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Configurations of effectuation, causation, and bricolage: implications for firm growth paths

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Abstract This study examines how firms' decision-making logics and entrepreneurial resourcing behaviors combine to create value. We conduct a qualitative comparative analysis investigating configurations of effectuation, causation, and bricolage that are associated with firm performance. We consider firm size and development stage as contextual factors that differentiate the effectiveness of ways in which firms combine effectuation, causation, and bricolage. Using a sample of 305 Chinese firms, we find six solutions explaining entrepreneurial processes in high-performing firms. Based on a comparison of effective configurations across firm size and development stages, we theorize three paths along which small early-stage firms can evolve into large late-stage firms while maintaining high performance.

Keywords Effectuation · Causation · Bricolage · Firm performance · Qualitative comparative analysis (QCA)

JEL classification L26 · M10 · M13

1 Introduction

Over the past decade, the two theoretical concepts of effectuation and bricolage have gained prominence in the study of entrepreneurial processes (Fisher 2012). The effectuation perspective, introduced by Sarasvathy (2001), distinguishes effectuation and causation as two alternative decision-making logics in new ventures. Bricolage, on the other hand, was defined by Baker and Nelson (2005) as a form of entrepreneurial resourcing behavior that allows new ventures to cope with resource-scarce environments.

The two perspectives developed to a large extent independently from one another, with most previous studies focusing exclusively on effectuation (e.g., Sarasvathy 2001; Dew et al. 2009; Yang and Gabrielsson 2017) or on bricolage (e.g., Baker and Nelson 2005; Duymedjian and Rüling 2010; Senyard et al. 2014). Some studies have suggested combining effectuation and bricolage in order to better understand complex entrepreneurial processes, arguing, for

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example, that effectuation, causation, and bricolage can coexist (Fisher 2012). Most of these studies, however, have focused on comparing and contrasting the two perspectives without exploring their interaction. In a recent conceptual paper, Welter et al. (2016) theorized how effectuation and bricolage combine to create value but did not offer empirical evidence. As a consequence, we still know very little about how effectuation, causation, and bricolage relate to each other and how their combination relates to firm performance. Other studies have explored the influence of contextual factors, such as firm size (Terwiesch and Ulrich 2008; Senyard et al. 2009; Berends et al. 2014) and firm development stage (Sarasvathy 2008; Brinckmann et al. 2010; Banerjee et al. 2013; Maine et al. 2015; Reymen et al. 2015) on effectuation, causation, and bricolage, but also without considering their combination. In addition, most previous studies focused primarily on small and early-stage firms, leaving the contexts of large and later-stage firms unexplored. As a consequence, whether and how effective combinations of effectuation, causation, and bricolage differ across firm contexts remain unclear.

Our study seeks to examine how firm-level decision-making logics, resourcing behavior, and contextual factors combine to yield high performance. Specifically, it addresses the following research questions: *(1) Which configurations of effectuation, causation, and bricolage are associated with high firm performance? (2) How do these configurations differ across firm contexts defined by firm size and development stage?*

We use qualitative comparative analysis (QCA) to investigate the above-mentioned research questions with a survey-based sample of 305 Chinese firms. Recently introduced to the field of management research (Fiss 2009), QCA relies on set theory and Boolean algebra, and it has been recognized as a well-structured method to identify configurations of conditions associated with an outcome (Wagemann et al. 2016).

Our results provide evidence that successful configurations of effectuation, causation, and bricolage vary across firm contexts. Moreover, on the basis of a comparison of our solutions across firm size and development stages, we theorize three paths for the effective transitions on the situations of small young firms growing up.

Our study contributes to the entrepreneurship literature in three ways. First, it proposes a more comprehensive theoretical framework to investigate how combinations of effectuation, causation, and bricolage are associated with performance in various firm contexts. Second, it extends the focus of previous effectuation research toward larger and later-stage firms and addresses the question of effective development of entrepreneurial processes as firms grow and mature. Third, we propose three possible growth paths requiring shifts in the configurations of effectuation, causation, and bricolage.

2 Theoretical framework

Effectuation describes a decision-making logic employed in uncertain new venture creation settings and has been contrasted with causation (Sarasvathy 2001; Read et al. 2009). Bricolage, on the other hand, stands for a form of resourcing behavior that allows firms to cope with resource constraints (e.g., Senyard et al. 2014; Stinchfield et al. 2013). Because most entrepreneurial firms face both uncertainty and resource scarcity, entrepreneurs need to consider combinations of decision-making logics and resourcing behavior. In the following subsections, we briefly introduce and compare effectuation, causation, and bricolage; review previous research on firm size and firm development stage as contextual factors; and, then, argue for the need of a more integrative research approach.

2.1 Effectuation, causation, and bricolage

Since the initial conceptualization of effectuation by Sarasvathy (2001), effectuation and causation have been considered two dominant types of entrepreneurial decision-making logics (e.g., Brettel et al. 2012; Chandler et al. 2011; Reymen et al. 2015), reflecting firm-level strategic orientations (Werhahn et al. 2015). Causation is effects-driven, emphasizes expected returns, relies on competitive analysis, and seeks to avoid the unexpected, whereas effectuation is means-driven, emphasizes affordable losses, and focuses on building strategic partnerships and embracing the unexpected (e.g., Sarasvathy 2001; Dew et al. 2009; Reymen et al. 2015).

Theoretical and empirical findings about the relation between effectuation and causation are inconclusive. Whereas a majority of previous studies have considered effectuation and causation incompatible (e.g., Corner and Ho 2010; Chandler et al. 2011; Brettel et al. 2012), others have argued that effectual and causal logics can coexist at the firm level (e.g., Fisher 2012; Reymen et al. 2015). The coexistence of causation and effectuation can take the following three forms: a combination of the two logics at the same time (Brettel et al. 2012), the dominance of logics at different moments in time (Nummela et al. 2014; Reymen et al. 2015; Smolka et al. 2016), and their temporal coexistence in separate functional areas (Sarasvathy 2001). Despite these studies, however, we still lack clear empirical evidence about the relationship between effectuation and causation and its performance implications.

In addition to decision-making logics, resourcing behavior is critical for entrepreneurial firms. Borrowing the concept of bricolage from French anthropologist Levi-Strauss (1966), Baker and Nelson (2005: 333) defined bricolage as "making do by applying combinations of resources at hand to new problems and opportunities." The three main characteristics of bricolage include making do, the use of resources at hand, and the combination of these resources for new purposes (Baker and Nelson 2005). As it allows the alleviation of resource constraints, bricolage has been shown to enhance the chances of survival of entrepreneurial firms (Stinchfield et al. 2013; Rego et al. 2014). Table 1 summarizes the main theoretical assumptions and characteristics of effectuation, causation, and bricolage.

2.2 Contextual factors: firm size and development stage

Previous research has recognized firm size and firm development stage as particularly important contextual factors (Sarasvathy 2001; Senyard et al. 2009; Berends et al. 2014; Reymen et al. 2015). Firm size captures not only the scale of firms' activities but also other characteristics, such as resource endowment, flexibility, and skills (Berends et al. 2014). Based on organizational life cycle models (Greiner 1972; Kazanjian 1988; Dodge et al. 1994), firm development stage reflects the idea that organizations experience typical patterns of evolution over time. Previous studies have suggested various ways to classify firm development stage, such as distinguishing conception and development, commercialization, growth, consolidation, and maturity (Galbraith 1982; Brettel et al. 2012), or separating growth, maturity, and decline (Miles et al. 1993; Karniouchina et al. 2013). Despite these differences, most of the previous literature agrees on a basic distinction between early and late development stages (e.g., Hanks et al. 1994; Sharma and Salvato 2011; Brettel et al. 2012). Early stages are characterized by scarce resources and uncertain environments, whereas firms tend to face the opposite conditions during later development stages. Taken together, firm size and development stage define firm-level contexts that bear on the effectiveness of decision-making logics and entrepreneurial resourcing behavior.

Previous research has separately studied moderating effects of firm size and development stage on the link between effectuation, causation, and bricolage, on the one hand, and firm performance, on the other. Regarding firm size, research has found that best practices regarding effectuation and causation differ between small and large firms (e.g., Berends et al. 2014), with causation seeming beneficial for larger firms (Terwiesch and Ulrich 2008), and effectuation more adapted to smaller firms (Berends et al. 2014). Bricolage, likewise, was found to be more strongly present among small firms (Senyard et al. 2014).

Concerning firm development stage, Sarasvathy (2001, 2008) as well as Reymen et al. (2015) argued that effectuation is more successful in early-stage firms than in large and mature firms. In a similar vein, Brinckmann et al. (2010) found that formal planning (reflecting causation) is more effective during venture expansion than during early-stage venture formation. Firm development stage has also been shown to influence the effectiveness of bricolage. Senyard et al. (2009) argued that bricolage is an effective approach for early-stage organizations, whereas it may harm performance as firms mature. Moreover, bricolage was found to be used more extensively in startups than in incumbent firms (Banerjee et al. 2013).

To summarize, the literature highlights several factors that interact in driving firm performance. In the present study, we seek to better understand how entrepreneurial decision-making logics (effectuation and causation) and resourcing behavior (bricolage) combine in various contexts (defined by firm size and development stage) to produce high performance.

3 Data and methods

To investigate the association of combinations of effectuation, causation, and bricolage with firm performance, we adopted fuzzy-set QCA as a research approach (Ragin 2008). From its roots in comparative political analysis (Ragin 2000), QCA has developed over the

Table 1 Causation, effectuation, and bricolage

	Effectuation	Causation	Bricolage
Attribute	Decision-making logic	Decision-making logic	Resourcing behavior
Theoretical foundation	Bounded rationality stemming from perceptions of uncertainty	Rational decision-making perspectives of neoclassical microeconomics	Penrose's distinction of resources and services: a resource can be viewed as a bundle of possible services
Underlying assumption	"To the extent we can control the future, we do not need to predict it."	"To the extent we can predict the future, we can control it."	"Resource environments are socially constructed rather than predefined."
Principles or elements	Means driven; affordable loss; partnerships; acknowledging the unexpected	Goals driven; expected returns; competitive analysis; avoiding the unexpected	Making do; resources at hand; recombination
Processes	Start from means to allow the effect to emerge	Select means to create a given effect	Making do with the resources at hand
Applicable contexts	Dynamic, non-linear, and ecological environment	Static, linear, and independent environment	Resource-scarce environment
Main theoretical contributions	Sarasvathy (2001); Sarasvathy (2008); Dew et al. (2009); Read et al. (2009); Chandler et al. (2011); Brettel et al. (2012); Fisher (2012); Berends et al. (2014); Maine et al. (2015); Reymen et al. (2015); Smolka et al. (2016); Welter et al. (2016)	Sarasvathy (2001); Sarasvathy (2008); Dew et al. (2009); Read et al. (2009); Chandler et al. (2011); Brettel et al. (2012); Fisher (2012); Berends et al. (2014); Maine et al. (2015); Reymen et al. (2015); Smolka et al. (2016)	Baker and Nelson (2005); Senyard et al. (2009); Duymedjian and Rüling (2010); Fisher (2012); Banerjee et al. (2013); Stinchfield et al. (2013); Senyard et al. (2014); Welter et al. (2016)

past decade into a research approach that is increasingly used in strategy, organization, and entrepreneurship research to identify configurations of conditions associated with an outcome (Fiss 2007; Wagemann et al. 2016). This development was fueled by the important shift from crisp-set algorithms (requiring a dichotomous treatment of set membership) to the development of fuzzy-set algorithms, which allows us to account for partial set membership of cases (Ragin 2008), and by the development of "best practices" to enhance the robustness of QCA analyses (Schneider and Wagemann 2010, 2012; Wagemann et al. 2016).

Other than conventional correlational methods, which rely on covariation to identify the average "net effects" of single variables, QCA identifies *configurations* of conditions that are jointly associated with an outcome (Fiss 2007; Goertz and Mahoney 2012; Ragin 2008).

3.1 Data collection

The data used in our study were collected through a survey using a questionnaire designed on the basis of previous high-validity studies (Brettel et al. 2012; Senyard et al. 2014; Wiklund and Shepherd 2005; Van Doorn et al. 2013). We, first, developed an English version of our questionnaire, which underwent two rounds of translation into Chinese by two independent translators and back-translation into English to ensure conceptual equivalence between the two languages. To make the survey respondent-friendly, we surveyed randomly selected managers from five firms who confirmed the relevance and wording of the survey items. These processes ensured that our questionnaire had content validity.

The reliability of our instrument was, then, pretested with an initial sample of 44 firms. The individual reliability of each construct was greater than the minimum acceptable Cronbach's α of 0.7, thus indicating high reliability (Nunally and Bernstein 1994). The results of confirmatory factor analysis (CFA) showed sufficient fit between the hypothesized measurement model and the observed data ($\chi^2 = 86.595$, df = 79, χ^2/df = 1.096, RMSEA = 0.047, CFI = 0.977, TLI = 0.966, SRMR = 0.078). Taken together, the pretest results provided support for convergent validity (Fornell and Larcker 1981).

The overall data collection period (including the pretest) lasted from December 2013 to July 2015. We collected data from firms located in the Chinese regions of Beijing, Shanghai, Guangzhou, Zhejiang, and Sichuan, focusing on firm owners and executives in charge of marketing, product development, and finance.

To do so, we first used a list of members of the Federation of Industry and Commerce in each region to randomly generate a list of senior managers from 3000 firms (e.g., CEOs, vice presidents, senior marketing managers, and senior financial managers). We, then, trained ten research assistants to contact the companies, explain the purposes of the study, and ask respondents whether they would participate in the survey. We also promised to provide a detailed report of our analysis. Regarding the firms that agreed to participate, our assistants sent the questionnaire by email or via the Wechat messaging platform. We received a total of 321 responses and removed 16 incomplete questionnaires (due to missing data or ambiguous responses), which resulted in 305 usable questionnaires. The overall response rate was 10.17%, which is comparable and within the 10 to 12% range of response rates that are typical for CEO surveys (e.g., Hambrick et al. 1993; Geletkanycz 1997). Table 2 summarizes the main sample characteristics.

Non-response bias and common method variance are two concerns in survey studies. We compared the differences in controls and other constructs between early and late batches of respondents (Armstrong and Overton 1977; Cheng et al. 2013). The *t* tests showed strong stability between the two batches ($p > 0.05$), suggesting low non-response bias. Following Chang et al. (2010) as well as Podsakoff et al. (2003), we conducted multiple statistical tests to examine common method variance. First, the unrotated principle component factor solution of Harman's one-factor test showed that the first factor accounted for 23.08% and the largest four factors together for 42.77%. Our results also yielded more than five components with eigenvalues much greater than 1, indicating that neither a single factor nor a general factor accounted for the majority of the covariance. Second, we assessed a model linking all items of the core constructs (i.e., effectuation, causation, bricolage, and firm performance) to a single factor. This model showed poor fit (i.e., $\chi^2 = 1544.98$; df = 170; χ^2/df = 9.09; CFI = 0.57; TLI = 0.52; RMSEA = 0.163). Third, we adopted Podsakoff et al.'s (2003) "single-common-method-factor approach" to assess the possibility of common method bias. The four-factor model showed good fit (i.e., $\chi^2 = 349.33$; df = 164; χ^2/df = 2.13; CFI = 0.94; TLI = 0.93; RMSEA = 0.061), and the fit improved only slightly after we added a latent method factor (i.e., $\chi^2 = 260.64$; df = 144; χ^2/df = 1.81; CFI = 0.96; TLI = 0.95; RMSEA = 0.052). Taken together, these results indicate that common method variance did not cause serious bias in our data.

Table 2 Characteristics of the research sample

		Number of firms	Percentage (%)
Firm age (years)	≤ 3	33	10.82
	3–8	84	27.54
	8–15	90	29.51
	> 15	98	32.13
Firm size (number of employees)	≤ 300	175	57.38
	300–500	33	10.82
	500–2000	36	11.80
	2000–5000	25	8.20
	> 5000	36	11.80
Firm development stage	Introduction	36	11.80
	Growth	154	50.49
	Maturity	93	30.49
	Decline	22	7.22
Industry	Agriculture	11	3.61
	Manufacture	146	47.87
	Service	148	48.52

3.2 Measurements

All four conditions used in our QCA analysis (effectuation, causation, bricolage, and performance) were measured with five-point Likert-type scales ranging from 1 (strongly disagree) to 5 (strongly agree).

Regarding firm performance, we decided to focus on financial performance as the most widely accepted performance dimension. Following prior studies by Wiklund and Shepherd (2005) and Van Doorn et al. (2013), we used four self-reported items, namely firm profitability, return on investment, return on sales, and return on assets (Cronbach's $\alpha = 0.93$, composite reliability (CR) = 0.93; average variance extracted (AVE) = 0.77). To safeguard against incorrect self-reporting of performance, we also collected objective performance data (net profit margin) from WIND and CSMAR databases for a subsample of 48 firms and found a significant correlation between the self-reported and objective performance measures ($r = 0.311$, $p < 0.05$), which supported the validity of our subjective performance measure.

To capture decision-making logics, we assessed causation ($\alpha = 0.87$; CR = 0.76; AVE = 0.45) and effectuation ($\alpha = 0.86$; CR = 0.74; AVE = 0.42) using a scale developed by Brettel et al. (2012). Following recent work by Blauth et al. (2014) and Appelhoff et al. (2016), we considered effectuation and causation as two independent constructs rather than the end points of a continuum as in Brettel et al. (2012). Moreover, as the scale was originally developed for the context of corporate R&D projects, we adapted it to explicitly address decision-making logics at the firm level. Bricolage was measured using eight items based on Senyard et al. (2009) and Senyard et al. (2014) ($\alpha = 0.91$; CR = 0.91; AVE = 0.55). All items used for assessing effectuation, causation, and bricolage are reported in Appendix 1.

For each latent construct, AVE (> 0.4) and CR (> 0.7) indicated good convergent validity (Hair et al. 1998). We, furthermore, employed CFA to evaluate the distinctiveness of the constructs. Table 3 shows the comparison among alternative factor models, suggesting that the four-factor model fit the observed data better than the alternatives ($\chi^2 = 349.33$; df = 164; χ^2/df = 2.13; CFI = 0.94; TLI = 0.93; RMSEA = 0.061) (Hair et al. 1998). In addition, all factor loadings in this model were significant. Taken together, these results indicated strong discriminant validity for the four constructs. Table 4 shows the descriptive statistics and correlations for the four conditions.

3.3 Constructing subsamples for firm size and development stages

We created four subsamples according to firm size and development stage. Firm size was measured by the number of employees (Baum et al. 2001; Stinchfield et al. 2013). We split our sample by categorizing firms with fewer than 500 employees as "small" and all others as "large" (Siu and Liu 2005). The contextual factor of firm development stage was captured with a four-stage self-classification scheme (introduction, growth, maturity, and decline) based on Sharma and Salvato (2011) with our survey instrument including descriptions of the characteristics of each stage. Our analysis followed previous studies by categorizing firms in introduction and growth stages as early-stage firms and firms in maturity and decline stages as late-stage firms (Sharma and Salvato 2011; Brettel et al. 2012). The resulting four subsamples comprised 147 small early-stage firms, 43 large early-stage firms, 61 small late-stage firms, and 54 large late-stage firms.

3.3.1 QCA analysis

QCA typically proceeds along a series of steps (e.g., Schneider and Wagemann 2010, 2012), which are represented in Fig. 1. Given the relative novelty of QCA in strategy and entrepreneurship research, we more generally introduce each step before presenting our concrete analytical process.

Step 1: calibration QCA, first, requires transforming raw data into set membership scores, a process referred to as "calibration" (Ragin 2008). Calibration requires setting three anchor points that define full set membership of a case in a set, full non-membership, as well as the point of maximum ambiguity between membership and non-membership. These anchor points need to be theoretically motivated and to build on substantive criteria external to the data (Ragin 2008). By convention, fuzzy-set membership scores range between 0 (full non-membership) and 1 (full membership), with 0.5 denoting the threshold between set membership and non-membership (Ragin 2008). For medium to large n studies, raw data are usually transformed into set membership scores by the so-called "direct method," using a logistic function in order to fit data in between the three qualitative anchors (Ragin 2008; Schneider and Wagemann 2012).

Because our data were based on Likert scales—and as we sought to capture with our sets the distinct *presence* of effectuation, causation, bricolage, and performance in a case—we put the 0.5 threshold for all sets at 3.5; that is, higher than the "neutral" Likert-scale value of 3. We used 5 as a value for full membership and 1 for full non-membership, and we employed the transformation function in the fs/QCA 2.0 software package (Ragin 2006) using the log odds of full membership to transform our original interval scale variables into continuous fuzzy membership scores (Ragin 2008; Fiss 2011).

Step 2: analysis of individually necessary conditions The second step tests whether any *individual* conditions are logically necessary for the outcome. This is required to avoid later steps that wrongly assume relationships of logical necessity (Schneider and Wagemann 2012: 278). In accordance with the QCA literature, we used fs/QCA 2.0 to test whether any of our three conditions (effectuation, causation, and bricolage) could be considered individually necessary for the outcome (high performance). A high threshold for the

Table 3 Confirmatory factor analyses

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA
Four-factor model	349.33	164	2.13	0.94	0.93	0.061
Three-factor model (causation and effectuation combined)	394.73	167	2.36	0.93	0.92	0.067
Three-factor model (effectuation and bricolage combined)	567.68	167	3.40	0.87	0.86	0.089
Two-factor model (causation, effectuation, and bricolage combined)	753.85	169	4.46	0.82	0.79	0.107
One-factor model (all constructs combined)	1544.98	170	9.09	0.57	0.52	0.163

assessment of the consistency of necessity is required to reduce the likelihood of logical contradictions and to avoid pitfalls of hidden or false necessary conditions (Schneider and Wagemann 2012).

The resulting consistency scores for the necessity of the three individual conditions (see Table 5) did not allow us to consider any of the conditions as individually necessary for high performance.

Step 3: truth tables and logical minimization To identify *combinations* of conditions that are logically *sufficient* for the presence of the outcome, the third step involves the construction of so-called truth tables, which represent in their rows all logically possible combinations of conditions. For each truth table row, a "consistency" measure indicates whether this combination of conditions can be interpreted as logically sufficient for the outcome. In practice, this step requires the definition of a consistency threshold below which a combination of conditions will not be considered sufficient.

After the identification of truth table rows sufficient for the outcome, a *logical minimization process*, using Boolean algebra, is used to yield a more parsimonious, overall solution term. An important aspect in this step concerns the problem of *limited empirical variety*—in other words, the decision whether to include in the logical minimization process truth table rows that are *not* covered by empirical evidence (Schneider and Wagemann 2012; Wagemann et al. 2016).

Table 4 Descriptive statistics and correlation

Variable	Mean	s.d.	1	2	3	4
1. Effectuation	3.61	0.48	1.000			
2. Causation	3.70	0.46	0.564*	1.000		
3. Bricolage	3.68	0.61	0.434*	0.382*	1.000	
4. Performance	3.42	0.78	0.251*	0.320*	0.412*	1.000

$N = 305$

* $p < 0.05$

After the calibration of all variables, we constructed one truth table for each of the four subsamples, which each represented in its eight rows (for n conditions, a truth table contains 2^n rows) all possible combinations of effectuation, causation, and bricolage (see Appendix tables 8, 9, 10 and 11 for the eleventh truth tables). Following standard QCA practice (e.g., Schneider and Wagemann 2012), we applied a frequency threshold to include only rows with at least three empirical cases in our analysis to prevent using rows with insufficient empirical evidence. For selecting sufficient truth table rows, we set relatively high consistency thresholds to derive solutions that could unambiguously be considered sufficient for high performance. We used 0.90 as a consistency threshold for small firms and 0.85 for large firms to reflect the lower consistency of truth table rows for large firms overall. We also assessed the score of each truth table row for so-called proportional reduction of inconsistency (PRI) (Schneider and Wagemann 2012: 241–244). PRI scores allow identification of truth table rows that are likely to be associated with both the outcome and its absence. To prevent such logical contradictions, we excluded all rows with a PRI < 0.5 from association with the outcome.

Logical minimization in our analysis used the Quine-McCluskey algorithm as implemented in the standard analysis procedure in the fs/QCA software package. The small number of truth table rows (three conditions yielding $2^3 = 8$ rows) combined with a relatively high number of cases largely mitigated the problem of limited diversity. For this reason, we did not make any directional assumptions regarding empty truth table rows, and the six resulting configurations, therefore, qualify as so-called "conservative" or "complex" solutions (Schneider and Wagemann 2012).

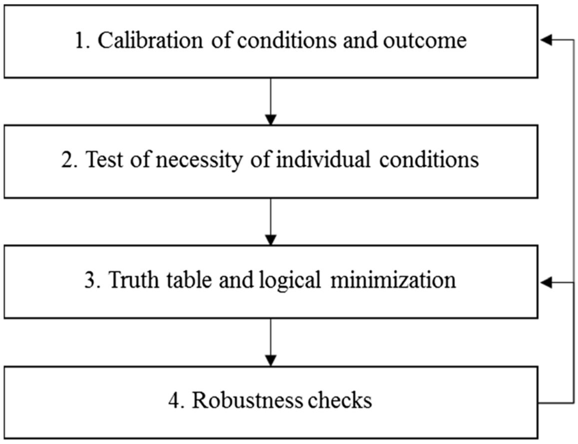

Fig. 1 QCA data analysis process

Step 4: robustness checks Our final step involved a series of robustness checks. The discussion of appropriate tests for the robustness of QCA analyses is not yet well developed in published empirical QCA studies in management (Wagemann et al. 2016). Actions proposed in the methods literature to assess the robustness of QCA results include the following: (1) analyses for the *absence* of the outcome, (2) varying calibration thresholds, and (3) varying consistency thresholds (e.g., Schneider and Wagemann 2010, 2012).

Our solutions for the *absence of the outcome* are shown in Appendix Table 12. All resulting solutions were logically incompatible with our main results (see subsequent texts); this observation confirms the absence of logically contradictory findings and strengthens our confidence in the calibration of conditions and in the analysis.

Results for the variation of crossover (0.5) calibration anchors and truth table consistency thresholds are listed in Appendix Table 13. For each of the four firm contexts, we generated solutions for lower (− 0.5) and higher (+ 0.5) calibration anchors, as well as for lower (− 0.05) and higher (+ 0.05) consistency thresholds, and we compared these solutions with the baseline scenario used in our main analysis. Lowering calibration anchors, in most cases, leads to decreases in solution coverage as in reduced explanatory power, whereas raising thresholds did not yield any consistent solutions. In addition, we varied the calibration anchor of our outcome condition (high performance) while keeping all other calibration anchors stable. This, likewise, did not result in any improvement of solutions (in terms of coverage or consistency) across the four firm contexts. Taken together, these observations corroborated our choice of crossover calibration anchors.

The variation in consistency thresholds did not produce any new or logically incompatible solution terms. For small early-stage and large late-stage firms, lower consistency thresholds (− 0.05) yielded logical supersets of the baseline solutions. For large early-stage firms, the solution was identical to the baseline scenario, and for small late-stage firms, the lowering of consistency thresholds produced a solution that was also present in the baseline case. Increasing the consistency thresholds (+ 0.05) led to the absence of consistent truth table rows (and, thus, the unavailability of solutions) for all four firm contexts. To summarize, the variation in consistency thresholds did not suggest any improvement of our results, thus corroborating the choices underlying our main data analysis.

4 Results

Our analysis yielded six combinations of conditions for high firm performance in the four different contexts under investigation. Table 6 summarizes our six solutions. In line with previous QCA studies, these solutions can be interpreted as alternative "recipes" or paths associated with the outcome.

Table 5 Analysis of individual necessity of conditions for high firm performance

	High performance			
	Early-stage		Late-stage	
Consistency of necessity	Small size	Large size	Small size	Large size
Bricolage	0.88	0.92	0.88	0.92
Causation	0.89	0.89	0.86	0.88
Effectuation	0.85	0.86	0.81	0.85

Table 6 Configurations of conditions for high firm performance

	Small size				Large size	
	Early stage		Late stage		Early stage	Late stage
	1a	1b	2a	2b	3	4
Causation	⊗	●	⊗		●	●
Effectuation	●	⊗		⊗	●	⊗
Bricolage	●	●	●	●	●	●
Consistency	0.89	0.89	0.90	0.89	0.85	0.86
Raw coverage	0.55	0.59	0.58	0.64	0.80	0.63
Unique coverage	0.05	0.09	0.04	0.10	0.80	0.63
Overall solution consistency	0.88		0.88		0.85	0.86
Overall solution coverage	0.64		0.68		0.80	0.63

Conditions in the solution terms are represented by ● (presence) and ⊗ (absence); a blank space indicates a "don't care" condition.

4.1 Small early-stage firms: effectuation-oriented vs. causation-oriented development

For small early-stage firms, we found two solutions (solutions 1a and 1b) that were present in 64% of all high-performing firms in the subsample. Solution 1a requires a combination of effectuation and bricolage and the absence of causation (effectuation ∗ ~causation ∗ bricolage), whereas solution 1b demands the combination of causation and bricolage and the absence of effectuation (~effectuation ∗ causation ∗ bricolage). Neither of these solutions allows combining effectuation and causation, and both require the presence of bricolage.

Solution 1a can be labeled *effectuation-oriented development*. Here, an effectual logic dominates, with firms focusing on flexibility and adaptation. The required absence of causation suggests that firms following this recipe do not engage in elaborate planning and prediction. This solution enables the enactment of experimental and iterative processes, retaining multiple open paths (Reymen et al. 2015). At the same time, bricolage in interaction with an effectual logic allows firms to "generate heterogeneous value from ostensibly identical resources" (Baker and Nelson 2005: 330), which can unlock value. Small early-stage firms often face abundant opportunities combined with high uncertainty and resource constraints. In this context, solution 1a creates value by exploiting opportunities effectually and leveraging existing resources in novel ways.

Solution 1b can be labeled *causation-oriented development*. In contrast from solution 1a, it relies on causation while excluding effectuation. Firms following this recipe set clear objectives and seek to follow optimal paths. They are likely to conduct thorough market research and competitive analyses to reduce uncertainty (Chandler et al. 2011). Although this solution requires the use of standardized resources, firms following this recipe nevertheless engage in bricolage as resource-generating behavior to complement, combine, and deploy resources.

4.2 Small late-stage firms: non-causation vs. non-effectuation maturity

For small late-stage firms, our analysis yielded two solutions (solutions 2a and 2b), which were present in 68% of all high-performing firms in this subsample. The main characteristic of these two solutions is that they combine bricolage with the absence of either causation (~causation ∗ bricolage) or effectuation (~effectuation ∗ bricolage). Effectuation in solution 2a and causation in solution 2b represent so-called "do not care" conditions (Fiss 2011: 407) or conditions whose presence or absence does not matter for the outcome. As in the case of small early-stage firms, neither solution allows for the combination of effectuation and causation, and both solutions require the presence of bricolage.

In solution 2a, which we propose to label *non-causation maturity*, the required absence of causation suggests that firms using this recipe do not follow a predetermined roadmap. Solution 2b, on the contrary, can be interpreted as *non-effectuation maturity*. Here, the absence of effectuation means firms following this recipe avoid any form of effectual reasoning. Instead of requiring the presence of either causation or effectuation, solutions 2a and 2b are characterized by the *absence* of one of the two logics. We think that small firms, even as they mature and face an increasing array of opportunities, continue to lack the organizational and marketing capabilities of larger firms (Berends et al. 2014). Their resources and skills often remain limited, and they need to choose specifically which logic *not* to follow—a choice that has been emphasized as an important source of value creation (Porter 1996).

4.3 Large early-stage firms: hybrid-logic advancement

For large early-stage firms, our analysis yielded only one solution (solution 3), which was present in 80% of all high-performing firms in this subsample, and which requires the combination of the three conditions (effectuation ∗ causation ∗ bricolage).

We propose to label this configuration *hybrid-logic advancement*. The context of large early-stage firms can be understood through the idea of "born giants" (Knight and Cavusgil 2004) or firms that grow very rapidly either externally (through mergers, takeovers, or acquisitions) or internally (by adopting platform or franchising strategies) (Combs and Castrogiovanni 1993). Such firms are characterized by a high volume of operations and often multiple business units or branches (including, for example, numerous geographical sites) (Lu and Beamish 2001); yet, they still face the typical early-stage problems of high uncertainty as well as the challenges of advancing into a more mature development stage. By combining causation, effectuation, and bricolage, hybrid-logic advancement enables large early-stage firms to achieve effectiveness in decision-making across multiple units.

4.4 Large late-stage firms: causation-oriented maturity

For large late-stage firms, our analysis yielded a single solution (solution 4), which was present in 63% of all high-performing firms in the subsample. Characteristic for this solution are the combination of causation and bricolage and the absence of effectuation (~effectuation ∗ causation ∗ bricolage).

Our solution for large late-stage firms corresponds to a recipe which we propose to label *causation-oriented maturity*. Large late-stage firms are often characterized by well-established products and high customer loyalty. Because they have been in their respective markets for years, offering products or services that customers use on a regular basis, a dominant causation-oriented logic in combination with bricolage (as an ability to effectively use resources at hand) can stabilize profitability as firms grow and mature. Large late-stage firms often face organizational inertia (Kelly and Amburgey 1991), tend to focus on extracting profits from current products or services, and are often less able to capitalize on new opportunities (Agarwal and Audretsch 2001). As they grow older, large late-stage firms might gradually slip into a dominant logic of causation. In this situation, bricolage provides a resource complement. Table 7 provides an overview of the solutions for all firm contexts together with their performance drivers.

5 Discussion

As we have argued in the literature review section previously, most previous studies in the entrepreneurship literature have examined effectuation and bricolage separately (e.g., Sarasvathy 2001; Dew et al. 2009; Baker and Nelson 2005; Senyard et al. 2014), and even though recent studies addressed their coexistence in entrepreneurial processes (e.g., Fisher 2012; Welter et al. 2016), we still know little about how they interact and how their combination affects firm performance. The results of our study suggest that successful configurations of effectuation, causation, and bricolage vary across firm sizes and development stages.

5.1 Configurations of effectuation, causation, and bricolage

One of the main findings of this study concerns the complementary relationship between decision-making logics and bricolage. As a component of all solutions terms, bricolage systematically supports entrepreneurial decision-making logics. Whereas previous bricolage studies focused on newly created firms (Senyard et al. 2014), considering bricolage as a mechanism to cope with resource scarcity, our study suggests that bricolage

Table 7 Summary of configurations and contexts for high performance

Firm contexts	Overall logic	Solution	Configuration	Underlying drivers and constraints
Small early-stage firms	Either/or (concentrating on one logic, avoiding the other)	Effectuation-oriented development (1a)	Effectuation, absence of causation, bricolage	Flexible and adaptive approach, experimental and iterative learning, multiple open paths
		Causation-oriented development (1b)	Causation, absence of effectuation, bricolage	Clear objectives, optimal path, focus and stability
Small late-stage firms	Exclusion (selecting what not to do)	Non-causation maturity (2a)	Absence of causation, bricolage	Relatively flexible and adaptive, open to opportunities, broader range of non-causal approaches, clear choice which logic not to adopt
		Non-effectuation maturity (2b)	Absence of effectuation, bricolage	Relatively causal, a broader range of non-effectual approaches, clear choice which logic not to adopt
Large early-stage firms	Hybrid (combining different logics)	Hybrid-logic advancement (3)	Effectuation, causation, bricolage	Combining causation and effectuation, separate sets of guiding principles create strong need for internal coordination
Large late-stage firms	Causation	Causation-oriented maturity (4)	Causation, absence of effectuation, bricolage	Clear objectives, exploitation of existing resources and capabilities, stability

also plays an important role in large and late-stage firms. As a consequence, bricolage should not just be seen as a mechanism to cope with resource scarcity by mobilizing all available "resources at hand" (Baker and Nelson 2005), but also as an important, more general mechanism of resource creation based on subjective construction (An et al. 2018; Duymedjian and Rüling 2010). By considering bricolage as an ability to overcome limitations concerning existing resources and their uses (Phillips and Tracey 2007), any firm can potentially engage in bricolage to repackage and recombine resources through "creative reinvention" (Rice and Rogers 1980).

A second implication of our findings concerns the relationship between effectuation and causation. As we have argued in our review of the previous literature, extant research seems inconclusive in this respect. Our results suggest that effectuation and causation can be mutually exclusive or complementary, depending on firm contexts. When firms lack resources and capabilities, especially when they are small and young, firms need to focus on either effectuation or causation to be successful. Once a firm has settled on one of the logics, the other one should be avoided because the two logics would potentially compete for scarce resources and management attention. Moreover, our study suggests that causation and effectuation are incompatible for large late-stage firms. In this context, the use of a causation logic while avoiding effectuation is associated with high performance. This is consistent with the existing literature arguing that firms are more likely to turn toward causal decision-making as they grow (Reymen et al. 2015). However, for large early-stage firms, our findings suggest a more complementary relationship of causation and effectuation. Large size drives firms toward adopting a more causal decision-making logic (Kraaijenbrink et al. 2011). Yet, when these firms are still in an early development stage, effectuation allows firms to deal with the high level uncertainty they usually face (Sarasvathy 2001; Forster and York 2009). It is, therefore, necessary for such firms to combine causation and effectuation logics. As effectuation and causation compete for resources, however, their combination is only suitable when firms are large.

5.2 Paths of effectuation, causation, and bricolage across firm contexts

Although our data are not longitudinal in nature, we believe that the systematic comparison of solutions across the four firm contexts allows us to consider possible high-performance development paths that firms can take as they grow larger and mature. Our argument here builds on the idea that firms normally evolve from small to large and from the early-stage into late-stage contexts (Churchill and Lewis 1983). The differences between our solutions for various firms' contexts suggest that firms need to adapt their decision-making logics and resourcing behavior as they move from one context to another. The following subsections explore three paths requiring an evolution of combinations of effectuation, causation, and bricolage in order to maintain high firm performance. Figure 2 graphically represents the three paths.

Path 1: from causation-oriented development to causation-oriented maturity The first development path leads from causation-oriented development (solution 1b) to non-effectuation maturity (solution 2b), and, then, to causation-oriented maturity (solution 4). This path suggests that small early-stage firms can start out with a causation-oriented logic and stick to this logic until maturity (as long as they also engage in bricolage).

Starting out with a causation-oriented logic is an effective and secure approach for small early-stage firms. Small young firms generally have limited resources and capabilities (Van de Vrande et al. 2009), and their main challenges are to gain customers and to survive (Churchill and Lewis 1983). Through elaborate planning, information gathering, and following well-established best practices, small early-stage firms can rely on causal logic to organize effectively. We expect causation-oriented development to matter especially for small early-stage firms in the following three situations: (1) when entrepreneurs identify themselves with linear or expert career motives (Gabrielsson and Politis 2011), (2) when firms originate within preexisting organizations that follow well-established routines, and (3) in mature industries with well-established best practices.

When small, causation-oriented firms mature, causation-oriented development continues to function as an effective recipe for high performance (with solution 2b representing a logical superset of solution 1b). They can maintain their previous causal recipe and follow a predetermined roadmap. As long as they strictly avoid effectuation and engage in bricolage, they can continue to achieve high performance. Because of their history and experience of causation, firms on this path should not quit this orientation by developing forms of effectual reasoning. Finally, when these firms at a later point in their life cycle grow into large and mature organizations, causation typically becomes an even more dominant driver of steady returns (solution 4) (Harting 2004; Berends et al. 2014; Reymen et al. 2015).

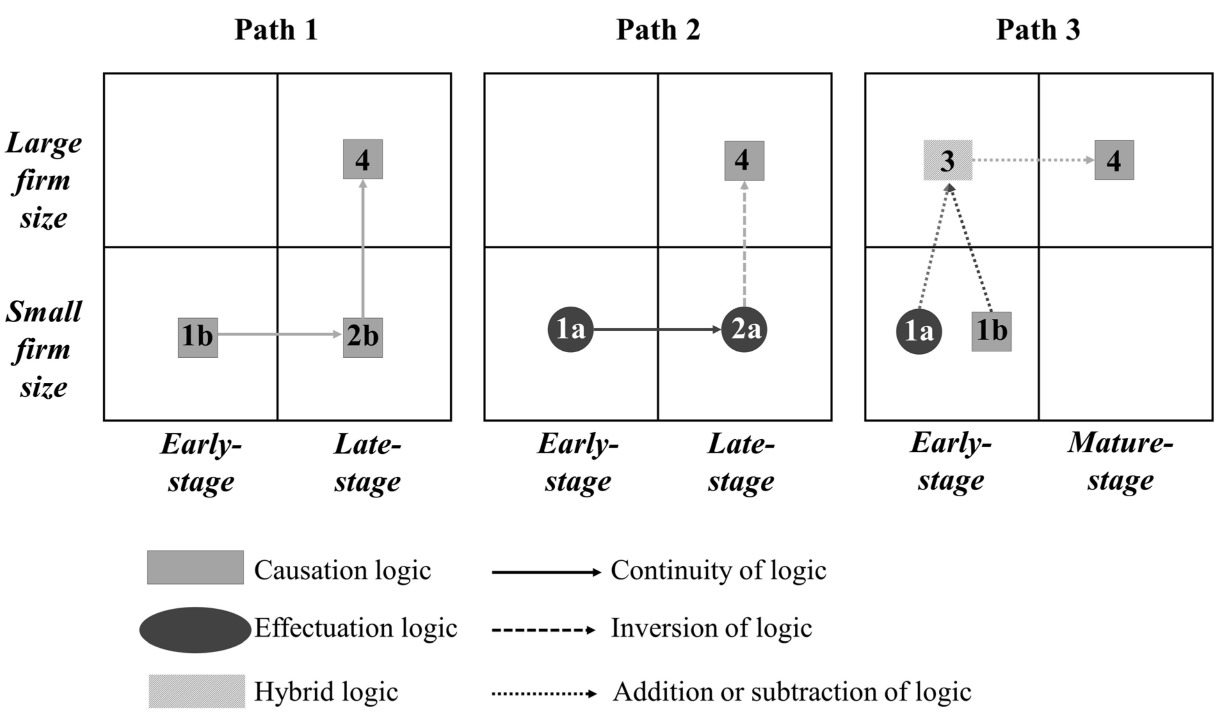

Fig. 2 High-performance firm development paths

Even though the end point on this path (solution 4) seems identical to its starting point (solution 1b), we believe that the underlying mechanisms differ. The causation-oriented logic adopted by small early-stage firms (solution 1b) corresponds to an autonomous and proactive option based on the idea that these firms "choose to adopt" a causal logic, whereas the causation-oriented logic characterizing high-performing large late-stage firms (solution 4) seems a more passive option, reflecting the fact that these firms "have to adopt" a causal logic. Here, resource and routine rigidity (Gilbert 2005) can cause large late-stage firms to slip gradually into a dominant logic of causation. Large late-stage firms usually have more established routines, structures, and processes that discipline the firms' actions and provide strategic purpose (Amburgey and Rao 1996; Henderson 1999). In this situation, one way to maintain competitive advantage is to exploit existing resources and capabilities. Decision-making logics emphasizing clear goals and detailed competitive analysis are more suitable when such firms aim for high profitability—provided they are combined with bricolage as a form of behavior that emphasizes the capacity to employ existing resources and capabilities in novel ways.

Overall, this path reflects a continuity of causation-oriented logic across firm contexts. We expect transitions on this path to be relatively smooth and incremental, as the dominant causal logic remains in place throughout a firm's trajectory. In a repetitive and incremental manner, such transitions lead to firms' refinement and consolidation toward success.

Path 2: from effectuation-oriented development to causation-oriented maturity The second path leads from effectuation-oriented development to causation-oriented maturity (corresponding to a shift from solution 1a to solution 2a and from there to solution 4). This path is characterized by a radical transition in decision-making logics, demanding a full shift from effectuation to causation in the later stage.

During earlier stages of firm development, a focus on effectuation enables small firms to explore and exploit abundant opportunities. As small, young firms enjoy greater flexibility through experimental and iterative learning, they can focus on short-term success and feedback (Sarasvathy 2001). When small, effectuating firms mature, one way to maintain success is to maintain their effectual approach while avoiding causation. As in the case of the previous path, firms evolving from solution 1a to 2a can maintain their effectual recipe. Therefore, no matter whether small young firms adopt either a causal or an effectual logic (solution 1a or 1b), they can maintain their dominant logic (or at least continue avoiding the opposite logic) as they mature, but only when they stay small and continue to engage in bricolage.

When small effectuating firms decide, at a later development stage, to expand to a larger scale (from solutions 2a to 4), an inversion in decision-making logics toward causation is required. Such an inversion may be trigged by radical strategic reorientation (Greenwood and Hinings 1996)—for example, when a firm enters a mature industry, replicates best practice, or expands through franchising. It can also be motivated by the decrease of perceived external uncertainty regarding both the business environment and the ventures' ability to respond (Jiang and Rüling in press). A full logic inversion may take a longer time period to implement, with CEO change and top management team turnover potentially facilitating such logic shifts (Ferreira et al. 2014).

The second path demands both continuity and inversion of strategic decision-making logics. During continuity of logic (from solutions 1a to 2a), the underlying strategic logic of effectual reasoning can remain unchanged (McAdam 2003). In inversion of logic (from solutions 2a to 4), "discontinuous change that requires upside down thinking" (Roffe 1999: 224) is needed to achieve the logic shift, finally reaching causation.

Path 3: from either/or to hybrid logic to causation-oriented maturity The third path leads from either/or logic development (solutions 1a and 1b) to hybrid logic advancement (solution 3) and from there to causation-oriented maturity (solution 4). This path reflects continuous adaptation over time, including both the shift to a hybrid logic that uses effectuation and causation simultaneously and the removal of effectual decision-making as a firm on this path matures.

Small early-stage firms on this path seek rapid growth by developing an ambidextrous logic that combines effectuation and causation with bricolage. This recipe enables firms that face challenges of extensive coordination and cooperation among divisions and activities to attain high performance. Here, being able to adopt and creatively combine logics of causation and effectuation seems essential. This can be achieved though "structural separation" (Jansen et al. 2009) when an effectual logic is, for example, adopted by R&D departments, whereas traditional functional departments or branches follow a more causal logic.

When large young firms on this path mature, they gradually withdraw from effectuation and shift toward a dominance of causation. We expect this withdrawal at a later stage to occur naturally and relatively smoothly. When decision-makers believe that their activities are measurable and relatively predictable, they will seek to increase efficiency with a high degree of causation logic.

5.3 Theoretical, empirical, and practice contributions

Our research makes three main theoretical contributions. First, we develop an integrative perspective combining effectuation, causation, and bricolage and explore their association with performance in different firm contexts. Although some recent studies have proposed connecting effectuation, causation, and bricolage (e.g., Welter et al. 2016), we still know very little about how these logics and behaviors interact and jointly affect firm performance. Our study has identified several successful configurations of effectuation, causation, and bricolage. Moreover, our findings suggest that contextual factors, such as firm size and development stage, affect the effectiveness of these configurations.

Second, our study proposes extending the focus of effectuation research from new venture settings to larger and later-stage firms. Prior studies of effectuation, causation, and bricolage have mostly focused on new ventures and, thus, tended to ignore their effects on large late-stage firms (e.g., Fisher 2012; Stinchfield et al. 2013; Senyard et al. 2014; Reymen et al. 2015). Our analysis yields a unique solution for large late-stage firms and suggests that this recipe clearly differs from those that are characteristic for new entrepreneurial ventures.

Third, we provide insights into the evolution of decision-making logics and entrepreneurial behaviors over firm life cycles. Prior studies of effectuation, causation, and bricolage mostly focused on single moments in time, and research examining the evolution of decision-making logics and bricolage is rare. Recently, Reymen et al. (2015) examined shifts of decision-making logics. Their study, however, only focused on the new venture creation process without addressing later phases. In the present study, the systematic comparison of solutions across firm contexts enabled us to discuss a limited number of possible paths along which small early-stage firms can profitably evolve into large and mature firms. We believe that the identification and discussion of these patterns has the potential to yield novel insights into the development of firm-level decision-making logics over time and provides a starting point for theorizing the transitions of configurations from a life cycle perspective.

Finally, we believe that our study also makes a case for QCA as an appropriate research approach for the investigation of configurations of causation, effectuation, and bricolage across firm contexts. By allowing for the coexistence of multiple "recipes" associated with an outcome and by emphasizing configurations instead of net effects, QCA enabled us to gain a deeper and more integrative understanding of complex combinations of effectuation, causation, and bricolage.

For managerial practice, our findings suggest that entrepreneurs and managers need to consider firm contexts—small versus large and early-stage versus late-stage firms—in order to develop appropriate decision-making logics and resource-generating behaviors. In addition, as firms grow, their ability to adapt and shift among logics becomes an essential entrepreneurial capability. Our findings also suggest that managers should not only keep their eyes on standardized resources but also need to resort to bricolage in order to creatively recombine and reinvent resources for value creation.

5.4 Limitations and future research

Our study is subject to several limitations that call for future research. The first limitation is related to the analytical focus of QCA on identifying combinations of conditions that are logically sufficient for an outcome, which leaves room for alternative paths not captured by our solutions (even though our solutions cover about two-thirds of all high-performing firms in our sample). Second, using the number of employees as a cutoff between large and small firms overlooks the differences across different locations and different industries. Future research could elaborate on this point to differentiate firm types based on more elaborate measures. Third, even though we used our solutions to propose and discuss paths of effectuation, causation, and bricolage over time, our data are not longitudinal in nature and do not provide full-fledged evidence of shifting patterns over time; this highlights a need for more truly longitudinal data collection and analysis of firm trajectories (Jiang and Rüling in press). Fourth, although firm size and development stage represent important contextual factors, the inclusion of environmental characteristics, such as the degree of uncertainty or industrial dynamism, could further enrich our understanding. Finally, our study focused on financial performance, and future studies could productively investigate and compare the association of effectuation, causation, and bricolage with other performance dimensions, such as growth performance or innovation performance. For example, we know from the literature that financial performance and growth performance do not necessarily coincide or can even be negatively related (Steffens et al. 2009). How they may be affected by effectuation, causation, and bricolage in different ways could open an interesting field for future research.

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Appendix 1

Measurement items for effectuation, causation, and bricolage

Effectuation—In the past three years, do the following statements represent how your firm went about doing business?

Preference for means

1. Firm activities were specified on the basis of given means/resources.
2. The targets were usually vaguely defined in the beginning.
3. Given means/resources had been the starting point.
4. The specification was predominantly based on given resources.
5. Given means had significantly impacted on the framework of the activity.

Preference for affordable loss

6. Considerations about potential losses were decisive for the selection of the option.
7. Budgets were approved on the basis of considerations about acceptable losses.
8. The selection of option was mostly based on a minimization of risks and costs.
9. Decisions on capital expenditures were primarily based on potential risks of losses.

Preference for partnerships

10. We tried to reduce risks through internal or external partnerships and agreements.
11. We jointly decided with our partners/stakeholders on the basis of our competences.
12. Our focus was rather on the reduction of risks by approaching potential partners and customers.
13. In order to reduce risks, we started partnerships and received precommitments.

Preference for acknowledgement

14. We always tried to integrate surprising results and findings during the process—even though this was not necessarily in line with the original target.
15. Our process was flexible enough to be adjusted to new findings.
16. New findings influenced the target.
17. The planning was carried out in small steps during the activity implementation.
18. Despite potential delays in execution, we were flexible and took advantage of opportunities as they arose.
19. Potential setbacks or external threats were used as advantageously as possible.

Causation—In the past three years, do the following statements represent how your firm went about doing business?

Preference for goals

1. Firm activities were specified on the basis of given targets.
2. The targets were clearly defined in the beginning.
3. Required means/resources have been determined on the basis of given targets.
4. The specification was predominantly based on given targets.
5. Given targets have significantly impacted on the framework of the activity.

Preference for expected returns

6. Considerations about potential returns were decisive for the selection of the option.
7. Budgets were approved based on calculations of expected returns (e.g., ROI).
8. The selection of the options was mostly based on analyses of future returns.
9. We mainly considered the potential odds of the activity.

Preference for competitive market analysis

10. We tried to identify risks of the activity through thorough market and competitor analyses.
11. We have analyzed the market and external trends to better assess future developments.
12. We have taken our decisions on the basis of systematic market analyses.
13. In order to identify risks, we focused on market analyses and forecasts.

Preference for overcoming the unexpected

14. We only integrated surprising results and findings when the original target was at risk.
15. Our processes focused on reaching the target without any delay.
16. New findings did not influence the target.
17. The planning was basically carried out at the beginning.
18. We first took care of reaching our initially defined targets without delays.
19. With the use of upfront market analyses, we tried to avoid setbacks or external threats.

Bricolage—In the past three years, do the following statements represent how your firm went about doing business?

1. We were confident of our ability to find workable solutions to new challenges by using our existing resources.
2. We gladly took on a broader range of challenges than others with our resources would be able to.
3. We used any existing resource that seemed useful to respond to a new problem or opportunity.
4. We dealt with new challenges by applying a combination of our existing resources and other resources inexpensively available to us.
5. When dealing with new problems or opportunities, we took action by assuming that we would find a workable solution.
6. By combining our existing resources, we took on a surprising variety of new challenges.
7. When we faced new challenges we put together workable solutions from our existing resources.
8. We combined resources to accomplish new challenges that the resources were not originally intended to accomplish.

Appendix 2

Truth tables

Table 8 Truth table for small early-stage firms

Row	Conditions			Number of cases	Raw consistency	PRI consistency	Outcome
	Causation	Effectuation	Bricolage				High performance
1	1	1	1	60	0.84	0.65	0
2	1	0	1	14	0.90	0.58	1
3	0	1	1	6	0.90	0.53	1
4	1	1	0	12	0.87	0.49	0
5	0	0	1	6	0.89	0.46	0
6	1	0	0	12	0.86	0.46	0
7	0	1	0	6	0.89	0.42	0
8	0	0	0	18	0.83	0.31	0

Table 9 Truth table for small late-stage firms

Row	Conditions			Number of cases	Raw consistency	PRI consistency	Outcome
	Causation	Effectuation	Bricolage				High performance
1	1	0	1	7	0.91	0.67	1
2	0	1	1	4	0.92	0.66	1
3	1	1	1	19	0.87	0.66	0
4	0	0	1	3	0.91	0.62	1
5	1	0	0	4	0.90	0.56	0
6	0	0	0	3	0.89	0.53	0
7	0	1	0	3	0.89	0.47	0
8	1	1	0	5	0.86	0.46	0

Table 10 Truth table for large early-stage firms

Row	Conditions			Number of cases	Raw consistency	PRI consistency	Outcome
	Causation	Effectuation	Bricolage				High performance
1	1	1	1	12	0.85	0.56	1
2	0	1	1	3	0.88	0.49	0
3	1	0	1	4	0.87	0.49	0
4	0	0	1	4	0.87	0.47	0
5	1	1	0	6	0.82	0.32	0
6	0	0	0	4	0.81	0.20	0
7	1	0	0	1	0.83	0.27	0
8	0	1	0	2	0.84	0.24	0

Table 11 Truth table for large late-stage firms

Row	Conditions			Number of cases	Raw consistency	PRI consistency	Outcome
	Causation	Effectuation	Bricolage				High performance
1	1	1	1	18	0.82	0.59	0
2	1	0	1	3	0.86	0.52	1
3	0	0	1	5	0.85	0.45	0
4	0	1	1	3	0.84	0.43	0
5	1	1	0	6	0.84	0.33	0
6	1	0	0	6	0.82	0.30	0
7	0	0	0	7	0.82	0.25	0
8	0	1	0	0			n/a

Appendix 3

Robustness checks

Table 12 Configurations for the *absence* of high firm performance

Entrepreneurial behaviors	Small size			Large size			
	Early stage		Late stage	Early stage		Late stage	
	1a	1b	2	3a	3b	4a	4b
Causation		⊗		⊗			●
Effectuation		⊗	●	⊗	●	⊗	
Bricolage	⊗		⊗		⊗	⊗	⊗
Consistency	0.84	0.84	0.88	0.89	0.90	0.92	0.90
Raw coverage	0.74	0.65	0.67	0.63	0.65	0.62	0.61
Unique coverage	0.14	0.51	0.67	0.12	0.14	0.05	0.04
Overall solution consistency	0.83		0.88	0.87		0.90	
Overall solution coverage	0.79		0.67	0.77		0.66	

Conditions in the solution terms are represented by ● (presence) and ⊗ (absence); a blank space indicates a "don't care" condition.

Table 13 Variation of calibration anchors and consistency thresholds

Firm context	Scenario	Solution term	Solution consistency	Solution coverage	Comment
Small early-stage firms	Baseline: calibration anchors at 3.5; consistency threshold at 0.9	CAU ∗ ~EFF ∗ BRI + ~CAU ∗ EFF ∗ BRI	0.88	0.64	
	Calibration anchors at 3.0	CAU ∗ ~EFF + ~CAU ∗ EFF ∗ BRI + CAU ∗ ~BRI + ~EFF ∗ ~BRI	0.88	0.51	Drop in coverage; new solution terms with very low unique coverage (0.042 and 0.0008)
	Calibration anchors at 4.0	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
	Consistency threshold at 0.85	CAU ∗ BRI + EFF ∗ BRI	0.82	0.85	Logical superset of the baseline solution
	Consistency threshold at 0.95	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
	Outcome calibration anchor at 3.0	BRI + CAU + EFF	0.83	0.91	Logical superset of the baseline solution
	Outcome calibration anchor at 4.0	Absence of consistent truth table rows	n/a	n/a	No consistent solution available
Small late-stage firms	Baseline: calibration anchors at 3.5; consistency threshold at 0.9	~CAU ∗ BRI + ~EFF ∗ BRI	0.88	0.68	
		CAU ∗ EFF ∗ ~BRI + CAU ∗ ~EFF ∗ BRI	0.97	0.51	

Table 13 (continued)

Firm context	Scenario	Solution term	Solution consistency	Solution coverage	Comment
	Calibration anchors at 3.0				Strong drop in coverage; second solution term is a subset of baseline scenario
	Calibration anchors at 4.0	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
	Consistency threshold at 0.85	~EFF * BRI	0.77	0.92	Solution term also present in baseline scenario; drop in overall solution consistency
	Consistency threshold at 0.95	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
	Outcome calibration anchor at 3.0	BRI + CAU + ~EFF	0.86	0.93	Logical superset of the baseline solution
	Outcome calibration anchor at 4.05	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
Large early-stage firms	Baseline: calibration anchors at 3.5; consistency threshold at 0.85	CAU * EFF * BRI	0.85	0.80	
	Calibration anchors at 3.0	CAU * EFF	0.82	0.89	Superset of baseline solution
	Calibration anchors at 4.0	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
	Consistency threshold at 0.80	CAU * EFF * BRI	0.85	0.80	Identical with baseline scenario
	Consistency threshold at 0.90	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
	Outcome calibration anchor at 3.0	BRI + CAU * EFF	0.86	0.92	Logical superset of the baseline solution
	Outcome calibration anchor at 4.0	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
Large late-stage firms	Baseline: calibration anchors at 3.5; consistency threshold at 0.85	CAU * ~EFF * BRI	0.86	0.63	
	Calibration anchors at 3.0	CAU * EFF * ~BRI	0.90	0.40	Strong drop in coverage
	Calibration anchors at 4.0	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
	Consistency threshold at 0.80	CAU * BRI	0.79	0.85	Superset of baseline solution
	Consistency threshold at 0.90	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available
	Outcome calibration anchor at 3.0	BRI + ~CAU * ~EFF + CAU * EFF	0.80	0.91	Logical superset of the baseline solution
	Outcome calibration anchor at 4.0	Absence of consistent truth table rows.	n/a	n/a	No consistent solution available

Notes: conditions on the solution terms in this table are represented by “CAU” for causation, “EFF” for effectuation, and “BRI” for bricolage. A tilde (~) indicates the *absence* of a condition

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