxima, where several strategies are reasonable solutions to the same problem, or a kind of Darwinian variability that is rational if the world (or task) changes, or a strategic unpredictability that can be rational in competitive games. As a consequence, models need to be tested at the individual level, whereas conclusions from group averages are likely to be uninformative." Equifinality can occur in two ways at the individual level: different recipe antecedent-solutions can indicate the same highly favorable outcome recipe and the same case (firm) can have high membership scores in two or more such highly desirable recipe antecedent-solutions—in fsQCA, empirical model metrics (indexes estimating consistency of numbers of cases and coverage of numbers of cases that the solution represents) indicating cases fitting more than one favorable outcome solution are labeled "intermediate" ("raw coverage") outcomes. Consequently, a given recipe of complex antecedent conditions may be a sufficient but not necessary indicator for a highly efficient firm outcome recipe. Additional recipes are identifiable that lead to the same outcome recipe. The fsQCA software provides metrics for unique indexes as well, that is, the indexes for cases with high outcome scores only for a specific favorable solution.

3. Complexity theory bases for management configurations

While not considered by Fiss (2007), Ordanini et al. (2014), or Ragin (2008), complexity theory provides a theoretical foundation for configural analysis and recipes in organizational studies and strategic management (cf. Anderson, 1999; Davis, Eisenhardt, & Bingham, 2007, 2009). The major tenets of complexity theory includes the proposition that that multiple paths lead to the same outcome, that is, "equifinality" occurs—alternative asymmetric combinations of indicators (i.e., algorithms) are sufficient but no one combination is necessary for predicting the occurrence of a specific pricing decision, and causal asymmetry occurs, that is, indicator configural models that accurately predict a high performance by the firm are not the mirror opposites of the indicator configural models that accurately predict a low performance.

A second complexity theory tenet is that, "Relationships between variables can be non-linear with abrupt switches occurring, so the same "cause" can, in specific circumstances, produce different effects (Urry, 2005, p. 4). Thus, for example an increase in gross revenue may be an outcome of a price increase in specific circumstances [contexts] and an increase in gross revenue may be an outcome of a price decrease in other specific contexts. The same point is relevant for revenue decreases and price increases and decreases. Taking steps toward a general theory of behavior of the firm includes explicating the specific contexts for the occurrence of all four price-demand relationships: demand increases associating with price increases and decreases and demand decreases associating with price increases and decreases. The same perspective is relevant for annual planning, substantial versus minimal corporate social responsibility programs, the market introduction of new products, changes in distribution systems, and additional firm actions.

The complexity turn in strategy theory includes the tipping-point tenet as Gladwell (2002) and Urry (2005) describe. If a system passes a particular threshold with minor changes in the controlling variables, switches occur such that a liquid turns into a gas, a large number of apathetic people suddenly tip into a forceful movement for change (Gladwell, 2002). Such tipping points give rise to unexpected structures and events whose properties can be different from the underlying elementary laws (Urry, 2005, p. 5). In models of implemented strategies, such tipping points frequently involve replacing a negative with a positive response to one issue in a string (path) of questions within a given complex configuration of antecedent conditions. Hall (1976, 1984) provides examples of several such tipping points in his process models of the implemented strategies of the rise and death of a firm—the *Saturday Evening Post* during 1940–1960. Hall also takes the worthwhile modeling step of examining outcome recipes rather than focusing on modeling outcome conditions individually. For example, Hall (1976, p.201) reports "[following WWII, the firm's] readership grew from 3.4 to almost 4 millions [sic], its revenues grew from 115 to 162 million constant dollars, but is profit margin fell from 14 percent in 1944 to 7 percent of revenues in 1946." Based on Boolean algebra and using fuzzy set qualitative comparative analysis (fsQCA, see Ragin, 2008), this combination outcome would indicate a high membership score for the firm in 1946 for the following outcome recipe: $C \cdot R \cdot \sim P \geq 0.95$ with C = circulation, R = gross revenues, P = profit margin and the mid-level dot representing the logical "AND" condition, the tilde ("~") represents the negation, 1 minus the score for the condition) and the number 0.95 representing a high score on a calibrated scale from 0.00 to 1.00. Additional examples of such "causal complexity" (Ragin, 2000) in outcomes appear in the following empirical examples in the present study.

The present study proposes and test the following six tenets derived from complexity theory. T1: No single antecedent condition is a sufficient or necessary indicator of a high score in an outcome condition. T2: A few of many available complex configurations of antecedent conditions are sufficient indicators of high scores in an outcome condition. T3: Contrarian cases occur, that is, low scores in a single antecedent condition associates with both high and low scores for an outcome condition for different cases. T4: Causal asymmetry occurs, that is, accurate causal models for high scores for an outcome condition are not the mirror opposites of causal models for low scores for the same outcome condition. T5: Examining the impacts of complex antecedent conditions on complex outcome conditions as recipes is uniquely informative in comparison to examining complex antecedent conditions of simple outcome conditions. T6: Different models of complex antecedent conditions similar in prowess in identifying high (low) firm complex outcomes differ in their predictive ability in identifying high

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performance with additional samples of firms. The sixth proposition is in response to Armstrong's (2012), Gigerenzer and Brighton (2009) and McClelland's (1998) advocacy of the necessity of testing for predictive validity with additional samples and not only for fit validity.

4. Configural theory of firm realized stratgies, competitive marketing stances, and performance efficiencies

The objective of this section and the next is to illustrate adopting a configural approach to strategic management theory that focuses on realized strategies and firm performance efficiency. The approach is exploratory at the meso-level of firms' realized strategies rather than more macro-level of generic organizational configurations (e.g., Miles & Snow's, 1978/2003 typology and Porter's (1980) four generic strategies: industry wide cost leadership, industry wide differentiation, market segment focus (low cost), and market segment focus (differentiation). Examining realized strategies at the meso-level suggest examining the possible contributions to theory and practice of deeper descriptions of firm recipes that appear in generic organizational configurations. The present study of meso-level realized strategies begins with a priori theory that specific recipes of antecedent ingredients lead to high firm performance efficiencies; these recipes include deeper descriptions of specific combinations of firm behaviors and competitive stances than found in the literature on generic organizational configurations. The research objective does not include attempting to claim that the particular realized strategy recipes that indicate high firm performance efficiency in the study are relevant for firms in industries other than firms in the one industry in the empirical study. Empirical studies in additional industries are necessary to learn if generalizing findings of recipes indicating high firm performance efficiency across industries is possible.

This study examines strategy implementation by emerging-markets' agribusinesses specializing in food production. The study focuses on firms based in Latin America because the region has become a leading global exporter of agricultural products, driven by the innovativeness not just of multinational corporations but also of local companies. The study adopts a complexity turn in assessing the impacts of possible configurations of firm behavior strategies occurring in various competitive contexts on various configural firm-level efficiency outcomes.

Fig. 1 includes associations of three Venn diagrams to indicate potential recipes of realized strategies and firm performance efficiencies. Firm realized strategies are defined as configurations of recipes of firm behavior in combination with recipes of competitive stances. For example, the following realized strategy may indicate a recipe of high firm efficiency: high-share of temporary (T) to total employees AND high sales growth (G) for past five years AND no introduction of radical changes (~R) AND low R&D/sales (~D) AND high vertical integration (V) AND high prices (P) relative to competitors. This recipe includes six ingredients; the following Boolean statement expresses this recipe: T·G· ~R· ~D·V·P with the mid-level dot ("·") representing the logical AND operation (i.e., the score for the complex statement is equal to the lowest score among the simple conditions in the model statement and indicates the membership score the ingredients share in the recipe). Fig. 1 includes the arbitrary identification of seven antecedents as possible conditions in firm behavior configurations, seven antecedent conditional components in a firm's competitive stance, and five conditions as possible components in a firm's complex outcome conditions. A strategy complexity turn recognizes the difficulty without accepting the futility of going deeper than identifying a few (e.g., three or four) generic strategic types of firms (e.g., Miles & Snow, 1978; Porter, 1980, 1985). The strategy complexity turn adopts ex ante theoretical and ex post realized perspectives for identifying complex antecedent conditions indicating high versus low complex outcome conditions.

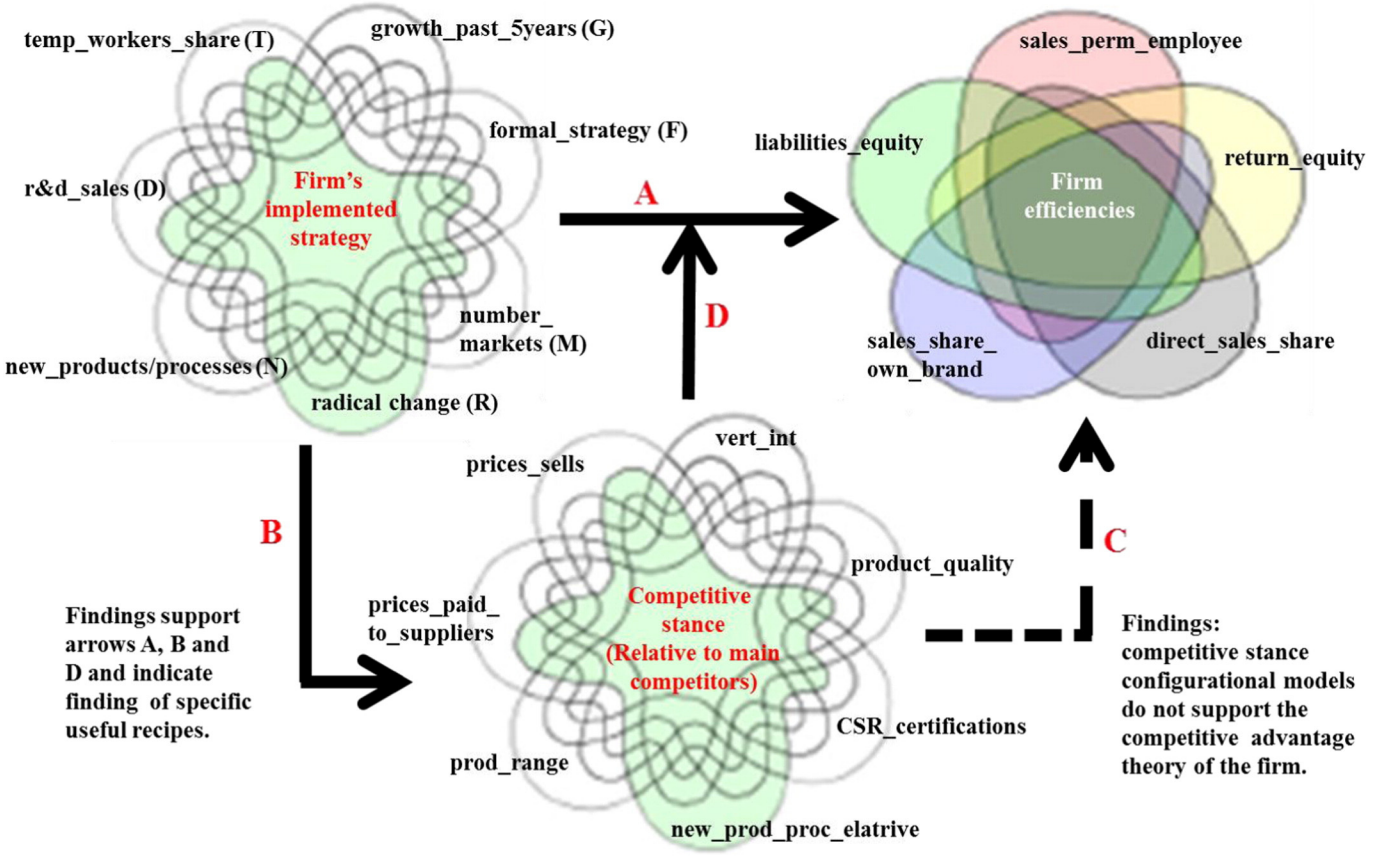

Fig. 1. Theory of firm behavior, competitive stance, and marketing efficiencies.

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Considering high versus low presence versus absence (3 options) for each of seven simple antecedent conditions as components for realized complex strategies or for competitive stances provides a total of 2187 configurations. Combining the three possibilities of seven simple antecedent conditions for firm behaviors with the three possibilities of each of the seven outcome/antecedent conditions for competitive stances provides 4,782,969 mathematically possible complex statements. Considering combinations three possibilities for each of the five simple strategy outcome conditions in Fig. 1 indicates 243 complex statements. Using the analogy of American gridiron (football), adopting the complexity turn to strategy theory includes the recognition that the possible numbers of realized strategy configurations is nearly endless but parsimonious models are possible for identifying strategies that work well versus poorly for winning/losing games. A parsimonious description of a high-performing gridiron strategy might be:

adequate_quarterback·one_world-class_receiver·four_superior_offensive&defensive_line_men.

A parsimonious description of a low performing strategy might be:

superior_quarterback·two_adequate_receivers·two_adequate_offensive&defensive_line_men. Similar to before-and-after game football commentators, strategy theorists describe configurations of strategies that work well or poorly in competitive contexts. The complexity turn includes explicitly recognizing that usually no one simple antecedent condition is sufficient consistently for achieving a winning performance or to cause an undesirable outcome; a complex antecedent condition resulting in low performance may include a desirable high score for a simple antecedent condition; the causal asymmetry tenet applies—specific antecedent configurations of low performing strategies are not the mirror opposites of high performing strategies; an overall desirable complex outcome may still include one or two undesirable features (e.g., the opening assessment of VW's 2014 configuration of performance indicators).

The present study adopts both theory to empirical regularities (T → E) and empirical regularities to theory (E → T) stance for identifying configurations of firm (case-level) behaviors impacting firm (case-level) performance outcomes. The study here builds on complexity theory in adopting the T → E stance recognizes the usefulness as well as limitations theory-based perspectives of how strategy configuration impact firm performances (e.g. Porter, 1980, 1985). Thus, both high and low temporary-to-full-time workers share are likely to appear in complex firm antecedent configurations indicating high firm-performance given that the former includes low formal planning, high R&D, low vertical integration, and low prices relative to competitors' prices and the later includes high formal planning, vertical integration, and high R&D in combination with high share of own brand sales. Models 1 and 2 are hypothetical expressions of these perspectives:

$$T \cdot F \cdot G \cdot \sim R \cdot \sim D \leq ROE \cdot Own_brand \quad (1)$$

$$\sim T \cdot N \cdot G \cdot R \cdot D \leq ROE \cdot Own_brand. \quad (2)$$

where T is high-share of temporary to total employees; F is a high score in formal strategy; G is high sales growth for past five years; R is the introduction of radical changes; D is high R&D/sales; N is number of new products/processes; ROE is return on equity. Note that models 1 and 2 include some different ingredients, different directions for some of the same ingredients, and high G in both models. Both models include a complex outcome algorithm rather than considering a simple stand-alone outcome condition. Taken together the two models suggest that high formal planning and low formal planning can occur in different configurations in the same set of data indicating high performance—which depends on what other ingredients appear in the respective recipes (cf., Armstrong, 1982). Consequently, while studies may find that main effects of specific simple antecedent conditions relate to high firm performance in a set of data, cases contrary to these main effects likely exist in the same data set; reporting on the relative size of main effects and on moderating influences on main effects are steps too simple for identifying regularities of antecedents affecting outcomes occurring consistently at the case-level in the data set (cf. Fiss, 2011).

For the following statement, T represents theory and E represents empirical regularizes. While T → E "glorifies hypothetico-deductivism and the significant difference philosophy" (Hubbard, 2016, p. 78), "the significant sameness model [(E → T)], however, emphasizes that by means of inductive enumeration the empirical regularities must come *first*. In this bottom-up (E → T) interpretation of research, the discovery of empirical generalizations *fuels* (high-level) theory development rather than vice versa … the process needs to be understood through repeatable facts, phenomenon, or regularities (italics in the original, Hubbard, 2016, pp. 78–79. Consequently, the present study adopts a discovery stance of identifying empirical regularities of complex firm antecedent conditions indicating high as well as low firm performance outcomes—this stance includes the expectation that the analysis of all possible configurations of complex antecedent conditions will indicate a few surprising complex conditions indicating high performance outcomes as well as others indicating low performance outcomes *consistently*. Here, central to the E → T stance is consistency in the regularities of the simple or complex outcome conditions at the level of cases—all, or nearly, all cases with high scores in the specific complex antecedent configuration have high (or low) scores in the outcome condition; and thus, the model demonstrates significant sameness.

4.1.1. Configurational models of firm ingredients

The seven simple conditions (i.e., dimensions or factors) in first Venn diagram in Fig. 1 serve to illustrate the six tenets of complexity theory. For example, Fig. 1 includes the proposal that the presence of formal (planned) strategy is an ingredient in a few configurations of firm realized strategy indicating high firm performance. However, a high score in formal strategy alone does not consistently indicate high firm performance. For example, consider the thought experiment findings that among 50 firms with high scores in a complex statement of high performance, 35 have scores in formal strategy and 15 have low scores in formal strategy; in the same sample of firms, 150 firms have low scores in firm performance with 30 of these firms with high scores formal strategy and 120 have low formal strategy scores. Rather than focus on the significant main effect of planned strategy and firm performance, configural analysis would include both T → E and E → T examination of the 200 firms to describe the subsets of firms in each of the four simple antecedent-outcome associations. This examination is to answer the following questions:

- In what complex antecedent conditions do high scores for formal planning and firm performance occur consistently (regularly)?
- In what complex conditions antecedent conditions do low scores in formal planning and high scores in firm performance occur consistently (regularly)?
- In what complex antecedent conditions do low scores for formal planning and high scores firm performance occur consistently (regularly)?
- In what complex antecedent conditions do low scores occur consistently (regularly) for both formal planning and firm performance?

Research applying complexity theory and configural analysis focus on case-level examination by discretizing variable data into crisp sets (e.g., low versus high), multiple-value scores (e.g., very low, low, medium, high, and very high), or fuzzy scores ranging from 0.00 to 1.00. This case-based research recognizes that in a reasonable large data set ($n \geq 100$) most cross-tabulations of quintiles for antecedents and an outcome condition usually results in a few-to-many cases occurring in all 25 cells formed by cross-tabbing an antecedent with an outcome quintile. Linear analysis focuses on symmetric relationships and the relative contribution/importance of each variable in one or a few multiple regression analyses on high versus low values for an outcome variable

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and fails to consider and explain observable cases representing associations' contrarian to the main effects—where main effects tests indicate statistical significance via NHST (null hypothesis significance testing). Complexity theory and configural analysis proposes and tests the perspective that different cases occur in a data set whereby both low and high scores for an antecedent condition associate with high scores with an outcome condition. As McClelland's (1998) use of algorithms based on quintiles implies, simple quintile cross-tabs of each simple antecedent condition with each outcome condition would serve to confirm this observation for nearly all antecedent (i.e., independent) variables in empirical studies in the social science and management sub-disciplines. The focus of most strategy theory and research is a mismatch to the significant sameness issues and outcome regularities proposed by complexity theory and observed by configural analysis (cf. Fiss, 2011).

For each of the simple antecedent conditions in firm behavior and competitive stance, strategy research literature focuses on simple symmetric relationships. For example, does formal versus informal planning contribute to high versus low firm performance? Does the use of a high share of temporary to permanent employees contribute to high versus low firm performance? And so on. This section includes a brief description of this literature. A key point is that most this research focuses on significant differences and symmetric relationships while the present study focuses on significant sameness (regularities), both contrarian and support cases, and asymmetric relationships. The intention here is to briefly describe key findings and offer examples, not a full review of the literature.

4.1.2. Formal planning (F) and firm performance

The strategy literature focuses nearly exclusively on whether or not a symmetric relationship exists for formal planning and firm performance, what factors increase versus decrease this positive relationship, and on simple performance conditions singularly (e.g., firm sales growth or profitability). Rather than consider the possible reality of firms-in-contexts when formal planning is an ingredient in configurations indicating low as well as high firm performance, strategy research describes negative or no formal planning and high firm performance findings as inconsistencies that are likely due to methods factors (e.g., multi-collinearity of variables in regression models), (e.g., Brinckmann, Grichnik, and Kapsa (2010); Dibrell, Craig, and Neubaum (2016); Miller & Cardinal, 1994; Pearce, Freeman, & Robinson, 1987; Schwenk & Shrader, 1994).

Rather than performing a null hypothesis statistical test (NHST) of formal planning as a main effect on firm performance, the present study tests the complexity-tenet based proposal that (P1) high formal planning and no formal planning are indicators of high (as well as low) performance in a few unique configurations as well as the proposition (P2) that neither low or high scores in formal planning is a condition in one or more complex antecedent configurations for some other firms achieving high (or low) firm performance. When a complex antecedent condition has merit in indicating high consistency (using a "statistical sameness test"; Hubbard, 2016) in the outcome condition (e.g., firm performance), then all (or nearly all) firms with high scores in the complex antecedent condition have high scores in the outcome condition. The replacement of NHST symmetric analysis with SST asymmetric analysis provides several beneficial outcomes including refocusing theory on the prime outcome of interest: high scores in a positive or negative outcome for a simple or complex outcome condition that is, achieving some amount of predictive precision rather than directional only significant difference testing (Meehl, 1967). Additional benefits include achieving the avoidance of focusing on relative sizes (i.e., "importance" comparisons) of main, moderating, mediating, and interaction effects (Fiss, 2011); the recognition/identification and modeling reflecting equifinality of alternative solutions; the resulting "mechanisms" or algorithms having practical usefulness for predicting relatively precise scores for a relevant outcome condition (e.g., McClelland's (1998) use of SST-based quintile algorithms to predict managers with "outstanding" versus "typical" competence in additional samples of managers separate from the samples used to construct the models—after he was unhappy with the low predictive accuracy of NHST based, symmetric, multiple regression models; see Gigerenzer and Brighton (2009), on the relatively poor performance of symmetric (multiple regression analysis) models versus asymmetric algorithm models in separate-samples predictive validation. Gigerenzer's (1991, p. 254) offers a profound insight relevant here—when jumping among theories, analytics, and outcomes— "Scientists' tools are not neutral." The focus on configurations (i.e., algorithms, mechanism, rules), SST, precise predictions, and predictive validation using separate samples beyond NHST symmetrical modeling brings to practical life a critical realism perspective (theories derived from facts, that is, abduction, Peirce, 1867, p. 90), and Little's (1993, p. 185) dictum, "The central explanatory task for social scientists is to uncover causal mechanisms [i.e., recipes, configurations]."

4.1.3. Internationalization of the firm: number of markets (M) served

Similar to more recent findings in all meta-analysis of symmetrical studies on the directional impact of internationalization (and other possible antecedents) affecting firm performance, Sullivan (1994) reports that the evidence is inconclusive and disturbing. "An elemental issue of international business is whether diversifying internationally improves the financial performance of a firm. A priori, the practices of thousands of companies indicate yes. However, looking to the literature for confirmation proves futile. We categorized seventeen empirical studies of the relationship between the degree of internationalization (DOI) of a firm and its financial performance on the basis of whether the study found a positive, indeterminate, or negative relationship. [His] Table 1 shows that six studies reported a positive, six an indeterminate, and five a negative relationship. The theoretical clarity of the relationship between DOI and financial performance makes such empirical disarray disturbing" (Sullivan, 1994, p. 327).

Sullivan (1994) and others (Hsu, Chen, & Cheng, 2013; Pangarkar, 2008; Thomas & Eden, 2004) provide similar symmetric-based reports indicating positive, negative, and no relationships for internationalization and firm performance with no testing for predictive validity of the resulting MRA-based models. The study by Hsu et al. (2013) includes regression models with 15 to 20 independent terms that result in low fit validity and a statistical significance for "number of host countries" at $p < 0.10$. Research by Armstrong (2012) and Goldstein and Gigerenzer (2009) indicate that regression models should be limited to three terms or fewer. More basic than trying only to improve method is to end the mismatch between theory and method by recognizing that (P3) internationalization alone is insufficient and unnecessary for firms consistently to achieve high performance. Also, (P4) internationalization by some firms (cases) in combination with additional antecedent antecedents (e.g., possibly formal planning and high R&D investing) may be sufficient (but still not necessary) for high firm performance. A few two-way and three-way interactions in regression analyses becomes intractable and do not adequately capture the complexity involved among a reasonable number of antecedent conditions (i.e., 3 to 7) for models indicating consistent high (or the negation of) high firm performance (cf. Ragin, 1997). Testing for sufficiency in consistency by an asymmetric model is possible (all, or nearly all, cases high in the complex antecedent condition are high in the outcome condition) matches with the theory that a few specific complex statements indicate the same outcome for some overlapping set of cases. Such testing is much more informative than $p < 0.05$ tests for each term in a regression model. The present study tests and confirms sameness-for-the-outcome sufficiency but not necessary antecedent configurations with internationalization an ingredient in some of these models.

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Table 1
Models for high ROE.

Model	Radical_Δ	R&D/sales	Gro_ 5 yrs.	Temp_share	Num_markets	New_prods/procs	Formal plan	C1	C2
1	·	·	·	~	·		·	0.87	0.16
2		·	·	~	·	·	·	0.87	0.16
3	~	~	·	~	·	~	~	0.89	0.07
4	·	·	·	·	~	~	·	0.87	0.03
5	·	·	~	·	~	·	·	0.89	0.06
6	·	·	~	·	~		·	0.86	0.07

Overall: Solution consistency, C1 = 0.84, solution coverage, C2 = 0.25.
Notes. Mid-level dot, "·" indicates presence of antecedent condition in the model, sideways tilde, "~" indicates the negation of the antecedent condition in the model; empty space indicate absence of the antecedent condition in the model. Absence indicates that the antecedent condition does not contribute or take-away from the consistency of a given model P1 receives support from these findings: both high formal planning and the negation of formal planning occur among the six models; though, 5 of 6 models includes formal planning and only one model includes the negation of formal planning.

4.1.4. Introduction of radical change (R) in business strategy

The first sentence in a Harvard Business Review (HBR) collection of articles focusing on introducing major changes in strategy in firms are ineffective, "Most major change initiatives—whether intended to boost quality, improve culture, or reverse a corporate death spiral—generate only lukewarm results. Many fail miserably" (HBR, 2006, p. 1).

In the context of enrollments in liberal arts colleges as the dependent variable, Kraatz and Zajac (2001) report several regression models with non-standardized b-coefficients typically with a mix of twenty significant and non-significant terms. They find adaptive strategic change was very prevalent and also performance enhancing for most organizations. "However, we also found that organizational resources decreased the propensity for adaptive strategic change and also appeared to mitigate the very need for it. We presented further evidence that strategic change may actually damage existing resources and performance among especially distinctive and richly endowed organizations" (Kraatz & Zajac, 2001, p. 653). Thus, strategic change can increase as well as decrease organizational performance depending on the presence of additional factors in heterogenetic contexts. While their conclusions are based on overdetermined regression models containing many significant and non-significant terms, with directional estimates only, with no testing for predictive validity, the contingent nature of the findings and their "hope that future research will give more attention to these important subtleties" (Kraatz & Zajac, 2001, p. 653) supports the adoption of complexity theory and configural analysis. Thus, P4: High scores in radical strategic change appear in a few realized strategies of some firms experiencing high (low) firm performance. P5: Low scores in radical strategic change appear in a few realized strategies of some firms experiencing high (low) firm performance. Strategy change theory should go further than just specifying P4 and P5 based on findings in the literature specific configurations that may be identifiable that should indicate high (low) performance outcomes. For example, consider models:

$$\sim F \cdot M \cdot R \cdot G \leq \sim ROE \cdot Liabilities_equity. \quad (3)$$

Model 3 states that the configuration containing low formal strategy AND high internationalization AND high radical change AND high sales growth associates with a negative complex outcome: low ROE AND high liabilities to firm equity. The study's context includes high complexity in managing customer relationships in several international markets for some firms; the lack of formal strategy with the presence of radical change likely overwhelms the sound decision-making and implementation abilities of such firms. The details in the findings below do not support the negative complex outcome that theoretical model 3 predicts.

The literature on change management does not provide much in the way of solid evidence as to what additional firm-level behaviors occur when firm's radically change their strategies that results in favorable versus unfavorable outcomes. By itself, radical change in strategy is unlikely to associate with a symmetric positive or negative outcome or a complex set of outcome conditions. Reading of the relevant literature supports two conclusions. First, the continuation of attempting to develop and test linear regression models base on symmetric thinking to compare the contribution of managing or experiencing radical change in strategy on firm performance versus other factors promises little of value. By's (2005, p. 371) main conclusion in his critical review of organizational change management support this first conclusion, "Theories and approaches to change management currently available to academics and practitioners are often contradictory, mostly lacking empirical evidence and supported by unchallenged hypotheses concerning the nature of contemporary organizational change management." Second, the core tenets of complexity theory offer a solid vision for theory construction for understanding high and low firm performance when radical change in strategy occurs. The second conclusion reflects Dunphy and Stace's (1993, p. 905) perspective that "managers and consultants need a model of change that is essentially a 'situational' or 'contingency model', one that indicates how to vary change strategies to achieve 'optimum fit' with the changing environment" (Dunphy & Stace, 1993: 905)—though the goal of "optimal fit" is unrealistic and goes beyond the complexity tenet of equifinality of alternative recipes that include high versus low radical change connecting to the same high (low) performance outcomes. The highly practical and highly theoretical perspective that is worthy of adoption: radical change in strategy works as an ingredient in a few complex antecedent conditions of firm behaviors in increasing firm performance and poorly in others. The possibility of uncovering such complex antecedent conditions (i.e., think Little's (1993) mechanisms) is a useful stance to adopt both in theory and practice.

4.1.5. Number (N) of introductions of new products and/or processes

The relevant literature suggests that bringing innovations to market in the form of new products and/or new services is necessary for firm success (Cooper, Easingwood, Edgett, Kleinschmidt, & Storey, 1994; Cooper & Kleinschmidt, 1995). Identifying "key success factors" for new product/service success is the central focus of the many contributions by Elko Kleinschmidt and Robert Cooper. Kleinschmidt and Cooper (1991) demonstrate that high and low innovativeness products are more likely to be more successful than those in-between; they point out that past research has not allowed for this non-linear relationship and that their data show that moderately innovative, middle-of-the-road products are less likely to succeed when measured by a number of performance criteria. More recent work includes additional breakthroughs in theory construction and testing; by adopting asymmetric modeling and tenets of complexity theory, Cheng, Chang, and Li (2013) and Ordanini et al. (2014) demonstrate that the negation of different factors (i.e., antecedent conditions) can sometimes contribute to high firm performance when testing complex antecedent conditions' abilities to identify high scores in firm performance.

The present study advances theory and testing by indicating when high or low activity in bringing new products or services to market is

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a factor contributing to low firm performance. P6: Low or high activity in bringing new products/services to market contributes to low firm performance in a few asymmetric complex antecedent models. P7: Low or high activity in bringing new products/services to market contributes to high firm performance in a few asymmetric complex antecedent models. Tests showing that a positive or inverted U-shaped relationship occur between the extent of new product/service activity and firm performance represents a perspective too simplistic to capture the complexities that occur in a large ($n > 100$) data set of firms within the same industry or in multiple industries. Even if the main effect between low versus high activity in new product/service introductions and low versus high firm performance is positive and statistically significant, high activity in new product/service introductions is neither sufficient nor necessary for high firm success. Contrarian cases occur as well whereby high new product/service activity associates with low firm performance for a substantial number of firms. Only when the strategist and researcher adopts the complexity theory tenet that construction of models indicating high (or low) firm performance occurs consistently only when a few complex conditional algorithms which include high or low new product/service activity plus a mix of a few additional conditions—contrarian cases (firms) occur for almost all factors (i.e., conditions or independent variables) to an extent that severely limits the value of reports on directional hypotheses of main effects and the relative importance of different independent variables.

4.1.6. Investment in R&D

A large scale meta-analysis (Capon, Farley, & Hoenig, 1990) tests the directionality of influence of a large number of factors, including research and development's (R&D), on firm profitability; this study has a large number of citations (Google.com citation count = 1203 as of March 3, 2016). Capon et al. (1990, p. 1157) conclude, "Dollars spent on R&D have an especially strong relationship to increased profitability. Investment in advertising is also worthwhile, especially in producer goods industries." They also point out, "Regression analysis and interpretation from statistical tabulation are the most popular statistical techniques used to test performance models. Although these methods work fairly well, it is apparent that new methodologies are needed to deal with special classes of problems found in performance measurement: high variable count, possible high levels of interactions among variables and possible interactions within and among systems of characteristics (environment, strategy and organization)" (Capon et al., 1990, p. 1158); this statement contradicts their additional perspective on the same page that, "Some explanatory variables have been studied so extensively that we wonder if more research effort is really needed."

The relevant empirical, meta-analysis, and review literature on R&D's impact of firm performance (Capon et al., 1990; Srinivasan & Hanssens, 2009) does not go beyond stating that tests for fit validity indicate a statistically significant positive relationship between level of R&D (standardized by sales) and firm performance, or beyond testing two-way interactions of R&D and another variable and indicating statistical significance against the null hypothesis of no influence on firm performance (e.g., Lin, Lee, & Hung, 2006). Lin et al. (2006) find no significant main effect for R&D and firm performance but a two-way interaction of R&D and commercial orientation; they conclude, "Our results suggest that firms in different technology categories should have different technology commercialization strategies. Commercialization orientation and R&D intensity complement each other. A firm's commercialization orientation can play a more important role than R&D in the process of exploiting the value of technology assets. The commercialization of a firm's technology assets, including knowledge flows and knowledge stocks, is a complex task and there is no single best strategy available for all firms" (Lin et al., 2006, p. 679). The R&D and performance as variables literature does not include examples of predictive validity using additional samples. The literature does not consider asymmetric relationships of complex antecedent conditions, with and without high R&D, that are sufficient to cause high firm performance. The literature does not consider the complexity theory tenet of causal asymmetry—the configural conditions indicating high performance are unique from the configural conditions indicating low performance. The present study moves beyond considering the directional association and statistical significance test of whether empirical findings do not support the null hypothesis about R&D and firm performance; the theory and findings here focus on the more valuable question of when, not if, high R&D indicates high performance and when high R&D indicates low performance and the same outcomes for low R&D. P8: High (low) R&D expenditure occurs in a few complex antecedent conditions indicating high firm performance. P9: High (low) R&D expenditure occurs in a few complex antecedent conditions indicating low firm performance. P10: High versus low firm R&D/sales is insufficient and not necessary for indicating high firm performance, that is, some complex antecedent condition occur that do not include either high or low R&D expenditures.

4.1.7. Share of temporary employees to total employees

The literature on the impact of using a large versus small share of temporary employees to total employees is stuck in considering whether or not the overall main effect of large versus small numbers of temporary employees is statistically significant against acceptance of the null hypothesis (e.g., Bryson, 2007; Roca-Puig, Beltrán-Martín, & Cipres, 2012). The relevant literature provides scant information on the issue of when high share of temporary to total employees indicates high (low) firm performance. Based on fit validity only models using regression analysis with 30 plus regression terms for a national sample of 2292 workplaces in Britain, Bryson (2007, p. 1) reports, "TAW [temporary agency workers] per se is not associated with workplace financial performance. It is also not associated with two of the three measures of labour productivity analyzed. However, it [TAW] does appear to be associated with higher sales per employee. Furthermore, when moving beyond the simple incidence of TAW at the workplace, the association between TAW use and workplace performance and productivity differs according to the jobs TAW perform and the number of TAW at the workplace." From a sample of 1403 Spanish manufacturing firms, Roca-Puig et al. (2012) report on the relative size of conditional effects on human performance investment for firms with high versus low numbers of temporary employment but not at the level of consistency of findings for cases in any of the contexts. Roca-Puig et al. (2012) conclude, "The positive effect of human capital [investment] on return of sales is greater in large firms with low temporary employment than in small firms with high temporary employment. In addition, this positive effect is not universal because in some scenarios it is not significant. The most beneficial context is that of large companies with a high level of human capital [investment] and a low use of temporary employment." They do not consider the complex conditions that include high temporary employment as one among a few ingredients indicating high return on sales using asymmetric models. Given the findings that Roca-Puig et al. (2012) report, additional analysis based on complexity theory (e.g., quintiles of use of temporary employment by quintiles of firm performance) would find firms in all 25 cells even if the cross-tabulation was restricted to top quintile of firms by size ($n = 281$); this perspective is an application of the perspective that the configuration of low temporary (~T) employment and large firm size (L) is insufficient for consistently indicating high firm performance (P): $\sim T \cdot L \neq P$. (Read: firms with both low T and high L are not consistently high in P, where the sideways tilde "~" indicates negation and the mid-level dot "·" indicates the logical "AND" condition). For example, assume the configuration of top quintiles in both T and L includes 50 firms, among the 50 firms, no >25 will be high in performance. This finding is based on a thought experiment, a hunch that $\sim T \cdot L$ is a model too simplistic for indicating high P consistently. A finding of 40 plus firms among the 50 firms having top quintile performance would indicate a high consistency, case-based, finding. P11: High (low) temporary employment share of employees is an ingredient in a few complex antecedent conditions indicating

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consistently high firm performance. P12: High (low) temporary employment share of employees is an ingredient in a few complex antecedent conditions indicating consistently low firm performance. P13: For some firms, share of temporary employees is not an ingredient in complex antecedent conditions indicating high (low) firm performance.

4.1.8. Realized high growth strategies

For a time, several strategy researchers and management consulting executives advocated that firms adopt the perspective that achieving high sales growth and high market share. With its vivid visuals of cows, dogs, stars, and question marks, the Boston Consulting Group (BCG) (1972) growth-share matrix has become the first product portfolio matrix to reach iconic status; the BCG growth-share matrix suggest investing in stars: product or brand providing high growth and high market share. In the 1980s many to nearly strategic management and marketing management textbooks presented mostly favorable descriptions of the BCG growth-share matrix. Ansoff's (1987) matrix that crosses existing and new markets with existing and new products to result in four strategies: market penetration, product development, market development, and diversification, Wernerfelt's (1984) "resource-based view of the firm," and Porter's (1990) "generic strategies" (two categories of competitive advantage cross-tabulated with two levels of competitive scope to provide four generic strategies: cost leadership, differentiation, cost focus, and focused differentiation) are additional examples of product portfolio planning matrixes. The more than three hundred thousand citations (count via Google.com/scholar) to these planning matrixes gives credence to the observation that they enchant researchers (likely because they appear to be substantive and are easy to comprehend) though they fail to connect directly to the issue of profitability of alternative strategies or to empirically get to "the crucial problem in strategic management: firm heterogeneity" (Powell et al., 2011)—and as tools for improving firm by researchers strategy they have a poor to no track record. Ramos-Rodríguez and Ruíz-Navarro (2004) findings on the 50 works that have had the greatest impact on strategic management research by counting citations in the *Strategic Management Journal* illustrates the enchantment of portfolio planning matrixes; "Porter's (1980) competitor oriented work was ranked first; an extraordinary distinction for a book that contains no evidence on this topic" (Armstrong & Green, 2007, p. 128). "Empirical evidence supports the conclusions that "the use of competitor-oriented objectives is detrimental to profitability. Because of this pattern of evidence, we suggest the firms should ignore their competitors when setting objectives and, instead, focus directly on profit maximization" (Armstrong & Collopy, 1996, p. 197). Anterasian, Graham, and Money (1996, p. 74) go further by offering the following suggestion for remedying this incompetency training, "…we suggest you find the portfolio models section and rip those pages out [of your textbooks]." In consequence to the scant empirical evidence (Anterasian et al., 1996; Armstrong & Collopy, 1996; Capon, Farley, & Hulbert, 1987) on prior sales growth indicating high firm performance, the present study includes the following propositions. P14: High (low) prior sales growth is not an ingredient in complex antecedent configurations that indicate high current firm performance. P15: High (low) prior sales growth is not an ingredient in some complex antecedent configurations that indicate low current firm performance.

4.2. Configurational models of competitive stance ingredients

The Armstrong and Collopy (1996) axiom is that the better perspective in implementing strategy to ignore competitors and focus not on seeking "competitive advantage" (Peteraf, 1993; Porter, 1980, 1985) but instead to focus on firm actions that directly associate with high profitability. If accurate configurations of firm behavior ingredients (top left Venn diagram in Fig. 1) may be more useful for indicating high ROE and complex outcome conditions in the firm efficiencies outputs (top right Venn diagram in Fig. 1) than configurations for competitive stance (bottom Venn diagram in Fig. 1). P16: Firm behavior configurations outperform competitive stance configurations in indicating high firm efficiencies. P17: Firm behavior configurations outperform competitive stance configurations in indicating low firm efficiencies.

The study includes seven possible competitive stance ingredients in the Venn diagram at the bottom of Fig. 1. Single and two question scales were used to collect responses for each of the seven conditions. The respondents in the study used seven-point scaled questions (items) in responding to the seven items whereby each respondent was asked to answer each question relative to their closet competitors' behavior:

- total of number of new products and new processes (2 items)
- consumer social responsibility (CSR) activities (1 items)
- firm's product/service quality relative to main competitors' (1 item)
- prices firm sells products (1 items)
- prices firm pays to suppliers (1 item)
- product and service ranges (2 items)
- degree of vertical integration (1 item).

4.3. Simple and complex outcome conditions

The Venn diagram in Fig. 1 for outcomes includes five simple conditions. A realized complex outcome condition might include high and low combinations of two or more of these five simple conditions. In particular, the focus for the present study is in examining the four combinations of ROE and liabilities/equity (L/E) ratio as well as the simple conditions of high ROE and the negation of ROE. The study also addresses the complex antecedent conditions for additional complex outcome configurations. Here is an additional complex outcome condition that the study examines:

$$\text{ROE} \cdot \sim \text{L/E} \cdot \text{sales_share_own_brand} \cdot \text{sales_per_permanent_employees}. \quad (4)$$

The model (4) represents the main ingredients in the recipe of the German "hidden champions" (Simon, 2009). Hidden champions are firms seeking high ROE while maintaining low debt-to-equity ratios, in marketing their own high-tech brands. Hidden champions are relatively small firms in number of permanent employees—part of the reason that they typically remain hidden from view (Simon, 2009). The present study seeks to identify firms exhibiting this hidden champion strategy and specific complex antecedent conditions indicating this complex outcome condition.

Finally, note that Fig. 1 shows four summary arrows of relationships. Arrow A represents the principal proposition that certain implemented firm strategies indicate high performance outcomes with additional implemented firm strategies indicate low performance outcomes. Arrow B represents the secondary proposition that a few firm's implemented strategies influence the firm's marketing stances relative to its main competitors' marketing stances (e.g., the firm's prices relative to its main competitors' prices). Arrow C in Fig. 1 represents a general "competitive advantage" proposition that a firm needs to win in the marketplace relative to its main competitors (Grant, 1991; Peteraf, 1993). Arrow D represents the proposition that knowledge of a firm's marketing stance relative to its main competitors' stances contributes to the accuracy of a firm's implemented strategy in indicating high (low) performance outcomes. The findings in the present study support all four propositions except for the ability of competitive advantage (arrow C) models accurately to predict high performance outcomes.

The study also examines the reproducibility of the impact of different models developed from different samples of firms. The study includes modeling configurations of implemented strategies of firms indicating high (low) performance outcomes for firms within four

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specific countries: Cosa Rica ($n = 76$), El Salvador ($n = 29$), Guatemala ($n = 42$), and Nicaragua ($n = 21$). What models, if any, are robust sufficiently for accurately predicting high (low) performance outcomes across these nations? Answers to this question provides for information on the predictive accuracies of models constructed from data from one sample per nation for accuracy on separate samples from the other three nations.

5. Method

This study examines strategy implementation and outcomes by entrepreneurial agribusinesses specialized in food production in Latin American. Such enterprises often have higher capabilities and more diverse strategic choices other commodity producers (Garcia, 2005). The present study focuses on firms based in Latin America; this region has become a leading global exporter of agricultural products, wherein many firms in the region and this study are driven by product and marketing innovativeness not just among multinational corporations but also among firms operating only within one national market (Da Silva, Baker, Shepherd, Jenane, & Miranda-da-Cruz, 2009; Rosales & Kuwayama, 2012).

In developing the study's propositions and the model in Fig. 1, initially a total of 110 h of open-ended conversations were conducted with the founders and CEO's of 17 agribusinesses across six nations Latin American. During 2013–14, each of these CEO was visited in face-to-face interviews at their establishments two-to-three times in 60–120 min interviews; the CEOs were asked to describe their current firm's strategy formulation and strategy execution steps and outcomes. This qualitative data collection step helped to identify the CEO's firm-specific strategic priorities and self-described idiosyncrasies. This preliminary research step was adopted because of the lack of empirical evidence on strategy formation and execution in the context of firms in Latin American in general, and in the agribusiness sector in particular (Nicholls-Nixon, Castilla, Garcia, & Pesquera, 2001). During the initial rounds of qualitative interviews, the written survey was constructed, pretested with the 17 CEOs, and revised to collect data from senior executives in 275 (247 usable completed surveys) Latin American agribusinesses in seven nations. The 275 cooperating senior executives were first contacted via telephone and the by submitting to them an online questionnaire. Selected firms were identified through national and local industrial chambers of commerce, commercial guides, and national agriculture ministries. The 247 useable surveys represent a response rate equal to 31.3% of the 789 firms' executives requested to participate.

The study is circumscribed to agribusinesses operating in the humid tropic nations of Latin America to limit the effects that climate and geography have on agriculture (FAO, 2012). As inclusion criteria, the firms had to be based in Latin America, not part of multinational groups (i.e., locally-owned), and not listed on the stock market. The questionnaire collected information on strategic-planning and implementation behaviors asking for specific numerical responses, yes/no responses, and Likert scales (1 to 7) responses. The survey included the following questions:

- the numbers of permanent and seasonal employees
- the number of national markets the firm participates in (e.g. domestic only = 1; continuing customers in two nations = 2, and so on)
- revenue growth during the past 5 years (numerical amount in USD)
- does firm have a formal, annual, written strategic plan (no = 0; partially = 0.5; yes = 1)
- strategy changed radically during the past 5 years (no = 0; partially = 0.5; yes = 1)
- R&D/sales ratio (percentage)
- liabilities/equity ratio (percentage)
- share of sales using firm's name and firm's own brand (percentage) versus contract sales
- number of new products firm introduced into market(s) within latest 3 years (number)
- number of new process firm went online in production within last 3 years (number)
- return-on-equity (percentage)
- annual firm revenue for latest full year (U.S. dollars)
- estimated prices paid to suppliers relative to closest competitors' prices paid (Likert, 1 = much lower to 7 = much higher)
- firm's prices to customers relative to closest competitors' prices (Likert scale)
- firm's product quality relative to closest competitors' product quality (Likert scale)
- firm's product range relative to closest competitors' product range (Liker scale)
- firm's degree of vertical integration relative to closest competitors' (Likert scale)
- number of ethical/quality international certifications relative to closest competitors' (Liker scale)
- number of new products introduced annually relative to closest competitors' (Liker scale)
- number of new processes introduced annually relative to closest competitors' (Likert scale)
- number of firm social responsibility activities relative to closest competitors' (Likert scale).

5.1. Analysis

Rather than applying NHST's to estimate the significance of independent and moderating influences on a dependent variable, the analysis in the present study included the construction of algorithms for estimating one-direction reasonably "precise outcome models" (POM's, Hubbard, 2016). The study sought to build moderately complex models of two to seven antecedent conditions whereby high scores in the model consistently (accurately) predict cases (firms) only with high scores for reasonable precise outcomes—outcomes such as high revenues in combination with low liabilities. Model construction included the construction of complex negation outcome conditions separately from modeling positive complex outcomes. Such work matches analytics with firm portfolio strategy theory (i.e., case-based theory) and represents model constructions based on the foundation of complexity theory tenets (i.e., the causal asymmetry tenet and the tenet for the same simple antecedent condition associating positively and negatively with a high positive or high negative outcome condition—which direction depends on the additional ingredients in alternative causal recipes). Asymmetric configurational analysis using the computer software fsQCA.com ("fuzzy-set Qualitative Comparative Analysis", Ragin, 2008) was the main analytic method used to analyze the survey responses.

Similar to z-transformations based on the mean and standard deviation in variable-level symmetric analysis, all the data in the present study was calibrated using the subroutine in fsQCA.com program. In the asymmetric configural analysis the calibrated scores for fuzzy-set analysis range from 0.00 to 1.00 and such scores are viewable accurately as membership scores that are discretize scores for a continuous variable—membership scores ranging from zero to 1.00 rather than five-levels in a transformation from continuous values to quintiles. The software program, fsQCA.com, includes a logistic distribution calibration that requires the researcher to specify three scores for each condition: 0.95 = threshold for full membership (the 90th decile when possible in the present study); 0.50 = score for maximum ambiguity (the median score or fifth decile suffices usually for this score); 0.05 = score for full non-membership in the condition (the first decile when possible in the present study). Note that the calibration of scores eliminates the recognition of "statistical outliers"; the use of fuzzy scores includes the recognition that variances due to extreme values can be unimportant in testing theory (Ragin, 2008).

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5.2. Consistency and coverage indexes

Two indexes are summary measures of the quality of a specific asymmetric model: the consistency and coverage indexes. The consistency index (C1) indicates the degree of accuracy that cases with high scores in the simple or complex antecedent condition has high scores in the outcome condition. The consistency index is analogous to r in (symmetric) correlation analysis. The coverage index (C2) indicates the share of cases with high scores in the outcome conditions represented by the simple or complex antecedent condition. The coverage index is analogous to r^2 ("coefficient of determination") in (symmetric) correlation analysis. Examples of the computations for the consistency and coverage indexes are available in Ragin (2008) and Woodside (2013).

The objective in the present study includes testing the general theory to learn if asymmetric analyses supports the theory by providing useful models as indicated by high consistency scores (C1 ≥ 0.85) and coverage scores indicating a few-to-many cases (C2 ≥ 0.02). A consistency above 0.85 indicates that the substantial majority of cases with high scores in the simple or complex antecedent condition have high scores in the outcome condition. Researchers using asymmetric methods are most interested in whether or not a model is accurate (i.e., consistent) rather than the number of cases that such models represent (i.e., coverage); thus, coverage sought is often relatively low. As Anscombe's (1973) quartet (four different XY plots for four different sets of data all having the same correlation, mean, and standard deviation) shows for symmetric correlation analysis (a high correlation may not represent a symmetric relationship), in the present study XY plots are highly informative in showing whether or not much of a separation actually occurs between low and high scores on the X-axis for models where C1 ≥ 0.85. Consequently, the present study includes XY plots of key findings.

6. Findings for the 17 propositions

This section first discusses the findings for each of the propositions. Then, a following subsection here presents specific outcomes for hypothetical models for the complex outcome conditions appearing in the theory section. The first sets of findings focus on the configurations indicating high versus low ROE. While seemingly complex at first blush, the resulting 15 asymmetric models in the following discussion represent <1% of the mathematical possible 2187 combinations for three outcomes (i.e., how, low, versus absent) across seven conditions).

To examine the generalization and predictive accuracy of models across naturally-formed samples (cultures), the findings also include the presentation of implemented models for the entire set of firms as well as models for data for firms within four specific nations: Costa Rica, Guatemala, Nicaragua, and El Salvador.

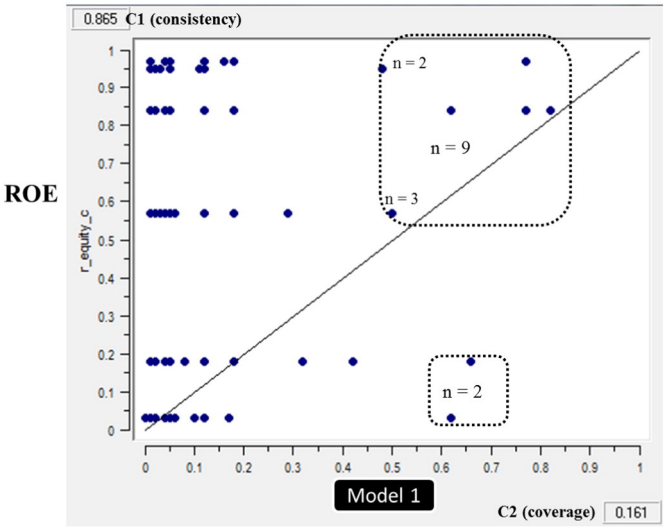

Fig. 2. Plot for model 1 indicating high ROE: Radical Δ·R&D_sales·growth_5_years·~ temp_share·markets·formal_plans ≤ ROE. Notes. Example of somewhat precise outcome modeling (SPOM). Nine of eleven cases (firms) above 0.45 in scores for model 1 have calibrated ROE scores 0.58 or higher. Different dotes indicate up to 5 cases (firms).

6.1. P1 findings receive support: high formal planning and no formal planning are indicators of high (as well as low) performance

P1 receives support. Formal written planning is an ingredient in five of the six complex configurations indicating high ROE (details appear in Table 1). Formal written planning is an ingredient in five of the nine complex configurations indicating low ROE (details appear in Table 2). Formal written planning by itself is an insufficient indicator or either high or low ROE. Formal written planning coupled with the introduction of new products or process occurs in five of five complex antecedent models indicating high ROE; however, the combination of these two ingredients is insufficient for indicating high ROE consistently.

The findings in Table 1 provide a somewhat-precise-outcome modeling (SPOM) example of cases with consistently high ROE—for each model, if a case (firm) scores high on the model, the case scores high on the outcome condition. Fig. 2 is an XY plot of the cases for model 1 and ROE as a simple outcome condition. Fig. 2 provides an example of SPOM: nine of eleven cases with relatively high scores for model 1 have relatively high calibrated scores for ROE. Parallel to the findings for the asymmetric test for consistency (C1 = 0.87) using all the data in the XY plot, calculating a Z-test statistic in a symmetric test for consistency is possible, $Z = 2.019$, $p < 0.05$ that the observed proportion (0.82) for the high scores provide high scores for the outcome condition.

Table 2
Models for high negation of ROE.

Model	Radical_Δ	R&D/sales	Gro_ 5 yrs.	Temp_share	Num_markets	New_prods/procs	Formal plan	C1	C2
1	~	~	~	~	·	~		0.87	0.14
2		~	~	~	·	·	~	1.00	1.08
3	·	~	~	~	·	·		0.94	0.19
4	·	~	~	·		·	·	1.00	1.19
5	~	·	~	~	~	~	·	0.99	0.01
6	~	·	~	~	~	~	·	0.98	0.11
7	~	~	~	·	~	~	·	0.98	0.12
8	~	·	~	·	·	·	·	0.94	0.10
9	·	·	~	·	·	·	~	1.00	1.04

Overall solution consistency, C1 = 0.97; solution coverage, C2 = 0.25.
Notes. Mid-level dot, "·" indicates presence of antecedent condition in the model, sideways tilde, "~" indicates the negation of the antecedent condition in the model; empty space indicate absence of the antecedent condition in the model. Absence indicates that the antecedent condition does not contribute or take-away from the consistency of a given model.
P1 receives additional both support from these findings: high formal planning and the negation of formal planning occur among the nine models; though, 5 of 9 models includes formal planning and only one model includes the negation of formal Planning in models indicating low ROE.

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The presence of formal planning appears in the majority (5/6) model indicating high ROE (Table 1). The presence of formal planning appears in the majority (5/6) models indicating the *negation* of ROE (Table 2). Such findings support Armstrong's (1982) perspective that the value of formal planning depends on specific contexts. Strategy theory involving the benefits of formal planning advances by going beyond reporting that the main effect of formal planning on performance is positive—or negative—to describing the configurations whereby formal planning has a positive and a negative association for both high and low firm performances. Such a complexity turn to theory construction goes well beyond symmetric theory construction and testing in the relevant literature. The models in Tables 1 and 2 are not overwhelmingly complex but do involve embracing a greater contingency perspective than perspectives available in model findings from symmetric tests. In Table 1 note that high radical change always couples with high formal planning for high ROE—though one model with the negation of radical change indicates high ROE as well. In Table 2 high radical change and formal planning do not appear together in any recipes indicating the negation of ROE. Taken together, the coupling of high radical change and high formal planning represents a foundation supporting the construction of recipes indicating high ROE. Both are present in four of the six models in Fig. 1. The appearance of both in one recipe does not occur in the negation of ROE models in Table 2.

6.2. P2 receives only limited support: neither high or low scores in formal planning occurs only for (two) models indicating low ROE

A total of 13 of the 15 models in Tables 1 and 2 include high formal planning or the negation of formal planning. The absence of formal planning as an ingredient occurs in two of the 15 models. The advisory rule these findings support: formal planning is insufficient for high or low ROE but the clear majority of successful implemented strategies include formal planning.

6.3. P3 receives support: internationalization alone is insufficient and unnecessary for firms to achieve high performance consistently

In Tables 1 and 2 the high and low number of markets served indicates the whether or not each model includes internationalization. When negation ("~") appears in a model for internationalization in models, the finding indicates that the implemented strategy focuses on the domestic market; the present of a mid-level dot ("·") indicates the presence of high internationalization as an ingredient in models indicating high ROE (Table 1) or low ROE (Table 2). The findings support P3: the internationalization of the firm is not a requirement for successful implemented strategies. Models 4–6 in Table 1 include a domestic focus as an ingredient in complex antecedent conditions indicating high success. Consequently, statements that internationalization of the firm is crucial for success are an overstatement. Notice in Table 1 that no simple antecedent condition is crucial for high ROE even though formal planning appears in five of six models.

6.4. (P4) receives support: internationalization by some firms (cases) in combination with additional antecedent antecedents (e.g., possibly formal planning and high R&D investing) is sufficient (but unnecessary) for high firm performance

The findings in Tables 1 and 2 go beyond indicating a positive or negative main effect of internationalization on firm performance. The findings indicate the complex antecedent conditions when the impact for internationalization is positive and when the impact is negative for high and for low performance outcomes. Note in Tables 1 and 2 supports the asymmetric causality tenet: none of the models in Table 2 are mirror opposites of the models in Table 1. These findings support the recognition that substantial heterogeneity occurs in firms' actions indicating high success and firm's actions indicating high failure. At the same time these findings support the theoretical stance that case-based modeling can capture firms' heterogeneity that complements yet goes beyond reporting of anecdotal accounts of idiosyncratic behavior and outcomes.

These findings confirm the complexity perspectives of relationship reversals in relationship valences and the necessity of separate examinations of strategies indicating success versus strategies indicating failure (i.e., causal asymmetry). A number of alternative strategies occur that include high internationalization and firm success as well as firm failure and a number of alternative strategies occur that include low internationalization and firm success as well as firm failure. Given confirmations of these perspectives support and extend Ordanini, Parasuraman, and Rubera's (2014, p. 145) conclusion that asymmetric analysis "offers significant new insights over those obtained from conventional approaches." Consequently, calling for the necessity of accomplishing "the internationalization of the firm" as a crucial ingredient for success is an inaccurate overgeneralization. Asymmetric modelling provides for a meso-perspective for viewing when, not if, internationalization has a positive and negative impact on high as well as low performances.

6.5. P5 receives support: low scores in radical strategic change appear in a few realized strategies of some firms experiencing high (low) firm performance

Among implemented strategies indicating high ROE, Table 1 includes one implemented strategy with the ingredient of low radical strategic change. Low radical strategic change couples with low formal planning, and no introductions of new products or services (model 3) in Table 1. Model 3 represents a comparatively static high-internationalization strategy that includes employing few temporary workers. In Table 1, high formal planning occurs whenever the occurrence of high radical change appears. Thus, for strategy success to include radical strategic change, formal planning appears to be a necessity ingredient.

The negation of radical strategic change in five of the nine models indicating high accuracy in predicting low ROE (Table 2). The finding that high radical strategic change occurs in three of the nine models for low ROE as well supports the conclusion that a focus on whether or not radical strategic change has a positive or negative main effect is misplaced. Radical strategic change appears in most implemented strategies resulting in high ROE as well as in some implemented strategies resulting in low ROE. Low radical strategic change occurs in the majority of strategies indicating low ROE and high radical strategic change occurs in the majority of strategies indicating high ROE. Examining the specific implemented strategies in Tables 1 and 2 provides insights when the inclusion (and absence) of radical strategic change supports and hurts the achievement of high ROE.

6.6. P6 receives support: low or high activity in bringing new products/services to market contributes to low firm performance in a few asymmetric complex antecedent models

Supporting P6, high scores in introducing new products and services appear in five of the nine models and low scores in introducing new products and services appear in four of the nine models in Table 2. The old saw that a firm needs to innovate continually is an over generalization. Just as a procession of moves indicates a successful game of chess, high scores in introducing new products or services couples with high formal planning in all strategies (i.e., two strategies) indicating success in Table 1; yet such a coupling does not guarantee success—the two ingredients appear together in two strategies indicating failure in Table 2. Regarding Table 1, the metaphor of lock combinations with six or seven tumbler locations for opening successful outcomes is apt. The same metaphor applies for opening the locks of failure (Table 2); the study of strategies indicating failure is worthwhile

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as Weick and Roberts (1993) explain in researching organizations seeking to learn from failure processes to aid in becoming "highly reliable organizations."

6.7. P7 receives support: low or high activity in bringing new products/services to market contributes to high firm performance in a few asymmetric complex antecedent models

Two of the six models in Table 1 include high scores in introductions of products/services and two models of low scores in introductions of products/services. The condition is absent in two models—for these models whether or not such introductions occur does not influence indicating the outcome of high ROE. These findings support the conclusion that the introduction of products/services is not by itself a necessary or sufficient condition for high ROE. Given the complexity in implemented strategies indicating success and failure requires the researcher to construct multiple modes of strategy implementation of both outcomes. Some of these models will include introductions of products/services. Such model construction does accomplish a useful amount of parsimonious generalization and explanation of firms' heterogeneity in implemented strategies supporting success or failure.

In Table 2, new product/service introductions appear in 5 of 9 models which indicate low ROE. Not launching new products/services appears in the remaining four models in Table 2. These findings support the conclusion that a positive or negative main effect of new product/service introductions is inconclusive by itself of whether or not a strategy is working well or poorly. "Bringing innovation to market" is not a necessary or sufficient condition for success or failure.

6.8. P8 receives support: high (low) R&D expenditure occurs in a few complex antecedent conditions indicating high firm performance

In Table 1, a high R&D/sales ratio appears in five of the six models indicating high ROE. The negation of R&D/sales appears in model 3 only in Table 1. The conditions making-up model 3 indicate a successful implemented strategy for a relatively static environment that includes annual sales growth. Table 1 includes the finding that for firms experiencing high ROE, high R&D/sales couples with high radical strategic change for four of six models. However, these two conditions occurring in tandem is no guarantee of indicating high ROE. Note that model 9 of Table 2 for low ROE includes both conditions.

The partial complex antecedent condition that includes high R&D/sales, high strategic change, and formal planning occurs in four of six models indicating high ROE and in none of the models indicating low ROE (Table 2). However, the occurrence of all three conditions in an implement strategy is neither necessary nor sufficient for high ROE.

6.9. P9 receives support: high (low) R&D expenditure occurs in a few complex antecedent conditions indicating low firm performance

Low R&D/sales ratios appear in the majority (5/9) models indicating low REO (Table 2). Low R&D/sales is not a conclusive indicator for low ROE; high R&D/sales occurs for four of nine models indicating low ROE. The coupling of low R&D/sales with the negation of growth occurs only for models indicating low ROE. Such a consistent finding supports the perspective that low R&D/sales with low growth signals low ROE.

6.10. P10 fails to receive support: P10 states that high versus low firm R&D/sales is insufficient and not necessary for indicating high firm performance

All models in Tables 1 and 2 include high or low, but not the absence of, R&D/sales. Such a finding supports the perspective that the strategist needs to actively consider when high versus low R&D/sales best serves to help the firm achieve its ROE objectives as well as prevent the occurrence of low ROE. While not necessary nor sufficient for the outcome, the finding that high R&D/sales occurs in four of five models indicating high ROE supports the perspective that high R&D/sales may be an ingredient in most successful implemented strategies.

6.11. P11 receives support: high (low) temporary employment share of employees is an ingredient in a few complex antecedent conditions indicating consistently high firm performance

In Table 1, high temporary-employment share of employees ("high temps") occurs for three of six models indicating high ROE. Low temps as an ingredient occurs for three of the six models. Note in Table 1 that radical strategic change, R&D/sales, and high temps occur in combination in four of the six models. While this complex condition is insufficient for indicating high ROE, the condition represents a recipe base that works well for building in one or more simple conditions to indicate high ROE.

6.12. P12 receives support: high (low) temporary employment share of employees is an ingredient in a few complex antecedent conditions indicating consistently low firm performance

In Table 2, the negation of temp share occurs in the majority (5/9) of models indicating low ROE. However, high temp share occurs in four of the nine models indicating low ROE. The share of temporary employees is not a useful indicator by itself of high or low ROE even though some prior studies (e.g., Dalton & Todor, 1979; Osterman, 1987; Shaw, Gupta, & Delery, 2005) indicate a positive main effect and some indicate a negative main effect of temp share on ROE.

6.13. P13 fails to receive support: P13 states that for some firms, share of temporary employees is not an ingredient in complex antecedent conditions indicating high (low) firm performance

Either high or low temp share is an ingredient in all the models in Table 1 and in Table 2. This finding supports the high relevancy of the issue of share of temporary employees in the study of both firm success and failure measured by high and low ROE.

6.14. P14 fails to receive support: P14 states that high (low) prior sales growth is not an ingredient in complex antecedent configurations that indicate high current firm performance

In Table 1, high prior (5 years) sales growth is an ingredient in four of six implemented strategies indicating high ROE. Low prior sales growth is an ingredient in two of the six implemented strategies indicating high ROE. The two models indicating high ROE with low prior sales growth include focuses on domestic markets. However, only considering this coupling for indicating high ROE is misleading—the same coupling occurs for models 5, 6, and 7 in Table 2. The findings for statistical sameness testing indicate high sameness (consistency) in the high ROE involves recipes consistency of six or seven of seven ingredients. Fewer ingredients do not provide for high consistency for high ROE. The same conclusion applies for reporting of low ROE in Table 2.

6.15. P15 fails to receive support: P15 states that high (low) prior sales growth is not an ingredient in some complex antecedent configurations that indicate low current firm performance

In Table 2, low prior sales growth is an ingredient in all the models indicating low ROE. Thus, for the firms in this this study, low sales growth is a necessary but an insufficient condition for indicating low ROE. Not for all studies necessarily, but for the firms in the present study, low prior sales growth appears in the complex antecedent conditions indicating ROE. Knowing the low prior sales growth also occurs in strategies indicating high ROE (Table 1) supports adopting an asymmetric stance for strategy theory construction.

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Table 3
Competitive stance models for low ROE.

Model	Prices_pd	Prices_sell	Vertical_integ	Prod_qual	CSR_certifs	New_prods/servs	Prod_range	C1	C2
1		~	~		~	~	~	0.90	0.19
2	~	~	~	~	~		~	0.84	0.12
3	·	·	·	·		~	·	0.86	0.18
4	·	~	~		~	·	·	0.92	0.14
5	·	·	~	·		~	~	0.88	0.13

Overall solution consistency = 0.84; overall solution coverage = 0.32.
Key: Relative to competitors: prices_pd: prices paid to suppliers; prices sell: prices points firm sells at; vertical integ: vertical integration; prod_qual; product quality; CSR_certs: corporate social responsibility by number of certifications; new prods/servs: number of new products/services; prod_range: product range.
Note. For example, consider model 3: relative to competitors, the firm pays high prices to suppliers, prices high, has high vertical integration, high product quality, does not introduce new products/services, and has a large product range.

6.16. P16 received support: firm behavior configurations outperform competitive stance configurations in indicating high firm efficiencies

Given the heavy continuing attention given to the topic of "competitive advantage, the finding of a lack of models for a firm's competitive stance and high ROE is surprising. Rather than indicating high ROE, a few configurations of competitive stance do indicate low ROE. Table 3 presents these models and statistical sameness tests indicating high consistency in identifying firms with low ROE when model scores are high for these five models. Paying high prices to suppliers is present in three of the five models but this condition is not sufficient nor necessary for indicating high scores in the negation of ROE. Paying high prices and selling at low price points relative to competitors' prices (model 4) does appear in one of the four models—a finding that might be expected to indicate low ROE. As pricing behavioral pricing theory predicts (Woodside, 2015), paying low prices and selling at high price points relative to competitors' prices does not appear in Table 3 but this complex configuration does not occur in any models predicting high ROE—no models relating to competitive advantage and high ROE occurred.

6.17. P17 receives support: firm behavior configurations outperform competitive stance configurations in indicating low firm efficiencies

The overall consistency score for the implemented strategy models in Table 2 equals 0.97—a consistency index higher than the overall scores for the competitive advantage models in Table 3 (C1 = 0.84). The findings for P17 and P16 support the recommendation by Armstrong and Collopy (1996) and others (Anterasian et al., 1996) that for achieving high ROE executives need to focus both eyes on their own implemented strategies rather than their firm's competitive advantages in their strategies relative to main competitors' strategies.

7. Findings for specifc ex ante model configurations

The analyses include testing the specific ex ante model configurations appearing earlier in this article. Two objectives drive these analyses. First, the shift away from NHST to SST includes specifying somewhat precise outcome models (SPOMs) based on ex ante theory construction rather than just clicking to run an asymmetric "analyze" software subroutine. By analogy, relying on software-generated exploratory models in SST is similar to relying on stepwise multiple regression analysis in NHST—a bad practice (Armstrong, 2012). Still, software-driven asymmetric modeling is defendable as a tool for discovery of unexpected configurations having high accuracy in predicting outcomes—especially in these early days of SPOM research. Second, this section serves to demonstrate testing for complex outcome configurations. Almost all studies in strategy theory testing construct single dimension outcomes even though strategy, financial, and marketing executives would likely consider several outcomes in combination. Just as calibrating simple conditions and using Boolean algebra is useful in estimating high scoring case membership in a complex antecedent condition, such analytic steps are possible for constructing complex outcome conditions. For example, consider two complex outcome conditions: ROE·Own_brand and ~ ROE·liabilities/ROE. High scores in the first complex outcome condition identifies firms with high ROE AND high own-brand sales share. The second complex outcome condition identifies firms having low ROE AND high liabilities as a share of ROE.

These analyses included computing fuzzy set scores for the complex antecedent and outcome conditions for models 1 and 2 appearing earlier. The consistency (C1) indexes for both models 1 and 2 are too low to indicate usefulness in accurately predicting high scores for ROE·Own-brand:

(1) T·F·G· ~ R· ~ D ≤ ROE·Own_brand; C1 = 0.51 and C2 = 0.14
(2) ~T·N·G·R·D ≤ ROE·Own_brand; C1 = 0.0.67 and C2 = 0.20.

Analysis of the data indicates that model 3 is useful in identifying firms with low ROE coupled with high liabilities as a share of equity:

(3) ~F·M·R·G ≤ ~ROE·Liabilities_equity, C1 = 0.91 and C2 = 0.07.

Fig. 3 provides the XY plot for the findings for model 3; 24 of 27 cases with scores equal or above 0.41 on the model are near or above the diagonal. A useful model in asymmetric analysis indicates that high scores on the model almost always occurs for high scores on the outcome condition but the model does not predict all cases having high scores on the

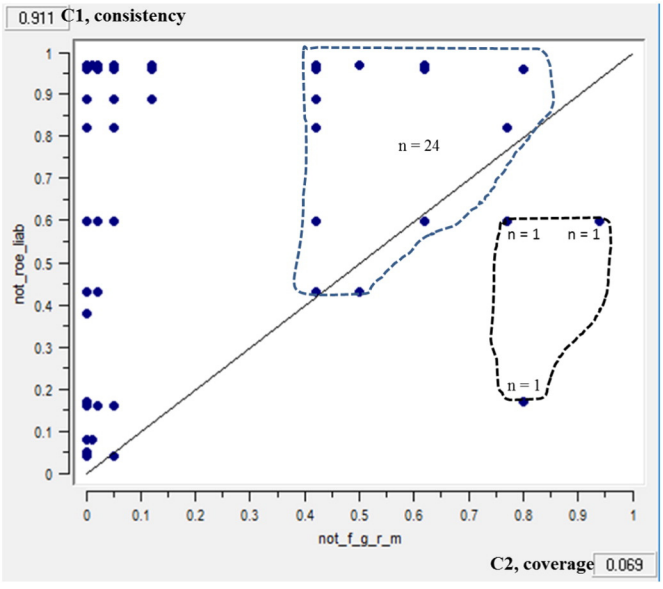

Fig. 3. Findings for model 3: ~ F·G·R·M ≤ ~ROE·Liabilities/ROE. Key. F = formal planning; G = prior 5 years sales growth; R = radical change; M = number of markets served (internationalization). Note. Each dote indicate XY plot location for one to five cases (firms); clicking on the dot in the output identifies the names of each case that the dot represents.

Table 4
Model for ROE for Costa Rica data and predictive validities (C1 = consistency; C2 = coverage).

Nation	Radical_Δ	R&D/sales	Gro_ 5 yrs	Temp_share	Num_markets	New_prods/procs	Formal plan	C1	C2
a									
Costa Rica	~	~	·	~	·	~	·	0.82	0.10
El Salvador	Use of the ROE model above for Costa Rica on El Salvador data							0.69	0.07
Guatemala	Use of the ROE model above for Costa Rica on Guatemala data							0.99	0.08
Nicaragua	Use of the ROE model above for Costa Rica on Nicaragua data							0.86	0.06
b									
Model for ROE for El Salvador data and predictive validities									
Costa Rica	Use of the ROE model below for El Salvador on Costa Rica data							0.63	0.09
El Salvador	~	~	·	~	~	·	·	0.82	0.20
Guatemala	Use of the ROE model above for El Salvador on Guatemala data							0.85	0.12
Nicaragua	Use of the ROE model above for El Salvador on Guatemala data							0.32	0.09
c									
Model for Guatemala data and predictive validities									
Costa Rica	Use of the ROE model below for Guatemala on Costa Rica data							0.84	0.09
El Salvador	Use of the ROE model below for Guatemala on El Salvador data							0.46	0.08
Guatemala	·	~	·	·	·	·	·	0.96	0.12
Nicaragua	Use of the ROE model above for Guatemala on Nicaragua data							0.56	0.07
d									
Model for Nicaragua data and predictive validities									
Costa Rica	Use of a ROE model below for Nicaragua on Costa Rica data							0.72	0.13
El Salvador	Use of the ROE model below for Nicaragua on El Salvador data							0.55	0.09
Guatemala	Use of the ROE model below for Nicaragua on Guatemala data							0.87	0.12
Nicaragua	·	·	·	~	·	·		0.95	0.23

outcome. Other models are necessary for predicting high scores in the complex outcome that have low scores for model 3 (i.e., dots in the upper left side of Fig. 3). Ragin (2008) suggests models with consistency indexes above 0.80 are useful; a more rigorous standard (e.g., 0.85 as a minimum consistency index) might serve the advancement strategy theory better. Displays of XY plots insures that models with high consistencies clearly illustrate a useful asymmetric association rather than XY plots with most cases in a very low range of model scores (Anscombe 1973 shows the usefulness of XY plots in symmetric analyses).

The findings indicate no support for configurations of implemented strategies that accurately predict the fourth complex outcome model:

(4) ROE·~L/
E·sales_share_own_brand·sales_per_permanent_employees.

Even though the findings do not support the ability of configurations of implemented strategy to indicate high scores in this particular complex outcome condition, the analysis indicates that such analysis is possible. Advances in theory may be possible by moving beyond the study of simple outcome conditions only (e.g., ROE only).

8. Findings for implemented stratigies for firms in specific nations

This section briefly presents the findings for predicting ROE for sampled firms within each of four countries. The findings in Tables 4a-4d include testing the predictive validities of a model with high consistency from the findings within each country on the data of the other three nations. "Predictive validity" here is the consistency level of a model constructed from one set of data when used on a second set of data, for example, constructing an implemented model using data from Costa Rican firms and then using this model to measure its ability to identify firms with high scores on the Nicaraguan data.

8.1. Costa Rica

Table 4a presents the findings for the lone implemented strategy model using data only from Costa Rican firms ($n = 76$). Note the "conservative international framing" of the model in Table 4a for Costa Rican firms (e.g., formal planning, no radical change, low R&D/sales, few temp-workers, and no new products/services) and growth orientation and high internationalization. The model has high predictive ability for the Guatemala and Nicaragua firm samples but not for the El Salvador firm sample. These findings support the generalizability of this particular model beyond one country but not to all countries included in the study.

8.2. El Salvador

Table 4b presents the findings for one of an implemented strategy model for El Salvador having a consistency above 0.80. "Domestic only, formal planning, low R&D/sales, growth orientation, new products/services, few temp-workers" are ingredients in this model. Like the prior model for Costa Rica, this model has high predictive validity for a subsample of Guatemalan firms (C1 = 0.85) in identifying firms with high ROE. This El Salvadoran model has low predictive validity for firms in Costa Rica (C1 = 0.63) and Nicaragua (0.32). Thus, while an implemented strategy in the form of a complex statement is

Table 5
Implemented strategy models for ROE with the competitive advantage possible Additionof Pay_lo & Sell_hi): an examination of findings for arrow 4 in Fig. 1 proposition.

Model	past5gro	temp_share	markets	new_create	rad_chg	formal_start	paylo_sellhi	r&d/sales	Coverage	Consistency
1	·	~	·	·	~	·	·		0.11	0.87
2	·	~	·	·		·		·	0.12	0.88
3	·	~		·	·	~	·	·	0.12	0.89
4	~	·	·	·	~	~	~	·	0.03	0.87
5	·	·	~	·	·	·	~	·	0.06	0.85
6	·	·	~	~	·	·	·	·	0.06	0.88

Solution coverage: 0.25; solution consistency: 0.86.

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Table 6
Implemented strategy models for the negation of ROE with the competitive advantage PossibleAddition of Pay_lo & Sell_hi): an examination of findings for arrow 4 in Fig. 1 proposition.

Model	paylo_sellhi	r&d/sales	past5gro	temp_share	Markets	newcreat	rad_chg	formal_strat	Coverage	Consistency
1	·	~	~	·	~		·	·	0.07	0.96
2	·	~	~	~	~	~	~	~	0.05	0.97
3	~	~	~	~	~	~	~	~	0.05	0.97
4	~	·	~	·	~	~	~	~	0.02	0.98
5	~	~	~	·	·	~	~	~	0.03	0.96
6	~	·	·	·	·	~	·	·	0.06	0.99
7	~	·	·	·	·	·	·	~	0.02	0.96

Solution coverage: 0.22; solution consistency: 0.97.

generalizable for more than one country is possible, high generalizability across all four countries does not occur.

8.3. Guatemala

Table 4c presents the findings for an implement strategy model having high consistency. All but one of seven features includes high scores for this model, R&D/sales is low. This model has high predictive validity (C1 = 0.84) for identifying a sub sample of Costa Rican firms with high ROE but not for El Salvador nor Nicaraguan firms. Thus, a model that works well in indicating high ROE in Guatemala works well in an additional country but not for all countries in the study.

8.4. Nicaragua

The model in Table 4d surprises: no formal planning in combination with high radical change, high R&D/sales, high internationalization, and high new product/services for a sub sample of Nicaraguan firms indicating high ROE (C1 = 095). Because these firms are readily identifying in this case-based modeling method, additional research should be able to point to useful explanations for such paradoxical firm behavior. The high predictive validity of the model for the Guatemalan sample (C1 = 0.87) supports the legitimacy of the model even though the generalizability of the model does not extend to all four countries.

8.5. Findings for adding competitive advantage feature in implemented strategy models (arrow 4 in Fig. 1)

While models with the competitive advantage features alone were not predictive of high ROE, the addition of a complex competitive advantage feature (i.e., the combination of negation of prices paid to supplier AND prices to customers, "pay_low·price:hi") is useful as an addition to some implemented strategy models predicting high ROE. Details appear in Table 5. Note in Table 5 that pay_lo·price:hi or its negation appears in five of the six models. (The negation of pay_lo·price:hi does not equal pay_hi·price:lo—the negation only means that the model includes the negation of the expression.) These findings support a perspective that competitive advantage features can play an auxiliary role to the impact of implemented strategy models on firm's outcomes of interest.

The study also included testing same competitive feature for possible implemented strategy models for the negation of ROE. The competitive advantage feature, pay_lo·price:hi, or its negation appears in all seven model in Table 6. The negation of pay_lo·price:hi appears in five of the seven models in Table 6. Thus, a failure to pay low prices to suppliers while pricing high to customers is ruled out as a pervasive reason for low ROE. The finding that for models for both high ROE and the negation of REO include complex competitive advantage, antecedent, conditions is the key finding. Competitive advantage considerations do appear to play indirect (via implemented strategies) roles affecting firm outcomes of theoretical interest and practical importance.

9. Discussion, limitations, and conclusions

The approach to theory construction and testing here supports Fiss's (2011) formula for "building better causal theories: a fuzzy set approach to typologies in organization research." The findings support the perspectives that competitive orientation and product portfolio planning tools are shallow and misleading approaches to the advancing useful strategy theory (cf. Anterasian et al., 1996; Armstrong & Collopy, 1996; Armstrong & Green, 2007). Embracing the core theoretical tenets of complexity theory is necessary for theory to respond and to adequately answer the crucial problem in strategy theory (Powell et al., 2011)—accounting for firm heterogeneity. Complexity theory tenets coupled with asymmetric modeling using Boolean algebra focus on identifying outcomes of interest (e.g., high ROE) consistently. This approach provides for parsimonious but not overly simplistic solutions that occur from building models to explain the relative importance of terms in regression models via symmetric tests using matrix algebra. As Fiss (2007) explains and demonstrates (Fiss, 2011) we can overcome the mismatch that now dominates strategic theory by matching case-based theory with case-based analytics.

The present study moves beyond Fiss (2007, 2011) and Ordanini et al.'s (2014) contributions in several ways. The study here examines both the implemented strategy and competitive advantage of firms' influences on desirable and undesirable outcome conditions. The study examines simple as well as complex outcome conditions. The study examines the predictive validities for constructed models across samples of firms from different nations. The findings support parsimonious model construction, more complex than the simpler 2-by-2 product portfolio modeling approach, but no more complex that the algorithm summations than a gridiron football quarterback carries on one forearm into battle.

This study has limits. The reliance mostly on self-report data may be the biggest limitation. Strategy theory researchers need to take steps to overcome the problem of "Telling more than we can know" (Nesbitt & Wilson, 1977). Future research and theory testing would benefit from completing separate interviews with three senior executives per firm (e.g., Cheng et al., 2013) and reconciling differing answers, as well as combining document analysis with interview responses. The reliance on fix-point item responses is another limitation of the present study as well as the use of cross-section data. Longitudinal case-focused studies are possible (Nutt, 1989) and their use in asymmetric modeling represents valuable improvements in advancing new knowledge in strategy theory. Given that researchers usually apply configural analysis with small samples ($n \leq 30$), adopting a longitudinal approach to data collection and theory construction may be doable by small teams of strategy theory researchers.

While now the overwhelming dominant logic, the focus on NHST in strategy research results in shallow advances in theory and, in general is harmful in management research (Hubbard, 2016). The reliance on NHST may be the principal reason for the lack of impact for the majority of studies published in the elite and all other journals (Pham, 2013) in sub disciplines of management (cf. Hubbard, 2016; Woodside, 2016). Building better causal models is possible by shifting from NHST to SST.

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In closing, Gigerenzer's (1991, p. 254) wisdom is worth repeating, "Scientist tools are not neutral."

References

Anderson, P. (1999). Complexity theory and organization science. *Organization Science*, *10*, 216–232.

Anscombe, F. J. (1973). Graphs in statistical analysis. *American Statistician*, *27*, 17–21.

Ansoff, H. I. (1987). The emerging paradigm of strategic behavior. *Strategic Management Journal*, *8*, 501–515.

Anterasian, C., Graham, J. L., & Money, R. B. (1996). Are U.S. managers superstitious about market share? *Sloan Management Review*, *37*, 67–77.

Armstrong, J. S., & Collopy, F. (1996). Competitor orientation: Effects of objectives and information of managerial decisions and profitability. *Journal of Marketing Research*, *33*, 188–199.

Armstrong, J. S. (1982). The value of formal planning for strategic decisions: Review of empirical research. *Strategic Management Journal*, *3*, 197–211.

Armstrong, J. S. (2012). Illusions in regression analysis. *International Journal of Forecasting*, *28*, 689–694.

Armstrong, J. S., & Green, K. C. (2007). Competitor-oriented objectives: the myth of market share. *International Journal of Business*, *12*, 115–134.

Arts, J. W. C., Brumbach, R. T., & Bijmolt, T. H. A. (2011). Generalizations on consumer innovation adoption: A meta-analysis on the drivers of intention and behavior. *International Journal of Research in Marketing*, *28*(2), 134–144.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*, 99–120.

Boston Consulting Group (1972). *Perspectives on experience.* Boston: Boston Consulting Group.

Boston, W. (2014). Volkswagen strains to keep foot on the gas. *Wall Street Journal* (December 11, 2014. Downloaded 21 December 2014 at: https://mail.google.com/mail/u/0/#apps/Wall+Street+Journal/n50/14a61a01a013cff0).

Brinckmann, J., Grichnik, D., & Kapsa, D. (2010). Should entrepreneurships plan or just storm the castle? A meta-analysis on contextual factors impacting the business planning–performance relationship in small firms. *Journal of Business Venturing*, *25*, 24–40.

Bryson, A. (2007). Temporary agency workers and workplace performance. London: London School of Economics and Political Science.

By, R. T. (2005). Organizational change management: A critical review. *Journal of Change Management*, *5*, 369–380.

Capon, N., Farley, J. U., & Hoenig, S. (1990). Determinants of financial performance. *Management Science*, *36*, 1143–1159.

Capon, N., Farley, J. U., & Hulbert, J. M. (1987). *Corporate strategic planning.* New York, NY: Columbia University Press.

Cheng, C. -F., Chang, M. -L., & Li, C. -S. (2013). Configural paths to successful product innovation. *Journal of Business Research*, *66*, 2561–2573.

Conant, J. S., Mokwa, M. P., & Varadarajan, P. R. (1990, July–August). Strategic types, distinctive marketing competencies and organizational performance: A multiple measures-based study. *Strategic Management Journal*, *11*, 365–383.

Cooper, R., & Kleinschmidt, E. (1995). New product performance: Keys to success, profitability & cycle time reduction. *Journal of Marketing Management*, *11*, 315–337.

Cooper, R., Easingwood, C., Edgett, S., Kleinschmidt, E., & Storey, C. (1994). What distinguishes the top performing new products in financial services? *Journal of Product Innovation Management*, *11*, 281–299.

Da Silva, C., Baker, D., Shepherd, A., Jenane, C., & Miranda-da-Cruz, S. (2009). Agro industries for development. *e-book.* London: FAO & UNIDO (http://www.fao.org/docrep/013/i0157e/i0157e00.pdf, accessed May 2012).

Dalton, D. R., & Todor, W. D. (1979). Manifest needs of stewards: Propensity to file a grievance. *Journal of Applied Psychology*, *64*, 654–659.

Davis, J., Eisenhardt, K. M., & Bingham, C. B. (2007). Complexity theory, market dynamism, and the strategy of simple rules. *Working paper, April 12.* Stanford, CA: Stanford University (66 pages; available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.457.883&rep=rep1&type=pdf.).

Davis, J., Eisenhardt, K. M., & Bingham, C. B. (2009). Optimal structure, market dynamism, and the strategy of simple rules. *Administrative Science Quarterly*, *54*, 413–452.

Dean, J. W., Jr., & Sharmand, M. P. (1996). Does decision process matter? A study of strategic decision-making effectiveness. *Academy of Management Journal*, *39*, 368–396.

Dibrell, C., Craig, J. B., & Neubaum, D. O. (2016). Linking the formal strategic planning process, planning flexibility, and innovativeness to firm performance. *Journal of Business Research*, *67*, 2000–2007.

Dunphy, D., & Stace, D. (1993). The strategic management of corporate change. *Human Relations*, *46*(8), 905–918.

FAO (2012). The State of World Fisheries and Aquaculture 2012. Rome, Italy: Food and Agricultural Organization of the United Nations (FAO) (209 pp.).

Fiss, P. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *Academy of Management Journal*, *54*, 393–420.

Fiss, P. C. (2007). A set-theoretic approach to organizational configurations. *Academy of Management Review*, *32*(4), 1180–1198.

Frösén, J., Luoma, J., Jaakkola, M., Tikkanen, H., & Aspara, J. (2016). What counts versus what can be counted: The complex interplay of market orientation and marketing performance measurement. *Journal of Marketing*, *80*, 60–78.

Garcia, M. (2005). *Agribusinesses in the new millennium.* Santiago, Chile: Comisión Económica para América Latina y el Caribe (CEPAL).

Gigerenzer, G. (1991). From tools to theories: A heuristic of discovery in cognitive psychology. *Psychological Review*, *98*, 254–267.

Gigerenzer, G., & Brighton, H. (2009). Homo heuristics: Why biased minds make better inferences. *Topics in Cognitive Science*, *1*, 107–143.

Gladwell, M. (2002). *The tipping point: How little things can make a big difference.* New York: Little, Brown.

Goldstein, D. G., & Gigerenzer, G. (2009). Fast and frugal forecasting. *International Journal of Forecasting*, *25*, 760–772.

Grant, R. B. (1991). A resource based theory of competitive advantage: Implications for strategy formulation. *California Management Review*, *33*, 114–135.

Hall, R. I. (1976). A system pathology of an organization: The rise and fall of the old Saturday Evening Post. *Administrative Science Quarterly*, *21*, 185–211.

Hall, R. I. (1984). The natural logic of management policy making: its implications for the survival of an organization. *Management Science*, *30*(8), 905–927.

HBR (2006). HBR's must-reads on change. (Downloaded February 24, 2016 at http://www.machon-adler.co.il/readers/reader17.pdf).

Hsu, W. -T., Chen, H. -L., & Cheng, C. -Y. (2013). Internationalization and firm performance of SMEs: The moderating effects of CEO attributes. *Journal of World Business*, *48*(2013), 1–12.

Hubbard, R. (2016). *Corrupt research.* Thousand Oaks, CA: Sage.

Karna, A., Richter, A., & Riesenkampff, E. (2016). Revisiting the role of the environment in the capabilities-financial performance relationship: A meta-analysis. *Strategic Management Journal*, *37*, 1154–1173.

Kleinschmidt, E., & Cooper, R. (1991). The impact of product innovativeness on performance. *Journal of Product Innovation Management*, *8*, 240–251.

Kraatz, M. S., & Zajac, E. J. (2001). How resources affect strategic change and performance in turbulent environments: Theory and evidence. *Organization Science*, *12*, 632–657.

Lin, B. -W., Lee, Y., & Hung, S. C. (2006). R&D intensity and commercialization orientation effects on financial performance. *Journal of Business Research*, *59*, 679–685.

Little, D. (1993). On the scope and limits of generalizations in the social sciences. *Synthese*, *97*, 193–207.

McClelland, D. C. (1998). Identifying competencies with behavioral-event interviews. *Psychological Science*, *9*, 331–3339.

McClelland, D. C., Davis, W. N., Kalin, R., & Wanner, E. (1972). *The drinking man.* New York: Free Press.

Meehl, P. E. (1967). Theory-testing in psychology and physics. A methodological paradox. *Philosophy of Science*, *34*, 103–115.

Miles, R. E., & Snow, C. C. (1978). *Organizational strategy, structure, and process. A. D. Meyer, collaborator; H. J. Coleman Jr., contributor.* New York: McGraw Hill.

Miller, C. C., & Cardinal, L. B. (1994). Strategic planning and firm performance: A synthesis of more than two decades of research. *Academy of Management Journal*, *37*, 1649–1665.

Mintzberg, H. (1978). Patterns in strategy formation. *Management Science*, *24*, 934–948.

Nesbitt, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, *84*, 231–259 (Downloadable at: http://people.virginia.edu/~tdw/nisbett&wilson.pdf).

Nicholls-Nixon, C. L., Castilla, J. A. D., Garcia, J. S., & Pesquera, M. R. (2001). Latin American management research: Review, synthesis, and extension. *Journal of Management*, *37*, 1178–1227.

Nutt, P. C. (1989). *Making tough decisions.* New York: Wiley.

Ordanini, A., Parasuraman, A., & Rubera, G. (2014). When the recipe is more important than the ingredients: A qualitative comparative analysis (QCA) of service innovation configurations. *Journal of Service Research*, *17*, 134–149.

Osterman, P. (1987). Turnover, employment security, and the performance of the firm. In M. Kleiner (Ed.), *Human resources and the performance of the firm* (pp. 275–317). Madison, WI: Industrial Relations Research Association.

Pangarkar, N. (2008). Internationalization and performance of small- and medium-sized enterprises. *Journal of World Business*, *43*(2008), 475–485.

Pearce, J. A., Freeman, E. B., & Robinson, R. B., Jr. (1987). The tenuous link between formal strategic planning and financial performance. *Academy of Management Journal*, *12*, 656–675.

Peirce, C. S. (1867). In C. Hartshorne, & P. Weiss (Eds.), *Collected papers of Charles Peirce, C. S. (1903): A syllabus of certain topics of logic, Boston: Alfred Mudge & Son. Sanders Pierce. Volume 5.* Cambridge, MA: Harvard University Press (1934).

Peteraf, M. A. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, *14*, 179–191.

Pham, M. T. (2013). The seven sins of consumer psychology. *Journal of Consumer Psychology*, *23*(4), 411–423.

Poppo, L., Zhou, K. Z., & Li, J. J. (2015). When can you trust "trust"? Calculative trust, relational trust, and supplier performance. *Strategic Management Journal*, *37*, 724–741.

Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and competitors.* New York: Free Press.

Porter, M. E. (1985). *Competitive advantage.* New York: Free Press.

Porter, M. (1990). *The competitive advantage of nations.* NY: The Free Press.

Powell, T. C., Lovallo, D., & Fox, C. R. (2011). Behavioral strategy. *Strategic Management Journal*, *32*, 1369–1386.

Ragin, C. C. (1997). Turning the tables: How case-oriented research challenges variable-oriented research. *Comparative Social Research*, *16*, 27–42.

Ragin, C. C. (2000). *Fuzzy-set social science.* Chicago, IL: University of Chicago Press.

Ragin, C. C. (2008). *Redesigning social inquiry: Fuzzy sets and beyond.* Chicago: Chicago University Press.

Ramos-Rodríguez, A. R., & Ruíz-Navarro, J. (2004). Changes in the intellectual structure of strategic management research: A bibliometric study of the "Strategic Management Journal", 1980–2000. *Strategic Management Journal*, *24*, 981–1004.

Roberts, S., & Pashler, H. (2000). How persuasive is a good fit? A comment on theory testing. *Psychological Review*, *107*, 358–367.

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Roca-Puig, V., Beltrán-Martín, I., & Cipres, M. S. (2012). Combined effect of human capital, temporary employment and organizational size on firm performance. *Personnel Review*, *41*, 4–22.
Rosales, O., & Kuwayama, M. (2012). China and Latin America and the Caribbean: Building a strategic economic and trade relationship. Santiago, Chile: Economic Commission for Latin America and the Carribean (ECLAC).
Rumelt, R. (2011). *Good strategy/bad strategy: The difference and why it matters*. New York: Crown Business.
Schwenk, C. R., & Shrader, C. B. (1994). Effects of formal strategic planning on financial performance in small firms: A meta-analysis. *Entrepreneurship Theory and Practice*, *17*, 53–64.
Shan, W. (1990). An empirical analysis of organizational strategies by entrepreneurial high-technology firms. *Strategic Management Journal*, *11*, 129–139.
Shaw, J. D., Gupta, N., & Delery, J. E. (2005). Alternative conceptualizations of the relationship between voluntary turnover and organizational performance. *Academy of Management Journal*, *48*, 50–68.
Simon, H. (2009). *Hidden champions of the 21st century: Success strategies of unknown world market leaders*. London: Springer.
Snow, C. C., & Hambrick, D. C. (1980). Measuring organizational strategies: Some theoretical and methodological problems. *The Academy of Management Review*, *5*, 527–538.
Srinivasan, S., & Hanssens, D. M. (2009). Marketing and firm value: Metrics, methods, findings, and future directions. *Journal of Marketing Research*, *46*, 293–312.
Sullivan, D. (1994). Measuring the degree of internationalization of a firm. *Journal of International Business Studies*, *2Q*, 325–342.
Teece, D. J. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies*, *45*, 8–37.
Thomas, D. E., & Eden, L. (2004). What is the shape of multi-nationality performance relationship? *The Multinational Business Review*, *12*(1), 89–110.
Urry, J. (2005). The complexity turn. *Theory, Culture & Society*, *22*, 1–14.
Weick, K. E., & Roberts, K. H. (1993). Collective mind in organizations: Heedful interrelating on flight decks. *Administrative Science Quarterly*, *38*, 357–381.
Wernerfelt, B. (1984). A resource based view of the firm. *Strategic Management Journal*, *5*, 171–180.
Wernerfelt, B. (1989). From critical resources to corporate strategy. *Journal of General Management*, *14*, 4–12.
Woodside, A. G. (2013). Moving beyond multiple regression analysis to algorithms: Calling for a paradigm shift from symmetric to asymmetric thinking in data analysis, and crafting theory. *Journal of Business Research*, *66*, 463–472.
Woodside, A. G. (2015). The general theory of behavioral pricing: Applying complexity theory to explicate heterogeneity and achieve high-predictive validity. *Industrial Marketing Management*, *47*, 39–52.
Woodside, A. G. (2016). The good practices manifesto: Overcoming bad practices pervasive in current research in business. *Journal of Business Research*, *69*, 365–381.
Woodside, A. G., Sullivan, D. P., & Trappey, R. J., III (1999). Assessing relationships among strategic types, distinctive marketing competencies, and organizational performance. *Journal of Business Research*, *45*, 135–146.

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