

Arch G. Woodside *Editor*

# The Complexity Turn

Cultural, Management, and Marketing  
Applications



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# Preface

“Taking the complexity turn” in the behavioral and management sciences (BMS) refers to embracing a paradigm shift away from symmetric thinking in theory construction and data analysis. The researcher adopts an algorithm and asymmetric alternative paradigm in theory construction and data analysis. The asymmetric perspective includes discarding null hypothesis statistical testing (NHST) and applies “somewhat precise outcome test” (SPOT). While NHST is the dominant logic in behavioral and management science, Hubbard’s (2016) review of the severe limitations of NHST is convincing. While Hubbard (2016) mentions that precise outcome modeling can be possible in BMS, he does not provide convincing examples of what to do and how to do it. This book fills in this gap. This book presents details and examples of how to do SPOT.

Embracing the complexity turn in research matches case-based data analysis with case-based theory construction. Doing so overcomes the pervasive mismatch of case-based theory construction with variable-based data analysis that Fiss (2007) describes in the management research literature. The complexity turn includes applying case-focused useful solutions for interpreting and predicting individual cases with small or large sets of data. Yes, the complexity turn enables seeing both the forest and individual trees in the forest. A startling stance and promise!

Here is an additional benefit from embracing the complexity turn: when testing models predictions using additional samples of cases, the predictive accuracy using algorithms outperforms the predictive accuracy using symmetric tests (i.e., multiple regression analysis (MRA) and structural equation modeling). McClelland (1998) reports this conclusion, and Gigerenzer and Brighton (2009) review meta-analysis that confirms this conclusion. Symmetric tests of the same data used in constructing models (i.e., fit validity) perform better than asymmetric tests of the same data used in constructing the model—because symmetric tests make use of more information in formulating the model. However, the real value of a model lies in its predictive validity (accuracy) when predicting using additional samples of cases, that is,

testing the model's predictive validity. Armstrong (2012) reviews work illustrating the illusions of multiple regression analysis. Most studies in BMS literatures make use of symmetric tests only, and these studies stop at reporting fit validity only. Thus, most studies exhibit severe weaknesses in their failure to consider the predictive accuracy of their models as well as alternative paradigms in constructing theory and modeling their data (exceptions include Frösén et al. 2016 and Ordanini et al. 2014). The failure to recognize and apply the core tenets on complexity theory is an additional severe weakness that is pervasive in the BMS literatures. This preface presents a brief introduction to these core tenets.

Taking the complexity turn includes recognizing that contrarian “stuff happens” that symmetric tests do not consider. Symmetric tests include testing for differences among means (i.e., “analysis of variance” or ANOVA, correlation analysis, multiple regression analysis or MRA, and structural equation modeling or SEM). The stuff that happens includes the occurrences of cases contrary to a direct positive relationship between X and Y where X is a simple or configural independent variable and Y is a dependent variable. For example, consider two variables, relationship trust and purchasing activity, between industrial suppliers and customers. Research often shows this relationship is symmetric and positive, where high trust associates with high purchases and low trust associates with low purchases. However, symmetric tests indicate that most relationships are only moderately symmetrical and contrarian cases occur even among only moderately large sets of data ( $n \geq 30$ ). Consequently, a few cases in an industrial marketing/purchasing study will occur where trust is low and purchasing activity is high as well as cases where trust is high and purchasing activity is low.

Thus, offering hypotheses and testing for symmetric relationships alone is usually insufficient for understanding, describing, and predicting relationships between simple/configural X and simple/configural Y relationships. **The occurrence of cases exhibiting relationships contrary to hypothesized symmetrical relationships is a main tenet (principle) of complexity theory.** Large effect size for a simple antecedent condition is neither sufficient nor necessary. A specific level of a simple antecedent condition is insufficient for accurately predicting the level of an outcome condition. Thus, watching sports competitions on TV frequently by itself is not an accurate predictor of heavy beer purchases even if the correlation between the two behaviors is positive and statistically significant (e.g.,  $r = 0.53$ ,  $p < 0.001$ ). Simple antecedent conditions associate consistently only rarely with a given level of an outcome condition (e.g., a sufficient symmetric association indicates a very high correlation, e.g.,  $r \geq 0.80$ , and looks like panel B in Fig. 1).

		Panel A: Rectangular						Panel B: Symmetrical				
		aq	br	cs	dt			High	aqbrcsdt			
		eu	f	gv	h			Medium	eufgvh			
		iw	jk	k	l			Low	iwjxkl			
		m	ny	oz	p			Low	mnvozp			
		Low	Medium	High	X			Low	Medium	High	X	
		Panel C: Asymmetric— Sufficient but Not Necessary						Panel D: Asymmetric— Insufficient but Necessary				
		aq	br	cs	dt			High	aqbrcetd			
		eu	f	gv	h			Medium	e u f g h			
		iw	xj	k	l			Low	i w j x k l			
		m	ny	oz	p			Low	m n v o x p			
		Low	Medium	High	X			Low	Medium	High	X	

**Fig. 1** Hypothetical relationships where X is a complex configurational condition (e.g., C•T•H•Z) and Y is a service outcome condition (e.g., heavy beer purchases)

A few recipes (i.e., “configurations” or “algorithms”) of antecedent conditions are sufficient. The performance of a specific level of an outcome condition (e.g., high firm success, heavy beer purchases, monthly holiday trip-taking) depends on specific recipes of antecedent conditions. Such complex antecedence conditions are configurations consisting of two high or low combinations of two or more simple conditions. In a seemingly old but valuable study, Bass et al. (1968, p. 267) present recipes of heavy buyers for nine product categories in their Table 4. A summary of some data from Bass et al. (1968) appears as Table 1 in this preface. Note that the highest beer consumption on average is by some of the seven persons in the bottom left cell in Table 1. The seven persons in the bottom left cell having incomes above \$15,000 (in 1964 dollars) and sixth-grade education levels consume 36.58 bottles of beer per month on average.

**Table 1** Cross-classification analysis showing average beer purchases, bottles per month, for 1400 households, education by income

Annual family income		Years of education				
(000)		6	10	12	14	16
Under \$3	Mean	10.01	6.53	6.18	12.27	15.21
	s.e.	1.64	2.38	1.74	7.78	13.17
	n	124	36	38	7	4
\$3–4,999	Mean	27.74	20.27	11.70	17.40	1.79
	s.e.	3.93	4.03	2.98	9.51	1.65
	n	48	38	45	14	7
\$5–7,999	Mean	25.23	26.03	22.63	24.27	16.80
	s.e.	2.62	2.45	1.85	3.58	3.85
	n	115	122	196	57	35
\$8–9,999	Mean	27.72	24.21	32.14	21.78	23.23
	s.e.	6.47	4.51	3.07	3.92	3.78
	n	30	56	88	32	30
\$10–14,999	Mean	34.24	24.05	21.54	30.63	24.18
	s.e.	6.47	4.51	3.07	3.92	3.78
	n	15	37	61	45	50
\$15 +	Mean	36.58	12.50	28.49	34.17	17.86
	s.e.	10.68	0.00	6.93	8.52	3.80
	n	7	1	15	10	37

Notes. Data are for 1964; s.e. = standard error of the mean, n = number in sample

Source: Data appear in Table 7 in Bass et al. (1968, p. 270)

Some antecedent conditions are necessary but insufficient for identifying high Y. Most simple conditions are neither necessary nor sufficient alone in predicting a level of an outcome condition. However, some conditions may be necessary but insufficient; for example, people who are heavy beer drinkers on a daily basis are all likely to be 25+ years of age. Panel D in Fig. 1 shows an example of a necessary but insufficient condition—some persons 25+ are heavy beer purchasers and some are not and all heavy beer purchases are 25+ years of age.

A simple antecedent condition usually associates with both high and low levels of Y. For many simple antecedent conditions, high levels of an antecedent condition associate with both a specific outcome condition and the negation of the same outcome condition—which depends on what additional ingredients occur in specific recipes of complex antecedent conditions associating with the specific outcome or the negation of this outcome. For example, frequent watching of sports competitions on TV may associate with heavy beer purchases for many cases (i.e., persons) as well as not buying beer at all.

**“Equifinality” is a second principle (tenet) of complexity theory relevant for both theory construction and data analysis in the behavioral and management sciences.** Different recipes of complex antecedent conditions are adequate for explaining a given level of the same simple or complex outcome condition(s). This tenet is known as the equifinality principle—different routes (paths) are

available that lead to the same outcome. For example, persons “between 25 and 50, not college grad, TV more than 3.5 hours” are not all the people who are heavy beer purchasers—additional specific configurations occur that are sufficient in indicating cases of heavy beer drinkers.

The “causal asymmetry principle” is a third tenet of complexity theory. Recipes associating with a low level of an outcome condition are not mirror opposites of recipes associating with a high level of the same outcome condition. This tenet is known as the causal asymmetry principle. For example, Bass et al. (1968, p. 267) describe light beer purchases to be “under 25 or over 50, college ed., nonprofessional, TV less than 2 hours.” Note that “nonprofessional” appears in this recipe, but occupational category does not appear in the recipe for the heavy beer purchaser.

Unlike symmetric tests’ reliance on matrix algebra, asymmetric theory construction and data analysis rely on Boolean algebra for specifying and testing recipes. Using Boolean algebra, the mathematical expression for a complex antecedent condition is equal to the lowest score among the scores for the simple conditions in the complex statement. (Variable values in a data set are calibrated into membership scores ranging from 0.00 to 1.00 for analyses using Boolean algebra procedures.) Thus, consider the following recipe and model for heavy beer purchases:

$$\text{income} \bullet \sim \text{education} \bullet \text{sports\_TV} \bullet \text{male} \leq \text{heavy beer purchases} \text{ (model 1).}$$

Model 1 claims that males with high incomes, low education (the sideways tilde, “ $\sim$ ” represents negation), and who watch sports on TV frequently are heavy beer purchases. The mid-level dot (“ $\bullet$ ”) represents the logical “and” condition. Using fuzzy set membership scores for all the simple conditions in the model and the Boolean algebra operation that the membership score for the recipe is equal to the lowest score among the simple conditions in the recipe, the receipt membership score for a male with high income and very low education who watched sports on TV every night would equal 1.0. For model 1 to be accurate, a person’s membership score for beer purchases should also equal 1.0. For this model if this person is a female with the same high membership scores for the other simple antecedent conditions, the recipe score for this second person equals 0.00. Thus, for person 2:  $\text{income} = 1.00$ ;  $\sim \text{education} = 1.00$ ;  $\text{sports_tv} = 1.00$ ;  $\text{male} = 0.00$ , the complex antecedent recipe score equals 0.00. Both continuous and discrete values for conditions can be calibrated (i.e., transformed) into membership scores; membership scores run from 0.00 to 1.00.

The software program (available for free download at [fsQCA.com](http://fsQCA.com)) includes a subroutine for calibrating continuous values into membership scores for a logarithmic function (whereby values distant from the median are nearly equal to one another and values near the median are not equal to one another). The point here is similar to Bass et al.’s (1968) attempt to eliminate noise; the fsQCA software for calibration removes extreme influences of extreme scores. Thus, a \$2.4 billion salary of one person (among 100 persons having a median salary of \$80,000) would equal 1.0 for a calibrated membership score—the same membership score as the second highest salary (e.g., \$700,000) among these 100 persons.

**Table 2** Analogies and distinctions in using regression analysis and fs/QCA

Symmetric: <u>Regression Analysis</u>	Asymmetric: <u>fsQCA</u>
Independent variable	Antecedent condition
Dependent variable	Outcome condition
Interaction effect	Recipe
Objective 1: net effects of variables	Objective 1: multiple case ID recipe
Objective 2: high adjusted R2	Objective 2: highly consistent accuracy
● = multiply	● = and
+ = add	+ = or
Value	Membership score
Z transformation score	Calibrated membership score
Two-directional tests	One-directional tests
Analysis: regression; ANOVA	Analysis: algorithms

Note: fsQCA = fuzzy set qualitative comparative analysis

Consequently, unlike using symmetric tests, no case “outliers” occur in asymmetric testing. Asymmetric testing via Boolean algebra versus symmetric tests via matrix algebra use different concepts as well as mathematical operations. Table 2 presents a summary of these different concepts and operations that this book describes and uses.

Table 3 presents 22 cases of hypothetical data to illustrate raw values of variables and calibrated membership scores for cases for these values. Table 3 includes income, education, gender, and beer purchases for the 22 cases. Linda is the first case in Table 3. Linda has the lowest income level (\$1500), a sixth-grade education, a gender dummy score equal to 0.0, and beer purchases equal to 10. The calibrated membership scores for Linda also appear in the first row of data in Table 3. These membership scores include the calculation of  $\sim$ education for Linda. No education is the negation of education:  $1 - 0.03 = 0.97$ . The scores for the lowest education level could be calculated to be equal to 0.01 with no substantive change in the findings for this example. The calibrated scores reflect information for cases in a larger data file; the complete data file includes the data in Appendices 1 and 2 as well as Table 4. The estimated membership score for Linda for the model in the final column of Table 4 is equal to zero:  $\text{income} \bullet \sim\text{education} \bullet \text{gender}$  (male = 0.00) =  $0.01 \bullet 0.97 \bullet 0.00 = 0.00$  using Boolean algebra. The model tested here is that cases with high income, low education, and being male are heavy beer purchasers. Linda has low income, low education, and is not male.

**Table 3** Income, education, gender, and beer purchases: Hypothetical Data for the first 21 of 60 cases

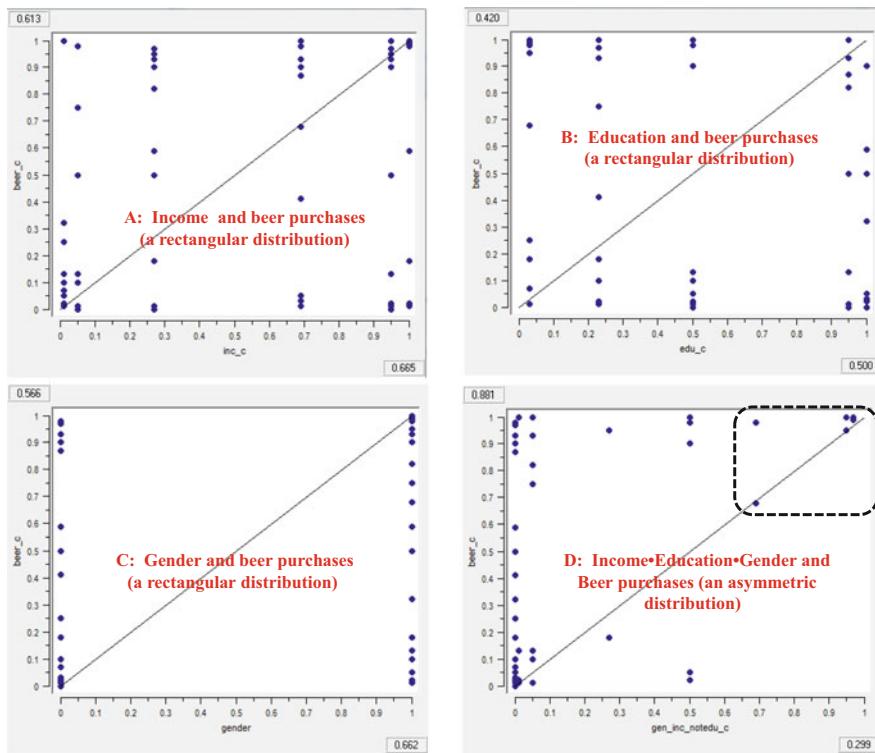
Case	income	edu	gender	beer	inc_c	edu_c	beer_c	not_edu_c	gen_inc_notedu_c
Linda	1500	6	0	10	0.01	0.03	0.07	0.97	0
jeff	1500	10	1	7	0.01	0.23	0.02	0.77	0.01
mary	1500	12	0	6	0.01	0.5	0.02	0.5	0
tom	1500	14	1	12	0.01	0.95	0.13	0.05	0.01
phil	1500	16	1	15	0.01	1	0.32	0	0
carol	4000	6	0	27	0.05	0.03	0.98	0.97	0
bruce	4000	10	1	20	0.05	0.23	0.75	0.77	0.05
arnold	4000	12	1	12	0.05	0.5	0.13	0.5	0.05
donna	4000	14	0	17	0.05	0.95	0.5	0.05	0
deb	4000	16	0	2	0.05	1	0	0	0
lance	6500	6	1	25	0.27	0.03	0.95	0.97	0.27
sandra	6500	10	0	26	0.27	0.23	0.97	0.77	0
kathy	6500	12	0	23	0.27	0.5	0.9	0.5	0
bill	6500	14	1	24	0.27	0.95	0.93	0.05	0.05
ralph	6500	16	1	17	0.27	1	0.5	0	0
peter	9000	6	1	28	0.69	0.03	0.98	0.97	0.69
sue	9000	10	0	24	0.69	0.23	0.93	0.77	0
matt	9000	12	1	32	0.69	0.5	1	0.5	0.5
jane	9000	14	0	22	0.69	0.95	0.87	0.05	0
martha	9000	16	0	23	0.69	1	0.9	0	0
carl	12,500	6	1	25	0.95	0.03	0.95	0.97	0.95

To examine a model's usefulness in identifying cases with high membership scores in an outcome condition, "consistency" and "coverage" indexes are estimated for different algorithm models via fsQCA. The consistency index indicates whether or not the model is dependable in accuracy in the membership scores for the simple or complex antecedent condition being equal or less than the membership score for the outcome condition across the cases in the study. The recommendation here is the consistency index should be greater than 0.85 for model of antecedent conditions to be useful—also the XY plot of the model should show the pattern apparent in panel C of Fig. 1. The coverage index estimates the relevancy of a model in estimating high membership scores in the outcome condition. The coverage index typically should range between 0.05 and higher. The equations for estimating consistency and coverage appear in Table 4 for the data for the 22 cases in Table 3.

**Table 4** Computing consistency and coverage indexes

case	X (inc_~edu_gen_c)	Y (beer_c)	min (Xi, Yi)	
linda	0	0.07	0	<p style="text-align: center;"><b>Consistency = 1.00</b></p>
jeff	0.01	0.02	0.01	
mary	0	0.02	0	
tom	0.01	0.13	0.01	
phil	0	0.32	0	
carol	0	<b><u>0.98</u></b>	0	
bruce	0.05	0.75	0.05	
arnold	0.05	0.13	0.05	
donna	0	0.5	0	
deb	0	0	0	
lance	0.27	<b><u>0.95</u></b>	0.27	
sandra	0	<b><u>0.97</u></b>	0	
kathy	0	0.9	0	
bill	0.05	<b><u>0.93</u></b>	0.05	
ralph	0	0.5	0	
peter	0.69	<b><u>0.98</u></b>	0.69	
sue	0	<b><u>0.93</u></b>	0	<p><b>Model: income~edu*gender <math>\leq</math> beer</b></p> <p><b>Consistency (<math>X_i \leq Y_i</math>)</b> = <math>\Sigma[\min(X_i, Y_i)]/\Sigma(X_i)</math></p> <p>Consistency = <math>2.58/ 2.58 = 1.000</math></p> <p><b>Coverage (<math>X_i \leq Y_i</math>)</b> = <math>\Sigma[\min(X_i, Y_i)]/\Sigma(Y_i)</math></p> <p>Coverage = <math>2.58/ 12.8 = 0.202</math></p> <p><b>Note. Heavy beer purchasing cases in bold and underlined.</b></p> <p>The analysis indicates perfect (1.00) consistency and modest (.202) coverage. Data includes 8 heavy beer purchasers (<math>\geq .85</math>); 3 of 8 have complex antecedent membership scores <math>\geq 0.5</math>. Model does not explain Carol, Lance, Sandra, Jane, and Bill's heavy beer purchases; need to consider different antecedent models for them.</p>
matt	0.5	1	0.5	
jane	0	<b><u>0.87</u></b>	0	
martha	0	0.9	0	
carl	0.95	<b><u>0.95</u></b>	0.95	
<b>Sum</b>	<b><u>2.58</u></b>	<b><u>12.8</u></b>	<b><u>2.58</u></b>	

The consistency and coverage findings in Table 4 indicate that high membership scores on the complex antecedents' model associate with heavy beer purchasers and that the model has perfect consistency. Figure 2 shows examples of inconsistency and consistency models. The final frame in Fig. 2 is an example of a "somewhat precise outcome test" (SPOT). The findings indicate that high scores in the complex antecedent model are sufficient for concluding that the case represents a heavy beer purchaser, but additional models with high consistency are necessary for identifying additional heavy beer purchases. The model is sufficient but not necessary for identifying high scores on the Y (beer purchaser) condition. Do females who are heavy beer purchasers (drinkers) occur in real life? Yes, of course. However, the model tested here does not account for the female heavy beer purchasers. One or two additional models need to be proposed and tested for high consistency that hopefully represents such female beer purchasers accurately.



**Fig. 2** Rectangular and Asymmetric Findings for Three Simple Antecedents and Gender•Income•Education $\leq$ Beer Purchases

## Testing Algorithms for Predictive Validity Using Additional Samples

Does the model just tested hold up well with case data in additional samples? Two additional samples of data appear in Appendices 1 and 2. For the data in Appendix 1, the model ( $income \cdot \sim education \cdot male$ ) has a consistency equal to 0.948 and coverage equal to 0.248; the model is quite useful for identifying cases of heavy beer purchasers. For the data in Appendix 2, the same model has a consistency equal to 0.767 and coverage equal to 0.651; the model is not useful for identifying cases of heavy beer purchasers. For the total sample from Table 3 and the two appendices, the same model has a consistency equal to 0.881 and a coverage equal to 0.299; the model for the total cases ( $n = 60$ ) is quite useful for identifying heavy beer purchasers.

**Table 5** Summary of symmetric test of main effects

Regression statistics			Correlations	Income	Edu	Gender
Multiple R	0.551		Income	1		
R Square	0.304		Edu	.000	1	
Adjusted R Square	0.267		Gender	0.052	-0.109	1
Standard Error	9.089		Beer	0.299	-0.335	0.369
Observations	60					
ANOVA						
	df		SS	MS	F	Significance F
Regression	3		2020	673.4	8.15	0.0001
Residual	56		4626	82.6		
Total	59		6646			
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	18.443765417	4.793747035	3.846188	0.000309	8.834624915	28.04068343
income	0.00054334	0.000214689	2.530821	0.014216	0.000113266	0.000973414
edu	-0.917586714	0.343054346	-2.67476	0.009785	-1.604807149	-0.230366279
gender	6.798785557	2.369183291	2.869675	0.005787	2.052741118	11.54483

Panel D in Fig. 1 shows an asymmetric association between the complex antecedent model under discussion and heavy beer purchasers. Panels A, B, and C are for the simple antecedent conditions for income, education, and gender, respectively, and heavy beer purchasers. These three simple antecedent models are low in consistency.

Table 5 presents the findings from running a regression analysis—a symmetric test of how well the three independent variables predict low and high beer purchases. The variable directional hypotheses (SVH) symmetric test is modestly successful with an adjusted  $R^2$  equal to 0.267. However, unlike the algorithm case-identification hypotheses (CIH), the SVH symmetric test does not identify heavy users and attempt to explain both directions in beer purchases—light and heavy. Contrarian cases occur in everyday life; some females are heavy beer purchasers; some highly educated consumers are heavy beer purchasers; some low-income consumers are heavy beer purchasers—even when the main effects counter to these contrarian cases are significant statistically. The usual presence of contrary cases means that correlations between independent variables and a dependent variable will be modest even when the main effects are quite large. Constructing theory to test for identifying cases with high scores on the outcome condition and using asymmetric tests to confirm or refute the theory is closer to reality and closer to what researchers typically seek to study.

## Research Applications of Case-Based Theory and Case-Identification Hypotheses Testing

Several examples of case-based theory matched with case-identification hypotheses testing are available in the literatures in business (management) subdisciplines. Fiss (2011) makes use of survey data of 205 high-technology manufacturing firms located in the United Kingdom to examine complex causal recipes that associate with high and very high firm performances. For the performance metric, Fiss used the following calibrated scores: 0.00 for average or below-average performance (up to ROA 7.8 %); 0.50 for ROA equal to 16.3 %; and 1.00 for an ROA of 25 % and above. In his Table 5, Fiss (2011, p. 409) reports three complex antecedent strategy recipes for identifying firms with very high performances. High structure complexity appears as a core ingredient in two of the three recipes; the negation of structure complexity appears as a periphery ingredient in the third recipe—such findings support the complexity theory proposition that high X relates to high Y and the negation of X may relate also to high Y in the same data set for different cases via different causal recipes. Low-cost strategy appears in all three recipes for identifying very high performing firms.

Ordanini et al. (2014, p. 134) demonstrate that recipes “are more important than the ingredients” in their “Qualitative Comparative Analysis (QCA) of Service Innovation Configurations.” They hired a professional telemarketing company to recruit a random sample 300 customers who had stayed at a luxury hotel for leisure during the previous 3 years. Each customer received an e-mailed description of a new hotel service and was scheduled for an interview 3–5 days later. Data on the study’s possible antecedent conditions were collected during the interviews. They varied three levels of coproduction requirements in a between-subjects design. New service outcome intentions were the outcome condition in their study. The findings provide strong support for the three propositions that their study examines. Proposition 1: The same attribute can either foster or inhibit new service adoption, depending on how it is configured with other attributes. Proposition 2: Disparate configurations of service attributes are equifinal in leading to adoption. Proposition 3: For adoption to occur, a configuration of attributes must be perceived as fitting the coproduction requirements. While not referring to the core tenets in complexity theory, Ordanini et al.’s (2014) three propositions and findings provide direct support for the core tenets. The Ordanini et al.’s study is a major breakthrough study in solving the paradoxical findings in the literature on adoption of product-service innovations

The QCA application also helps reconcile the inconclusive evidence concerning the role of individual drivers of service innovation success (Szymanski et al. 2007). Our findings suggest that relative advantage, by itself, is necessary—but not sufficient—for adoption, while the other three drivers—novelty, meaningfulness, and complexity—when considered individually are neither necessary nor sufficient.

What matters for adoption to occur is whether the drivers and the coproduction setting are appropriately aligned (Ordanini et al. 2014, p. 144).

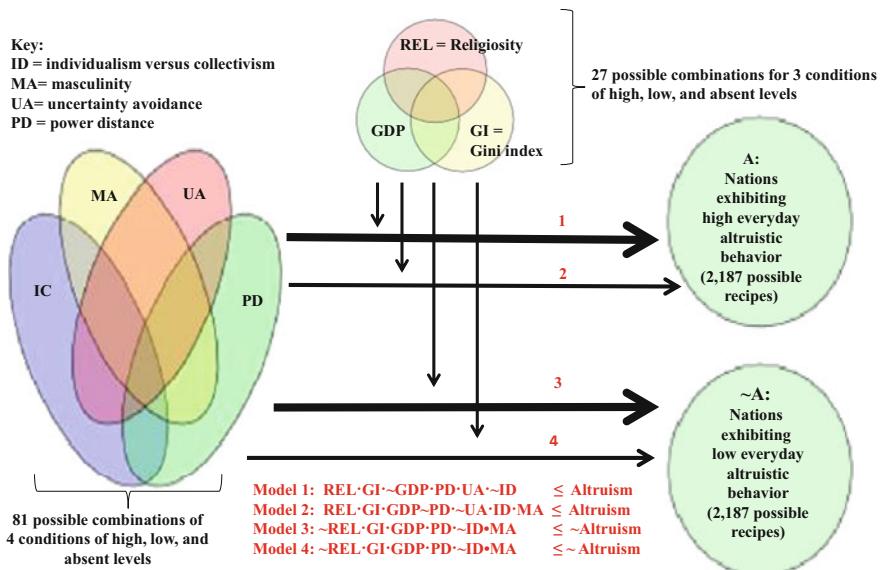
Ordanini et al. (2104, p. 141) compare their case-based theory and CIH testing with the conventional and dominant logic approaches of case-based theory followed by SVH testing, for example, cluster analysis. From the findings for these comparisons, they conclude that the findings from QCA were richer and more precise than those from cluster analysis. “We repeated the clustering using latent class analysis but the results were still inferior to those obtained from QCA.” They also modeled the negation of adoption intentions, and their findings from four complex antecedent models indicate high non-adoption of the new service—these findings support the causal asymmetry principle in complexity theory.

Prado and Woodside (2015) provide a third example of matching case-based theory with testing CIH. This study tests a theory of causally complex configurations of antecedent conditions influencing the adoption versus non-adoption of international supplier ethical certification standards. Using objective measures of antecedents and outcomes, a large-scale study of exporting firms in the cut-flower industry in two South American countries (Colombia and Ecuador) supports the theory. Prado and Woodside’s (2015) complex antecedent models include the adoption and the negation of adoption of supplier ethical industry standards. They conclude, “The findings support the general conclusion that a simple antecedent condition has a positive or negative influence on adoption or non-adoption is overly simplistic. Impacts of simple antecedent conditions depend on the presence, absence, or negation of additional simple antecedent conditions within alternative complex antecedent statements” (Prado and Woodside, 2015, preprint copy).

Figure 3 illustrates the use of Venn diagrams and causal recipes reflecting some of the core tenets of complexity theory. Figure 3 illustrates the idea of moving away from net effect interpretations and that different antecedent variables have different sizes of net effects. The typical real-life finding is that no single variable is sufficient or necessary for predicting cases with high outcome scores consistently in almost all studies. For the models in Fig. 3, religiosity is an exception to the just made assertion. High national religiosity associates with national high in altruistic behavior and low national religiosity associates with nations low in altruistic behavior—a symmetric relationship; the ability to predict nations with high and low altruistic behavior improves dramatically with the inclusion of additional ingredients in the respective recipes (Ferguson et al. 2015).

Notice in Fig. 3 that the visual includes separate models for high and low outcomes. Such a visual illustrates the asymmetric nature of reality and causal asymmetry in general—the models for the negation of altruistic behavior are unique models rather than simply the mirror opposite of models for high altruistic behavior. The thickness of the arrows in Fig. 3 is to indicate that some models usually have higher coverage—relevant for more cases—than other models. Such findings occur usually for the sets of useful models for both high and low outcome conditions.

Models 1 and 2 in Fig. 3 include several ingredients that are counter to one another. For example, the negation of ID appears in model 1 and high ID appears in



**Fig. 3** Visual of Case-Based Theory Construction and Case Identification Hypotheses Testing. Notes. Visual here uses Hofstede's perspective that cultural values affect behavior, but the visual is modifiable to represent other case-based theories with other moderating conditions affecting an outcome and negation outcome condition. This visual illustrates core tenets of complexity theory: two or more recipes associate with cases having high outcome scores; two or more recipes associate with cases having low outcome scores; some ingredients in recipes associate with both high and low outcome scores; moderates may be ingredients in some but not all recipes. *Thick arrows* indicate higher coverage, while *thin arrows* indicate low coverage. Specific models for each arrow appear below the visual. Source: Models are from Ferguson, Megehee, and Woodside (2015)

model 2—with both models being different recipes for nations high in altruistic behavior. MA is absent in model 1 and a positive ingredient in model 2; this finding illustrates the three possible levels for each simple condition as contributions in different recipes. This exposition ignores the possibility of a fourth level, that is, a curvilinear contribution of a simple antecedent condition into a recipe. This fourth possibility is beyond the scope of this discussion.

The number (2187) of the possible configurations is quite large for recipes among seven antecedent conditions. The software program, fsQCA.com, can manage to process all possible combinations for seven antecedent conditions—much like SPSS software considering positive and negative additional terms in its stepwise regression routine. Care is necessary not to automatically test for all recipes; researchers should apply Armstrong's (2012) advice about not performing stepwise regression to automatically applying case-based data analysis for all possible

configurations of antecedent conditions. A priori theory should drive the testing of CIH. However, this heuristic is easy to suggest but tough to adhere to in practice. Surprises occur in testing seemingly unlikely associations with high as well as outcome conditions, especially when testing for all combinations that offer consistency ( $\geq 0.85$ ), and a practical level of consistency ( $= 0.50$ ) is available by a few clicks using the fsQCA software. This last observation reflects the perspective that theory and data analysis are two-way processes even if the focus is on asymmetric associations.

## Conclusion

Given the literature review in this preface, a shift away from the use of symmetric tests only in research in the subdisciplines of business research is gaining some traction. However, most researchers in these subdisciplines are still unaware of the mismatch in their theories of typologies and their writing of symmetric variable hypotheses. The use of symmetric tools such as ANOVA, correlation, and MRA/SEM alone fails to uncover the inherent complexity in relationships that occur in researchers' data sets. Reading Ragin (1997) "Turning the tables: How case-oriented methods challenge variable-oriented methods" is a useful place to start reading about the mostly unrecognized severe limitations of symmetric testing. Ragin (1997) is an open-access paper only two clicks away.

The recognition of unsound practices in relying on symmetric tests began before Bass et al. (1968) as this chapter describes, but most scholars continue to ignore the suggestions and worthwhile procedures and tools that Armstrong (2012), Gigerenzer and Brighton (2009), McClelland (1998), and Ragin (2008) describe. Given the establishment and success of the members of COMPASSS.ORG, the valuable case theory-analytical matching studies by Fiss (2011), Ordanini et al. (2014), and others (e.g., Wu et al. 2014), along with the publication of recent books in management (Fiss et al. 2013) and marketing (Meier and Donzé 2013) on case-based theory matched with case-based analytics, asymmetric theory building, and data analysis, is likely to be entering a tipping point at about the midpoint of the second decade in the twenty-first century. This shift in theory construction and data analytics is sufficiently radical as to generate substantial resistance by many reviewers at most journals. One step likely to help overcome this resistance is for scholars to include both conventional symmetric variable-based analysis and case-based analysis and findings in their journal submissions; the study by Ordanini et al. (2014) includes both alternative approaches. Acceptances of submissions of case-based analytical submissions are likely to continue to be low for a few additional years if authors do not follow Ordanini et al.'s (2014) dual-analytical practice.

## Appendix 1: Data for Cases 23–45

case	income	edu	gender	beer	inc_c	edu_c	beer_c	not_edu_c	gen_inc_notedu_c
liz	12,500	10	0	26	0.95	0.23	0.97	0.77	0
chuck	12,500	12	1	23	0.95	0.5	0.9	0.5	0.5
george	12,500	14	1	24	0.95	0.95	0.93	0.05	0.05
sarah	12,500	16	0	17	0.95	1	0.5	0	0
doug	18,000	6	1	37	1	0.03	1	0.97	0.97
betty	18,000	10	0	13	1	0.23	0.18	0.77	0
albert	18,000	12	1	28	1	0.5	0.98	0.5	0.5
nigel	18,000	14	1	34	1	0.95	1	0.05	0.05
shirley	18,000	16	0	18	1	1	0.59	0	0
judy	1500	6	0	14	0.01	0.03	0.25	0.97	0
luke	1500	10	1	39	0.01	0.23	1	0.77	0.01
adel	1500	12	0	11	0.01	0.5	0.1	0.5	0
mark	1500	14	1	3	0.01	0.95	0.01	0.05	0.01
roger	1500	16	1	9	0.01	1	0.05	0	0
ann	4000	6	0	5	0.05	0.03	0.01	0.97	0
kane	4000	10	1	11	0.05	0.23	0.1	0.77	0.05
able	4000	12	1	4	0.05	0.5	0.01	0.5	0.05
julia	4000	14	0	0	0.05	0.95	0	0.05	0
peggy	4000	16	0	0	0.05	1	0	0	0
don	6500	6	1	13	0.27	0.03	0.18	0.97	0.27
meg	6500	10	0	5	0.27	0.23	0.01	0.77	0
virginia	6500	12	0	2	0.27	0.5	0	0.5	0
tim	6500	14	1	21	0.27	0.95	0.82	0.05	0.05

## Appendix 2: Data for Cases 46–60

case	income	edu	gender	beer	inc_c	edu_c	beer_c	not_edu_c	gen_inc_notedu_c
hugh	6500	16	1	18	0.27	1	0.59	0	0
arch	9000	6	1	19	0.69	0.03	0.68	0.97	0.69
christine	9000	10	0	16	0.69	0.23	0.41	0.77	0
dilbert	9000	12	1	9	0.69	0.5	0.05	0.5	0.5
audrey	9000	14	0	3	0.69	0.95	0.01	0.05	0
vivian	9000	16	0	8	0.69	1	0.03	0	0
aaron	12,500	6	1	33	0.95	0.03	1	0.97	0.95
olivia	12,500	10	0	5	0.95	0.23	0.01	0.77	0
nick	12,500	12	1	7	0.95	0.5	0.02	0.5	0.5
kent	12,500	14	1	12	0.95	0.95	0.13	0.05	0.05
kim	12,500	16	0	0	0.95	1	0	0	0

(continued)

case	income	edu	gender	beer	inc_c	edu_c	beer_c	not_edu_c	gen_inc_notedu_c
graham	18,000	6	1	31	1	0.03	0.99	0.97	0.97
ruby	18,000	10	0	5	1	0.23	0.01	0.77	0
brad	18,000	12	1	36	1	0.5	1	0.5	0.5
clark	18,000	14	1	3	1	0.95	0.01	0.05	0.05
amber	18,000	16	0	6	1	1	0.02	0	0

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# Embracing the Complexity Turn in Management Research for Modeling Multiple Realities

Arch G. Woodside

*For every complex problem, there is a solution that is simple, neat, and wrong.*

(H.L. Mencken)

**Abstract** Chapter 2 describes tenets of complexity theory including the precept that within the same set of data X relates to Y positively, negatively, and not at all. A consequence to this first precept is that reporting how X relates positively to Y with and without additional terms in multiple regression models ignores important information available in a data set. Performing contrarian case analysis indicates that cases having low X with high Y and high X with low Y occur even when the relationship between X and Y is positive and the effect size of the relationship is large. Findings from contrarian case analysis support the necessity of modeling multiple realities using complex antecedent configurations. Complex antecedent configurations (i.e., 2–7 features per recipe) can show that high X is an indicator of high Y when high X combines with certain additional antecedent conditions (e.g., high A, high B, and low C)—and low X is an indicator of *high Y as well* when low X combines in other recipes (e.g., high A, low R, and high S), where A, B, C, R, and S are additional antecedent conditions. Thus, modeling multiple realities—configural analysis—is necessary, to learn the configurations of multiple indicators for high Y outcomes and the negation of high Y. For a number of X antecedent conditions, a high X may be necessary for high Y to occur but high X alone is almost never sufficient for a high Y outcome.

**Keywords** Antecedent • Configuration • Contrarian case • fsQCA • Model • Necessary • Outcome • Sufficiency

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## 1 Introduction: Beyond Rote Applications of Regression Analysis

This chapter elaborates on the perspective that the current symmetric-based dominant logic in research in the management sub-disciplines is less informative and less theoretically useful than the alternative logic of asymmetric testing (McClelland 1998; Woodside 2013a, b). The contribution here provides details of why and how to use this relatively new theoretical stance and analytics in the management sub-disciplines.

The dominant logic in research in papers submitted to leading journals in the fields of marketing, management, finance, and international business includes question-and-answer surveys using 5 and 7 point scales and analyses of the resulting data using structural equation modeling; for example, about seven of ten submissions to the leading journal in management research employ these features. The use of structural equation modeling (SEM) became popular in the 1980s and has grown to become central in the dominant logic in crafting and testing models well into the twenty-first century. SEM combines and extends factor analysis and multiple regression analysis (MRA). SEM and MRA are symmetric tests that report on the “net effects” of variables on a dependent variable with a set of independent variables.

Along with using SEM/MRA and structured scale measures, the current dominant logic includes the following features: collecting survey data via scaled responses from one person per organization with the respondent answering the questions one-time only; useable response rates less than 20 % of the surveys sent to potential respondents; presentation of the fit validities of one-to-five sets of empirical models with no testing for predictive validity with holdout samples (see Gigerenzer and Brighton (2009) for a review of problems associating with not testing for predictive validity with holdout samples and how to do so); reporting of empirical models that include both significant and non-significant terms; no testing or reporting of contrarian cases in these papers—no recognition that the direction of impacts is the opposite of that found in the models reported for some of the respondents; and thus, no recognition of why the resulting models (empirical findings) explain little of the variance in the dependent variable (adjusted  $R^2$ 's most frequently less than 0.20).

Even though SEM reports are usually elegant to contemplate, the limitations of employing the current dominant logic in the management sub-disciplines are tellingly severe. The limitations include requiring respondents transform their beliefs and evaluations to 5 or 7 point scales, the operational step of collecting answers from one person per organization or household rather than seeking confirmatory/negative answers from two or more respondents in the same organization (for an exception, see Cheng et al. 2013), modeling using net effects symmetric tools such as MRA or SEM when patterns of relationships in the data are asymmetric, and testing only for fit validity and not testing for predictive validity. However, describing such limitations is insufficient to achieve useful innovations

to theory construction and testing. Proposing and showing useful research analytic innovations are necessary steps for achieving change—especially in moving early-career academic researchers away from using MRA and SEM only and to embrace the use of asymmetric theory construction and testing.

Question surveying from a distance severely limits the collection of contextual information; context is one of the two blades in Herbert Simon's metaphor of human decision making. "Human rational behaviour is shaped by a scissors whose blades are the structure of task environments and the computational capabilities of the actor (Simon 1990, p. 1). Simon's scissors metaphor supports calls for "direct research" (Mintzberg and Campbell 1979)—to include the study of context as well as to craft isomorphic models of real-life thinking processes in these contexts (Woodside 2011, b). Asking questions alone to describe and explain decision processes requires a respondent to interpret the question, retrieve relevant information usually from long-term memory, edit the retrieved information for relevancy and self-protection, and report in a format and style usually to appear sane and accurate to some degree; responses following these steps quite often have little relationship to reality (Bargh and Chartrand 1999; Nesbitt and Wilson 1977). Verbal responses in answering questions require subjective personal introspections (SPI); SPI's frequently include accurate information only to a modest degree (Woodside 2006) and frequently both attitudes and beliefs expressed following SPIs serve as poor predictors of future behavior.

The theoretical and practical value of asking respondents to convert their SPI thinking into 5 or 7 point scales joins with the lack of contextual data collection to result data of highly questionable value. As Mintzberg and Campbell (1979) ruminants aloud to himself and to us:

"Hmmmm ...what have we here? The amount of control is 4.2, the complexity of environment, 3.6." What does it mean to measure the "amount of control" in an organization, or the "complexity" of its environment? Some of these concepts may be useful in describing organizations in theory, but that does not mean we can plug them into our research holus-bolus as measures. As soon as the researcher insists on forcing the organization into abstract categories—into his terms instead of its own—he is reduced to using perceptual measures, which often distort the reality. The researcher intent on generating a direct measure of amount of control or of complexity of environment can only ask people what they believe, on 7-point scales or the like. He gets answers, all right, ready for the computer; what he does not get is any idea of what he has measured. (What does "amount of control" [or "trust"] mean anyway?) The result is sterile description, of organizations as categories of abstract variables instead of flesh-and-blood processes. And theory building becomes impossible. (Mintzberg and Campbell 1979, p. 586)

Woodside (2013a) compares and contrasts the use of symmetric (e.g., MRA and SEM) versus asymmetric (e.g., analysis by quintiles and by fuzzy set qualitative comparative analysis) whereby symmetric tests consider the accuracy in high values of X (an antecedent condition) indicating high values of Y (an outcome condition) and low values of X indicating low values of Y where asymmetric tests consider the accuracy of high values of X indicating high values of Y without predicting how low values of X relates to values of Y. Might not seem that different but symmetric tests rarely match well with reality except for testing the association

of two or more items to measure the same construct (coefficient alpha is a symmetric test and researchers seek high coefficient alphas (e.g.,  $r > 0.70$ ). Asymmetric tests reflect realities well given that the causes of high Y scores usually differ substantially from the causes of low Y scores (i.e., the principle of causal asymmetry, see Fiss 2011); examples of this tenet appear later in this chapter.

Following this introduction, this treatise includes three complementary parts. First, tenets in complexity theory provides useful foundation for analyzing data—the nearly rote statements of main effects and rote applications of multiple regression analysis (MRA) appearing in most academic studies in management-related sub-disciplines ignore the complexities inherent in realities and apparent (with a little digging) in the data sets of academic studies. Second, contrarian case analyses confirm that substantial numbers of cases occur which display relationships that are counter to a negative (or positive) main effect between X and Y—even when the effect size is large of the reported X-Y relationship. For example, when X associates positively with Y with a correlation of 0.60 ( $p < .001$ ), the same data set includes cases of high X and low Y and cases of low X and high Y; researchers ignore these contrarian cases in most reports even though examining such cases is highly informative. Third, using configural analysis of complex antecedent conditions, modeling of the multiple realities is possible and insightful—modeling the existence of a net effect of X for different numbers of additional independent variables offers a meager portion of the meal-of-information extractable by drilling deeper.

The study here is valuable in describing how complexity theory serves as a useful foundation for building and testing theory beyond the now dominant logic of applying MRA perspectives of net effects main and interaction terms. Embracing a complexity theory perspective (CTP) provides vision for explicit consideration of hypotheses counter to the dominant logic of presenting one theory per study. Thus, a CTP expands on Armstrong, Brodie, and Parsons' (2001) observation that advocating of a single dominant hypothesis lacks objectivity relative to the use of exploratory and competing hypotheses approaches—even though their “publication audit” of over 1700 empirical papers in six leading marketing journals during 1984–1999 indicates that three of every four studies use only the single, dominant, hypothesis perspective.

The study here is valuable in describing how contrarian case analysis is useful in probing complexity theory tenets and building and testing new theory by developing compound outcome statements—descriptions and examples of such statements appear in Sect. 3. The study here is valuable in bridging configural analysis using fuzzy set qualitative comparative analysis (fsQCA) with complexity theory in sub-disciplines of management (e.g., finance, marketing, organization science, and strategic management); such bridging expands on the contributions of Ragin (2008) in sociological methods, Fiss (2007, 2011; Meier and Donzé 2012) in organization science, and Woodside and colleagues (2013a, b; Chung and Woodside 2011; Schuhmacher et al. 2013; Woodside and Zhang 2013) in marketing.

Following this introduction, Sect. 2 presents tenets in complexity theory. Section 3 describes how contrarian case analysis and findings show that cases occur contrarian to main effects having large effects sizes—most researchers usually ignore such contrarian cases both in formulating theory, examining data, and in predicting fit validity. Section 4 reports on models of the multiple realities that occur within each of several data sets. Section 5 concludes with the call to recognize the need to perform and report multiple models showing how high X associates with high Y in more than one model/path (being done to some extent now using MRA), how *low* X also associates with high Y in more than one model (rarely being done), and how models of the negation of Y are not the mirror opposites of models of high Y—“causal asymmetry” (Fiss 2011; Fiss et al. 2013) occurs whereby complex antecedent conditions indicate the negation of Y are not simply the opposites of the recipe of simple conditions in the complex antecedent statements indicating high Y.

## 2 Complexity Theory Tenets

The literature on complexity theory is expansive and heads in several discernable directions. Anderson (1999) provides advances in theory and research on complexity theory relevant to organization science. Several useful studies expand on the insights of Anderson’s (1999) and prior work (e.g., March and Simon 1958) especially in the advancing complexity theory of organizational behavior through simulation methods (e.g., Davis et al. 2007; Huff and Huff 2000). Urry (2005) provides a far-ranging literature review of complexity theory in the natural and social sciences and offers many useful insights. Example insights include the following perspectives, “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); “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” (Urry 2005, p. 5). Reporting on findings that include reversals in causal effects (e.g., positive to negative for the same antecedent with the same outcome) and reporting on tipping-point patterns in phenomena are primary foci in the present chapter.

Simon’s (1962) presentation of “the architecture of complexity” focuses on confirming and expanding on the tenet that complexity takes the form of hierarchy—the complex system being composed of subsystems that, in turn, have their own subsystems, and so on. Related to the central task of science relating to complexity and in general, in his essay, “Science seeks parsimony, not simplicity: searching for pattern in phenomena,” Simon (2004) provides the following dictum, “The primordial acts of science are to observe phenomena, to seek patterns (redundancy) in them, and to redescribe them in terms of the discovered patterns, thereby

removing redundancy. The simplicity that is sought and found beautiful is the simplicity of parsimony, which rests, in turn, on the exploitation of redundancy.” Simon’s working definition of parsimony is “pattern in the phenomena.” The core focus of the present chapter is to advocate formulating parsimonious theories—descriptions, explanations, and predictions of patterns in phenomena—and to show research method fundamentals for testing such theories. Implemented decision rules by firms are parsimonious patterns which are operational algorithms (e.g., Howard and Morgenroth 1968; Morgenroth 1964); related to consumer research profiles of buyers are examples of parsimonious patterns.

In marketing, famously, Kotler (1967, p. 1) pronounced, “Marketing decisions must be made in the context of insufficient information about processes that are dynamic, nonlinear, lagged, stochastic, interactive, and downright difficult.” Yet the substantial majority of studies in the nearly 50 decades since this pronouncement continue to ignore all the decision features that Kotler describes. Gummesson (2008) urges marketing scholars and educators to accept the complexity of marketing and develop a network-based stakeholder approach—balanced centricity—epitomized by the concept of many-to-many marketing. Gummesson (2008) calls for a rejuvenation of marketing.

Reality is complex whether we like it or not. This is where network theory comes in. Its basics are simple; a network is made up of nodes (such as people or organizations) and relationships and interaction between those. Network theory is part of “complexity theory,” recognizing that numerous variables interact, that the number of unique situation is unlimited, that change is a natural state of affairs, and that processes are iterative rather than linear... But is balanced centricity a realistic objective or is it yet another professorial whim? I do not have the answer but I am convinced that if we keep fragmenting marketing and other business functions and duck complexity, context and dynamics, we will not move ahead. A change requires that we reconsider marketing basics and abandon mainstream methodological rigidity and move toward a more pragmatic and holistic research agenda. (Gummesson 2008, p. 16, 17)

Scholars before Gummesson (2008) describe the need to reconsider mainstream methodological rigidity and move toward more pragmatic and holistic (i.e. patterns or systems) research agenda. Bass et al. (1968) offer evidence that the contention that the low  $R^2$ ’s obtained in regression analysis leads to false conclusions about the ability of socioeconomic variables as well as attitudinal measures to substantially explain variance in dependent variables since  $R^2$  is a measure of a model’s ability to predict individual rather than group behavior. McClelland (1998) goes further in stressing that most researchers do not really want to explain variance in dependent variables; what they want to do is to describe, explain, and accurately predict high scores in an outcome condition (i.e., create algorithms—decision rules—that work almost all the time in providing an effective decision and avoiding bad decisions). Without likely being aware of McClelland’s (1998) contributions to asymmetric thinking, research methods, and parsimony, Ragin (2000, 2006, 2008) relies on Boolean algebra rather than the dominating use of matrix algebra-based statistical methods to offer parallel insights and methods in sociological research and beyond.

Three additional points need stressing that relate to complexity theory's focus on patterns in phenomena. First, "Scientists' tools are not neutral" (Gigerenzer 1991). Research methods and instruments shape the way we think and test theories. Thus, reviewers' question whether a given paper is trying to make a contribution to theory or method sometimes misses the point that a research paper tries to do both—as is the case here. Second, reports of model confirmation relying only on fit validity need to stop; reports that partial regression coefficients in an MRA model are significant are insufficient findings and of limited usefulness. Analysts assume that models with a better fit provide more accurate forecasts. This view ignores the extensive research showing that fit bears little relationship to ex ante forecast accuracy, especially for time series. Typically, fit improves as complexity increases, while ex ante forecast accuracy decreases as complexity increases, a conclusion that Zellner (2001) traces back to Sir Harold Jeffreys in the 1930s (Armstrong 2012). Gigerenzer and Brighton provides substantial empirical evidence supporting the focus for accuracy and theory advancement via predictive validity and not just fit validity.

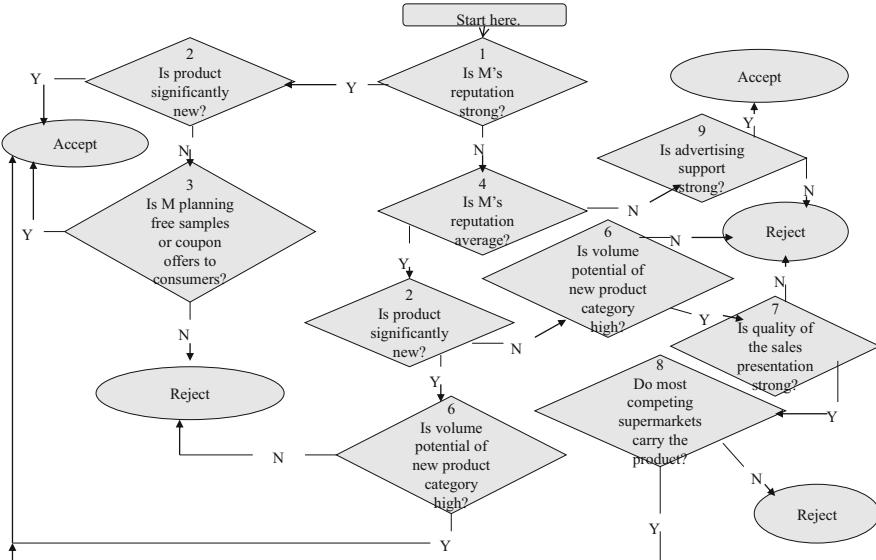
Third, "Developing the full potential of complexity theory, especially in the social sciences, requires more rigorous theory development and fewer popular articles extolling the virtues of the 'new paradigm', more studies testing the new theories and fewer anecdotal claims of efficacy, greater development of tools tailored for particular contexts, and fewer claims of universality. Without such rigor, social scientists face the danger that, despite its high potential, 'complexity theory' will soon be discarded, perhaps prematurely, as yet another unfortunate case of physics envy" (Sterman and Wittenberg 1999, p. 338). The following tenets ( $T_i$ ) and sections are steps to contribute rigor in response to Sterman and Wittenberg's (1999) call to do so.

### **T.1: A simple antecedent condition may be necessary but a simple antecedent condition is rarely sufficient for predicting a high or low score in an outcome condition**

$$X \not\rightarrow Y \quad (1)$$

For example, being male may be a necessity condition to play in the U.S. National Football League (NF) but being male is insufficient in describing or predicting membership in the NFL. Such modeling of complex antecedent conditions frequently ignores simple conditions and outcome associations that are nearly always true (e.g. males as a necessary condition for NFL membership).

A high score of a simple antecedent condition is insufficient in describing, explaining, or predicting a high score for most outcome conditions. The configurations in Fig. 1 provide examples of this tenet. Figure 1 is a summary map of decision rules representing the decisions of a professional supermarket buying committee's process of accepting and rejecting new product offerings from manufacturers. The first question asked about a new product under consideration, "Does the manufacturer have a strong reputation?" If the answer is yes, this answer is not sufficient for the committee to accept the new product for the supermarket stores.



**Fig. 1** An ethnographic decision process model of supermarket committee buying decisions of a manufacturer’s (M’s) new product offering. Source: adapted from Montgomery (1975)

The product under consideration has to pass a second hurdle, “Is the product significantly new?” If yes, the product is accepted by the selection committee. This one configuration describes one of several accept configurations in Fig. 1.

The first sufficiency model in Fig. 1 describes a recipe consistency of two features—a strong manufacturer’s reputation (R) and a new grocery product offered by this manufacturer that the committee judges to be significantly new (N). An offering having high membership in both conditions ( $R \cdot N$ ) indicates that the supermarket buying committee will accept (i.e., agree to buy) the new offering (i.e.,  $R \cdot N \rightarrow \text{Accept}$ ). The mid-level dot, “•”, indicates the logical “and” condition in Boolean algebra, that is,  $R \cdot N$  is equal to the lowest score for the recipe,  $R \cdot N$ . Thus, if  $R = .05$  and  $N = .99$ , then  $R \cdot N = .05$ . Both R and N must be high for this recipe to indicate an “Accept” outcome. Figure 2 shows that high  $R \cdot N$  is sufficient for “Accept” but not necessary—additional models (paths) appear in Fig. 1 for reaching the “Accept” decision.

A key point here is that the objective of building and examining configurations is not to explain variance but to describe and explain combinations of features which accurately indicate a high score in an outcome condition. The outcome condition could be a “Yes” decision by a supermarket buying committee to take-on a manufacturer’s new product offering or the negation of doing so, “No”, or other outcomes in different problems (e.g., a hiring decision; an employee promotion decision; a decision as to which university to apply to enter; to accept or reject a proposal to go to a movie or a marriage proposal; to select a vehicle to test drive and/or to buy). A sideways tilde (“~”) indicates the negation score of a simple



**Fig. 2** Thought experiment for thirty decisions ( $n = 30$ ) of a complex antecedent condition and a simple outcome condition: supplier reputation and newness of grocery product association with decision to carry the product. Note. In this example, each number is a case identification and represents the plot of one decision. Note that the high  $R \bullet N$  scores has high consistency with “Yes” (accept) but consistency is not 100 percent. Also note the relationship is asymmetric; low scores on  $R \bullet N$  associate with both low and high scores on the outcome condition—more than one recipe is available to get to an accept condition. As in real-life, most outcomes are to reject the new product proposals

condition; thus, “ $\sim R$ ” represents the negation of the reputation score in the supermarket buying committee example.

### T.2: A Complex antecedent condition of two or more simple conditions is sufficient for a consistently high score in an outcome condition: the recipe principle

Both nodes must have high scores in the first configuration in Fig. 1 for an accept outcome (A) to occur: reputation (R) must be high and significantly new (N) must be high. If both R and N are high, then  $A = 1.0$  is the outcome predicted to occur. Model 2 represents this one configuration of a complete decision rule for the supermarket buying committee.

$$R \bullet N \rightarrow A \quad (2)$$

A configuration score of 1.00 is the highest score possible for all configurations using Boolean algebra and calibrated scores. Calibrating scores is converting original values to a scale of 0.00–1.00. Ragin (2008) provides details on how and why scores are calibrated in creating and testing asymmetric theory using Boolean algebra versus doing so via matrix algebra and symmetrical tests (i.e., statistical hypothesis testing). Additional details on calibration appear below.

Note that calibrated scores can be dummy codes of 0.00 and 1.00 or calibrated scores can range between 0.00 and 1.00. From the information in Fig. 1, consider a manufacturer's reputation includes three levels: weak/low, average, and strong/high. These three levels can be calibrated to equal 0.00, 0.50, and 1.00. The benefits of calibrating scores and using Boolean algebra include the ability to plot complicated statement on the X axis to test the consistency of asymmetric relationships between X and Y. For example, is the statement accurate that all decisions where  $R \cdot N = 1.00$  indicate that  $Y = 1.00$ ? Consider the simulated findings from a thought experiment of thirty supermarket buying decisions testing the  $R \cdot N$  complex antecedent conditions in the XY plot in Fig. 2—a buying committee made decisions one day on 30 new products being offered by 30 different manufacturers.

Note that the X-axis in Fig. 2 displays  $R \cdot N$  and not R or N.  $R \cdot N$  is a combinatory statement. For this introduction,  $R \cdot N$  can take on two membership scores (0.0, 1.0). Note that when  $R \cdot N = 1.0$ , nearly all cases are accepted consistently—11 of 12 cases or .97 of the  $R \cdot N$  cases are accepted. The coverage by all the accepted cases by this model is high as well; this model ( $R \cdot N$ ) represents 11 of the 16 accept cases (coverage =  $11/16 = 0.69$ ). The two indexes, consistency and coverage, indicate the usefulness of a model in explaining high outcome scores. Consistency is an asymmetric metric analogous to the symmetric correlation metric; coverage is an asymmetric metric analogous to the symmetric “coefficient of determination” (i.e.,  $r^2$ ). Table 1 shows the calculations for consistency and coverage for the  $R \cdot N$  model in the thought experiment.

A useful rule of thumb to apply: for a model to be predictive of high scores for an outcome condition, consistency should greater than 0.80 and coverage should be greater than .01 (cf. Ragin 2008). A model with high consistency and very low coverage score indicates a rare bird—a model for a rare case among the cases of data—whereby this rare case associates with a high outcome score. Doug Flutie (retired American NFL and Canadian league football player) is one such rare bird: a quarterback “too short to play quarterback and win” who consistently won games. Flutie would have a high score for short (S) and in the NFL draft for quarterbacks, not short ( $\sim S = 1.00$ ) is a requirement in all NFL teams’ selection models. Thus, Flutie was almost not selected by any NFL team in the draft year he was available even though he was a Heisman Trophy winner the year of his draft (i.e., Flutie was selected as the best college football player nationally). Flutie is short; his height is less than 5'10" (1.778 m) when almost all NFL quarterbacks are tall ( $\geq 6.0'$ ).

### **T.3: A model that is sufficient is not necessary for an outcome having a high score to occur: the equifinality principle**

Additional paths occur for reaching an accept decision in Fig. 1. Table 2 summarizes six paths appearing in Fig. 1 leading to an accept decision and six paths leading to a reject decision. Equifinality is the principle that multiple paths occur which lead to the same outcome. The occurrences of different paths usually do not occur with the same frequency among the set of paths. Complexity theory informs that the equifinality principle that the occurrences of anyone feature may not be

**Table 1** Calculating consistency and coverage for a complex antecedent condition and an outcome condition

Case	R•N	A	Minimum (R•Ni, Ai)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	0.0
6	0.0	0.0	0.0
7	0.0	0.0	0.0
8	0.0	0.0	0.0
9	0.0	0.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	0.0	0.0	0.0
13	0.0	0.0	0.0
14	0.0	1.0	0.0
15	0.0	1.0	0.0
16	0.0	1.0	0.0
17	0.0	1.0	0.0
18	0.0	1.0	0.0
19	1.0	0.0	0.0
20	1.0	1.0	1.0
21	1.0	1.0	1.0
22	1.0	1.0	1.0
23	1.0	1.0	1.0
24	1.0	1.0	1.0
25	1.0	1.0	1.0
26	1.0	1.0	1.0
27	1.0	1.0	1.0
28	1.0	1.0	1.0
29	1.0	1.0	1.0
30	1.0	1.0	1.0
$\Sigma$	12.0	16.0	11.0
Consistency ( $R \cdot Ni \leq Ai$ ) = $\Sigma (\min (R \cdot Ni, Ai)) / \Sigma (R \cdot Ni) = 11.0 / 12.0 = 0.96667$			
Coverage ( $R \cdot Ni \leq Ai$ ) = $\Sigma (\min (R \cdot Ni, Ai)) / \Sigma (Ai) = 11.0 / 16.0 = 0.6875$			

Note. R = manufacturer's reputation; N = product newness; A = accept the product

necessary for reaching a given outcome. For example, a high manufacturer's reputation is not necessary as an antecedent for all accept decisions to occur.

**Table 2** Management decision paths leading to supermarket buying committee adopting versus rejecting manufacturers' new product proposals

Path	Boolean expression	Key
1. 1-2	$R \bullet N \rightarrow A$	$R$ = Reputation; $N$ = New; $A$ = Accept
2. 1-2-3 (a)	$R \sim N \bullet F \rightarrow A$	$F$ = Free samples
3. 1-2-3 (b)	$R \sim N \sim F \rightarrow R$	$\sim$ = Not; $R$ = Reject
4. 1-4-9	$\sim R \sim RA \bullet S \rightarrow A$	$RA$ = Reputation average; $S$ = ad support
5. 1-4-9 (b)	$\sim R \sim RA \sim S \rightarrow R$	
6. 1-4-2-6 (a)	$\sim R \bullet RA \bullet N \bullet V \rightarrow A$	$V$ = Volume potential
7. 1-4-9-6 (b)	$\sim R \bullet RA \bullet N \bullet \sim V \rightarrow R$	
8. 1-4-2-6 (b)	$\sim R \bullet RA \bullet \sim N \bullet V \rightarrow R$	
9. 1-4-2-6-7	$\sim R \bullet RA \bullet \sim N \bullet V \bullet \sim Q \rightarrow R$	
10. 1-4-2-6-7-8	$\sim R \bullet RA \bullet \sim N \bullet V \bullet Q \bullet C \rightarrow A$	$Q$ = quality of sales presentation $C$ = Competitors' carry new product
11. 1-4-2-6-7-8 (a)	$\sim R \bullet RA \bullet \sim N \bullet V \bullet Q \bullet C \rightarrow A$	
12. 1-4-2-6-7-8 (b)	$\sim R \bullet RA \bullet \sim N \bullet V \bullet Q \bullet \sim C \rightarrow R$	

Notes. Mid-level dot ("•") indicates the conjunctive "and". The horizontal arrow ("→") points to an accept or reject outcome

#### **T.4: Recipes indicating a second outcome (e.g., rejection) are unique and not the mirror opposites of recipes of a different outcome (e.g., acceptance): the causal asymmetry principle**

The causal asymmetry principle indicates that the study of the causes of acceptance often tells us very little about the causes of failure. Consequently, separate asymmetric models of failure (or other outcomes besides the original focus of a study on success or other positive condition) are necessary if a researcher seeks to describe and explain success versus failure, promotion versus dismissal, hiring versus rejection, and so on. The causal asymmetry principle serves as a foundation principle of complexity theory in research on "highly reliable organizations" (HROs) (Weick and Sutcliffe 2001, 2007; Weick et al. 1999). Weick and Sutcliffe (2001) identify five characteristics of HROs as responsible for the "mindfulness" that keeps them working well when facing unexpected situations: preoccupation with failure; reluctance to simplify interpretations; sensitivity to operations; commitment to resilience, and deference to expertise.

The causal asymmetry principle and the recipe principle support the suggestions that the study of "key success factors" (KSFs) (Cooper 1993; Di Benedetto 1999) using a net effects approach (Cooper 1993; Di Benedetto 1999) to explain and describe success is misleading and insufficient. No one factor is sufficient or likely necessary for success and research focusing only on success is unlikely to be very informative about the causes of failure. The literature on KSFs suggests the certain activities consistently associate with success and never with failure (e.g., submitting products to customers for in-use testing, Di Benedetto 1999), while the literature focusing on recipes proposes and finds that the same attribute can either foster or inhibit new service adoption, depending on how it is configured with other attributes (Ordanini et al. 2014; Prado and Woodside 2014). This finding and prior

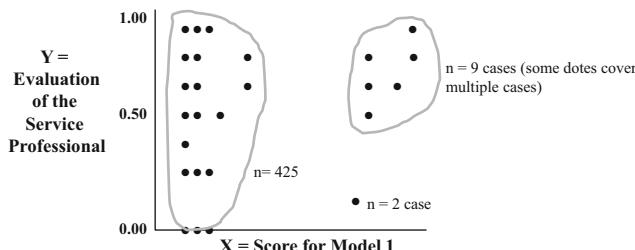
findings that an attribute can contribute positively and negatively to the same outcome depending upon the other ingredients specific recipes follows from the fifth principle of complexity theory.

**T.5: An individual feature (attribute or action) in a recipe can contribute positively or negatively to a specific outcome depending on the presence or absence of the other ingredients in the recipes**

The findings in Fig. 3 illustrate this fifth complexity principle. The findings are from a study of customer evaluations of services received from a beauty parlor and health spa (Wu et al. 2014). Four recipe models appear in Fig. 3 for customer evaluations of quality of the work by the service professional experienced by the customer. Notice that the absence of a companion visiting the beauty parlor and health spa contributes positively in the first three models but negatively in the fourth model appearing at the top of Fig. 3. The first three models include youthful customers and the fourth model includes older customers in the recipes. Rather than making blanket statements that older or younger customers rate the work of service professionals highly positively with or without being accompanied by a companion, each of the four recipes include a unique blend of ingredients to indicate that high scores on these recipes associated with high scores on the same outcome.

**T.6: For high Y scores, a given recipe is relevant for some but not all cases; coverage is less than 1.00 for any one recipe. T2.7: a few exceptions occur for high X scores for a given recipe that works well for predicting high Y scores**

Note in Fig. 3 that for 9 of the 11 cases with high X scores also have high Y scores for model 1 in the XY plot. For the two cases having low Y scores with high recipe



Model		Raw coverage	Unique Coverage	Consistency
1	~comp~servicew~housek~female~educ~age	0.026	0.026	0.941
2	~spa_expend~comp~servicew~housek~female~educ~age	0.005	0.005	0.939
3	spa_expend~comp~servicew~housek~female~edu~age	0.004	0.004	0.956
4	spa-expend~comp~servicew~housek~female~educ~age	0.033	0.033	0.938

Notes. For example, model 1 states that a case (customer) with a high score for the configuration of no companion, not a service worker, a housekeeper, female, with low education, and young will give a high score for service professional evaluations. The presence of a companion contributes either positively or negatively to the outcome (high score for service professional evaluation) depending on the additional ingredients in each particular model.

**Fig. 3** Plot for Model 1. Source: Table 7 in Wu et al. (2014, p. 1657) covering demographics, companion present/absent, and customer expenditure level on beauty/salon visits—algorithm model predicting high quality of service provider (service professional evaluation)

**Table 3** Hospitality employees' happiness and managers' evaluations of employees' in-role performances

			In-Role Performance Quality (IRP)					Very high	Total
			Very low	2.00	3.00	4.00	5.00		
Happiness Quintiles for Hospitality Employees	Very low	1.00	Count	14	8	13	10	4	49
			% within happy_segs	28.6%	16.3%	26.5%	20.4%	8.2%	100.0%
		2.00	Count	12	14	10	11	13	60
			% within happy_segs	20.0%	23.3%	18.7%	18.3%	21.7%	100.0%
		3.00	Count	10	9	9	4	7	39
			% within happy_segs	25.6%	23.1%	23.1%	10.3%	17.9%	100.0%
		4.00	Count	9	10	14	6	11	50
			% within happy_segs	18.0%	20.0%	28.0%	12.0%	22.0%	100.0%
	Very high	5.00	Count	7	6	10	12	14	49
			% within happy_segs	14.3%	12.2%	20.4%	24.5%	28.6%	100.0%
Possibly surprising findings: cases do occur of very unhappy employees with very high IRP scores and vice versa.			Count	52	47	56	43	49	247
			% within happy_segs	21.1%	19.0%	22.7%	17.4%	19.8%	100.0%

Notes. Total sample:  $\phi = 0.259$ ;  $p < 0.413$ ;  $\phi^2 = 0.07$  (very small effect size). Q1 and Q5 happiness and five quintiles for IRP:  $\phi = 0.299$ ,  $p < 0.068$ ;  $\phi^2 = 0.09$  (medium effect size). Comparing Q1 and Q5 for both happiness and IRP:  $\phi = 0.478$ ,  $\phi^2 = 0.228$  (medium-to-large effect size)

(X) scores, some additional ingredient would need to be identified to shift these two cases to the left without also shifting the other nine cases high in X. Such theory to analysis to theory to analysis pondering is a central aspect for improving on the informativeness of recipes.

### 3 Contrarian Case Analysis

From a study of employees' evaluations of their work environments including their overall happiness with their jobs, Table 3 illustrates the occurrence of contrarian cases that run counter to a large main effect. This study merges two data files; the first file includes the employees' job evaluations and the second file includes their supervisors' evaluations of the work performances of these same employees.

Table 3 reports a quintile analysis of hospitality employee happiness and their managers' in-role performance (IRP) evaluations (Hsiao, et al. 2015). A quintile analysis includes dividing the respondent cases from the lowest to highest quintile for each measured construct and examining the relationships among two or more constructs (McClelland 1998). Even though the findings for the total sample are not significant statistically, note the modest positive relationship—14 versus 4 employees very low in happiness are very low versus very high in employees' in-role performances (IRP), respectively. The distribution of the 49 very happy employees includes 14 with very high IRP scores and only 7 with very low IRP scores. The key point here relates to the occurrence of employees unhappy to very unhappy who have high to very high IRPs ( $10 + 4 + 11 + 13 = 38$  cases or 38/247 or

15.4 % of the total cases) as well as employees happy to very happy having low to very low IRPs ( $9 + 10 + 7 + 6 = 32$  or  $32/247$  or 13.0 % of the total cases. Thus, more than one-fourth of the total cases in the study exhibit two relationships counter to the symmetric relationship that happy employees are productive employees and unhappy employees are unproductive employees.

Hsiao et al. (2015) were able to offer asymmetric empirical models via qualitative comparative analysis for all four sets of relationships: unhappy and highly unproductive employees, unhappy and highly productive employees, happy and highly unproductive employees, and happy and highly productive employees. The state of happiness alone was not sufficient or necessary in their study for low or high IRP. However, employees' high IRP was sufficient for predicting high "Customer-Directed Extra Role Performances" (CDERP)—that is, "going beyond the call of duty" and doing extra actions to insure high customer happiness.

The Hsiao et al. (2015) findings on contrarian case responses are illustrative of usual occurrences among large data sets ( $n \geq 100$ ). Even when an effect size is large between two variables, cases exist in almost all large data sets that run counter to the main effects relationship. Hypothesizing main effects and moderating effects only without examining and explaining such contrarian cases represents over simplistic theorizing and handing of a data set.

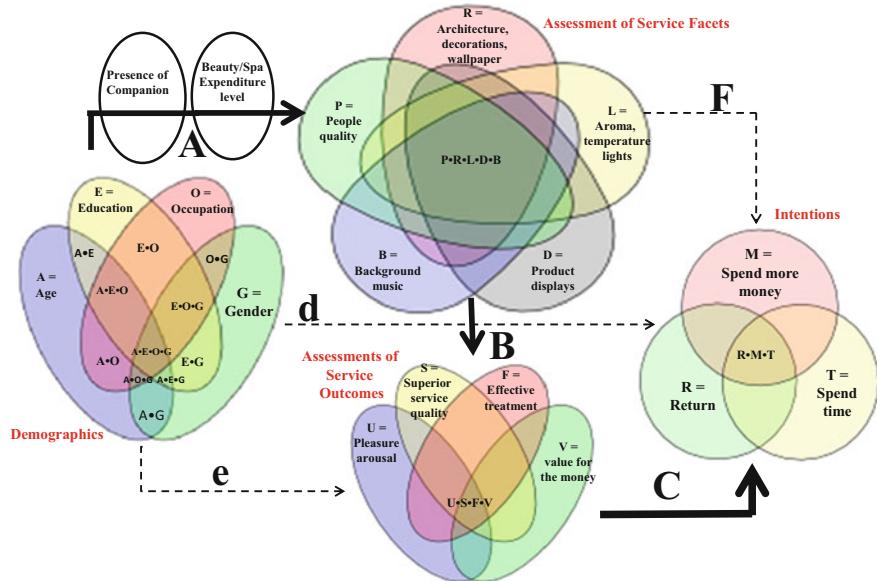
## 4 Modeling Multiple Realities

Examples of modeling multiple realities here appear in the Wu et al. (2014) study of customer evaluations of beauty parlor and health club visits. Table 4 provides examples of additional models of equifinality solutions whereby high scores on

**Table 4** Four sets of models for customer evaluations of experiences for four service facets

		Raw coverage	Unique coverage	Consistency
A.	<i>Models for arouse pleasure</i>			
1.	educ•servicew•~housek•~female	0.016	0.008	0.968
2.	edu•age•servicew•~housek	0.011	0.098	0.905
3.	~edu•~age•~servicew•~female	0.021	0.021	0.895
B.	<i>Models for delivered service quality</i>			
4.	educ•servicew•~housek•~female	0.015	0.008	0.972
5.	educ•age•servicew•~housek	0.102	0.094	0.916
C.	<i>Models for effective treatment</i>			
6.	educ•servicew•~housek•~female	0.020	0.020	0.072
7.	educ•~age•~servicew•housek•female	0.036	0.036	0.866
D.	<i>Models for high value for the money</i>			
8.	edu•servicew•~housek•~female	0.017	0.017	0.919
9.	~age•~servicew•housek•female	0.053	0.053	0.863

Source: Adapted from Table 11a in Wu et al. (2014, p. 1664)



**Fig. 4** Modeling multiple realities. Note. Thick arrows indicate propositions regarding effective algorithms; thin and dotted arrows indicate predictions of low accuracy. Source: Figure 2, Wu et al. (2014, p. 1650)

these models (i.e., complex X recipes) indicate high scores on the outcome conditions. Note in Table 4 that models include indicators of high scores for arouse pleasure, delivered service quality, effective treatment, and high value for the money. Each set of models includes different ingredients for gender; separate models include female and ~female (i.e., male). This finding illustrates the point that reporting a main effect for gender is an inadequate representation of the impact of gender on high scores for any of the four outcome conditions. Similar conclusions are supportable for the other ingredients in the four sets of models. However, high education is a necessary condition for the effective treatment outcome condition in Table 4—both of the two useful models for this outcome condition include education as an ingredient.

Figure 4 presents Venn diagrams as a way of illustrating the possibilities of the presence and absence of ingredients in complex antecedent conditions (i.e., recipes) indicating high scores in an outcome condition. For example, for demographics 16 configurations are possible visually in Fig. 4.

Actually 81 combinations are possible if you consider any one of the features having three possible impacts within a recipe: high score (e.g., old age or A), low score (e.g., young age or ~A) and age not an ingredient in the recipe). Both theory and the mechanics of the software program (available for free at [fsQCA.com](http://fsQCA.com)) are useful bases for interacting with data for information on relevant recipes. Such analyses provide a useful match among the tenets of complexity theory and the inherent complexity of relationships in data.

## 5 Conclusion

Prior studies (e.g., Armstrong 2012; Bass, et al. 1968; McClelland 1998; Montgomery 1975) identify serious problems with the near total reliance by most researchers on symmetric statistical tests and difficulties in achieving theory advances relying on such tools (Gigerenzer 1991). Gigerenzer (1991) and McClelland (1998) call attention and demonstrate the value of using asymmetric tests to both advance theory as well as provide useful empirical models of the occurrence of multiple realities. Ragin (2008) has been the principal advocate in the behavioral sciences along with Gigerenzer (1991) and Armstrong (2012) on advancing new competencies in the theory and research relevant for advancing theory-crafting and analytical skills of academic researchers in the sub-disciplines of management. Because the body of work and rigorous tools relating to complexity theory applications and fsQCA is growing in the management sub-disciplines, the present dominant logic of MRA/SEM and survey research features described in this chapter will end during the second decade of the twenty-first century. At least this prediction is what this chapter advocates and attempts to show how to accomplish.

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# Taking the Complexity Turn in Strategic Management Theory and Research

Esteban R. Brenes, Luciano Ciravegna, and Arch G. Woodside

*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 et al. 2011: 1370)

**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 tests” (SPOT) 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

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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.

**Keywords** Asymmetric • Competitive advantage • Configuration • Implemented strategy • Internationalization

## 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 configural 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 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 et al. 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 and 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 et al. 2014) rather than linear, additive, symmetric models (e.g., Conant et al. 1990; Dean and Sharmand 1996; Karna et al. 2016; Popko et al. 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 and 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 and 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  $(EBITDA_{2014}/EBITDA_{2013}) \cdot (VWemployees_{2014}/EBITA_{2014})$ , 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<sub>2014</sub>) 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 organizational strategies rather than single alternative performance metrics per model.

Following this introduction, Sect. 2 describes theory and empirical research focusing on the use of recipes in strategic management, organizational psychology, and service research. Section 3 describes core tenets of complexity theory as a general foundation bases for configuration research. Section 4 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 and Hrebiniak 1980; Woodside et al. 1999), and proposes additional tenets to Fiss' (2007, 2011) perspective on building better causal theories in strategic management. Section 5 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 6 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 percent 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; 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 et al. (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 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 et al. 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. Ordanini et al. (2014) and Fiss (2007) 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 et al. 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 Urry (2005) and Gladwell (2002) 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 its 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:  $C \bullet R \sim P \geq 0.95$  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 performance with additional samples of firms. The sixth proposition is in response to Armstrong's (2012), McClelland's (1998) and Gigerenzer and Brighton's (2009) advocacy of the necessity of testing for predictive validity with additional samples and not only for fit validity.

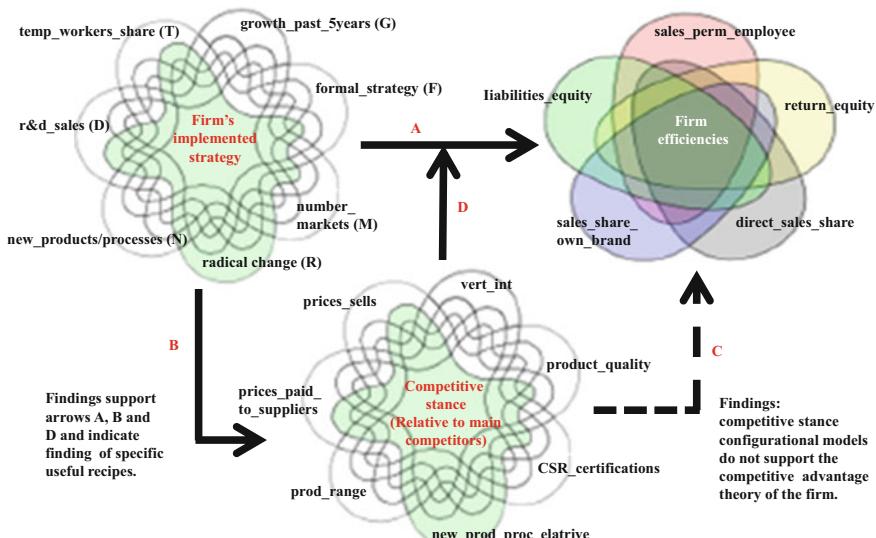
#### **4 Configural Theory of Firm Realized Strategies, Competitive Marketing Stances, and Performance Efficiencies**

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 and 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 configurational firm-level efficiency outcomes.

Figure 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:  $T \cdot G \cdot \sim R \cdot \sim D \cdot V \cdot P$  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). Figure 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



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

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 and 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.

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 ( $T \rightarrow E$ ) and empirical regularities to theory ( $E \rightarrow T$ ) 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  $T \rightarrow E$  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:

$$T \cdot F \cdot G \cdot \sim R \cdot \sim D \leq ROE \cdot \text{Own\_brand} \quad (1)$$

$$\sim T \cdot N \cdot G \cdot R \cdot D \leq ROE \cdot \text{Own\_brand} \quad (2)$$

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 regularities. While  $T \rightarrow E$  “glorifies hypothetico-deductivism and the significant difference philosophy” (Hubbard 2016, p. 78), “the significant sameness model  $[(E \rightarrow T)]$ , however, emphasizes that by means of inductive enumeration the empirical regularities must come *first*. In this bottom-up ( $E \rightarrow T$ ) 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  $E \rightarrow T$  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 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  $T \rightarrow E$  and  $E \rightarrow T$  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 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 configurational 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 of 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.

**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 et al. (2010); Dibrell et al. (2016); Miller and Cardinal 1994; Pearce et al. 1987; Schwenk and 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 1903, 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].”

**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 et al. 2013; Pangarkar 2008; Thomas and 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 15–20 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

**Table 1** Models for high ROE

Model	Radical_△	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	0.15
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

regression analyses becomes intractable and do not adequately capture the complexity involved among a reasonable number of antecedent conditions (i.e., 3–7) 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  $p < .05$  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.

**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 and 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 and 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:

$$\sim F \bullet M \bullet R \bullet G \leq \sim ROE \bullet Liabilities\_equity \quad (3)$$

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 organisational 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 and 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.

**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 et al. 1994; Cooper and 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 et al. (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 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.

**Investment in R&D** A large scale meta-analysis (Capon et al. 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 and 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 et al. 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.

**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 et al. 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 more than 25 will be high in performance. This finding is based on a thought experiment, a

hunch that  $\sim T \bullet L$  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 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.

**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 and 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 and Collopy 1996, p. 197). Anterasian et al. (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 and

Collopy 1996; Capon et al. 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 closest 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:

$$\text{ROE} \bullet \sim \text{L/E} \bullet \text{sales\_share\_own\_brand} \bullet \text{sales\_per\_permanent\_employees} \quad (4)$$

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 specific countries: Costa 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 et al. 2009).

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 2013–2014, 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 (Charlene et al. 2011). 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. 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 (1–7) 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 = .5; yes = 1)

- strategy changed radically during the past 5 years (no = 0; partially = .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).

## 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 (2014).

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 ( $C1 \geq 0.85$ ) and coverage scores indicating a few-to-many cases ( $C2 \geq 0.02$ ). 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  $C1 \geq 0.85$ . 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 less than one percent 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.

### 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 of 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 test (SPOT) 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. Figure 2 is an XY plot of the cases for model 1 and ROE as a simple outcome condition. Figure 2 provides an example of SPOT: 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,  $Z = 2.019$ ,  $p < .05$  that the observed proportion (0.82) for the high scores provide high scores for the outcome condition.

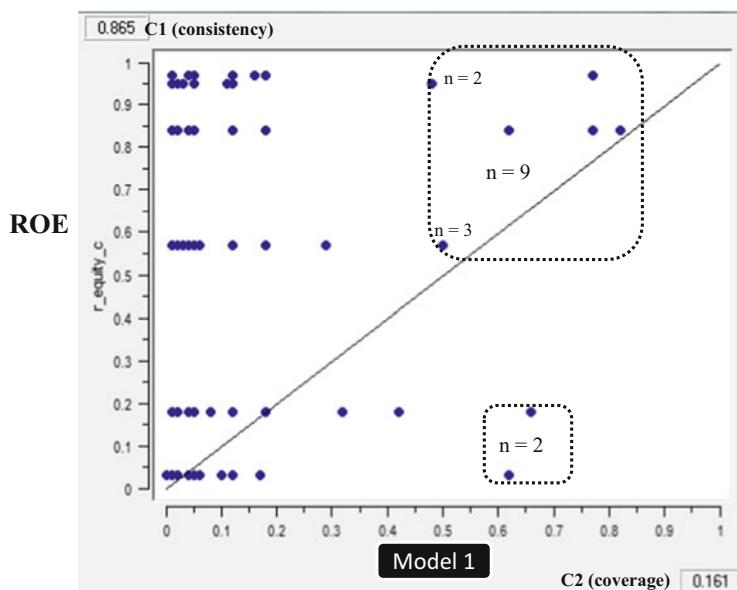
**Table 2** Models for high negation of ROE

Model	Radical $\Delta$	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	0.08
3	•	~	~	~	•	•		0.94	0.19
4	•	~	~	•		•	•	1.00	0.19
5	~	•	~	~	~	~	•	0.99	0.01
6	~	•	~	~	~	~	•	0.98	0.11
7	~	~	~	•	~	~	•	0.98	0.12
8	~	•	~	•	•	•	•	0.94	0.10
9	•	•	~	•	•	•	~	1.00	0.04

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



**Fig. 2** Plot for model 1 indicating high ROE: Radical  $\Delta$  • R&D\_sales • growth\_5\_years • ~ temp\_share • markets • formal\_plans  $\leq$  ROE. Notes. Example of somewhat precise outcome test (SPOT). Nine of eleven cases (firms) above 0.45 in scores for model 1 have calibrated ROE scores 0.58 or higher. Different dots indicate up to five cases (firms)

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.

### **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.

### **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 is 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.

**(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 et al. (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.

**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.

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

**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.

**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.

**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.

**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.

**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.

**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., Dan et al. 1979; Osterman 1987; Shaw et al. 2005) indicate a positive main effect and some indicate a negative main effect of temp share on ROE.

**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.

**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 indicates 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.

**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.

**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

**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

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.

### 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 Specific 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 tests (SPOTs) 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 SPOT 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.

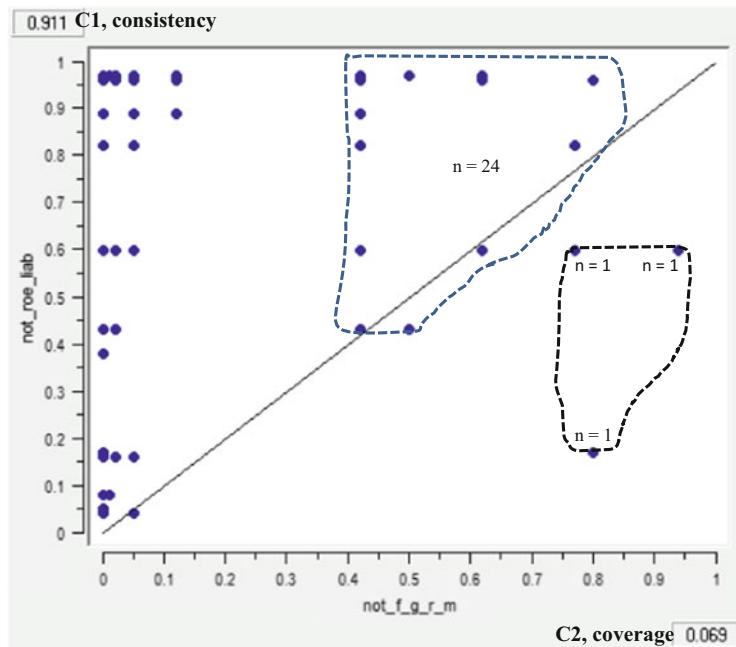
These analyses included computing fuzzy set scores for the complex antecedent and outcome conditions for models 1 and 2 appearing earlier. The consistency (C1) indexes for both models 1 and 2 are too low to indicate usefulness in accurately predicting high scores for ROE•Own-brand:

1.  $T \cdot F \cdot G \cdot \sim R \cdot \sim D \leq ROE \cdot Own\_brand$ ; C1 = 0.51 and C2 = 0.14
2.  $\sim T \cdot N \cdot G \cdot R \cdot D \leq ROE \cdot Own\_brand$ ; C1 = .067 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.  $\sim F \cdot M \cdot R \cdot G \leq \sim ROE \cdot Liabilities\_equity$ , C1 = 0.91 and C2 = 0.07.

Figure 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 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



**Fig. 3** Findings for model 3:  $\sim F \bullet G \bullet R \bullet M \leq \sim ROE \bullet Liabilities/ROE$ . Key. F = formal planning; G = prior 5 years sales growth; R = radical change; M = number of markets served (internationalization). Note. Each dot 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

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. $ROE \bullet \sim L/E \bullet sales\_share\_own\_brand \bullet sales\_per\_permanent\_employees$ .

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).

**Table 4** Cross-validation of models

**Table 4a**  
**Model for ROE for Costa Rica Data and Predictive Validities (C1 = Consistency; C2 = Coverage)**

<u>Nation</u>	<u>Radical <math>\Delta</math></u>	<u>R&amp;D/sales</u>	<u>Gro 5yrs</u>	<u>Temp share</u>	<u>Num markets</u>	<u>New prods/procs</u>	<u>Formal plan</u>	<u>C1</u>	<u>C2</u>
Costa Rica	~	~	•	~	•	~	•	0.82	0.10
El Salvador								0.69	0.07
Guatemala								0.99	0.08
Nicaragua								0.86	0.06

<u>Nation</u>	<b>Model for ROE for El Salvador Data and Predictive Validities</b>							<u>C1</u>	<u>C2</u>
	<u>Radical <math>\Delta</math></u>	<u>R&amp;D/sales</u>	<u>Gro 5yrs</u>	<u>Temp share</u>	<u>Num markets</u>	<u>New prods/procs</u>	<u>Formal plan</u>		
Costa Rica								0.63	0.09
El Salvador	~	~	•	~	~	•	•	0.82	0.20
Guatemala								0.85	0.12
Nicaragua								0.32	0.09

<u>Nation</u>	<b>Model for Guatemala Data and Predictive Validities</b>							<u>C1</u>	<u>C2</u>
	<u>Radical <math>\Delta</math></u>	<u>R&amp;D/sales</u>	<u>Gro 5yrs</u>	<u>Temp share</u>	<u>Num markets</u>	<u>New prods/procs</u>	<u>Formal plan</u>		
Costa Rica								0.84	0.09
El Salvador								0.46	0.08
Guatemala	•	~	•	•	•	•	•	0.96	0.12
Nicaragua								0.56	0.07

<u>Nation</u>	<b>Model for Nicaragua data and Predictive Validities</b>							<u>C1</u>	<u>C2</u>
	<u>Radical <math>\Delta</math></u>	<u>R&amp;D/sales</u>	<u>Gro 5yrs</u>	<u>Temp share</u>	<u>Num markets</u>	<u>New prods/procs</u>	<u>Formal plan</u>		
Costa Rica								0.72	0.13
El Salvador								0.55	0.09
Guatemala								0.87	0.12
Nicaragua	•	•	•	~	•	•	•	0.95	0.23

## 8 Findings for Implemented Straties 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–d 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 4 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 4 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 ( $C_1 = 0.85$ ) in identifying firms with high ROE. This El Salvadoran model has low predictive validity for firms in Costa Rica ( $C_1 = 0.63$ ) and Nicaragua (0.32). Thus, while an implemented strategy in the form of a complex statement is 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 ( $C_1 = 0.84$ ) 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 ( $C_1 = 0.95$ ). 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 ( $C_1 = 0.87$ ) 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 and Collopy 1996; Armstrong and 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.

**Table 5** Implemented strategy models for ROE with the competitive advantage possible addition of Pay\_lo & Sell\_hi): an examination of findings for arrow 4 in Fig. 1 proposition

Model	Model: r_equity_c = f(r_d_sales_c, past5gro_c, temp_share_c, markets_c, newcreate_c, rad_chg_c, formal_strat_c, paylo_sellhi_c)	Coverage	Consistency
Implemented strategy models with competitive advantage feature (paylo_sellhi )			
1	past5gro_c*c~temp_share_c*markets_c*newcreate_c*rad_chg_c*c*formal_strat_c*paylo_sellhi_c	0.11	0.87
2	r_d_sales_c*past5gro_c*c~temp_share_c*markets_c*newcreate_c*rad_chg_c*c*formal_strat_c	0.12	0.88
3	r_d_sales_c*c*past5gro_c*c~temp_share_c*newcreate_c*rad_chg_c*c*formal_strat_c*paylo_sellhi_c	0.12	0.89
4	r_d_sales_c*c~past5gro_c*c~temp_share_c*markets_c*newcreate_c*rad_chg_c*c*formal_strat_c*paylo_sellhi_c	0.03	0.87
5	r_d_sales_c*c*past5gro_c*c~temp_share_c*markets_c*newcreate_c*c*rad_chg_c*c*formal_strat_c*paylo_sellhi_c	0.06	0.85
6	r_d_sales_c*c*past5gro_c*c~temp_share_c*markets_c*c~newcreate_c*rad_chg_c*c*formal_strat_c*paylo_sellhi_c	0.06	0.88
Solution coverage: 0.25; solution consistency: 0.86			

**Table 6** Implemented strategy models for the negation of ROE with the competitive advantage possible addition of Pay\_lo & Sell\_hi; an examination of findings for arrow 4 in Fig. 1 proposition

Model	Model: not_roe_c = f (paylo_sellhi_c, r_d_sales_c, past5gro_c, temp_share_c, markets_c, newcreate_c, rad_chg_c, formal_strat_c)	Coverage	Consistency
Models for implemented strategy with the competitive advantage feature (pay_low AND price_hi)			
1	paylo_sellhi_c*~r_d_sales_c*~past5gro_c*temp_share_c*~markets_c*rad_chg_c*formal_strat_c	0.07	0.96
2	paylo_sellhi_c*~r_d_sales_c*~past5gro_c*~temp_share_c*~markets_c*~newcreate_c*~rad_chg_c*~formal_strat_c	0.05	0.97
3	~paylo_sellhi_c*~r_d_sales_c*~past5gro_c*~temp_share_c*markets_c*~newcreate_c*~rad_chg_c*~formal_strat_c	0.05	0.97
4	~paylo_sellhi_c*~r_d_sales_c*~past5gro_c*~temp_share_c*~markets_c*~newcreate_c*rad_chg_c*~formal_strat_c	0.02	0.98
5	~paylo_sellhi_c*~r_d_sales_c*~past5gro_c*temp_share_c*markets_c*~newcreate_c*rad_chg_c*~formal_strat_c	0.03	0.96
6	~paylo_sellhi_c*~r_d_sales_c*~past5gro_c*temp_share_c*markets_c*~newcreate_c*~rad_chg_c*formal_strat_c	0.06	0.99
7	~paylo_sellhi_c*~r_d_sales_c*~past5gro_c*temp_share_c*markets_c*~newcreate_c*rad_chg_c*~formal_strat_c	0.02	0.96
Solution coverage: 0.22; solution consistency: 0.97			

The present study moves beyond Fiss's (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 than 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 and Wilson 1977). Future research and theory testing would benefit from completing separate interview 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 configurational 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. In closing, Gigerenzer's (1991, p. 254) wisdom is worth repeating, "Scientist tools are not neutral."

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# The Complexity Turn in Human Resources Theory and Research

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*Relationships between variables can be non-linear with abrupt switches occurring, so the same “cause” can, in specific circumstances, produce different effects.*  
*(“The Complexity Turn”, Urry 2005).*

**Abstract** This study proposes and tests empirically a configural asymmetric theory of the antecedents to hospitality employee happiness-at-work and managers' assessments of employees' quality of work-performance. The study confirms and goes beyond prior statistical findings of small-to-medium effect sizes of happiness-performance relationships. The study merges data from surveys of employees ( $n = 247$ ) and surveys completed by their managers ( $n = 43$ ) and by using qualitative comparative analysis via the software program, [fsQCA.com](#). The study analyzes data from Janfusan Fancyworld, the largest (in revenues and number of employees) tourism business group in Taiwan; Janfusan Fancyworld includes tourist hotels, amusement parks, restaurants and additional firms in related service sectors. The findings support the four principles of configural analysis and theory construction: recognize equifinality of different solutions for the same outcome; test for asymmetric solutions; test for causal asymmetric outcomes for very high versus very low happiness and work performance; and embrace complexity. Additional research in other firms and additional countries is necessary to confirm the usefulness of examining algorithms for predicting very high (low) happiness and very high (low) quality of work performance. The implications are substantial that configural theory and research will resolve perplexing happiness-performance

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conundrums. The study provides algorithms involving employees' demographic characteristics and their assessments of work facet-specifics which are useful for explaining very high happiness-at-work and high quality-of-work performance (as assessed by managers)—as well as algorithms explaining very low happiness and very low quality-of-work performance. The study is the first to propose and test the principles of configural theory in the context of hospitality frontline service employees' happiness-at-work and managers' assessments of these employees quality of work performances.

**Keywords** Configuration • Customer-directed extra role performance • Demographics • Employee happiness-at-work • In-role performance • Work facet-specifics

## 1 Introduction

Warr (2007) emphasizes three principal domains of happiness: context-free or a person's chronic state of happiness; domain-specific happiness covering only feelings in a targeted domain (e.g., happiness at home with family members, happiness at work), and "facet-specific" happiness focusing on particular aspects of a domain, such as your pay, physical surroundings at work, or your boss. "Many publications appear to be based on the assumption that causes and consequences are the same at each level of scope. They are not, and must be distinguished from each other" (Warr 2007, p. 726).

The study here focuses on the relationships among the second and third domains of happiness—how they relate to each other among hospitality front-line service employees (HFSE) as well as work-domain and work facet-specific happiness associating with managers' assessments of work performances of HFSEs. The study advances theory for solving the happiness-performance conundrum: estimates indicate a small-to-medium effect size (Cohen 1977) of the relationship of employee work-domain happiness and managers' assessment of employee work-performance with some studies indicate no significant relationship as well as occurrence of a number of cases of employees very low in work-domain happiness with very high performance assessments and employees with high work-domain happiness with very low performance assessments. The theory and empirical findings in this report serve to increase understanding and explanation of the contexts when the positive effect sizes for happiness-performance associations are small versus large as well as the contexts when work-domain happiness and work performance associate negatively.

This study includes an empirical test of the theory via the collection and merging of two data files—HFSEs' of facets-specific and work-domain happiness and their managers' assessments of these employees' work in-role performance (IRP) and their customer-directed extra-role performance (CDERP). Bettencourt, Bettencourt and Brown (1997), Gwinner and Meuter (2001), and Karatepe (2013) suggest that

CDERP is the extra effort of employees when providing service to customers that raises the quality and positive perception of the service given. While the relationship between IRP and CDERP is positive and the effect size is large for this relationship, hospitality managers in the present study emphasized the need to assess both—and managers and employees were able to distinguish between IRP and CDERP as overlapping but unique domains.

Following this introduction, section two provides a brief review of relevant literature on employee work-domain happiness and managers' performance assessments. Section three introduces a configural theory of alternative antecedent recipes associating with high employee work-domain happiness, IRP, and CDERP. Section 4 describes the method of the empirical study to test the theory. Section 4.5 presents the findings of the study. Section 5 is a discussion of the findings, includes limitations of the empirical study, and concludes with implications to theory and practice and suggestions for future research.

## 2 Employee Work-Doman Happiness and Managers' Assessment of Employee Performance

Lyubomirsky et al. (2005) provide an extensive meta-analysis of general and specific categories of happiness and success. Their overall assessments of work-life happiness and success indicate a small-to medium effect size (a weighted mean  $r = .20$  for 19 cross-sectional studies and a weighted  $r = .05$  for 11 longitudinal studies).

The Lyubomirsky et al. (2005) meta-analysis summarizes findings across all three levels of happiness and various domains of work-related success. Drilling down to the relationship between work-related happiness and managers' assessments of employee work performance indicates a small effect size. Work performance may be more strongly predicted by general well-being than by job satisfaction. "In two studies, Wright and Cropanzano (2000) report that job performance, as judged by supervisors, was significantly correlated with well-being ( $r$ 's of .32 and .34, respectively), but uncorrelated with measures of job satisfaction ( $r$ 's of  $-.08$  and  $.08$ , respectively)" (Lyubomirsky et al. 2005, p. 822). Adopting the perspective that "job satisfaction" and "employee-at-work happiness" are analogous concepts, the Lyubomirsky et al. (2005) general conclusion of a "robust" positive relationship between happiness and success ("robust" appears eight times in their meta-analysis) fails to hold for the nitty-gritty findings for employee work-happiness and managers' assessment of employee work performance.

Additional reviews (Iaffaldano and Muchinsky 1985; Judge et al. 2001; Vroom 1964) confirm that the uncorrected relationship between job satisfaction and performance is modest. However, Fisher (2010) emphasizes that when corrections for unreliability and sampling error are applied, meta-analytic studies show moderate

relationships between job satisfaction and both core and contextual performance (Judge et al. 2001; LePine et al. 2002).

Rather than continuing to examine the issue of how large is the effect size between employee job happiness and managers' evaluations of employee job performance, the study here proposes redirecting focus on examining the complex antecedent conditions associating with very high and low happiness-at-work as an outcome as well as the configural conditions that include very high (low) happiness and manager's assessments of very high (low) job performance as an outcome condition.

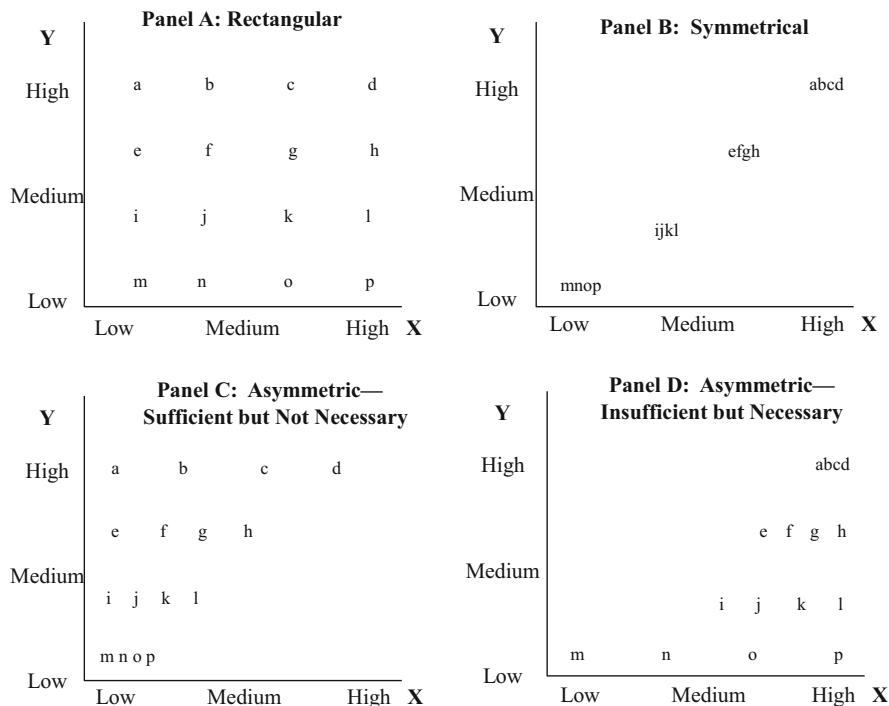
### **3 Configurational Theory of Antecedents and Outcomes of Employee Happiness-at-Work and Manager's Assessment of Job Performance**

Heretofore happiness-success research and modeling makes use almost exclusively of symmetric tests of statistical hypotheses—tests such as analysis of variance (ANOVA), multiple regression analysis (MRA) and structural equation modeling (SEM). Such statistical tools implicitly assume and test symmetrical theory, that is, a high value in an independent variable (i.e., X, one construct or an equation containing several constructs) relates closely with a high value in a dependent variable (Y) and low value in the same independent variable relates closely with a low value in the same dependent variable. The symmetric perspective builds from the assumption of sufficiency and necessary of the relationship between X and Y—for Y to be high, X must be high; for Y to be low, X must be low.

#### ***3.1 General Configural Theory***

Most real-life contexts include asymmetrical relationships quite often and only rarely symmetrical ones (Ragin 2008). Panel B in Fig. 1 illustrates the symmetrical stance. Panels C and D illustrate two symmetrical stances. Panel C illustrates the sufficiency but not necessary relationship. Panel D illustrates the necessary but not sufficiency stance. (Panel A shows a rectangular distribution of cases, that is, no relationship other than a random distribution of Y's for X's.)

The insight, “Scientists’ tools are not neutral” (Gigerenzer 1991, p. 19) and the limitations of examining theoretical relationships empirically using symmetric statistical tests have lead researchers in marketing (Bass et al. 1968), in psychology (McClelland 1998), in sociology (Ragin 2008), in management (Fiss 2007; 2011), and in tourism (Woodside et al. 2011) to call for building and testing theory using algorithms from an asymmetric stance. For example, in building models which predict success at work McClelland (1998) advocates focusing theory and tests on



**Fig. 1** Rectangular, symmetrical and asymmetrical relationships: Hypothetical plots of 16 cases (a through p) for outcome Y and complex or simple causal statement X

“competency-qualification algorithms” following the identification of “critical frequencies” (i.e., tipping points, see Gladwell 1996) or levels that best distinguish between “outstanding” and “typical” executives.

Because data are noisy (i.e., construct values near the median for an independent variable associate frequently with a wide range of values for a dependent variable), quite often individual (case-level) memberships within level 5 (highest) versus level 1 (lowest) among quintiles are representative of critical frequencies (i.e., “tipping points”). For example, while the correlation for the total set of data in the current study employee happiness-at-work and job performance equals .17 ( $p < .009$ , a small-to-medium effect size,  $n = 243$ ), a comparison of distributions of the critical frequencies within quintiles 1 and 5 for low/high happiness and low/high performance results in a large effect size ( $\phi = .48$ ,  $p < .003$ ,  $n = 38$ ). Details appear below.

Both in theory and in real-life contexts, researchers and executives seek in particular to build algorithms accurate in identifying exceptional employee outcomes (e.g., algorithms that identify individuals either very high or very low in happiness and/or job performance). McClelland (1998) emphasizes examining and reporting antecedents for high versus typical employee performance in terms of symmetrical tests (e.g., ANOVA, correlation, MRA, SEM) understates and

misrepresents the significance of the focal relationship while configural statements based on tipping-points provide highly useful “competency algorithms.” For a classification of “outstanding” versus “typical” performer, the competency algorithm McClelland (1998, p. 334) reports requires a case (i.e., individual executive) to achieve “for at least 1 of the 3 individual-initiative competencies, 1 of the organizational competencies, and 6 of the 12 valid competencies overall.”

Ragin (2010) advances theory and provides useful software ([fsQCA.com](http://fsQCA.com)) for model-building and empirical-testing alternative algorithms that identify cases with high (or low) focal outcomes consistently. An algorithm is a conjunctive statement that requires the presence of two-or-more conditions in a given case for a favorable (unfavorable) conclusion or decision. For example, the following algorithm predicts high performer and is a complex antecedent condition (a recipe) that combines four simple antecedent conditions: a frontline employee who is happy-at-work, works well with other employees, never causes peer conflicts, and always arrives to work on-time is a high performer. This configural statement does not tell us that exhibiting this recipe is the only recipe that results in the identification of a high performer; the statement says only that an employee high in all four ingredients is a high performer. The statement indicates sufficiency but not necessity.

Configurational analysis stresses four principles in study of antecedent conditions affecting an outcome. The first is the principle of equifinality, that is, “a system can reach the same final state, from different initial conditions and by a variety of different paths” (Katz and Kahn 1978, p. 30). While “unifinality” assumes the occurrence of one optimal configuration, equifinality assumes that two or more configurations can be equally effective in achieving high performance within the same context (Fiss 2007; Galunic and Eisenhardt 1994; Gresov and Drazin 1997). Thus, two frontline employees may be both very happy-at-work but for different combinations of antecedents.

The principle of asymmetry relationships is the second principle of configural analysis. Statistical tests such as multiple regression, structural equation modeling, and analysis of variance test for the presence of symmetric relationships. However, large effect sized (e.g., correlations above .60) rarely occur and usually occur only for tests for reliability (e.g., coefficient alpha). Real-life is most often made up of asymmetric relationships between simple and complex X scores and Y scores as appearing in panels c and d in Fig. 1.

The principle of complexity is the third tenet of configural analysis. Emergence is a central idea to the principle of complexity: It is not that the sum is greater than the size of its parts—but that there are system effects that are different from their parts (Jervis 1997; Urry 2005). The complexity principle supports a shift from reductionist analyses to those that involve the study of complex adaptive (“vital”) matter that shows ordering but which remains on “the edge of chaos” (Urry 2005, p. 1). Thus, the configural analysis focus is a shift away from examining/deconstructing the net effect of each independent variable, interactions, moderating, mediator, and total effects to the study of alternative causal configurations or recipes that consistently result in a given outcome of interest (cf. Ragin 1997)—such as high employee happiness or employee work performance. Ragin (1997)

refers to this paradigm shift as “turning the tables: how case-oriented methods challenge variable oriented methods.”

The butterfly effect is relevant for the study of operations of the complexity principle—if combined in certain configurations with other antecedents, the flapping of a butterfly wings in a nearby location contributes to a huge impact in a distant location (see Lorenz 1961). Consequently, the relevant issue is not to focus on the net effect of each independent variable but on the totality of testing each complex combination of antecedent conditions.

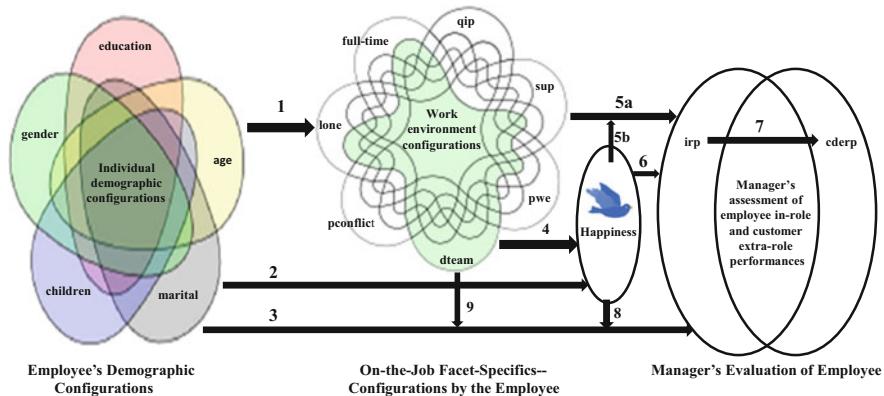
The principle of complexity goes beyond the butterfly effect to include reversals of what variable-based research describes as “main effects.” Reversals of influence of a simple antecedent condition on an outcome condition can occur depending upon the other ingredients in alternative configurations. Thus, high happiness may occur in 6 of the 9, and low happiness may occur in 2 of the 9, complex configurations associating with high performance—a statement that illustrates that high happiness is not a necessity for high performance among all employees. In this brief thought experiment, the state of employee happiness is irrelevant in 1 of the 9 configurations. All 9 configurations are relevant to one or more employees with high happiness-at-work uniquely or in overlapping relationships; the 9 configurations may “explain” most but not all cases of high happiness among a sample of employees.

Third, configural theory also stresses the principle of causal asymmetry, that is, the causes leading to the presence of an outcome of interest may be quite different from those leading to the absence of the outcome (Ragin 2008). The use of “cause” here refers to relevant association and not causation from the perspective of true experiments with treatment and control groups and random assignment of cases to groups. A highly negative score for one minus happiness-at-work is an indicator (but not necessarily the same concept) of high unhappiness. The principle of causal asymmetry suggests that high unhappiness is not an ingredient necessarily in all configurations that lead to low performance even if high happiness appears in nearly all algorithms associating with high performance.

### 3.2 *Happiness-Performance Configural Theory*

Figure 2 is a visual summary of a configural theory of complex antecedent conditions leading to high as well as low happiness and high as well as low employee work performances (IRP and CDERP). The Venn diagrams in Fig. 2 are to suggest the adoption of the perspective of configural influence on outcome conditions.

The arrows in Fig. 2 illustrate testable propositions of seven principal associations: (1) demographic configurations influence on facet-specific domains of work; (2) demographic configurations influence on happiness-at-work; (3) demographic configurations influence on employee IRP; (4) configurations of facet-specific domains-of-work influence on happiness; (5a) configurations of facet-specific domains-of-work influence IRP; (5b) happiness affects 5a; (6) happiness as a



**Fig. 2** Configural Modeling Associations with Very High/Low Hospitality-Service Employee Work Contexts, Very High/Low Happiness, In-Role, and Customer-Directed Extra Role Performances. Key: dteam = job demands of teamwork; cderp = customer-directed extra role performance; irp = in-role performance; lone = do not join social activities with my colleagues; pconflict = peer conflict; pwe = physical work environment pleasing; qip = quality of interpersonal relationships; sup = supervisor support

stand-alone antecedent influences IRP; and (7) IRP's stand-alone influences CDERP.

### 3.3 The Relevancy of Demographics to Happiness-at-Work

The literature on the net effects of employee demographic variables on work performance is vast and summaries are available (e.g., Kossek and Ozeki 1998; Sloan 2012; Warr 2007). Kossek and Ozeki's (1998) meta-analytic (using effect sizes of correlations) findings show that regardless of the type of measure used (bidirectional work-family conflict, work-to-family, family-to-work), a consistent negative relationship exists among all forms of work-family conflict and job and/or life satisfaction.

Using survey response data ( $n = 1380$ ) to a questionnaire distributed to a random sample of 2500 employees working in career service positions of one state in the southern USA ("career service jobs") are all positions in the state in which the workers do not serve the governor directly, Sloan (2012) examined how demographic and job characteristics influence self-management of job-happiness. From symmetric tests (MRA) and focusing on net effects of demographic influences on job-happiness, Sloan (2012, p. 13) concludes, "... men manage their happiness at work more than women ( $b = -.153$ ). In other words, compared to men women are more expressive of happiness at work." Sloan also reports:

Among the demographic variables and controls, whites and married respondents reported less happiness management than the non-whites and non-married workers

and older workers manage their happiness more than younger workers. Interestingly, age and race are very strong predictors of happiness management ( $b = .153$  and  $b = -.142$ , respectively). Along with men, the older workers and non-white workers put an effort into appearing emotionless (or at least, joyless) while working. In addition, income and education have significant negative associations with happiness management; however, these effects are explained with the addition of the job characteristic variables (Sloan 2012, pp. 14–15).

While the present study focuses on theory and model testing to identify hospitality service-employees very (and low) in happiness and not how well workers manage happiness, the point here is that focusing on the symmetric main effects of demographic variables on happiness management or high (low) happiness conditions provides less useful information than the asymmetric combinatory effects of demographic antecedents in identifying outcomes such as very high happiness or very high job performance.

For example, asymmetric outcomes are likely to show that the algorithm of young, unmarried, females, employee with children and low education are low in happiness at work due to the high demands and conflicts of work-family requirements. Considering quintile 1 and 5 for age and education along with two categories each for gender, employment status, and children, the total number of combinations is 32. For the expressed algorithm to be highly accurate/useful in indicating cases of low happiness, all or nearly all cases fitting into the segment (i.e.,  $\sim h \leq \sim \text{age} \bullet \text{children} \bullet \sim \text{education} \bullet \text{female} \bullet \sim \text{married}$ ) would be low in job-happiness. In the Boolean statement the tilde (“ $\sim$ ”) expresses negation and the mid-level dot (“ $\bullet$ ”) expresses the logical “and” condition. This one statement indicates only that high scores in the negation of happiness will not occur when the complex statement scores are high and high scores in  $\sim$ happiness will occur for young AND female employees AND having low education AND having children, AND working part-time. The statement says nothing about cases (i.e., employees) with low scores on this one Boolean algebra statement—some of the cases not in this segment will be high and some will be low in happiness.

Because causal asymmetry occurs frequently in real-life, the assumption is often inaccurate that the mirror opposite of the complex statement indicates the opposite outcome. However, theory might suggest that older AND male employees AND high education, AND working full-time are high in happiness (with children not contributing (being unnecessary)) in predicting high happiness accurately. (The following empirical study does support both models—the first for not happy-at-work ( $\sim h$ ) and the second for happy-at-work ( $h$ ).)

The theory and analysis does not claim that all employees who are very high (or very low) in job-happiness are identifiable by complex statements of demographic conditions. The theory and analysis only states that some complex statements are accurate in identifying employees who are very high (or very low) in job-happiness. For some cases of the data, complex demographic-statements alone may be insufficient or irrelevant in identifying very high (low) happy employees or employees with very high (low) job performances; antecedents other than

demographics (e.g., emotions relating to job facet-specifics) may be necessary and informative in providing necessary information for identifying such cases.

In general terms, considering highest and lowest quintiles and two categories of gender and the absence and presence of children, the inclusion of five demographics in a study of configural influences of demographics on happiness and job performance implies that combinations of two-to-five of these simple antecedents will be useful in predicting very high (low) happiness-at-work and very high (low) work performance. An “accurate parsimonious configural model” indicates that fewer than all the available antecedents are necessary for accurately predicting an outcome of interest—such as the model indicating that older-married-males working full-time are very high in happiness-at-work with no need to consider whether or not they are fathers.

### **3.4 Work Facet-Specifics**

The study proposes configurations of seven work facet-specifics influence happiness-at-work and work performance. The seven appear in a flower-like Venn diagram in the center of Fig. 2; this diagram illustrates all possible two-way to seven-way combinations of the seven simple antecedent conditions. Thus, theory includes the proposition that parsimonious models (most likely of three-to-six very high and low combinations of the seven facet-specific antecedents) associates with very high (low) happiness and very high (low) work performance.

For example, the study proposes and tests the following work facet-specific statements. Very high happiness associates with the combination of full-time employment, low peer conflict, highly pleasing work environment, high-quality interpersonal relationships, and high supervisory support. Very low happiness associates with part-time employment, not joining social activities with colleagues at work (lone), and not having a pleasing work environment. The following Boolean statements represent these two propositions:

$$\begin{aligned} h \leq \text{full-time} \bullet \neg \text{conflict} \bullet \text{pleasing} \bullet \text{high-quality-interpersonal} \bullet \\ \text{high-supervisory-support} \\ \neg h \leq \neg \text{full-time} \bullet \text{lone} \bullet \neg \text{pleasing}. \end{aligned}$$

Considering two levels of part versus full-time and quintile 1 versus 5 for the other six antecedents, a total of 128 combinations are possible theoretically for the seven antecedents—but additional combinations can be relevant if only two to six simple antecedents are necessary for predicting high scores in happiness and/or job performance. The general proposition for work facet-specific antecedents is that a few configurations of these antecedents are useful for predicting very high (low) happiness and very high (low) work performance.

The following literature review serves as the basis of the selection of work facet-specific antecedents for the current study. Certainly additional facet-specific antecedents may be relevant and are worthy of attention in future research.

**Physical Work Environment** Scholars advocate that the physical work environment (PWE) of services of the entity can impact behavior and can be conducive to marketing services (Kotler 2000; Shostack 1985) and should therefore be properly planned and designed. The PWE in service sector likely enters several configural models impacting happiness and job performance because customers and employees are both present during hospitality service enactments. The implications of the physical environment are observable service providers and recipients which can influence strategic planning and space design greatly in comparison (Crosby et al. 1990; Lovelock 1996). Thus, many scholars discuss the physical environment's impact on customers (Babin et al. 1994; Baker 1986; Bitner 1990; Donovan and Rossiter 1982; Foxall and Greenley 1999; Wirtz and Bateson 1999; Machleit and Eroglu 2000; Turley and Milliman 2000; Wart et al. 1992; Yoo et al. 1998). Environment awareness can cause employees to have a different perspective on the companies they work for and can affect their emotional responses (Russell and Lanius 1984; Russell and Pratt 1980).

**Quality of Interpersonal Relationships** Howton (1963) refers to interpersonal relations as one of the resulting factors of an organization's work environment while Schutte et al. (2001) propose that interpersonal relations relate closely to emotional intelligence. Interpersonal relations are the interactions between human beings, and in the context of the service industry, refer to an individual's relations (service contact employee) with management, subordinates (such as probationary service personnel) and colleagues (such as those whose collaborative work or duties are the same). Interpersonal relation quality refers to employees' attitude towards themselves, their bosses and colleagues, in addition to their relation quality awareness and satisfaction.

Interpersonal relation is a dynamic type of relation that can affect an organization's members' mood and attitudes, which affects each individual's performance in the organization. Thus, employees' self-awareness of their interpersonal relations can affect their performance in their organization. In the service industry, management, subordinates and colleagues need interpersonal interactions to communicate and overcome problems that arise in the work place. For a service employee, positive interpersonal relations can allow a person to dispel negative moods and can add to a positive performance.

Employees who have a high quality of interpersonal relations can cause a rise in positive moods. Service contact employees in an organization who are able to perceive the quality of interpersonal relationships can have a positive impact on their emotions.

**Peer Conflicts** In the large and dense tourism industry, the first line of employees has people from all sorts of working environments and backgrounds with different values and beliefs. These differences are plausible causes of conflicts in an

organization. Those organizations that have positive interpersonal relations can raise moods of employees, yet working situations that often have employee conflicts can have a negative impact on moods.

In different organizations different types of conflicts that occur. As Slack (1997) points out, participants can have different levels of conflict, which include personal conflict, interpersonal conflict, group (the organization) conflict, and inter-group (inter-organizational) conflict. The study uses Slack's interpersonal conflict to discuss peer conflict and its effect on employee moods.

Gibson et al. (1994) and Slack (1997) propose that conflicts within organizations can arise from factors such as resource limitations, differences in goals, lack of cooperation, communication distortion, differences in pay compensation, power inconsistencies in decision-making. Some studies identify interpersonal conflict behavior triggering negative reactions (Hepbur et al. 1997; Terry et al. 1995). Spector and Jex (1998) points out that frequency of interpersonal conflicts that take place in an organization have a correlation with negative work attitude and dissatisfaction. Frone (2000) offers a similar conclusion in a second empirical study.

As a majority of services require different co-workers, peer conflict may not be avoidable. These conflicts with their peers may affect the mood of employees and a drop in service performance. Thus, for modeling the negation of happiness ( $\sim h$ ) and very low in-role performance evaluations ( $\sim irp$ ), configurations of facet-specific antecedents are likely to often include service staff employees' conflicts with their peers.

**Teamwork** Teamwork refers to the need for cooperation in order to achieve a set goal, which brings about a certain type of interaction between two or more employees; therefore, teamwork requires a high degree of interaction among its members, in attempts to reach common goals (George and Jones 2002). The team may also as a result face more and perhaps complex interpersonal challenges.

The interaction within members of the team can have a great impact on employees' happiness. As Frijda (1988) points out, happiness within an organization or group can play the role of signaling, which means the transmission of how members of the group feel about their interpersonal relations with others (Hess and Kirouac 2000). The display of emotions can have a great deal to do with the status of members in the group (Clark 1999; Collins 1990; Lovaglia and Houser 1996; Lucas and Lovaglia 1998). As a result of constant interaction between team members, members may mimic emotions and the spread of emotions is inevitable; in related research of organization literature, scholars have pointed out that emotions of the team can be transferred, and different types of teams can have different emotional effects on their members (Barsade 2000, 2002; Bartel and Saavedra 2000).

Hospitality frontline services often need teamwork to complete tasks, and teamwork indeed may affect team members' interpersonal and emotional link. Service employees need high degrees of teamwork and thus interpersonal conflict with their peers or the quality of the management staff can affect emotions; if the

demand for teamwork is less, then it minimizes the interpersonal interaction. Hence, teamwork is likely to be integral in configurations in modeling happiness as well as IRP.

### ***3.5 Happiness-at-Work and Job Performance***

Is high happiness-at-work sufficient and/or necessary for high job performance? Given that the literature on happiness-at-work and job performance indicates a small-to-medium effect size for their relationship (Choi and Kim 2012; Lyubomirsky et al. 2005; Zelenski et al. 2008), the study here proposes that happiness-at-work by itself is insufficient and unnecessary for high job performance. Thus, assuming that arrow 6 and Fig. 2 indicates either sufficiency or necessary, the evidence in the following study does not support the existence of arrow 6.

However, the configural theory includes the proposition that happiness in recipes with work facet-specific (arrow 5b in Fig. 2) and/or demographic antecedents (arrow 8 in Fig. 2) are sufficient in predicting very high work performance.

Note also that arrow 9 appears in Fig. 2. Arrow 9 represents the proposition that a one or a few facet-specific work antecedents influence IRP in conjunction with a few configurations of demographics and happiness. Such a proposition suggests consideration of very complex configurations is useful for explaining and describing very high (low) IRP.

### ***3.6 In-Role Performance (IRP) and Customer-Directed Extra-Role Performance (CDERP)***

Effective interaction between service employees and customers may contribute to maintaining a firm's customers, with the feedback from existing customers possessing the potential to attract new customers. Netemeyer et al. (2005) define this performance as “in-role performance” (IRP) and “extra-role performance” (ERP). Arrow 6 in Fig. 2 indicates more than just a direct relationship between IRP and customer-directed extra-role performance (CDERP). In the present study Arrow 6 implies sufficiency and necessary—employees with very high scores in IRP will have very high scores in CDERP and employees with very low scores in IRP will have very low scores in CDERP. (The findings below do support the sufficiency implication but not the necessity implication.)

The concept of IRP includes three perspectives. First, Motowidlo and Van Scotter (1994) propose that IRP reflects an organization's performance demands from its employees, which relates to a company's service objectives and critical techniques. Second, Singh et al. (1996) suggests that the operational definition of

IRP comprises items such as product, customer requests, time management efficiency, company resources, customer service volume, and other factors that affect performance quality. Third, Singh (2000) proposes IRP as product production capabilities and quality, with product production capabilities referring to a quantifiable output (such as customers contracting a specific amount) and product quality referring to employees (the management of interaction between customers and employees).

This study also explores CDERP. Borman and Motowidlo (1993) propose that a customer's evaluation of an organization's performance has something to do with contextual customer performance that does not relate to the demands of the employee's IRP. Bettencourt et al. (2001) and Bettencourt and Brown (1997) suggest that CDERP is the extra effort of employees when providing service to customers that raises the quality and positive perception of the service given.

## 4 Method

The main study includes the use and merging of two files of survey data. Employees and their immediate supervisors of a large-size hospitality service business-group participated in the study. Employees completed a survey covering demographics, work facet-specific information, and a happiness-at-work scale; their supervisors completed IRP and CDERP scales on the performance assessments of these same employees. All surveys were coded by a matched employee-supervisor number and all completed surveys were collected by a team of university professors in person and did not go through the business group's mail distribution center.

Janfusan Fancyworld, the largest (in revenues and number of employees) tourism business group in Taiwan, was the business-group participating in the study. Janfusan Fancyworld includes tourist hotels, amusement parks, restaurants and other related service sectors. The anonymity in participating in the study was assured by letter from the CEO to all participants—both frontline employees and their supervisors and by letter by the professors (the authors) directing the study.

### 4.1 Survey Instruments

Except for full versus part-time question item, the work facet-specific questions included 7-point Likert scales, ranging from 1 (strongly disagree to 7 (strongly agree). The IRP and CDERP item responses ranged from 1 to 10, with 10 reflecting the best quality and 1 reflecting the worst quality). Table 1 includes these items and the item-to-total scale correlations and coefficient alphas for the scales.

To learn whether or not the questions and topics of the survey were understood and answered by the survey takers, two pre-tests were done. The respondents for first pre-test included key professionals. The respondents for second pre-test

**Table 1** Construct scale and coefficient alpha (corrected item to total correlations)(decimal points omitted)

Work Facet-Specific Antecedents (and Outcomes)	Outcomes
•Supervisor support (supsup) (65)	•Happiness-at-work (hap) (96) –Happy / unhappy (87)
–When I encounter difficult, my supervisor gives me support (48)	–Pleasant / unpleasant (88)
–My supervisor clearly understands what I think and how I feel (48)	–Satisfied / unsatisfied (85)
•Quality of interpersonal relationships (qip) (74)	–Content / discontent (83)
–I feel very happy about working with my colleagues (58)	–Enjoyable / non-enjoyable (80)
–Most of colleagues are very nice that they help each other actively (58)	–Comforting / uncomforting (82)
•Physical work environment (pwe) (77)	–Gratifying / non-gratifying (86)
–Overall, the present working environment is what I want (62)	•In-role performance (irp)(83)
–I work at a pleasant environment (62)	–This employee is qualified with the knowledge of the company, and competitors' products/ service (58)
•I seldom join social activities with my colleagues (lone)	–Overall job performance is approved to reach the set goal (78)
•Peer conflict (pconflict) (56)	–This employee is accurately accomplishing job regulations (59)
–I usually have a conflict with my colleagues because of issues of work (38)	–Follows requirements of the company to serve customers (66)
–There is usually an argument between colleagues and me (31)	•Customer-directed extra-role performance (cderp) (89)
–Colleagues always ascribe problems of work to me (41)	–The degree of this employee is willing to pay extra time or efforts to make a customer satisfied (68)
•Demands of teamwork (dteam) (78)	–Even if beyond job requirements, this employee still takes initiatives to assist a customer (83)
–The assistance from colleagues can help me collect useful information and suggestion on my job (55)	–How often does this employee voluntarily go out of his/ her way to make customer contented? (71)
–Teamwork eases the loading of responsibility on job (60)	–How often does this employee goes above and beyond job expectation or “call of duty” while serving customers? (78)
–In order to achieve goal, I have to cooperate closely with my colleagues (69)	

included service employees and management staff. Careful revision steps were taken to keep the respondents from making the wrong interpretations and thus altering the accuracy of the data.

## **4.2 Work Facet-Specific Scales**

The survey scale for service working environment adopted the measurements in Bitner (1992). After the reliability analysis, two items were deleted and two items were kept and tested ( $\alpha = 0.77$ ). See Table 1 for details.

The assessment of quality of interpersonal relationship was based upon measurements developed by Lin (1998) and further revised. The original measurements of Lin included 6 items. After the pre-test, four items were deleted, and two items remained and tested ( $\alpha = 0.74$ ).

The assessment of peer conflicts combines the measurements of interpersonal conflicts developed by Spector and Jex (1998) and Frone (2000). Three items were selected after the pre-test. Also, the content of items was revised and tested ( $\alpha = 0.56$ ) in order to reflect realistic situations.

The study uses Van de Vliert and Euwema's (1994) "Job Dependence Scale" to evaluate the degree of dependency on teamwork by the employees. Items were revised based on the results of the pre-test and five items were selected and tested ( $\alpha = 0.78$ ) following reliability analysis.

For measuring happiness-at-work, the survey uses the emotional reaction measurements by Havlena and Holbrook (1986) which comprises seven items ( $\alpha = 0.96$ ).

For performance outcomes this study adopts two performance indicators in-use by the business group's appraisals of frontline employees for IRP and CDERP. IRP ( $\alpha = 0.83$ ) and CDERP ( $\alpha = 0.89$ ) include four items respectively, scaling included choices of 1–10 to measure service performance levels of employees.

## **4.3 Data Collection Procedure**

The two respective surveys were taken had 406 participants and 48 management supervisory participants. Five supervisors turned-in incomplete surveys consistently which rendered forty-three effective sets of supervisor surveys; in addition to eliminating the five management staff participant surveys and the thirty-two employee participant surveys that they were paired with, seven other employee surveys were filled incompletely or incorrectly. In total, there were 367 fully completed and useable employee surveys. The manager sample is less than the employee respondents, but each manager provided employee performance measures for several employees and this study combines the data from the two sets of sample sources.

Therefore, the management staff and employee pairings totaled 367. A total of 247 of the 367 cases were available for data analysis in this study. Unfortunately, data for 120 cases were carried away as refuse accidentally and were not reclaimable.

Twenty-four of the forty-three staff management group were women, making up 55.8 % of the group while 83.7 % of the group were thirty years-or-older, 39.5 % of the group received an education level of beyond college, and 60 percent of the group was married and had children. The majority of the staffs (approximately 81.4 %) were employed full-time, with more than 5 years of service.

Two-thirds of the 367 person employees were women. This gender bias is possibly due to the fact that many service enterprises employ more females than males (such as restaurants). Unmarried individuals comprised 54.8 % of the group, with 31.1 % of the group between the ages of 26 and 30 while 39.8 % of the group had received their highest level of education at the high school level, 29.7 % and 27.5 % received degrees from colleges and professional schools, respectively and 76.8 % of the employees worked full-time, with most employees, around 40.5 %, having one to 5 years of service.

#### **4.4 Data Analysis**

Data analyses include both symmetric statistical tests via correlations, regression analysis, and analysis of variance as well as asymmetric algorithm construction and testing using the software program [fsQCA.com](http://fsQCA.com) (fsQCA = “fuzzy set Qualitative Comparative Analysis.”)

Testing by fsQCA requires calibration all variable scales into calibrated scales with scores ranging from endpoints of 0.00 for full non-membership to 1.00 for full membership. The fsQCA program provides calibrated scores. Fuzzy-set calibration makes use of external information on the degree to which cases satisfy membership criteria and not inductively derived determination criteria (e.g., not using sample means). To perform fuzzy-set calibration, criteria are necessary for three breakpoints—0.05 for threshold for full non-membership; 0.50 for the crossover point of maximum membership ambiguity; and 0.95 for the threshold of full membership. Specifying the original values for these three breakpoints, permits the software to calibrate all remaining scores. Calibrated scores are membership scores and not probabilities.

For the present report the following simple procedure was used to calibrate the original multiple-value scales. Scores for cases in the highest quintile equal 0.95; calibrated scores for cases in the middle quintile were set at 0.50; calibrated scores for cases in the lowest quintile were set at 0.05. Consequently the fsQCA software set scores for the second quintile to 0.81 and the fourth quintile to 0.82. Table 2 reports the original and calibrated scores for happiness using this procedure.

Using the fuzzy set calibration method did not change any of the results in the findings section below. Fuzzy set scores for all original scores also appear in Table 2. The complete coverage of the range for possible scores (from 7 to 49)

**Table 2** Original and calibrated happiness scales and frequency of cases by scores

Observed original	Using 5 scores calibrated	Using fuzzy scores calibrated	Frequency	Percent	Cumulative percent
7	0.05	0.01	6	2.5	2.5
13	0.05	0.03	1	0.4	2.9
14	0.05	0.04	9	3.7	6.6
15	0.05	0.05	1	0.4	7
16	0.05	0.06	2	0.8	7.8
18	0.05	0.07	6	2.5	10.3
20	0.05	0.08	2	0.8	11.1
21	0.05	0.09	14	5.8	16.9
22	0.05	0.16	6	2.5	19.3
23	0.18	0.23	2	0.8	20.2
24	0.18	0.24	10	4.1	24.3
25	0.18	0.25	5	2.1	26.3
26	0.18	0.28	4	1.6	28
27	0.18	0.32	9	3.7	31.7
28	0.5	0.36	27	11.1	42.8
29	0.5	0.37	10	4.1	46.9
30	0.5	0.45	6	2.5	49.4
31	0.5	0.5	9	3.7	53.1
32	0.5	0.57	8	3.3	56.4
33	0.5	0.65	8	3.3	59.7
34	0.82	0.71	7	2.9	62.6
35	0.82	0.77	16	6.6	69.1
36	0.82	0.82	12	4.9	74.1

Notes. The use of either set of calibration scores resulted in nearly identical findings in the study. The fuzzy set scores results from the use of the calibration subroutine in the software isQCA with the original to fuzzy set scores:

41 = 0.95

31 = 0.50

15 = 0.05

The findings in the main analysis follows from the use of the 5 scores calibrations						
37	0.82	0.86	5	2.1	76.1	
38	0.82	0.9	7	2.9	79	
39	0.95	0.92	9	3.7	82.7	
40	0.95	0.94	8	3.3	86	
41	0.95	0.95	6	2.5	88.5	
42	0.95	0.96	12	4.9	93.4	
43	0.95	0.97	3	1.2	94.7	
44	0.95	0.98	3	1.2	95.9	
45	0.95	0.99	2	0.8	96.7	
46	0.95	0.99	2	0.8	97.5	
47	0.95	0.99	2	0.8	98.4	
48	0.95	1	1	0.4	98.8	
49	0.95	1	3	1.2	100	
Total			243	100	100	

on the original happiness scale as well as the closeness in values for the mean, median, and mode offers support of the discriminating usefulness of the scale.

Ragin (2008) and Woodside (2013) provide numerical examples for calculating consistency and coverage—both researchers stress the first importance of achieving high consistency over high coverage. The primary importance of consistency relates to the equifinality principle; the existence of multiple configurations of antecedent conditions useful in predicting high scores of an outcome condition means that any one configuration will have a low coverage of cases.

In fsQCA the consistency and coverage indexes are the metrics indicating the useful of a given model of a simple antecedent condition or a set of complex antecedent conditions for predicting scores in an outcome condition. The consistency index gauges the degree to which the cases share the antecedent condition (simple or complex) in displaying the outcome in question—consistency is analogous to correlation in statistical analysis. The coverage index in fsQCA assesses the degree a simple or complex antecedent condition (recipe) “accounts for” instances of an outcome condition—coverage is analogous to  $r^2$  in statistical analysis.

The score for a complex antecedent condition is equal to the lowest score for the simple antecedent conditions within the complex statement. Using a thought experiment (hypothetical fuzzy set score data) for five employees, the appendix numerical examples of computing membership scores for complex antecedent conditions.

The guidelines used in the study here is that an fsQCA model is useful when its consistency is equal to or above 0.85 and its coverage is above 0.00. A high consistency score (e.g. consistency = 0.85) indicates high membership scores in the outcome condition for nearly all cases with high scores in the simple or complex antecedent condition with most other cases fitting an asymmetric sufficiency distribution (i.e., panel c in Fig. 1). See Ragin (2008) for detailed training on using fsQCA.

## 4.5 Findings

The findings here do not include responses for four cases of data. The four cases are employees in the oldest age group ( $\geq 56$  years of age). The four members in the oldest age group had significantly lower happiness, IPR, and CDERP scores in comparison to the cases in the three age groups prior to this group. Age as an antecedent condition in the configural analyses plays no role in the models with the inclusion of the above 55 years-of-age group. Possibly the findings for the oldest age group members indicates that business group needs to devote special attention and nurturing to the oldest-aged frontline employees. The XY plots for happiness, IPR, and CERP with the other demographics and work facet-specific scales exhibited linear significant and non-significant relationships.

From the dominant logic perspective of statistical analysis, the findings for the present study are similar to the findings in prior studies on employees’ happiness-at-work and supervisors’ assessments of employees’ performances—the relationships

**Table 3** Hospitality employees' happiness and managers' evaluations of employees' in-role performances

			In-Role Performance Quality (IRP)					Very high	Total	
			Very low	2.00	3.00	4.00	5.00			
Happiness Quintiles for Hospitality Employees	Very low	1.00	Count	14	8	13	10	4	49	
			% within happy_segs	28.6%	16.3%	26.5%	20.4%	8.2%	100.0%	
		2.00	Count	12	14	10	11	13	60	
			% within happy_segs	20.0%	23.3%	18.7%	18.3%	21.7%	100.0%	
		3.00	Count	10	9	9	4	7	39	
	High		% within happy_segs	25.6%	23.1%	23.1%	10.3%	17.9%	100.0%	
		4.00	Count	9	10	14	6	11	50	
			% within happy_segs	18.0%	20.0%	28.0%	12.0%	22.0%	100.0%	
		5.00	Count	7	6	10	12	14	49	
			% within happy_segs	14.3%	12.2%	20.4%	24.5%	28.6%	100.0%	
Possibly surprising findings: cases do occur of very unhappy employees with very high IRP scores and vice versa.			Count	52	47	56	43	49	247	
			% within happy_segs	21.1%	19.0%	22.7%	17.4%	19.8%	100.0%	

Notes. Table 1 reports a quintile analysis of hospitality employee happiness and their managers' in-role performance (IRP) evaluations. Even though the findings for the total sample are not significant statistically, note the modest positive relationship—14 versus 4 employees very low in happiness are very low versus very high in IRP, respectively. The distribution of the 49 very happy employees includes 14 with very high IRP scores and only 7 with very low IRP scores. However, the fsQCA shows how different configurations of complex antecedent conditions for very unhappy versus very happy hospitality employees associate with high IRP scores as well as how different complex antecedent conditions for very happy hospitality employees associate with very low versus very high IRP scores. Total sample:  $\varphi = 0.259$ ;  $p < 0.413$ ;  $\varphi^2 = 0.07$  (very small effect size). Q1 and Q5 happiness and five quintiles for IRP:  $\varphi = 0.299$ ,  $p < 0.068$ ;  $\varphi^2 = 0.09$  (medium effect size). Comparing Q1 and Q5 for both happiness and IRP:  $\varphi = 0.478$ ,  $\varphi^2 = 0.228$  (medium-to-large effect size)

are significant but the effect size is small. The correlations of happiness-at-work and IRP and CDERP equal 0.17 and 0.18 respectively.

From a group level perspective, the quintile analysis in Table 3 indicates happiness does not relate significantly to IRP. However, testing only the highest and lowest quintiles indicates a significant and medium-to-large effect size relationship ( $\varphi^2 = .228$ , a medium-to-large effect size). But, examining Table 3 supports the conclusion that very high happiness (quintile 5) does not associate consistently with very high (quintile 5) IRP; in fact, 7 of the 49 cases in Q5 have very low IRP assessments.

The similar lack of consistency occurs for very low happiness and very low performance; four cases occur whereby very unhappy employees have very high happiness.

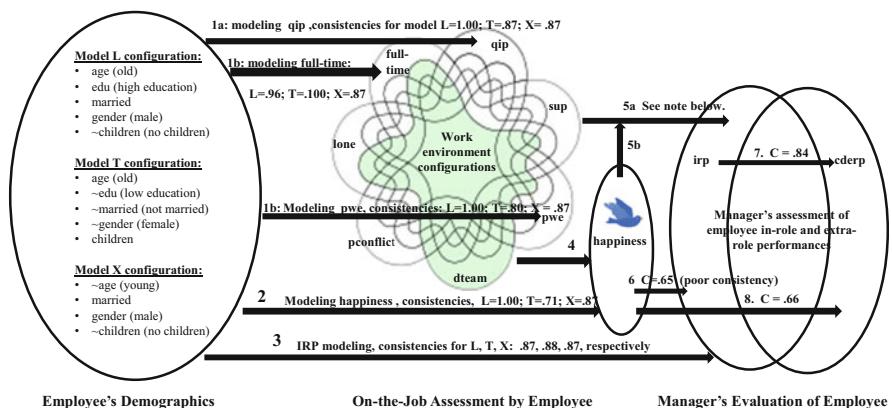
The findings do not support a strong symmetric relationship between employee happiness-at-work and performance assessments. Rather than ending the analysis with statistical analysis, transcending a net effects view to analysis by algorithms considers causal recipes that do provide high consistency of cases in all four corners of Table 3.

Conclusion: arrow 6 in Fig. 2 receives insufficient support—high happiness-at-work alone does not predict high performance consistently. High happiness may be a contributing factor to high performance in some configurations with additional antecedents—the findings below do support this perspective.

## 4.6 Findings for Models for Very High Happiness and Very High Performance

Figure 3 presents many findings of the propositions of the study that appear in Fig. 2. Figure 3 includes three complex antecedent demographic models (L, T, and X) that associate with high happiness—two models include males (one for young and one for older male employees) and one model includes females (older, not married, low in education, with children—but not necessarily at home).

These three demographic models associate consistently with high scores in several work facet-specific conditions (not all of facet-specific conditions were tested). All three demographic models associate with high scores in full-time,



**Fig. 3** Consistencies of Configural Models for Hospitality-Service Employee Context Outcomes, Very High Happiness, and Very High In-Role and Very High Customer-Directed Extra Role Performances. Key: C = consistency; for highly consistent model in associating antecedent configuration with the outcome,  $C \geq .85$ ; dteam = job demands teamwork; cderp = customer-directed extra role performance; ipr = in-role performance; lone = do not join social activities with my colleagues; pconflict = peer conflict; pwe = physical work environment pleasing; qip = quality of interpersonal relationships; sup = supervisor support; yservice = years of service;  $\bullet$  = logical “and” condition;  $\sim$  = negation. Notes on findings. For arrow 4 findings, see Table 6a; high scores for a few facet-specific configurations predict high happiness. Happiness alone does not offer a consistent model for explaining high ipr or cderp. Arrows 5a,b include 7 highly consistent models, 5 for high happiness; one for unhappiness; one without happiness entering the model. An example model for arrows 5a,b: high IRP  $\leq$  pwe  $\bullet$  dteam  $\bullet$   $\sim$  pconflict  $\bullet$   $\sim$  lone  $\bullet$  supsup  $\bullet$   $\sim$  qip  $\bullet$   $\sim$  yservice  $\bullet$  happy,  $C = .90$

physical-work environment pleasing (pwe), and high quality of interpersonal relationships (qip).

The three demographic models associate with high happiness consistently and high IRP consistently. The following two models are additional models associating consistently with high happiness (“+” include Boolean algebra means “or”; “gender” means male and “~gender” means female):  $\sim\text{age} \bullet \text{married} \bullet \text{gender} \bullet \sim\text{children} + \text{age} \bullet \text{edu} \bullet \text{married} \bullet \text{gender}$ . Thus, young males with no children who are married and older males with high education who are married are happy-at-work consistently.

Arrow 6 in Fig. 3 shows high happiness does not associate consistently with high IRP (consistency = 0.65). What additional ingredients are necessary to be present for very high or very low happiness to associate consistently with very high IRP?

Table 4 includes the complex antecedent models resulting in very high in-role performance assessments by managers (IRP). High supervisory support appears among the ingredients in six of the seven models in Table 4. High happiness appears in five, low happiness appears in one, and happiness is not an ingredient in one of the seven.

## 4.7 Very Low Happiness and Very High IRP

Note in Table 4a that model 4 includes the negation of happiness with additional ingredients that predict high IRP consistently. These cases are employees with many years of service, experiencing low peer conflict, high team work demand, who do not join in social activities with colleagues, and have low supervisory support.

Table 4b sheds additional light on low happiness and high IRP. Table 4b includes models of demographics and happiness associating with high IRP. Two of the nine models in Table 4b include very low happiness and additional ingredients associating with very high IRP.

The first of these models includes older employees with many years of service, low in education, married, with children and working full-time, without gender relevancy to the model. The second of these two models includes unhappy females with children at home, not married, low in education, and young with few years of service—a configuration that likely highly relates to high family-job stress. Both models may associate with low salaries (a guess here because education is very low). The main point here is that modeling such complex configurations helps to clarify the low happiness and high performing employees.

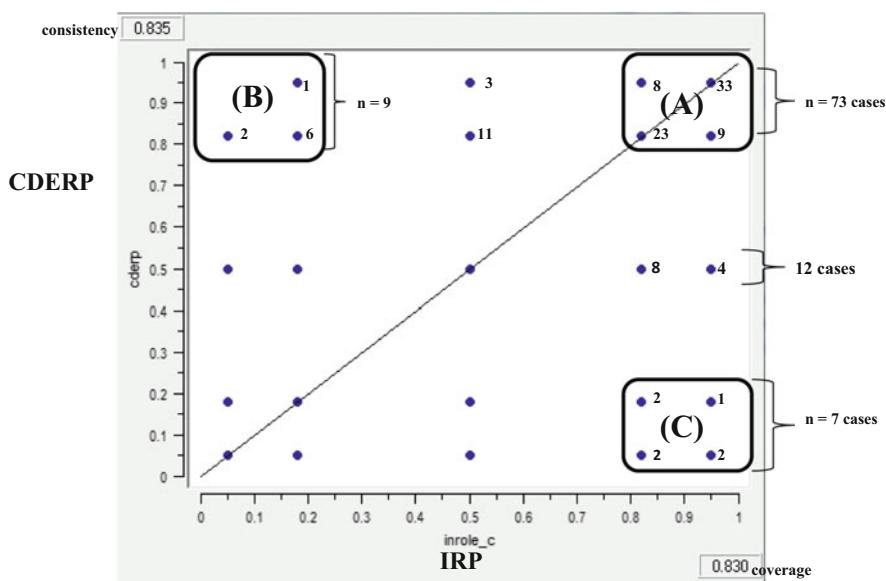
**Table 4** (a) Configurations of on-job happiness and additional on-job antecedents associating with managers' judgments of employees' high in-role performances (IRP) (arrows 5 and 5b in Fig. 3) (b) Configurational models for demographics and happiness for very high in-role performance

Model		Raw coverage	Unique coverage	Consistency
(a)				
1	pwell3_c*~dteam_c*~pconflict_c*1one_c*supsup_c*qip_c*yservice_c	0.125820	0.020845	0.911004
2	hap_c*pwell3_c*~dteam_c*~pconflict_c*~1one_c*supsup_c*~qip_c*yservice_c	0.155635	0.035367	0.903133
3	hap_c*pwell3_c*~dteam_c*~pconflict_c*~1one_c*supsup_c*~qip_c*yservice_c	0.111951	0.003737	0.929015
4	~hap_c*~pwell3_c*dteam_c*pconflict_c*1one_c*~supsup_c*qip_c*yservice_c	0.110290	0.015032	0.949250
5	hap_c*pwell3_c*~dteam_c*~pconflict_c*~1one_c*supsup_c*qip_c*yservice_c	0.129973	0.024998	0.975686
6	hap_c*pwell3_c*~dteam_c*pconflict_c*~1one_c*supsup_c*qip_c*yservice_c	0.114609	0.007474	0.981508
7	hap_c*pwell3_c*dteam_c*pconflict_c*1one_c*supsup_c*qip_c*yservice_c	0.104394	0.004817	0.955893
	Solution coverage: 0.249481			
	Solution consistency: 0.862970			
(b)				
	~yservice_c*~age_c*~edu_c*married*~gender*children*~fulltime	0.041608	0.022257	0.939961
	yservice_c*age_c*~edu_c*married*children*fulltime*~hap_c	0.122498	0.084046	0.923607
	yservice_c*age_c*~edu_c*married*gender*fulltime*hap_c	0.067021	0.027988	0.932948
	~yservice_c*~age_c*~edu_c*~married*~gender*children*fulltime*~hap_c	0.027822	0.006395	0.912807
	~yservice_c*~age_c*~edu_c*married*gender*~children*~fulltime*hap_c	0.026078	0.006727	1.000000
	yservice_c*age_c*~edu_c*~married*~gender*~children*fulltime*hap_c	0.056889	0.036708	0.938356
	~yservice_c*~age_c*~edu_c*~married*~gender*~children*fulltime*hap_c	0.045844	0.026493	0.924623
	~yservice_c*age_c*~edu_c*~married*~gender*children*fulltime*hap_c	0.025828	0.003737	0.906705
	~yservice_c*age_c*~edu_c*~married*~gender*children*fulltime*hap_c	0.051491	0.012790	0.932331
	Solution coverage: 0.270908			
	Solution consistency: 0.894435			

#### 4.8 IRP and CDERP

The findings in IRP indicate that high IRP alone associates consistently with high CDERP (consistency = 0.84). However, a few ( $n = 9$ ) cases occur where employees score low on IPR but high on CDERP. These nine cases appear in the top left corner of the XY plot in Fig. 4. Space is not devoted here to examining such cases but such a finding indicates that case level analysis is possible while generalizing to the total sample—a particular advantage of using qualitative comparative analysis.

Figure 4 shows that more than three-fourths of the cases very high in IRP are very high in CDERP ( $n = 92$ ). Thus, consistency for very high IPR in predicting very high CDERP equal to 0.835 indicates that the simple antecedent condition of high IRP alone is sufficient for estimating high CDERP. Even higher consistency is achievable by including facet-specific, happiness, and/or demographics with IRP in modeling high CDERP. (This report does not include this level of complexity.)



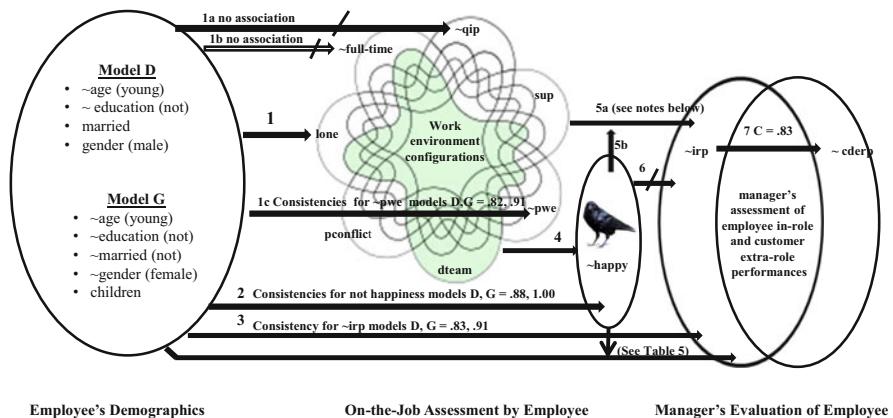
**Fig. 4** Impact of Managers' Evaluations of Hospitality Service Workers' In-Role Performance (IRP) on Managers' Evaluations of Customer-Directed Extra-Role Performance (CDERP) ( $n = 243$  cases). Notes. Numbers indicate the number of cases for each dot. (A) While high IRP is informative in explaining high CDERP; (B) nine cases exhibit high CDERP and low IRP. Thus, high IRP is not necessary for high CDERP. Also, the few cases that are (C) high IRP and low in CDEREP indicates that IRP is not completely sufficient for explaining high CDERP—seven cases occur with high IRP and very low CDERP

## 4.9 Findings for Models for Very Low Happiness and Very Low Performance

Figure 5 includes two complex demographic antecedent models with consistency for high happiness and high IRP. Model D represents young married males low in education. Model G represents young single females who are low in education with children.

Models D and G also relate consistently to the negation of finding their physical work environment please (~pwe) but do not relate consistently to full versus part-time employment status.

As appearing in Fig. 4, the negation of IRP (~IRP) relates to the negation of CDERP (~CDERP) consistently. Given these findings and the findings for IRP and CDERP, the IRP and CDERP tends toward being symmetrical for the substantial majority of cases.



**Fig. 5** Configural Modeling Associations with Hospitality-Service Employee Work Contexts, Negation of Happiness, Very Low In-Role, and Very Low Customer-Directed Extra Role Performances. Key: dteam = job demands of teamwork; cderp = customer-directed extra role performance; irp = in-role performance; lone = do not join social activities with my colleagues; pconflict = peer conflict; pwe = physical work environment pleasing; qip = quality of interpersonal relationships; sup = supervisor support; yservice (not shown in figure). Notes on findings. (1) For arrow 4: five work environment configurations have high consistencies in associating with not happiness. For example,  $\sim\text{happy} \leq \sim\text{yservice} \bullet \sim\text{qip} \bullet \sim\text{pwe} \sim\text{dteam} \bullet \sim\text{pconflict} \bullet \sim\text{lone} \bullet \sim\text{sup}$ , consistency = .93. See Table 6b for detailed findings. For arrows 5a and 5b, 6 of 7 models predicting high membership in low irp (i.e.,  $\sim\text{irp}$ ) very well include  $\sim\text{yservice}$ . Example model:  $\sim\text{irp} = \sim\text{fulltime} \bullet \sim\text{happy} \bullet \sim\text{pwe} \bullet \sim\text{dteam} \bullet \sim\text{pconflict} \bullet \sim\text{lone} \bullet \sim\text{supsup\_c} \bullet \sim\text{yservice} \bullet \sim\text{qip\_c}$  (consistency = 0.982)

#### **4.10 Work Facet-Specific and Happiness Configurational Models Relating to Negation of IRP**

Table 5a includes four models of work facet-specific models that relate consistently to high ~IRP (i.e., very low performance). All four of these models include the negation of full-time employment (i.e., high part-time employees) with very few years of service (~yservice). Three of the four models include low happiness as an ingredient; one includes high happiness.

**High Happiness and Low Performance** The one complex model for ~IPR that includes high happiness also includes low supervisory support, low quality of interpersonal relationships (~qip), and very few years of service (~yservice), ~lone, high peer conflict, and high job teamwork demands (dteam). Thus, part-time employees experiencing little supervisor support, high peer conflict, and new to the job, with high requirements for team work and poor quality of interpersonal relationships are one answer to the conundrum of very high happiness and very low performance. This configuration is still perplexing however. Why high happiness is an ingredient in this recipe that predicts very low performance accurately remains unclear and requires additional study.

Table 5b sheds additional light on the occurrence of high happiness and low performance. Table 5b includes one such model (model 6). Model 6 includes females new to the job, older, working full-time, unmarried, with (most likely grown) children, with low education. Being new to the job may be a principal ingredient in their very low IRP scores as well as being high in happiness.

#### **4.11 Work Face-Specific Configurations for Very High and Very Low Happiness**

High scores for five work contexts associate with very high happiness. All the configurations that do so include high supervisory support as an ingredient. Details for each of the five work facet-specific configurations appear in Table 6a. High quality of interpersonal relationships (qip) occurs in five of the six models; the negation of qip (~qip) does not occur in any of the models. These models support the importance of carefully designing specific aspects of the workplace to achieve the objective of high happiness.

High scores for five work contexts associate with very low happiness. All five include either ~qip and/or the negation of pleasing working environment (~pwe). Details appear in Table 6b. These work facet-specific findings for the configurations affecting the negation of happiness are not mirror opposites of the configurations affecting happiness. This general finding supports the principle of causal asymmetry—the configurations of conditions serving to increase happiness are distinct from the configurations of conditions serving to increase unhappiness.

**Table 5** (a) Configurations of on-job happiness and additional on-job antecedents associating with managers' judgments of employees' very low in-role performances (~IRP) (arrows 5 and 5b in Fig. 4). (b) Configurational models for demographics and happiness for very low in-role performance

Model		Raw coverage	Unique coverage	Consistency
<b>(a)</b>				
1	$\sim qip\_c^* \sim yservice\_c^* \sim hap\_c^* \sim pwel3\_c^* \sim dtteam\_c^* \sim pconflict\_c^* \sim lone\_c^* \sim supsup\_c^* \sim fulltime$	0.058733	0.018354	0.982265
2	$\sim qip\_c^* \sim yservice\_c^* \sim hap\_c^* \sim pwel3\_c^* \sim dtteam\_c^* \sim pconflict\_c^* \sim lone\_c^* \sim supsup\_c^* \sim fulltime$	0.042989	0.008402	0.975926
3	$qip\_c^* \sim yservice\_c^* \sim hap\_c^* \sim pwel3\_c^* \sim dtteam\_c^* \sim pconflict\_c^* \sim lone\_c^* \sim supsup\_c^* \sim fulltime$	0.052451	0.009952	0.934592
4	$qip\_c^* \sim yservice\_c^* \sim hap\_c^* \sim pwel3\_c^* \sim dtteam\_c^* \sim pconflict\_c^* \sim lone\_c^* \sim supsup\_c^* \sim fulltime$	0.137940	0.118280	0.919022
	Solution coverage: 0.197487			
	Solution consistency: 0.921233			
<b>(b)</b>				
1	$\sim hap\_c^* \sim yservice\_c^* \sim age\_c^* \sim edu\_c^* \sim married^* \sim children^* \sim fulltime$	0.066400	0.026185	0.913580
2	$\sim yservice\_c^* \sim age\_c^* \sim edu\_c^* \sim married^* \sim gender^* \sim children^* \sim fulltime$	0.057509	0.017293	0.901535
3	$\sim hap\_c^* \sim yservice\_c^* \sim age\_c^* \sim edu\_c^* \sim married^* \sim gender^* \sim children^* \sim fulltime$	0.027327	0.006281	0.912807
4	$\sim hap\_c^* \sim yservice\_c^* \sim age\_c^* \sim edu\_c^* \sim married^* \sim gender^* \sim children^* \sim fulltime$	0.050575	0.030916	0.922619
5	$\sim hap\_c^* \sim yservice\_c^* \sim age\_c^* \sim edu\_c^* \sim married^* \sim gender^* \sim children^* \sim fulltime$	0.053430	0.033771	0.926450
6	$hap\_c^* \sim yservice\_c^* \sim age\_c^* \sim edu\_c^* \sim married^* \sim gender^* \sim children^* \sim fulltime$	0.025369	0.003671	0.906705
	Solution coverage: 0.161025			
	Solution consistency: 0.876944			

**Table 6** (a) On-job antecedent configurations associating with very high happiness-at-work (arrow 4 in Fig. 3) (b) On-job antecedent configurations associating with very low happiness-at-work (findings for arrow 4 in Fig. 4)

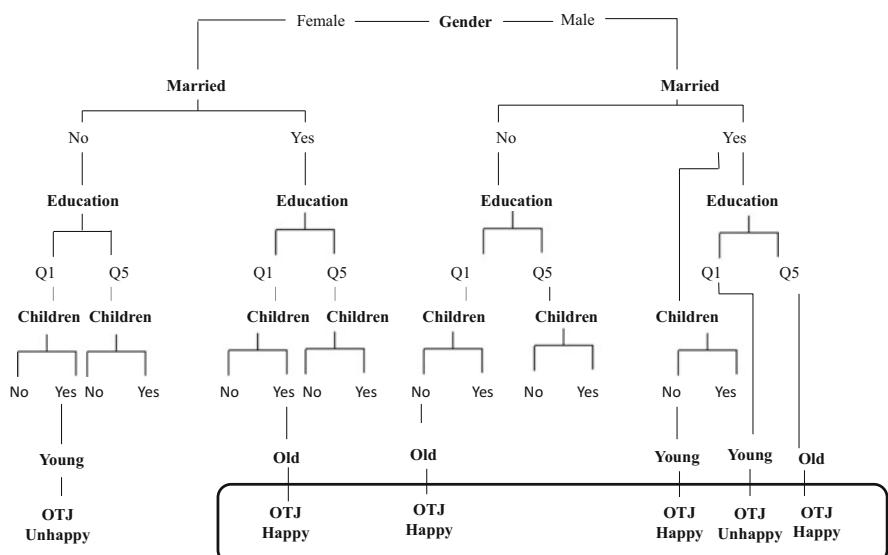
		Raw coverage	Unique coverage	Consistency
<b>(a)</b>				
$\sim pconflict\_c^*pwe13\_c^*dtteam\_c^*supsup\_c^*lone\_c^*fulltime$	0.221722	0.077981	0.920395	
$qip\_c^*pwe13\_c^*~dtteam\_c^*supsup\_c^*1one\_c^*fulltime$	0.262792	0.069750	0.921452	
$pconflict\_c^*qip\_c^*pwe13\_c^*supsup\_c^*1one\_c^*fulltime$	0.207722	0.023420	0.924471	
$\sim pconflict\_c^*qip\_c^*~pwe13\_c^*dtteam\_c^*supsup\_c^*~lone\_c^*~fulltime$	0.050318	0.016377	0.919380	
$\sim pconflict\_c^*qip\_c^*pwe13\_c^*dtteam\_c^*supsup\_c^*1one\_c^*~fulltime$	0.069410	0.035469	1.000000	
Solution coverage: 0.438184				
Solution consistency: 0.907238				
Note. High supervisory support is an ingredient in all models which indicates its necessity for very high happiness-at-work				
<b>(b)</b>				
$\sim qip\_c^*~pwe13\_c^*~dtteam\_c^*~supsup\_c^*fulltime$	0.335357	0.060408	0.9227514	
$qip\_c^*~pwe13\_c^*~lone\_c^*~supsup\_c^*fulltime$	0.338953	0.056333	0.910300	
$\sim qip\_c^*~pwe13\_c^*~dtteam\_c^*~pconflict\_c^*~lone\_c^*~supsup\_c$	0.230843	0.017978	0.937378	
$qip\_c^*~pwe13\_c^*~dtteam\_c^*~pconflict\_c^*~supsup\_c^*fulltime$	0.240271	0.012305	0.898148	
$qip\_c^*~pwe13\_c^*~dtteam\_c^*~supsup\_c^*~lone\_c^*~supsup\_c^*~fulltime$	0.055134	0.014383	0.981508	
$\sim qip\_c^*~pwe13\_c^*~dtteam\_c^*~pconflict\_c^*~lone\_c^*~supsup\_c^*~fulltime$	0.162685	0.028366	0.900088	
Solution coverage: 0.538953				
Solution consistency: 0.859126				
Note. Five of the six models include the negation of supervisory support—for many cases having very low supervisory support associates with very low performance but not always				

## 5 Discussion, Limitations, and Contributions

The study here contributes to moving beyond the issues of whether or not happiness-at-work influences job performance, the size of the effect of this relationship, and whether or not the impact is always positive. The study contributes to theory and research by proposing that the impact of employee happiness-at-work on manager's assessment of employee performance depends on configurations of employee demographics and employees' judgments of work facet-specific factors.

Rather than looking narrowly at happiness-at-work and managers' assessments of employee work performance, a more complex in-depth stance is necessary to learn the combinations of conditions whereby high happiness associates with very high as well as very low performance. Separately, theory and empirical reports need to consider the configurations associating with very low happiness and very low versus very high managers' assessments of employee work performance.

Frontline, middle, and senior managers may seek to focus on all the complex antecedent conditions associating with high versus low quality of employee performances. These complex conditions are likely to include recipes with very high happiness, very low happiness, and happiness not in one or more of the recipes. Identifying these alternative complex configurations is possible and a worthy objective of theory, research, and practice.



**Fig. 6** Demographics-only causal asymmetry configurations associating with on-the-job (Un) Happiness. Notes. Q1 = Lowest education quintile; Q5 = highest education quintile. OJJ = on-the-job. The associations are relevant only for the data in the present study do not necessarily hold for other data sets

The high importance of happiness-in-many-contexts relating to very high (low) quality of work assessments by managers is a key finding of the present study. Research to advance theory of how happiness affects performance is worthwhile but needs to embrace moving beyond a net-effects symmetric perspective to the construction of useful algorithms for predicting happiness as well as for predicting the conditions when happiness associates with very high (low) quality of work performance.

Figure 6 is an additional method for visualizing findings of demographic configurations associating with high versus low happiness-at-work—these findings are limited to the data in the present study and should be taken to suggest that unhappiness-at-work usually follows for young unmarried females with low education and children. Figure 6 is a way of illustrating the importance in advancing theory to focus on conditional statements that go beyond attempting to combine main and interaction effects in multiple regression models (Woodside 2013). Such tree diagrams as Fig. 6 can be drawn for high and low performance as well.

## 5.1 *Confirming the Four Principles of Configural Theory*

The findings support the four principles of configural theory. The multiple configurations associating (leading to) high values in happiness and in-role performances confirm the principle of equifinality. Consequently, a single configuration may be sufficient but it is not necessary for accurately predicting high employee happiness or high employee quality of work performance.

The findings confirm the second principle of configural theory—configural relationships that are accurate in predicting very high happiness and very high quality of work performance are symmetric and indicate sufficiency but not necessity. Low scores on these configurations associate with both low and high scores on the two outcome conditions (very low and very high happiness or performance). This perspective is another way of saying that linear causality is rare in real-life and researchers should discard the view of single-model sufficiency and necessary. Thus, researchers should end reporting in terms of “critical importance” and “key success factors” since no one condition is likely to be both sufficient and necessary.

The findings confirm the third principle of configural theory. Achieving very high happiness and very high quality work performance are complex undertakings. The examination of net effect and two and three-way interactions are insufficient in describing and understanding very high happiness and performance. Useful models in describing and understanding such outcome conditions likely requires embracing a configural stance such as crafting and testing algorithms via fsQCA.

The findings confirm the fourth principle. The findings support a causal asymmetry perspective—the configurations associating very high quality of work performance are not the mirror opposites of the configurations associating with very low work performance—the same conclusion applies for happiness-at-work. Having a deep accurate understanding of what brings about high quality of work

performance only provides partially accurate hints of the causes of very low quality of work performance. Modeling both very high and very low quality of work performances and happiness are necessary.

## **5.2 *The Employee Happiness-at-Work and Manager's Assessment of Quality of Employee Performance Relationship***

From the stance of statistical testing of the hypothesis, the present study confirms both the small and medium-to-large effect size of the relationship of employees' happiness-at-work and managers' assessment of quality of employees' work performance. The relationship effect size is likely small but significant when taking into account the total sample of data in a study; the relationship is likely to be medium when limiting the analysis to the very low and very high quintiles of respondents for happiness-at-work and managers' assessments of quality of employees' work. These findings complement the findings for configural analysis.

From the stance of configural analysis, high happiness-at-work is insufficient in explaining high quality of work as assessed by managers. However, incorporating work facet-specific antecedents or demographics with happiness-at-work results in several complex configurations that are sufficient in explaining and predicting high quality of work as assessed by managers—and for some employees, low quality of work performance. If theory and practice seeks to understand how happiness affects high work performance, scholars' and practitioners' insight will improve by including work facet-specific contextual and/or demographic information in crafting complex statements along with happiness to explain high work performance.

The same perspective applies for increasing insight for explaining very low work performance. Unhappiness alone is not informative sufficiently to adequately explain very low work performance. However, the negation of happiness in combination with facet-specific simple antecedents combines into complex statements (algorithms) that do adequately explain very low work performance.

## **5.3 *Happiness, IRP, and CDERP***

Happiness alone is insufficient for predicting CDERP. However, IRP is sufficient alone for explaining CDERP. The findings of the study support the perspective that employees need to perform the basic in-role work requirements very well to achieve high evaluations in customer-directed extra role performances.

While not included in this study, additional analyses indicate that the inclusion of a few work facet-specific antecedents with IRP does improve the configural

power in explaining CDERP; these findings are available from the authors by request.

#### **5.4 Limitations and Suggestions for Future Research**

The study here develops and explores configural theory of hospitality service employees' happiness and work performance. A general confirmation of the theory and findings for alternative configurations requires going beyond one empirical study in one industry in one country. One helpful step is to replicate the survey one within the same industry to additional firms in the same country as well as additional country contexts.

The predictive accuracy of configural models useful in this study needs to be tested using holdout samples of cases. This step can be taken by splitting the present sample into two subsamples randomly and repeating the analyses along with using the models useful for the first subsample to test their predictive accuracy on the cases in the second sample, and vice versa. This second step was taken in the present study and the findings proved substantial support for the usefulness of the models in the present study. (Details of predictive validity tests are available by request to the authors.)

#### **5.5 Keeping One Eye on Cases and the Second on the Sample**

As McClelland (1998) emphasizes, the focus on creating and testing theories based on algorithms permits generalizing beyond the individual case in data set and yet permits the examination of individual cases in the analytical output. Both executives and employees benefit and will usually appreciate being able to receive feedback on performances at the individual, case, level rather than the dominant scholarly practice of reporting findings only at the level variables.

The use of qualitative comparative analysis to study causal complexity in employee happiness-at-work and quality of work performance offers breakthroughs in formulating theory and understanding how contexts affects work outcomes. The present study confirms Ragin's (1999, p. 1228) tenet, "It is much more fruitful to allow for the possibility that a given outcome may follow from a variety of different combinations of theoretically relevant causal conditions" [than limiting one's perspective and testing to a single theoretical statement].

## Appendix: Examples of Computing Scores for Complex Antecedent Conditions

Consider the following descriptions of five employees. Bob is very young with little education, he is unmarried with no children, he works part-time, he is a new employee, he is very happy-at-work; Bob's manager rates Bob's job performance to be very low.

Edwina is very young with little education, unmarried, children at home, she works full-time, three years of working in the firm, she is very unhappy-at-work; Edwina's manager rates Edwina's job performance to be very high.

Helen is 54 years old, married, grown children, 18 years working in the firm, working full-time, very little education, working full-time, very happy at work; Helen's manager rates her job performance to be very high.

Linda is new to the firm, 24 years old, university graduate, married, not children, working full-time, very happy-at-work; Linda's manager rates her performance to be acceptable but not high, "she has a long way to go but she shows promise."

Consider the following complex antecedent conditions:

Model D:  $\sim\text{age} \bullet \sim\text{education} \bullet \sim\text{married} \bullet \sim\text{children} \bullet \text{gender}$

Model R:  $\sim\text{age} \bullet \sim\text{education} \bullet \sim\text{married} \bullet \text{children} \bullet \sim\text{gender}$

Model V:  $\sim\text{age} \bullet \text{education} \bullet \text{married} \bullet \sim\text{children} \bullet \sim\text{gender}$

With  $\sim\text{age}$  = the negation of age (i.e., high score means very young);

$\sim\text{education}$  = very low education score

$\sim\text{married}$  = not married

$\sim\text{children}$  = no children

$\sim\text{gender}$  = female (thus, gender = male).

Using the logical "AND" in Boolean algebra, the membership score for the complex statement is equal to the lowest score among the scores for the simple antecedents in the complex statement. Computing the complex antecedent scores for models D, R, and V, for the four employees:

Case	Age	Education	Married	Children	Gender	D	R	V
Bob	0.01	0.01	0.01	0.01	0.99	0.99	0.01	0.01
Edwina	0.01	0.01	0.01	0.99	0.01	0.01	0.99	0.01
Helen	0.98	0.01	0.99	0.99	0.01	0.01	0.01	0.01
Linda	0.06	0.82	0.99	0.01	0.01	0.01	0.01	0.82

Bob's score for  $\sim\text{age}$  = .99; his score for  $\sim\text{education}$  = 0.99; his score for  $\sim\text{married}$  = 0.99; his score for  $\sim\text{children}$  = 0.99; his score for  $\text{gender}$  = 0.99. Thus, Bob's score for model D equals 0.99—the lowest score among the five simple antecedent conditions. Here are Linda's scores for the simple antecedent conditions in Model V:  $\sim\text{age} = .94$ ;  $\text{education} = 0.82$ ;  $\text{married} = 0.99$ ;  $\sim\text{children} = 0.99$ ;  $\sim\text{gender} = 0.99$ ; Linda's score for model V is equal to the lowest score among the five values (i.e., .82).

Construction of XY plots by hand is possible with the each set of scores for models D, R, and V on the X-axis and the scores for full-time, happiness, and job performance on the Y-axes. Note that full-time equals 0.00 and part-time equals 0.01; “very happy” equals 0.99 and very unhappy equals 0.01; very high performance equals 0.00 and very low performance equals 0.01. With five demographic antecedent conditions, all possible combinations include 32 models for the complex combinations

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# The Complexity Turn in Behavioral Pricing

Arch G. Woodside

*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 et al. 2011, p. 1370)

**Abstract** Building behavioral-pricing models-in-contexts enriches one or more goals of science and practice: description, understanding, prediction, and influence/control. The general theory of behavioral strategy includes a set of tenets that describes alternative configurations of decision processes and objectives, contextual features, and beliefs/assessments associating with different outcomes involving specific price-points. This article explicates these tenets and discusses empirical studies which support the general theory. The empirical studies include the use of alternative data collection and analytical tools including true field experiments, think aloud methods, long interviews, ethnographic decision-tree-modeling, and building and testing algorithms (e.g., fuzzy-set qualitative comparative analysis). The general theory of behavioral pricing involves the blending of cognitive science, complexity theory, economics, marketing, psychology, and implemented practices. Consequently, behavioral pricing theory is distinct from context-free microeconomics, market-driven, and competitor-only price-setting. Capturing and reporting contextually-driven alternative routines to price setting by a compelling set of tenets represents what is particularly new and valuable about the general theory. The general theory serves as a useful foundation for advances in pricing theory and improving pricing practice.

**Keywords** behavioral • business-to-business • configuration • empiricism • pricing • theory

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## 1 Introduction

Powell et al. (2011, p. 1371) go on to 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 influencing behavioral strategy and its sub-fields including behavioral pricing.

The focus on capturing heterogeneity, realism, and the centrality of the merging tenet builds from the behavioral theory of the firm’s perspective that organizations comprise differentiated subunits with conflicting goals, resources, and time horizons (Cyert and March 1963). Marketing, pricing, and organizational buying strategies are largely political processes within specific contexts; these contexts involve coalition building, bargaining, and conflict resolution among representatives of differentiated subunits with conflicting goals, resources, and time horizons (Cyert and March 1963; Pettigrew 1975). However, while including strategy as a political process, behavioral pricing theory goes beyond this perspective to include cognitive science theory and findings especially on how executives transform information into knowledge and how they create and apply useful algorithms (i.e., rules on how-to-decide that usually lead to desirable outcomes) in selecting choices outcomes (e.g., acceptable specific price-points and increases/decreases in prices). Examples of such cognitive science advances in behavioral pricing in business-to-business contexts include the studies by Morgenroth (1964), Howard and Morgenroth (1968), Joskow (1973), Woodside and Wilson (2000), and Woodside (2003). These B2B studies and additional studies in business-to-consumer contexts (e.g., Woodside et al. 2013) support the conclusion that the general theory of behavioral pricing is an insightful and useful blending of cognitive science, complexity theory, economics, marketing, psychology, and implemented practices in explicit contexts.

The core contributions of the present study and the general theory of behavioral pricing include explicating and solving the principal dilemma for advancing theory and research on behavioral pricing—that is, the need to generalize beyond the individual case and the need for specificity (reporting the nitty-gritty details necessary for deep understanding that captures the requisite complexity/heterogeneity within the individual case). Solving the dilemma includes embracing several steps possible but rarely taken-in-combination in pricing research; these steps include going into the field to perform “direct research” (Mintzberg 1979) and embracing the major tenets of complexity theory (Byrne 1998, 2005; Manson 2001; Simon 1962; Urry 2005). The major tenets of complexity theory include the proposition that multiple paths lead to the same outcome/price, 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. A second tenet: causal asymmetry occurs, that is, indicator configural models that accurately predict a high price-point are not the mirror opposites of the indicator configural models that accurately predict a low price-point. A third tenet: both low and high price-points are antecedents to purchase in different sets of complex antecedent configurations. A corollary to the third tenet: both low and high price-points are antecedents to non-purchase in different sets of complex antecedent configurations. A fourth tenet: no one necessary antecedent condition is sufficient for purchase (e.g., low price alone is insufficient for purchase). A fifth tenet: theorists and practitioners never explicate all necessary conditions; thus, mistakes occur and learning is a continuing process forevermore.

Another 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.” (“The Complexity Turn,” Urry 2005, p. 4). Thus, an increase in customer demand may be an outcome of a price increase “in specific circumstances [contexts]” and an increase in demand may be an outcome of a price decrease in other specific contexts. The same point is relevant for demand decreases and price increases and decreases. The general theory of behavioral pricing includes explicating the specific configural contexts for the occurrences of all four price-demand relationships: demand increases associating with price increases and decreases and demand decreases associating with price increases and decreases.

The complexity turn to behavioral pricing practice and theory includes the tipping-point tenet as Urry (2005) and Gladwell (2002) describe. “Moreover, if a system passes particular thresholds 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 behavioral pricing models such tipping points frequently involve replacing a negative with a positive response to one issue in a string (i.e., path or recipe) of questions and answers for a given complex configuration of antecedent conditions. Examples of such “causal complexity” (Ragin 2000) appear in empirical examples later in the present study.

Following this introduction, Sect. 2 presents the general theory of behavior pricing in the form of the theory’s major tenets and by illustrating applications of these tenets in industrial marketing and B2B-service contexts. Section 3 describes complementary research methods useful for examining the tenets of the general theory and advancing new tenets. Section 4 discusses limitations in the study. Section 5 offers practical implications for planning and implementing pricing strategies in B2B contexts. Section 6 concludes with comparisons between the microeconomic and rational view of pricing decisions/outcomes and the general theory of behavioral pricing. Section 6 includes implications for further theory development and new research in behavioral pricing.

## 2 The General Theory of Behavior Pricing

The three major objectives of the general theory include capturing heterogeneity of pricing decisions by marketers and responses to pricing decisions by customers; building isomorphic models of information-in-use within real-life contexts—of marketing and customer organizations participating in price-setting and price-responding (customer price-responses include evaluating, negotiating, and accepting/rejecting proposal and specific price-points of a vendor); and achieving high predictive validity (accuracy) that includes highly accurate predictions via heuristics-in-use by the vendors and the customers in deciding issues relating to setting and accepting/rejecting products/services for different price-points. Not all pricing researchers value these objectives highly; Joskow (1973) points out that some researchers criticize attempts to construct models of actual decision-making processes. Friedman (1966) argues that it is not a function of economic theory to recreate the real world, but to construct theoretical paradigms that predict well. Joskow (1973) responds to Friedman's perspective with evidence that current (i.e., symmetric-based) models of regulated firms do not predict pricing behavior very well. “In addition, the value of ‘as if’ models declines as we not only become interested in predicting how firms behave given current structural interrelationships, but begin to ask questions about structural changes aimed at changing the nature of firm responses. For those interested in public policy analysis regarding regulated [utility] industries, a more detailed [nuanced] understanding of firm decision processes, decision processes of regulatory agencies, and their interrelationship appears to be in order” (Joskow 1973, pp. 119–120). This behavioral theory perspective is relevant for less regulated industries as well—a more detailed understanding is necessary (that is now lacking) of firm pricing-decision processes, customers' decision processes in evaluating and responding to marketers' responses to RFQs (request for quotation), and the subsequent process-dynamics—and final price points offered and accepted/rejected.

In his data collection during 1970–1971 on advancing a behavioral theory of pricing in highly regulated firms, Joskow (1972, 1973) did manage to take the necessary step of doing direct research but his data analysis is limited to symmetric testing via regression modeling. The idea of testing for sufficient but not necessary outcomes via algorithm modeling was advocated more than two decades later by McClelland (1998) and advanced substantially by Charles Ragin in several publications including his masterwork, *Redesigning Social Inquiry* (2008). Asymmetric theory and analysis of Joskow's (1972) behavioral pricing data awaits doing. However, unfortunately Joskow (2015) reports that his Ph.D. dissertation (Joskow 1972) does not include the data and the data are no longer available.

## ***2.1 The Most In-Depth Behavioral Pricing Study***

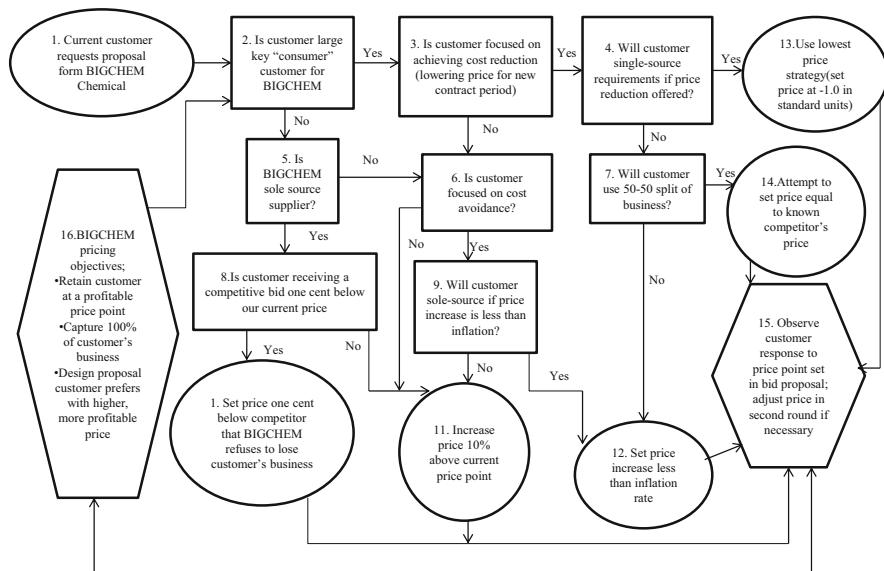
Unfortunately, the most in-depth, available, behavioral study of firms engaging (i.e., colluding illegally in this case) in setting prices in a business-to-business industry (Eichenwald 2001) does not provide details with respect to conversations and decisions regarding specific price-points in the price-fixing meetings. Eichenwald (2001) does not report on customers' responses to the pricing decisions made by the colluding industrial (agricultural chemicals) marketers. The development of ethnographic pricing models using the price-collusion original data set awaits the researcher willing to wade into the court records and the FBI (U.S. Federal Bureau of Investigation) files—the multiple decision processes and outcomes in these processes that are available over a five-year period. Such research on decision processes of price setting and changes in B2B contexts rarely is available but the literature does include example studies (e.g., Morgenroth 1964; Howard and Morgenroth 1968; Woodside and Wilson 2000).

## ***2.2 Capturing Heterogeneity***

To capture heterogeneity, the general theory of behavioral pricing does not rely alone on the use of written surveys with fixed-point scales and symmetric statistical tests of observable choices by vendors and customers but includes “direct research” (Mintzberg 1979) ethnographic methods to record tacit knowledge and cognitive processes preceding the observable outcomes. These ethnographic methods include participant observation, applications of the think aloud method, historical analysis of documents, and the long interview method (Gladwin 1980, 1982, 1983; McCracken 1988; Woodside 2010)—and the use of asymmetric analytics such as reporting on the use/value of fast and frugal heuristics (Gigerenzer et al. 1999) as well as fuzzy-set qualitative comparative analysis (Ragin 2008). Direct research is going physically into the context of the study to observe, interview, record, and examine rather than rely principally on data from an internet, mail, or telephone survey. The later studies typically involve one executive responding per firm and less than 25 in 100 firms providing useable responses to the fixed-point scales items. Direct research seeks confirmatory evidence from multiple sources having direct knowledge of processes and the outcomes of thinking and actions of participants enacting behaviors related to a given context or issue.

While the core tenets of the general theory apply across B2B contexts and firms in different industries, presenting the tenets here make use of findings from a specific industrial marketing-buying pricing study (e.g., Woodside and Wilson 2000). Taking a meso-step toward generalization, the study here describes how the tenets apply to a second study—a study on pricing petroleum at the wholesale level. The first study (Woodside and Wilson 2000) included multiple-rounds of meetings of executives by the researchers at the marketing headquarters of a

solvents manufacturer in Houston and long interviews, face-to-face, with four of the manufacturer's customers and 250 file-drawer customers; the four customers interviewed were located in Cleveland, north-central Pennsylvania, and western South Carolina. Each customer interview was ninety minutes; customers were selected that filled certain profiles of interest in the study—configurations of customers with large versus small purchasing requirements for solvents and both aggressive versus non-aggressive customers. Figure 1 is an “ethnographic decision tree model (EDTM)” (Gladwin 1989) of the marketer’s framing and price-point selection processes for four customers in the study and more than 250 additional customers. EDTMs are suitable for linear programming and for use in testing the predictive accuracy of the algorithms appearing in subroutines in the model via fuzzy-set qualitative comparative analysis (Ragin 2008; Woodside 2010). EDTMs are isomorphic representations of reality in the thinking and doing processes of pricing and responding to specific price-points. While being a complex, heterogeneous model, the thoughts and actions of the product managers and sales representatives in this firm center on asking a brief series of questions. The questions cover the following issues. How much business does the customer represent (box 2)? How does the customer frame key aspects of his/her firm’s relationship with us and our competitors (boxes 3–7)? Which objectives should dominate our response to the customer’s response to our proposal (boxes 15 and 16)? For example, if the customer firm is a key account (i.e. large business for the marketer) and the customer insists on achieving a price reduction, the marketer is likely to respond with a “creative proposal” that includes: first, a low price; second, funding for



**Fig. 1** Summary pricing, and sales negotiations, decision model for BIGCHEM chemical based on customer decision profiles. Source: Adapted from Fig. 6 in Woodside and Wilson (2000, p. 363)

storage equipment or related facilities at the customer's sites; and third, "price protection" against price increases during the contract period. Whether or not such an outcome occurs depends on the marketer's belief that "preferred supplier participation" status was given to the marketer's firm by the customer—a euphemism for being awarded the largest share or 100 percent of the customer requirements for solvents.

### **2.3 *The Core Tenets in the General Theory of Behavioral Pricing***

The following discussion covers the core tenets ( $T_i$ s) of the general theory of behavior pricing. While the discussion of each tenant refers to findings in the study by Woodside and Wilson (2000), these tenets are applicable and prevalent for nearly all pricing contexts in business and industrial marketing/purchasing contexts. "High score" in the following discussion refers to a calibrated score in fuzzy or crisp set qualitative comparative analysis (fsQCA, see Ragin 2008). All QCA calibrated scores range from 0.00 to 1.00. Such calibrated scores indicate the degree of membership in a condition. For example, the score may indicate membership in "high price" with a score of 0.30 being a relatively low score in high price and a score of 0.95 equal to a score of "full membership" in high price. Calibrated scores do not indicate probabilities. From a practical as well as theoretical perspective, small-to-medium changes in fuzzy-set calibrated reference-points rarely change the substantive impact of findings in studies using QCA (for additional details, see Ragin 2008; Woodside 2013).

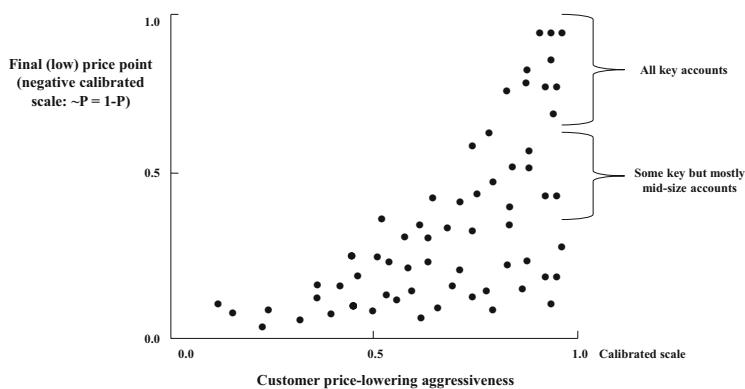
**T<sub>1</sub>: A case (e.g., one specific price decision among 100+ decisions) with a high score in one antecedent condition is insufficient in associating with a high or low outcome score (e.g., a high price-point).** A few specific combinations of two-plus antecedent conditions are sufficient in identifying with an outcome condition of particular interest (e.g., a high or low price-point) but a single antecedent condition is not. Consciously and/or unconsciously decision-makers (DMs) process two-plus antecedent conditions to reach a conclusion, decision, and action. For example, in Fig. 1 the shortest path to an outcome involves asking and answering three questions. In Fig. 1 "cost reduction" is a B2B purchasing term that refers to seeking price decreases in purchasing requirements from a supplier; "cost avoidance" refers to seeking price increases less than the industry price inflation rate. Cost reduction is a more aggressive stance some buyers assume than cost avoidance. A "market price" stance is less aggressive than cost avoidance; willing to accept "list price" is the least aggressive purchasing stance.

Related to Fig. 1, not all key account customers adopt a highly aggressive stance with respect to price. Consequently, a key account may or may not receive a low price quote or the lowest price quote. A specific price-point in a response to an RFQ depends on the combination of two-plus antecedent conditions. From the

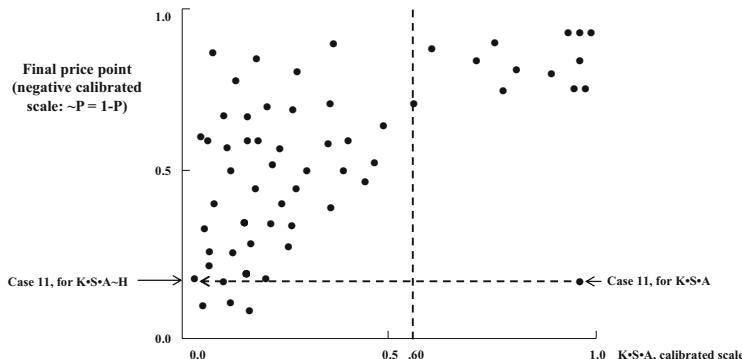
perspectives of data analysis and sense-making, a discussion of net effects and relative sizes of net effects of independent variables provide limited usefulness in comparison to adopting a configurational (i.e., recipe or combination) perspective.

**T<sub>2</sub>: Decision-makers rarely use all available information in all real-life cognitive processes.** From a “property-space” (Lazarsfeld 1937) or “truth table” (Ragin 2008) perspective (i.e., identifying every theoretically possible combination of antecedent conditions) all configurations possible theoretically do not occur in practice or in behavioral pricing models. For example, the marketer considers the aggressiveness of customers’ responses to price-points only for key account customers. The marketer rarely considers how aggressive the customer stands for non-key account customers (e.g., Fig. 1 does not include such a path). Customer price-lowering aggressiveness is a necessary but not sufficient condition for the customer to achieve the lowest price that the marketer is willing to offer. See Fig. 2. Such a necessary but not sufficient condition for lowering price provides valuable information for customers—being a large-requirements (volume) customer who is willing to single-source a purchase requirement with a supplier is insufficient for achieving a high membership score in the outcome condition (i.e., a very low price). In addition, such a customer needs to aggressively pursue a lower price.

Using Boolean algebra, the following configuration identifies a “causal recipe” that is sufficient for the marketer to include a very-low price-point in the response to the RFQ:  $K \cdot S \cdot A \geq 0.70$ , where  $K$  = key (large volume) customer account;  $S$  = willing to single-source;  $A$  = aggressively pursuing a price-lowering strategy. The mid-level dot (“•”) represents the logical “and” condition in Boolean algebra. A sideway tilde (“~”) represents negation or one minus the membership score, for example,  $\sim S = 1-S$ , and represents a membership score in not being willing to



**Fig. 2** XY plot of pricing antecedent condition for a necessary but not sufficient condition. Note. Each dot is a case, that is, a customer firm, plotted on the customer’s price-lowering aggressiveness and the final price quoted to the customer by the marketer’s firm. Data ( $n = 80$ ) and plot are from additional analysis of marketer’s responses to customers’ requests for proposals (RFQs) and follow-up documents of customers’ responses to marketer’s proposals from the study by Woodside and Wilson (2000)



**Fig. 3** Complex antecedent condition the is sufficient but not necessary:  $K \cdot S \cdot A$  where  $K$  = key account;  $S$  = willingness to singe-source;  $A$  = customer aggressiveness in seeking to lower price. Note. Customers with high membership scores ( $\geq 0.60$ ) on  $K \cdot S \cdot A$  receive very low final price quotes with the exception of case 11. The explanation for case 11 relates to the title of Van Maanen (1978), “The Asshole.” Case 11 is super-aggressive in attempting to lower price. Assuming that case 11 to be the only asshole ( $H$ ), the membership scores on not an asshole ( $\sim H$ ) for case 11 equals 0.0. Creating a configuration that includes  $K \cdot S \cdot A \cdot \sim H$  serves to shift the position of case 11 on the X axis to the far left. Thus, a very complex antecedent condition is necessary to include case 11 to result in very high consistency

single-source. The score equal to or greater than 0.80 indicates for this configuration that such customers have a high membership scores for all three of these antecedent conditions.

For a complex antecedent statement (i.e., the combination of two plus simple antecedent conditions), the total score for the statement is equal to the lowest score among the scores in the configural statement. Thus, a customer having the following scores,  $K = 1.00$ ;  $S = 1.00$ ; and  $A = 0.60$  would have a membership score equal to 0.60 for  $K \cdot S \cdot A$ . See Fig. 3 for an XY plot that shows a pattern indicating high consistency—scores high on X associate with scores high on Y with the exception of one case—customer number 11.

Woodside and Baxter (2013) describes contexts where a very limited number of customers do not fit the general pattern of findings in a study and how to create and test alternative models to explain such instances as case 11. The note at the bottom of Fig. 3 describes additional information on case 11 and how to refine the model to account for similar cases. A configuration of high membership scores for the combination of the first three antecedent conditions was sufficient for a very low price in the Woodside and Wilson (2000) study except for one customer firm. This one customer firm (case 11 in Fig. 3) is a “contrarian case.” A contrarian case is an individual (e.g., decision or firm) that has an outcome score opposite to a substantial majority of the cases with similar high scores on the antecedent condition. The presence of contrarian cases means that a researcher needs to conduct “an elaborate dialogue of ideas and evidence that leads to a progressive refinement of understanding of the relevant cases and to a more nuanced elaboration of the relevant causal conditions” (Ragin 2000, p. 317).

Case 11 in Fig. 3 was a super-aggressive customer in demanding additional add-on concessions that the industrial marketer labelled, “an asshole” (cf. van Maanen 1978). Adding the condition, “not an asshole” (i.e.,  $\sim H$ , where the sideways tilde indicates taking the negation and “H” stands for “asshole”) into the configural statement results in a shift to the far left of the XY plot for case 11 in Fig. 11 and is a useful explanation as to why case 11 did not have a high outcome associated with the three-term configural statement, K•S•A.

**T<sub>3</sub>: Decision-makers do not trade off high accuracy for low effort but create and use algorithms that are fast, frugal, and accurate/useful in achieving their objectives.** The suggestion Powell et al. (2011) imply that individuals fail to do as well as they can do in deciding and the proposition that DMs tradeoff high accuracy to achieve low effort (Payne et al. 1988) are inaccurate (see Gigerenzer and Brighton 2009, for evidence and a thorough discussion of these points). Professional B2B marketers and buyers are able to create and use relatively simple heuristics to achieve high accuracy and enable these DMs to achieve their objectives more than is possible by using all the available information and statistical multivariate procedures. While individuals are limited in their conscious cognitive capacity, the available evidence does not support a conclusion of lower competence by decision makers from not using all the information available as symmetric tests as the following perspective implies:

Research in behavioral decision theory (BDT) shows that individuals lack the cognitive capacity to make fully informed and unbiased decisions in complex environments (Kahneman et al. 1982; Payne et al. 1988). To cope with complex judgments and decisions, people use simplifying heuristics that are prone to systematic biases. Decision makers do not maximize the subjective expected utility of total wealth, but focus on deviations from cognitive reference points. BDT has found many applications in the social sciences, including strategic management (Bazerman and Moore 2008). (Powell et al. 2011)

Gigerenzer and Brighton (2009) provide an extensive review of compelling evidence that simple heuristics (i.e., simple algorithms) using limited amounts of information outperform the symmetric-based statistical models using all information available—when using holdout samples to test for predictive validity. They conclude, “Heuristics are efficient cognitive processes that ignore information. In contrast to the widely held view that less processing reduces accuracy, the study of heuristics shows that less information, computation, and time can in fact improve accuracy” (Gigerenzer and Brighton 2009, p. 107). Morgenroth (1964) and Howard and Morgenroth (1968) describe the use of holdout samples for testing for predictive validity and the achievement of high predictive validity for parsimonious algorithms in B2B pricing decisions.

Gigerenzer and Brighton (2009) describe how, “In the 1970s, the term “heuristic” acquired a different connotation, undergoing a shift from being regarded as a method that makes computers smart to one that explains why people are not smart. Daniel Kahneman, Amos Tversky, and their collaborators published a series of experiments in which people’s reasoning was interpreted as exhibiting fallacies. ‘Heuristics and biases’ became one phrase. It was repeatedly emphasized that

heuristics are sometimes good and sometimes bad, but virtually every experiment was designed to show that people violate a law of logic, probability, or some other standard of rationality... Another negative and substantial consequence was that computational models of heuristics, such as lexicographic rules (Fishburn 1974) and elimination-by-aspects (Tversky 1972), became replaced by one-word labels: availability, representativeness, and anchoring. These were seen as the mind's substitutes for rational cognitive procedures. By the end of the twentieth century, the use of heuristics became associated with shoddy mental software, generating three widespread misconceptions: (1) heuristics are always second-best; (2) we use heuristics only because of our cognitive limitations; (3) more information, more computation, and more time would always be better" (Gigerenzer and Brighton 2009, p. 109).

Gigerenzer and Brighton (2009) show how multiple regression analysis (MRA) and additional symmetric statistical tests outperform simple algorithms for fit validity but the opposite holds for predictive validity (via cross-validation with holdout samples). In cross-validation a model is fitted to one half of the data and tested on the other half and vice versa. Test of sufficiency models in industrial pricing contexts support the conclusion that simple heuristics provide high validity in predicting decision choices. Given that the proof of a model's worth lies in predictive validity, algorithm models such as the model appearing in Fig. 1 need to be tested on fresh data—data not used in creating the model.

In a behavioral-pricing research example, in a study creating and using simple heuristics in a B2B pricing context, Morgenroth (1964, p. 21) reports, "To determine its predictive accuracy [of the behavioral pricing model] fresh data were introduced into the [whole pricing algorithm] model. From a series of cabinets in the office of the division one file drawer in each cabinet was haphazardly chosen. The cabinets contained pricing data and decisions of the division over a six-year period. A systematic sample of every tenth filing was taken. The filings were arranged internally in chronological order, with the date that a competitor's move was initially made (the triggering) serving as the specific criterion of order. This sample yielded 32 decisions which were compared with the decisions predicted by the model... Agreement existed in all cases tried. Hence the hypothesis that the model can predict the executive's decision was not disconfirmed by the tests."

Unfortunately, neither Morgenroth (1964) nor Woodside and Wilson (2000) provide a side-by-side comparison of MRA and QCA tests for predictive validity in B2B contexts—QCA as a tool was unavailable at the time these two studies were done. Woodside and Wilson (2000) also do not report testing for predictive validity using a holdout (fresh) sample of customer cases. Thus, the evidence supporting higher predictive validity for algorithms versus MRA models is not conclusive in the context of pricing in B2B contexts—but the studies by Gigerenzer and colleagues (Gigerenzer and Selten 2001; Gigerenzer et al. 1999) offer consistent findings that algorithms created by biased minds provide more accurate models in predicting outcomes than the use of MRA and models that maximize subjective expected utility. Additional field studies using both symmetric (e.g., MRA) and asymmetric tests (e.g., QCA) are necessary to confirm this claim.

**T<sub>4</sub>: Necessary but insufficient conditions (NBICs) are always present in behavioral pricing but often are unreported.** Both marketers and buyers do not think to report on NBICs that researchers may find of great interest for advancing theory and practice. NBICs include antecedents that appear in a limited number of branches in an ethnographic decision tree model such as the one appearing in Fig. 1 as well as antecedents that pricing decision participants fail to mention and researchers fail to ask about. “You can’t think of everything” and “we learn from our mistakes” might come to mind here; both sellers and buyers learn to include additional necessary conditions into their configurational process models as mistakes surface.

Information on both types of NBICs in-use can be learned by asking participants to use “the think aloud method” (van Someren et al. 1994) in responding to different highly-relevant pricing scenario-problems. Such scenario-problems can be presented to participants in the form of paragraphs and/or choice and conjoint experiments. In one instance of doing so, a buyer announced, “I would never buy from a supplier I never heard of.” “Buyer awareness of the supplier” is a seemingly obvious NBIC that did not occur in the study before hearing this oral remark by a purchasing agent.

NBICs are often put forth explicitly in marketers’ and buyers’ documents and face-to-face statements as well as appearing without warning in long interviews. The second category of NBICs represents a form of “tacit knowledge” (Nonaka 1994; Polanyi 1958/2002. Tacit knowledge is unconscious and semi-conscious beliefs—“the type of knowledge that you gain through personal experience of working in an organization, but that is not written down and is difficult to share” (FT Lexicon 2013).

**T<sub>5</sub>: Participants in setting price and responding to a price-point use neither equally weighted nor unequally weighted conditions in compensatory rules when crafting a price-point or responding to a price-point—marketers and buyers make use of conditional configurational statements.** Examples of the conditional statements with respect to price-points that marketers use appear in Fig. 4 and below in Fig. 7. These conditional statements refer to specific contexts and require asymmetric, rather than symmetric, tests of their efficacy, that is, for high sufficiency—whereby low outcome scores associate with both low and high outcome scores. Only high scores on the path in the statement associates with a high score for the outcome condition. A simple antecedent condition may have a statistically significant positive relationship with price for all cases while at the same time have a highly negative association with price for several individual cases. Consequently, studies on how participants weight the importance of simple antecedent conditions and whether or not a series of simple antecedent conditions each have a significant positive or negative influence on price are not very useful. For example, the positive impact of customer aggressiveness on lowering price changes to an apparent negative impact if the customer scores high on being an asshole. Useful, accurate, interpretation of what is happening depends on focusing on multiple configurations (paths) of complex antecedent conditions.

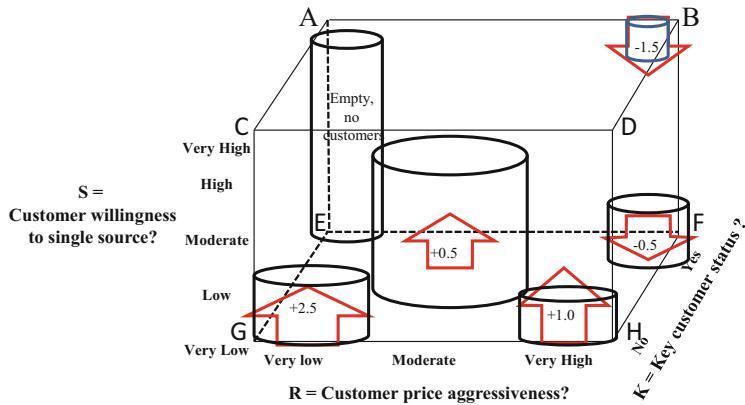
Configuration (Alternative path/Boolean expression)	Conditional Statement
<b>A</b> Path: $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 = 13$ reductions Boolean: $K \cdot R \cdot S \leq (\text{Price} \leq -1.0)$	<b>Lowering-price-strategy:</b> If a key (K) account customer who is focused on cost aggressively on lowering-price (A) and is willing to single-source (S), then price more than 35% below the annual average price.
<b>B</b> Path: $1 \rightarrow 3 \rightarrow 6 \rightarrow 9 = 11$ Boolean: $K \cdot \sim A \cdot \sim V \leq 11$	<b>High-price-increase strategy:</b> If key (K) account customer who is <b>not</b> focused on aggressively ( $\sim A$ ) on price reductions and <b>not</b> focused on cost avoidance ( $\sim V$ ), then increase price 10% above the current price that K is now paying. (A rare context.)
<b>C</b> Path: $(1 \rightarrow 2 \rightarrow 5 \rightarrow 8 = 10) \rightarrow 15$ Boolean: $(\sim K \cdot S \cdot C \leq 10) \cdot 15$	<b>Signaling competitor pricing for small but important customer:</b> If customer is not a key account ( $\sim K$ ) but does single source (S), but has received an RFQ response from a competitor (C), then price 1¢ below competitor's bid; observe customer's response.
<b>D</b> Path: $1 \rightarrow 2 \rightarrow 5 \rightarrow 8 = 11$ Boolean: $\sim K \cdot S \cdot \sim C \leq 11$	<b>Highest-price-increase strategy:</b> If customer is not a key account ( $\sim$ ) but does single source (S) and has not received a competitor's response ( $\sim C$ ) to an RFQ, then increase the price above the already high price by 10% that this customer is now paying.
<b>E</b> Path: $(1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 7 = 14) \rightarrow 15$ Boolean: $(K \cdot R \cdot \sim S \cdot L = 14) \cdot 15$	<b>Competitor-pairing pricing:</b> If customer is a key account (K) and is focused on cost reductions (R) but is unwilling to single-source ( $\sim S$ ) but will split business 50-50 (L), then set new price equal to competitor's price and watch competitor's response.

**Fig. 4** Examples of industrial solvents conditional pricing in alternative contexts

Figure 4 includes the main paths (i.e., configurations or recipes) that appear in Fig. 1. The findings in both Figs. 1 and 4 illustrate the tenet that a marketer may apply price-increasing and price-decreasing strategies for the same B2B product/service for different customers, strategies that do not depend exclusively on the buyers' purchase quantities—the implementation of quantity discount sizes depends on the presence and absence of additional antecedents in the configurations.

**T<sub>6</sub>:** **The average price increase or decrease across all customers provides insufficient information for advancing theory because specific price points are contingent on several complex antecedent conditions: monthly or annual prices may increase on average for most customers but decrease for a substantial minority, while some customers receive the same price quote as one given last year.** Figure 5 illustrates this sixth tenet from data in the Woodside and Wilson (2000) study. Figure 5 shows most customers receive price increases of varying amounts contingent on the membership score for a combination of three antecedent conditions. However, customers with high scores on all three antecedent conditions (location B in Fig. 5) receive substantial price decreases.

Customers knowing their configural location within such three- to five-sided dimensions are more likely to more able to create effective strategies to reduce price increases or even gain price decreases than customers without such knowledge. One strategy planning take-away is that an average price increase rarely applies to all customers.

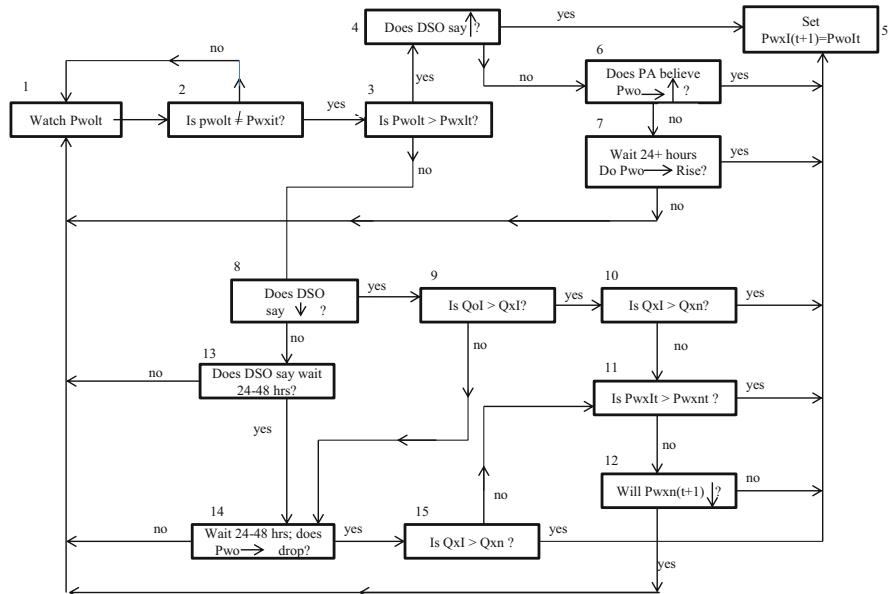


**Fig. 5** Price increase and decrease points in standard units (Z-scores) with cylinders indicating number of customers (not volume of business). Notes. Most customers accept price increases. High scores in all three antecedent conditions ( $K \cdot R \cdot S$ ) sufficient for lowest price point. Focusing on the overall average price change ( $Z = +0.2$ ) is misleading because specific configurations of antecedent conditions associate with a specific price point

**T<sub>7</sub>: Equifinality occurs: more than one configuration leads to the same solution (outcome), that is, a specific price-point.** For example, several routes lead to outcomes 11 and 12 in Fig. 1. Behavioral pricing theory and research includes observations of usually two-to-five combinations of complex antecedent conditions that lead to the same outcome. The findings from the wholesale pricing study by Morgenroth (1964) and Howard and Morgenroth (1968) illustrate tenet 7 vividly. Figure 6 summarizes these authors behavioral pricing model in an ethnographic decision tree diagram. The model includes three outcomes: an increase in price (top-third of Fig. 6), a price decrease (bottom two-thirds of Fig. 6) and no change in price (box 1) in Fig. 6.

Figure 6 looks complex at first blush but examining a few paths in the model show that such isomorphic models are easy-to-grasp. The shortest path in Fig. 6 appears at the top of Fig. 7—makes no change in our (X) price if the competitor's (O) price remains the same as our price. Price increases are less complex than price decreases in this model because the market has few competitors and demand is inelastic. Consequently, if O increases its price, then X can increase price and profits for both will increase. Thus, the second path in Fig. 7, as appearing in Fig. 6, includes boxes 1–2–3–4–5 for such a price increase by O and then by X.

Price decreases in Figs. 6 and 7 are more complex than price increases because firm X wants to limit the possibility of a price war between X and Y. Additional antecedent conditions are activated for price decreases that do not appear for price increases—such as information on the market shares for O and X in the local and nearby markets (boxes 9 and 10 in Fig. 6). This point illustrates the eighth tenet.



**Fig. 6** Wholesale pricing of petroleum. Source: Morgenroth, 1964, p. 19. Key. P = price; t = time, at present; PA = price analyst; r = retail; (t+1) = time, subsequent to considering price change; w = Wholesale; Q = Quantity; ≠—is not equal to; or is different from; x—our company; l = local market, wherein price change is being considered is greater than; o-> is other major competitors in local market; n = nearby market with funnel influences; ↑ = raise price; o = other major competitor initiator; DSO = district sales office; ↓—drop price

<u>Alternate Route</u>	<u>English Equivalent</u>
A. 1 – 2 – No – 1	Watch Others' Wholesale Local price. Is it different from the Company's price? If "No", watch.
B. 1 – 2 Yes – 3 Yes – 4 Yes – 5	Another raises his Local Wholesale Price. District Sales office (DSO) says to raise price so the Company meets the price
C. 1 – 2 – Yes – 3- Yes – 4 – Yes – 5	Another raises his Local Wholesale price. DSO says not to raise price, but Price Analyst (PA) believes others may follow, so Company meets the price.
D. 1 – 2 – Yes – 4 – No – 6 – No – 7 No – 1	Another raises his price. DSO says not to raise price. PA is dubious. The company waits 24-48 hours. The other competitors follow up, so the Company meets the price.
E. 1 – 2 – Yes – 3 – Yes – 4 – No – 6 – No – 7 – 1	Same ad D, but others do not follow, so Company watches market.
F. 1 – 2- Yes – 3 – Yes – 9 – 10 – Yes – 5	Another drops his Local Wholesale Price. DSO says to follow down. The other's local market share is larger than the Company's local market share. The company's local market volume is larger than its nearby market volume. The Company meets the price.
G. 1 – 2 – Yes – 3- No – 8 – Yes – 9 - Yes- 10 – 11 – Yes 5	Same as F, except that the Company's nearby market volume is larger than its local market local market volume. The nearby market wholesale price is below the local wholesale price, so the Company meets the price.
H. 1 – 2 Yes – No – 8 – Yes – 9 – Yes 10 – No – 11 – No – 12 – 1	Same as G, except that the Company's Local Wholesale Price is below its nearby market wholesale price. This will funnel the larger market, so the Company does not change price.

**Fig. 7** Example heuristics in the wholesale petroleum pricing model. Source: Morgenroth (1964, p. 23)

**T<sub>8</sub>: Causal asymmetry occurs: the explanations for price increases are not the mirror opposites of the explanations for price decreases—different complex configurations sometimes having different simple antecedent conditions occur for different outcomes in behavioral pricing.** Fiss (2011), Ragin (2008), and Woodside (2013) all stress the reality of causal asymmetry. “While a correlational understanding of causality implies causal symmetry because correlations tend to be symmetric [i.e., correlations test for symmetry]. For instance, if one were to model the inverse of high performance, then the results of a correlational analysis would be unchanged, except for the sign of the coefficients. However, a causal understanding of necessary and sufficient conditions is causally asymmetric—that is, the set of causal conditions leading to the presence of the outcome may frequently be different from the set of conditions leading to the absence of the outcome” (Fiss 2011, p. 394).

Such findings in behavioral pricing as in Fig. 1 by Woodside and Wilson (2000) and Fig. 6 by Morgenroth (1964) and Howard and Morgenroth (1968) support the causal asymmetry stance for theory development and theory testing. Relying solely on symmetric testing tools such as MRA and structural equation modeling does not reflect the reality of asymmetric relationships in behavioral pricing. As Gigerenzer (1991) stresses, tools shape theory as well as how a researcher goes about analyzing data. Tools and theory are necessary to use that support consistent findings of causal asymmetry as well as equifinality and configural complexity (i.e., heterogeneity) in relationships among antecedent conditions and outcomes of interest—such as specific price-points and price increases/decreases.

**T<sub>9</sub>: From a behavioral pricing perspective, two or more participants engage in interactions involving setting a specific price-point resulting in a sale/purchase.** Behavioral pricing theory recognizes that B2B price setting usually involves multiple participants influencing the selection and calibration of antecedents in the pricing process. In the Morgenroth (1964) study for example, Fig. 6 shows three persons are involved in setting price: the pricing manager, the district sales officer, and the pricing analyst. A set price is frequently negotiated between the marketer and customer. The customer frequently includes multiple-parties in B2B contexts as well (Woodside and Samuel 1981).

**T<sub>10</sub>: Price setting frequently involves a series of feedback loops in real-life contexts. Formal meetings often occur in negotiating annual contracts among manufacturers buying component parts and informal meetings both precede and follow these formal meetings.** Woodside and Samuel (1981) provide a marketing-purchasing participant observation study that confirms this tenth tenet. Their study includes a decision systems analysis (DSA) showing several feedback loops in negotiation processes involving centralized purchasing offices and various plant-level purchasing officers and well as company-wide purchasing committees negotiating with global suppliers. The use of DSA is a useful precursor tool for the creation of more formal ethnographic decision tree models and the use of fuzzy set qualitative comparative analysis.

*The Informant* (Eichenwald 2001) is viewable correctly as a report on a marketing anthropological study of behavioral pricing by the United States Federal Bureau of Investigation (FBI). The study includes in-depth reporting on several (in this case, illegal) meetings of competing manufacturers jointly setting prices globally for agricultural-related products with several feedback loops in discussions of the same issues. The FBI study employed a mixed-methods design. Along with unobtrusively (secretly) filming these price-setting meetings and recording verbal exchanges occurring during the meetings, the FBI analyzed thousands of price-fixing documents from several years, and completed multiple rounds of interviews with a participant observer (the informant). The result is a treasure trove that appears to support the tenth tenet—and all tenets of the general theory of behavioral pricing. T<sub>10</sub> needs formal testing via separate studies comparing data from the FBI case with the behavioral pricing and classic microeconomic pricing theory.

### 3 Discussion with a Worked Example of Examining Complex Antecedent Configurations

Behavioral pricing modeling and testing has been around a while now but still such modeling is a mouse next to the dominating elephant of symmetrical theory and testing approaches in pricing research. The availability of behavioral pricing studies reporting complex configural antecedents, equifinality, and causal asymmetry is spotty in comparison to the plethora of studies by authors adopting a combination of net effects, finality, and causal symmetry stance. The principle objective of this paper is to generate the start-up of continuing behavioral pricing research that provides an annual stream of useful studies capturing heterogeneity, realism, and accurate predictive—not just fit—validity. The intention is to present a set of tenets that together offers a new reality-based behavioral pricing theory that has much promise in describing, explaining, and predicting price-related decisions and actions by marketers and buyers. The set of tenets itself includes a configuration of theory and tools.

Table 1 is a summary of comparisons of the assumptions and perspectives of microeconomics and the dominant logic theory toward pricing and decision-making (e.g., Kahneman et al. 1982; Nicholson 2011; Perloff 2007) versus the behavioral theory of pricing for B2B products and services. The central point in considering the comparisons in Table 1 is that while microeconomic theory and the dominant logic of research on decision-making are elegant and frequently inaccurate, the perspectives and assumptions of behavioral pricing theory are messy and frequently accurate. The general theory of behavioral pricing may offer unique advantages for attaining the objectives of heterogeneity, realism, and high-predictive accuracy.

Gladwin (1989), Morgenroth (1964), Howard and Morgenroth (1968), van Maanen (1978), Van Someren et al. (1994), Vyas and Woodside (1984), Woodside

**Table 1** Comparison of perspectives of microeconomics/dominant logic and the general theory of behavioral pricing

	Concept	Microeconomics/ dominant logic	General theory of behavioral pricing
1.	Context?	Ignore	Embrace
2.	XY relationship assumption?	Symmetric	Asymmetric
3.	Stance toward complexity?	Dismiss (“all else equal”)	Capture, report
4.	Research focus?	Variables; statistical models	Cases; isomorphic algorithms
5.	Focus of findings?	Net effects; fit validity only	Configurations; fit and predictive validity
6.	Theoretical stance?	Rationality	Bounded rationality
7.	View of decision- maker?	Biased; mistake prone	Biased; prone toward high accuracy
8.	Decision-maker?	Individual	Group (e.g., “buying center”)
9.	Directionality	Ignore	Feedback loops
10.	Stance toward information?	Use all information available	Use all information necessary
11.	Foundation for analysis?	Matrix algebra	Boolean algebra
12.	Stance toward markets?	Many buyers and sellers	Few buyers and sellers
13.	Weighting attributes?	Yes	No
14.	Firm’s principal objective?	Maximize profits	Context-bound satisficing profits

and Samuel (1981), Woodside (2010), and Woodside et al. (2012) offer details and examples for collecting data from decision participants on their perceiving information, sense-making, assessing issues, and choice-making processes in natural contexts; these sources also discuss the collection of documents and data from direct observations of participants’ actions in natural contexts. The blessings from such data collection and handling include the combination of verbal and written data and process information relevant to specific contexts that the use of fixed-point (e.g., 1–5 or 1–7 valuations) surveys cannot provide; also, invariably, participants blurt out information during moments in think aloud data collection procedures that they would never report in written survey responses—especially when the participants are interviewed on two or more occasions.

The bane of management ethnographic research is the great amount of effort and time necessary for implementing field data collection in behavioral pricing research. However, the data collection of 5–100+ such case studies enables useful construction of isomorphic models—models that support Kotler’s (1967) perspective of the features of real-life decision processes in ways that symmetric models (structural equation models) using fixed-point responses cannot do. The data collection of an additional 5–100+ management ethnographic cases enables the testing for predictive validity of algorithms (i.e., complex configurations consisting

of two or more simple antecedent conditions) within the isomorphic models created from the first set of data. McClelland (1998), Morgenroth (1964), and Howard and Morgenroth (1968) illustrate such tests for predictive validity; their findings include high predictive validities (e.g.,  $r^2 > 0.90$ ) between predictions and observed outcomes.

The blessings of collecting fixed-point survey data include the relative ease of data collection and ease of testing models using symmetric methods (MRA and SEM). The banes include requiring participants to convert what they think they know into scaled responses (the failure to collect real-life, naturally-occurring, data), the absence of contextual information, usually the absence of confirmations of facts and procedures learned by going into the field and comparing documents and observations with verbal and/or fixed-point scaled responses, and the circumspect nature of any open-ended written responses by respondents to survey questions. While surveys using fixed-point scales followed by symmetric model-building and testing may provide useful information on participants' evaluations of the quality of procedures and outcomes, such studies offer inadequate information in describing and understanding the nitty-gritty steps in the processes and provide models with low fit validity—and low predictive validity (on the rare occasions when these studies include predictive validities). The implicit suggestion by Kotler (1967) and the explicit suggestions by Mintzberg (1979) and Woodside (2013) to move beyond fixed-point surveys coupled with symmetric testing to ethnographic studies coupled with asymmetric testing has merit for model building in behavioral pricing.

### ***3.1 Embracing Complexity Theory***

Marketing scholars would benefit from heeding Urry's (2005) and others' (Davis et al. 2009; Popper 1961; Simon 2009) call to embrace many tenets of complexity theory. As Simon (2009, p. 32) states aptly, "Science seeks parsimony, not simplicity searching for pattern in phenomena." Simon (2009) refers to this perspective as one of Popper's (1961) major dictums. Both theory and Ragin's (2000, p. 317) recommendations for "elaborate dialogue of ideas and evidence" should guide searching for patterns in the data. Complex (i.e., recipes of a few to many specific levels of simple antecedent conditions) resulting in outcomes of interest is the focus of pattern search in the general theory of behavioral pricing. Given the relevancy of complexity theory and Gigerenzer's (1991) wisdom that "Scientists tools are not neutral" in behavioral pricing, fuzzy-set qualitative comparative analysis (fsQCA) is a particularly useful theory-method for explicating parsimonious patterns in pricing-related data. At the minimum, the focus and use of fsQCA in testing theory and searching for asymmetric parsimonious patterns complement the theoretical stance and use of MRA for testing for the net effects of individual variables in symmetric models (cf. Ragin 2006).

### 3.2 A Worked Example of Relevant Analytics for Testing the General Theory

The website [fsQCA.com](http://fsQCA.com) provides a software program for testing theory and elaborate dialogues with data for identifying parsimonious patterns. The data in Table 2 and the output in Table 3 serve to illustrate the use of the fsQCA software in testing core tenets of the general theory of behavioral pricing. The data in Table 2 are based in part on data collected for the Woodside and Wilson (2000) study but the data in Table 2 are presented as a thought experiment (Gendler 1998). All conditions (columns) in Table 2 represent calibrated data. Assume for the thought experiment that the measures have high nomological validity (our purposes here does not include a full accounting on how the measures were developed). Table 2 includes 11 conditions (8 antecedents and 3 outcomes). Applying McClelland's approach of using quintiles for each of the 8 antecedent conditions (McClelland 1998, focuses on building algorithms of cases in the highest and lowest quintiles of variables to describe and predict highly competent individuals), a property space analysis (i.e., "truth table") indicates 32,768 possible combinations or patterns. Considering terciles (low, medium, and high) results in 512 combinations; it is best not to consider dichotomizing the conditions into high and low only due to the normal distribution for many of the simple conditions (Fitzsimons 2008).

The data in Table 2 are fuzzy-set membership scores for each condition; fuzzy-set scores range from 0.00 to 1.00. Consider fuzzy set scores as taking steps beyond the use of quintiles whereby membership scores represent a logarithmic function of original scores. Calibration conceptually refers to a kind of membership, for example, "high price point" and not price points in general. The fsQCA software program computes all membership scores given the researcher provides the original values associating with the full membership threshold score equal to 0.95; the original value indicating "maximum ambiguity score equal to 0.50; and the value indicating the threshold for non-membership equal to 0.05. The median value of an original scale is usefully calibrated to be equal to 0.50. For a variable that is normally distributed, the original score having a z-score equal to +1.65 is a useful first estimate for a calibrated membership score equal to 0.95; an original score having a score of -1.65 is a useful first estimate for a calibrated membership score equal to 0.05. However, Ragin (2008) emphasis that theory and prior experience should be the guiding forces in calibration. Consider the following data of price points in a set of 12 cases (values are U.S. dollars): 1.25; 1.30; 1.33; 1.40; 3.80; 4.50; 8.60; 11.10; 14.20; 15.10; 18.10; 25.50. The pricing manager decides to calibrate these original values; the pricing manager identifies values below a breakpoint of 1.50 as clearly indicating non-membership in a high-price scale; she selects the median price equal to 6.46 as the cross-over membership score equal to 0.50, and the score of 13.0 (the upper 90th percentile limit for the mean original value equal to 9.84 as equal to full membership in high-price membership. Using the fsQCA software subroutine, here are the resulting calibrated membership scores for the 12 original prices \$1.25→0.04; \$1.30→0.04; \$1.33→0.04;

**Table 2** Simple antecedent conditions and compound outcome of Seller-Offer•Customer-Acceptance: Calibrated Scales with S•O = Union of S-Offer and C-Accept

Case	ss: S-Size	so: S-Objective	se: S-Expertise	cs: C-Size	co: C-Objective	ce: C-Expertise	cw: C-Willing	pp: Price- Point	sof: S-Offer	ca: C-Accept	sof: S•O
1	.96	.85	.97	.86	.92	.98	.74	.18	1	1	1
Case 1 description: Big, high-profit focused, expert seller; big, high-profit focused, expert customer willing to single-source, for a low price-point, both seller and customer agree on this price-point; thus, S•O = 1.											
2	.96	.95	.65	.34	.12	.77	.07	.94	1	1	1
3	.22	.99	.32	.92	.96	.40	.93	.04	1	0	0
4	.05	.91	.05	.96	.92	.99	.30	.06	0	0	0
5	.50	.20	.65	.15	.22	.05	.96	.95	1	1	1
6	.05	.05	.25	.55	.60	.88	.05	.77	1	0	0
7	.61	.99	.23	.81	.19	.21	.91	.91	1	1	1
8	.96	.44	.72	.91	.60	.99	.90	.07	1	1	1
9	.31	.09	.14	.23	.08	.11	.35	.88	0	1	1
10	.91	.22	.13	.88	.99	.88	.43	.21	0	1	0
11	.56	.88	.78	.23	.86	.07	.89	.14	1	1	1
12	.96	.85	.97	.12	.30	.18	.91	.81	1	1	1

Key: S-Size = seller size for this product category; S-Objective = seller knowledge•experience•capability; S-Expertise = seller knowledge•experience; C-Size = customer size for this product category; C-Objective = customer aggressiveness for price reduction; C-expertise = customer knowledge•experience•capability; C-Willing = customer's willingness to single source requirements; Price-Point = price point now on table; S-Offer = does seller offer this price point? C-Accept = does buyer accept this price point?

**Table 3** Findings for high consistency that both parties accept

Models with high consistency in predicting both seller offer and buyer accepts	Ravr coverage	Unique coverage	Consistency
1 pp*~cw*~ce*~co*~cs*~se*~so*~ss	0.113750	0.070000	0.919192
2 pp*cw*~ce*~co*cs*~se*so*ss	0.140000	0.052500	0.910569
3 pp*cw*~ce*~co*~cs*se*so*ss	0.177500	0.070000	0.928105
4 pp*~cw*ce*~co*~cs*se*so*ss	0.147500	0.072500	0.893939
5 ~pp*w*~ce*co*~cs*se*so*ss	0.132500	0.052500	0.803030
6 ~pp*cw*ce*co*cs*se*~so*ss	0.136250	0.070000	0.819549
solution coverage: 0.510000			
solution consistency: 0.929385			

Example: Model 1, description: high price point, not customer willing to single source, customer low in expertise, customer's objective is not aggressive, seller low in expertise; seller size is small, seller not high profit objective, seller is not large in size

Notes. The price point in a seller's offer that the buyer accepts is high in models 1–4 and low in models 5 and 6. The customer is willing to single source in models 2, 3, 5, and 6 but not willing to do so in models 1 and 2. The six configurations do not include one valence consistently for any of the simple antecedent conditions. Thus, the direction of the impact on price (and other simple antecedent conditions) is contingent on the recipe for the complex configuration in which price (and the other simple conditions) in which it appears

Key: S-Size = seller size for this product category; S-Objective = seller profit aggressive; S-Expertise = seller knowledge•experience•capability; C-Size = customer size for this product category; C-Objective = customer aggressiveness for price reduction; C-expertise = customer knowledge•experience•capability; C-Willing = customer's willingness to single source requirements; Price-Point = price point now on table; S-Offer = does seller offer this price point? C-Accept = does buyer accept this price point?

\$1.40→0.04; \$3.80→0.17; \$4.50→0.23; \$8.60→0.73; \$11.1→0.89; \$14.1→0.97; \$15.1→0.98; \$18.1→1.00; \$25.50→1.00, where the numbers following the arrows indicating the calibrated scores. Note that the variability in the original values is not equally important in the calibrated membership scores; once the full membership threshold is reached, all higher values receive nearly identical membership scores—including in this instance the very high price \$25.50 even though the z-score for \$25.50 for a mean equal to 8.848 and a standard deviation equal to 2.314 equals 7.196. Using terciles for clarity purposes, the eight antecedent conditions provide for a truth table with 512 cells (i.e., complex configurations) the include big/medium/small, high/medium/low profit focused, high/medium/low expert seller; big/medium/small, high/medium/low profit focused, high/medium/low expert customer very/somewhat/not willing to single-source, for a high/medium/low price-point. Complexity theory, empirical findings from applying fsQCA, and elementary logic indicate that most of the 512 cells will be empty if a given study has a few or even 1000 plus cases. The outcomes include the seller only, the customer only, and both seller and customer agreeing on a contract that the particular combination represents.

The tenets of complexity theory provide several expectations to follow from examining the data in Table 2. These expectations support the following

perspectives. A few (not many) of the patterns will provide highly consistent outcomes (e.g., seller-customer joint agreements). Both low and high price points within different complex antecedent configurations will associate with seller-customer joint agreements. Not all eight antecedent conditions will occur necessarily in the configurations indicating high consistency with seller-customer joint agreements. The valences for most-to-all antecedents will not be consistent for the configurations providing the highly consistent outcome of seller-customer joint agreements. A few of the combinations will provide highly consistent seller agree outcomes; a few of the combinations will provide highly consistent customer agree outcomes; such models of agreement will be distinct from the combinations indicating that both the seller and buyer agree—thus, model testing for high consistency of outcomes can and should be done for all three possible outcomes. The testing for the negation of outcomes provides for distinct models of high consistency which are not mirror opposites of the positive outcome models (the causal asymmetry tenet).

Empirically examining all the tenets of the general theory of behavioral pricing is beyond the scope of the present study. However, the configural findings for testing for seller-customer agreement using the data in Table 2 appear in Table 3. These findings include six complex antecedent conditions that associate consistently with high scores in the outcome condition, that is, high scores in each of the six models indicates high score in the outcome condition of seller-customer agreement. Positive price-points appear in four of the six complex configurations and negative price-points appear in two of them.

These findings are from the “intermediate solutions” from using the fsQCA software; these intermediate solutions include all eight antecedents—such a finding does not always occur when testing using intermediate solutions. The fsQCA output includes parsimonious solutions and complex solutions—in this example application the intermediate and complex solutions are the same. Coverage in Table 3 indicates the share of cases whereby high scores for the complex antecedent condition associates with high scores for the outcome solution—coverage is analogous to the “coefficient of determination” ( $R^2$ ) in MRA (Woodside 2013).

## 4 Limitations

The intention here does not include a complete exposition of the general theory of behavioral pricing. While Woodside et al. (2013) provide direct comparisons of theory and findings using symmetric versus asymmetric tools (e.g., MRA versus QCA), they do so for a field experiment focusing on pricing in a consumer goods context and not a B2B context. Certainly, direct comparisons of using both theory-method approaches in B2B contexts warrant researchers’ attention. The paper’s title may appear to claim too much given that the evidence is limited in support of the general theory. However, the presentation here focuses on developing the theory and to call for the use of marketing and consumer anthropological studies focusing

on the tenets of behavioral pricing to test the general theory. One objective for the study here is to encourage additional research and literature reviews on behavioral pricing topics to both confirm and extend the core tenets of the theory.

The general theory of behavioral pricing as explicated here fit well in Cyert and March's (1963) four objectives for starting the quest for a behavioral theory of the firm. Here are the four objectives as Cyert and March expressed in 1962:

1. Focus on a small number of key economic decisions made by the firm. In the first instance, these were price and output decisions; subsequently they included internal allocation and market strategy decisions.
2. Develop process-oriented models of the firm. That is, we viewed decisions of the firm as the result of a well defined sequence of behaviors in that firm; we wished to study the decisions by studying the process.
3. Link models of the firm as closely as possible to empirical observations of both the decision output and the process structure of actual business organizations. The models were to be both explicitly based on observations of firms and subject to empirical test against the actual behavior of identifiable firms.
4. Develop a theory with generality beyond the specific firms studied. We wanted a set of summary concepts and relations that could be used to understand the behavior of a variety of organizations in a variety of decision situations. (Cyert and March 1963, p. 2, italics in original)

Yet, the present study is limited in its scope and depth in contributing to these four objectives. The present paper provides an approach to constructing and testing complex antecedent conditions that builds upon the objectives of the behavioral theory of the firm and complexity theory but does not provide a full empirical examination that matches the four commitments as Cyert and March (1963) describe. Clearly the tenets of the general theory of behavioral pricing need examination by field studies involving more than one marketer and only a limited number of cases of customers. However, the advances of joining complexity theory, complex configurational modeling, and the tenets of the basic behavioral theory of the firm provide insight for a useful way forward.

## 5 Practical Implications

Famously, Kotler (1967, p. 1) pronounced, "Marketing decisions must be made in the context of insufficient information about processes that are dynamic, nonlinear, lagged, stochastic, interactive, and downright difficult." Kotler's perspective is relevant to pricing decisions and customers' responses to specific price points as well as to advancing knowledge in behavioral pricing.

Consequently, research on issues involving pricing decision processes and outcomes in industrial marketing contexts requires the use of methods that go beyond arms-length surveys using fixed-point scales. The Morgenroth (1964), Howard and Morgenroth (1968) and the Woodside and Wilson (2000) studies included multiple

face-to-face interviews with multiple participants in the pricing decision processes, document analysis of several cases (decisions), and in the study by Woodside and Wilson (2000) interviews with customers as well as members of the industrial marketing firm. The data analysis benefitted by the use of asymmetric analytical tools as McClelland (1998) and Ragin propose (2008). The findings support the tenets of the general theory of behavioral pricing as described in the present article.

### ***5.1 One Antecedent Condition is Rarely Sufficient as an Indicator for a High or Low Outcome Score***

Reviewing the tenets of the theory and empirical findings offers strategic insights for both marketers (M) and customers (C). An insight for both M and C that follows from the first tenet: very large customer size alone is insufficient for offering or receiving price-points lower than the average price point for all customers. B2B customers need to call attention to their size when aggressively pursuing a low price-point.

### ***5.2 Decision-Makers Rarely Use All Available Information in Real-Life Contexts***

An insight for M from the second tenet: different information streams relevant for different customer segments results in modifications to marketing strategy designs for these different customer segments. Customers can be segmented by a combination of size and the decision processes that they enact. For C: what works for big customers in the industry in gaining favored price treatment with suppliers is unlikely to work with small customers. Small customers will need to enact decision processes relevant for their size to gain favored treatment from suppliers.

### ***5.3 Decision-Makers Do Not Tradeoff High Accuracy for Low Effort but Create and Use Algorithms***

Woodside and Wilson (2000) describe purchasing executives reporting the use of compensatory decision rules for information gathering purposes but not when making actual choices among suppliers and their responses to RFQs—buyers use algorithms. Their conscious explication of these algorithms is likely to be a valuable exercise in learning how well the algorithms serve to reach their buying objectives. For M, learning buyers' algorithms-in-use will likely impact how M

designs RFQ responses and the effectiveness of these responses in gaining share-of-business from the customers.

#### **5.4 Learning Necessary but Insufficient Conditions (NBICs)**

M and C are likely not to be consciously aware of all relevant necessary but insufficient conditions affecting the setting of price and responses to price-points. The in-depth study of multiple cases using the long interview method is likely a necessary requirement for uncovering such information—such was the case in learning the seemingly trivial information that not all customers were aware of all three national manufacturers of the chemical purchasing requirements in the study by Woodside and Wilson (2000).

#### **5.5 Prices Vary Considerably for Different Customers in the Same Industry but the Variance Occurs in Different Complex Configurations-in-Use by their Industrial Suppliers**

The wide variation in prices for the same company manufacturing commodities in the chemical industry in Woodside and Wilson's (2000) study might surprise many industrial buyers. The low price among all customers was one-tenth of the highest prices that some customers were paying for the same products. Part, but not all, of this price variance would relate to costs in servicing large versus small customer accounts. Small-order customers are at a considerable disadvantage in attempting to negotiate price reductions with manufacturers of their purchase requirements. However, a share of large customers would likely benefit from an increase in their aggressiveness in negotiating price reductions. The cases were rare whereby large customers were too aggressive for the manufacturer to comply with requests for additional price reductions and additional add-on benefits (shipments with very low transportation charges)—compliance to such requests was usually granted.

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# The Complexity Turn in Cultures' Consequences on Entrepreneurship, Innovation, and Quality-of-Life

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*"But we are not Denmark! I love Denmark. We're the United States of America and it's our job to rein in the excesses of capitalism so it doesn't run amok!" (Hilary Clinton, Las Vegas, Democrat Presidential Primary Debate 2015)*

*"You're not to think you are anything special." (First rule in the Danish Law of Janteloven)*

**Abstract** This study examines influences on quality-of-life of national cultures as complex wholes and entrepreneurship activities in Brazil, Russia, India, China, Germany, and the United States. The study tests McClelland's (1961) and more recent scholars' proposition that some cultural recipes nurture entrepreneur startups while other cultures are biased toward thwarting startups. The study applies complexity theory to construct and empirically test a general theory of cultures', entrepreneurship's, and innovation's impact on quality-of-life across nations. Because culture represents a complex whole of attitudes, beliefs, values, and behavior, the study applies a set-theoretic approach to theory construction and testing of alternative cultural recipes. Each of 28 nations is scored for the level of the national cultures for each of six focal countries. The findings include presenting the complex X (national cultural recipe) with Y (entrepreneur nurture/thwart) plots of the 28 nations for the six focal nations. The findings include recognizing national cultures (Switzerland, USA) nurturing entrepreneurial behavior versus other national cultures thwarting (Brazil and India) entrepreneurial behavior. The study concludes with a call to recognize the implicit shift in cultural implicit thinking and

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behavior necessary for advancing national platforms of actions to nurture entrepreneurship successfully. Entrepreneur strategy implications follow from the findings including the observation that actions nurturing firm start-ups by nations low in entrepreneurship will unlikely to be successful without reducing such nations' high levels of corruption.

**Keywords** Complexity theory • Culture • Entrepreneurship • Innovation • Recipe • QOL

## **1 Introduction: National Cultures, Capitalism, Entrepreneurship, and Computing Cultural Complex Wholes**

The two quotes indicate differences in the cultural recipes of the USA and Denmark. The statements are suggestive that the approaches to entrepreneurship and capitalism may be different in these countries based on differences in their cultural configurations (recipes). The present study quantifies (i.e., models) and empirically examines models of national cultures as complex wholes and confirms how a few unique cultural recipes nurture, while others thwart, replicative (i.e., frequently observed new small shops) and innovative (usual and often high-tech) entrepreneurial start-ups. The study supports and deepens McClelland's (1961) perspective on how personal achievement motivation favorable impacts entrepreneurial behavior and Schumpeter's (2000) theory of how entrepreneurship as innovation favorably impacts a nation's quality-of-life.

The statement by Hillary Clinton was in response to a comment her main opponent for the 2016 Democrat presidential nomination. Bernie Sanders, Clinton's debate opponent, said, "Look to countries like Denmark, like Sweden and Norway and learn from what they have accomplished for their working people." The present study does look at these countries and performs a comparative analysis to report to show that while the USA and Denmark rank among the top ten in entrepreneurship, both display similar ingredients in their cultural configurations that support high entrepreneurship activity, and unique ingredients in these configurations that are the basis for the Sanders and Clinton Denmark-USA confrontation. "Culture configuration" represents the complex whole of a culture at the national level, a nation's DNA. Using Hofstede's (2001) cultural values, the foundational cultural codes for the USA and Denmark differ on one of four major values: masculinity (MA), individualism (ID), power distance (PD), and uncertainty avoidance (UA).

The following brief elaboration describes a useful method of quantifying cultures as complex wholes that appears in the main study in this article. With the numbers representing calibrated membership scores that range from .00 to .99 and the total score equal to the Boolean algebra combination of the four scores, here are the cultural complex wholes for the USA and Denmark for the cultural configuration maximizing the total score for the USA (the mid-level dot, “•” represents the

logical “AND” condition in Boolean algebra and the tilde, “~” represents the negation operation):

$$\text{USA}_{\text{usa}} : (\text{MA} = .67) \bullet (\text{ID} = .99) \bullet (\neg \text{PD} = .72) \bullet (\neg \text{UA} = .85), \text{total} = .67$$

$$\text{Denmark}_{\text{usa}} : (\text{MA} = .05) \bullet (\text{ID} = .85) \bullet (\neg \text{PD} = .96) \bullet (\neg \text{UA} = .69), \text{total} = .05.$$

The total score for a recipe equals the lowest score appearing among the ingredients in the recipe; the total score represents how much common membership the ingredients share in the recipe (Ragin 2008). Here is an example of computing a negation of a membership score: the PD member score for the USA equals .28, the negation of .28 equals .72 ( $1 - .28 = .72$ ). Any one nation can be selected as the focal nation for computing cultural recipes in comparison to the cultural recipe of the focal nation. Thus, selecting the USA as the focal nation, the USA's fundamental cultural recipe using Hofstede's four cultural values equals:  $\text{MA} \bullet \text{ID} \bullet \neg \text{PD} \bullet \neg \text{UA}$ , the computation of all other nation's membership score for the USA cultural value recipe permits evaluating how close and far away other nations are from the USA recipe and XY plots of nations on the USA cultural value recipe and entrepreneurship behavior.

Applying the cultural configuration that maximizes the membership scores for Denmark provides the following computations and total scores for the USA and Denmark:

$\text{USA}_{\text{denmark}}$

$$(\neg \text{MA} = .33) \bullet (\text{ID} = .99) \bullet (\neg \text{PD} = .72) \bullet (\neg \text{UA} = .85), \text{total} = .33$$

$\text{Denmark}_{\text{denmark}}$ :

$$(\neg \text{MA} = .95) \bullet (\text{ID} = .85) \bullet (\neg \text{PD} = .96) \bullet (\neg \text{UA} = .69), \text{total} = .69.$$

Masculinity scores indicate a difference between these two configurations of complex wholes. Thus, while both the USA and Denmark rank among the top ten globally in entrepreneurial startups (Ács et al. 2015), the USA scores high and Denmark scores low for the masculinity cultural value. Why U.S. Senator Bernie Sanders mentioned Denmark in the Democrat debate in October 2015: Countries with similar configurations to Denmark's tend to have a low Gini index (income distribution, a measure of inequality), high personal income taxes for high income households, and generous social programs to support families, preschool education, and low-income households), and they have low levels of government/business corruption. Examining cultures as complex wholes provides clues as to how two countries can achieve relatively high scores for entrepreneurship as well as quality-of-life (QOL, see evidence below for QOL estimates) and yet still differ dramatically in income distributions and support for the well-being of a large share of their residents.<sup>1</sup> The Danish custom of referring to the “First rule in the Danish Law of

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<sup>1</sup>The evidence is mixed as to whether the USA is shifting toward or away from Denmark on the cultural value where the two countries most differ—masculinity. Since 1920 versus 1915 respectively, women do have the right to vote now in the USA as well as in Denmark, though in 2014 education attainment by women in Denmark ties for first place while being 39th in the USA; on

Janteloven” frequently may be an attempt to keep-in-check the nation’s very high score for ID—the ID score for Denmark is nearly as high as the ID score for the USA.

While Shane and Venkataraman (2000) recommend adoption of Venkataraman’s (1997) definition of “the field of entrepreneurship” as the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited, the present study defines “an entrepreneurship” as the start-up of a new business firm or organization having its own legal and/or societal identity. The focus here is on constructing and testing an innovative macro-level theory to describe and explain the antecedents and outcomes of the frequency of occurrence of entrepreneurial start-ups. The study here proposes viewing national cultures and entrepreneurial nurturing and start-ups as complex wholes, that is, as configurations of ingredients. “Quality-of-life” (QOL) is the final outcome in the theory and empirical study; for QOL the study applies a proxy configuration of national levels of health and wealth. A restriction of the study is its focus on constructing and testing a macro-theory of entrepreneurship (start-ups) and not a behavioral theory of the antecedents, actions, and outcomes of the entrepreneurial firm.

What is new here? The study here constructs testable models using complexity theory; the study tests these models using asymmetric configural analysis via Boolean algebra rather than the conventional practice of symmetric-based regression analysis. The theory and findings advance understanding of how and how attempts by nations to nurture business start-ups success versus fail. The findings support the view that distinct national efforts (combinations computed in configural recipes) to support firm start-ups do have an asymmetric association with national firm start-ups. The findings include the general observation that while cultures as complex wholes (recipes) are useful indicators of the frequency of entrepreneurial start-ups, cultural recipes are not indicators of high versus low efforts to nurture the occurrence of entrepreneurial start-ups. While at first blush this general finding may appear to be surprising, some nations’ efforts to nurture business start-ups are viewable as counter-cultural endeavors; among countries traditionally low (e.g., Brazil, Russia, and India) in business startups, dramatic introductions to nurture business startups are most likely to end in failure due to the failure to simultaneously include structural changes (e.g., increases in income distribution and business/government transparency). Asymmetric index measures indicate high associations among cultural recipes, entrepreneurial start-ups, innovations in goods and services, and QOL. Thus, the theory and findings here support the general view that entrepreneurship as a scholarly field of study and as a national policy have great importance for advancing national well-being.

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nearly all family/child nurturing programs as well as pay gender-disparity, Denmark does better than the USA (SIGI, 2014). Thus, Sanders’ suggestion to look to Denmark and Clinton’s implied response that overcoming resistance to change the cultural configuration for a country is nearly impossible. However, national cultures do shift; successful efforts to do so usually require new national laws and enforcement programs (e.g., Thirteenth Amendment to the U.S. Constitution; U. S.1964 Civils Rights Act; 1973 Danish Gender Equal Pay Act and “Gender Mainstreaming” acts in Denmark and the European Union).

The present study includes asking the following research questions; the study provides and tests answers to these questions via theory and empirical research using data from primary and secondary sources. First, do alternative cultural recipes indicate (a) high versus low entrepreneurial start-ups and (b) high versus low nurturing behavior for business start-ups? Second, do alternative recipes of national efforts to nurture business start-ups indicate high frequency of business start-ups? Third, does recipes of (a) high nurturing activity for entrepreneurial actions and (b) high frequency of business start-ups associate with high business innovative behavior? Fourth, do recipes of (a) nurturing business start-ups, (b) the frequency of business start-ups, and (c) business innovations indicate high national QOL?

Following this introduction, Sect. 2 briefly describes prior scholarly work relating to the research questions in the present study. Section 3 describes the tenets complexity theory and their relevancy to theory construction in the present study. Section 4 describes the theory. Section 5 is the method section. Section 6 presents the findings. Section 7 includes a general discussion, limitations of the study, and implications for theory and the practice of nurturing entrepreneurial behavior as national policy.

## **2 Theories and Findings on Entrepreneurship and Cultures' Impact on QOL**

Special care is necessary in distinguishing different types of entrepreneurs and categories of entrepreneurial behavior. “Innovative” entrepreneurs are distinguishable from “replicative” entrepreneurs who are also known as “opportunity” entrepreneurs. Strategic management scholars Christensen (2011) and economists (Schumpeter 1934) focus mostly on describing the work and outcomes of innovative entrepreneurs—the new business owners that introduce new technology based products and services that are disruptive of the status quo. Replicative entrepreneurs are small business owner-managers whose businesses stay small; these owner managers do not seek to grow their businesses; they seek continuing employment and to generate a positive cash flow sufficient to improve their personal quality of life (QOL) (cf. Shane 2008).

Though not emphasizing culture's role per se as a principal antecedent for entrepreneurial behavior, Schumpeter (1934, 1976, 2000) remains the most influential scholar in describing the importance of innovative entrepreneurs and in developing a theory of entrepreneurship's impact. Schumpeter (2000) focuses attention on “technological entrepreneurship”, that is, the successful innovative implemented-strategies that cause disruption of the status quo. “Schumpeter was the first to clearly posit the centrality of the entrepreneur to economic progress. For Schumpeter, the entrepreneur is essential to the progression of capitalism because he [the entrepreneur] creates change. And capitalism, according to Schumpeter, is distinguished by a striving for disruption, rather than stability, as innovations are introduced that reshape the existing structure of industry.” Empirical research

focusing on how business start-ups destroy the status quo (e.g., the “innovators dilemma,” Christensen 2011) support Schumpeter’s theory that:

...the function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way, by opening up a new source of supply of materials or a new outlet for products, by reorganizing an industry and so on. . . This kind of activity is primarily responsible for the recurrent “prosperities” that revolutionize the economic organism and the recurrent “recessions” that are due to the disequilibrating impact of new products or methods. (Schumpeter 1976, p. 132)

For the sake of emphasizing their main thesis, Henrekson and Sanandaji (2014) use an inaccurate title to their paper, “Small business activity does not measure entrepreneurship.” Their thesis has merit and their paper usefully points to the confusion in reporting on replicative entrepreneurship as an indicator of innovative entrepreneurship; Kirzner (2009) refers to these two types of entrepreneurs as “alerts” versus the “creatives”. “Entrepreneurship [national and regional government] policy mainly aims to promote innovative Schumpeterian entrepreneurship [and not the Kirznerian opportunity-alert entrepreneurship]. However, the rate of entrepreneurship is commonly proxied using quantity-based metrics, such as small business activity, the self-employment rate, or the number of startups. We argue that those metrics give rise to misleading inferences regarding high-impact Schumpeterian entrepreneurship” (Henrekson and Sanandaji 2014, p. 1760). To unambiguously identify high-impact entrepreneurs Henrekson and Sanandaji (2014) focus on self-made billionaires (in US dollars) who appear on *Forbes* magazine’s list and who became wealthy by founding new firms. They identify 996 such billionaire entrepreneurs in 50 countries in 1996–2010, a systematic cross-country study of billionaire entrepreneurs. “The rate of billionaire entrepreneurs correlates negatively with self-employment, small business ownership, and firm startup rates. Countries with higher income, higher trust, lower taxes, more venture capital investment, and lower regulatory burdens have higher billionaire entrepreneurship rates but less self-employment” (Henrekson and Sanandaji 2014, p. 1760). The top-ten billionaire entrepreneurs’ countries (BEs per million people (1996–2000) include Hong Kong (2.8 BEs per million), Israel (1.7), U.S. (1.8), Switzerland (1.4), Singapore (1.1), Norway (1.0), Ireland (0.9), Taiwan (0.8), Canada (0.7), and Australia (0.6).

The Economist (2014, p. 1) points out, “Countries with a lot of small companies are often stagnant. People start their own businesses because there are no other opportunities. Those businesses stay small because they are doing exactly what other small businesses do. The same is true of industries. In America industries that produce more entrepreneur billionaires tend to have a lower share of employees working in firms with less than 20 employees. This makes sense: successful [innovative] entrepreneurs inevitably destroy their smaller rivals as they take their companies to scale. Walmart became the world’s largest retailer by replacing thousands of Mom-and-Pop shops. Amazon became a bookselling giant by driving thousands of booksellers out of business. By sponsoring new ways of doing things entrepreneurs create new organizations that employ thousands of people including people who might otherwise have been self-employed. In other words, they

simultaneously boost the economy's overall productivity and reduce its level of self-employment."

Henrekson and Sanandaji (2014) warn that high taxes can encourage replicative entrepreneurship rather than innovative entrepreneurship. Self-employed owners face lower tax rates than the employed (and can evade taxes more easily). They also face a lower chance of being audited. This situation encourages new business-owners to stay small and encourages workers to sell their labor to small companies versus big companies. The same outcomes apply to heavy regulation. Henrekson and Sanandaji (2014) warn that conceptual confusion over the nature of entrepreneurship can also create policy confusion: attempts by governments to boost the number of small businesses can reduce the likelihood that one of those small businesses will outcompete all the others. This perspective begs the question as to whether or not national policy to encourage the start-ups of either type of entrepreneurship helps to boost nations' QOL: are the views of Henrekson and Sanandaji (2014) and Shane (2008) accurate that the national benefits of (replicative) entrepreneurship are illusionary? The present study explores answers empirically to this question.

Models 1 follows from using a Boolean algebra operation to create an algorithm to express the hypothesis that nurturing replicative rather than highly innovative new business startups indicates low QOL:

$$E_n \bullet \sim I_s = \sim QOL \quad (1)$$

$$E_n \bullet I_s = QOL \quad (2)$$

where  $E_n$  = entrepreneurial nurturing;  $I_s$  = index measuring innovative startups; QOL = quality of life proxy; the mid-level dot ("•") indicates the logical "AND" operation using Boolean algebra and the sideways tilde ("~") indicates negation. For example, using calibrated fuzzy membership scores (ranging from 0.00 to 1.00, see Ragin 2008) for all terms, nations scoring a relatively high  $E_n$  score in combination for a high  $\sim I_s$  score have a high  $\sim QOL$  score, that is, the QOL in these countries is low. Evidence supporting model 1 indicates support for the hypothesis that nations nurturing small business entrepreneurial behavior without innovative startups have low QOL. Model 2 implies that the configuration of high entrepreneurship nurturing behavior and high innovation behavior supports high QOL. The evidence in the present study supports model 2 and appears in the findings section.

The [fsQCA.com](#) software program applies a logistic function for calibrated scores for antecedent and outcome conditions—thus, extreme original values (values below the 5th percentile are all close to 0.01 and the values above the 95th percentile are close to 0.99 on a calibrated scale; "outliers" in statistical analysis are represented by calibrated scores of either 0.00 or 1.00 on a calibrated scale). The findings appearing below support the propositions that nations with high  $E_n \bullet \sim I_s$  scores do occur and that these nations have high  $\sim QOL$ , that is, such nations have low QOL.

## 2.1 National Cultures and Entrepreneurship

McClelland's (1961) iconic work, *The Achieving Society*, has had nearly the same level of high impact on entrepreneurship as a field of study as Schumpeter (1934, 1976, 2000). Relying on a series of quasi-experiments, document analysis of children's stories, and the use of an instrument to measure nAch (need for achievement), McClelland (1961) findings support the hypotheses that nations high versus low in nAch embrace entrepreneurial behavior and the high entrepreneurial behavior results in more rapid economic development among these high versus low nAch countries. McClelland's (1961) instrument for measuring the level of nAch includes indicators for the moderate risk-taking, energetic and/or novel instrumental activity, taking individual responsibility, seeking knowledge of results of decisions, anticipating of future possibilities, and high organization skills. High individualism and not high uncertainty avoidance (two of Hofstede's four primary cultural values) are key features of high nAch.

McClelland developed these and additional findings in becoming an entrepreneur himself—in 1963, McClelland and his associate D.G. Berlew co-founded McBer Consulting Company, which had the goal of helping managers train and assess their employees. Their firm specialized in mapping the competencies of entrepreneurs and managers globally for which they developed the “Behavior Event Interviewing” (BEI) methodology (New World Encyclopedia 2015). During the 1960s the McBer Company (lead by McClelland) took on the Herculean task of attempting to induce high nAch via training in thinking and acting according to high nAch tenets among interacting members of communities. McClelland (1966) insights highly relevant and still fresh today for national economic development via entrepreneurial behavior:

If psychologists can detect nAch levels individuals or nations, particularly before their effects are widespread, can't the knowledge somehow be put to use to foster economic development? Obviously detection or diagnosis is not enough. What good is it to tell Britain (or India for that matter) that it needs more nAch, a greater spirit of enterprise? In most cases, informed observers of the local scene know very well that such a need exists, though they may be slower to discover it than the psychologist hovering over nAch scores. What is needed is some method of developing nAch in individuals or nations. (McClelland 1966, p. 7)

McClelland (1966) was well aware of the near impossibility of successfully increasing a nation's nAch but nonetheless he created an innovative training program to do so. Demonstration executions of the program were implemented in Mexico and India; McClelland (1966) describes testing the efficacy and specific findings indicating successful impacts of these training program executions. Summarizing McClelland's (1966) perspective: attempts to introduce behavioral change strategies to encourage adoption of the language, beliefs, feelings, and actions of high nAch for members of nations low in nAch may be a necessary condition for successful economic development via entrepreneur behavior in such nations.

McClelland's (1998) work includes methodological advances to more accurately predict high versus low entrepreneurial and managerial competencies (i.e., assessing predictive accuracy of models using additional samples) than models based on regression analysis. McClelland's (1998) created asymmetric models to identify potential outstanding performers as individuals whose scores reached designated tipping points within clusters of substitutable competencies. He also found that experts' judgments of competencies necessary or shown by executives in various positions agreed only moderately with competencies shown to be important by the data from the behavioral event interviews. Though ignored widely, McClelland's creativity in advancing from symmetric (e.g., analysis of variance, correlation, and regression analysis) tests to asymmetric configural testing represents a major breakthrough in explaining and accurately modeling entrepreneurial behavior and outcomes. McClelland's (1961, 1987, 1998) unique configurational analysis for advancing theory and data analysis illustrate Gigerenzer's (1991, p. 19) wisdom, "Scientists' tools are not neutral." Research methods and instruments shape the way we think and test theories.

Using symmetric tests predicting high/low entrepreneurial behavior and high/low cultural values, researchers (Gilleard 1989; Hunt and Levie 2003) in entrepreneurship report limited to no support for McClelland's hypotheses. However, these studies fail to recognize that McClelland (1998) also reports rather moderate to little success in achieving predictive accuracy for his hypotheses when using symmetric tests. McClelland (1961, 1987, 1998) refocused his research from predicting symmetric low-to-high variable outcomes to predicting high-only case outcomes (an asymmetric configural perspective on theory construction and testing). In this theory-method focus McClelland's (1998) work predates Ragin's (2008) similar call for asymmetric configural theory/analysis; for instance, Ragin's (2008) *Redesigning Social Inquiry: Fuzzy sets and Beyond*—an exposition of why and how to use Boolean rather than matrix algebra operations in theory construction and testing. Applying complexity theory and Boolean-based configural analysis, the present study serves to confirm and expand on McClelland's (1961, 1987) perspectives on the roles cultures play in the economic development of nations.

Scholarship is extensive on studying the associations of cultural values with activities enabling entrepreneurial behavior. Studies are available that test hypotheses that the cultural value typologies developed by Hofstede (1980, 1983, 1984, 2001), Schwartz (1994a, b, 2006a, b), Inglehart (2006; Inglehart and Baker 2000; Inglehart and Norris 2003); Steenkamp (2001), and Suddle et al. (2010) associate with entrepreneurial activities. Hofstede's (2001) typology is one that the majority of entrepreneur scholars examine in estimating the influence of cultural value dimensions on entrepreneurial behavior. All studies using the various typologies indicate that the net effects of specific culture value dimensions associate significantly with activities supporting entrepreneurial behavior or entrepreneurial start-ups.

For example, Baughn and Neupert (2003) test the net effects influence of Hofstede's four principal cultural value dimensions to support entrepreneurial nurturing activities in 44 nations. The four cultural value dimensions Baughn and

Neupert (2003) examine include power distance, uncertainty avoidance (UA), individualism versus collectivism, and masculinity versus femininity. Power distance measures the degree of inequality in power between a superior and a subordinate in a hierarchy as perceived by the less powerful member. Inequality is a common phenomenon found in countries with high scores on the power distance index (PD). Individualism measures the degree of independence in the way people work. In countries that score high on the individualism index (ID), people act as individuals with a great deal of independence. High ID countries are called individualism countries. On the contrary, countries scoring low on ID are collectivistic countries, and people in collectivistic countries like to act as members of groups. Masculinity measures the degree of dominance of the masculine values in a country. Masculine values like assertiveness and competitiveness are dominant in countries with high scores on the masculinity index (MA). In contrast, feminine values like nurturance and tenderness are dominant in countries with low MA scores. Uncertainty avoidance measures the degree of how comfortable people of a culture are in unstructured situations. People in countries with higher scores on the uncertainty avoidance index (UA) feel more anxious and stressed when facing uncertain situations than those in countries with lower scores on UA.

Baughn and Neupert's (2003) find that individualism/collectivism and UA influence entrepreneur nurturing actions; their findings support five hypotheses. H1: Obtaining loans and venture capital for start-ups is easier in nations with cultures characterized by low uncertainty avoidance. H2: Obtaining loans and venture capital for start-ups is easier in nations characterized by individualistic cultures. H3: Administrative burdens associated with start-ups are less restrictive in nations characterized by low uncertainty avoidance cultures. H4: Legal protection for start-ups is stronger in nations characterized by individualistic cultures. H5: Greater labor flexibility is found in nations characterized by low uncertainty avoidance cultures. Baughn and Neupert (2003) find that the net effects for power distance and masculinity/femininity not to be significant in their regression models when their models include the four cultural value dimensions and GDP per capita and GDP growth.

Given that the definition of "culture" refers to the complex whole that includes knowledge, belief, art, morals, custom and any other capabilities and habit acquired by (wo)man as a member of society (Soares et al. (2007), the studies by Baughn and Neupert (2003) as well as all prior studies examining the influences of cultural value dimensions on entrepreneurial behavior (e.g., Hechavarria and Reynolds 2009; Tiessen 1997; Suddle et al. 2010) are not studies of the influence of cultures but are studies of the influences of separate cultural value dimensions; these prior studies focus on reporting on the net effects of the cultural value dimensions whereby the separate dimensions are examined in competition with each other in regression analyses that report on the separate influence of each dimension separate from the influence of other dimensions in the regression models. What Fiss (2007) describes as a mismatch between theory and data analysis in organizational behavior pertains to theory construction of culture and data analysis of cultural value

dimensions in studies on cultural influences on entrepreneurship (cf. Ordinani et al. 2014; Woodside 2014).

Configurational approaches to organization are based on the fundamental premise that patterns of attributes will exhibit different features [i.e., antecedent ingredients] and lead to different outcomes depending on how they are arranged [in recipes]. But while theoretical discussions of configurational theory thus stress nonlinearity, synergistic effects, and equifinality, empirical research has so far largely drawn on economic methods that by their very nature tend to imply linearity, additive effects, and unifinality. 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 [in] examining combinations of variables. This [mismatch] becomes particularly evident in the fact that regression analysis focuses on the unique contributions of a variable while constant the values of all other variables in the equation. (Fiss 2007, p. 2007)

Operationally, a culture is a configuration of two or more ingredients representing the complex whole of individual dimensions. (Similar to studies in other sub-disciplines of business/management and cognitive science (Gigerenzer and Brighton 2009; Hsu et al. 2014; Ordinani et al. 2014) rather than symmetric tests such as regression analysis, asymmetric tests using algorithm operations are necessary for examining the influences of cultures as recipes on entrepreneurial behavior. Consequently, with the exception of McClelland (1961), the present study is unique from prior work; the present study examines the influences of cultures as recipes on entrepreneurial activity. Complexity theory provides a theoretical foundation for examining cultures as complex whole—the topic of the next section

### 3 Complexity Theory and Entrepreneurship

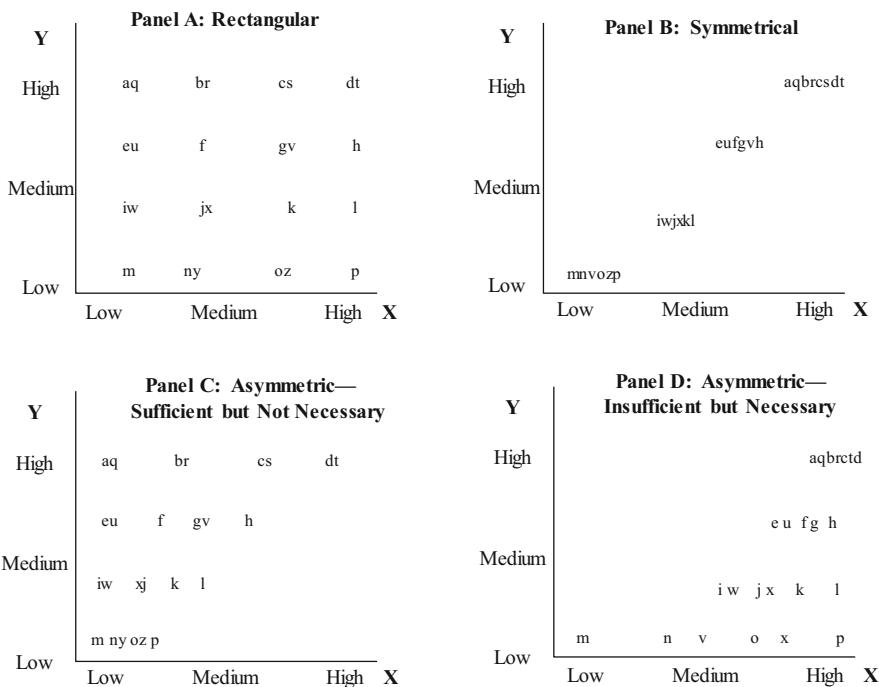
Complexity theory is the natural home (i.e., perfect fit) for the construction of generalizable case-based models that describe, explain, and predict simple and complex outcome conditions—including case-based modeling at the macro (national) and micro (firm) levels of analysis. The discussion here presents key tenets ( $T_i$ ) of complexity theory relevant for research in the behavioral sciences and to the field of entrepreneurship. Applications of complexity theory are available for case-based modeling of behavior in several additional behavioral science sub-disciplines including sociology (Urry 2005), hospitality and human resources (Hsiao et al. 2013), customer service-assessment research (Wu et al. 2014), new product adoption (Ordinani et al. 2014), and tourism research (Hsu et al. 2014).

Here are six principal tenets of complexity theory.  $T_{1a}$ : A simple antecedent condition, X, (“independent variable” in the language of symmetric testing) has a positive as well as a negative relationship to an outcome condition (“dependent variable”) in the same data set—that is, a substantial number of cases occur that exhibit contrarian X–Y associations when an X–Y main effect indicates a highly

significant positive or negative relationship. T<sub>1b</sub>: The presence of cases with high scores in a simple antecedent condition is rarely a sufficient indicator consistently of high scores in an outcome condition or the negation of the outcome condition. Because of high validity of T<sub>1a</sub>, if the focus is on identifying recipes that include entrepreneurial behavior indicating high QOL consistently, then the researcher needs to look beyond the study of net effects to examine recipes of two plus ingredients

T<sub>2</sub>: For most-to-all antecedent conditions (X<sub>i</sub>), a case's high simple antecedent-condition score is neither necessary nor sufficient for the case to have a high outcome condition; cases exhibiting a high outcome condition consistently (e.g., countries exhibiting high entrepreneurial behavior consistently) does not occur for most-to-all simple condition X and Y associations even when the correlation between a simple X and Y is high ( $r \geq .60$ )—that is, most relationships between X and Y are not symmetrical whereby high X associates with high Y and low X associates with low Y consistently. T<sub>3</sub>: A few complex antecedent conditions (i.e., algorithms) occur that, with few to no exceptions, consistently indicate high scores in a focal outcome condition among some cases—that is, a few complex antecedent conditions are sufficient in identifying cases with high scores in an outcome condition. T<sub>4</sub>: Any one complex antecedent condition that is sufficient consistently in identifying cases with high outcome scores is not necessary—that is, more than one path (configuration) occurs to reach a given outcome (T<sub>4</sub> is the “equifinality principle”). T<sub>5</sub>: The mirror opposites of complex antecedent conditions that consistently indicate cases with high scores in a focal outcome condition do not indicate the negation of the outcome condition because a data set usually has some cases in all four low-high simple X and low-high Y combinations—the “causal asymmetry” principle (Fiss 2011). A consequence of T<sub>5</sub> for understanding the causal configurations indicating nations consistently with high versus low scores in entrepreneurial nurturing behavior a researcher needs to construct separate case-based models for the negation as well as for the positive focal outcomes using separate complex antecedent conditions, for example, for learning the complex antecedent conditions that consistently indicate that low versus high scores for entrepreneurship, innovation, and quality-of-life as outcome conditions. T<sub>6</sub>: certain simple antecedent conditions may be necessary but are not sufficient for occurrence of cases consistently having high scores in an outcome condition; for example, low business corruption (high transparency) may be necessary but it is insufficient for consistently indicating nations (cases) high in innovation-entrepreneurial behavior.

The four panels in Fig. 1 are X–Y plots that illustrate some of the complexity theory tenets. Note that the X in Fig. 1 represents a complex configuration of a few simple antecedent conditions and not just one simple X conditions. A complex configuration is computed by using combinations of calibrated scores for each simple condition appearing as an ingredient in the complex statement and Boolean, rather than matrix, algebra. Calibrated scores are crisp or fuzzy-set membership



**Fig. 1** Hypothetical Relationships where X is a Complex Configural Condition e.g., C•T•H•Z and Y is a Simple or Complex Outcome Condition e.g., national entrepreneur nurturing, innovation, quality-of-life

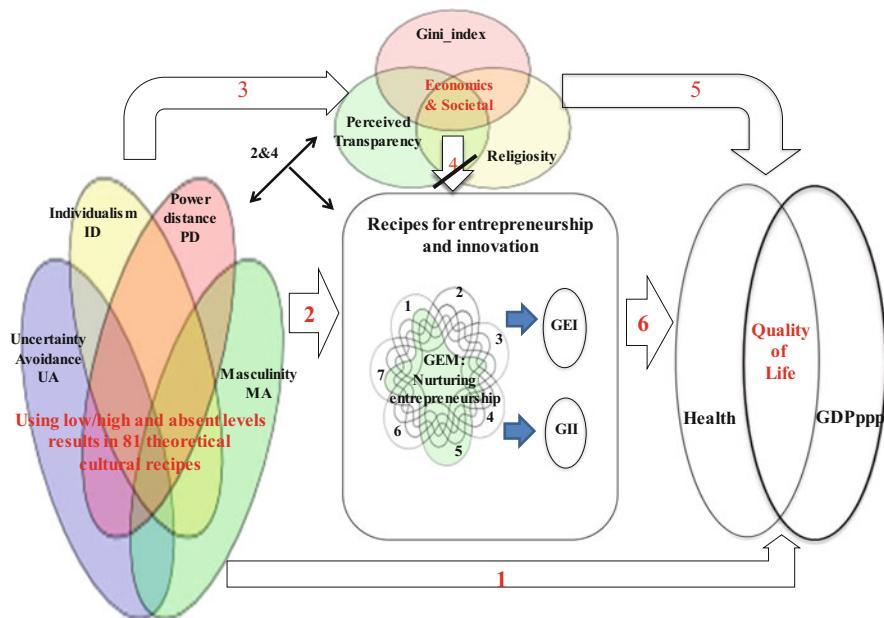
scores ranging from 0.00 to 1.00. Details on computing calibrated scores appear in section five. Panel B in Fig. 1 shows a symmetric relationship—what conventional analysis (analysis of variance, correlation, and regression analysis) examine in statistical hypothesis testing. Separate and distinct tests for asymmetric relationships (panels C and D) based on Boolean algebra are available (e.g., [fsQCA.com](http://fsQCA.com)); these tests consistency (C1) and coverage (C2) indexes which are distinct from but analogous in interpretations to the correlation ( $r$ ) and “coefficient of determination” ( $r^2$ ) indexes, respectively.

Of course, given the shortcomings as Anscombe (1973) describes in using all such indexes alone in reporting the shape and information indicated in relationships, reporting by showing X-Y plots of findings is necessary as Anscombe (1973) emphasizes. The study below includes the necessary reporting of X-Y plots of key findings. Panel A in Fig. 1 indicates low scores for all four relationship indexes (C1, C2,  $r$ , and  $r^2$ )—thus, the cases in the X-Y plot in panel A show a rectangular distribution. The following sections describe a general macro (national) case-based entrepreneur theory and empirical study applies these five complexity theory tenets.

## 4 The General Theory of Culture, Entrepreneurship, Innovation, and QOL

Figure 2 is a visual summary of the principal propositions of a general case (i.e., nation) theory of cultural value configurations, entrepreneurship, innovation, and QOL. Principal propositions appear as arrows in Fig. 2. As well as additional propositions, these propositions are testable by asymmetric consistency and coverage indexes as well as symmetric statistical hypothesis tests. All propositions in the general theory are asymmetric statements that predict specific complex antecedent configurations associate with high scores in an outcome condition. Unlike symmetric tests (e.g., analysis of variance, correlation, and regression analysis) asymmetric propositions do not claim that low scores in a complex antecedent condition associates with low scores in the outcome condition—the expectation is that both low and high scores in the outcome condition occur for the cases having low scores in the complex antecedent condition.

The causal asymmetry tenet that follows from complexity theory is testable using asymmetric set-theory as well by simply calculating the negation of the



**Fig. 2** Asymmetric Theory of Culture and Entrepreneur Actions. Notes.. GEM = Global Entrepreneur Monitor. GEDI = Global Entrepreneur Development Index. GII = Global Innovation Index. GEM nurturing activities: 1—sufficient venture capitalist funding; 2—national government policy supports new and growing firms; 3—primary and secondary education encourages creativity and initiative; 4—sufficient suppliers, subcontractors, consultants to support start-ups; 5—new and growing firms can easily enter new markets; 6—national culture highly supportive of individual success; 7—physical infrastructure provides good support for start-ups

outcome condition (e.g., QOL = 1-QOL). Consequently, a study can examine if cases with high scores of a complex antecedent condition associate with high negation scores in the outcome condition. Based on the causal asymmetry tenet, the expectation is that the causal recipes associating with high scores in the negation of an outcome condition will not be the mirror opposites of the causal recipes associating the high scores of the (positive) condition of the same outcome. Thus, for example the antecedent recipes associating with QOL and  $\sim$ QOL might contain some of the same ingredients while being distinctly different from one another.

**P<sub>1a&b</sub>:** (P<sub>1a</sub>) Cases (nations) having high scores for a few cultural recipes associate directly with high scores in QOL while (P<sub>1b</sub>) other cases (nations) for a few distinct cultural recipes associate directly with the high scores for the negation of QOL

First, using complexity theory and as Hofstede (1984), McClelland (1961, 1966), and Inglehart and Baker (2000) propose, arrow 1 represents the proposition (P<sub>1a</sub>) that a few complex antecedent configurations of cultural values indicate high QOL; P<sub>1b</sub> is that additional complex antecedent configurations indicate the negation of high QOL (that is,  $\sim$ QOL). P<sub>1c</sub>: the complex antecedent conditions indicating  $\sim$ QOL are not the mirror opposites of the complex antecedent conditions indicating QOL. The union of a nation's GDP in purchase parity dollars (ppp) and life longevity is the proxy for measuring QOL appearing in Fig. 2. Using calibrated scores, here are example calculations for QOL for four nations: Japan, Mexico, Netherlands, and Portugal:

Nation	GDPppp	Life_longevity	QOL	$\sim$ QOL
Japan	0.35	1.00	0.35	0.65
Mexico	0.01	0.32	0.01	0.99
Netherlands	0.80	0.98	0.80	0.20
Portugal	0.07	0.98	0.07	0.93.

The calibrated membership score for QOL represents how much membership a nation has in common for the two ingredients making up QOL as a complex statement; the score is equal to the lowest value among the ingredients in the complex statement, QOL. Thus, QOL for Japan equals 0.35, the lower score of the two ingredient scores in the complex statement. The negation of QOL ( $\sim$ QOL) is equal to one minus a nation's score for QOL.

Building from prior studies on the net effects of cultural values, the general theory includes the prediction that empirical evidence will support the following asymmetric models:

$$ID \bullet \sim UA \bullet \sim PD \leq QOL \quad (3)$$

$$PD \bullet UA \bullet MA \leq \sim QOL \quad (4)$$

where ID = individualism; UA = uncertainty avoidance; PD = power distance; and MA = masculinity. A total of 81 possible cultural recipes follow from considering

three levels (low versus high versus absent) for each of the four cultural values; 81 cultural recipes follow from considering three levels (absent, low or negation, and high) for each cultural value. The use of fuzzy set scores ranging from 0.0 to 1.0 supports consideration of high numbers of recipe configurations having different cut-offs for minimal scores that still indicate high scores in an outcome condition. The present study does not include consideration of curvilinear inclusions of individual cultural values as ingredients in a given recipe though such recipes can be planned and examined.

To insure for clarity, consider the following examples. Here are the computations of the recipe scores for model 2 for Germany and Greece:

- Germany: ID = 0.65, ~UA = 0.59, ~PD = 0.81, recipe score = 0.59; QOL = 0.77
- Greece: ID = 0.12, ~UA = 0.00; ~PD = 0.17, recipe score = 0.00; QOL = 0.06.

The computations of the recipe scores for model 3 for the same two countries follow:

- Germany: PD = 0.19, UA = 0.41, MA = 0.76, recipe score = 0.19; ~QOL = 0.23
- Greece: PD = 0.83, UA = 1.00, MA = 0.53, recipe score = 0.53; ~QOL = 0.94.

Note that the recipe scores represent the logical “AND” Boolean algebra condition of the degree of overlap the ingredients in the antecedent condition share in common; thus, the recipes are membership scores equal to the lowest scores among the ingredients in the recipes. The findings for Germany and Greece support the perspective that model 2 reports a high complex antecedent recipe score associating with a high outcome score for Germany and a low recipe score associating with a low outcome score for Greece. The outcomes for model 3 indicate the opposite associations. The findings reported below support the conclusion that both models 2 and 3 have high consistency ( $C_1 \geq 0.80$ ) and reasonable coverage ( $C_2 \geq 0.05$ ) for indicating high QOL and high ~QOL, respectively.

## **P<sub>2</sub>: A few specific cultural recipes affect high scores in nations' positive and negation of entrepreneurial-related behaviors**

P<sub>2</sub> proposes that a few unique cultural recipes influence levels of entrepreneurial behavior. Using Hofstede's cultural value dimensions, the relevant literature (e.g., Kreiser et al. 2010; Lee and Peterson 2000; Thomas and Mueller 2000; Tiessen 1997) reports extensive influence of the net effects of Hofstede's individual cultural values on entrepreneur behavior across nations which suggests that the cultures as complex wholes would also impact entrepreneur behavior. P<sub>2</sub> includes nine sub-propositions—three sets each containing three sub-propositions covering ENB, replicative, and innovative entrepreneurship activities.

**P2.2: A few cultural recipes affect entrepreneurial nurturing/thwarting behavior** The GEM 2014 data enable reporting on ENB for 73 countries. GEM does not measure the number of entrepreneur start-ups per se; the evidence in the present study indicates the high scores on ENB in countries contribute to high

scores on entrepreneur and innovative activities across countries. The following details on GEM's method appear in the GEM 2014 report (Singer et al. 2014). In order to capture the interactions between individuals and their environment, GEM uses two tools for collecting data on attributes, attitudes and activities of individuals (Adult Population Survey) and on experts' opinions about the components of the "Entrepreneurial Conditions Framework (National Experts Survey)". A minimum of 2000 randomly selected adults (over 18 years old) must be surveyed in each country. The "Adult Population Survey" is conducted each year, from April to June, by independent survey vendors, using the GEM questionnaire. The "National Experts Survey" is conducted every year, during the same period of time, by GEM national teams, comprised of at least 36 experts (four experts for each of the nine components of the "Entrepreneurial Conditions Framework"), using the GEM questionnaire.

The present study includes calibrated indexes of scores for seven ENB dimensions developed from the Global Entrepreneurship Monitor (GEM) data for 2014. Thus, the present study includes new, original, data analysis from the GEM 2014 National Experts Survey. Bergmann et al. (2013) describe the use of data from the National Experts Survey for 109 scholarly studies. Bergmann et al.'s (2013) study of 109 studies is not intended to, and does not examine, the national cultures of the 73 nations as complex wholes or the experts' assessments of their nations' ENB as complex wholes as outcomes as well as antecedents to entrepreneur start-ups and innovations or the QOL in the nations. The present study does report on these complex-whole relationships. The following propositions express how cultural recipes impact ENB using the country specific expert assessments in the GEM data as measures of ENB. P2.2a: One-to-three cultural recipes favorable impact national ENB as measured by GEM. P2.2b: One-to-three cultural recipes negatively impact national ENB as measures by GEM. P2.2c: Several cultural recipes are not indicative of positive or negative ENB as measured by GEM—such cultural recipes are uninformative about ENB.

**P2.3: A few cultural recipes affect replicative entrepreneurship** The present study examines three unique sets of entrepreneurship scores for nations as outcomes of cultural value recipes and antecedents to nation's QOL for two reasons. First, confirmation by multiple replications that produce similar findings would provide strong support for the general theory; replication of the same findings using distinctly different methods and/or observers is one of the cornerstones for high external validity (Hubbard and Armstrong 1994) even though such replications/extensions are rarely done (Evanschitsky et al. 2007). Second, some researchers offer criticisms of nation's entrepreneurship scores and country rankings for entrepreneurship in the GEM annual reports; for example, Ács and Szerb (2009) summarize criticisms of the GEM "Total Early-stage Entrepreneurial Activity (TEA) index", the principal country entrepreneur index in the GEM annual reports.

The present study includes calibrating country scores for 28 countries reported in the Global Entrepreneurship Index (GEI) by Ács et al. (2015); the GEI national scores serves here as a proxy for replicative entrepreneurship. The GEI is a

composite index of both individual- and country-level institutional data that “gives policymakers a tool for understanding the entrepreneurial strengths and weaknesses of their countries’ economies, thereby enabling them to implement policies that foster productive entrepreneurship. GEI is designed to help governments harness the power of entrepreneurship to address these types of challenges” (Ács et al. 2015, p. 2). Because the GEI includes country-level estimates of individual firm data on business start-ups that mostly represent replicative entrepreneurship activity, the GEI focuses more on entrepreneur acts versus GEM’s focus on ENB. Even recognizing that the GEI national rankings is composite index, the present study considers the GEI scores as a proxy for replicative entrepreneurship to a greater extent than the GEM and the other indexes on national entrepreneurship. The key point here is that examining antecedents and outcomes for both GEM and GEI data aids in validating the general theory of entrepreneurship behavior. P2.3a: One-to-three cultural recipes favorable impact national replicative entrepreneurship as measured by GEI. P2.3b: One-to-three cultural recipes negatively impact replicative entrepreneurship as measures by GEI. P2.3c: Several cultural recipes are not indicative of positive or negative replicative entrepreneurship as measured by GEI—such cultural recipes are uninformative about replicative entrepreneurship.

**P2.4: A few cultural recipes affect innovative entrepreneurship** The present study makes use of the 2015 Global Innovation Index (GII) (Dutta et al. 2015a, b) scores for the 28 nations in the study. Similar to the GEM and GEI scores, the GII national scores are composite scores. The GII scores focus on estimating innovation by firms all industries and the implementation of national policies supporting innovative behaviors. The GII serves as a useful proxy for estimating Schumpeter’s (1934/1942) “creative destruction” innovative forms of entrepreneurship. The GII 2015 reports covers 141 economies around the world and uses 79 indicators across a range of innovative policy and firm behavior themes. The GII scores overlap but are distinct in many ways from the GEM and GEI scores. In the GII 2015 Dutta et al. (2015a, b, p. xvii) report that “Switzerland, the United Kingdom (UK), Sweden, the Netherlands, and the United States of America (USA) are the world’s five most-innovative nations; at the same time, China, Malaysia, Viet Nam, India, Jordan, Kenya, Uganda, and a group of other countries are outpacing their economic peers in 2015.” P2.4a: One-to-three cultural recipes favorable impact national innovative entrepreneurship as measured by GII. P2.4b: One-to-three cultural recipes negatively impact innovative entrepreneurship as measures by GII. P2.4c: Several cultural recipes are not indicative of positive or negative replicative entrepreneurship as measured by GII—such cultural recipes are uninformative about replicative entrepreneurship

The five nations Dutta et al. (2015a, b) all exhibit the same recipe for three of the four core cultural values: ID•~UA•~PD. The present study incudes a formal empirical test of this model; the evidence indicates high consistency and coverage by the model: nations with high scores on this cultural values recipes consistently exhibit high scores on innovative behavior. Including MA versus ~MA divides nations high in innovative behavior into two subsets with the Switzerland,

UK, USA and others in one subset; the Netherlands, Sweden, and others (e.g., Denmark) group into in the other subset. The ability of a model to achieve high consistency in indicating high outcome scores declines as a researcher adds ingredients into the model but doing so aids in explaining additional behavioral indicators of unique aspects of cultures. Thus, nations high in ID•~UA•~PD and high in MA have lower levels of government/business transparency and higher Gini indexes than nations high ID•~UA•~PD and high in ~MA. Adding in religiosity (and/or other cultural behaviors) serves to reduce coverage (from several to one to two countries), for example, the following model includes two nations (Canada and USA) with high scores for the model and high scores for innovative behavior: ID•~UA•~PD•MA•Religiosity.

### **P3: Recipes of high entrepreneurship nurturing behavior (ENB) indicate high replicative and high innovative behavior**

P3 indicates that a few recipes of ENB associates with high replicative innovative behavior and a few recipes associate with high innovative behavior. An original analysis of the GEM 2014 data for the present study identifies these two sets of recipes. Note that the note at the bottom of Fig. 1 identifies seven unique entrepreneurship nurturing behaviors; these seven were identified using exploratory factor analysis of the responses to surveys of experts in each country. The method section describes details of the analysis of the seven ENB ingredients. The results in the findings section indicate strong support for P3.

Models 4 and 5 are formal general statements of P3a and P3b:

$$\text{GEI} \geq f (\text{GEM\_1}, \text{GEM\_2}, \text{GEM3}, \text{GEM\_4}, \text{GEM\_5}, \text{GEM\_6}, \text{GEM\_7}) \quad (5)$$

$$\text{GII} \geq f (\text{GEM\_1}, \text{GEM\_2}, \text{GEM3}, \text{GEM\_4}, \text{GEM\_5}, \text{GEM\_6}, \text{GEM\_7}) \quad (6)$$

where  $\text{GEM}_i = 1$ —sufficient venture capitalist funding; 2—national government policy supports new & growing firms; 3—primary and secondary education encourages creativity and initiative; 4—sufficient suppliers, subcontractors, consultants to support start-ups; 5—new & growing firms can easily enter new markets; 6—national culture highly supportive of individual success; 7—physical infrastructure provides good support for start-ups. With seven ingredients, 2187 theoretically possible recipes occur in considering the combinations of ingredient absent, its negation, and a high score for each ingredient. Two key theoretical points here are that (1) few nations have the capability of achieving high scores on all ENBs and (2) a few recipes containing two to five high scores among the seven ingredients will likely indicate high replicative and the same or other ENB recipes will indicate high innovative behavior.

### **P4: Recipes occur for low ENB indicating low replicative and low innovative behavior**

P4 indicates that the absence of ENB associates with low replicative and low innovative behavior. Following the core tenets of complexity theory, the expectation is that asymmetric analysis will show that the ENB recipes work well to

increase replicative and innovative behaviors are not the mirror opposites of ENB recipes that work badly. Thus, models 6 and 7 of P4a and P4b state that some ENB recipes achieve high scores in the negation of replicative and innovative entrepreneurship.

$$\sim\text{GEI} \geq f(\text{GEM\_1}, \text{GEM\_2}, \text{GEM3}, \text{GEM\_4}, \text{GEM\_5}, \text{GEM\_6}, \text{GEM\_7}) \quad (7)$$

$$\sim\text{GII} \geq f(\text{GEM\_1}, \text{GEM\_2}, \text{GEM3}, \text{GEM\_4}, \text{GEM\_5}, \text{GEM\_6}, \text{GEM\_7}) \quad (8)$$

P4 suggests recipes occur that include high scores for ENB ingredients and or the absence or negation of some ENB ingredients that hurt replicative and innovative entrepreneurship. Thus, certain ENB programs are counter-productive in stimulating entrepreneurship activity. This study serves to test this proposition and to identify such counter-productive ENB programs.

#### **P5: High scores on (a) ENB, (b) replicative, and (c) innovative entrepreneurship behavior indicate high quality-of-life (QOL)**

P5 is a foundational proposition in the study of entrepreneurship. P5 includes Schumpeter's (1942/1976) perspective that high innovative entrepreneurship is a strong indicator of high quality-of-life (QOL). The general theory here includes the following corollary propositions with P5. P5d: High innovative entrepreneurship is a more consistent indicator of high QOL than ENB and replicative entrepreneurship. Successful high-tech product launches are representative of high innovative entrepreneurship; such launches enable nations engaging in such launches to manufacturer products that residents of other nations desire and buy. Thus, nations highly successful in innovative entrepreneurship accumulate wealth partly from their marketing success of high-tech products in other countries. Replicative entrepreneurship is more home-country focused and such entrepreneurship are unlikely to result in substantial purchases of products and services by residents in other countries, for example, Greece has a high number of replicative entrepreneur startups per capita annually but struggles with a lower QOL while Ireland has a high number of innovative entrepreneur startups per capita annually and a substantially higher QOL than Greece.

#### **P6: Cultural value recipes impact perceived transparency**

“Perceived transparency (PT)” here refers to country scores in the “Corrupt Practices Index (CPI) (Transparency International 2014)”. CPI is a composite score; the method section provides a description of its computation. The annual 2014 CPI report identifies the following five nations to have the highest PT scores (least corrupt): Denmark, New Zealand, Finland, Sweden, and Norway. Country PT scores remain mostly stable from one year to the next. P6a: a few cultural recipes indicate high perceived transparency; the complex configurations (recipes) including  $\sim\text{MA}\bullet\sim\text{PD}$  scores high in PT. This complex configuration ( $\sim\text{MA}\bullet\sim\text{PD}$ ) is likely indicative of “gender mainstreaming” policies and open access to records held by government and near government organizations and agencies, that is, inclusion rather than exclusive of residents to how things get done. Such transparency is likely necessary for reducing corruption. P6b: Combinations of cultural value

recipes which include MA•PD indicate low PT; MA•PD is likely to be a foundational recipe for high corruption. The present study includes empirical testing of P6a and P6b. With one country exception for each model, the findings include strong support of these predictions. The findings section presents details and discussion.

### **P7 Recipes including the Gini Index, perceive transparency, and religiosity impact entrepreneurship**

The top of Fig. 1 visualizes the possibilities of recipes for the Gini, PT and religiosity (R) influence entrepreneurship activities (arrow 4 in Fig. 1). P7a: Nations with the following recipe are high entrepreneurship activities with entrepreneur activities measured by GEM, GEI, and GII data:  $\sim\text{Gini}\bullet\text{PT}\bullet\sim\text{R}$ . Rationale: the recipe,  $\sim\text{Gini}\bullet\text{PT}\bullet\sim\text{R}$ , appears in the Danish culture and Denmark is high in entrepreneur activities, thus, using Denmark is an exemplar, the configuration would indicate entrepreneurship. However, the findings do not support this proposition. For P7b: Nations with recipes that include the following ingredients have low levels of entrepreneur activities:  $\text{Gini}\sim\bullet\text{PT}\bullet\text{R}$ . Rationale,  $\text{Gini}\sim\bullet\text{PT}\bullet\text{R}$  represents some cultural complex nations not known for high entrepreneurship; the recipe appears in Mexico's culture. However, the findings do not support P7b. Such theory and analysis points to the likely folly of creating and believing in propositions based on exemplar (anecdotal) cases. None the possible configurations of Gini, PT, and R indicate high or low entrepreneurship activity as measured by GEM, GEI, and GII.

### **P8: Certain recipes that include Gini, PT, and R influence QOL**

Arrow 5 in Fig. 1 is a visual of P8. P8a: the recipe that includes  $\sim\text{Gini}\bullet\text{PT}\bullet\sim\text{R}$  indicates high QOL. P8b: the recipe that includes  $\text{Gini}\sim\bullet\text{PT}$  indicates low QOL; high or low R does not matter for nations with high scores for  $\text{Gini}\sim\bullet\text{PT}$ . The negation of Gini with high PT may be necessary (but insufficient) for achieving high QOL if the rationale is accurate that transparency in sharing of wealth is necessary for high QOL. The findings support only half of this perspective: high PT appears to be a necessity (but not a sufficient) condition for high QOL. Low Gini is neither a necessary nor sufficient condition for high QOL. Details appear in the findings section.

### **P9: Complex configurations combining cultural values with Gini, PT, and R contribute nuance in explaining replicative entrepreneurship**

An arrow above the Venn diagram for cultural values the links to Gini, PT, and R visualizes P9. Doing such additional complexity analysis may increase understanding of how for some nations Gini is high and QOL is high (e.g., USA) as well as when Gini is low and QOL is high (Denmark) as well as Gini is low and QOL is low (e.g., Brazil) and when Gini is high and QOL is low (e.g., Portugal). Complex recipes that include different configurations of cultural values configure with low versus high Gini occur for all such QOL outcomes. Consequently, even though the main effect of Gini with QOL is negative, cases contrary to this main effect occur—just reporting that a negative main effect occurs between Gini and QOL is

insufficient in both data analysis and theory. Details appear in the findings section that supports a more nuanced view of reality via configural modeling.

## 5 Method: data collection and analyses

Except for the GEM data, the data for the present study comes from secondary sources. These data are readily available via Google searches with the sources of the data identified earlier in the present study or here. For example, consider religiosity. Countries vary by the importance of religiosity by its residents. For use of a religiosity index in the present study makes use of country religious scores in at Wikipedia (2015) and WIN-Gallup (2012) “Religiosity and Atheism Index; this index measures global self-perceptions on beliefs based on interviews with more than 50,000 adults across 57 countries in five continents. Share of residents who answer positive to the following question is used for the religiosity index. “Irrespective of whether you attend a place of worship or not, would you say you are a religious person, not a religious persons or a convinced atheist?” The percent share responding yes for Brazil was 86; China, 14; Germany, 51; Russia, 55; for India, 79; USA, 60; Denmark, 18. The original shares responding yes were calibrated using the logarithmic function in the fsQCA program to range from 0.00 to 1.00. The resulting calibrated scores for all the countries in the present study appear in Table 1. The calibration scores for the main antecedent and outcome conditions appearing in Fig. 2 appear in Table 1 as well. All calibrated scores for human longevity and  $GDP_{PPP}$  are available from authors by request; a fuzzy-set score for QOL is computed by taking the lower of the two scores for longevity and  $GDP_{PPP}$  to equal the membership score for QOL.

For the present study, the original variable data were calibrated into log fuzzy-set membership scores using the subroutine command for calibrating data in the software program, [fsQCA.com](#). The [fsQCA.com](#) software is free to download for performing fuzzy-set qualitative comparative analysis. Using Boolean algebra for asymmetric analysis, the fsQCA software tests for accuracy in predicting high scores of an outcome condition for high scores alternative configurations of simply and complex configurations of antecedent conditions. Ragin (2008) and Woodside (2013) offer tutorials on testing using fsQCA.

### 5.1 Calibration procedure

Calibrated membership scores are computed based on theory and knowledge of the distributions of variables for the data in the study. The fsQCA software requires the researcher to identify the membership score indicating the “threshold for full membership” equal to a 0.95 score, the membership score equal to 0.50 representing “maximum ambiguity,” and the membership score of 0.05

**Table 1** Calibrated scores for the study's antecedent and outcome conditions for 28 nations

Case	Cultural value recipe	gem_mdn	gini	global_ii	gei	pt	qol	religiosity_c
Argentina	MA●~ID●PD●UA	0.24	0.99	0.02	0.17	0.01	0.03	0.95
Australia	MA●ID●~PD●~UA	0.35	0.18	0.69	0.99	0.92	0.77	0.16
Austria	MA●ID●~PD●UA	0.53	0.03	0.64	0.57	0.54	0.77	0.83
Belgium	~MA●ID●PD●UA	0.60	0.39	0.42	0.69	0.86	0.65	0.18
Brazil	~MA●~ID●PD●UA	0.22	1	0.03	0.03	0.06	0.01	1
Canada	~MA●ID●~PD●~UA	0.83	0.35	0.73	0.99	0.93	0.73	0.5
China	~MA●~ID●PD●~UA	0.43	0.48	0.35	0.14	0.04	0	0
Colombia	MA●~ID●PD●UA	0.40	1	0.03	0.32	0.02	0	0.99
Denmark	~MA●ID●~PD●~UA	0.82	0.01	0.91	0.97	0.98	0.69	0.02
Finland	MA●~ID●~PD●~UA	0.76	0.05	0.96	0.8	0.97	0.5	0.09
France	~MA●ID●PD●UA	0.62	0.36	0.49	0.87	0.68	0.5	0.11
Germany	MA●~ID●~PD●~UA	0.74	0.08	0.87	0.9	0.9	0.77	0.44
UK	MA●ID●~PD●~UA	0.58	0.5	0.98	0.98	0.88	0.5	0.07
Greece	MA●~ID●PD●UA	0.09	0.53	0.15	0.23	0.04	0.06	0.97
India	MA●~ID●PD●~UA	0.86	0.44	0.01	0.02	0.37	0	0.99
Ireland	MA●ID●~PD●~UA	0.67	0.53	0.94	0.63	0.82	0.86	0.8
Italy	MA●ID●PD●UA	0.13	0.7	0.32	0.21	0.07	0.27	0.97
Japan	MA●~ID●PD●UA	0.68	0.85	0.58	0.35	0.86	0.35	0.04
Mexico	MA●~ID●PD~UA	0.28	1	0.07	0.08	0.01	0.01	0.97
Netherland	~MA●ID●~PD●~UA	0.92	0.21	0.98	0.84	0.95	0.8	0.05
Norway	~MA●ID●~PD●~UA	0.68	0.03	0.53	0.75	0.96	0.99	0.03

(continued)

**Table 1** (continued)

Case	Cultural value recipe	gem_mdn	gini	global_ii	gei	pt	qol	religiosity_c
Portugal	MA●~ID●PD●UA	0.64	0.87	0.33	0.38	0.41	0.07	0.97
Russia	MA●~ID●PD●~UA	0.28	0.42	0.12	0.1	0	0.01	0.7
Spain	~MA●~ID●PD●UA	0.32	0.57	0.38	0.36	0.31	0.23	0.71
Sweden	~MA●ID●~PD●~UA	0.73	0.02	0.98	0.98	0.97	0.77	0.01
Switzerland	MA●ID●~PD●~UA	0.95	0.47	0.99	0.94	0.96	0.97	0.48
Turkey	~MA●~ID●PD●UA	0.51	0.89	0.06	0.44	0.17	0.02	1
USA	MA●ID●~PD●~UA	0.64	0.99	0.97	0.99	0.82	0.9	0.94

Key and notes. Gem\_mdn = median Global Entrepreneur Monitor calibrated score; gini = Gini index calibrated; global\_ii = Global Innovation Index calibrated score; gei = Global Entrepreneurship Index calibrated score; pt = perceived transparency calibrated score; qol = quality of life calibrated fuzzy set scores = gdp\_ppp•health where gdp\_ppp is GDP in purchase parity prices and health is average human longevity; religiosity\_c = religiosity calibrated score. For example, note that the median GEM calibrated score for Argentina is low (.24), Gini index is high (.99); Global II is low (.02); GEI is low (.17); PT is low (.01); quality-of-life is low (.03), and religiosity is high (.95).

representing the threshold for full non-membership. The estimates for these scores for the antecedent and outcome conditions appear in Table 2. Note that asymmetric analysis makes use of the term, “condition”, rather than the symmetric nomenclature for “variable”. The calibration procedure is robust and outcomes and interpretation of outcomes are usually very clear. For example, the findings and interpretation of these findings do not change substantively bases on using fully non-membership scores covering five to ten percent of the cases below the threshold and the same perspective applies for full membership threshold scores equating to five or ten present above the threshold. For the present study, the value indicating that ten percent of the country scores were higher was selected at the 0.95 membership score, the median value was selected as the 0.50 membership score, and the value indicating that ten percent of the country scores were below was selected as the 0.05 membership score.

## 5.2 *Country Cultural Value Recipes*

Table 3 presents focal country cultural value recipes for the BRIC nations and Germany and the USA. Country's cultural value recipe score can be computed for every country based on any one country's recipe. For example, in Table 3 applying the cultural value recipe for Brazil (MA●~ID●PD●UA) equals 0.63. Note that Brazil's MA equals 0.37; thus, Brazil's score for ~MA equals 0.63. Brazil's score for ~MA is the lowest score in its culture value recipe. Thus, the score for the entire cultural recipe equals 0.63. Three countries are found that having higher membership scores for the Brazilian values recipe than Brazil by looking down the column for Brazil in Table 3—Portugal, Spain, and Turkey. In fact, these three countries have the same culture recipe configuration (but different scores for this recipe) as Brazil.

Performing such comparative analysis of one cultural recipe for all countries is how fsQCA came by its name. The fsQCA procedure permits a comparative analysis of all cases using one complex configuration statement (recipe). The comparative analysis for Brazil as the focal country indicates Australia and the USA have scores furthest away from the cultural recipe representing Brazil; the scores in Table 3 indicate that Australia and the USA scores on the Brazilian recipe to be equal to 0.01. Russia, China, and India have the same cultural recipe using Hofstede's four cultural values: MA●~ID●PD●~UA. Germany and the USA share the same cultural value recipe: MA●ID●~PD●~UA; also, Great Britain share this same culture value recipe.

**Table 2** Variable to calibration scores for three anchors

Calibrated score	GEM Cultural Factors						
	1	2	3	4	5	6	7
0.05	9.39	9.8	9.54	27.95	9.23	13.91	4.54
0.50	18.22	24.31	21.31	51.77	19.8	21.73	5.91
0.95	37.58	35.66	42.14	79.78	32.8	37.51	17.99
	<b>gedi</b>	<b>global_ii</b>	<b>gem_mdn</b>	<b>religiosity</b>			
0.05	35	100	3.69	24.5			24.5
0.50	110.5	120	5.8	42			26
0.95	120	30	6.7	89.2			56
					Cultural values		
	<b>perceived transparency</b>	<b>gdp_ppp</b>	<b>life expect</b>	<b>MA</b>	<b>ID</b>	<b>PD</b>	<b>UA</b>
0.05	110	25	72	5	13	11	23
0.50	140	40	76	56	65	50	68
0.95	168	55	80	95	91	93	112

**Table 3** Calibrated culture value membership scores by nation and complex wholes for BRIC, Germany/USA, and Denmark

Nation	MA	ID	PD	UA	Brazil	Russia	India	China	Germany/USA	Denmark
Argentina	0.50	0.23	0.50	0.92	0.50	0.08	0.08	0.08	0.08	0.08
Australia	0.64	0.99	0.21	0.20	0.01	0.01	0.01	0.01	0.64	0.36
Austria	0.93	0.36	0.02	0.50	0.02	0.02	0.02	0.02	0.36	0.07
Belgium	0.46	0.87	0.91	0.97	0.13	0.03	0.03	0.03	0.03	0.03
Brazil	0.37	0.15	0.95	0.71	0.63	0.29	0.29	0.29	0.05	0.05
Canada	0.43	0.94	0.26	0.17	0.06	0.06	0.06	0.06	0.43	0.57
China	0.67	0.04	0.99	0.07	0.07	0.67	0.67	0.67	0.01	0.01
Colombia	0.72	0.03	0.93	0.82	0.28	0.18	0.18	0.18	0.03	0.03
Denmark	0.05	0.85	0.04	0.03	0.03	0.04	0.04	0.04	0.05	0.85
Finland	0.10	0.50	0.16	0.31	0.16	0.10	0.10	0.10	0.10	0.50
France	0.28	0.78	0.94	0.92	0.22	0.08	0.08	0.08	0.06	0.06
Germany	0.76	0.65	0.19	0.41	0.19	0.19	0.19	0.19	0.59	0.24
Great Britain	0.76	0.98	0.19	0.08	0.02	0.02	0.02	0.02	0.76	0.24
Greece	0.53	0.12	0.83	1.00	0.47	0.00	0.00	0.00	0.00	0.00
India	0.50	0.26	0.98	0.11	0.11	0.50	0.50	0.50	0.02	0.02
Ireland	0.80	0.75	0.10	0.08	0.08	0.10	0.10	0.10	0.75	0.20
Italy	0.83	0.89	0.54	0.68	0.11	0.11	0.11	0.11	0.32	0.17
Japan	0.99	0.23	0.67	0.96	0.01	0.04	0.04	0.04	0.04	0.01
Mexico	0.82	0.09	0.99	0.86	0.18	0.14	0.14	0.14	0.01	0.01

(continued)

**Table 3** (continued)

Nation	MA	ID	PD	UA	Brazil	Russia	India	China	Germany/USA	Denmark
Netherland	0.04	0.94	0.24	0.23	0.06	0.04	0.04	0.04	0.04	0.76
Norway	0.03	0.72	0.13	0.19	0.13	0.03	0.03	0.03	0.03	0.72
Portugal	0.14	0.08	0.88	0.99	0.86	0.01	0.01	0.01	0.01	0.01
Russia	0.98	0.07	0.98	0.05	0.02	0.93	0.93	0.93	0.02	0.02
Spain	0.26	0.30	0.76	0.92	0.70	0.08	0.08	0.08	0.08	0.08
Sweden	0.02	0.78	0.13	0.05	0.05	0.02	0.02	0.02	0.02	0.78
Switzerland	0.83	0.69	0.17	0.30	0.17	0.17	0.17	0.17	0.17	0.17
Turkey	0.31	0.14	0.92	0.90	0.69	0.10	0.10	0.10	0.08	0.08
USA	0.67	0.99	0.28	0.15	0.01	0.01	0.01	0.01	0.67	0.33

Key Cultural recipes:

Brazil: ~MA●~ID●PD●UA

Russia: MA●~ID●PD●~UA

India: MA●~ID●PD●~UA

China: MA●~ID●PD●~UA

Germany / USA: MA●ID●PD●~UA

Denmark ~MA●ID●~PD●~UA

Where MA = masculinity; ID = individualism; PD = power distance; UA = uncertainty avoidance

### **5.3 GEM Factor Scores and Items in Seven Factors**

The GEM 2014 data set includes means for the ten experts' responses for each of 73 countries for each of 41 survey items. For the purposes of the present study, an exploratory factor analysis with a varimax rotation was performed on these data. A seven factor solution explains 65 percent of the variance in the data. Two items were selected to represent each factor. The reported values for each of the two items were multiplied together. The total scores for each of the seven factors were then calibrated. Table 4 presents details for the factor analysis findings.

Correlation within and between items in factors were computed. The correlation matrix and the calibrated scores are not included in this article but are available from the authors by request. For each of the countries in the present study the median score for each of the seven items was used to represent the countries total GEM score. A fuzzy set score was also calculated across the seven GEM calibrated scores for each country (i.e., this score is equal to the lowest score across the 7 GEM calibrated factor scores for each country) but the resulting country scores were all too low for useful analysis, that is, all but three countries had one or two of the seven GEM factor ingredients that had very low scores; consequently, the overall fuzzy set scores for all countries were low. Switzerland, India, and the Netherlands are the three countries having fuzzy set scores for the seven GEM ingredients equal to scores above 0.50. However, the analyses for the present study includes computing fuzzy set models of the seven GEM ingredients to predict entrepreneurship (GEI) and innovation (GII) behaviors. The findings include answers to the questions as to which GEM entrepreneur nurturing behavioral recipes impact high GEI and high GII as well as low GEI and low GII.

### **5.4 Consistency, Coverage, and XY Plots**

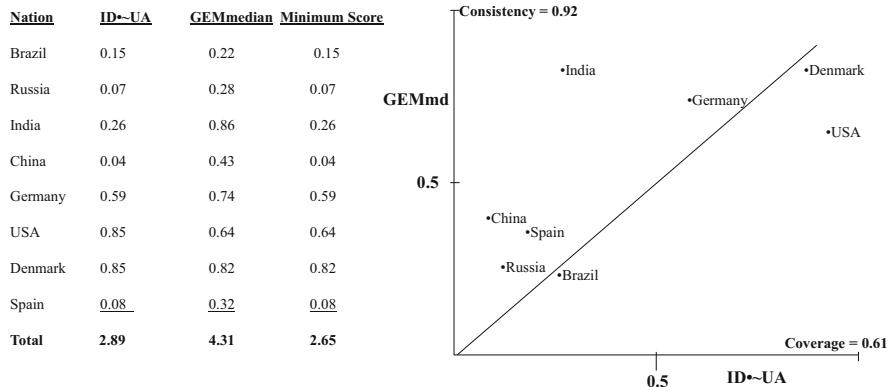
A consistency coefficient (C1) indicates the level of accuracy that high scores in an asymmetric recipe associates with high scores in an outcome of interest. The consistency index in asymmetric testing is analogous to a correlation ( $r$ ) in symmetric testing. However, unlike a correlation coefficient, low scores of a recipe do not influence a consistency coefficient since C1 is a measure of asymmetry and not symmetry. A coverage coefficient (C2) indicates the share of cases having high outcomes scores applicable for the specific antecedent recipe. C2 is the asymmetric measure analogous to the coefficient of determination ( $r^2$ ) in symmetric analysis. However, unlike  $r^2$  estimates increasing when terms are adding to a regression model, C2 estimates decline as a researcher adds additional ingredients in an antecedent recipe because the researcher is adding restrictions to the applicability of a recipe by adding ingredients.

For the present study, the requirement was set that a model's consistency (C1)—for a complex antecedent configuration of antecedent conditions—needs to be equal

**Table 4** Findings for GEM expert survey from exploratory factor analysis with Varimax rotation

Factor	Explained variance (%)	Item	Factor loading
1	16	In my country, there are an adequate number of <b>government programs</b> for new and growing businesses	.81
		In my country, a wide range of government assistance for new and growing firms can be obtained through contact with a single agency	.80
2	10	In my country, the <b>national culture</b> is highly supportive of <b>individual success</b> achieved through own personal efforts	.90
		In my country, the national culture emphasizes self-sufficiency, autonomy, and personal initiative	.88
3	8	In my country, the <b>science and technology</b> base efficiently supports the creation of world-class new technology-based ventures in at least one area	.81
		In my country, science parks and business incubators provide effective support for new and growing firms	.70
4	8	In my country, it is not too expensive for a new or growing firm to get good <b>access to communications</b> phone, Internet, etc.	.86
		In my country, a new or growing firm can get good access to communications telephone, internet, etc. in about a week	.83
5	7	In my country, there is sufficient <b>debt funding</b> available for new and growing firms	.83
		In my country, there is sufficient equity funding available for new and growing firms	.77
6	7	In my country, it is easy for new and growing firms to get good, <b>professional legal and accounting services</b>	.84
		In my country, it is easy for new and growing firms to get good subcontractors, suppliers, and consultants	.77
7	6	In my country, teaching in <b>primary and secondary education</b> provides adequate attention to entrepreneurship and new firm creation	.80
		In my country, teaching in primary and secondary education provides adequate instruction in market economic principles	.79

or above 0.85 to conclude that the model has high consistency in predicting high scores for the focal outcome condition. For the purposes of the present study, a conclusion was set *ex ante* that a model's coverage (C2) must be equal or above 0.40 for the model to be judged as having high coverage. Frequently, to achieve  $C1 \geq 0.85$ , C2 is equal or less than 0.05; such findings are useful for identifying a complex antecedent conditions indicating a few cases (e.g., countries) with high scores on the focal outcome condition. A researcher benefits from looking at the XY plot for such models that achieve high consistency whether or not coverage is high. In asymmetric modeling high C1 is often achievable only when C2 is low; this



Consistency for ( $ID \sim UA \leq GEMmd$ ) =  $\Sigma(\text{minimum for } ID \sim UA) / \Sigma (ID \sim UA) = 2.65/2.89 = 0.92$ .

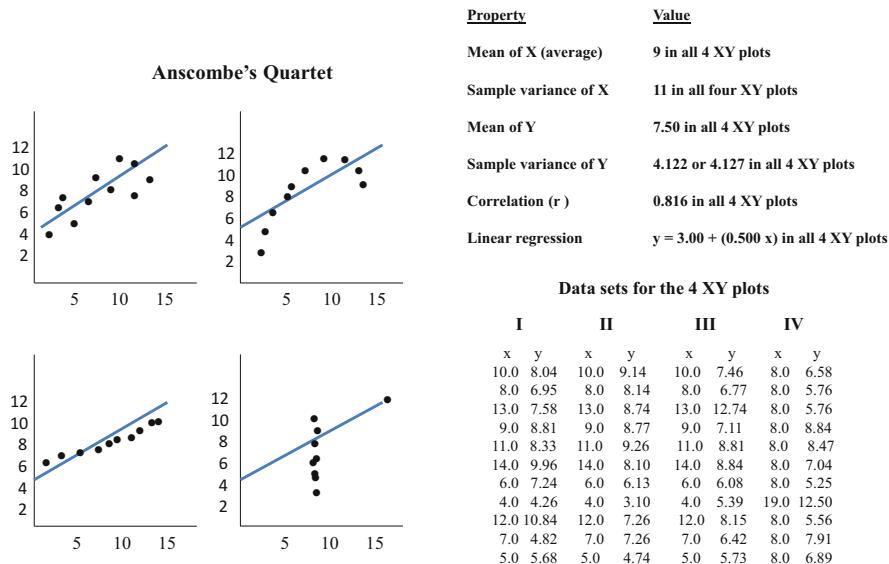
Coverage for ( $ID \sim UA \leq GEMmd$ ) =  $\Sigma(\text{minimum for } ID \sim UA) / \Sigma (GEMmd) = 2.65/4.31 = 0.61$ .

**Fig. 3** Example computations of consistency and coverage indexes. Note. Table 5 is a pedagogical example that includes eight countries to show how consistency and coverage indexes are computed; the main study includes computations and XY plots includes 28 countries

perspective is another way of stating that contrarian cases occur in a set of data—the equifinality tenet in complexity theory that more than one path occurs for reaching the same outcome.

Figure 3 includes examples calculations of consistency and coverage indexes. The data output in Fig. 3 only includes eight countries for illustrative purposes; the findings section presents the results for all 28 countries in the study. The example calculations describe the asymmetric relationship between the fuzzy-set equal to  $ID \sim UA$  recipe and the GEM median outcome. The  $C1 = 0.92$  and  $C2 = 0.61$  findings in Fig. 3 indicate that the  $ID \sim UA$  is a “core recipe”; a “core recipe” is a model that includes two or three antecedent ingredients that results in  $C1 \geq 0.85$  and  $C2 \geq 0.40$ . An “extended recipe” is a model that includes four plus antecedent ingredients that results in  $C1 \geq 0.85$  and  $C2 \geq .01$ . The terminology here is similar to Fiss’ (2011) use of “core” and “peripheral” terminology, “with the core elements [ingredients] being essential and the peripheral elements being less important and perhaps even expendable or exchangeable” (Fiss 2011, p. 394). However, not thinking in terms of “essential” and “important” is preferable since different core recipes may occur and each ingredient is important in a recipe with a  $C1 \geq 0.85$ . “Importance” is a symmetric term in judging the relative size of influence among standardized b coefficients in regression analysis—a mismatch to most useful modeling of symmetric outcomes and for using complexity theory.

Examining the usefulness of an asymmetric model’s by reporting  $C1$  and  $C2$  is insufficient because the distribution of cases for a recipe having a high  $C1$  coefficient may cover a small range. Similar to Anscombe (1973) demonstration of the need for showing XY plots when performing correlation analysis in symmetric analysis, in most instances the findings in the present study include XY plots for the asymmetric findings along with  $C1$  and  $C2$  coefficients. “Anscombe’s quartet”



**Fig. 4** Anscombe's Quartet of Different XY Plots of Four Data Sets Having Identical Averages, Variances, and Correlations. Source: Adapted from Anscombe (1973, pp. 19–20)

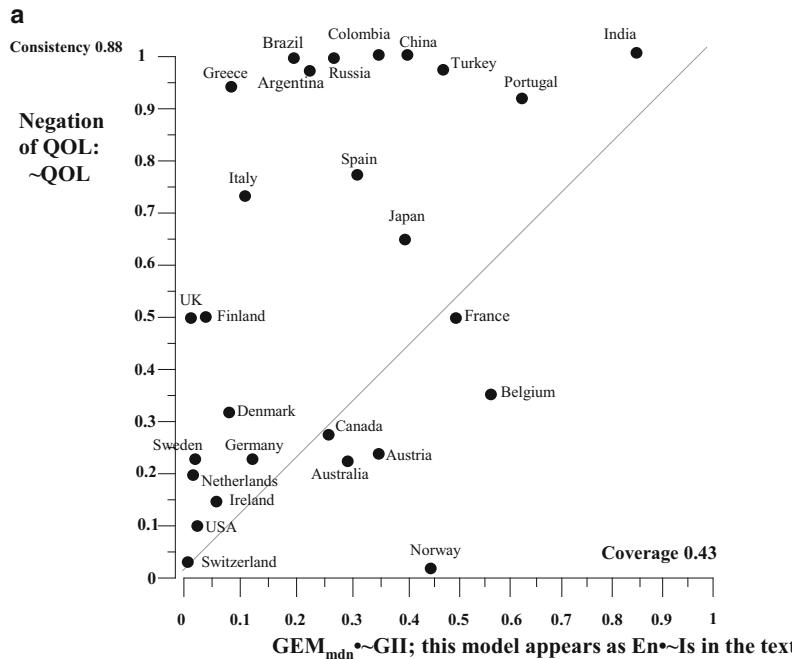
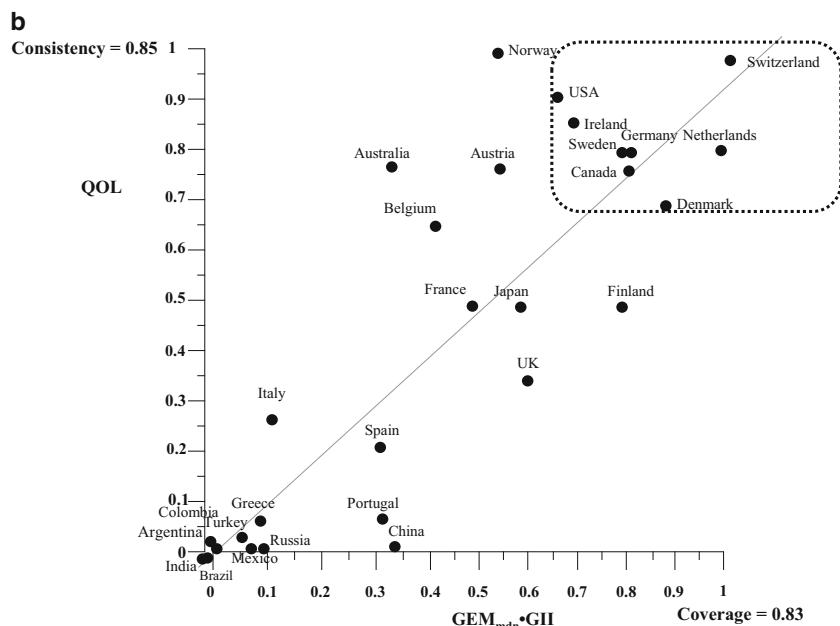
appears in Fig. 4. The correlation is equal to 0.82 for all four data sets in Fig. 4; yet, the XY plots are very different for the four data sets. A high  $r$  coefficient does not necessarily indicate a linear relationship or useful information. A high consistency coefficient does not necessarily indicate a useful model that discerns high scores easily for an outcome condition. Thus, the findings section discusses and shows a substantial number of XY plots.

## 6 Findings

Before presenting the main findings for the propositions, the first topic describes the findings for model 1:  $E_n \bullet \sim I_s = \sim QOL$ . Also, the first section provides the findings for model 2:  $E_n \bullet I_s = QOL$ . Doing so provides show how to apply Boolean algebra and to interpret output from doing such analyses. Following the discussion of the findings for models 1 and 2, this section presents the findings for the nine propositions.

### Findings for Model 1 and 2: $E_n \bullet \sim I_s = \sim QOL$ and $E_n \bullet I_s = QOL$

Figure 5a provides the findings for model 1 where the median score for the seven factors in the GEM data represent high entrepreneurship nurturing behavior ( $ENB = E_n$ ) and the calibrated Global Innovation Index score represents  $I_s$  ( $GII = I_s$ ). The findings indicate model 1 is useful with  $C1 = 0.88$  and  $C2 = 0.43$ . These findings meet the criterion that  $E_n \bullet \sim I_s$  is a core recipe for high negation of QOL (see Fig. 5a).

Model 2:  $\text{GEM}_{\text{mdn}} \cdot \text{GII} \leq \text{QOL}$ 

**Fig. 5** (a) Model 1: Median score for GEM and global innovation index predicting negation of QOL. (b) Model 2: Median score for GEM and global innovation index predicting negation of QOL

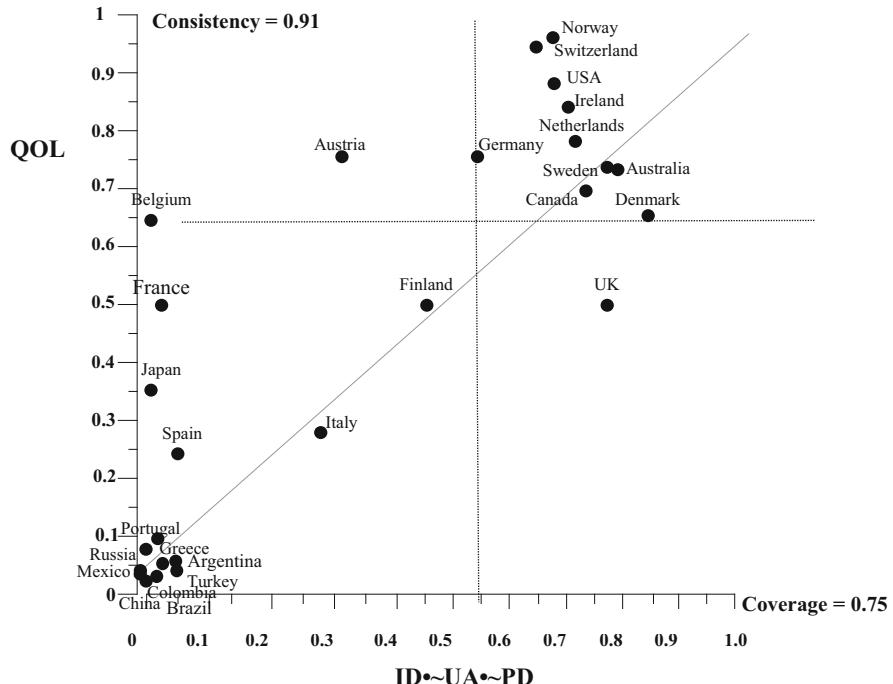
The findings indicate that five nations have medium to high scores on  $E_n \sim I_s$ : India, Turkey, Portugal, Belgium, and France. India stands out as a nation highest in the combination of ENB and the negation of innovation. Belgium and France manage to avoid high scores in the negation of QOL while still achieving mid-calibrated scores for  $E_n \sim I_s$ . The key point is that high scores in  $E_n \sim I_s$  indicate cases (nations) with high scores in  $\sim QOL$ . Thus, high ENB with low innovation is bad practice. This conclusion receives additional support from examining the complex condition including high scores in ENB and innovation (Fig. 5b).

Figure 5b indicates that the combination of high  $E_n \cdot I_s$  (i.e., GEM•GII) supports high QOL. Given that model 2 has high C1 (0.85) and high C2 (0.83) coefficients,  $E_n \cdot I_s$  is a core recipe supporting high QOL. Eight countries have high scores in the complex configuration equal to  $E_n \cdot I_s$ ; these eight nations include Germany and the USA. These initial findings provide credence in using configurational modeling of entrepreneurship behavior for explaining both low and high QOL.

**Findings for P1a&1b: (P1a) Cases (nations) having high scores for a few cultural recipes associate directly with high scores in QOL while (P1b) some cases (nations) for a few distinct cultural recipes associate directly with the high scores for the negation of QOL**

The findings provide substantial support for P1a and P1b. The XY plot supporting P1a appears in Fig. 6. These findings provide formal confirmation of McClelland's (1961) central proposition: nations exhibiting behaviors that include high individualism and willingness to take risk ( $\sim UA$ ) represent "achieving societies". The inclusion of low power distance ( $\sim PD$ ) in the complex is not necessary to have a model sufficient in predicting high QOL. The complex model,  $ID \sim UA$  is a core recipe for predicting high QOL. Adding the ingredient,  $\sim PD$ , serves to increase C1 without reducing C2 substantially. Achieving  $\sim PD$  likely reflects low levels of hubris in interactions and decision making in a society which is likely to add in achieving high quality entrepreneurial decisions and behavior. The model predicts eleven countries high in  $ID \sim UA \sim PD$  have high QOL; the model predictions are accurate for ten of the eleven countries; the ten include Germany and USA. A high score on the model for the Great Britain does not associate. The moderate score on QOL reduces the accuracy of the model; the findings indicate that ten of eleven countries with scores equal to or higher than 0.55 on  $ID \sim UA \sim PD$  have QOL scores above 0.65. The relatively high QOL for Austria and Belgium without high scores for the complex recipe supports the equifinality tenet from complexity theory—these two countries have cultural values that indicate high QOL unique from the ten countries represented by high scores in  $ID \sim UA \sim PD$ .

The findings in Table 5 help elaborate and deepen the interpretation of the findings in Fig. 6. Table 5 shows how the C1 coefficients for predicting QOL are below 0.50 for each of the following simple conditions:  $\sim ID$ ,  $UA$ , and  $PD$ . These simple conditions contribute to high levels of the negation of QOL but alone are insufficient for predicting  $\sim QOL$  accurately. The following three simple conditions provide C1 coefficients above 0.50 for predicting QOL but they are insufficient for predicting high QOL:  $ID$ ,  $\sim UA$ , and  $\sim PD$ .  $MA$  and  $\sim MA$  alone or in combination



**Fig. 6** Configuration model of cultural complex whole for high quality-of-life:  $\sim\text{UA}\sim\text{PD}\sim\text{ID} \leq \text{QOL}$

with any single other cultural value is insufficient in predicting high QOL consistently. Additional findings indicate that high MA as an ingredient in complex cultural value configurations contributes to high negation of QOL (i.e.,  $\sim\text{QOL}$ ).

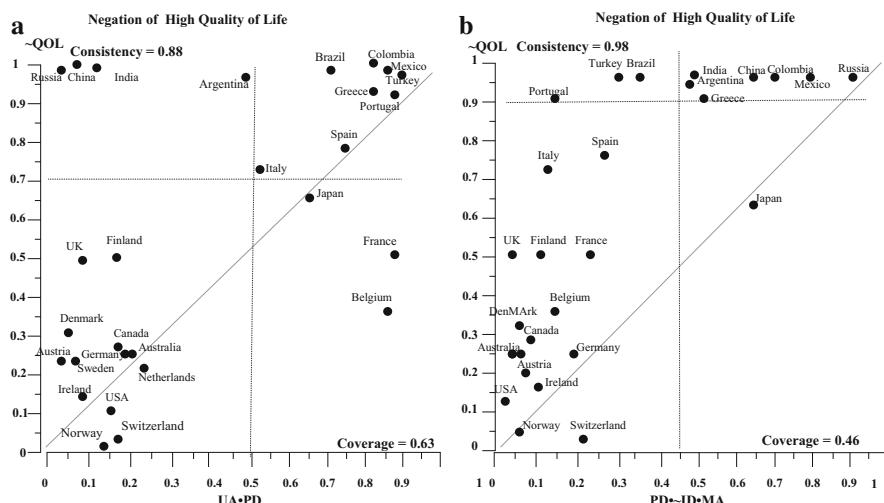
Figure 7a, b shows the XY plots for two cultural value recipes supporting  $\sim\text{QOL}$ , that is, low quality-of-life. The high consistency (C1) and coverage (C2) coefficients for the two models in Fig. 7a and b support P1b: some cases (nations) for a few distinct cultural recipes associate directly with the high scores for the negation of QOL. For the model,  $\text{UA}\cdot\text{PD}$ , Fig. 7a identifies six Latin-based language countries including Brazil, Turkey, and Greece having high scores in the model and high scores in  $\sim\text{QOL}$ . For the  $\text{UA}\cdot\text{PD}$  model, C1 and C2 coefficients are both above the threshold requirements to indicate that high scores in  $\text{UA}\cdot\text{PD}$  indicates high  $\sim\text{QOL}$  with high (not perfect) consistency.

Figure 7b is astonishing! The seven nations with calibrated scores above 0.45 for the model, complex recipe  $\text{PD}\sim\text{ID}\cdot\text{MA}$ , have calibrated scores for  $\sim\text{QOL}$  above 0.90. While the model for Fig. 7a includes Brazil, the model for Fig. 7b includes the remaining three BRIC nations. Mexico and Greece have high scores in both models and high scores in  $\sim\text{QOL}$ . These findings support the conclusion that nations with high UA in combination with high PD reflect  $\sim\text{QOL}$ . High MA coupling with high

**Table 5** Simple and Complex Configurations of Hofstede's Four Cultural Values and Country QOL

1	Models	C1 = consistency	C2 = coverage	Highest-scoring country for recipe
<i>Simple</i>				
1.	ID	0.76	0.89	USA
2.	~ID	0.30	0.34	Colombia
3.	UA	0.36	0.40	Greece
4.	~UA	0.69	0.79	Denmark
5.	PD	0.29	0.35	China & Mexico
6.	~PD	0.82	0.88	Austria
7.	MA	0.52	0.61	Japan & Russia
8.	~MA	0.56	0.62	Sweden
<i>Complex</i>				
9.	ID•~UA	0.86	0.76	Great Britain
10.	ID•~PD	0.89	0.79	Denmark
11.	ID•~PD•~UA	0.92	0.75	Denmark
12.	ID•~PD•~UA•MA	0.91	0.44	Switzerland
13.	ID•~PD•~UA•~MA	0.94	0.49	Norway

Notes. Only complex models fulfill both criteria for useful core models: C1  $\geq 0.85$  and C2  $\geq 0.40$ . Only the five complex models in Table 5 meet both the two criteria for high C1 and high C. Note that high ID is a necessity but insufficient condition for high QOL.

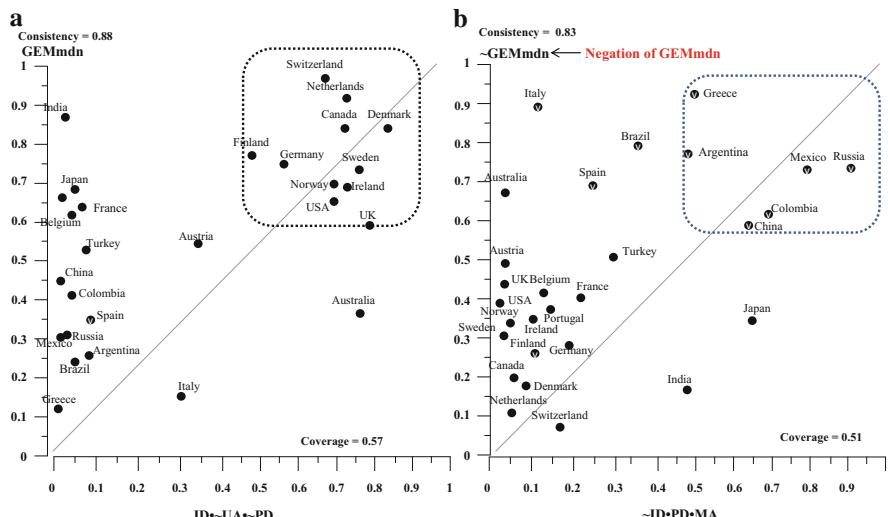
**Fig. 7** (a, b) Two cultural complex whole models that indicate high negation of quality-of-life

PD•~ID indicates high ~QOL; consequently, high MA associates with high QOL and high ~QOL—which depends upon the other ingredients in the recipes. This finding supports the complexity tenet that contrarian cases occur in a data set, or

stated differently, a simple X relates positively, negatively, and not at all with Y in the same data set. Note for not relating to Y (the outcome condition,  $\sim QOL$ ), that MA does not appear in the model for Fig. 7a, UA•PD.

**Findings for P2: A few specific cultural recipes affect high scores in nations' positive and negation of entrepreneurial-related behaviors for data from the (a) Global Entrepreneurship Monitor (GEM), (b) Global Entrepreneurship Index (GEI), and (c) Global Innovation Index (GII)**

The findings support P2a consistently. For P2a, one recipe indicates high entrepreneurship activity for all three entrepreneurial metrics (GEM, GEI, and GII): ID• $\sim$ UA• $\sim$ PD. Figure 8a presents details for this indicating low-to-high GEM performance for this cultural recipe. Figure 8a shows that eleven of twelve countries with high scores for the ID• $\sim$ UA• $\sim$ PD recipe have relatively high GEM scores—Australia being the exception. Table 9a indicates that a very similar pattern occurs for ID• $\sim$ UA• $\sim$ PD and GEI except that Australia has a high rather than a moderate score in GEI versus GEM. (Here in the text, "GEM" refers to "GEMmdn" in the relevant figures.) Figure 10a is an XY plot that indicates the same pattern for ID• $\sim$ UA• $\sim$ PD and GII. The high consistency and high coverage indexes across the three different indicators for the entrepreneurship supports that general conclusion that the ID• $\sim$ UA• $\sim$ PD cultural recipe nurtures entrepreneurial activity from nurturing to replicative to innovative actions. This evidence provides independent support of McClelland's (1961) thesis that high economic achieving societies engage in a configuration of individual initiative and relatively high risk taking rather than alternative cultural recipes. The need to include  $\sim$ PD in the recipe to achieve high consistency indexes consistently across the three entrepreneurship indicators is new

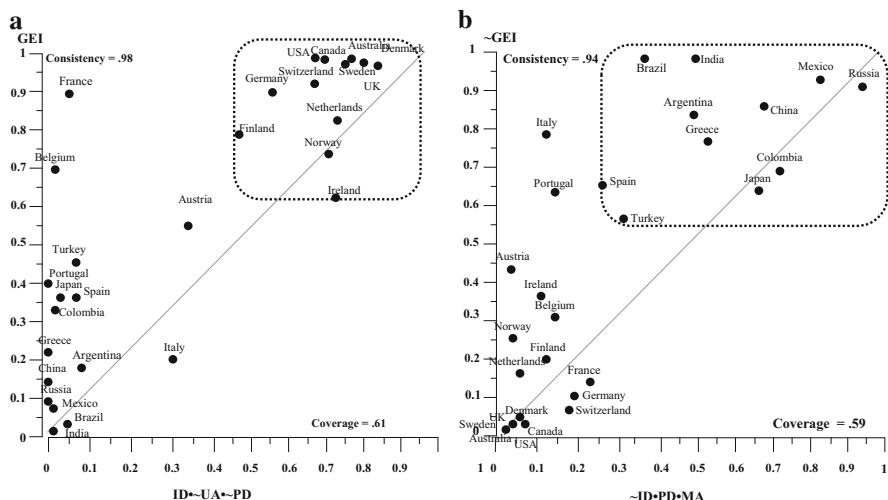


**Fig. 8** Cultural value recipes indicating substantial influence on GEM<sub>mdn</sub> and  $\sim$ GEM<sub>mdn</sub>. Note. GEM = global entrepreneurship median calibrated scores

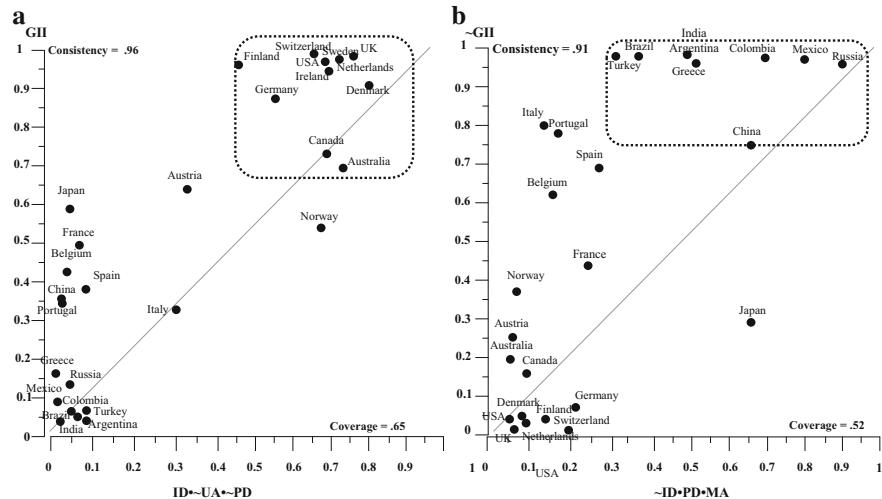
and goes moves theory beyond McClelland's (1961) thesis; the benefits of low levels of hubris in displays of low PD likely occurs (a speculations that the following findings for low entrepreneurship activity supports).

The findings support P2b consistently. For P2b, one recipe indicates low entrepreneurship activity for all three entrepreneurial metrics (GEM, GEI, and GII):  $\sim ID \bullet PD \bullet MA$ . Supporting a tenet of complexity theory, this cultural recipe is not the mirror opposite of the recipe that supports consistent high entrepreneurship activity. Figure 8b shows that for 6 of 7 countries with calibrated scores above 0.50 in  $\sim ID \bullet PD \bullet MA$  have high scores in  $\sim GEM$ —Japan being the lone exception. The high-high scores for  $\sim ID \bullet PD \bullet MA$  and  $\sim GEM$  include two of the four BRIC nations: Russia and China. All four BRIC nations appear in the same upper left location for  $\sim ID \bullet PD \bullet MA$  and  $\sim GEI$  and  $\sim GII$  in Figs. 9b and 10b, respectively. These consistent findings indicate strong support that different nation's cultural recipes can thwart versus nurture entrepreneurial actions; more specifically, the present study provides details on the specific recipes for such entrepreneurship thwarting versus helping cultures.

Japan is high-high in the  $\sim ID \bullet PD \bullet MA$  and  $\sim GEI$  XY plot in Fig. 9b. This finding supports the repeated contention of the Economist (Anonymous 2011, 2014) that Japan needs to introduce national policies that would reduce high MA behavior; here is the title of one of the articles in *The Economist* (Anonymous 2014): Holding back half the nation; Japanese women and work. *The Economist* has been very vocal ("read my lips") about the need for cultural change in Japan; note in Fig. 11 how *The Economist* visualizes the plight of women as wasted talent in Japan. In contrast, for nearly two decades now the United Nations, and specific countries such as Denmark, have pass legislation and policies to nurture "gender



**Fig. 9** Cultural value recipes indicating substantial influence on GEI and  $\sim GEI$ . Note: GEI = Global entrepreneurship index calibrated scores

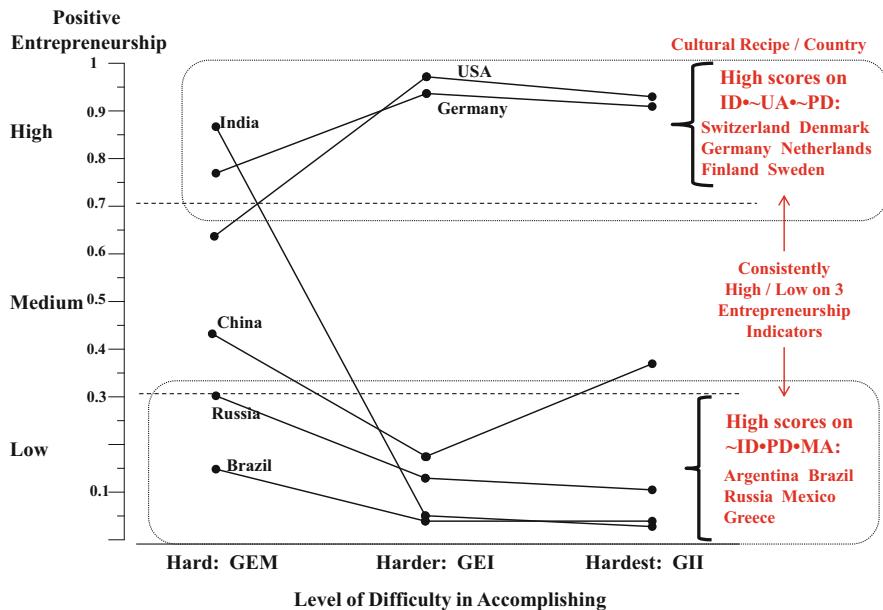


**Fig. 10** Cultural value recipes indicating substantial influence on GII and ~GII. Note: GII = Global innovation index calibrated scores.



**Fig. 11** Women inside and emerging from a garbage can representing an outcome of high masculinity in Japan. Source: Anonymous (2011), *The Economist*, Schumpeter: Land of the Wasted Talent, November 5, p. 80

mainstreaming" that effectively would shift a country's high MA to a high ~MA (Elnain et al. 2001). Thus, while likely to be exceptionally difficult to accomplish (e.g., centuries of slavery in the USA followed by a century of "Jim Crow" laws supporting racial oppression and segregation), ingredients within a cultural recipe can move a bit with major nudges via national will/plans of action.



**Fig. 12** Countries by three indicators of entrepreneurship indicators and cultural recipes—calibrated scores

Figure 12 summarizes the findings for the two major cultural recipes relevant for BRIC, Germany, and the USA and the three indexes for entrepreneurship activity: GEM, GEI, and GII. Figure 12 includes six countries only for clarity and to illustrate the high level of consistency of findings across the three different entrepreneurship indexes. The three entrepreneurship indexes appear on the X axis in Fig. 12 from GEM to GEI to GII to represent level of difficulty in accomplishing: hard, harder, and hardest, respectively. The GEM index focuses on activities that nurture entrepreneur capabilities (such nurturing is hard to accomplish since planning and implementing multiple supporting actions need to occur). The GEI index is composite metric of actions that include measuring the extent of replicative types of start-ups; the GEI focuses on “harder” aspects of growing entrepreneurship in its measuring actual startups. The GII index focuses on the most difficult type of entrepreneurship activities (“hardest”) in its estimating of innovation startups.

Given that the three sets of estimates are accurate, India’s high level score for GEM versus India’s low level scores for GEI and GII is the most dramatic finding in Fig. 12. The consistent high scores on the three entrepreneurship indexes for countries scoring high on the ID•UA•PD cultural recipe (Germany and the USA) and the high scores of negation of the three entrepreneurship indexes (except India for GEM) for countries scoring high on the ~ID•PD•MA cultural recipe is the most informative finding in Fig. 12. The nations with alternative recipes to the two just described fall in the moderate range of entrepreneurship activities fairly consistently for the three indexes. These findings and the prior findings on high

ID•~UA•~PD indicating high QOL give credence to McClelland's (1966, 1987) innovative training programs to transform leaders in communities of nations low in ID•UA to think and act as individuals and teams high in ID•UA. His studies indicate modest but significant levels of training success. However, such training may be necessary to accomplish on a massive scale to accomplish national levels of adoption of ID•UA. This observation is not to indicate that the task is impossible, just that substantial effort and time are necessary to achieve such a shift in cultural recipes.

### **Findings for P3a: Recipes of high entrepreneurship nurturing behavior (ENB) indicate high replicative entrepreneurship**

Does nurturing entrepreneurship startups measured by GEM impact entrepreneurship startups measured by GEI? The findings in Figs. 13a and 14a support the perspective that specific recipes of entrepreneurship nurturing behavior (ENB) as measured by GEM indicate high scores in entrepreneurship as measured by GEM and GII. Figure 13a includes seven recipes of ENB ingredients of GEM indicate high GEI outcome scores. The seven models provide high overall consistency ( $C_1 = 0.87$ ) and coverage ( $C_2 = 0.71$ ) in predicting high GEM scores. The findings in Fig. 13a support the perspective that no one recipe with high scores in all areas (i.e., “pillars” of GEM, Singer et al. 2014) is necessary or occurs for countries to

**a** GEM Recipes Supporting High Global Entrepreneurship Index (GEI) Scores

Model	1	2	3	4	5	6	7	C1	C2
1	•			~	•	~	•	.98	.03
2	•	~	•		•	•	~	.88	.03
3	•	~	•	•	•		~	.87	.03
4	•		•	•	•	•	•	.90	.06
5	•	•	•	•	•		•	.88	.04
6	~	•	~	~	•	~	~	.89	.01
7	~	•	~	•	~	~	•	.95	.04

Overall C1 = .87

Overall C2 = .71

•

**b** GEM Recipes Supporting High Negation Global Entrepreneurship Index (~GEI) Scores

Model	1	2	3	4	5	6	7	C1	C2
1	~	~	~	~	~	~		.92	.03
2	~	~	~	~		~	~	.92	.05
3	•	~	•	~	~	~	~	.94	.04
4	•	•	~	~	~	~	•	.87	.02

C1=.91

C2=.44

19

**Fig. 13:** Nurturing entrepreneurship and startup activity. (a) GEM Recipes Supporting High Global Entrepreneurship Index (GEI) Scores. (b) GEM Recipes Supporting High Negation Global Entrepreneurship Index (~GEI) Scores. Note: 1 = G\_programs; 2 = nurturing culture; 3 = science & tech base; 4 = communication access; 5 = debt funding; 6 = legal/accounting services; 7 = primary and secondary education. The “•” indicates presence in the model; “~” indicates negation

**a** GEM Recipes Supporting High Global Entrepreneurship Index (GII) Scores

Model	1	2	3	4	5	6	7	C1	C2
1	~	●	~	●	~	~	●	.85	.05
2	●	~	●	~	●	~	●	.87	.02
3	●	~	●	~	●	●	~	.86	.01
4	●	~	●	●	●	~	~	.91	.07
5	●	~	●	●	●	●	●	.94	.08
6	●	●	●	●	●	~	●	.92	.09

C1=.90 C2=.56

**b** GEM Recipes Supporting High Negation Global Entrepreneurship Index (~GII) Scores

Model	1	2	3	4	5	6	7	C1	C2
1	~	~	~	~	~	~		.94	.02
2	~	~	~	~	~	~	~	.93	.04

C1=.93 C2=.33

**Fig. 14:** Nurturing entrepreneurship and innovation. (a) GEM Recipes Supporting High Global Entrepreneurship Index (GII) Scores. (b) GEM Recipes Supporting High Negation Global Entrepreneurship Index (~GII) Scores. Note: 1 = G\_programs; 2 = nurturing culture; 3 = science and tech base; 4 = communication access; 5 = debt funding; 6 = legal/accounting services; 7 = primary and secondary education. The “●” indicates presence in the model; “~” indicates negation

indicate high GEM scores. However, Fig. 13a shows that all seven recipes include at least three high scoring ingredients; six of the seven recipes include either high scores for entrepreneurship government supporting programs (the first ingredient) or a supportive national culture (the second ingredient) but not both. A surprising finding! Possibly national government policy-makers may believe that their nation does not need supportive government programs if a pro-entrepreneurial culture exists. Such a speculation is worthy of additional research. High score in adequate debt funding (the fifth ingredient) is in six of the seven models in Fig. 13a.

Note that model 4 includes six of the seven ingredients and has very high C1 and the highest C2 indexes; this model represents an exemplar of the nurturing tools the leaders’ of a country may seek to implement to stimulate high numbers of entrepreneurial startups. Models 1 and 2 in Fig. 13a represent likely workable and adequate “bare bones” minimal country “business models” in nurturing entrepreneurial startups: only four of seven ingredients have high scores and two ingredients have negative presence in achieving high GEM scores. Both models 1 and 2 include highly supportive government programs, high science and technological bases, and strong debt funding. What become clear from examining the findings in Fig. 13a is that country leaders may be effective by emphasizing specific ingredients in nurturing entrepreneurial startups rather than attempting the seemingly impossible task for insuring high levels of all ingredients—the construction of all nurturing pillars is unlikely to occur and is unnecessary to achieve high impact on entrepreneurship.

**P4a: Recipes occur for low ENB indicating low replicative entrepreneurship**  
**Does not nurturing entrepreneurship matter?** Figure 13b indicates that the negation of entrepreneurship is an outcome of the negation of ENB. Nurturing entrepreneurship helps and not nurturing entrepreneurship hurts. Figure 13b includes four models that support the negation of entrepreneurship (~GEI). Model 1 indicates that the systemic negation of nurturing ingredients provides high ~GEI with high consistency and though low coverage (low coverage indicates the recipe occurs for very few countries in the sample). Models and 3 and 4 in Fig. 13b indicate that highly nurturing government programs can be counterproductive in certain circumstances (in certain recipes). Note that model 5 in Fig. 13a and model 4 in Fig. 13b start with the same two ingredients (supportive government programs and culture) and then diverge dramatically; five remaining ingredients have high scores for model 5 in Fig. 13a and four remaining ingredients are present negatively in model 4 in Fig. 13b.

The findings for outcomes GEI and ~GEI in Fig. 13a, b provide substantial nomological validity for the perspective that specific recipes for ENB help to accomplish the growth of entrepreneurial actions and that other recipes best described as anti-ENB very much hurt entrepreneurial actions.

**P3b: Recipes occur for high ENB indicating high innovative behavior**

Does ENB support business innovation? The findings for GEM recipes supportive of high innovation behavior as indicated by GII appear in Fig. 14a. These findings support the perspective that a few specific GEM recipes affect high innovation behavior. Five of the six recipes in Fig. 14a include supportive government programs as an ingredient in high GII scores. The six models in Fig. 14a provide high overall C1 and C2 indexes. The findings support the view that country leaders should become cognizant that a model that includes high scores on all GEM ingredients is not present; certain specific recipes support high innovation behavior. Possibly the analogy of lock combinations to open-up innovation safes is useful to adopt when viewing Fig. 14a; substantial planning may be necessary in learning what combinations of ENB ingredients will have high positive impacts on innovation.

**P4b: Recipes occur for low ENB indicating low innovative behavior**

Can the negation of ENB hurt business innovation? The findings in Fig. 14b supports the proposition that the negation of ENB ingredients associates with the negation of innovation behavior. Figure 14b includes two nearly identical models. The negation of almost all ENB represents a major negative impact on a country's innovation behavior. These findings add credence to the perspective that the presence of high scores in ENB ingredients in several recipes mostly supports high innovation and the negation of ENB is detrimental to innovation behavior.

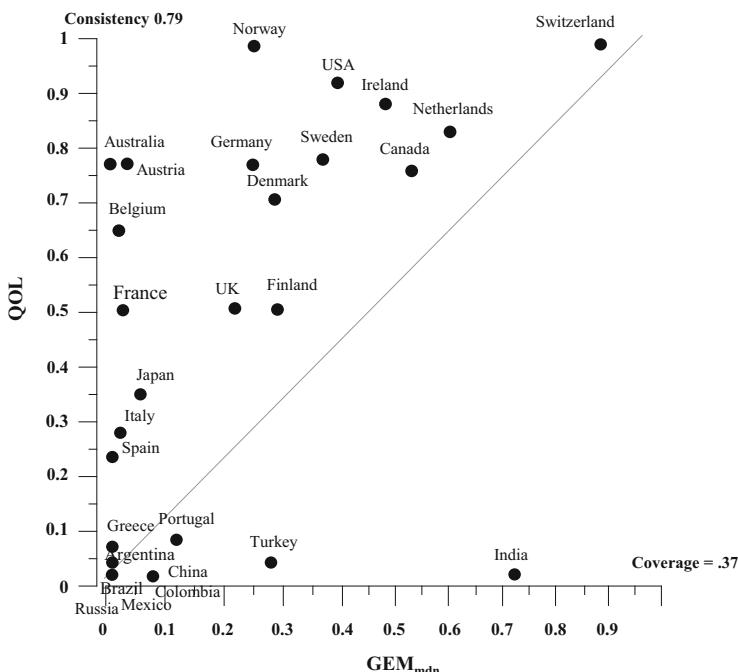
**The findings support P5: High scores on (a) ENB, (b) replicative, and (c) innovative entrepreneurship behavior indicate high quality-of-life (QOL)**

Though the consistency indexes are somewhat lower than the consistency scores for the cultural recipes and QOL, Figs. 15–17 provide substantial support the high entrepreneurship activities (nurturing, replicative, and innovative) sustain high QOL. In Fig. 15, the relationship between GEM → QOL produces a consistency index equal to .79 and a coverage index equal to .37. India is the exception to the finding that high GEM indicate high QOL and likely indicates that India will be unable to shift QOL upward by ENB alone. India's low scores on GEI and GII supports the conclusion that India needs to also support actions relating directly to achieving high GEI and high GII for entrepreneurship to affect QOL in India.

The general patterns in the XY plots in Figs. 15–17 supports the findings appearing earlier in this study. Countries high in ID•~UA•~PD are high in both entrepreneurship and QOL. Countries high in ~ID•UA•MA are high in both the negation of entrepreneurship measures and ~QOL.

**The findings support P6: Cultural value recipes impact perceived transparency**

The findings inside arrow 5 in Fig. 18 (upper left of Fig. 18) indicate substantial support for P6. Specifically cultural recipe ID•~UA•~PD•MA indicates high



**Fig. 15** Global entrepreneurship monitor median and quality of life

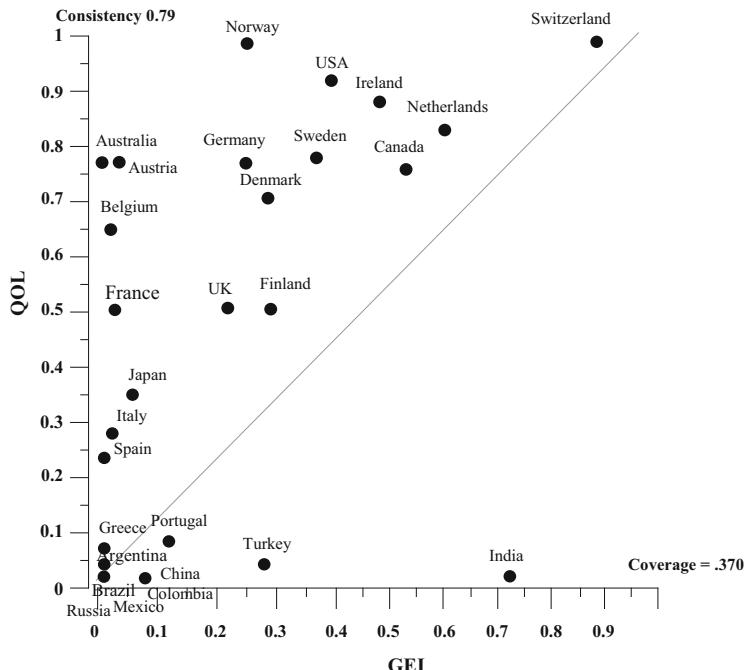


Fig. 16 Global entrepreneurship index and quality of life

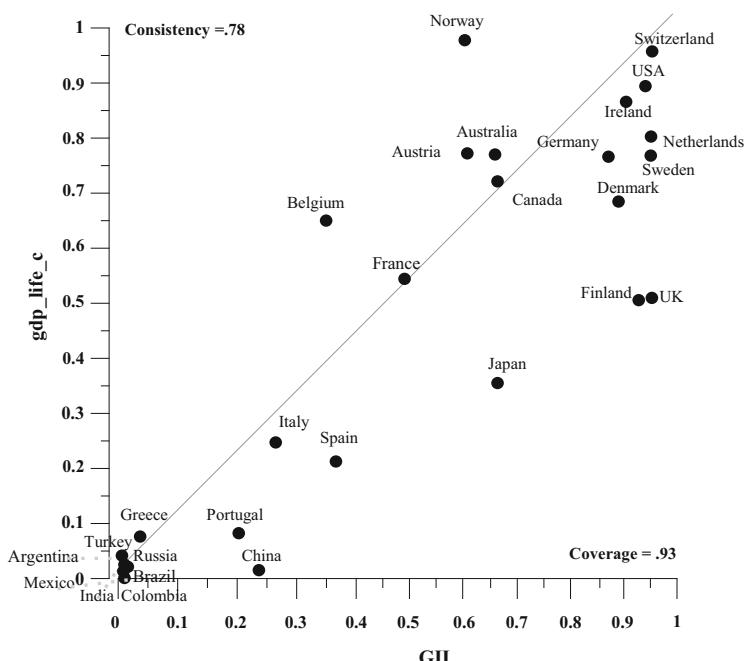
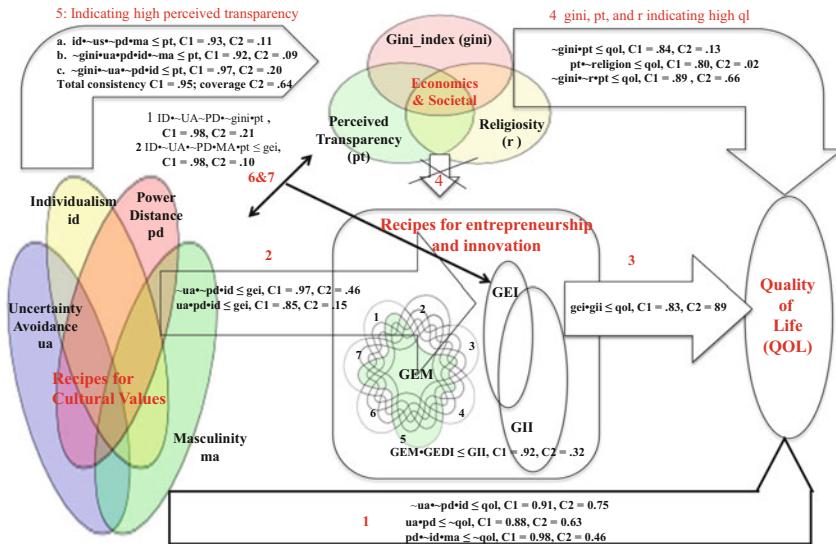


Fig. 17 Global innovation index and quality of life



**Fig. 18** Summary of main findings for asymmetric theory of culture, entrepreneur actions, and quality-of-life

perceived transparency with  $C1 = .93, C2 = .11$ . Additional findings not appearing in a figure include the  $PD \sim MA$  cultural recipe indicating the negation of perceive transparency.

#### **The findings do not support P7: Recipes including the Gini, perceive transparency, and religiosity impact entrepreneurship**

The study's findings do not support P7. No cultural recipe appears to indicate combinations of high or low Gini, perceived transparency, and/or religiosity impact any of the three indexes for entrepreneurship. High entrepreneurship relies on foundational cultural recipes rather than the presence or absence of income equality, transparency, or religiosity.

#### **The findings support P8: Certain recipes that include Gini, PT, and R influence QOL**

Note in Fig. 18 in arrow 4 that three economic/societal recipes associate with high QOL. Perceived transparencies appear in all three recipes. The negation of Gini appears in two of the recipes and the negation of religiosity appears in one of them. The main conclusion that appears valid is that some high perceived transparency with the negation of income equality or the negation of religiosity may contribute to high QOL.

**The findings support P9: Complex configurations combining cultural values with Gini, perceive transparency, and religiosity contribute nuance in explaining replicative entrepreneurship**

Two models (both appearing in Fig. 18 as arrows 6&7) indicate specific cultural value, gini, and perceived transparency recipes contribute to high entrepreneurship activity (GEI). Here are these two models:

$$ID \cdot \sim UA \sim PD \cdot \sim gini \cdot pt \leq GEI, C1 = .98, C2 = .21$$

$$ID \cdot \sim UA \cdot \sim PD \cdot MA \cdot pt \leq GEI, C1 = .98, C2 = .10$$

Religiosity is not an ingredient in either of these two models. The findings indicate that these two models generate very high consistency for high entrepreneurship activity.

## 7 General discussion

The present study provides independent and rigorous support for McClelland's (1961) findings that individual initiative and some positive amount of risk-taking highly support entrepreneurial activities. The findings support this general conclusion across three separate indexes relating to entrepreneurship. The high consistency of the finding for each and across the three indexes for the impact of culture value recipes suggests high nomological validity for the cultural value recipe associations with entrepreneurship.

While literature reviews indicating conflicting findings and worth of the Hofstede's (1984) cultural value paradigm (Kirkman et al. 2006; Venaik and Brewer 2010), the present study indicates high value in applying Hofstede's data via asymmetric analysis (i.e., recipes) even if the conventional approach of symmetric tests (regression analysis and structural equation modeling) indicates sometime conflicting evidence of Hofstede's paradigm. The cultural value approach in the present study more closely matches with the proposition central to culture—cultures represent a complex whole rather than a collection of net effects of individual ingredients.

The findings support the major tenet of the general theory that entrepreneurship matters in generating high quality of life for the residents of a nation. Support for this central tenet is consistent across three indexes relating to entrepreneurship. The findings support the Schumpeter's (2000) perspective that high innovation associates with a nation's high quality of life as well as the view that high innovation enhances the impact of high ENB on nations' quality of life. The present study confirms the high value in entrepreneurship nurturing behavior as measured by the GEM. The study clarifies the different recipes of ENB indicates high GEI and GII scores. Specific recipes of the negation of GEM associate with the negation of GEI and GII scores. The findings in the present study shows how perceived transparency and low income inequality ( $\sim gini$ ) enriches the impact of cultural values and

entrepreneurship recipes on quality of life. Some nations continue to work very hard at maintain low levels of corruption (e.g., Denmark, New Zealand, and Finland). The findings in the present study suggest that emulated this practice likely supporting high QOL.

The present study contributes to theory by showcasing the substantial theoretical contributions possible to achieve from adopting complexity theory and asymmetric analysis into research on entrepreneurship. Antecedents, processes, and outcomes that describe, explain, and predict entrepreneurship needs to move beyond linear models and net effects descriptions (Fiss 2007; Ordanini et al. 2014; Woodside 2013) because of the inherent applicability of complexity theory in these antecedents, processes, and outcomes.

## 8 Limitations and Suggestions for Additional Research

While the value of the present study is high due to the use of primary and secondary data from multiple sources, the advances in theory and data analytics, and the usefulness of the findings, the relationships described among recipes and entrepreneurship and QOL outcome derive from cross-sectional data and survey based interviews. Natural field experimentation is possible as McClelland (1966) describes to test the introduction of entrepreneurship-generating training programs. Such research work is rare and needs encouragement. Also, the present study applies and extends to recipes only Hofstede's cultural value paradigm. Future research should include "critical tests" (Carlsmith et al. 1976) of comparisons of the strengths of recipe relationships using additional cultural value paradigms (e.g., Inglehart and Baker 2000; Schwartz 1994a, b, 2006a, b). Critical tests includes examining the relative contributions of alternative theories attempting to describe, explain, and predict the same set of antecedents, processes, and outcomes.

Finally, the present study does not test the models that the findings support for predictive validation. Performing tests for predictive validity via holdout samples is a necessity step that is often missing in both symmetric and asymmetric testing (Gigerenzer and Brighton 2009). Future research should include taking this step in studies that include the collection of data from relatively large samples of nations ( $n > 100$ , if possible).



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# The Complexity Turn to Modeling Firm Heterogeneity in Corporate Social and Financial Performance

Lars E. Isaksson and Arch G. Woodside

**Abstract** Prior research on the association between corporate social performance (CSP) and corporate financial performance (CFP) includes conflicting perspectives and inconclusive findings as to whether or not CSP has a positive, negative, or neutral association with CFP. While Wang et al. (2015) meta-analysis confirms the relationship between CSP and CFP to be significant and positive, in some contexts CSP and CFP associate negatively; CSP may need to receive “good management” support to yield positive financial outcomes [Luo and Bhattacharya (J Mark 73:198–213, 2009)]. The study here tests and supports the perspective that “good management” occurs in configurations (i.e., business models) with high CSP to indicate high CFP. A configurational theoretical stance implies that recipes of bad management with high or low CSP are likely to associate with low CFP. Configurational analysis supports this theoretical perspective. Building from complexity theory, a configurational analysis includes the propositions that complex multiple recipes lead to the same outcome (equifinality tenet) whereby variables (ingredients) found to associate causally in one configuration may be absent in another recipe or even inversely related in a third recipe associated with this same outcome. The present study employs a mixed methods research design (using surveys of senior executives, independent CSP firm assessments using ESG factors (environment, social (or human rights), and governance), and analysis of corporate annual reports of 82 mostly highly-global Swedish firms). The study overcomes the mismatch between case-level theory proposals and variable-based data analyses that is widespread in the relevant literature. The study’s findings support the core tenets of complexity theory.

**Keywords** Configurational theory • Corporate firm performance • Corporate social performance • Equifinality • ESG factors • Recipe

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## 1 Introduction and Review of Corporate Social Performance

The study here applies complexity theory and configurational analysis to offer a case-level theory and case-level empirical research of recipe antecedent conditions and recipe outcome conditions that describe, explain, and predict cases (firms) high and cases (firms) low in corporate social performance (CSP). Adopting a case-level approach to both theory and data analysis serves to overcome “the mismatch between configurational theory and methods” that Fiss (2007) describes. Fiss (2007) and others (Ordanini et al. 2014; Woodside 2014) stress that configurational (set-theoretic) approaches to organization research build from the fundamental premise that patterns of attributes (i.e., recipes) include specific ingredients (i.e., features) and that some of the recipes are sufficient in indicating specific outcomes. A core tenet in complexity theory is that configurational analysis supports that contrarian cases to main effect occur frequently (e.g., 20 % of the cases) in data sets; consequently, the same ingredient can have a positive and a negative influence on the same outcome in the same data set. The present study advances a configurational theory of CSP antecedents and outcomes to include the examination of contrarian cases. Different antecedent recipes of firms with high CSP as well as firms having low CSP and corporate financial performance (CFP) outcomes are the conditions of interest in the present study.

Fiss (2007) and others (Ordanini et al. 2014; Woodside 2014), emphasize that while theoretical discussions of configuration theory stress nonlinearity, synergistic effects, and equifinality, conventional empirical research largely draws on symmetric econometric methods (e.g., regression analysis) that by their very nature imply linearity, additive effects, and unifinality. The conventional logic in prior CSP research is to apply classic linear regression models to describe and explain antecedents (i.e., independent variables) to low and high CSP as an outcome variable; this body of research includes an unrecognized paradigm shift from case-level theory to variable-level data analysis and back again at the end of the studies to case-level theory discussions. As the following literature review describes, conflicting findings of positive, negative and no impact of independent variables on CSP as a dependent variable are the principle outcome in this body of work. Embracing a paradigm shift by applying complexity theory and case-level perspective to both theory and data analysis enables resolving the conflict. The resolution enriches insight and knowledge in describing antecedent recipes for firms high as well as firms that are low in CSP outcomes and how CSP recipes associate with high versus low CFP recipes. This case-level paradigm shift in analysis emphasizes the substantial usefulness in examining recipe outcomes as well as antecedent recipes. The present study contributes new theory and empirical findings that support this paradigm shift.

Following this introduction, Sect. 2 briefly reviews prior research on CSP and the contributions made in this literature by the present study. Section 3 describes the configurational analysis concept and good management theory. Section 3.1

describes details of a general theory of CSP and CFP. Section 3.2 explains the study's method to test this general theory. Section 6 presents the findings. Section 7 includes a general discussion of the theory and findings. Section 8 provides conclusions, limitations, and suggestions for future research.

## 2 Corporate Social Performance and Contributions of the Present Study

While multiple definitions are available, the present study defines high CSP to be "a commitment to improve societal well-being through discretionary business practices and contributions of corporate resources" (Du et al. 2010, p. 8; Kotler and Lee 2005), in combination with actions that represents differentiating factor that if successful can enhance a firm's competitiveness and reputation (Hill et al. 2007; Fombrun et al. 2000). Both of these statements imply a need to design business practices actively to achieve high CSP and a perspective towards strategic CSP (instead of ethical CSP) with the organization as the unit of analysis (instead of the society). The topic of CSP receives substantial attention among firms globally (KPMG 2011; Porter 2008; Reid and Toffel 2009). CSP is a topic of study in the strategic management field (Drucker 1984; Mintzberg 1983; Porter 2008); strategy researchers and consultants frequently claim that high CSP to be in firms' best long-term interest (e.g., KPMG 2011; Reid and Toffel 2009) and to be a core-business function central to firms' successful financial performance (Carroll and Shabana 2010; Isaksson et al. 2014). Thus, as a field of study CSP is an increasingly relevant concept for firms worldwide today (Carroll and Shabana 2010; Kang 2009; Moon and Deleon 2007; Porter 2008; Reid and Toffel 2009).

Some researchers hail high CSP as yielding direct- and indirect-enhancements of financial performance (Lev et al. 2011; McWilliams and Siegel 2000) and in resulting in substantial competitive advantages (Carroll and Shabana 2010; Kang 2009; KPMG 2011; McWilliams and Siegel 2000; McWilliams and Siegel 2011; Orlitzky et al. 2003; Porter and Kramer 2006). For example, the claims include that high CSP associates with improved brand performance, enhanced reputational capital and financial performance (Drucker 1984; Harrison et al. 2010; Melo and Garrido-Morgado 2012; Moon and Deleon 2007; Vogel 2005; Waddock and Graves 1997; Wang et al. 2015; Wood 2010). Thus, CSP is an important research field as firms' investing to achieve high CSP want to obtain specific benefits in return (Bondy et al. 2012).

The present study contributes to CSP in several ways. To advance the perspective that high CSP associates with high CFP, the present study reassesses CSP fundamentals, re-approaches CSP measurement, and contributes to CSP's theoretical development. First, prior research indicates that the association between CSP and CFP can be positive (Mattingly 2015; Orlitzky et al. 2003), difficult to extract (Lindgreen and Swaen 2010), neutral (McWilliams and Siegel 2001a; Ramchander

et al. 2012), negative (Lopez et al. 2007), ambiguous and conflicting (McWilliams and Siegel 2000), or inconclusive or difficult to measure (Aupperle et al. 1985). While the most recent meta-analysis (Wang et al. 2015) confirm the relationship between CSP and CFP to be indeed significant and positive, the prior available research remains reliant on symmetric- and index-based data analysis only (Mattingly 2015) and offers inconclusive direction of causality (Carroll and Shabana 2010; Ramchander et al. 2012). Using tenets from complexity theory and asymmetric analysis, the present study reassesses the major aspects of how high CSP associates with high CFP. The study here adopts a recipe (i.e., configurational) perspective of proposing and testing sufficient and necessary ingredients to enactments of high CSP (Lindgreen and Swaen 2010) as tests the “good management” proposition for yielding high CFP (Graves and Waddock 1999; Luo and Bhattacharya 2009). Hence, the study matches the CSP firm construct with firm-level data analysis via a recipe based case-level approach to provide useful guidance for explicating the complexity in predicting high versus low CSP and high versus low CFP (cf. Fiss 2007, 2011; Woodside 2014).

Second, since prior research focuses on global indexes of CSP and how CSP globally relates to CFP and governance (Barnett and Salomon 2012; Kolk and Pinske 2006; Wood 2010), the present study contributes by examining both a global CSP measurement (indexed) and separate the CSP components and the inter-relationships with other operative and managerial aspects (i.e., “good- versus bad-management”) of firms (Carroll and Shabana 2010; Mattingly 2015; Surroca et al. 2010; Wood 2010; Wang et al. 2015). Thus, the present study considers the possible benefits of refuting the starting point from which most CSP-related research commences, namely that the definition of CSP itself is a composite index for assessing CSP by overall index values for a combination of environmental, social, and governance features. The study here proposes that such starting point is fundamentally flawed; researchers and practitioners can achieve a deeper understanding of antecedents and outcomes to CFP via the study of separate components versus the component index approach to studying CSP. This research therefore decomposes the composite measure in re-investigating CSP-CFP associations. The findings support the substantial value of this examination of antecedents and outcomes to the separate parts of CSP index measures.

Third, since firms struggle to comprehend and implement CSP enabling components (Hill et al. 2008; Isaksson et al. 2014), research that clarifies the concept is a valuable contribution to strategic management theory and practice (executive decision-making). Common comprehension issues include difficulties in understanding how “doing good” can be a part of a firm’s strategic management (Lev et al. 2011; Luo and Bhattacharya 2009; McWilliams and Siegel 2011) and what high CSP provides “to our firm” (Maak 2008). Since the strategic management concept entails a systematic analysis of internal and external factors associating with customers and the organization itself, CSP study may support the design of highly effective management practices, that is, good management practice and operating efficiency (Becchetti and Trovato 2011). Hence, being a complex yet promising concept (Carroll 2000; Sen et al. 2006), research targeting further

understanding of the intricate relationship among its antecedents, internal and external factors, organizational, and managerial design (structural components) to achieve potential benefits, is of value. Consequently, including research on both CSP and CFP in the strategic management discipline may be necessary for achieving deep knowledge of “good management” practices.

The difficulties described are solvable by conceptual developments assuming a case-level approach (Fiss 2007, 2011; McWilliams and Siegel 2011; Woodside 2014). By quantitative modeling at the case level, academics and practitioners alike can appreciate that different avenues—different recipes—are available for achieving successful CSP investments to encourage firms to engage in, or strive for, high CFP. The present study probes how the various underlying components of, and antecedents to, firms’ CSP fit together conjunctively to result in high as well as low CFP. The outcome opportunities of high CSP are more multifaceted than prior conceptualizations (e.g., Sen et al. 2006). The study responds to the research call for multi-method approaches and decompositions of CSP measures (Szwajkowski and Figlewicz 1999).

Finally, high CSP alone is not likely to consistently result in high CFP without strategic alignment (Porter and Kramer 2006). Thus, firms may need to plan, organize, manage, and implement CSP programs in the same fashion as they would apply any other strategic tool (or managerial discipline) in targeting firm objectives, for example marketing (Luo and Bhattacharya 2009; Lusch 2007; Orlitzky et al. 2003; Wagner et al. 2009b). This perspective is a core tenet for investigating CSP impacts at the case-level. Thus, firms may need to learn how to synchronize and align CSP with additional overall firm-level objectives (Porter and Kramer 2006; Maignan and Ralson 2002). Such alignment is especially important since ill-planned or insincere CSP (that is, applying the CSP concept yet ignoring its potential capabilities via bad or unworkable management practices) risks being counterproductive and contributing to negative outcomes (Ramchander et al. 2012; Russo and Fouts 1997; Wagner et al. 2009b). If a multinational enterprise’s (MNE) CSP is not a strategic fit with good management practices, the firm will likely find that CSP does not yield positive impacts on their CFP (Hill et al. 2008; Isaksson et al. 2014).

### 3 Configurational Analysis and Good Management Theory

This study tests and supports McGuire et al.’s (1988), Ullman’s (1985), and Waddock and Graves’ (1997) perspective that “good management theory” coupled with high CSP associates with high CFP. While recent research shows that firms with low CSP have higher CFP than firms with moderate CSP, and that firms with high CSP have the highest CFP (Barnett and Salomon 2012), a core proposition in the present study is that high CSP among cases (firms) alone is insufficient for achieving high CFP consistently but that the occurrence of the combination of good

management (gm) and high CSP is sufficient in indicating high CFP occurring consistently. The theory predicts an asymmetric association as model 1 states:

$$gm \bullet CSP \leq CFP \quad (1)$$

where the mid-level dot “•” (or a star, “\*”) represents the logical Boolean “AND” condition, that is, if a firm has both high gm and high CSP, CFP is high. Rather than testing the net effects of antecedent influences as variables via matrix algebra and symmetric tests, the present study focuses on testing configurations of antecedent conditions using Boolean algebra and asymmetric tests. Thus, model 1 states that high CFP follows when both gm and CSP are high. Such “qualitative comparative analysis” (Ragin 2008) calibrates all variable values into calibrated scores ranging from 0.00 to 1.00.). Model 1 makes no claim about other combinations of gm and CSP (model 1 being an asymmetric statement) where different firms low in gm or CSP may have low as well as high CFP. Model 1 states only that nearly all firms high in the combination of the two simple conditions will be high in CFP.

### **3.1 Good Management and CSP**

“Good management” practice may need to be present for the achievement of high CSP to yield high CFP results (Luo and Bhattacharya 2009). Such a theoretical stance implies that the coupling of bad management with low CSP is likely to associate with low CFP; however, the absence of this mirror opposite perspective is irrelevant to the claim made by model 1. In many instances the mirror opposite set of antecedent conditions is not a consistent indicator of the negation of a positive outcome condition. The idea that symmetry often does not occur for complex causal antecedent conditions for high versus low outcomes is known as the causal asymmetry principle (Fiss 2007). This principle implies that accurate models indicating success outcomes usually provide insufficient information for modeling the causal recipes associated with failure—separate models of success and failure outcomes are necessary for high versus low CFP, respectively. Complexity theory and the findings in the present study support these tenets. Complexity theory includes the proposition that a few complex, multiple, recipes indicate the occurrence of same outcome (the equifinality tenet, Fiss 2007; Ragin 2008; Weick 1979) whereby antecedents found to associate causally in one configuration may be absent in another recipe or even inversely related in a third recipe associated with this same outcome (Ordanini et al. 2014; Ragin 2008).

The theory proposes that regardless of whether or not MNEs invest in CSP to gain some tangible or intangible benefits, MNEs need to provide good management and executive support for those benefits to emerge. The potential tangible benefits include positive support between CSP and CFP (Hill et al. 2007; Hull and Rothenberg 2008; KPMG 2011; McWilliams and Siegel 2000; Orlitzky et al.

2003; Wood 2010; Wang et al. 2015); cost savings from environmental programs (Gadenne et al. 2009); improved sales performance (Kang 2009; Porter 2008; Wieseke et al. 2009); increased levels of future cash-flows and the possibility for the expected cash-flows to emerge aiding long-term stock performance (Luo and Bhattacharya 2009; Ramchander et al. 2012); favorable procurement conditions (discounts from suppliers) and lower cost of capital (Deegan 2007). The intangible benefits supporting CSP and competitive advantages and differentiation effects (Carroll and Shabana 2010) include increased employee commitment to work tasks (Kang 2009; Porter 2008; Shen and Benson 2014; Wieseke et al. 2009); decreased levels of employee turnover and increased firm attractiveness for future recruitment (Carroll and Shabana 2010; DeTienne et al. 2012; Shen and Benson 2014); increased customer loyalty and stronger stakeholder relationships (Du et al. 2010); increased attractiveness to investors (Deegan 2007); increased brand related asset value and improved reputation (Melo and Garrido-Morgado 2012; Fombrun et al. 2000); and erected legitimacy or integrity support (Porter 2008; Porter and Kramer 2006). Thus, MNEs may seek to cultivate achieving high CSP (Ramchander et al. 2012; Stainer 2006) for at least reputational reasons (Carroll and Shabana 2010; Freeman et al. 2004; KPMG 2011; Melo and Garrido-Morgado 2012; Miller 2004).

If MNE executives intend to achieve some of the described benefits associated with high CSP, the inclusion of representatives of their primary stakeholders (customers, suppliers, employees and managers) in their corporate social responsibility (CSR) dialogues (Biehal and Sheinin 2007; Murray and Montanari 1986) may be necessary since firm level CSP activities that lack stakeholder support will not provide beneficial results (Carroll and Shabana 2010). Yet, the inclusion of stakeholder preference depends on how successful the top-management-team (TMT) and individual managers are in managing their customer relationships (Deshpandé et al. 1993; Freeman 1984; Kohli and Jaworski 1990; Mattingly 2015; Ruekert 1992).

The above reasons support calls to ensure that CSP efforts are part of, and aligned with, the overall repertoire of value creation tools such as marketing, R&D and branding to avoid “flying blind” with respect to CSP (Luo and Bhattacharya 2009). Assessing both internal and external firm level factors (orientations) (Aguinis and Glavas 2012) with respect to CSP may be necessary and the present study includes both sets of factors. The management of stakeholder relationships may hence be of essence (Cousins and Stanwix 2001; Dyer and Chu 2003) and such management provides critical control factors such as interaction structures, failure correction and conflict management. It also influences the cooperative culture and the selection of firm level characteristics (Ring and Vandeven 1992). Firms’ with a strong external orientation that actively monitor and manage their customers, may allocate more resources (to satisfy their needs and wants) to attract and keep them (Harrison et al. 2010). Examples of such specific modes of interaction can be direct cooperation, strategic alliances, intra-departmental interactions or

customer joint projects (Delmas and Toffel 2008; Ellis 2010; Lam et al. 2010; Peloza 2006). Firms interested in creating CSP can plan how to extract value from it (strategic intent) and how to make it an omnipresent (integrated) part of the firm (Porter and Kramer 2006) its corporate culture and general strategy (Kiessling et al. 2015; Isaksson et al. 2014). CSP enhancement therefore becomes a part of the “corporate DNA” (Lindgreen and Swaen 2010).

### ***3.2 Alternative Perspectives of Management Practice and CSP***

Researchers’ preferences limit prior research in the CSP field to a large extent. First, the theory perspectives in the majority of studies address CSP from control theory, goal theory, stewardship theory, stakeholder theory, institutional theory perspectives or resource based theory (Bondy et al. 2012; Donaldson and Preston 1995; Lev et al. 2011; Lindgreen and Swaen 2010; Orlitzky et al. 2003). The foci among these theories investigate CSP from an explicitly normative and ethical perspective, (Lindgreen and Swaen 2010; Orlitzky et al. 2003) and from a traditional approach using variable-based symmetric research and a non-critical acceptance of adapting a global index-based (Mattingly 2015) measurement strategy (Wang et al. 2015). Positive CSP is viewable as a key antecedent to decreasing the risk of problems with third parties, media and government (Nielsen and Thomsen 2010). Even prior to the emergence of internet based social networks (e.g., Twitter or Facebook) customers became increasingly better organized, more informed and more demanding (Appiah-Adu and Singh 1998; Ruekert 1992). Opposition to this view includes Friedman’s (1970) reasoning that firms’ have no social responsibility other than maximizing CFP for its owners; however, such non-responsibility view could today be said to verged to be within the scope of both profit maximization and responses to a society’s norms (Carroll and Shabana 2010). Caring for what interests a firm’s customers (or other stakeholder categories) is decidedly pro-shareholder (Drucker 1984; Freeman et al. 2004; Miller 2004). The shared opinion and advice to practitioners is therefore not to view CSP from a cost perspective but as a long term investment opportunity (Carroll and Shabana 2010; Drucker 1984; Kang 2009; McWilliams and Siegel 2011; Orlitzky 2000; Porter and Kramer 2006; Wood 2010). Firms are advised to gather market intelligence (regarding the supply of and demand for CSP investment opportunities) so that engaging in CSP activities does not reduce, or have no impact on CFP, but yield a positive return (Mackey et al. 2007).

## 4 Complexity and the General Theory of CSP and CFP

### 4.1 Entrepreneurship Examples of the Core Tenets of Complexity Theory

The following five core tenets in complexity theory guide the construction and testing of the general theory of CSP and CFP. The discussion includes an example of each core tenet. The CSP/CFP theory is an individual firm identification model matched with systematic cross-case analysis that models relations among variables in terms of set membership and uses Boolean algebra to identify configurations that reflect sufficient conditions for an outcome of interest. First, a high positive or negative score in a simple antecedent condition may be necessary but it is not sufficient to indicate a high score for an outcome condition consistently. Thus, large size firms (large in assets) may be a necessary condition for high CSP but not all large firms are high in CSP.

Second, a few complex antecedent conditions of specific scores for two or more simple conditions indicate cases with high scores in the focal outcome (CSP or SFP) consistently. This second tenet is the sufficient but not necessary perspective of complex antecedent conditions indicating an outcome of interest. Thus, the general theory of CSP may propose that all (or nearly all) large asset (A) firms, high in marketing intensity (I), manufacturing (M) consumer (C) products have high scores in CSP. Model 2 is a formal statement of this specific model:

$$A \cdot I \cdot M \cdot C \leq CSP \quad (2)$$

Model 2 states that all or nearly all firms with high scores in the complex antecedent condition (i.e.,  $A \cdot I \cdot M \cdot C$ ) have high scores in the outcome condition (i.e., CSP). A “high score in a complex antecedent condition” means that the score is high for each of the simple conditions in the statement. For example, a firm in the highest quintile in scores for each of the four simple conditions in model 2 would have a high score for the complex condition. Model 2 indicates that these firms have high scores in CSP consistently. Model 2 is an asymmetric statement; both firms with low scores in model 2 include firms with high and low scores in CSP. The complex antecedent statement representing model 2 predicts only high scores will occur consistently for CSP.

Third, with reasonable large sample sizes of cases (i.e.,  $n = 30$ ), some cases occur that exhibit contrarian relationships for a simple antecedent condition with the outcome condition of interest. Thus, even if the main effect is large ( $r^2 \geq 0.30$ ) for firm size and CSP, a few small (e.g., first quintile) firms will have high scores (e.g., fifth quintile) for CSP. Such observations in data analysis and in complexity theory call attention to the need to go beyond modeling main effects only. The general theory probes the issue of whether or not specific complex antecedent conditions occur that indicate contrarian associations consistently. For example, in what complex conditions (if any) do small size firms achieve high CSP

consistently? Asking such probing questions aids in deepening theory construction and data analysis by recognizing that high X (antecedent) relates to high Y (outcome) consistently in certain circumstances as well as low X relates to high Y consistently in other circumstances.

The fourth tenet is the equifinality proposition—a few complex antecedent conditions occur that indicate high scores in the outcome condition of interest. For example, research on antecedents to high CSP is likely to recognize different complex antecedent conditions for business-to-business (B2B) product manufacturers and business-to-business (B2C) product manufacturers. Theoretical conjecturers of equifinality occurrences serve to deepen theory construction and data analysis. Causal asymmetry is a fifth tenet of complexity theory—complex antecedent conditions consistently indicating the negation of an outcome of interest (e.g. high CSP) are not the mirror opposites of the complex antecedent conditions that indicate high scores in the same outcome condition. Thus, data analysis supporting model 2 should not be taken to imply that model 3 is accurate; the proposal for model 3 needs to rest on evidence beyond being the mirror opposite of model 2:

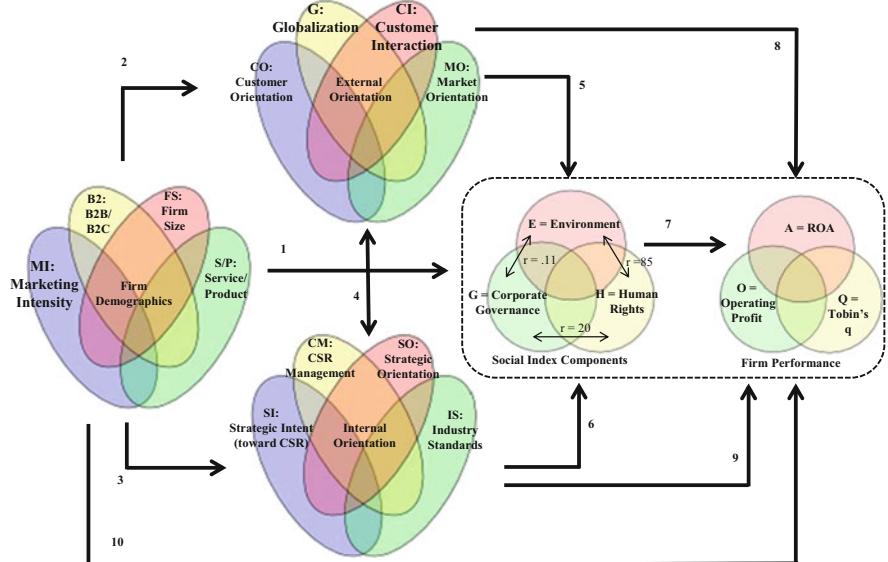
$$\sim A \bullet \sim I \bullet \sim M \bullet \sim C \leq \sim CSP \quad (3)$$

## 4.2 Three Core Input Configurations to CSP and CFP

The literature review supports set-theoretic tenets on the impact of three core input configurations (firm, demographics, external orientation, and internal orientation to two output configurations (CSP and CFP). The research in the present study therefore investigates the complex configural reasons behind MNEs' propensity to voluntarily pursue CSP; how configurations of reasons are structured externally and internally in relation to CSP and CFP outcomes, and how firms implement CSP activities (i.e., operationalize these activities). Apart from investigating each relationship (arrow 1–10 in Fig. 1) separately using fsQCA (fuzzy state qualitative comparative analysis), the present study further decomposes and investigates each constituent latent component including the negation of each leading to the research findings. In total, 85 comparative relationships were calculated using fuzzy logic algorithms. Figure 1 summarizes the general model of antecedents and outcomes for CSP.

## 4.3 Configurations of Firm Demographics

Firm demographics (FD) are commonly included in symmetric research as control variables. Since this research applies an asymmetric case-level approach we



**Fig. 1** The General Theory of Corporate Social Performance

dismantled the aggregated CSP measurement components to gain insight whether or not for example only large versus small MNEs, or a certain MNE industry affiliation, affect CSP outcomes in a specific manner. The four selected constructs are market intensity, customer categories, firm size and industry affiliation.

**Market intensity** Researchers recommend assessing market intensity (MI) when researching CSP and CFP related research (Luo and Bhattacharya 2009; McWilliams and Siegel 2001a). For example, firms with higher advertising intensity may derive more risk-reduction benefits from CSP than firms with lower advertising intensity CSP (Luo and Bhattacharya 2009). The ratio of advertising spending to sales revenue has been used as a measure to assess market intensity expressed as a percentage (McWilliams and Siegel 2001a; Walls et al. 2012). Since the advertising expenditures were not retrievable in all annual reports we used the ratio of sales cost to sales revenue as a proxy for market intensity. This alteration of McWilliams and Siegel's (2001a) measure maintains the purpose of assessing whether market activity costs affect CFP in CSP research contexts. Hence, out of the 27 different propositions assessed in this research we present the first propositions. P1: Cases with high MI alone is an insufficient indicator of high (a) CSP and (b) CFP outcomes. P2: High MI is an ingredient in configurations of firm demographics which do indicate high (a) CSP and (b) CFP outcomes. P3: Low MI, that is, the negation of MI ( $\sim$ MI), is an ingredient in configurations of firm demographics indicating high CFP because some firms have highly profitable business models that include relatively low marketing-related expenditures.

**Customer Categories** Since CSR differs across industries, customers differ by industries as well. The cosmetics, pharmaceuticals and utilities industries for example, focus on different customer categories (McWilliams and Siegel 2001a; Simpson and Kohers 2002). The key customer categories, consumers (B2C) and business (B2B) can affect firm willingness to engage in CSP differently (Naffziger et al. 2003). To exemplify, food and cosmetics (and other consumer goods firms) are likely to focus on consumers (B2C) while for example pharmaceutical firms mostly focus on their business customers (B2B). Banking, insurance, and utilities are likely to focus on all three categories (B2C, B2B and B2G) given the nature of their business' (e.g., supplying financial resources, electricity or water) which are present by all three categories. In turn, the customer categories and the way firms orient their activities around them, can lead to formalized organizational structures which in turn can increase CSP (Berkhout and Rowlands 2007). The study therefore included Delmas and Toffel (2008) measure assessing to what extent firms' have B2C customers (consumers); B2B customers (other firms); or B2G government or municipal customers (Delmas and Toffel 2008; McWilliams and Siegel 2001a). P4: Broad categories of industry-customer focus (B2B, B2C, and both B2B and B2C) are ingredients in complex antecedent configurations indicating high (a) CSP and (b) CFP. P5: Broad categories of industry customer focus (B2B, B2C, and both B2B and B2C) are ingredients in complex antecedent configurations indicating the negation of (a) CSP and (b) CFP.

**Firm Size** Firm size (FS) is frequently included in CSP assessments. One reason is that performance varies substantially across industries (Hull and Rothenberg 2008; Marcel 2009; Waddock and Graves 1997) and average size of firms active in each industry. Prior CSP research suggests using a weighted average of a firm's total assets (Hull and Rothenberg 2008) calculated over a three-year period with a cumulative weight of 0.5. The full weight (1.0) was given to the value of the most recent year  $Y_1$  while a 0.5 weight were given to the value of each year  $Y_{-1}$ , and a 0.25 weight were given to each year  $Y_{-2}$  (Hull 2011). P6: Different complex antecedent conditions occur including large (FS) and small (~FS) firm size simplex conditions that indicate high (a) CSP and (b) CFP. P7: Different complex antecedent conditions occur that include large (FS) and small (~FS) firm size simplex conditions that indicate the negation of (a) CSP and (b) CFP.

**Service or Product Provider (IND)** Inclusion of industry affiliation is important in CSP research since high CSP for example can be more frequent in industries like food, cosmetics, pharmaceuticals, financial services, utilities and automobile industry (McWilliams and Siegel 2001a; Simpson and Kohers 2002) than in industries such as information and communication technologies (ICT) or on-line businesses. The type of CSP also differs across industries. Firms that prefer project specific contributions (i.e. random contributions) are common in the retailing and financial services industries (Lev et al. 2011). Firms with commodity type- or heavy industrial products are also likely to engage in high CSR efforts (Hult et al. 2007; McWilliams and Siegel 2001a) yet for different reasons. Industry affiliation is generally measured as a general industry coding practice applicable for a specific

country (Siegel and Vitaliano 2007). The present study advances an asymmetric and case-level view by coding each Top-100 MNE as a “services provider” or a “goods provider” as suggested by Siegel and Vitaliano (2007). P8: Service-provider versus goods provider industry is an ingredient in recipes indicating high (a) CSP and (b) CFP outcomes. P9: Additional recipes include high scores in goods provider versus service provider industry membership in indicating high (a) CSP and (b) CFP outcomes.

#### **4.4 Configurations 2: External Orientation (EO)**

MNE’s that voluntarily choose to change their practices and allocate resources to engage in CSP activities regardless the associated costs, may believe that doing so benefits the firm (Moon and Deleon 2007). Therefore, including the firms’ external orientation is important (Aguinis and Glavas 2012). Executives in firms’ likely recognize that more types of stakeholder categories are relevant to a firm today than these executives previously believed were relevant (Delmas and Toffel 2008; Donaldson and Preston 1995). To nurture and develop honest and open involvements with stakeholders in general and customers specifically, can be a helpful part of firms’ strategies (Jaworski and Kohli 1993; Noland and Phillips 2010). We therefore included external orientations into the general model and selected customer orientation (CO), globalization, customer interaction and market orientation as constructs.

**Customer Orientation** Firms that apply CSP initiatives indicate to some extent to be willing to assess, change, adjust, or develop their business activities, or business practices, to achieve some benefits from understanding their customers better than prior to these initiatives (Mulyanegara 2010). Firms therefore alter their business activities and practices and apply CSP differently to different types of customers in order to for example gain CSP related cost reductions or increase positive reputation (Moon and Deleon 2007; Naffziger et al. 2003). Thus, the inclusion of the type of relationship firms deploy with their customers in CSR research may be a valuable step. To assess this external orientation component, the study included Lam et al.’s (2010) set of questions. These questions measure the level of customer orientation using a seven-point Likert scale items and satellite around firms’ view of the extent they see customer preferences as an important success factor; goal alignment with customer satisfaction; and problem-solving approaches in selling to customers. Hence, P10: Customer orientation is an antecedent condition in complex antecedent external conditions indicating (a) high CSP and (b) CFP outcomes. P11: The negation of customer orientation in an antecedent condition appearing in complex antecedent external conditions indicate the negation of (a) CSP and (b) CFP outcomes. The study applies six of Lam et al.’s (2010) nine instruments and rephrases them from an individual respondent’s perspective to an organizational respondents

perspective (i.e. questions were changed from “I focus on customer solutions” to “we focus on customer solutions”).

**Globalization (G)** The generic text book definition of an MNE is a firm that conducts business (selling to a customer or buying from a supplier) in at least one other country than a firm’s domestic market. The Swedish origin firms in the top-100 CSP index display on average a level of globalization (to what extent the sample firms are an MNE) of: 18 % domestic sales revenue; 46 % European sales revenue; 19 % American sales revenue (North-, Central- and South America combined); 11 % Asian sales revenue and 5% for the combined African and Middle-East sales revenue. This research attached the highest score to the firm with the lowest domestic sales revenue in relation to total sales revenue (i.e. the most globalized firm), and the lowest score to the firm with the highest domestic sales revenue in relation to total sales revenue (i.e. the relatively least global firm). We therefore propose that (P12): High G (globalization) is an antecedent condition in complex antecedent external conditions that indicate high (a) CSP and (b) CFP outcomes, and, P13: The negation of G is an antecedent condition in complex antecedent external conditions that indicate the negation of (a) CSP and (b) CFP outcomes.

**Customer Interaction** Unlike the customer orientation (CI) which regards the type of stakeholder relationships, customer interaction assesses the structure and frequency of such relationships. The study here applied Peloza and Papania’s (2008) set of questions that measure the level of structured interaction with customers and suppliers. Answers to these questions are measured as a dummy being “1” for “yes” and “0” for “no”. These questions evolve around whether firms’ have formal written procedures how to interact with the key market stakeholder (customers); and whether they have regular scheduled meetings with customers or occasionally shared project organizations with their customers. This study renamed Peloza and Papania’s (2008) instrument as “Customer Interaction” and measuring the responses by applying factor analysis with principal component method of extraction. Thus, P14: CI is an antecedent condition in complex antecedent external conditions that indicate high (a) CSP and (CFP) outcomes, and P15: The negation of CI is an antecedent that appears in complex antecedent conditions that indicate the negation of (a) CSP and (b) CFP outcomes.

**Market Orientation** Market orientation (MO) is a business philosophy and a policy statement (Kohli and Jaworski 1990) that addresses how organizations adapt to their customer environment to develop competitive advantages (Hurley and Hult 1998; Liao et al. 2010; Slater and Narver 2000). Reukert (1992, p. 227) defines MO as, “The organization wide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organization wide responsiveness to it.” Similar to CSP, MO has for the past ten years also increased in popularity due to its strong relation with the strategic management field (Liao et al. 2010).

Since the purpose with strategic CSP is to achieve more favorable customer perceptions of a firm (i.e. its goods and services) to positively affect firm level performance, and MO focuses solely on customers' liking to increase conversion rates to gain high sales revenue, the conjunctive use of these concepts are logical. In other words, both CSP and MO include references to organization wide generation, dissemination, and responsiveness to market intelligence (Kohli and Jaworski 1990). A pervasive tenet in the MO and the CSP literature is that profitability is a consequence of the concepts rather than a part of it (Kohli and Jaworski 1990). Hence, to gain some benefits from either of, or a combination of, the two concepts a firm benefit from implementing a high MO, and or, CSP to gain trust and credibility from its buyers (Kohli and Jaworski 1990; Hill et al. 2007). To assess MO, we applied Ellis (2010) set of questions that measure the level of MO on a seven-point Likert scale items. These questions evolve around firms' view on for example knowledge of how customers value a firm's products; how well they know their competitors or if various managers do field visits to customers to learn from them first hand. Hence, P16: High MO is an ingredient in complex antecedent conditions that indicate high (a) CSP and (b) CFP outcomes. P17: The negation of MO is an ingredient in complex antecedent conditions that indicate the negation of (a) CSP and (b) CFP outcomes.

#### **4.5 Configuration 3: Internal Orientation (IO)**

Since CSP has emerged as an important long-term investment that can lead to competitive advantages (Kang 2009; Orlitzky 2000; Orlitzky et al. 2003; Ramchander et al. 2012), investigating constructs of internal orientation of firms that undertake CSP is useful. That is, researchers need to investigate internal orientation from a holistic perspective (Gummesson 2008). Thus, the present study examines how a firm's internal orientation relates to the firms' external orientation (Aguinis and Glavas 2012). CSP may benefit from group coordination which is an element of organizational design and the subject of managerial choice (Grant 1996). Further, since the type of coordination of CSP activities is an important issue, executives need to decide consciously whether organizational design or empowerment of internal interest groups (managerial choice) should hold the decision authority for CSP. An example of organizational design is where a dedicated formal or informal position is responsible for CSP activities. The issue could also be whether an organizational design is mechanistic (more centralized, hierarchical and bureaucratic) or organic, hence more decentralized, flat and informal (Burns and Stalker 1961/2001). An example of empowerment is whether CSP decisions are taken at the corporate level (by the owners, the board or the CEO), or at the business level by a CSR-manager or some other manager (for example a marketing manager). Thus, the present study includes internal orientation in the general model and selects strategic CSP intent, operative CSP

management (CM), strategic orientation and industrial standards as constructs for internal orientation.

**Strategic Intent (SI)** The study includes Carroll and Shabana's (2010) instruments for assessing the CSP business-case rationale to assess firms' internal orientation with respect to their CSP reasons thereof. These instruments evolve around firms' reasons to engage in CSP, for example, to gain risk reductions, increase reputation or to gain some competitive advantages. We renamed the instrument to "Strategic CSR Intention" and adjusted the instrument to contain a seven-point Likert scales. The following discussion describes each internal orientation factor in the Strategic CSR Intention scale. P18: While high SI toward achieving high CSP is insufficient for achieving high the objective, high SI is an ingredient in internal orientation recipes that do indicate high CSP. P19: High scores in the negation of SI alone are insufficient for indication low CSP but high scores in the negation of SI is an ingredient in recipes indicating low CSP.

**CSP Management** CSP management can be a relevant factor for decreasing the risks of CSP failure (Luo and Bhattacharya 2009; Maak 2008; Orlitzky et al. 2003; Wagner et al. 2009b) and for achieving CSP potential intangible and tangible benefits (Maak 2008; Porter and Kramer 2006). Group-level coordination can be for example where CSP issues are a fixed topic on TMT meeting agendas (Lam et al. 2010; Leire and Mont 2010) or on the board level agenda (Berkhout and Rowlands 2007; Carroll and Shabana 2010). In the case of environmentally driven CSP (i.e., implementation of waste reduction programs), prior research supports that decision making occurs in formalized organizational structures (Berkhout and Rowlands 2007). Decision making regarding non-environmental activities on the other hand, can occur either by organizational design or by managerial choice (Leire and Mont 2010) by being part of TMT (Lam et al. 2010; Leire and Mont 2010) or company board-of-trustee agendas (Berkhout and Rowlands 2007; Carroll and Shabana 2010). To assess the operative CSP management structure (that is, how the firm conducts decision making in CSP matters) the present study adapted Berkhout and Rowlands (2007) suggestions regarding firm level propensity to use group coordination (i.e., via a committee) to address CSP. Since research suggests that group level coordination can be important but not directly provide instruments to measure it, we modified these discussions to extract a set of instruments assessing the presence of group coordination in relation to CSP. Our 20th proposition (P20) is therefore: While insufficient for achieving high CSP consistently, high firm effort to manage CSP is an ingredient in recipes indicating high CSP. P21: The negation of CSP management is an ingredient in one or more recipes indicating the negation of CSP.

**Strategic Orientation (SO)** Since this research focus on strategic CSP, that is, situations and contexts where firms seek to gain some direct or indirect benefit for the firm from their social interactions (McWilliams and Siegel 2011; Porter and Kramer 2006), the present study applies Tomášková and Kopfová's (2010) set of questions that measure the level of SO on seven-point Likert scale items. These

questions evolve around firms' view on, for example, monitoring demands of current and prospective customers; the extent that product offerings reflect current customer demands and longevity of goal achievement of market share goals versus financial goals only. The study here includes four their nine items omitting five items (addressing innovation and relationships with employees). P22: While insufficient for indicating high CSP, high SO is an ingredient in recipes indicating high CSP. P23: The negation of SO is an ingredient in one or more recipes indicating the negation of CSP.

**Industrial Standards (IS)** The International Organization for Standardization (ISO) certifies firms around the world according to various standards. Research on ISO is intended to increase understanding of operative processes intended to improve firm performance, for example, the standard for waste reduction (ISO14001) or quality improvement (ISO9001). The ISO14001 standard, which is an environmental performance certification, was complemented in 2011 with the new ISO26000 CSR standard (Balzarova and Castka 2012; Halebian et al. 2009; Harrison et al. 2010; ISO 2009; Wieske et al. 2009). Since the ISO14001 (environmental certification) is a program that may help firms to better understand internal waste processes its use is widespread among firms taking sustainability seriously. Adoption of ISO standards may provide a positive impact on CSP investments even though ISO140001 in itself does not cover measures or obligations to improve the environmental footprint of firms. The presence of an environmental standard may affect how firms and customers exchange CSP related information (Cheng 2008; Delmas and Toffel 2008; Gadenne et al. 2009). Other general standards such as quality monitoring (ISO9001) can affect firm level CSP.

Implementation of the new industrial CSP standard (ISO26000) should therefore tautologically also affect firm level CSR. Firms with an ISO14001 certification are also more likely to invest in CSP given the close relationship between CSP and sustainability. With the ISO26000 standard being relatively new (Moratis and Cochius 2011) few MNEs have completed its implementation to qualify inclusion in this research, we hence applied ISO14001 (the environmental standard) as a proxy for CSP (the ISO26000 standard) where a value of "1" represents "not being considered", and "7" represents being "successfully implemented" (Delmas and Toffel 2008; Gadenne et al. 2009). P24: While not sufficient or necessary by itself, a high score in ISO 1401 certification appears in one or more recipes of firms having high CSP consistently. P25: High negation scores for ISO 1401 appear in one or more recipes for high scores for the negation of CSP.

#### **4.6 Configuration 4: Corporate Social Performance (CSP)**

The praxis within CSP research is to substitute the lack of a precise instrument with an approximate metric that ranks firms on some CSP related trait, for example sustainability or ethical behavior. The KLD ([Kinder, Lydenberg, Domini](#)) index is

the most commonly used index in CSP research (Mattingly 2015; Kinder et al. 2009; Ramchander et al. 2012). The KLD index is a registered investment advisory tool providing social outcomes for U.S. firms to the investment community (MSCI 2012). It is further a free float-adjusted market capitalization index designed to measure the equity performance of U.S. companies that have low-to-high “Environmental, Social and Governance” (ESG) performance consisting of the largest NYSE and NASDAQ listed US equities ranked by investable market capitalization. KLD screens each firm annually, using a variety of measures including the UNPRI framework. MSCI (the owner of KLD) is a leading provider of investment decision support tools (such as the KLD index) to 6,200 firms worldwide, ranging from large institutional owners (pension plans) to boutique hedge funds. MSCI offer a range of products and services including indices, portfolio risk and performance analytics, and governance tools (MSCI 2012). Launched in 1990 the KLD is one of the first “Socially Responsible Investing” (SRI) indexes. Reasons for the strong propensity to use CSP indexes (despite their substitutive nature) are that corporate governance and CSP associate increasingly closely together (Hull and Rothenberg 2008; Kolk and Pinkse 2010; Ring and Vandeven 1992; Waddock and Graves 1997; Walls et al. 2012).

The present study also examines configurations of E, S, and G outcomes and antecedents. “E•S•G” is a complex condition stating that the firm scores high in all three simple conditions; thus,  $E \vee S \vee G$ , where “ $\vee$ ” signifies intersection. A few firms are identifiable as having high scores in all three conditions: E•S•G. Asymmetric, antecedent, external orientation (EO) models are effective identifying high E•S•G firms. Additional asymmetric EO models are effective in identifying firms scoring low for all three simple conditions:  $\sim E \sim S \sim G$ . The findings also confirm the existence of firms that score high on two and low on one condition (e.g., E•S• $\sim$ G). The findings in the present study that different models of E, S, and G are useful antecedent conditions for indicating high scores in the three individual firm performance conditions (i.e., operating profit, ROA, and Tobin’s Q).

P26: Specific configurations of E, S, and G simple conditions indicate high scores in one-to-all three firm performance outcome conditions. P27: the negation of one or more simple conditions of E, S, and G indicate high scores in the negation of one-or-more firm performance outcome conditions.

#### **4.7 Configuration 5: Corporate Financial Performance**

Although researchers report positive, negative, or neutral impact from CSP on firm performance, the common view today is that empirical findings support a CSP and CFP positive relationship (Hill et al. 2007; Hull and Rothenberg 2008; Mattingly 2015; McWilliams and Siegel 2000; Orlitzky et al. 2003; Wang et al. 2015; Wood 2010). The literature further discusses causality and focus on whether CSP leads to improved CFP (mainly addressed in financial terms) or if strong CFP leads to increased levels of CSP. Waddock and Graves (1997) claim the existence of a

causal link yet discuss potential bi-directionality. Their conclusion is that while CSP improves CFP, high CFP can also generate high CSP engagement where slack resources are available. Empirically, Waddock and Graves (1997) conclude that CFP, among other managerial practices and outcomes, also depends on CSP. Caring for the social arena (and its stakeholders) can associate to good managerial practice. Thus, with CSP being a market-located social behavior, high CSP contributes to high CFP. Overall, researchers find CSR to impact CFP positively in symmetric tests—when using accounting and market-value measures including return-on-assets (Choi and Wang 2009; Garcia-Castro et al. 2010; Jo and Harjoto 2011; Wang et al. 2015); operating profit (Mattingly 2015; Harjoto 2008; Orlitzky et al. 2003; Walls et al. 2012; Wood 2010); Tobin's Q (Jo and Harjoto 2011; Garcia-Castro et al. 2010; Semenova et al. 2008; Surroca et al. 2010); return-on-equity (ROE); and return-on-sales (ROS) (Garcia-Castro et al. 2010; Waddock and Graves 1997). For measuring CFP, the present study includes two accounting based CFP measures (ROA and operating profit) and one market-value measure (Tobin's Q).

**Return on Assets** The practice of measuring CFP by managerial accounting measures are prevalent in business related research and CSP. While return on assets (ROA) as an accounting based firm performance measure (earnings generated from invested capital (assets) independent from firm size), have been used in prior CSP research, assessing CSP using additional measures is advisable because ROA represents firms' profitability in respect to total set of resources, that is, all assets in its control (Hull and Rothenberg 2008; Marcel 2009; Waddock and Graves 1997).

However, ROA can vary substantially and be dependent on a firm's industry belonging. The assets in question are further the sort that is valued on the balance sheet, that is, fixed assets and not intangible assets like human resources, corporate culture, or CSP derived reputation or other social capital derivatives. ROA (in solitude) is for these reasons less suitable or dependable for comparing one firm against another—some firms have their value based for example on trademarks, brand names or patents, which according to GAAP accounting rules are not recognized as assets (McClure 2010a, b). Despite these shortcomings ROA is in use widely by researchers to measure the impact from CSP on CFP (Jo and Harjoto 2011; Garcia-Castro et al. 2010; Choi and Wang 2009; Hull and Rothenberg 2008; Marcel 2009; Waddock and Graves 1997; Walls et al. 2012).

**Operating Profit** Operating profit (OP) is another commonly applied CFP indicator in CSP research (Harjoto 2008; Mattingly 2015; Orlitzky et al. 2003; Walls et al. 2012; Wood 2010). OP is identified commonly as EBIT (earnings before interest and tax). This accounting based measure is the profit earned from a firm's normal core business operations hence potential returns from investment activities are excluded. A firm's operating income figure is therefore often seen as reliable for making comparisons between firms (Loth 2010). An important factor to the widespread use of OP is that OP excludes taxes and interest expenses which effectively null potential effects of different capital structures and tax rates (McClure 2010b).

Another reason to compare OP is that management has more control over operating expenses than the firm's cost of sales which means that differences in this ratio could be directly attributable to managerial skills and decision making (Loth 2010), hence, from a managerial point of view this accounting measure of CFP is basically the outcome (reflection) of operating efficiency which is an important mechanism explaining positive findings of CSP on accounting based CFP (Becchetti and Trovato 2011). OP is expressible as an absolute value (annual revenue deducted by the operating expenses) or as a percentage (operating profit margin) where the operating profit is divided by sales revenue (Harjoto 2008; Orlitzky et al. 2003; Wood 2010). Since the research assess both tangible and intangible benefits of CSP, and as such depend on mixed methods (e.g., top-management-team (TMT) members' perception of achieved benefits and corporate annual reports), the present study investigates CFP by using primary and secondary data. A seven-point Likert scale was used to measure upper management's views on whether their firm (in comparison with their major competitors) were significantly better for the past three years in terms of OP, ROA, sales growth and market share (Bruner and Hensel 2001; Ellis 2010; Garcia-Castro et al. 2010). The present study included triangulating the CFP measures to increase research robustness; the triangulation of financial statements (operating profit, ROA, sales growth, and market share) indicated that respondents accurately assessed firm performance.

**Tobin's Q (TQ)** Since CSP is both a tangible and intangible concept with a potential time lag between implementation and CFP effects (outcomes), TQ is one of the applied measures of CFP in use in CSP related research. TQ is a market value measure of the long-term market perception of a firm's past performance and future prospects. The claim is that TQ is a comprehensive measure of long-term financial performance calculated as the ratio of market value to the replacement cost of all tangible assets (Andersen and Dejoy 2011). Several researchers (Garcia-Castro et al. 2010; Jo and Harjoto 2011; Semenova et al. 2008; Surroca et al. 2010) report a positive association between CSP and TQ, with a time-related positive effect (increasing market value effect from CSP over time), for instance, environmental performance correlates with intangible asset values measured as TQ. The studies also report a positive relation between CSP and stock returns and that lagging companies were penalized with lower TQ. A positive TQ score above "1" indicates the presence of intangible market value of a firm above the market value of its tangible assets, hence a proxy for CSP derived value (Baron et al. 2011; Surroca et al. 2010; Jo and Harjoto 2011; Garcia-Castro et al. 2010).

## 5 Research Method

### 5.1 Qualitative Sample Component

Europe is the regional context of the present study. The study addresses publicly traded multi-national enterprises (MNE's) on the Stockholm Stock Exchange.

Sweden was selected for this research for four reasons. First, no prior published literature examines Sweden in the present context (i.e., strategic CSP from a case-level asymmetric perspective). Second, Sweden is a recognized world leader in sustainability (KPMG 2011; Swedish-Institute 2009; Zadek and MacGillivray 2008) and a world leading country in regards to CSP (ITIF 2009, 2011; KPMG 2011; Swedish-Institute 2009, 2011) and also a top ranking nation on various performance indexes, for example in intellectual property generation (ITIF 2009; Swedish-Institute 2009), global reputation and global competitiveness (Swedish-Institute 2011). Third, Sweden has a large base of MNE's and is an innovator in CSP applications (Zadek and MacGillivray 2008). Finally, the MO-CFP relationship is found to be strong in cultures with low power-distance and low uncertainty-avoidance (Kirca et al. 2005). In this aspect, Sweden ranks among the top ten nations for lowest power distance and among the top five for lowest uncertainty avoidance according to Hofstede's cultural dimensions (Hofstede 2010). With CSP being positive for firms, Sweden (on a national level) is also a leader in intellectual property generation (IP), information and communication technologies adaptation (ICT), globalization, innovation and international competitiveness. Sweden has further high levels of institutional ownership which potentially affects firm level propensity to engage voluntarily in CSP generating activities (Jakobson 2012; Mattingly 2015).

To commence this study, the first step was to conduct exploratory qualitative research by performing six in-depth interviews to extract firm specific views of CSR. The respondents were CSP executive managers in industry leading Swedish MNE's who were interviewed to establish the alignment of CSP with their firm level objectives, firm demographics (characteristics), CSP and CFP as well as other external and internal aspects (orientations). The industries represented were pharmaceutical (here represented by AstraZeneca), telecommunication (Millicom), ICT (ÅF), cosmetics (Oriflame), industrial equipment (Sandvik) and resource extraction-mining (represented by the Lundin group). In this way, the study follows the advice to include managerial views (additional primary data) possibly insightful and supportive in CSP research (Mulyanegara 2010) since different industries approach CSP differently (Siegel and Vitaliano 2007). In turn this step increased the overall research quality and robustness (Bansal and Roth 2000; Szwajkowski and Figlewicz 1999) and enhances academics and practitioners understanding of CSP.

The interviews displayed that the majority (two-thirds) of these executives applied a decentralized view of CSP management and delegated the accountability to the regional- or business area managers. They viewed CSR to be "just like any other management discipline," and to be organic (organizations that are decentralized, flat, informal and with low level of specialization) in their organizational designs and corporate cultures. Hence, they opted to empower their regional- and business area managers with the decision of CSP deliverables (what initiatives to engage in). The remaining respondents (one-third) assumed a centralized view of CSP management and maintained TMT responsibility and accountability for the

deliverables (the specific initiatives). These firms perceived CSP to be “special and unlike” other management disciplines. They also viewed CSP as a strategic business enabler too important to delegate and in need of executive supervision. These firms were further more scientifically (technology) oriented and considerably more mechanistic (organizations that are centralized, hierarchical, bureaucratic and with high levels of specialization) in their organizational design than those firms who were more decentralized.

## 5.2 *Independent Quantitative Sample Component*

Several researchers (McWilliams and Siegel 2001a; Melo and Garrido-Morgado 2012; Orlitzky et al. 2003; Ramchander et al. 2012; Semenova et al. 2008; Waddock and Graves 1997; Walls et al. 2012) use an index as proxy to measure CSP levels among firms (Mattingly 2015). The prime reason being that a specific measurement for the CSP concept has not yet been developed (Hill et al. 2007; Mattingly 2015). The dominant index based approach is to compare a firm’s position on some country specific “social index” with a particular research scope, for instance to compare an index ranking with the level of corporate governance (Walls et al. 2012). As mentioned above, the index of preference among researchers is the KLD index (Kinder et al. 2009) used by CSP researchers to substitute (proxy) a CSP measure (Mattingly 2015). However, since the KLD rankings are only suitable for CSP research in the U.S. context (Waddock and Graves 1997; Walls et al. 2012), we selected the “OMX-GES Sweden Index” (from here after referred to as “the Index”). Similar to the KLD index, our selected Index analyzes firms’ management of environment, social and corporate Governance (ESG) factors based on international norms in accordance with the “United Nations Principles for Responsible Investment” (the UNPRI framework). The Index as operationalized by prior researchers was compared within our research model using mixed methods to extract primary data (questionnaire) and secondary data collected via annual reports and websites. The Index is currently the only available index similar to the KLD index in the Nordics (Kiessling et al. 2015; Isaksson et al. 2014; Semenova et al. 2008). The Index was constructed by NASDAQ-OMX and OMX-GES (a Swedish Investment advisory firm similar to MSCI) to aid investors comparing responsibility levels among firms listed and traded on the NASDAQ-OMX Stock Exchange in Stockholm Sweden and is used to assess CSP levels among Swedish firms traded on the NASDAQ-OMX Stock Exchange in Stockholm.

The OMX-GES Index evaluates both the firms’ preparedness (e.g. good management systems) as well as performance through a number of criteria and sub-criteria. Thus, it evaluates a firm’s present status and readiness for the future. The Index is today used as a foundation for short and long-term investment recommendations; as a tool for financial analysts; as a tool for best-in-class analyses or as a basis for sustainability analyses and for research in CSP where each MNE are awarded an aggregate score in the form of a rank on the Index. Being a high

quality Top-100 index the Index covers one hundred MNE's from thirty-four different industries that meet the Index criteria regarding ESG factors for inclusion. The firms represented on the Index have between \$11.7 million USD to \$33.3 billion USD in annual revenue, between 1217 and 281,145 employees, and an average level of globalization (to what extent the sample firms are multinational operating firms) of: 18% domestic sales revenue; 46% European sales revenue; 19% American sales revenue (North-, Central- and South America combined); 11% Asian sales revenue and 5% for the combined African and Middle-East sales revenue. By personally contacting every MNE on the Index the present study achieved a response rate of 82 percent ( $n = 82$ ) after six incomplete questionnaires were deleted. However, since the CSP construct in the present study is multi-dimensional and complex (Carroll 1979, 2000; Kiessling et al. 2015; Mattingly 2015) and each CSP simple condition can be assessed individually instead of using an aggregate index outcome metric the present study includes data analysis for both the three components of CSP as well as E•S•G as a complex whole. Fiss (2007, 2011) argues that the prevailing aggregate measurement approach, for example reliance on the KLD index, lacks empirical validity as (Mattingly and Berman 2006; Mattingly 2015) indicate. The included CSP indicators do not converge on a single dimension (Mattingly and Berman 2006; Szwajkowski and Figlewicz 1999). The present study therefore follows Mattingly's (2015) suggestion to decompose the aggregated average score (based on the separate environmental, social, and governance scores) to assess how each of the sub-measurement components relate to each of the other model constructs. Mattingly (2015, p. 11) concludes, "Decomposing CSP into its constituent latent components has begun to yield understanding, and exemplifies the benefits of progressively sophisticated analytical methods when examining CSP... [and that] recent contributions, consistent with this guidance, have begun using decomposed measures for CSP and have also begun to model conditional effects." The ESG scores for each firm in the study appear in the Appendix. Table 7 in the Appendix includes the original scores for the three CSP factors. Table 8 in the Appendices includes the calibrated scores using logistic distributions whereby the calibrated scores range from 0.00 to 1.00.

### 5.3 Data Analysis

Asymmetric data analysis via fuzzy-set qualitative comparative analysis (fsQCA) is the main inquiry procedure in the present study to test the efficacy of each of the 27 propositions in the general theory. The general theory includes a series of one-directional statements of relationships of high scores in complex antecedent conditions predicting high scores in simple and complex outcome conditions. Such statements are viewable accurately to be if-then algorithms expressing that a certain outcome will occur consistently when all conditions in the complex antecedent statement are satisfied (cf. Ragin 2008). McClelland (1998) describes data analysis by algorithms to overcome the limitations of symmetric testing by regression

analysis. McClelland's (1998) method has properties mathematically analogous with fsQCA; the discretized continuous variables by quintiles and tested for consistency in accuracy in predicting an outcome based on theory-induced combinations of a top ( $Q_5$ ) and/or bottom ( $Q_1$ ) quintiles occurring across three to seven transformed variables. While his research findings receive numerous citations annually, McClelland's (1998) algorithm approach to data analysis does not. McClelland (1998) points out that data are noisy and one way to reduce the static in data is to convert continuous variables into quintiles and to examine cases that occur in the very low and very high quintiles. Such examinations serve to shift the focus of studies from variables to cases and end the mismatch between case-level theory construction and variable-level symmetric data analysis to case-level theory and case-level data analysis (cf. Fiss 2007). This shift illustrates Gigerenzer's (1991, p. 264) wisdom, "Scientists' tools are not [theory] neutral."

**Calibrating Data** Calibrated scores for fuzzy-set analysis range from 0.00 to 1.00 and such scores are viewable accurately as membership scores that are discrete scores for a continuous variable—membership scores ranging from zero to 1.00 rather than five-levels in a transformation from continuous to quintiles. The software program, [fsQCA.com](#), includes a logistic (lazy “” distribution) calibration that requires the researcher to specify three scores for each condition: 0.95 = threshold for full membership; 0.50 = score for maximum ambiguity; 0.05 = score for full non-membership in the condition. A useful heuristic to apply is that the 0.95 represents the 90th percentile of values in the distribution of values of a variable to be converted into membership scores; 0.50 represents the median; and 0.05 represents the 10th percentile of values. Note that the calibration of scores eliminates the recognition of “statistical outliers”; fuzzy scores recognizes that variances due to extreme values can be unimportant in testing theory.

**Fuzzy-set Scoring** A fuzzy-set score is a membership score that represents the logical “AND” condition for two or more simple conditions—the fuzzy-set score indicates how much the two conditions share in common. Thus, a fuzzy-set score is equal to the lowest calibrated score across the two or more conditions. Tables 1 and 2 respectively present the averages for the original values and fuzzy-set membership scores for E, S, and G for corporate social performance (CSP) for each of the 82 MNEs in the present study. To compare and contrast the matrix algebra operation for symmetric tests versus the Boolean algebra operation for asymmetric tests, compare the average values in Table 1 for  $(E+S+G)/3$ , and G, with the membership scores in  $E \cdot S \cdot G$  in Table 2 for the first two MNEs: ABB and SKF. The two averages for these two firms differ marginally: 5.67 versus 5.41, respectively (a 4.8 % descriptive difference). The two fuzzy-set scores differ dramatically for these two firms: 0.97 versus 0.22, respectively (a descriptive difference of 441 %). While ABB has relatively high membership scores in all three simple conditions for E, S, and G, SKF has relatively high membership scores for E and S but has a relatively low membership score for G. Consequently, the  $E \cdot S \cdot G$  for ABB indicates a high membership score (0.97) and a low membership score for SKF (0.22). Note that the present study calls for plotting for scores for the complex

**Table 1** Set-theoretic demographic case models indicating overall corporate social performance (CSP) and overall corporate financial performance (CFP)

Model	Service Firm	Large Asset	B2B firm	Mktg. Intensity	Coverage	Consistency	Outcome
1	•	•	~	•	0.07	0.96	CSP
2		~	~	~	0.07	0.91	~CSP
3	~	•	•		0.08	0.93	~CSP
4	•	•	~	•	0.08	0.83	CFP
5	~		•	~	0.16	0.87	~CFP
6	~	•	•		0.06	0.81	~CFP

Note. “•” indicates high score for the feature in the model; “~” indicates low score for the feature in the model; blank space indicates that the score for the feature does not influence the mode. For example, the first model includes service firms with large assets, that are not B2B firms, using high marketing intensity. Product firms are indicated by ~ for service firm feature. Only one useful model for indicating high overall CSP occurs (model 1). Only one useful model indicates high overall CFP (model 4). Two models provide consistent high scores for ~CSP and two models provide consistent high scores for ~CFP.

condition E•S•G on the Y-axis as a complex outcome condition in the general theory as well as X axis as a complex antecedent condition as well as on X-axis for testing whether or not the complex statement indicates high scores for CFP.

**Consistency and Coverage Indexes** The present study includes extensive use of XY plots due to the possibility the high values in fsQCA summary indexes (“consistency” (C1) and “coverage” (“C2”) indicating the level of unique coverage for a model) are misleading in indicating high usefulness for a respective model when the plots indicate that no cases have high scores on the complex antecedent condition. The consistency index 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 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 ( $C1 \geq 0.80$ ) and coverage scores indicating a few to many

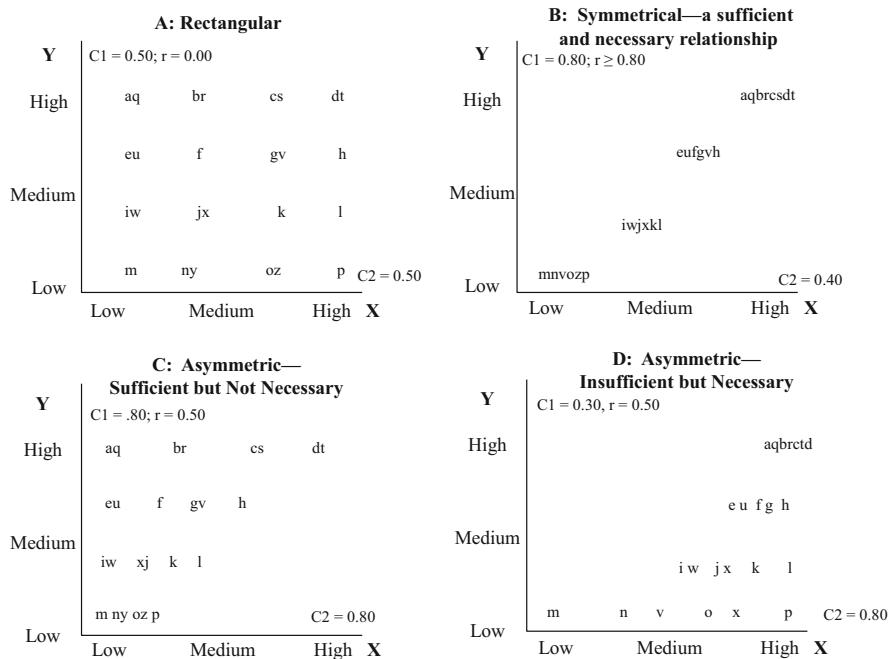
**Table 2** Set-theoretic external orientation models indicating high and low scores for corporate social performance dimensions and overall CSP (13 models)

Model	CO	Globalization	Customer Interaction	Market Orientation	C1	C2	Outcome
1	~			•	0.17	0.82	Governance
2	•	~	~		0.13	0.91	Governance
3				No model with high consistency.			~Governance
4	•		~		0.02	0.85	Environment
5	•			•	0.09	0.80	Environment
6	•	•			0.03	0.82	Environment
7	~			•	0.04	0.81	~Environment
8	•		~	•	0.07	0.85	Human resources
9	•			•	0.23	0.82	Human resources
10				No model with high consistency.			~Human resources
11	•	~	~	•	0.39	0.80	CSP (all)
12	~				0.13	0.91	~CSP (all)
13		•			0.07	0.83	~CSP (all)
14			~	~	0.01	0.86	~CSP (all)
15			•	•	0.07	0.83	~CSP (all)

Notes. Only one model (11) includes all four external orientation dimensions. Surprisingly, globalization appears in only 4 of 15 models. The appearance of only customer orientation (~CO) alone or globalization alone indicates low overall CSP. “~” signifies negation; “•” Signifies high membership score

cases ( $C2 \geq 0.02$ ). A consistency above 0.80 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 (1973) 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  $C1 \geq 0.80$ . Consequently, the present study includes several XY plots of key findings.

To insure clarity in interpreting the findings of the present study, Fig. 2 illustrates four XY plots showing different levels of explanation (ability) of complex antecedent condition that does versus does not accurately predict cases with high scores in an outcome condition. Figure 2, panel a, illustrates a rectangular distribution of cases that has a consistency index ( $C1$ ) equal to 0.50 and a coverage index equal to 0.50; the correlation for a rectangular XY plot is equal to zero; the inclusion of the index values in the panels is to demonstrate what indexes associate approximately with the XY plots. The XY plot in panel b illustrates a necessary and sufficient relationship; both  $C1$  and  $r$  is equal to, or close to, 1.00 for necessary and sufficient



**Fig. 2** Hypothetical Relationships where X is a Complex Configural Condition (e.g., C•T•H•Z) and Y is a Simple or Complex Outcome Condition e.g., national entrepreneur nurturing, innovation, quality-of-life. Key: C1 = consistency; C2 = coverage. Notes: Comparing consistencies (C1s) with symmetric tests (correlations) for panels B and C illustrates large decrease for r but not for C1. Panels C and D represent most significant empirical relationships

conditions. The XY plot in panel c illustrates a sufficient but not necessary relationship—high X is sufficient but not necessary for high Y to occur. Consequently, an additional model or models are necessary to indicate (panel d) a necessary but not sufficient relationship—high X is necessary but not sufficient for high Y to occur. Consequently, additional ingredients in the configuration for X would be necessary to screen out (decrease the scores for X for cases having low scores for Y without decreases the scores for X for cases having high scores for Y. This brief tutorial serves to indicate that a useful asymmetric model contains a consistency index (C1) greater than 0.80. Set-theoretical researchers are less concerned about the coverage (C2) of a model realizing that two to five asymmetric models are usually necessary to capture most cases having high scores for Y (i.e., XY plots usually support the equifinality tenet in complexity theory).

## 6 Findings

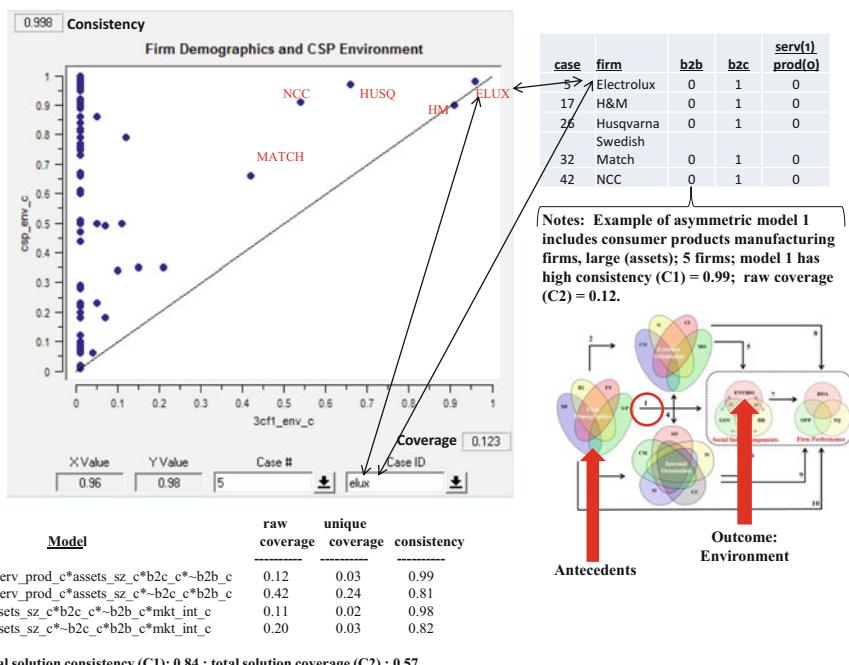
### 6.1 Firm demographics and CSP and CFP

**Market Intensity** The finding support P1. Cases with high MI alone are an insufficient indicator of high (a) CSP and (b) CFP outcomes for the three simple CSP conditions and three simple CFP conditions appearing in Fig. 1. The findings for the two complex statements (i.e., E•H•G for CSP and A•O•Q for CFP) support the same conclusion. High scores for MI as a simple condition do not indicate high scores for simple nor complex statements for CSP and CFP. All C1 indexes are below 0.65 for these relationships; the XY plots for the simple condition, MI, and the simple and complex outcomes for CSP and CFP look most similar to panel a in Fig. 1.

The findings support P2: High MI is an ingredient in configurations of firm demographics which do indicate high (a) CSP and (b) CFP outcomes. Figure 3 includes four models useful for indicating high outcome scores for the environment (E) outcome, one of the three CSP dimensions; two of these four models in high MI. The XY plot in Fig. 3 shows the findings for the first model:

$$\sim\text{serv\_prod\_c} * \text{assets\_sz\_c} * \text{b2c\_c} * \sim\text{b2b\_c} \leq E$$

(Model 1 in Fig. 3)



**Fig. 3** Findings for firm demographics and environment: XY plot for model 1, Firms with high scores for B2C manufacturers with large assets have high environment scores

Model 1 in Fig. 3 states that for MNEs having high scores in the configuration of being a product manufacturer, large in assets, and a B2C company, then these MNEs have high scores in E. Model 1 identifies five such MNEs; the names of these firms appear in Fig. 3. Note that model 1 and the additional models in Fig. 3 are asymmetric models -each of the four models predict only that high scores for the model indicate high scores for the outcome, E. Asymmetric models indicate sufficiency and not necessity.

Model 2 in Fig. 3 (no XY plot shown) indicates that product manufacturing firms with large assets which are B2B firms also indicates high scores in E. Models 3 and 4 in Fig. 3 are similar in that both are large assets firms operating with high marketing intensity and being either B2B or B2C. Consequently, a firm with large assets is a recipe necessity condition as an ingredient in all four models; this statement is not stating that large assets is a necessity in general but only that for firm demographic models indicating high E, all such models include large assets as a feature in their recipes (i.e., configurations).

For the governance (G) dimension in CSP, one firm demographic model indicates high scores for G:  $\text{serv\_prod\_c} * \text{assets\_sz\_c} * \text{b2c\_c} * \sim \text{b2b\_c} * \text{mkt\_int\_c} \leq G$ , C1 = 0.96, C2 = 0.02, that is, service MNEs with large assets, that are B2C firms with high market intensity. This model does not appear among the four models indicating high E (to limit the number of figures and tables to a reasonable number, this report does not include an XY plot for each outcome condition). Thus, demographic models indicating high E versus high G are distinguishable from one another by whether or not the firms are product manufacturing firms or service manufacturing firms, respectively. The combination of large assets and high marketing intensity are ingredients in both high E and high G sufficiency models but this combination of two ingredients alone is insufficient.

For indicating high scores consistently for human rights (H) (i.e., “social” as a CSP outcome, three models indicate such an outcome:

- $\sim \text{serv\_prod\_c} * \text{assets\_sz\_c} * \text{b2c\_c} * \sim \text{b2b\_c} \leq H$ , C1 = 0.93, C2 = 0.03
- $\sim \text{serv\_prod\_c} * \text{assets\_sz\_c} * \sim \text{b2c\_c} * \text{b2b\_c} \leq H$ , C1 = 0.83, C2 = 0.41
- $\text{assets\_sz\_c} * \text{b2c\_c} * \sim \text{b2b\_c} * \text{mkt\_int\_c} \leq H$ , C1 = 0.95, C2 = 0.02

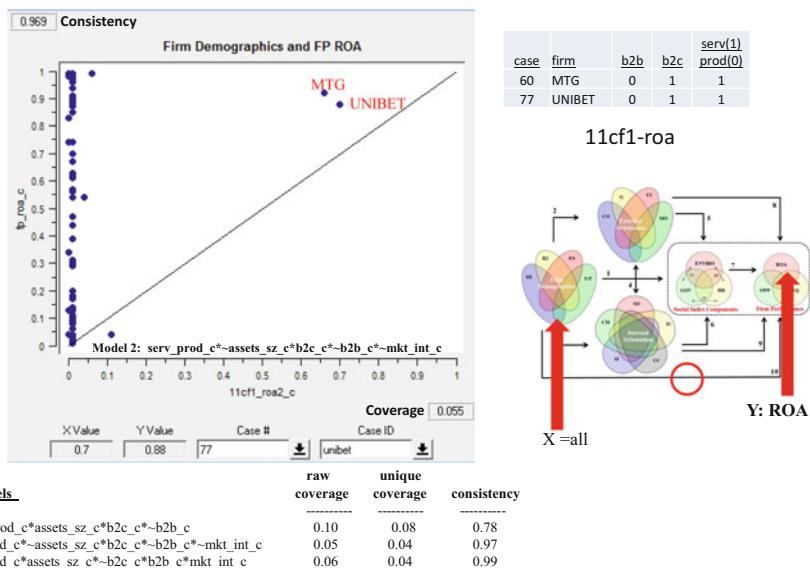
Note that all three of these models include large assets as an ingredient. As in indicating high E and G, large assets are a necessary localized ingredient for all models indicating high H. A large assets condition is insufficient for high E, H, or G but large assets appear in all models for each; thus, to achieve high scores consistently in E, H, or G, such models need to include large assets as a condition. Of course, some firms with small assets have high E, H, and/or G scores but small assets firms either as a single condition or in configurations with additional ingredients are insufficient to consistently indicate any of the three outcomes.

**The Negation of Marketing Intensity** The findings support P3. Low MI that is, the negation of MI ( $\sim \text{MI}$ ), is an ingredient in configurations of firm demographics indicating high CFP. For example, the configuration of service firms, small in assets, serving B2B markets, and low market intensity have high ROA and high opportunity profits. For ROA and operating profits (OP), here are the specific

findings for this model (the findings for coverage (C1) and consistency (C2) are the same for both outcomes (i.e., service firms, small in assets, serving b2c markets with a low level of marketing intensity):

- $\text{serv\_prod\_c}^* \sim \text{assets\_sz\_c}^* \text{b2c\_c}^* \sim \text{b2b\_c}^* \sim \text{mkt\_int\_c} \leq \text{ROA}$ , C1 = 0.05, C2 = 0.97
- $\text{serv\_prod\_c}^* \sim \text{assets\_sz\_c}^* \text{b2c\_c}^* \sim \text{b2b\_c}^* \sim \text{mkt\_int\_c} \leq \text{OP}$ , C1 = 0.05, C2 = 0.97

Figure 4 presents the XY plot for this model (i.e., model 2 in Fig. 4) for ROA. Note in the bottom of Fig. 4 that model 3 includes firms with high scores in marketing intensity in the configuration. Thus, firms with low as well as high market intensity can have high CFP; studies indicating that the main effect of market intensity and firm financial performance is significant and positive versus studies indicating the main effect is significant and negative usually fail to consider that high versus low market intensity can be an ingredient in high CFP—which depends on the alternative configurations of the ingredients in the antecedent models. The same perspective is necessary to adopt to understand and describe how low versus high market intensity may be ingredients in low CFP. An XY plot for firm demographics and CFP outcomes do not appear here to provide space for XY plots of findings for additional propositions.



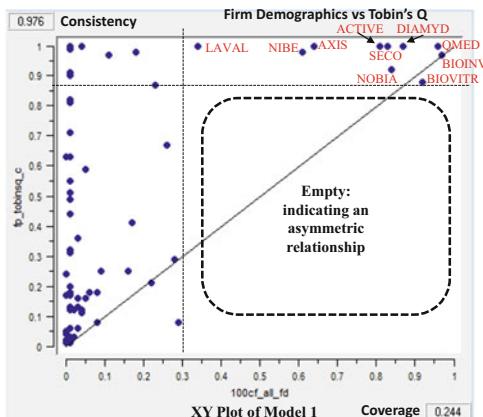
**Fig. 4** Firm demographic configurations indicating high firm ROA; XY plot shows findings for Model 2. Note. Verbal statement of model 2: the configuration of service firms, small in assets, serving B2B markets, and low market intensity

**Customer Industry** The findings support P4: Broad categories of customer-industry focus (B2B, B2C, and both B2B and B2C) are ingredients in complex antecedent configurations indicating high (a) CSP and (b) CFP. Findings for industry-customer foci and the CSP metric, Environment (E), appear in Fig. 3. These findings indicate that for two of the four models B2B firm is ingredients in high E and two models indicate that B2C firm is an ingredient in high E. Such findings support the perspective that focusing a study on the size of main effects provides less insight than focusing on the configurations of when one type of customer focus versus another customer focus contributes to high E. Configurational modeling is a shift away from considering symmetric patterns in variables to considering case configurations indicating a given case-based outcome. The findings in Fig. 3 receive support for how industry-customer focus affects the other two factors in CSP. The findings in Fig. 4 support P4b as well. Industry-customer focus influence on CFP indicates that both B2B and B2C markets are ingredients in high CFP for ROA. The findings are similar for CFP for operating profits and TQ (specific findings available on-line vis-à-vis supplementary on-line material).

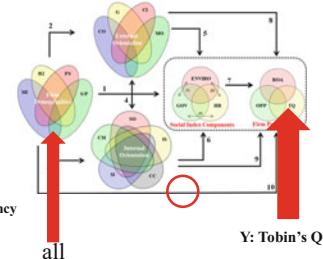
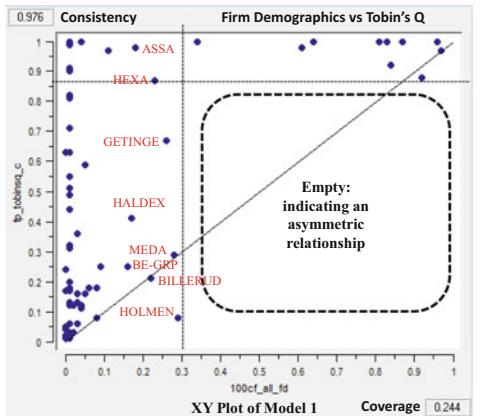
The findings support P5: Broad categories of customer-industry focus (B2B, B2C, and both B2B and B2C) are ingredients in complex antecedent configurations indicating the negation of (a) CSP and (b) CFP. Figures 3–5 are illustrative of the presence of specific categories of markets served being ingredients in firm outcomes high in CSP and CFP factors. Note that in the models appearing in Figs. 3–5 whether or not B2B or B2C firms associate with high CSP and high CFP outcomes depend on specific recipes that include additional demographic factors. A localized necessity condition for either high B2B or high B2C does not occur across these models. The both type of market serves can associate with high CSP and high SFP.

The findings in Fig. 5a, b do include a localized necessity condition for indicating high TQ via firm demographic recipes. Note the inclusion of high marketing intensity in all three models bottom of Fig. 5. Given that TQ is a market value measure of the long-term market perception of a firm's past performance and future prospects, the necessity condition of high marketing intensity in firm recipes indicating high TQ may be unsurprising and obvious. However, the empirical finding of the association provides independent nomological validation of the proposal. Note as well that firms in the sample high in marketing intensity without being high in TQ do occur—thus, while high marketing intensity is a localized necessity condition for the sample of firms, high marketing intensity is not a condition sufficient for the occurrence of high TQ.

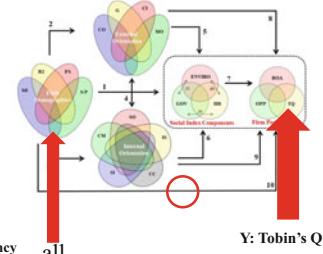
**Firm Size** The findings partially support P6: different complex antecedent conditions occur that include large (FS) but not small ( $\sim$ FS) firm size simplex conditions that indicate high (a) CSP for human rights. Firms with high scores on human rights consistently for demographic recipes indicate that such cases are restricted to large firms with a two to three additional demographic ingredients. Certainly some small firms have high human rights scores but the findings do not include a recipe whereby small asset firms consistently have high scores in human rights—Fig. 6

**a**

case	Firm	b2b	b2c	serv(t) prod(o)
22	ALFA LAVAL	1	0	0
61	NIBE	1	0	0
54	AXIS	1	0	0
63	ACTIVE BIO	1	0	0
41	SECO TOOL	1	0	0
74	DIAMYD	1	0	0
46	Q-MED	1	0	0
23	NOBIA	1	0	0
53	BIOVITRUM	1	0	0
67	BIOINVENT	1	0	0

**b**

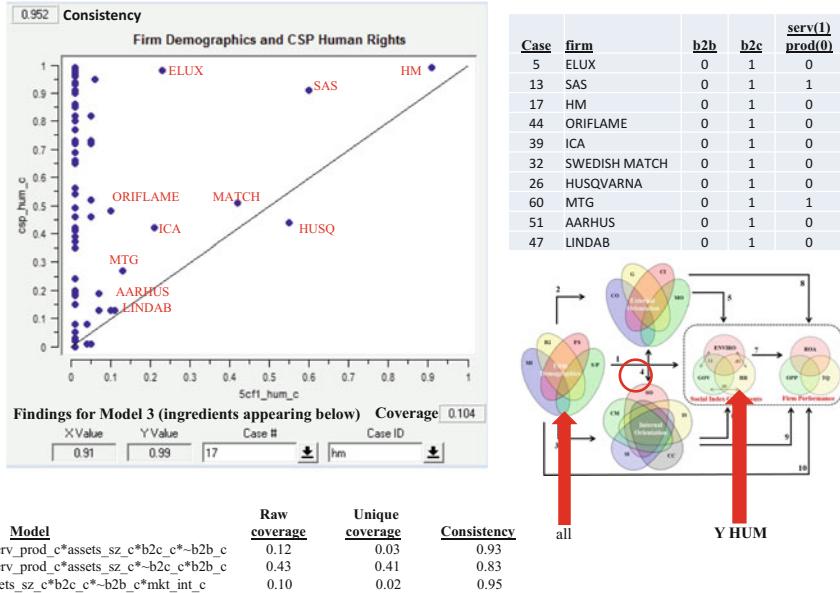
Case	Firm	b2b	b2c	serv(t) prod(o)
34	ASSA	1	0	0
56	HEXAGON	1	0	0
43	GETINGE	1	0	0
31	HALDEX	1	0	0
59	MEDA	1	0	0
57	BE-GROUP	1	0	0
9	BILLERUD	1	0	0
10	HOLMEN	1	0	0

**Model**

Model	raw coverage	unique coverage	consistency
1 ~serv_prod_c*~assets_sz_c*b2c_c*b2b_c*mkt_int_c	0.24	0.23	0.98
2 ~serv_prod_c*assets_sz_c*b2c_c*b2b_c*mkt_int_c	0.09	0.07	1.00
3 serv_prod_c*assets_sz_c*b2c_c*b2b_c*mkt_int_c	0.05	0.03	0.92

Solution coverage: 0.34 ; solution consistency: 0.97

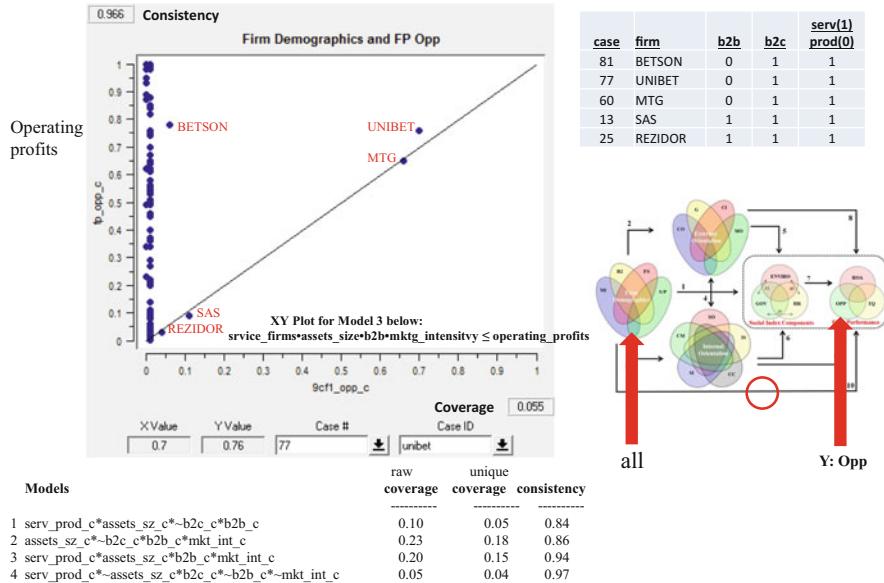
**Fig. 5 (a)** Firm Demographic Models indicating Cases with High Tobin's Q. **(b)** Firm Demographic Models indicating Cases with High Tobin's Q. Note: Figure 5b provides the names and XY plots of closet “out-group” to “in-group” firms above 0.30 scores on X. A majority of firms in the in-group are bio-techs (8/10) and the majority of firms in the ‘out-group’ are heavy industrial firms (7/10)



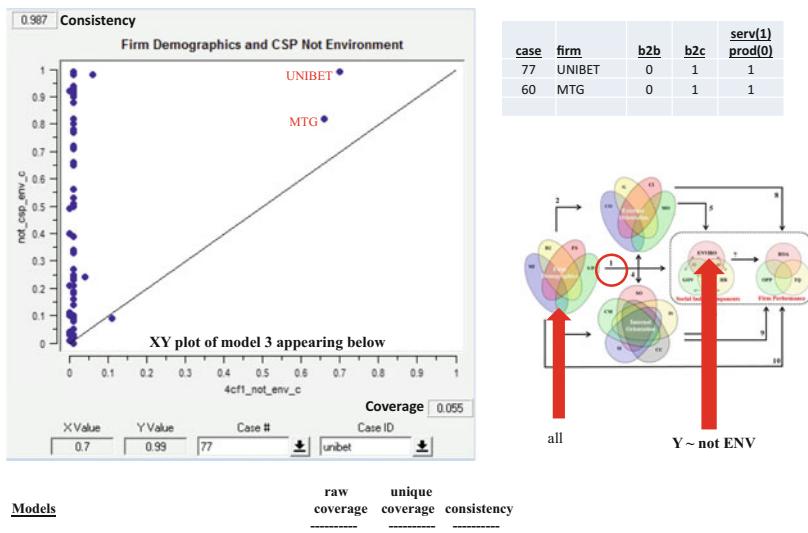
**Fig. 6** Firm Demographic Models indicating High Human Rights Outcome

presents details of the three recipes that all include large assets as an ingredient. The findings do fully support P6b CFP in that at least one recipe includes small and at least one include large asset firms that indicate high operating profits—Fig. 7 describes the findings for three models and an XY plot for one of these three models.

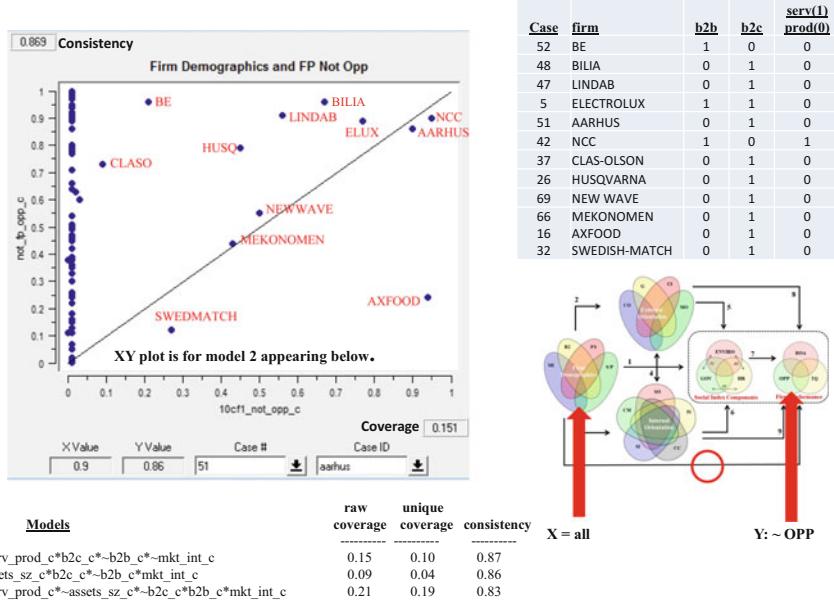
**Negation of CSP and CFP** The findings partially support P7: different complex antecedent conditions occur that include large firm size (FS) and small (~FS) simple conditions that indicate the negation of (a) CSP and the negation of (b) CFP. With the exception of governance, a few specific configurations of demographic conditions identify firms with high negation scores for CSP and CFP outcome conditions. Configurations of demographic conditions alone fail to indicate high scores for corporate governance. Figures 8 and 9 are illustrative of additional findings for the other two CSP outcomes as well as all three CFP outcomes. All three models in Fig. 8 include service firms as an ingredient in predicting high negation of environmental social performance. Thus, the service firm condition is a localized necessary condition in configurations that are consistent accurate reporting of low environmental performance. Model 2 in Fig. 8 includes neither low nor high marketing intensity; the simple condition of marketing intensity has no impact on decreasing or increasing the accuracy of model 2. The combination of the three conditions in model 2 is sufficient in indicating high scores in the negation of environment social performance.



**Fig. 7** Firm Demographic Models indicating High Operating Profits



**Fig. 8** Configuration models indicating the negation of Environment (ENV). Note. Service industry firms in all three models Indicate a local necessary condition for high scores in ENV negation



**Fig. 9** Firm Demographic Models indicating Firms with High Negation of Operating Profits

The three models in Fig. 9 are firm demographic models indicating consistent high negation of operating profits. For example, model 3 in Fig. 9 is the complex combination of three simple conditions: product firms, low in assets, serving b2b markets, using high marketing intensity. The findings indicate that this business model works “well” in generating poor operating profits. The causal asymmetry tenet supports the perspective that the direct opposite business model may or may not indicate high operating profits. Comparing the models in Fig. 7 for high operating profits and Fig. 9 for the negation of high operating profits indicates no mirror opposites occur for the nine possible comparisons; a finding that supports the causal asymmetry tenet.

**Findings for Service Versus Product Firms** The findings support P8: service-provider versus goods provider industry is an ingredient in recipes indicating high (a) CSP and (b) CFP outcomes. The findings support P9: additional recipes include high scores in goods provider versus service provider industry membership in indicating high (a) CSP and (b) CFP outcomes. The findings in Figs. 3–9 and Table 1 indicate that concluding that a symmetric main effect occurs for service versus product firm categories and CSP or CFP as dependent variables provides scant information. Both categories of firms occur among firms with high CSP and CFP outcomes. Adopting a case-based outcome analytics provides information on the complex conditions whereby cases for each firm category indicate the respective outcomes.

**Firm Demographic Models of Overall CSP, ~CSP, CFP, and ~CFP** This section presents four sets of models for the four overall outcomes regarding corporate social performance and corporate financial performance. The conventional practice in the literature is to report overall CSP and CFP using variable-based symmetric methods (i.e., multiple regression analysis) with global dependent measures. The foundations for the present study includes demonstrating the usefulness of report findings on each of the components of CSP and CFP using set-theoretic, cased-based, asymmetric methods (fsQCA); the tenets of complexity theory are the fundamental rationales for adopting this unconventional data analysis and theoretical stance.

Rather than computing an average for the three dimensions of CSP or CFP for the dependent variable as appearing in Appendix Table 7, the application of set-theoretic methods computes the share score that the three dimensions have in common (i.e., the lowest share score across the three dimensions) for each of these two outcome conditions as appearing in Appendix Table 8. Because the procedure is a conjunctive computation whereby the overall score is equal to the lowest score across the three dimensions, this Boolean operation indicates that several firms have low overall CSP and CFP scores even though they have high scores on one or two of the three dimensions of each. The procedure sets a high bar for high performance and a low bar (i.e., negation outcome) for low performance. Theoretically and practically the set-theoretic approach is appealing because high scores on any two of three dimensions does not mask a low score on the remaining dimension—such cases occur frequently among the scores for the firms in the study.

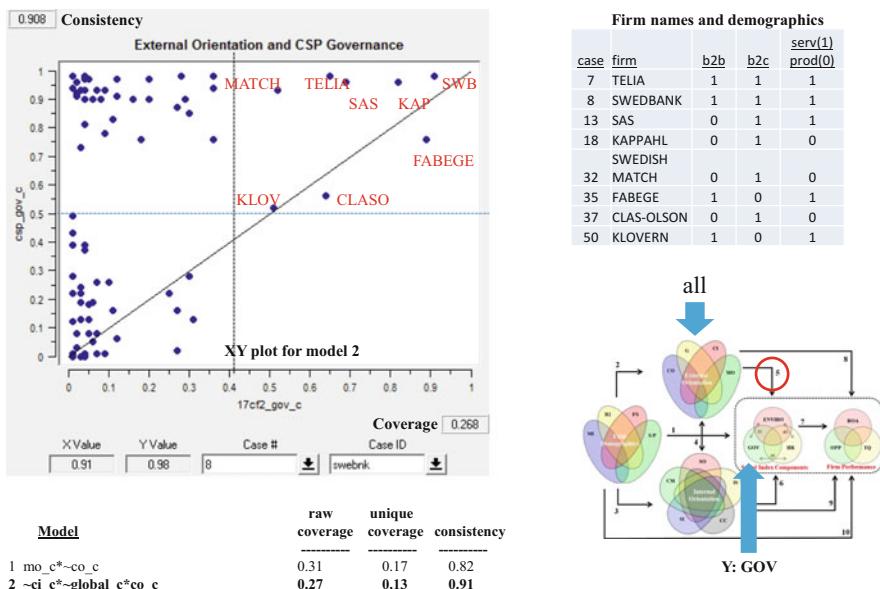
Table 1 presents the findings for the four outcome conditions. The findings indicate that one set-theoretic model provides consistent high scores for both CSP and CFP: large-asset, service firms, serving B2C markets, using high marketing intensity. This configuration appears as model 1 and 4 in Table 1. This finding does not mean that only firms having this configuration are high in CSP and CFP; the finding indicates that most firms that do have this configuration are high in CSP and CFP. A few unique configurations indicate high scores in ~CSP and ~CFP; note that the combination of product firms (~service firms) and B2B firms appears in three of the four negative outcome conditions in Table 1. This finding likely represents the negative impact of by-products occurring in the manufacturing process of some industrial products. The analysis points to the limitation of reporting main effects via symmetric analysis for the individual dimensions (i.e., features) for the four firm demographics. For firm asset size, model 2 indicates that small firms associate with ~CFP and model 3 indicates that large firms associate with ~CFP. Which is it? The correct answer is that the association for firm size and ~CFP depends on what additional ingredients are in the specific complex conditional algorithms for small and large asset firms.

## 6.2 Findings for External Orientation

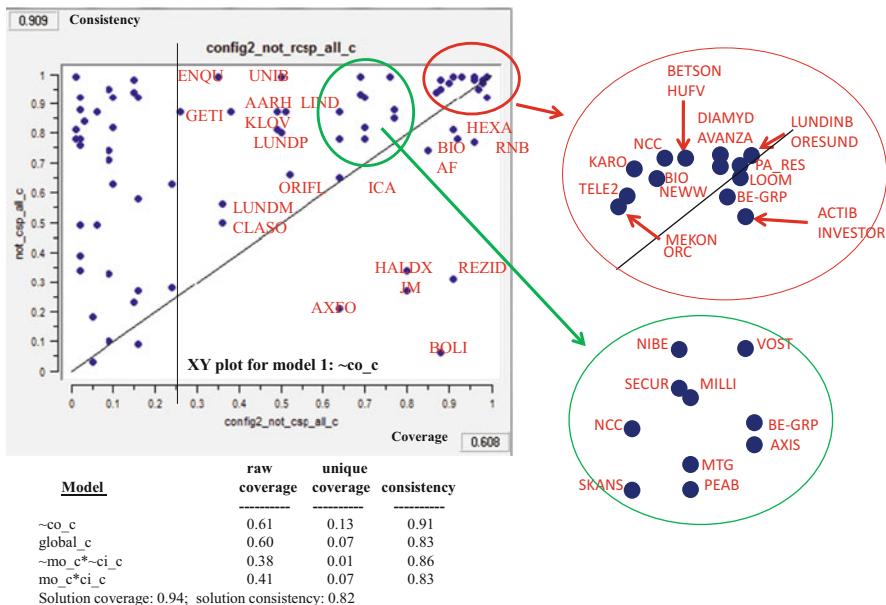
**Customer Orientation and CSP and CFP** The findings partially support P10: customer orientation (CO) is an antecedent condition in complex antecedent external conditions indicating (a) high CSP and (b) CFP outcomes. CO appears in 10 of 13 CSP or ~CSP dimensions or overall CSP or ~CSP models, respectively. Table 2 presents details. CO appears in all three models that indicate high environment CSP consistently. CO also appears in the lone overall CSP model (model 11 in Table 2) as well as one of four of the overall ~CSP models (model 12 in Table 2). Thus, CO is viewable as a substantial influence on CSP.

The findings indicate strong support for P11a but the findings to not support P11b. P11 is that the negation of customer orientation in an antecedent condition appearing in complex antecedent external conditions indicating the negation of (a) CSP and (b) CFP outcomes. There is only one instance where the negation of CO occurs for a negation of a CSP dimension (~environment, model 7 in Table 2). For one model that negation of CO is an ingredient in positive outcome for one of the CSP dimensions (for governance, model 1 in Table 2); however, the consistency of this model is equal to 0.82. A careful examination of Table 2 indicates that high customer orientation is an ingredient in several models indicating high CSP outcomes and the negation of customer orientation alone is sufficient to indicate the negation of overall CSP.

Figures 10 and 11 are XY plots for external orientation models for governance and the negation of overall CSP, respectively. Figure 10 indicates that the



**Fig. 10** External orientation models indicating high scores in governance CSP



**Fig. 11** External orientation models indicating negation of overall CSP. Note. For model 1, consistency equals 0.91; the findings include 36 firms with high scores for ~CSP and 5 firms with low scores for ~CSP among the firms having scores greater than 0.25 for the simple antecedent condition, ~co\_c; applying a sign statistical test, the alternative hypothesis receives support,  $p < .001$

configuration including the negation of customer interaction, the negation of globalization, and high customer orientation indicates high overall CSP ( $\sim ci\_c \cdot \sim global\_c \cdot co\_c \leq csp$ ). The XY plot in Fig. 10 names the ten firms with high scores for governance CSP that have high scores for this model; no firm with high scores for the model have low scores for governance CSP—the high consistency indicates such a finding. Figure 11 is an XY plot for firms that are low in overall CSP (i.e., ~CSP) for the simple antecedent condition, low customer orientation. When ~co\_c is high (i.e., low customer orientation), Fig. 11 identifies 36 firms by name with high scores and 5 firms by name with low scores for ~CSP for this simple antecedent condition. Applying a t-test for the proportion, 0.88 (36/41) against the null hypothesis of 0.50 to these findings supports the alternative hypothesis ( $p < .0001$ ). Set-theoretic analysis does not apply such statistical tests typically but the test here is done to indicate that such testing is possible within case-level analysis.

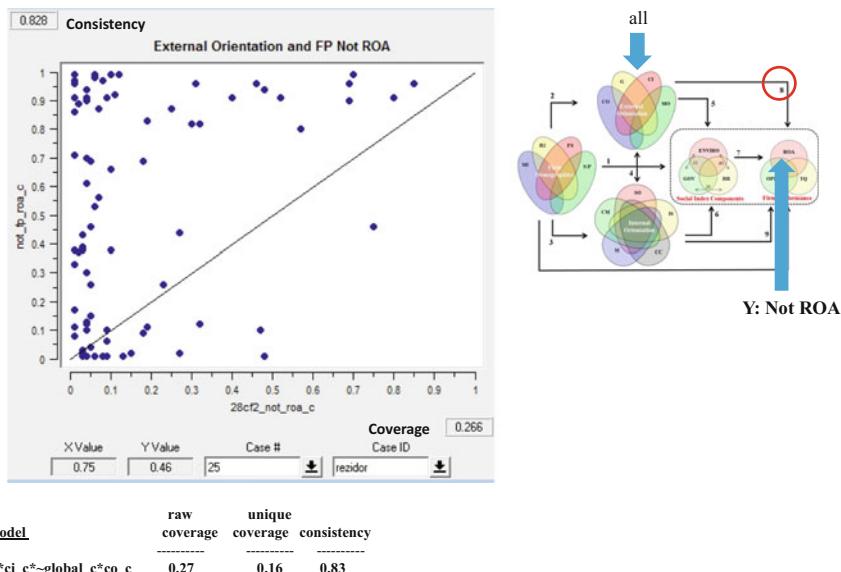
In regard to P11b, only two external orientation (EO) models have high consistency in indicating high CFP outcome or the negation of a CFP outcome. ROA is the specific outcome.

- $mo\_c * global\_c * co\_c \leq ROA$ , coverage = 0.27, consistency = 0.86
- $mo\_c * ci\_c * \sim global\_c * co\_c \leq \sim ROA$ , coverage = 0.27, consistency = 0.83

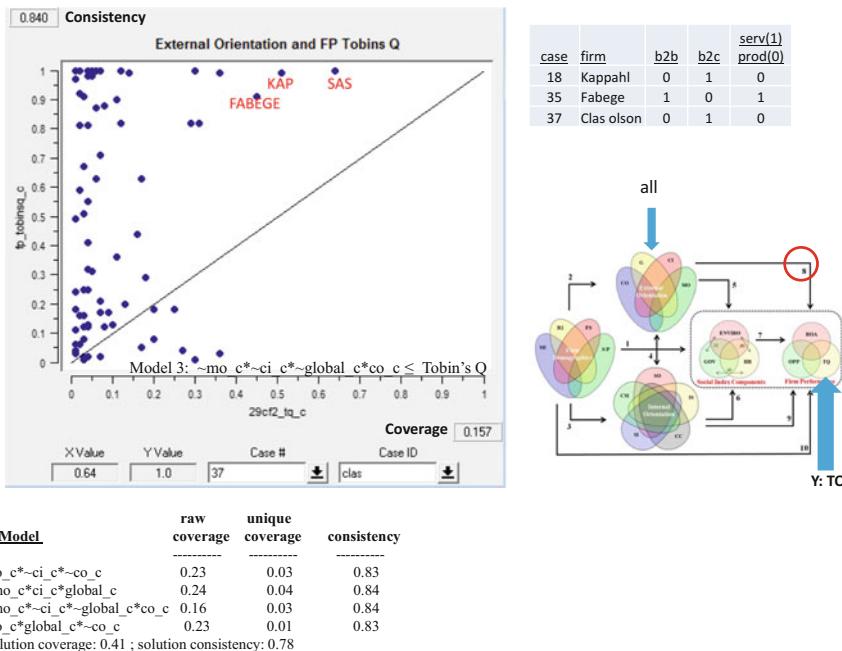
Note that high market orientation (MO) and customer orientation (CO) are ingredients in both models. When MO, globalization, and customer orientation are all high, then ROA is high. High MO in combination with low globalization and high CO indicate low ROA. Such findings provide a nuance perspective that high MO and CO in combination is an insufficient indicator of high or low ROA. Figure 12 is an XY plot of the EO model indicating the negation of ROA.

Figure 13 is an XY plot and includes EO models that indicate high scores for TQ. The negation of MO is an ingredient in two of four models that indicate high TQ scores. None of the possible EO models clearly indicate high or the negation of overall CFP. The sparseness of support for P11b do not rule out more complex influences of EO factors on CFP outcomes via EO influences on CFP in configurations with CSP ingredients. Such an issue is worth additional exploration in a follow-study. The findings support the conclusion that, with the exception of one model for high ROA and one for the negation of ROA, EO configurations alone do not support high or the negation of CFP.

**Globalization and CSP and CFP** The findings do not support P12 or P13. Contrary to P12, high G (globalization) is *not* an antecedent condition in complex antecedent external conditions that indicate high (a) CSP and (b) CFP outcomes, except for one model (i.e., model 6 in Table 1) for high environment CSP. P13 receives no support; the negation of G is *not* an antecedent condition in complex antecedent external conditions that indicate the negation of (a) CSP and (b) CFP outcomes. The general conclusion is that globalization is not an ingredient simply or in a complex antecedent condition that affects CSP or CFP.



**Fig. 12** External orientation model indicating the negation of ROA



**Fig. 13** External orientation models Indicating high Tobin's Q

**Customer Interaction (CI) and CSP and CFP** The findings do not support P14. Contrary to P14, CI is *not* an antecedent condition in complex antecedent external conditions that indicate high (a) CSP and (CFP) outcomes. The findings do not support P15; contrary to P15, the negation of CI is *not* an antecedent that appears in complex antecedent conditions that indicate the negation of (a) CSP and (b) CFP outcomes. Surprisingly, the findings include models showing that the negation of CI is an ingredient in complex models indicating *high* CSP scores for governance, environment, human resources, and overall CSP; these are surprising findings indicating that structuring customer-firm interactions may restrict firms' capabilities to achieve objectives of high CSP outcomes. Emphasizing here what has been described earlier, the EO factors do not indicate high or low scores for CFP factors individually or as complex outcomes; this finding includes findings for CI.

**Market Orientation and CSP and CFP** The findings do support P16a: high MO is an ingredient in complex antecedent conditions that indicate high (a) CSP. The findings do not support P16b, that is, contrary to P16b; MO is not an external orientation ingredient in models capable of indicating high or low CFP outcomes. The findings include limited support for P17a and not support for P17b. P17 states that the negation of MO is an ingredient in complex antecedent conditions that indicate the negation of (a) CSP and (b) CFP outcomes. Both high and low MO appear in different models that indicate the negation of overall CSP; as Table 2

describes, a negation of MO appears in only one CSP model indicating a negation outcome. Thus, high MO frequently contributes to high CSP outcomes while low MO does not contribute frequently to either high or low CSP outcomes.

### **6.3 Findings for Internal Orientation (IO) Impacts on CSP and CFP**

The findings provide substantial support for four dimensions of IO. Each IO dimension alone is insufficient for indicating high or low CSP. However, different configurations of the four IO dimensions do provide consistent indications of high and low CSP. While findings also include some useful IO models indicating high and low CFP outcomes, these findings include fewer models than for IO models indicating high and low CSP. Table 3 describes 14 useful models indicating either high or low CSP outcomes; Table 4 includes 8 useful models indicating either high or low CFO outcomes.

The findings in Table 3 indicate while nine different models of IO dimensions indicate high scores among specific dimensions of CSP, no models support the view

**Table 3** Set-theoretic internal orientation (IO) models indicating high and low scores for corporate social performance dimensions and overall CSP

Model	CSR SI	CSR Mgt.	SO	Industry Stds.	Coverage	Consistency	Outcome
1	~	.	.		0.04	0.82	Governance
2	.	.		~	0.05	0.82	Governance
3	.	.	.	.	0.18	0.81	Governance
4	No model has high consistency						
5	.	.	~		0.06	0.84	Environment
6	.	.	~		0.01	0.85	Environment
7	.	.		.	0.30	0.82	Environment
8	~	~		.	0.01	0.82	~Environment
9	~		~	~	0.03	0.81	~Environment
10		.	.		0.03	0.85	Human resources
11	.	.	.		0.04	0.86	Human resources
12	.		~	.	0.06	0.83	Human resources
13	~	~	~	~	0.06	0.88	~Human resources
14	~		~	~	0.04	0.83	~Human resources
15		No model has high consistency					
16	~			~	0.24	0.92	Overall CSP ~Overall CSP

Note. SI = strategic intent; SO = CSR strategic orientation. Model 3 supports the proposition that the configuration of all four internal orientation (IO) factors affect a high governance outcome. While Model 15 indicates that IO factors do not impact over CSP outcome, the models for the individual CSP outcomes indicate substantial impacts of IO factors on individual CSP outcomes

**Table 4** Set-theoretic internal orientation models indicating high and low scores for corporate financial performance dimensions and overall CFP

Model	CSR SI	CSR Mgt.	SO	Industry Stds.	Coverage	Consistency	Outcome
1				No internal orientation model indicates high operating profits.			Operating profits
2	~	.	.		0.23	0.92	~Operating profit
3	.	.	.	~	0.22	0.92	~Operating profit
4	.	.	.	~	0.23	0.90	~Operating profit
5				No internal orientation model indicates high ROA.			ROA
6	~	.	.	.	0.19	0.84	~ROA
7				No internal orientation model indicates high Tobin's Q.			Tobin's Q
8				No internal orientation model indicates negation ~Tobin's Q.			~Tobin's Q
9				No internal orientation model indicates high overall CFP.			CFP
10	~			~	0.50	0.86	~CFP
11		.	.		0.37	0.84	~CFP
12	.	.	.	~	0.25	0.85	~CFP
13	.	.	.		0.42	0.83	~CFP

Note. Configurations of IO dimensions are informative of high negation scores for operating profits, ROA, Tobin's Q, and overall CFP. Configurations of IO factors alone are not informative of high operating profits, ROA, Tobin's Q, or overall CFP

that configurations of SI dimensions indicate overall CSP. While firms with high scores in all three dimensions of CSP do occur, they are rare birds and configurations of SI dimensions are not useful tools for identifying these rare birds.

**CSR Strategic Intent** Seven of the eight IO models indicating high CSP outcomes include high CSR-SI; one of the eight includes the negation of CSR-SI (model 1 in Table 3). Notice in Table 3 that SI is high in seven of the nine models indicating high scores for dimensions of CSP (i.e., environment, human resources, and governance) and SI is negative in only one of the nine models. This meta-finding supports the conclusion that for all but one model where CSR-SI matters, high CSR-SI is an ingredient in models indicating high CSP. However, at least one additional ingredient with high scores is present among the seven models; for several of these models high scores in CSR-management occurs with high scores in CSR-SI for high scores in outcomes in CSR dimensions. Note that when high scores occur for three or all four of the four IO dimensions, then at least one of the three CSP outcome dimensions is high. These findings support P18: While high SI toward achieving high CSP is insufficient for achieving high the objective, high SI is an ingredient in internal orientation recipes that do indicate high CSP. The findings also support P19: High scores in the negation of SI alone are insufficient for indication low CSP but high scores in the negation of SI is an ingredient in recipes indicating low CSP.

The findings in Table 4 refer to arrow 9 in Fig. 2—internal orientation models indicating high and low CFP outcomes. CSR-SI is an ingredient in five negation CFP outcome models and no positive CFP models; in fact, the findings for internal orientation include no positive CFP outcome models. Thus, a few configurational models of CSR-focused strategic orientation indicate low CFP and none indicate high CFP outcomes. The negation of CSR-SI appears in three of the five models in

Table 4; positive CSR-SI appears in two models. Thus, stating that low CSR-SI associates with low CFP is a statement too simple; firms with low CFP are identifiable when CSR-SI is high as well. The absence of high CSR-SI in models indicating high CFP and the general absence of high CFP outcomes supports the perspective internal orientation to high CSR across the four CSR dimensions is unrelated to high CFP outcomes. These findings support adopting a skeptical stance toward firms' adopting a high CSR internal orientations in the belief that doing so helps to achieve high CFP.

**CSR-Management** The findings do support P20. P20 states that while insufficient for achieving high CSP consistently, high firm effort to manage CSR is an ingredient in recipes indicating high CSP. In Table 3 eight of the nine high score outcomes across the three CSP dimensions occur for high CSR-management. The negation of CSR-management does not occur for any model indicating a high score for one of the dimensions of CSP. These findings support the conclusion that a high score in CSR-management is usually an ingredient in models accurate in indicating high CSP outcomes. In Table 4 high CSR-management is an ingredient in seven informative negation models for CFP outcomes; none of the CSR internal orientation dimensions support positive CFP outcome models. These findings indicate that high CSR-management is an ingredient in models indicating high CSP outcomes but a negation, rather than a positive, association may be the prevalent contribution of high CSR-management to CFP. The findings also provide support for P21: The negation of CSR-management is an ingredient in one or more recipes indicating the negation of CSP. Models 8 and 13 include the negation of CSR-management in configurations indicating the negation of CSP. These findings indicate that low CSR-management does contribute to the negation of CSP outcomes—a finding supporting the stance that a firm not managing CSR will likely experience low CSP outcomes.

The findings do not support the perspective that high CSR-management always contributes to high CFP. However, these findings do not test for possible delayed positive impact of CSR-management and the additional internal orientation CSR metrics on CFP. The findings do support adopting a skeptical stance toward such a positive CSR-CFP perspective.

**Strategic Orientation Findings** The findings support P22 and P23. For P22, in Table 3 while insufficient for indicating high CSP, high SO is an ingredient in recipes indicating high CSP. The negation of SO also appears in three models indicating high CSP outcomes in Table 3; such findings support the complexity tenet that reversals occur in models indicating a high outcome condition. For P23, in Table 4 the negation of SO is an ingredient in three recipes indicating the negation of CSP. The central conclusion is that high and low SO are ingredients in most models indicating either high or low CSP outcomes.

**Findings for Industry Standards** The findings support P24 and P25. P24: While insufficient or necessary by itself, a high score in ISO 14001 certification (a proxy for the new ISO26000 CSR standard) appears in one or more recipes of firms having

high CSP consistently; models 3, 7, and 12 in Table 3 confirm P24. P25: High negation scores for ISO 14001 appear in one or more recipes for high scores for the negation of CSP; models 9, 13, 14, and 16 in Table 3 confirm P25. Note that the negation of industry standards appears in one model (i.e., model 2) indicating high governance; this finding supports the possibility of reversals in impact as complexity theory predicts. High and low impacts of an antecedent condition on an outcome condition depend on which additional ingredients are present and absent in specific antecedent configurations.

## 6.4 Findings for CSP Impact on CFP

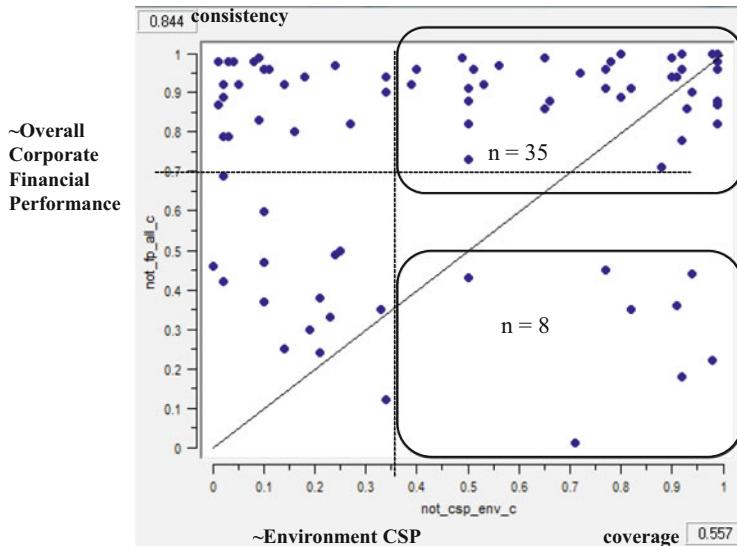
Except for one model with Tobin Q as an outcome condition (i.e., model 5 in Table 5), the findings do not support P26. P26 states that specific configurations of E, S, and G conditions indicate high scores in one-to-all three firm performance outcome conditions. The perspective that configurations of CSP dimensions are paths for achieving high CFP does not receive support. With the exception of one model (i.e., model 8 in Table 5 and one model in appearing as Fig. 14), P27 does not receive support. P27 states that configurations of the negation of one or more conditions of E, S, and G indicate high scores in the negation of one-or-more firm performance outcome conditions.

Figure 14 shows 35 of 43 firms (81%) high in the negation the environment (CSP-E) have low overall CFP. Thus, while the findings do not support the perspective that high E indicates high overall CFP, the findings do indicate that

**Table 5** Set-theoretic Corporate Social Performance and Corporate Financial Performance

Model	Environment (E)	Human Rights (H)	Governance (G)	C1	C2	Outcome
1	No configurations of CSP dimensions indicate high operating profits.					Operating profits
2	No configurations of CSP dimensions indicate high negation of operating profits.					~Operating profits
3	No configurations of CSP dimensions indicate high ROA.					ROA
4	No configurations of CSP dimensions indicate high negation of ROA.					~ROA
5	•	~	~	0.20	0.84	Tobin's Q
6	No configuration of CSP dimensions indicate high negation of Tobin's Q.					~Tobin's Q
7	No configuration of CSP dimensions indicate high overall CFP.					CFP
8	~	~	~	0.27	0.85	~Overall CFP

Notes. C1 = coverage; C2 = consistency. See Fig. 15 for details (XY plot with names of MNE's with high scores for Model 8:  $\sim E \bullet \sim H \bullet G \leq \sim CFP$ ). The findings confirm the perspective that high scores in configurations of CSP dimensions do not indicate high scores for CFP dimensions with the lone exception of model 5. Most firms high in the negation of all three CSP dimensions are high in the negation of CFP (i.e., these firms have low scores for overall CFP)

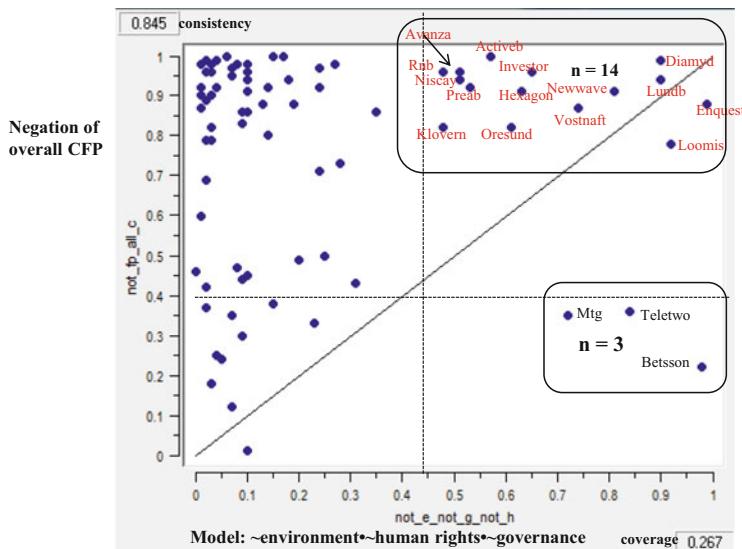


**Fig. 14** Model for high scores in the negation of environment CSP and the negation of overall CFP:  $\sim E\_CSP \leq \sim CFP$ . Note. The finding show that more firms with scores 0.4 or higher for the negation of environmental CSP are more than four times as likely to have high ( $\geq 0.7$ ) versus low ( $\leq 0.5$ ) scores in the negation of overall CFP; 35 firms versus 8 firms with scores  $\geq 0.4$  in the negation of environmental CSP have high scores in the negation of overall CFP

low E is frequently detrimental to overall CFP. The findings in Fig. 15 offer additional credence to the perspective that poor CSP associates with poor CFP. Fourteen of seventeen firms high in the configuration of the negation of all three CSP dimensions have low CFP. The names for all 17 firms appear in Table 15. Consequently, these findings support the perspective not engaging highly in all three CSP dimensions are likely to hurt CFP yet, engaging highly in all three CSP dimensions does not indicate that a high CFP outcome will always occur.

## 6.5 Additional Findings

Figure 16 presents additional findings that examine one of the possible sets of models associating external and internal orientations (i.e., arrow 4 in Fig.1). Figure 16 includes the findings for a useful model indicating the configuration of two external orientation dimensions (~customer interaction “AND” customer orientation associates with high scores for the internal orientation dimension, strategic intent). This model has high consistency (0.958) and high coverage (0.437). The names of all firms with relatively high scores for the model appear in Fig. 16. Eighteen of twenty firms with high scores in the model have high strategic intent scores. Additional findings support the view that configurations of external



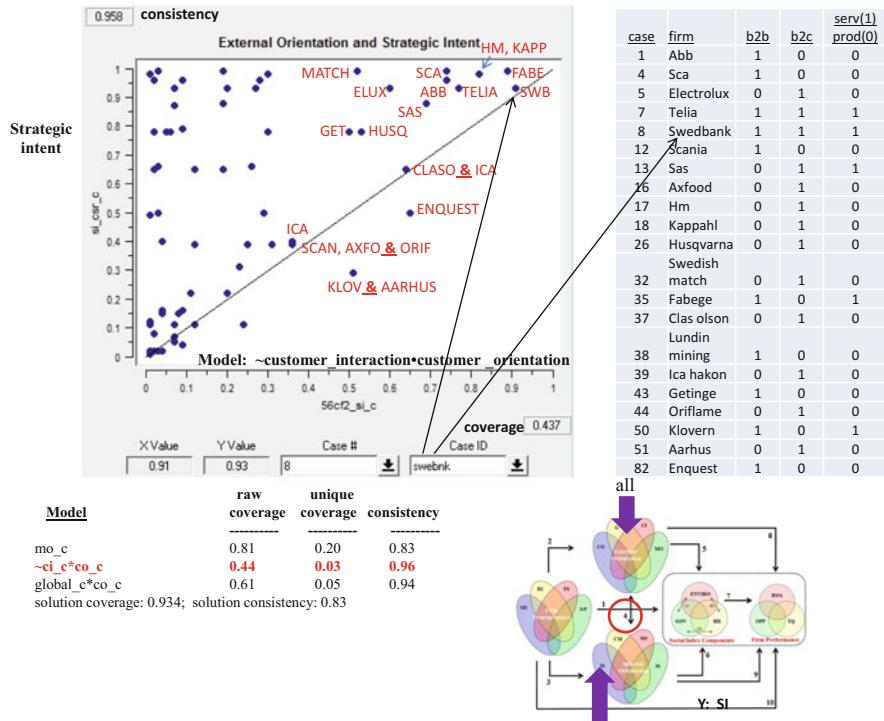
**Fig. 15** Set-theoretic model of configuring high negation for all three CSP dimensions and the negation of overall CFP

orientations impact internal orientation configurations and vice versa; these additional findings are available by request from the authors.

## 6.6 Limitations and Suggestions for Additional Research

While the findings provide substantial support for applying complexity theory in constructing useful theories of the antecedents and outcomes of CSP, the study is limited to the context of one data set of multi-national enterprises with headquarters in Sweden. The data set includes MNE firms in a wide range of service- and product manufacturing industries both for B2B and B2C environments. Still, the findings need confirmation by additional studies in the contexts of MNE firms with headquarters in Germany, the USA, the UK, and additional countries to learn if they apply generally.

The findings are based on cross-sectional data without testing for longitudinal influences of configurations from prior years on present outcomes. The impact of antecedent configuration on CSP and configurations of CSP dimensions on CFP outcomes is not instantaneous. Research that incorporates time-delay influences of two to five years or longer would be a major advance in knowledge of how the influences on CSP and CSP influences on CFP. Even with the substantial number of CSP-CFP studies in the literature, the field of study is still in the exploratory stage of uncovering relationships.



**Fig. 16** Model: ~customer interaction AND customer orientation indicating high strategic intent

## 7 Discussion and Conclusion

While the positive relation between CSP and CFP was confirmed in two significant meta-analyses: Orlitzky et al. (2003) meta-study (covering 52 studies and 33,878 observations for the years 1972–2003) and Wang et al. (2015) meta-study targeting 125,085 observations in 42 studies for the subsequent years 2003–2012, a total of almost 159,000 observations spanning four decades. However, the fashion to measure the CSP-CFP link remains index-based (Mattingly 2015; Isaksson et al. 2014; Kiessling et al. 2015) in combination with traditional quantitative measurement (regression analysis, structured equation modeling and other variable based methods). Since CSP is considered to be a tacit concept, one should expect to some extent that the results in general can be difficult to measure or establish in every research context. Hence, a recipe based approach has both a logical and theoretical appeal. Therefore, the progressive way to further advance CSP research is by assessing the CSP-CFP relationship with respect to its complexity and apply case-level analysis (Ordanini et al. 2014; Fiss 2007, 2011; Ragin 2008; Woodside 2014).

Table 6 summarizes the propositions and findings. The general theory and findings in the present study supports the usefulness of matching case-based propositions with case-based data analysis rather than continuing with the conventional mismatch of case-based propositions and variable-based data analysis (Fiss 2007, 2011). Such mismatches appear frequently in the relevant literature that advances typology theories of the firm with multiple regression based analysis (e.g., structural equation models). The general theory here builds from the platform of the core tenets of complexity theory. Consequently, the general theory recognized that antecedent configurations indicating high or low scores in CSP outcomes have substantial heterogeneity; reporting only main effects, two or three-way interactions, and modifying or mediating effects are solutions to far away from the realities of relationship reversals, equifinality, causal asymmetries for high versus low outcome conditions, and the general low ability in regression models to achieve high levels of explanation of variance in a dependent variable. A paradigm shift to case level outcomes and prediction of sufficiency but not necessity is much more achievable and useful than the conventional theory-analysis mismatch in CSP-CFP research. The shift has the additional benefit of being able to readily identifying firms in the XY plots of useful asymmetric models.

The findings in the present study indicate tenuous (i.e., shaky, questionable) positive CSP and positive CFP associations and more sturdy negative CSP and negative CFP associations. High CSP does not indicate high CFP outcomes; the negation of all three dimensions of CSP does indicate the negation of CFP. Such a combination of findings is an expression of the causal theory tenet of causal asymmetry: the antecedent configurations of success or failure are not mirror opposites of the revers outcomes. Hence, do not expect that high overall CSP supports high CFP outcomes; but expect that the consistent negation of CSP activities associates with low CFP outcomes. Such asymmetric combinations of findings support the need to look beyond CSP for achieving high CFP; the low CFP that firms experience across the board for low CSP scores may indicate a widespread inability to achieve high performance generally (i.e. across most functional areas). While providing some support to good management theory, the study provides greater support to the development of the proposition that bad management practices result in bad financial outcomes as well as viewing. This asymmetric perspective matches well with Weick's (1987) view that the causes indicating failure are quite unique usually from the causes indicating success. Embracing complexity theory and configurational analysis are useful progressive steps in responding to Weick (1987, p. 112) call for requisite variety in managing firms, "The point is that accidents [and bad management practices] occur because humans who operate and manage complex systems are themselves not sufficiently complex to sense and anticipate the problems generated by those systems. This is a problem of 'requisite variety,' because the variety that exists in the system to be managed exceeds the variety of who must regulate it. When people have less variety than is requisite to cope with the system, they miss important information, their diagnoses are incomplete, and their remedies are sort-sighted and can magnify rather than reduce the problem."

**Table 6** Summary table of modelling firm heterogeneity

Configuration category	Proposition	Finding
Configuration 1: Company Demographics	<b>Market intensity:</b>	
	P1: Cases with high MI alone is an insufficient indicator of high (a) CSP and (b) CFP outcomes.	P1: Supported
	P2: High MI is an ingredient in configurations of firm demographics which do indicate high (a) CSP and (b) CFP outcomes.	P2: Supported
	P3: Low MI that is, the negation of MI ( $\sim$ MI), is an ingredient in configurations of firm demographics indicating high CFP.	P3: Supported
	<b>Customer categories:</b>	
	P4: Broad categories of industry-customer focus (B2B, B2C, and both B2B and B2C) are ingredients in complex antecedent configurations indicating high (a) CSP and (b) CFP.	P4: Supported
	P5: Broad categories of industry customer focus (B2B, B2C, and both B2B and B2C) are ingredients in complex antecedent configurations indicating the negation of (a) CSP and (b) CFP.	P5: Supported
	<b>Firm size:</b>	
	P6: Different complex antecedent conditions occur including large (FS) and small ( $\sim$ FS) firm size simplex conditions that indicate high (a) CSP and (b) CFP.	P6: Partially Supported
	P7: Different complex antecedent conditions occur that include large (FS) and small ( $\sim$ FS) firm size simplex conditions that indicate the negation of (a) CSP and (b) CFP.	P7: Partially Supported
	<b>Service or product provider:</b>	
	P8: Service-provider versus goods provider industry is an ingredient in recipes indicating high (a) CSP and (b) CFP outcomes.	P8: Supported
	P9: Additional recipes include high scores in goods provider versus service provider industry membership in indicating high (a) CSP and (b) CFP outcomes.	P9: Supported
Configuration 2: External Orientation	<b>Customer Orientation:</b>	
	P10: Customer orientation is an antecedent condition in complex antecedent external conditions indicating (a) high CSP and (b) CFP outcomes.	P10: Partially Supported
	P11: The negation of customer orientation in an antecedent condition appearing in complex antecedent external conditions indicate the negation of (a) CSP and (b) CFP outcomes.	P11a: Strong Support P11b: Not supported

(continued)

**Table 6** (continued)

Configuration category	Proposition	Finding
<b>Globalization (G):</b>		
	P12: High G (globalization) is an antecedent condition in complex antecedent external conditions that indicate high (a) CSP and (b) CFP outcomes.	P12: Not Supported
	P13: The negation of G is an antecedent condition in complex antecedent external conditions that indicate the negation of (a) CSP and (b) CFP outcomes.	P13: Not Supported
<b>Customer Interaction (CI):</b>		
	P14: CI is an antecedent condition is complex antecedent external conditions that indicate high (a) CSP and (CFP) outcomes.	P14: Not Supported
	P15: The negation of CI is an antecedent that appears in complex antecedent conditions that indicate the negation of (a) CSP and (b) CFP outcomes.	P15: Not Supported
<b>Market Orientation (MO):</b>		
	P16: High MO is an ingredient in complex antecedent conditions that indicate high (a) CSP and (b) CFP outcomes.	P16a: Supported P16b: Not Supported
	P17: The negation of MO is an ingredient in complex antecedent conditions that indicate the negation of (a) CSP and (b) CFP outcomes.	P17a: Limited Support P17b: Not Supported
Configuration 3: Internal Orientation	<b>Strategic intent (SI):</b>	
	P18: While high SI toward achieving high CSP is insufficient for achieving high the objective, high SI is an ingredient in internal orientation recipes that do indicate high CSP.	P18: Supported
	P19: High scores in the negation of SI alone are insufficient for indication low CSP but high scores in the negation of SI is an ingredient in recipes indicating low CSP.	P19: Supported
	<b>CSR management (CM):</b>	
	P20: While insufficient for achieving high CSP consistently, high firm effort to manage CSP is an ingredient in recipes indicating high CSP.	P20: Supported
	P21: The negation of CSP management is an ingredient in one or more recipes indicating the negation of CSP.	P21: Supported
	<b>Strategic Orientation (SO):</b>	
	P22: While insufficient for indicating high CSP, high SO is an ingredient in recipes indicating high CSP.	P22: Supported
	P23: The negation of SO is an ingredient in one or more recipes indicating the negation of CSP.	P23: Supported

(continued)

**Table 6** (continued)

Configuration category	Proposition	Finding
	<b>Industrial standards (IS):</b>	
	P24: While not sufficient or necessary by itself, high scores in ISO 14001 certification appears in one or more recipes of firms having high CSP consistently.	P24: Supported
Configuration 4: Corporate Social Performance	<b>CSP Performance (ESG):</b>	
	P26: Specific configurations of E, S, and G simple conditions indicate high scores in one-to-all three firm performance outcome conditions.	P26: Not Supported
	P27: The negation of one or more simple conditions of E, S, and G indicate high scores in the negation of one-or-more firm performance outcome conditions.	P27: Not Supported

In addition to demonstrating how to construct and test theory that matches Weick's need for requisite variety, the present study responds to the what Powell et al. (2011, p. 1370) identify as the crucial problem in strategy theory, "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." The complexity in interpreting Fig. 1 may cause a headache initially but understanding its expression of complex realities is achievable. Such understanding enables advance the construction of implementable models of firm heterogeneity of the configurations of CSP antecedents and outcomes.

## Appendix

**Table 7** Multinational firms in the study with CSP raw current Indexing

Case #	Multi-national firm	CSP-Environ.	CSP-Societal	CSP-Gov.	Average
1	ABB	5.37	5.11	6.55	5.67
2	SKF	6.56	4.55	5.29	5.46
3	BOLIDEN	5.67	4.13	6.44	5.41
4	SCA	6.35	4.90	4.97	5.41
5	ELECTROLUX	5.72	4.76	5.50	5.32
6	STORA ENSO	5.95	4.55	5.36	5.29
7	TELIASONERA	4.71	4.45	6.55	5.23
8	SWEDBANK	4.69	4.41	6.51	5.20
9	BILLERUD	5.79	3.36	6.27	5.14
10	HOLMEN	5.76	5.04	4.59	5.13
11	ASTRAZENECA	5.25	4.55	5.32	5.04
12	SCANIA	5.60	4.38	5.11	5.03
13	SAS	4.74	3.92	6.41	5.02
14	TIETO	3.80	4.87	6.37	5.01
15	SKANSKA	5.16	4.34	5.29	4.93
16	AXFOOD	4.18	4.24	6.30	4.90
17	HENNES & MAURITZ	4.69	5.01	4.83	4.84
18	KAPPAHL	4.46	3.50	6.41	4.79
19	SHB	4.62	4.45	5.18	4.75
20	SANDVIK	4.71	3.22	6.23	4.72
21	NORDEA BANK	3.45	4.06	6.55	4.69
22	ALFA LAVAL	3.83	3.85	6.27	4.65
23	NOBIA	4.83	3.15	5.95	4.64
24	JM	3.99	3.26	6.44	4.56
25	REZIDOR HOTEL GROUP	4.08	3.26	6.27	4.53
26	HUSQVARNA	5.34	2.63	5.50	4.49
27	ATLAS COPCO	4.27	3.89	5.25	4.47
28	SEB	3.66	4.66	5.08	4.46
29	AF	4.18	3.61	5.36	4.38
30	TRELLEBORG	4.36	3.64	5.11	4.37
31	HALDEX	3.80	3.08	6.16	4.35
32	SWEDISH MATCH	3.80	2.77	6.27	4.28
33	SSAB	4.29	3.50	4.97	4.25
34	ASSA	4.08	3.43	5.22	4.24
35	FABEGE	3.69	3.08	5.92	4.23
36	SAAB	4.48	2.84	5.29	4.20
37	CLAS OHLSON	3.43	3.22	5.71	4.12
38	LUNDIN MINING	3.22	3.08	5.92	4.07
39	ICA	2.92	2.59	6.55	4.02
40	AUTOLIV	3.41	2.59	5.99	3.99

(continued)

**Table 7** (continued)

Case #	Multi-national firm	CSP-Environ.	CSP-Societal	CSP-Gov.	Average
Case #	MNE	CSP-Env.	CSP-Soc.	CSP-Gov.	AVERAGE
41	SECO TOOLS	4.13	2.87	4.97	3.99
42	NCC	4.76	2.66	4.34	3.92
43	GETINGE	3.41	3.15	5.11	3.89
44	ORIFLAME	2.87	2.70	6.09	3.89
45	LUNDIN PETROLEUM	2.29	2.66	6.51	3.82
46	Q-MED	2.68	2.56	6.16	3.80
47	LINDAB	3.41	1.82	6.16	3.80
48	BILIA	3.38	1.82	6.16	3.79
49	PEAB	3.31	2.52	5.29	3.71
50	KLÖVERN	3.41	2.03	5.67	3.70
51	AARHUSKARLSHAMN	2.92	1.82	6.16	3.63
52	RNB	2.43	2.80	5.53	3.59
53	BIOVITRUM	2.38	2.17	6.16	3.57
54	AXIS	2.43	1.89	6.16	3.49
55	MILLICOM CELLULAR	1.40	2.56	6.48	3.48
56	HEXAGON	2.43	2.49	5.25	3.39
57	BE Group	2.66	1.23	6.27	3.38
58	HUFVUDSTADEN	3.80	2.00	4.34	3.38
59	MEDA	1.84	2.07	5.92	3.27
60	MTG	2.19	2.24	5.39	3.27
61	NIBE	4.06	1.51	3.92	3.16
62	SECURITAS	1.31	3.05	5.11	3.15
63	ACTIVE BIOTECH	2.29	1.54	5.57	3.13
64	INVESTOR	1.47	2.45	5.39	3.10
65	NISCAYAH	1.52	2.73	4.87	3.04
66	MEKONOMEN	1.21	1.51	6.20	2.97
67	BIOINVENT INTL.	1.40	1.02	6.30	2.91
68	ORC SOFTWARE	1.17	0.88	6.44	2.83
69	NEW WAVE GROUP	2.19	2.03	4.17	2.80
70	PA RESOURCES	1.38	0.81	6.20	2.79
71	KARO BIO	0.30	1.89	6.02	2.74
72	TELE2	1.52	1.23	5.18	2.64
73	LOOMIS	1.40	1.09	4.69	2.39
74	DIAMYD MEDICAL	1.66	0.95	4.38	2.33
75	AVANZA	0.00	1.23	5.64	2.29
76	LE LUNDBERG	1.66	0.88	4.06	2.20
77	UNIBET	0.00	0.49	5.88	2.12
78	EPICEPT	0.00	0.00	6.06	2.02
79	INVESTMENT ÖRESUND	0.00	0.00	5.53	1.84
80	VOSTOK NAFTA	0.00	0.00	5.36	1.79
81	BETSSON	0.19	0.25	4.17	1.53
82	ENQUEST	0.00	0.00	1.86	0.62

**Table 8** Calibrated UNPRI ESG (CSP) factors

Case #	MNE	Calibrated UNPRI ESG (CSP) Factors (Note: the $\sim$ (tilde) sign = 'negation of')							
		Enviro.	Social	Govern.	$\sim$ Enviro.	$\sim$ Social	$\sim$ Govern.	E-SG	$\sim$ (E-SG)
1	ABB	0.97	0.99	0.98	0.03	0.01	0.02	0.97	0.03
2	SKF	1.00	0.97	0.22	0.00	0.03	0.78	0.22	0.78
3	BOLIDEN	0.98	0.94	0.97	0.02	0.06	0.03	0.94	0.06
4	SCA	0.99	0.99	0.08	0.01	0.01	0.92	0.08	0.92
5	ELECTROLUX	0.98	0.98	0.37	0.02	0.02	0.63	0.37	0.63
6	STORA ENSO	0.99	0.97	0.26	0.01	0.03	0.74	0.26	0.74
7	TELLASONERA	0.90	0.97	0.98	0.10	0.03	0.02	0.90	0.10
8	SWEDBANK	0.90	0.97	0.98	0.10	0.03	0.02	0.90	0.10
9	BILLERUD	0.98	0.77	0.93	0.02	0.23	0.07	0.77	0.23
10	HOLMEN	0.98	0.99	0.02	0.02	0.01	0.98	0.02	0.98
11	ASTRAZENECA	0.96	0.97	0.24	0.04	0.03	0.76	0.24	0.76
12	SCANIA	0.98	0.96	0.13	0.02	0.04	0.87	0.13	0.87
13	SAS	0.91	0.91	0.96	0.09	0.09	0.04	0.91	0.09
14	TIETO	0.66	0.99	0.96	0.34	0.01	0.04	0.66	0.34
15	SKANSKA	0.95	0.96	0.22	0.05	0.04	0.78	0.22	0.78
16	AXFOOD	0.79	0.95	0.94	0.21	0.05	0.06	0.79	0.21
17	H&M	0.90	0.99	0.05	0.10	0.01	0.95	0.05	0.95
18	KAPPAAU	0.86	0.82	0.96	0.14	0.18	0.04	0.82	0.18
19	SHB	0.89	0.97	0.16	0.11	0.03	0.84	0.16	0.84
20	SANDVIK	0.90	0.72	0.92	0.10	0.28	0.08	0.72	0.28
21	NORDEA BANK	0.51	0.93	0.98	0.49	0.07	0.02	0.51	0.49
22	ALFA LAVAL	0.67	0.90	0.93	0.33	0.10	0.07	0.67	0.33
23	NOBIA	0.92	0.69	0.78	0.08	0.31	0.22	0.69	0.31
24	JM	0.73	0.73	0.97	0.27	0.27	0.03	0.73	0.27
25	REZIDOR	0.76	0.73	0.93	0.24	0.27	0.07	0.73	0.27

Case #	MNE	Enviro.	Social	Govern.	~ Enviro.	~ Social	~ Govern.	E*S*G	E*S*G
26	HUSQVARNA	0.97	0.44	0.37	0.03	0.56	0.63	0.37	0.63
27	ATLAS COPCO	0.81	0.91	0.19	0.19	0.09	0.81	0.19	0.81
28	SEB	0.60	0.98	0.12	0.40	0.02	0.88	0.12	0.88
29	AF	0.79	0.85	0.26	0.21	0.15	0.74	0.26	0.74
30	TRELLEBORG	0.84	0.86	0.13	0.16	0.14	0.87	0.13	0.87
31	HALDEX	0.66	0.66	0.90	0.34	0.10	0.66	0.34	0.34
32	SWED-MATCH	0.66	0.51	0.93	0.34	0.49	0.07	0.51	0.49
33	SSAB	0.82	0.82	0.08	0.18	0.18	0.92	0.08	0.92
34	ASSA	0.76	0.80	0.18	0.24	0.20	0.82	0.18	0.82
35	FABEGE	0.61	0.66	0.76	0.39	0.34	0.24	0.61	0.39
36	SAAB	0.86	0.54	0.22	0.14	0.46	0.78	0.22	0.78
37	CLAS OHLSON	0.50	0.72	0.56	0.50	0.28	0.44	0.50	0.50
38	LUNDIN MINING	0.44	0.66	0.76	0.56	0.34	0.24	0.44	0.56
39	ICA	0.35	0.42	0.98	0.65	0.58	0.02	0.35	0.65
40	AUTOLIV	0.50	0.42	0.81	0.50	0.58	0.19	0.42	0.58
41	SECO TOOLS	0.77	0.56	0.08	0.23	0.44	0.92	0.08	0.92
42	NCC	0.91	0.46	0.01	0.09	0.54	0.99	0.01	0.99
43	GETINGE	0.50	0.69	0.13	0.50	0.31	0.87	0.13	0.87
44	ORIFLAME	0.34	0.48	0.87	0.66	0.52	0.13	0.34	0.66
45	LUNDIN PETROL	0.20	0.46	0.98	0.80	0.54	0.02	0.20	0.80
46	Q-MED	0.29	0.41	0.90	0.71	0.59	0.10	0.29	0.71
47	LINDAB	0.50	0.13	0.90	0.50	0.87	0.10	0.13	0.87
48	BILJA	0.49	0.13	0.90	0.51	0.87	0.10	0.13	0.87
49	PEAB	0.47	0.39	0.22	0.53	0.61	0.78	0.22	0.78
50	KLÖVERN	0.50	0.19	0.52	0.50	0.81	0.48	0.19	0.81
51	AARHUS	0.35	0.13	0.90	0.65	0.87	0.10	0.13	0.87

(continued)

Table 8 (continued)

Case #	MNE	Calibrated UNPRI ESG (CSP) Factors (Note: the $\sim$ (tilde) sign = 'negation of')						E-SG	$\sim(E\bullet S\bullet G)$
		Enviro.	Social	Govern.	$\sim$ Enviro.	$\sim$ Social	$\sim$ Govern.		
52	RNB	0.23	0.52	0.39	0.77	0.48	0.61	0.23	0.77
53	BIOVITRUM	0.22	0.24	0.90	0.78	0.76	0.10	0.22	0.78
54	AXIS	0.23	0.15	0.90	0.77	0.85	0.10	0.15	0.85
55	MILLICOM CELL	0.08	0.41	0.97	0.92	0.59	0.03	0.08	0.92
56	HEXAGON	0.23	0.37	0.19	0.77	0.63	0.81	0.19	0.81
57	BE Group	0.28	0.05	0.93	0.72	0.95	0.07	0.05	0.95
58	HUFVUDSTADEN	0.66	0.18	0.01	0.34	0.82	0.99	0.01	0.99
59	MEDA	0.12	0.20	0.76	0.88	0.80	0.24	0.12	0.88
60	MTG	0.18	0.27	0.28	0.82	0.73	0.72	0.18	0.82
61	NIBE	0.75	0.08	0.00	0.25	0.92	1.01	0.01	0.99
62	SECURITAS	0.07	0.65	0.13	0.93	0.35	0.87	0.07	0.93
63	ACTIVE BIO	0.20	0.08	0.43	0.80	0.92	0.57	0.08	0.92
64	INVESTOR	0.08	0.35	0.28	0.92	0.65	0.72	0.08	0.92
65	NISCAYAH	0.09	0.49	0.06	0.91	0.51	0.94	0.06	0.94
66	MEKONOMEN	0.06	0.08	0.91	0.94	0.92	0.09	0.06	0.94
67	BIOINVENT	0.08	0.03	0.94	0.92	0.97	0.06	0.03	0.97
68	ORC SOFTWARE	0.06	0.02	0.97	0.94	0.98	0.03	0.02	0.98
69	NEW WAVE	0.18	0.19	0.01	0.82	0.81	0.99	0.01	0.99
70	PA RESOURCES	0.07	0.02	0.91	0.93	0.98	0.09	0.02	0.98
71	KARO BIO	0.02	0.15	0.83	0.98	0.85	0.17	0.02	0.98
72	TELE2	0.09	0.05	0.16	0.91	0.95	0.84	0.05	0.95
73	LOOMIS	0.08	0.03	0.03	0.92	0.97	0.97	0.03	0.97
74	DIAMYD	0.10	0.03	0.01	0.90	0.97	0.99	0.01	0.99
75	AVANZA	0.01	0.05	0.49	0.99	0.95	0.51	0.01	0.99

76	LE LUNDBERG	0.10	0.02	0.00	0.90	0.98	1.01	0.01	0.99
77	UNIBET	0.01	0.01	0.73	0.99	0.99	0.27	0.01	0.99
78	EPIC EPT	0.01	0.00	0.85	0.99	1.01	0.15	0.01	0.99
79	INVEST ÖRES.	0.01	0.00	0.39	0.99	1.01	0.61	0.01	0.99
80	VOSTOK NAFTA	0.01	0.00	0.26	0.99	1.01	0.74	0.01	0.99
81	BETSSON	0.02	0.01	0.01	0.98	0.99	0.99	0.01	0.99
82	ENQUEST	0.01	0.00	0.00	0.99	1.01	1.01	0.01	0.99

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