



Using fuzzy-set qualitative comparative analysis for a finer-grained understanding of entrepreneurship



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ABSTRACT

Entrepreneurship theory has largely been developed and tested using symmetrical correlational methods, effectively describing the sample-average respondent and subsuming individual differences. Such methods necessarily limit investigation of asymmetries that are evident in entrepreneurship, and provide only a single explanation that belies the multiple pathways to entrepreneurship observed in practice. This paper employs a case-based approach—fuzzy-set Qualitative Comparative Analysis (fsQCA)—to identify configurations of antecedent attributes of individuals in groups within samples, thereby revealing asymmetries and multiple entrepreneurial pathways that are otherwise hidden in the data. We explain the application of fsQCA to reveal these common issues in entrepreneurship; demonstrate how fsQCA complements correlational methods and offers finer-grained understanding of individual entrepreneurial behavior; and offer a comprehensive research agenda to build new entrepreneurship theory.

Executive summary

The great majority of entrepreneurship theory has been conceptualized to be tested using symmetric quantitative methods, such as multiple regression analysis and structural equation modeling. These traditional symmetric methods test relationships between proposed independent and dependent variables to explain entrepreneurial phenomena. Symmetric methods require the data to conform to restrictive assumptions, including normally distributed data, symmetric data relationships, and independence of the variables, and these restrictions limit the ability of these methods to deal with some of the complexity of entrepreneurial behavior that we observe. In effect, the complexity of entrepreneurial phenomena exceeds the capability of traditional methods to reflect important aspects of its heterogeneity.

Five main issues occur in entrepreneurship that are problematic for traditional symmetric methods, such that these issues have been afforded less research attention. First, the majority of key entrepreneurship variables exhibit highly skewed distributions, rather than being normally distributed around their means, necessitating data manipulation and the elimination of outlier observations, yet the skew and the outliers may be important in understanding the entrepreneurship context. Second, the heterogeneity of entrepreneurial behavior is reflective of inter-case differences amongst entrepreneurs and their ventures, whereas traditional methods are designed to capture the commonalities across all the cases, and necessarily suppress inter-case differences that may be causal for the observed heterogeneity. Third, entrepreneurial phenomena are often characterized by relationship asymmetry, meaning that an antecedent variable may be both positively and negatively associated with the outcome, for different cases. Symmetric methods find the single “net-effects model” which highlights the dominant relationship found and ignores any minority relationships that lie within

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the data. Fourth, entrepreneurial outcomes, whether at the individual, firm or institutional level of analysis, tend to be pursued after taking into account the interdependencies between and among the antecedent variables, yet traditional methods explain entrepreneurship phenomenon as the linear additive impact of the antecedent variables considered discretely – i.e. independently of the effect of other antecedent variables. Finally, we observe entrepreneurs and organizations taking a variety of pathways to entrepreneurial outcomes, yet traditional methods offer a single dominant net-effects explanation. Thus, symmetric methods cannot reveal important aspects of entrepreneurial heterogeneity (because it is not the method's purpose) that we observe in practice.

Fuzzy-set qualitative comparative analysis (fsQCA) provides a method to dig deeper into the data to reveal finer-grained detail about the complexity of entrepreneurial phenomenon. The fsQCA method accommodates data asymmetry, recognizes the potential interdependence of antecedent variables, identifies asymmetric data relationships, and reveals multiple equally-effective pathways to the same outcome, if they exist. FsQCA examines the within-case relationships among the antecedent variables (referred to as conditions), and characterizes cases as having a particular combination of conditions (known as a configuration) that associates with the dependent variable (known as the outcome). It discovers the configuration common to multiple cases who take a particular pathway to a given outcome, as distinct from those who take other pathways to the same outcome. FsQCA is thus complementary to traditional symmetric methods, adding finer-grained detail about entrepreneurial phenomena and providing an empirical basis for abduction, i.e., it can reveal surprising empirical findings to provoke new theory building efforts.

In this paper we outline the fsQCA method, demonstrate the additional information this method can provide from a given data set, and provide a comprehensive agenda for future entrepreneurship research where fsQCA can be used to complement traditional methods and thereby provide new information for future theory building. This paper provides motivation for entrepreneurial public policy on multiple fronts, rather than for “one-size-fits-all” policies. It similarly suggests that educators can go beyond the notion of the archetypical entrepreneur to encourage entrepreneurship by those who do not fit the classical mold, and that would-be entrepreneurs and investors should recognize that individuals exhibiting a variety of different configurations can act entrepreneurially and potentially achieve entrepreneurial success.

1. Introduction

Entrepreneurship theory has been built largely for testing by traditional symmetric analytical methods that seek to discover the general determinants of observed entrepreneurial phenomena. These methods, such as multiple regression analysis and structural equation modelling, require symmetric central tendency in the data employed, such that the mean and standard deviation statistics can be interpreted as representative of the data for each variable. Moreover, the data for each variable is assumed to be normally distributed around the sample (or by extension, the population) means. Symmetric methods effectively calculate the sample-average relationship between each independent variable and the dependent variable, to find the regression equation that purports to measure the influence of each independent variable on the specified dependent variable. The regression equation is the linear addition of the correlation coefficients of the independent variables with the dependent variable. Importantly, each independent variable is considered discretely, that is, holding constant the impact of all other independent variables on the dependent variable, except for a limited number of interactive terms that may be included in the analysis to reflect the hypothesized interdependence of two or more antecedent variables.

Entrepreneurship scholars are increasingly recognizing that traditional symmetric methods provide an incomplete toolkit for the study of entrepreneurial phenomena, which in most cases exhibit substantial heterogeneity (Shane and Venkataraman, 2000), such that the development of entrepreneurship theory is being limited by our reliance on the relatively simple explanatory models implicit in traditional analytical methods. First, these methods require data normally distributed about its mean, but for many key entrepreneurial variables the data is excessively skewed with some (outlier) data observations many times greater than three standard deviations from the mean (see Crawford et al., 2015). The traditional remedy for this problem is to conduct a mathematical (e.g., logarithmic) transformation of the data to achieve an approximately normal distribution for the offending variable, and to delete the remaining outliers. Yet many of entrepreneurship's most interesting cases may be outliers, and to eliminate them shifts the mean and standard deviation substantially, such that the regression equation no longer represents the average case, nor the population (Crawford et al., 2015; see also Wiklund et al., 2018).

Second, the average case is often of limited interest in entrepreneurship studies, in which the entrepreneurial entity is typically not the average individual, firm, or nation. While symmetric methods find the general drivers of an entrepreneurial phenomenon, which has value for identifying commonalities amongst the cases for entrepreneurship policy and other purposes such as education programs, our interest often lies in difference across the cases. For example, why do some nascent entrepreneurs proceed relatively quickly to launch while others are “still trying” years later? (Kautonen et al., 2015). Or, why are some new ventures “born global” while others restrict operations to their home market? (Knight and Cavusgil, 2004). Or, why do some nations spawn a relatively high proportion of new firms annually while others have a much lower rate of new venture formation? (Reynolds et al., 2005). While symmetric methods find antecedent variables that are statistically significant, the relationships (regression coefficients) they propose are reflective of the hypothetical-average case, rather than reflecting any specific case.

Third, some data relationships in entrepreneurship are likely asymmetric across cases—i.e., the relationship between an independent variable and the dependent variable may be positive for some cases and negative for other cases. For example, based on theorizing that there are competing demands between work and family responsibilities, being married might correlate negatively with starting a new venture. Yet we observe frequently cases in which the marital partner strongly supports the new venture formation and contributes a separate income source, pertinent knowledge, and/or emotional support (see Carter, 2011). Similarly, the level of education may correlate positively with new venture start-up rates across nations, but some countries with low education

levels may exhibit extraordinarily high start-up rates. Symmetric methods subsume the asymmetry of data relationships and provide a net-effects model of causality according to whichever sign of the relationship is in the majority. Thus, although the net effect might be that an antecedent variable is positively related to the dependent variable, within the sample there may be a minority of cases for which the relationship is negative, and others for which that antecedent variable has no influence on the focal outcome. Identifying and investigating the reasons for these differences will serve to advance our understanding of entrepreneurship.

Fourth, entrepreneurs are likely to use holistic reasoning (Magnussen & Torestad, 1993; Muñoz and Dimov (2015); Obschonka et al., 2013) to arrive at decisions after considering the interdependent interplay of personal and contextual factors that are salient to their personal wellbeing (for reviews see Stephan, 2018; Wiklund et al., 2019). Interdependent influences are also likely to be involved in the decision making at the firm or nation levels of analysis. Yet traditional symmetric methods are based on the logic of linear additive independent effects, in which the influence of the independent variables are considered discretely, except when the scholars hypothesize an interdependent relationship among two or more of the antecedent variables. Although it is relatively easy to theorize on two-way interactions and somewhat difficult for three-way interactions, higher order interactions become increasing difficult to hypothesize, which is necessary for deduction. Moreover, the addition of more explanatory variables (the interaction effects) reduces the “degrees of freedom” of the regression analysis. Exclusion of apparent interdependencies from the analysis, because the empirical method cannot accommodate such interdependencies, constrains theory development in empirical studies to that which can be tested by the method.¹

Fifth, entrepreneurial actors (individuals and organizations) are heterogeneous (Gartner, 1985; Venkataraman, 1997; Shane and Venkataraman, 2000), and entrepreneurial ventures are pursued for a variety of distinct purposes (such as profit, social impact, or job satisfaction objectives), such that different combinations of interdependent antecedent factors may drive entrepreneurial outcomes. For example, the same generic decision—e.g., to start a new venture, to grow the venture, or to exit the venture—might be arrived at via different but equally-effective cognitive and circumstantial pathways. By constraining the calculated causes of entrepreneurial phenomena to a single dominant net-effects explanation, symmetric methods leave hidden in the data a variety of reasons that provoke entrepreneurial activity for minority groups within the sample (and population). Understanding the antecedent causes of these multiple pathways can potentially make important contributions to the field of entrepreneurship at the individual, firm, and national levels of analysis.

In summary, while symmetric analytical methods are valuable for testing hypotheses about general causal relationships that underlie entrepreneurial phenomena, and thereby building entrepreneurship theory, they necessarily leave unexplained a great deal of the variance in the entrepreneurial phenomenon under examination. There is a need for a complementary analytical tool that can (1) explore the relationships among the data at the case-level – e.g., “within-person” relationships; (2) accommodate data-distribution asymmetry and retain outlier observations; (3) identify data-relationship asymmetries across cases; (4) align with holistic theories to recognize the interdependence of many antecedent variables; (5) and identify multiple equally-effective pathways to the same outcome, if they exist.

Fuzzy-set Qualitative Comparative Analysis (fsQCA; Ragin, 1987, 2000, 2008) is a case-based asymmetrical method that satisfies the above methodological needs (Woodside, 2013; Zyphur, 2009). FsQCA software (Ragin, 2008) provides a new tool for the entrepreneurship researcher’s toolkit that can provide more granular information about entrepreneurial phenomena to supplement information gained at the aggregate level by traditional symmetrical methods. FsQCA examines the relationships between and among the antecedent variables (referring to these variables as “conditions”), and characterizes cases as having a particular combination of conditions (referred to as a “configuration”) that associates with the focal outcome. FSQCA is an inductive method that seeks to discover the conditions common to cases who take a particular pathway (i.e. configuration), as distinct from those who take other pathways, to a given outcome. The approach can produce surprising findings as part of an abductive approach to theory building (Shepherd and Suddaby, 2017). Thus, fsQCA is complementary to traditional symmetrical analytical tools, as it adds finer-grained detail about entrepreneurial phenomena and provides an empirical basis for new theory building about those phenomena.

There has been a rapid recent increase of interest in fsQCA in the business and management literatures. Misangyi and colleagues (2017) found 96 management and business articles using QCA, with 75% of these published in the last three years of their study. Similarly, Kraus, Ribeiro-Soriano, & Schüssler (2017) reviewed 77 papers that used fsQCA in the fields of business and management, noting that more than three-quarters of these papers were published in the final three years of their study. Most of these prior papers investigated phenomena at the organizational level, focusing on firm performance, and were published in marketing and general management journals, with only two in entrepreneurship journals (although we subsequently found four more² and unpublished new papers are no doubt in the pipeline). Short et al. (2008) had earlier identified several entrepreneurship research questions in which the configural approach offers interesting research opportunities, and Harms et al. (2009) had argued that the fuzzy-set approach is a highly appropriate method for research in the entrepreneurship domain. More recently, Kuckertz and Prochotta (2018:6) surveyed 225 experienced entrepreneurship scholars and concluded that fsQCA is a “neglected method with the potential to produce new insights.”

Thus we believe that the field of entrepreneurship research is at the dawn of a new era, with the potential to build upon prior

¹ Note that while interaction effects can be tested by symmetric analysis, the regression coefficient found is the net effect or average for all cases in the sample, and thus is not necessarily applicable to any particular case within the sample.

² Muñoz and Dimov (2015) found two main alternative configurations for the development of sustainability-oriented new ventures; Beynon et al. (2016) examined the relationship between entrepreneurial attitudes and entrepreneurial activity at the national level of analysis; Devece et al. (2016) identified configurations of antecedent conditions that increase the likelihood of success for new ventures; and Muñoz and Kibler (2016) examined which combinations of local institutional forces play the largest role in determining social entrepreneurs’ confidence in their ability to achieve their social objectives. Other entrepreneurship scholars have used the configural approach prior to the advent of the fsQCA software (see, e.g. Wiklund and Shepherd, 2005).

studies (including re-examining old databases) to identify new information about the drivers of entrepreneurial phenomena that will allow finer-grained development of entrepreneurship theory. It is important to caution that FsQCA is not appropriate for every entrepreneurship research issue, and like any tool, it can be used inappropriately.

The purpose of this paper is threefold. First, in the next section we outline the fsQCA method for entrepreneurship researchers who may be wondering whether, or how, they can use this tool to gain further insights into entrepreneurial phenomena. In the third section we demonstrate the fine-grained detail that fsQCA can divulge, by using it to re-examine the dataset of a previously-published symmetrical research study (Douglas, 2013). Fourth, we offer a broad research agenda of research questions for which fsQCA can facilitate the building of new entrepreneurship theory. Finally, we offer concluding remarks.

2. Fuzzy-set qualitative comparative analysis

It is not our purpose here to provide a fully-comprehensive “how-to” guide for fuzzy-set Qualitative Comparative Analysis (fsQCA) since such guides already exist in the management (e.g. Greckhamer et al., 2018) and entrepreneurship literatures (e.g. Leppänen et al., 2019). Rather, our purpose is to outline the method for the scholar who is relatively new to fsQCA and who may be considering the use of this method in the entrepreneurship context.

FsQCA is well-suited to the dealing with the complexity of entrepreneurial phenomena. This method is based on complexity theory, and utilizes an inductive research method based on the principles of conjunction, equifinality, and causal asymmetry (Misangyi et al., 2017: 256). *Conjunction* implies that the antecedent conditions within a configuration (also known as a recipe) operate interdependently with each other, rather than discretely or via simple two- or three-way interactions between selected conditions. FsQCA considers the possibility that all of the antecedent conditions may interact interdependently with each other, and reveals combinations of conditions that are found to be sufficient for the focal outcome. *Equifinality* implies the existence of multiple equally-effective combinations of conditions that culminate in the same outcome. FsQCA may identify several configurations that indicate high tipping behavior, indicating that each configuration is sufficient for indicating a high outcome score. *Causal asymmetry* means that conditions found to be related to the outcome in one configuration may be unrelated or even inversely related in another configuration that is associated with the same outcome (Meyer et al., 1993). Woodside et al. (2018:12) note that “the directionality between X and Y depends on what additional simple conditions occur in given contexts”.³

FsQCA builds on the idea that relationships between constructs are “frequently better understood in terms of set-theoretic relations rather than correlations” (Fiss, 2011:395). Accordingly, the analysis is rooted in Boolean algebra and aims to identify necessary and sufficient subset relationships that associate with an outcome of interest. To perform fsQCA analysis, one first needs to specify the configural model—i.e., to identify which antecedent conditions should be included in the model to explain the outcome of interest. As in traditional quantitative methods, it is important to explicitly recognize and minimize “researcher degrees of freedom” (Gelman and Loken, 2014) to avoid the researcher’s choices distorting the results by generating “false positives” (Simmons et al., 2011). Researcher degrees of freedom are present when the researcher chooses between alternatives in the analytical process. Researcher discretion includes which constructs to include in the model; which proxy variables might represent those constructs; which way to operationalize the variables (e.g. using binary, categorical, or continuous measures); and which covariates to include in the model. Gelman and Loken (2014) argue that researchers purposefully or inadvertently make such choices, and that each choice represents a fork in the pathway to the results obtained. Multiple forks in the analytical pathway result in many different possible paths to a final result, and thus many different sets of possible results, with each set reflecting the assumptions and choices made along a “forking path”.

Thus, the antecedent conditions selected for the configural model must be supported by extant theory, or at least accompanied by plausible propositions for new theory (Greckhamer et al., 2018). That is, a theoretical rationale should be offered for how each selected condition is expected to operate in conjunction with other conditions to culminate in the focal outcome. Although the fsQCA process is inductive and may be used iteratively in theory-elaborating studies (Greckhamer et al., 2018) and as part of an abductive approach to empirical theorizing (for abductive, empirical theorizing see Shepherd and Suddaby, 2017), it should not be used as a “fishing expedition” (Gelman and Loken, 2014). Krogslund, Choi, & Poertner (2014) demonstrate that fsQCA will include, as apparently causal conditions, conditions that are unrelated to the focal outcome if they co-vary with the focal outcome (i.e., omitted variable bias). It is imperative that the researcher includes in the model only those antecedent conditions that prior theory, informed reasoning, or a prior surprising finding suggests are likely to interact with each other to culminate in the focal outcome.⁴

Next, the data must be “calibrated” to enable Boolean analysis. Fuzzy sets are characterized by observations that have some degree of partial membership⁵ in the set (Ragin, 2008; Hannan, 2010). The purpose of calibration is to choose threshold raw data scores that the researcher judges will reflect that the respondent is either “fully in” the membership of the set, or “fully out” of the set

³ In symmetric analysis, a statistically significant and sizeable main effect of an independent variable on a dependent variable may cause the researcher to fail to notice the occurrence of several contrarian cases to this main effect. By explaining these contrarian cases with additional configurations, fsQCA serves to increase the information provided.

⁴ Some suggest that registration *ex ante* of specific complex antecedent conditions, and prior testing of configural models, is necessary to avoid accusations of “fishing expeditions” (see, e.g., Nuzzo, 2014; Wasserstein and Lazar, 2016). Iterative model development using multiple samples in the early stages of a research project allows two-way talk between theory construction and data analysis (i.e., abduction) to facilitate theory building (see Shepherd and Suddaby, 2017).

⁵ Partial membership in a condition (e.g. age) ranges from relatively low scores on the condition (i.e., relatively young) to relatively high scores on the condition (i.e., relatively old). Fully-in (i.e., old) might be set at 65 and fully-out (i.e., young) might be set at, say 15, for a particular research question (see Hannan, 2010).

(i.e., non-membership). Between these two thresholds there is ambiguity whether the intermediate scores are in or out of the set, and a point of “maximum ambiguity” must be set, typically at the median value. The fsQCA software then converts all raw data scores to fuzzy-set membership scores using these three anchors and based on log-odds of full membership. Set membership indicates differences in kind, while calibration incorporates differences in degree, thus concomitantly allowing for qualitative and quantitative distinctions (Greckhamer et al., 2018).

To calibrate a crisp set characterized by binary variables (e.g., biological sex), the researcher would set 1 to represent “fully in” (e.g., females) and 0 to represent “fully out” (not females, therefore males).⁶ For multi-value sets, which include meaningful theoretical anchors based on psychometric theory, the researcher would normally set the point of maximum ambiguity at the midpoint, for example, 3 on a five-point scale. The fully-in point might be set at 4 or 5, and the fully-out point at 1 or 2, depending on theoretical and contextual knowledge about the asymmetry and kurtosis of the data distribution. For fuzzy-set (continuous) variables, researchers must apply theoretical and contextual knowledge to determine the most appropriate thresholds for full membership and non-membership, as well as the point of maximum ambiguity (Greckhamer et al., 2018; Ragin, 2008; Verkuilen, 2005; Hannan, 2010). To determine these cut-off thresholds, the researcher may refer to extant theory or provide theoretical rationales, or refer to external samples for empirical justification, and only as a matter of last resort should the choice of cutoff points simply be based on the sample data’s frequency distribution.⁷ Again, cognizant of researcher degrees of freedom, the researcher should explicitly state the rationale for the calibration points and apply these points consistently across conditions to avoid distortion of the results.⁸

Third, the researcher must be concerned with the empirical relevance, or “coverage” (Ragin, 2008: 44), of a configuration. Coverage indicates the proportion of the sample’s cases that share a particular configuration. The coverage statistic for each configuration is an analogue of the coefficient of determination (R^2) in regression analysis, such that “configuration coverage” of 100% would indicate that a single configuration is common to all cases. “Solution coverage” indicates the proportion of the sample explained collectively by all the configurations that exceed the consistency threshold (explained below). It should be appreciated that the extent of coverage is dependent on the judicious choice of conditions to be included in the configurational model.

If k is the number of conditions included in the model, it is theoretically possible to have 2^k different combinations of conditions, but many of these possible configurations will not be observed in the data. The combinations not observed in the data are called “counterfactuals” or “logical remainders” and their existence indicates “limited diversity” within the sample—that is, the configurations that are observed in the data are a limited subset of all configurations that are theoretically possible. The researcher must set a minimum frequency threshold of at least 1 to exclude configurations that are not observed, but with large samples and many included conditions, the researcher would set this threshold higher to exclude configurations that are empirically trivial (e.g. coverage less than 0.2) and to avoid making the results unnecessarily complex.⁹

Fourth, the researcher must set the “consistency” threshold for configurations to indicate the acceptable level of dissimilarity (of the within-case relationships between the conditions and the outcome) for the cases represented by a particular configuration. Consistency indicates “how closely a perfect subset relation is approximated” (Ragin, 2008: 44), with 1 indicating perfect consistency—that is, all cases in the subgroup have the same interactions between conditions in that configuration. With a consistency threshold of 0.75, as suggested by Ragin (2008), not all cases in a configuration exhibit exactly the same conditions and/or degrees of interdependency among those conditions, but they are highly similar. For example, firms populating the same configuration (e.g. born global ventures) will exhibit slightly different combinations of conditions and/or interdependencies among conditions due to their differing contextual factors. Therefore, consistency assesses the degree to which the combination of conditions consistently produces the focal outcome, and is thus a conceptual analog to statistical significance in regression analysis. Current best practice is that minimal consistency be set at 0.80, although higher-consistency levels can be used to provide greater homogeneity within configurations, and/or to reduce solution complexity.¹⁰

The “proportional reduction in inconsistency” (PRI) measure is an additional indicator of the consistency of subset relations, which is more exacting than the “raw” consistency measure (Greckhamer, 2016). With fuzzy sets, it is possible for the same condition

⁶ We note that biological sex may or may not correlate highly with socially-constructed gender traits (see, e.g., Ahl, 2006).

⁷ Note that extant theory to support the choice of cut-off thresholds may be lacking because of the paucity of prior research that has examined the relationship between the condition and the outcome in conjunctural interdependence with the other conditions.

⁸ For example, the researcher might set the fully-out and fully-in thresholds at the first and the fifth quintiles of the data, or alternatively at the mean \pm one standard deviation points, and apply this rule to all variables, rather than add researcher degrees of freedom by *ad hoc* adjustments to the calibration thresholds (unless a strong theoretical or empirical basis exists for different thresholds for particular conditions). As a check for robustness of the results, these thresholds might be adjusted up and down to check the sensitivity of the result to the calibration parameters, given that this sensitivity can be substantial in small ($n < 50$) samples – see Krogslund, et al. (2014).

⁹ The rule of thumb is that in small samples ($n < 50$) use all observed configurations (even if only one case), while in large samples ($n > 50$) exclude relatively rare configurations while retaining at least 80% of the original sample. Therefore, trivial findings are avoided by the ensuring that consistency is high (> 0.80); coverage non-trivial (> 0.02), and at least 80% of cases are retained in the analysis (Ragin, 2008). If a configurational model has high consistency, the model is a well-defined predictively useful complex statement that represents a rigorous expression relevant for examination using additional sets of cases. Thus, fsQCA provides a bridge between anecdotal case studies and quantitative modeling (see Woodside, 2013).

¹⁰ Krogslund et al. (2014) demonstrate that for small samples ($n < 50$, but particularly for $n < 25$), the conditions and configurations included in the fsQCA solution are susceptible to changes in model specification and to minor changes in the calibration, coverage, and consistency thresholds set by the researcher. For larger samples, and as the researcher increases the minimum frequency and consistency thresholds, the potential distortion attenuates markedly.

to be a subset of the outcome and a subset of the negation of the outcome (i.e. relationship asymmetry), thus creating an empirical paradox. For example, high attitude to autonomy might be associated with growth-oriented entrepreneurial intentions (Douglas, 2013) for some individuals (who see venture growth providing them with greater autonomy), and simultaneously associated with the non-growth intention of other individuals (who see venture growth as restricting their autonomy). Greckhamer, et al. (2018) deem that PRI scores below 0.5 indicate inconsistency, while higher thresholds (0.65 – 0.75) are preferable (see, e.g., Frambach et al., 2016).

Fifth, the researcher should conduct “necessity analysis” to identify which individual conditions, if any, are necessary for the outcome to occur. For example, is a high attitude to decision-making autonomy a necessary condition for entrepreneurial behavior, or is a pro-social attitude a necessary condition for social entrepreneurship? Or, at the macro level, is a reliable legal system necessary for licensing patented technology in developing nations? To test for necessity the fsQCA program examines each condition (and its negation) in relation to the outcome (Ragin, 2008). For a condition to be deemed necessary for the outcome (or for its negation), it must exhibit consistency exceeding the 0.90 threshold (Schneider & Wagemann, 2012; Schneider, 2018) and have non-trivial coverage. A necessary condition is likely not sufficient to produce the outcome, as it most likely operates in conjunction with other conditions to drive the focal outcome.

Sixth, the researcher commands the fsQCA software to undertake “sufficiency” analysis to generate the “truth table” revealing which configurations are sufficient for the focal outcome. The software generates a complex, an intermediate, and a parsimonious solution. The complex solution does not take into account the logical remainders, i.e., combinations not observed in the data. The logical remainders are factored into the counterfactual analysis to arrive at the intermediate and parsimonious solutions (Ragin, 2008). Counterfactual cases are distinguished as “easy” or “difficult”. Easy counterfactuals are those consistent with prior empirical evidence and theoretical knowledge, while difficult counterfactuals are those that may be consistent with prior empirical evidence but not with theoretical knowledge (Fiss, 2011; Greckhamer et al., 2018). The intermediate solution considers the easy counterfactuals, while the parsimonious solution produces the most concise result by considering all logical remainders. Taken together, the intermediate and parsimonious solutions allow the researcher to identify the “core” and “peripheral” conditions. Core conditions are those “for which the evidence indicates a strong causal relationship with the outcome of interest. In contrast, peripheral conditions are those for which the evidence of a causal relationship with the outcome is weaker” (Fiss, 2011: 398). For example, a core condition for a high national rate of start-up activity might be an effective legal system, while a peripheral condition might be the availability of equity and debt funding for small businesses (Kegel, 2016), with the latter condition less consistently found in the cases. Core conditions remain part of the solution when all counterfactuals are included, and are thus part of both the intermediate and parsimonious solutions, while peripheral conditions are eliminated in the parsimonious solution, appearing only in the intermediate solution.

Finally, the configurations found are arrayed in a table for inspection and comparison. Core conditions are identified using a symbol such as a larger black circle (●), and peripheral conditions are identified as a smaller version of that symbol (◐). A condition that is “absent” from a configuration—is present in its negated form, meaning that non-membership in the set is important for the configuration—is indicated by a different symbol, usually a tilde (~) or an x in a circle (⊗). A blank space in the relevant cell in the table indicates “don’t care”—meaning that it is unimportant for that configuration whether that condition is high or low. In some cases, two or more configurations will share the same core conditions and differ only in their peripheral conditions, and these can be paired as neutral (or sibling¹¹) permutations (Fiss, 2011), being essentially alike but differing in their peripheral details. For example, sibling permutations of nations with high startup rates might share core conditions of high national income and advanced industrialization but differ in the liberalism or conservatism of their current governments.

In summary, we emphasize that the researcher must ensure that the results are not overly dependent on the decisions made regarding construct selection, proxies, metrics, calibration cut-offs, and the coverage and consistency thresholds, and should reveal all such “forks” taken in the analytical process (Gelman & Loken, 2014; Greckhamer, et al., 2018). In Table 1, we list key considerations for fsQCA that serve to provide guidance to entrepreneurship researchers when conducting their own studies to avoid excessive researcher degrees of freedom.

3. Re-examining the data of a prior entrepreneurship study

To illustrate the potential contribution that fsQCA can make to research into entrepreneurial phenomena, we now use this tool to re-analyze data from an earlier study that had utilized traditional symmetric analytical methods. We chose a “micro-entrepreneurship” investigation of the determinants of entrepreneurial intention by Douglas (2013), who used multiple regression analysis, consistent with what is commonly used in the “intentions” literature (see surveys by Liñán and Fayolle, 2015; Schlaegel and Koenig, 2014; Zhao et al., 2010). Entrepreneurial intention (EI) refers to an individual’s conditional decision that they want to start an entrepreneurial new business venture (Bird, 1988; Boyd and Vozikis, 1994; Krueger et al., 2000; Thompson, 2009). Many studies have investigated the antecedents of the formation of EI, generally using multiple regression or structural equation modelling to analyze a sample of a population of potential entrepreneurs. We shall see that fsQCA offers a different perspective on the same data, and reveals patterns in the data that the original symmetric approach did not.

¹¹ We believe the label “sibling” is more informative and evocative than the label “neutral” for configurations that share the same core conditions and differ only in their peripheral conditions. Siblings share the same parents and usually bear a common family resemblance, albeit with individual differences (see, e.g. Hannan, 2010).

Table 1
Key considerations for the appropriate use of fsQCA.

Potential issue	Researcher should:
1 Model specification errors and “fishing expeditions” (Gelman & Loken, 2015)	<ul style="list-style-type: none"> ● Include only the antecedent conditions for which a theoretical basis exists for the causal impact of each condition, either alone or in interdependent combinations with other conditions, on the focal outcome variable. ● Delete antecedent conditions that covary with a hypothesized causal condition but which cannot be theoretically linked to the outcome condition (where the covariance is likely due to a third variable). ● Pre-register your model specification in advance of data collection to avoid supposition that model specification may have been adjusted to “improve” the results. (Nuzzo, 2014)
2 Construct clarity (Suddaby, 2010)	<ul style="list-style-type: none"> ● Avoid the use of new definitions and/or new metrics for previously validated constructs, in order to avoid an additional “forking point” in the research process. ● Measure conditions directly and objectively wherever possible, rather than indirectly and subjectively
3 Difficulty of interpreting excessively complex fsQCA results	<ul style="list-style-type: none"> ● Because the solution becomes exponentially more complex as more conditions are included in the configural model, increase the parsimony of the model (and avoid adding researcher degrees of freedom involved in interpreting results), by combining several conditions into theoretically meaningful higher-order constructs (Greckhamer et al., 2018).
4 Parameter Sensitivity (Krogslund et al., 2015).	<ul style="list-style-type: none"> ● Set coverage and consistency thresholds higher, rather than at Ragin’s (2008) minimum levels, particularly when sample size is small ($n < 50$) and especially when $n < 25$. ● Set calibration cut-offs consistently across all conditions (e.g. ± 1 SD) rather than separately for each condition, unless a very strong theoretical rationale is provided. ● Repeat the analysis with higher and lower cut-off points to check the robustness of the results (Greckhamer et al., 2018).
5 Exaggerating the importance of some “sufficient” conditions in revealed configurations	<ul style="list-style-type: none"> ● Distinguish between “core” and “peripheral” conditions in sufficiency analysis by ascertaining which conditions are more consistently present (or absent) in both the Intermediate and Parsimonious solutions (i.e. core), or only in the Intermediate solution (i.e. peripheral) (Fiss, 2011). ● Run “proportional reduction in inconsistency” (PRI) analysis to ensure more consistent sufficiency analysis. PRI scores below 0.5 are deemed insufficiently consistent and should preferably be > 0.7 (Greckhamer et al., 2018)
6 Claiming that an antecedent variable is a necessary condition for the outcome	<ul style="list-style-type: none"> ● Run necessity analysis to verify whether any antecedent condition achieves consistency above 0.90, which is deemed to indicate necessity (Schneider, 2018).
7 Claiming that the “absence” of a condition in a configuration means that it is not important to the configuration.	<ul style="list-style-type: none"> ● Understand that the “absence” of a condition means that the negation of the condition is important to the outcome. For example, the absence of being male, and of being married, means that being a single female is seemingly causal for the outcome.
8 Misinterpreting that a condition that is “don’t care” or “unimportant” in a recipe is not important to anyone.	<ul style="list-style-type: none"> ● Understand that an “unimportant” condition is neither consistently fully-in nor fully-out of the set for the majority of respondents in the configuration. But because the condition is fully-in the set for some, its presence (or conversely its absence) is indeed important for some members of that configuration.

We chose the Douglas study of EI for this illustrative example for three main reasons. First, it represents an extension of a genre of prior studies seeking to determine the antecedents of EI for the individual (Liñán and Fayolle (2015)). It was the first to demonstrate empirically two main pathways to commercial entrepreneurship, arguing that growth-oriented and independence-oriented EI are distinct constructs with different antecedent variables. Second, using the same data as that study allows replication of that earlier study using a different analytical method, and thereby demonstrates whether or not fsQCA can extract different information about alternative pathways to entrepreneurial behavior. Third, using the same data avoids the introduction of additional researcher degrees of freedom that would be associated with collecting a new sample to search for these more granular results.

In Douglas (2013), the sample of 106 respondents (52% of whom were male) were on average 30 years old with business experience averaging 6.32 years.¹² The study included control variables for age, sex, and possession (or not) of a prior business degree, but business experience was excluded from the regression model because of collinearity with respondent age. Building on the theories of both self-determination (Deci and Ryan, 1985) and planned behavior (Ajzen and Fishbein, 1977), the model proposed that EI depends on the “perceived desirability” and “perceived feasibility” of entrepreneurial behavior (Krueger and Carsrud, 1993; Krueger et al., 2000; Shapero and Sokol, 1982). In the model, perceived desirability depends on individuals’ attitudes to the outcomes of entrepreneurial action—specified as income, work enjoyment, autonomy, risk, and work effort. The study used entrepreneurial self-efficacy (ESE), operationalized using De Noble et al. (1999) 23-item scale, to represent the perceived feasibility of entrepreneurial action. The study set out to explain two dependent variables representing broad types of EI: (1) *Independence-oriented*

¹² The sample comprised MBA and EMBA students. We note that small samples are not problematic for fsQCA. Indeed QCA was first developed to allow analysis of small samples (Ragin, 1987). But, as Krogslund et al. (2014) point out, with very small samples ($n < 25$), stability of the solution is susceptible to small variations in coverage, consistency, and calibration thresholds.

Table 2

Regression Results for the Independence and Growth Models of Entrepreneurial Intention (Douglas, 2013).

Variable	Independence-oriented Intentions (IOI)	Growth-oriented Intentions (GOI)
Constant	5.352***	2.9343***
Entrepreneurial Self-Efficacy	-0.0448	0.6651***
Attitude to work enjoyment	0.1617	-0.2926**
Attitude to income	-0.0405	0.0406
Attitude to work effort	-0.0586	0.1743
Attitude to autonomy	0.3042	-0.0089
Attitude to risk	-0.3429**	0.2362
Age	-0.0124	-0.0114
Sex (Male = 1)	-0.1860	0.3219*
Prior business degree	0.0711	0.1895
<i>R-squared</i>	0.094	0.155
<i>RMSE</i>	0.887	0.969
<i>Probability</i>	0.285	0.026

n = 106; *p < 0.10; **p < 0.05; ***p < 0.01.

intention (IOI), which refers to an individual's commitment to pursuit of psychic income (Gimeno et al., 1997; Lee et al., 2011) via entrepreneurial action; and (2) *Growth-oriented intention* (GOI), which refers to an individual's commitment to pursuing entrepreneurial opportunities to grow profits (Davidsson et al., 2009). The study created new measures for these two dependent variables, which had acceptable reliability with Cronbach alphas of 0.839 and 0.711, respectively. Respondents revealed the strength of their intention for both types of entrepreneurship, typically demonstrating a stronger preference for one type over the other.

Using multiple regression analysis, Douglas (2013) found a single dominant model for IOI and a different single dominant model for GOI, as shown in Table 2, confirming that they are distinct alternative pathways to the formation of entrepreneurial intentions. For the IOI model, only one antecedent variable was significant for the sample as a whole—attitude to risk was negatively associated with IOI and this model explained 10% of the variance in IOI. For the GOI model, ESE exhibited a positive association; attitude toward work enjoyment had a negative association; and male sex was marginally significant. This model explained 15% of the variance in GOI. The relatively high unexplained variance remaining in each of these regression models indicates that there must be considerable heterogeneity regarding the drivers of both IOI and GOI that might become evident by the application of the fsQCA method.

To align the fsQCA study with the regression study, we initially considered including all the same antecedent variables used by Douglas (2013) as conditions in our configural model. The regression model included three control variables (namely age, sex, and prior business degree); five attitude measures (namely attitudes to profit, autonomy, work enjoyment, risk, and work effort); and the ESE measure. Thus, there are $2^9 = 512$ possible combinations of the conditions, which rendered a very complex solution with relatively low consistency and coverage. The goal in fsQCA is to maximize consistency and coverage, while minimizing complexity of the resulting configurations. Accordingly, we iterated to a simpler model by excluding the control variables, which raised the consistency and coverage levels of the configurations while substantially reducing the complexity of the solution.¹³

We calibrated the data by setting the fully-in and fully-out cutoff points at \pm one standard deviation (SD) from the median, for all conditions and the outcome, with the point of maximum ambiguity set to the median for each variable. The Likert-scale scores in the Douglas (2013) study had been averaged across multiple items for each construct to generate continuous variable scores for each respondent, such that these conditions were also calibrated following the \pm 1 SD rule. We saw no theoretical or contextual reasons to modify this calibration rule for any of the conditions, and by using the same rule we avoided introducing additional degrees of researcher freedom. Table 3 shows the calibration cutoffs and descriptive statistics.

Third, we conducted necessity analyses to evaluate whether any condition was necessary for the outcome to occur. For example, is risk aversion a necessary condition for IOI, or is high ESE a necessary condition for GOI, as might be implied by the Douglas (2013) results? As noted earlier, to be deemed a necessary condition for the outcome, a condition must exceed the 0.90 consistency threshold and have non-trivial coverage (Schneider, 2018; Schneider and Wagemann, 2012). Our analyses of the conditions individually revealed that all conditions had less than 0.85 consistency for the two outcomes (IOI and GOI) and similarly for their negations (\sim IOI and \sim GOI).

3.1. Sufficiency Analyses for Independence-Oriented Intentions

For both the IOI and the GOI outcomes, we set the consistency cutoff at 0.80; the PRI consistency cutoff at 0.65 (following Greckhamer, 2016); and the coverage or frequency cutoff at 2 cases per configuration, but nonetheless retaining more than 80% of

¹³ We decided to exclude the control variables for three reasons. First, the notion of statistical control does not translate to the QCA setting—the conditions included in an fsQCA model should form a cohesive model based on theory or introspection, yet the theoretical arguments for individual differences in EI based on age, sex, and prior degree are weak and frequently contradicted empirically. Second, when included they did not serve the consistency, coverage, and complexity goals of fsQCA. Third, these variables were generally not important in the regression models—only male sex was marginally significant in the GOI equation.

Table 3
Sample Statistics and Calibration Parameters for fsQCA.

Variable	Mean	Std Dev	Min	Max	Median	Fully in	Max'm ambig.	Fully out
Independence-oriented intentions	5.465	0.891	2.875	7.000	5.500	6.391	5.500	4.609
Growth-oriented intentions	4.587	1.009	1.600	6.400	4.600	5.609	4.600	3.591
Entrepreneurial Self-Efficacy	3.681	0.416	2.217	4.739	3.696	4.111	3.696	3.280
Attitude to work enjoyment	1.447	0.779	-0.750	3.652	1.437	2.215	1.437	0.658
Attitude to income	2.441	0.804	0.875	4.563	2.313	3.116	2.313	1.509
Attitude to work effort	-0.193	0.519	-1.813	1.125	-0.188	0.332	-0.188	-0.707
Attitude to autonomy	0.705	0.489	-0.375	2.625	0.625	1.114	0.625	0.136
Attitude to risk	-0.453	0.542	-2.813	0.938	-0.437	0.105	-0.437	-0.979

Table 4
Configurations Sufficient for Independence-Oriented Intentions (IOI).

Recipe	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b
Entrep'l self-efficacy	⊗	⊗		●		●	●			●
Attitude to work enjoyment	●		●	⊗				●	●	
Attitude to income		●	⊗	⊗	●					
Attitude to work effort					⊗	⊗				
Attitude to autonomy									●	●
Attitude to risk							⊗	⊗		
Consistency	0.95	0.93	0.91	0.91	0.91	0.90	0.90	0.92	0.91	0.89
Raw coverage	0.25	0.27	0.40	0.41	0.36	0.42	0.44	0.39	0.34	0.44
Unique coverage	0.01	0.01	0.02	0.00	0.01	0.01	0.01	0.01	0.00	0.01
Solution consistency	0.86									
Solution coverage	0.87									

Note: Full black circles indicate the presence of a condition, and crossed open circles ("⊗") indicate its absence (or negation). Blank spaces indicate "do not care" (i.e., the condition score, whether high or low, is unimportant in that particular configuration in regard to the outcome). Large circles suggest core, or central conditions, whereas small circles indicate peripheral, or contributing/complementary, conditions.

total cases. We also ensured that the solution as a whole exceeded the 0.80 consistency threshold. Considering IOI first, we found 10 pathways to IOI, with solution coverage of 0.87, as evident in Table 4. These ten pathways were grouped into five distinct pairs of sibling or neutral (Fiss, 2011) permutations that exhibited the same core conditions and varied only in their peripheral conditions. The recipes for IOI are quite parsimonious at consistency levels of 0.89 and higher, with only two conditions per configuration.¹⁴

Pathway 1a includes as a core condition the absence (i.e., negation) of entrepreneurial self-efficacy plus a high peripheral score on attitude towards work enjoyment. This pathway indicates the interdependence of very little (i.e. fully-out) ESE and high work enjoyment, suggesting individuals who would enjoy behaving entrepreneurially but who would most likely make management mistakes due to lack of prior knowledge and experience. Similarly, pathway 1b includes the absence of ESE but has a high peripheral score on attitude towards income. This pathway indicates the interdependence of little or no ESE and high preference for income, suggesting individuals who would seek profit maximization but whose lack of ESE is likely to put them at a competitive disadvantage relative to rivals who could potentially bankrupt them. Without entrepreneurial self-efficacy, and yet seeking to enjoy themselves or to maximize profit, these individuals seem ill-equipped to survive the launch and growth of an entrepreneurial venture, so we label path 1 as the *Unlikely Survivor* pathway.

Pathways 2a and 2b are both characterized by a low (fully-out) score on attitude towards income, but 2a has a high peripheral score on attitude toward work enjoyment while 2b has a high peripheral score on ESE. The interdependence of the absence of income motivation and the preference for work enjoyment (pathway 2a) suggests individuals who want to act entrepreneurially not for monetary gain but for the non-monetary benefits derived from job satisfaction. The sibling permutation (pathway 2b) represents the interaction of the absence of income motivation with high ESE, suggesting potentially quite capable entrepreneurs whose main purpose is not to make money but who could exhibit competency and conduct the business efficiently. As such, pathway 2 seems to depict variants of what we might label *Lifestyle Entrepreneurs*, for whom the playing the game is more important than monetary gains.

Pathways 3a and 3b both exhibit the core condition of a very low attitude towards work effort, but 3a has a high peripheral score on attitude toward income while 3b has a high peripheral score on ESE. Pathway 3a thus exhibits the interdependence of unwillingness to work hard with strong desire to make money, which evokes individuals who want to get rich without investing much effort. Pathway 3b exhibits the interdependence of unwillingness to work hard and the high ESE, which seems to typify individuals who don't want to work hard but who are quite confident of their entrepreneurial abilities. Since the core condition in each case is unwillingness to work hard, an evocative label for pathway 3 is *Leisure-oriented Entrepreneurs*.

¹⁴ Lower settings of the consistency threshold would usually admit additional configurations and additional conditions into those configurations. We choose this relatively high consistency threshold because it results in a parsimonious and plausible set of configurations, keeping in mind the fsQCA goal of maximizing consistency and coverage while reducing complexity.

Pathways 4a and 4b both exhibit the core condition of a very low attitude toward risk, but 4a has a high peripheral score on entrepreneurial self-efficacy, while 4b has a high peripheral score on attitude to income. Pathway 4a involves the interdependence of high risk aversion and ESE, indicating individuals who are managerially competent but want to minimize risk taking. Pathway 4b involves the interdependence of high risk aversion and preference for income. In both configurations the individuals are highly risk averse and would be likely to seek low-risk new ventures, presumably involving little innovation. Consequently we label pathway 4 as depicting *Conservative Entrepreneurs*.

Pathways 5a and 5b both exhibit the core condition of a very high attitude toward autonomy, but in pathway 5a this interacts with a high peripheral score on attitude to income, while in pathway 5b this strong preference for autonomy interacts with a high peripheral score on ESE. The core condition of high preference for decision-making autonomy, interacting with two other frequently mentioned characteristics of entrepreneurs induces us to label pathway 5 as depicting *Autonomous Entrepreneurs*.

Thus, when we take into account the interdependencies and asymmetries of the antecedent conditions we find that five different main configurations of conditions (each containing sibling pairs) culminate in the formation of individuals' intention to undertake what Douglas (2013) called independence-oriented entrepreneurship (IOI). Thus the fsQCA method offers a more fine-grained explanation of this main type of entrepreneurial intention, finding within that main type five sibling pairs of independence-oriented entrepreneurial intention which can be characterized as distinct sub-types. These findings suggest the need for further theorizing and empirical research. For example, the formation of IOI despite having little or no confidence in their entrepreneurial management capabilities seems foolhardy unless the individual envisions team entrepreneurship rather than solo entrepreneurship (Cooney, 2005), and/or has strong social and business networks that they expect would provide the guidance and business acumen that they lack (Brüderl and Preisendörfer, 1998). This example suggests missing variables that could be hypothesized to interact with low ESE and subsequently tested empirically. Similarly, each of the other configurations must be theorized and tested for the validity of the apparent interdependencies.

3.2. Sufficiency analyses for growth-oriented intentions

For GOI, we found three alternative paths, as shown in the left side of Table 5. As can be seen, pathway 6 to the formation of entrepreneurial intention includes high emphasis on income, effort, and autonomy as core conditions, and the presence of ESE in a peripheral role. This brings to mind the classical notion of the profit-seeking, hard-working, independent decision-making, and managerially competent entrepreneur, which we label the *Archetype Entrepreneur*.

Pathway 7 represents individuals who are managerially competent and willing to work hard, as core conditions, with not-seeking-autonomy and not-seeking-risk as peripheral conditions. The interaction of these four cognitions seems to indicate a risk-averse, autonomy-declining individual who is nonetheless managerially competent and willing to work hard. This situation is evocative of intrapreneurship, in which entrepreneurial individuals are largely protected from risk by their employers and constrained in their decision making by senior managers (Antoncic, 2002; Douglas and Fitzsimmons, 2013; Parker, 2011) so we label this pathway the *Intrapreneur*.

Pathway 8 exhibits as core conditions high self-confidence in managerial competence, high attitude to income, and high attitude (willingness) to take risks, and as peripheral conditions low attitude to work effort and low attitude to autonomy. Such individuals would tend to avoid work and decline decision-making, but have high ESE, are profit-seeking and are risk tolerant. As such they might be expected to "back themselves" to place high-stake risky bets, and refrain from any further work effort and decision making while waiting for success of failure of their gamble to be determined by circumstances outside their control. Accordingly, we label this path the *Gambler Entrepreneur* (Coad et al., 2013).

Table 5

Configurations Sufficient for Growth-Oriented Intentions (GOI) and for the Absence of Growth-Oriented Intention (~GOI).

Recipe	Growth			~Growth			
	6	7	8	9	10	11a	11b
Entrepreneurial Self-Efficacy	●	●	●	⊗	⊗	⊗	⊗
Attitude to work enjoyment				⊗			⊗
Attitude to income	●		●		⊗	⊗	
Attitude to work effort	●	●	⊗	●	⊗	⊗	⊗
Attitude to autonomy	●	⊗	⊗	⊗		●	●
Attitude to risk		⊗	●		⊗		⊗
Consistency	0.85	0.87	0.91	0.87	0.94	0.93	0.94
Raw coverage	0.29	0.26	0.21	0.18	0.24	0.22	0.18
Unique coverage	0.12	0.10	0.08	0.09	0.05	0.03	0.03
Solution consistency	0.85			0.88			
Solution coverage	0.48			0.41			

Note: Full black circles indicate the presence of a condition, and crossed open circles ("⊗") indicate its absence (or negation). Blank spaces indicate "do not care" (i.e., the condition score, whether high or low, is unimportant in that particular configuration in regard to the outcome). Large circles suggest core, or central conditions, whereas small circles indicate peripheral, or contributing/complementary, conditions.

We also found three pathways for \sim GOI, i.e., the absence of growth-oriented intentions, which we also show in Table 5 for easy comparison with the GOI results. These individuals have little or no intention to grow their new venture. It is notable that each of the \sim GOI pathways includes \sim ESE, that is, a low (fully-out) score on entrepreneurial self-efficacy. Pathway 9 includes a high score on attitude to work effort in conjunctural interdependence with the absence (negation) of three conditions (i.e., ESE, work enjoyment, and autonomy) in peripheral roles. Such individuals feel compelled to work, but don't enjoy it; have very low ESE; and very low attitude to decision-making autonomy. This is evocative of workaholics (see, e.g., Buelens and Poelmans, 2004), so we label this path the *Workaholic Entrepreneur*.

Pathway 10 exhibits no core conditions but four peripheral conditions, namely low ESE, and low attitudes to each of income, work effort, and risk. Such individuals do not feel confident of their management skills, do not care much for income, and would seek to avoid both hard work and risk. Intending to be an entrepreneur seems to be a bad fit for these individuals' competencies and cognitions, so we label this path the *Misfit Entrepreneur*. Whether such individuals ever progress from intention to entrepreneurial action is an empirical question that might be investigated (Kautonen et al., 2015).

Pathway 11 comprises a pair of sibling permutations. Both 11a and 11b have a high score on attitude to autonomy as core conditions, with different combinations of peripheral conditions. Such individuals strongly value their independence but have low ESE and place low value on the other entrepreneurial outcomes. They are similar to pathway 10's misfit entrepreneurs, except that they highly value their autonomy. As such, these individuals are likely to not seek or value the advice of others in their deficit areas. We label this group *Headstrong Entrepreneurs*. We summarize our taxonomy of entrepreneurs in Table 6.

As the tables illustrate, IOI and GOI each involve a number of very different pathways—i.e., configurations of antecedent conditions. Relative to GOI, the pathways for IOI are simpler yet more numerous. In total, we are able to explain a higher proportion of cases for IOI than for GOI. Considering the absence of EI, the software found no configurations with high consistency (> 0.80) for \sim IOI, while for \sim GOI, we found several highly consistent pathways indicating which individuals do not want to seek growth. Note that the conditions for GOI are not the opposite of the conditions for \sim GOI, confirming that there are asymmetric relationships between the conditions and the outcomes.

In summary, the fsQCA results reveal nuanced detail about the heterogeneity within the sample, identifying sub-groups for which different configurations lead to the same outcome, for both the IOI and GOI outcomes. The fsQCA is able to unpack heterogeneity that symmetric analysis cannot, resulting in a taxonomy of entrepreneurial intention types that is more fine-grained than the growth-oriented vs independence-oriented dichotomy suggested by Douglas (2013). Scholars (e.g., Doty and Glick, 1994; Fiss, 2011; Ketchen and Shook, 1996) have argued that taxonomies are valuable for theory building because they encapsulate the distinct characteristics of separate types, and facilitate communication among researchers. Taxonomies of entrepreneurial types are not new, but fsQCA allows researchers to find taxonomies empirically and subsequently to build new theory in an abductive approach to empirical theorizing (consistent with Shepherd and Suddaby, 2017).

4. Future research opportunities

There appear to be many interesting research questions for which scholars can use fsQCA to investigate patterns between and

Table 6
A Taxonomy of Commercial-Entrepreneurship Types.

Recipe	Core conditions.	Peripheral conditions.	Taxonomy name.
IOI			
1a	Not confident ESE	Enjoys work	Unlikely-survivor entrepreneur
1b	Not confident ESE	Wants income	
2a	Not profit-seeking	Enjoys work	Lifestyle-oriented entrepreneur
2b	Not profit-seeking	Confident of ESE	Leisure-oriented entrepreneur
3a	Not willing to work hard	Wants income	
3b	Not willing to work hard	Confident of ESE	
4a	Not willing to take risk	Confident of ESE	Conservative entrepreneur
4b	Not willing to take risk	Wants income	Autonomous entrepreneur
5a	Wants autonomy	Wants income	
5b	Wants autonomy	Confident of ESE	
GOI			
6	Wants income, and willing to work hard	Confident of ESE	Archetype entrepreneur
7	Confident of ESE, and willing to work hard	Not seeking autonomy, and not seeking risk	Intrapreneur
8	Confident of ESE, wants income, willing to bear risk	Not keen to work hard, and not seeking autonomy	Gambler entrepreneur
Non-GOI			
9	Willing to work hard	Not confident of ESE, not enjoying work, not seeking autonomy.	Workaholic entrepreneur
10	None	Not confident of ESE, not seeking income, not enjoying work, not seeking risk	Misfit entrepreneur
11a	Wants autonomy	Not confident of ESE, not profit-seeking, and not enjoying work	Headstrong entrepreneur
11b	Wants autonomy	Not confident of ESE, not enjoying work, not enjoying work, not seeking risk	

among the antecedent conditions that associate with a focal outcome of interest in the entrepreneurial domain.¹⁵ Gabriel and colleagues (2018: 20) suggest that fsQCA can help answer four main questions: (1) which theoretically possible configurations of conditions exist in the data, and which are absent; (2) which configurations are most frequently (and least frequently) represented in the data (i.e., how many individuals are characterized by each configuration); (3) are any conditions *necessary* to produce the outcome (or the absence of that outcome); and (4) which conditions or configurations of conditions are *sufficient* for the focal outcome to occur (or not occur)? These broad questions suggest future research opportunities in a variety of entrepreneurial contexts. First, we stay with EI and consider the new insights for other types of EI that arise from our re-evaluation of the Douglas (2013) data. After that, we offer avenues for future entrepreneurship by using fsQCA to explore Shepherd's (2015) call for entrepreneurship research that is more interactive, activity based, cognitively hot, and both compassionate and prosocial.

4.1. Future research on entrepreneurial intentions

It is important to note that EI does not automatically lead to entrepreneurial action (Kautonen et al., 2015) nor does entrepreneurial action automatically lead to venture survival or success (Ucbasaran et al., 2013). Indeed, some of the configurations may not bode well for raising funds from investors, or accessing other resources important for new venture creation, or learning to overcome liabilities of newness, or managing stakeholders to establish organizational legitimacy, and so on. For example, some of the configurations revealed above include the absence of self-efficacy as a core condition (Unlikely Survivors) or a peripheral condition (Workaholic, Misfit, and Headstrong entrepreneurs). A low ESE score means the individual has low confidence in their ability to succeed at entrepreneurship (Krueger and Carsrud, 1993). A low ESE is likely to adversely affect a potential investor's evaluation of that individual's ability to deal with major obstacles (given that individuals high in self-esteem are more likely to persist in the face of obstacles and achieve success [Bandura, 1977]). Similarly, attitude toward autonomy is very low in two of the three GOI configurations (Intrapreneur and Gambler) indicating that these individuals do not like being responsible for making decisions but still intend to enter a career in which decision-making autonomy is critical to their survival and success. Future studies might consider these antecedent conditions in failed ventures—that is, which configurations are more likely to succeed and which are more likely to fail, and why?

Next, there are opportunities to gain greater insights into the configurations of the intention to engage in *social* entrepreneurship; a domain in which there is substantial heterogeneity (Martin and Osberg, 2007; Newbert and Hill, 2014). Using fsQCA, researchers might identify a variety of configurations corresponding to a taxonomy of social entrepreneurs and can proceed to build theory to explain how and why the differing configurations of antecedent conditions culminate in the pursuit of social entrepreneurship for various purposes (Battilana and Lee, 2014).

Third, researchers could use fsQCA to explore differences in the drivers of EI among other distinguishable subgroups of entrepreneurs, such as mum-preneurs (Duberley and Carrigan, 2013), elder-preneurs (Kautonen et al., 2010; Watkins-Mathys, 2012), migrant-preneurs (Levie, 2007), refugee-preneurs (Wauters and Lambrecht, 2008), serial entrepreneurs (Westhead et al., 2005), and international entrepreneurs (Joardar and Wu, 2011). While these groups will have much in common internally, which can be discerned using symmetric methods, they will also exhibit diversity in their experiential backgrounds, personal circumstances, cognitions, self-efficacies, and human and social capital. As we saw with IOI and GOI, there are likely to be distinct configurations within a particular sub-category of entrepreneurs that represent alternative multiple pathways to entrepreneurial behavior.

Fourth, an under-researched issue related to EI is the decision of nascent entrepreneurs to stop “exploring” and start “exploiting” a potential opportunity (Choi et al., 2008; Kautonen et al., 2015). That is, what factors drive the decision to suspend the opportunity-recognition and viability-screening processes and proceed to the launch of a new venture? The configurations of antecedent conditions for this decision are likely to vary across individuals. Some may conduct extensive business planning (Brinkmann et al., 2010) whereas others may forego this planning and proceed effectually (Sarasvarthy, 2001). Some may undertake formal market research whereas others may simply trust their instincts, and so on.

Finally, the decision to exit the entrepreneurial process may also be a planned behavior (Ajzen, 1991) preceded by the formation of the intention to exit. While DeTienne et al. (2015) discuss a typology of exit strategies, fsQCA would likely extend this work by revealing multiple configurations of antecedent conditions that culminate in the exit decision. Such a taxonomy would spur theory-building research to understand the interplay between and among the antecedent conditions that underlie entrepreneurs' exit decisions.

4.2. Using fsQCA for an interactive perspective of entrepreneurship

Research on entrepreneurial cognition (for a review, see Grégoire et al., 2011) and entrepreneurial thinking (for a review, see Shepherd et al., 2015) has made a substantial contribution to our understanding of how entrepreneurs form opportunity beliefs (McMullen and Shepherd, 2006), generate novel insights (Cornelissen and Clarke, 2010; Grégoire, et al., 2011), and assess the attractiveness of potential opportunities for exploitation (Choi and Shepherd, 2004; Wood et al., 2017). Shepherd (2015) proposed that scholars can make important contributions to the entrepreneurship literature by exploring the development of potential

¹⁵ There are, of course, research questions where fsQCA would add little, if anything, over and above traditional methods. For example, where policy must be devised to correct a widespread social or economic problem, the researcher's perspective needs to be focused at the aggregate level to identify the main underlying antecedents, such that public funding is utilized most effectively (Tanner, 2014). Similarly, policy interventions using public funding, or education programs, must be evaluated for their effectiveness (or not) at the aggregate level of analysis. But even then it might be useful to understand the impact on sub-groups.

opportunities, the transformation of communities of inquiry (around a particular potential opportunity) over time, and the ways entrepreneurs and communities of inquiry interact to mutually adjust for the co-construction of value. The fsQCA method seems likely to provide some unique insights to advance this important research stream.

First, future research can contribute to the literature by investigating the multiple paths to the creation and development of potential opportunities. There are likely to be multiple pathways of mutual adjustment between entrepreneurs and their communities of inquiry for co-constructing opportunities that deliver considerable value. That is, fsQCA can help identify multiple configurations (i) of interactions (between the entrepreneur and the community of inquiry) and the development of an opportunity; (ii) of sub-communities that interact and make up the community of inquiry for a focal potential opportunity; (iii) of the entrepreneurial team members interacting in groups within the community of inquiry (and/or the engagement of different communities of inquiry); (iv) of development paths (in terms of opportunity beliefs) for entrepreneurial teams and/or communities of inquiry as the result of—perhaps—an idiosyncratic mutual adjustment process; and (v) of beliefs, actions, doubts, terminations, and new ideas that may each lead to successful opportunity exploitation.

Second, although we have increased our understanding of the generation (Grégoire et al., 2011) and assessment of opportunities for exploitation (Baron and Ensley, 2006), the fuzzy-set approach focuses our attention on individuals within the sample (rather than an average of the sample as a whole). By focusing on the valence of personal and environmental factors for a particular individual, we may discover within-person changes resulting from interactions relating to a potential opportunity. For example, what within-person changes occur in an entrepreneur over time as he or she interacts with prototypes of a potential opportunity and a community of inquiry? Do other entrepreneurs experience different changes throughout the mutual adjustment process of co-constructing and refining a potential opportunity?

Finally, of particular interest will be the outlier—the individual who experiences interactions and changes that are unique—who nonetheless eventually develops, refines, and successfully exploits an opportunity. As we develop a deeper understanding of outliers, we make important advancements in our knowledge of entrepreneurial phenomena. The outlier individual could, for example, have attention deficit and hyperactivity disorder (see Wiklund et al., 2016), which could be highly informative about the role of attention allocation in the process of co-developing and refining a potential opportunity. Similarly, there may be some unique aspects of a community of inquiry that can shed new light on the entrepreneurial mutual adjustment process. For example, one community of inquiry might comprise active (almost radical) user-innovators who are passionate about both the innovation process and its outcomes (Schreier and Prügl, 2008). This community of inquiry might differ in nature and process from a more analytical community of inquiry, yet both communities of inquiry are critical to the co-development of entrepreneurial opportunities.

4.3. *The fsQCA approach to entrepreneurship that is more activity based*

Consistent with the importance of future research investigating the micro-foundations of entrepreneurial action (Shepherd, 2015; in line with research on the emergence of new firms [Delmar and Shane, 2004; Gartner, 1985; Lichtenstein et al., 2007]), future research using fsQCA can be the basis for unique contributions that advance this research stream. Specifically, there are likely multiple activity-based pathways that lead to a specific entrepreneurial action, and recognition of this equifinality is highly important. For example, what are the multiple activity pathways to the creation of a new organization, to entry into a new market, to crowdfunding a new project, to adding or subtracting a member of the entrepreneurial team, to raising a round of venture capital, and so on? Indeed, when exploring the activities involved in creating a new organization, rather than simply counting the number of activities to capture the extent of emergence, it seems more beneficial to explore the different paths to emergence and the nature of the activities that constitute these different paths (e.g., initial activities, the sequence of activities, and the timing and inter-relationship of those activities).

Furthermore, the holistic approach can itself provide multiple pathways for investigating configurations of activities. We can gain a deeper understanding of activity-based entrepreneurship if we explore the different configurations of activities that stimulate entrepreneurial action, the different activity configurations that constitute a particular entrepreneurial action, and the different activity configurations that are triggered by a focal entrepreneurial action. For example, what are the activity configurations that combine prior knowledge and motivation in forming a third-person opportunity belief (McMullen and Shepherd, 2006)? What are the activity configurations of entrepreneurial action (first-person opportunity belief), and how are they influenced by the activity configurations of forming a third-person opportunity belief? Indeed, there are likely configurations of the different activity configurations—that is, we can explore the configurations of the activity sub-configurations of the attention stage, evaluation stage, and exploitation stage of entrepreneurial action.

4.4. *The fsQCA approach to entrepreneurship that is cognitively hot*

Until relatively recently, entrepreneurship research investigated entrepreneurial cognition while ignoring emotions (for a review see Grégoire, et al., 2011) or focused on how negative emotions obstructed entrepreneurial cognition (Shepherd, 2003; Shepherd et al., 2009). Building on positive psychology (Fredrickson, 1998; Seligman and Csikszentmihalyi, 2000), Shepherd (2015) called for more research on how entrepreneurial action influences positive emotions and how positive emotions influence entrepreneurial action—that is, hot cognition. Again, we believe that the fsQCA method can be useful in advancing research on this topic.

Different people likely react in emotionally different ways to specific actions, and different activity paths may be involved in different entrepreneurial actions, thereby generating different emotional reactions. Therefore, what are the different pathways to an entrepreneur's positive emotions? Shepherd (2015) suggested the answer lies in the challenging nature of the entrepreneurial task.

However, perhaps a specific entrepreneurial task is more challenging for one individual than for another, and the reverse may be true for a different entrepreneurial task. Besides, there are surely other stimulants of positive emotion. Perhaps there is a “building the entrepreneurial team” pathway to positive emotions in which a specific configuration of team members “clicks” to generate positive emotions. Maybe the pathways leading to positive emotions differ in terms of which positive emotions they stimulate. For instance, entrepreneurial teams engage in activities that may generate positive emotions such as hope, enthusiasm, and pride.

Furthermore, fsQCA focuses our scholarly attention on different configurations, such as (i) configurations of activities and interactions that generate positive emotions; (ii) configurations of different positive emotions that are generated by entrepreneurial action; and (iii) configurations of entrepreneurial team members that are antecedent to and/or the consequences of positive emotions (or positive emotion configurations). The method can also shed light on (iv) how configurations of positive emotions enhance the formation or performance of activity-based configurations for entrepreneurial action, and (v) on how configurations of positive emotions “undo” negative emotions generated throughout the entrepreneurial process. We note that outliers that are extremely high in hot cognition and outliers that are extremely low in hot cognition may both exhibit high entrepreneurial performance (i.e. causal asymmetry), providing the basis for new insights into entrepreneurial phenomena.

4.5. The fsQCA approach to entrepreneurship that is more compassionate and prosocial

Recently the work on compassion organizing—“a collective response to a particular incident of human suffering that entails the coordination of individual compassion” (Dutton et al., 2006: 61)—has been extended to the entrepreneurial context (e.g., Shepherd and Williams, 2014; Miller et al., 2012; Williams and Shepherd, 2016). Shepherd (2015) proposed this nascent research stream investigate the alleviation of suffering of non-employees (i.e., outsiders) by the creation of new ventures (*de novo* and *de alio*) through resourceful and prosocial actions (see Shepherd and Williams, 2014). Utilizing fsQCA is likely to generate numerous contributions to the entrepreneurship literature on this topic.

First, there are many sets of multiple paths to be explored: there are multiple paths to suffering, to entrepreneurial action to alleviate suffering, and to victim functioning. Indeed, as we discussed above, there are multiple paths to the formation of opportunity beliefs, and thus, there are likely multiple paths to developing an opportunity for compassion. There are also multiple paths to a specific entrepreneurial action (and multiple entrepreneurial actions), and thus there are likely multiple paths to a broad, customized, and speedy response to suffering. Furthermore, there are likely multiple paths by which entrepreneurial cognitions lead to positive emotions (and vice versa), and thus there are likely different emotional, cognitive, and hot cognition paths to compassion venturing. Moreover, the multiple paths of suffering, compassion venturing, and individuals’ responses to adversity are interdependent, and researchers can explore these paths in terms of a more macro path to the alleviation of others’ suffering.

Second, a focus on configurations is likely to reveal unique elements of compassion and prosocial behavior, with configurations including high levels of specific positive emotions and high specific negative emotions; of activities, interactions, and people in the rapid emergence of response groups; of different aspects of a community facing adversity (e.g., strength and type of culture, informal communication channels, weak ties with other communities, and so on); and of resources at hand, a resourcefulness mindset, local knowledge, and social capital. While the possibilities are endless, given the considerable implications of compassion venturing, it is important that future research investigates the multiple paths, the multiple configurations, and the outliers from the norm (in path, configuration, and performance).

Finally, given the uncertainty and time pressures associated with people suffering in the aftermath of an adverse event, fsQCA provides a means to avoid over-simplifying the situation to fit a linear-additive explanation. People’s suffering ebbs and flows; it progresses through stages of recovery, but sometimes skips a stage (e.g., resilience) or reverts back to a previous stage (e.g., as with chronic dysfunction). While the creation of an organization is unlikely to be linear, the rapid (almost instantaneous) emergence of a compassion venture after an adverse event is likely to be non-linear, with some activities being performed in parallel or “out of” sequence and with many complex trade-offs (e.g., between customization and speed). Although this time pressure and complexity represent a challenge to researchers, they also represent an opportunity to explore the many things happening over a short period (e.g., ventures created in days and weeks rather than months and years [Shepherd and Williams, 2014]).

5. Conclusion, limitations, and implications

We have argued that while research using traditional symmetric methods has contributed much to revealing the determinants of entrepreneurial phenomena, such methods may leave information largely undiscovered about individuals and sub-groups within the population. To make further progress in explaining and predicting entrepreneurial phenomena, researchers can use fsQCA to complement knowledge derived from traditional analytical methods. In this regard, the current paper makes three main contributions to the entrepreneurship literature.

First, we shine a light on the complexities of entrepreneurial phenomena that are left unexamined by traditional methods, and provide an overview of the fsQCA method for those considering the use of this tool to reveal information on these complexities in the entrepreneurship context. This analytical tool is complementary to symmetric quantitative methods, adding the capability of dealing with outliers, asymmetric data, asymmetric relationships, and the interdependency of all antecedent conditions to reveal multiple pathways and fine-grained detail about the underlying antecedents of entrepreneurial behavior.

Second, this paper replicates and extends the Douglas (2013) regression study of entrepreneurial intentions (which had found a broad two-way distinction between growth-oriented and independence-oriented entrepreneurial intentions), demonstrating that the fsQCA method can reveal richer explanations of entrepreneurial decision-making. We found five different main patterns of

antecedent conditions within the independence-oriented entrepreneurial intentions construct, and six different configurations of growth-oriented and non-growth-oriented entrepreneurial intentions. Our replication supports the finding that different individuals intend to undertake the two main kinds of (commercial) entrepreneurship, but we also show that different individuals want to undertake the same broad kind of entrepreneurship for different reasons. On the basis of that analysis, we presented a taxonomy of entrepreneurial (intention) types that may prove useful for theory building in the entrepreneurship domain.

The third goal of this paper was to offer a broad range of potential research topics for which fsQCA offers promise to advance the entrepreneurship field. This agenda for research using fsQCA provides a rich smorgasbord of research topics for entrepreneurship scholars wishing to investigate new issues in the entrepreneurship domain.

5.1. Limitations

Of course, fsQCA has limitations. It is an inductive, iterative method (Greckhamer et al., 2018) that finds combinations of antecedent conditions that associate with the focal outcome of interest. It does not explain how or why those outcomes combine or interact to “cause” the outcome—such theory building is for the researcher to develop, subsequent to the revelation of new empirical information and by using experiments and longitudinal studies to explore causation. And like other analytical methods, fsQCA is prone to the “forking paths” problem (Gelman and Loken, 2014), whereby the researcher’s degrees of freedom may influence the results claimed. The best practice use of fsQCA requires explicit statement of the assumptions underlying the choice taken at each fork in the path toward the reported results, including the choice of the constructs to include in the configurational model, the proxy variables used when direct measures are not possible, the metrics used, the rules for data (and case) inclusion or exclusion, the thresholds for coverage and consistency chosen, and so on.

Questions of reproducibility and validity of the fsQCA results must be addressed by subsequent fsQCA studies that do (or do not) reveal the same configurations of conditions. As with traditional quantitative methods, the results are sample dependent, such that a sample that is quite different is likely to generate a quite different set of configurations. To reproduce and validate the initial fsQCA results, the researcher needs to use consistent decision rules in subsequent studies to avoid adding researcher degrees of freedom, and subsequent samples must be drawn from the same population to include cases that are hypothesized to share that configuration. With large samples, the researcher could split the sample and run fsQCA on each sub-sample to gauge model efficacy.

5.2. Implications

This paper has implications for entrepreneurial policy, practice, education and further research. A better understanding of the heterogeneity of entrepreneurial phenomena may lead to more focused prescriptions for policy action on multiple fronts, rather than a “one-size fits all” approach. For example, it may be a more productive use of public funds to support would-be entrepreneurs who exhibit particular configurations, rather than support a wider array of individuals based on a more general symmetric-model characterization of the focal phenomenon. Similarly, institutions that support new venture startup rates might be studied for their interdependencies rather than viewed in isolation.

In entrepreneurship education, it seems more fruitful to highlight that multiple configurations of attitudes, abilities, socio-demographic characteristics, and context can enable an entrepreneurial career, rather than to focus on sample averages, which may have little relevance to particular individuals. Further, the predominant notion of the solo entrepreneur as a person with high ESE across a range of management subfields should give way to the desirability of complementary individuals in top management teams, in which the attitude and ability deficits of one team member can be compensated for by the strengths of other members of the management team. At the macro level, non-credit experiential modes of entrepreneurship learning might be integrated with traditional education models to take advantage of the probable synergies.

Implications for practice include the recognition by would-be entrepreneurs and investors that individuals with different configurations of attitudes and abilities may well achieve entrepreneurial success. Further, simple conditions, such as being male, married, or business educated, are unlikely to be either necessary or sufficient when considered in isolation, and when found in configurations with other antecedent conditions may exhibit a positive, negative, or no relationship with the focal outcome. Such asymmetries, and the multiple pathways to entrepreneurial outcomes, should be recognized as potentially viable by debt and equity financing organizations, rather than inducing reluctance to fund new ventures that do not conform to the traditional view of a potentially successful new business.

Finally, the implications for future research are profound. The latter part of this paper presented a comprehensive research agenda where investigation of the conjunctural interdependence of antecedent conditions may allow discovery and validation of patterns that will serve to build new entrepreneurship theory at both the micro and macro levels. Having revealed multiple configurations that are apparently causal for entrepreneurial phenomena, researchers must apply themselves to theory building and testing for the generality of the configurations found in fsQCA studies. They may find that some configurations are replicated across samples or regions and thus appear to be a common characteristic of entrepreneurs more generally, while others are reflective of distinctive differences among entrepreneurs and entrepreneurial behaviors in different regions, entrepreneurship types, cultures, or levels of economic development. Finally, the relationship between the inductive fsQCA method and abductive theory development cries out for further analysis and theoretical development, especially in the context of researcher degrees of freedom.

In conclusion, we trust that researchers will embrace fsQCA as an analytical tool that is complementary to symmetric analysis, using it to reveal finer-grained details about entrepreneurial phenomena. This analytical tool, relatively new in the entrepreneurship literature, promises to unearth empirical evidence about data asymmetry and outliers, asymmetric data relationships, conjunctural

interdependence, and the equifinality of multiple pathways to a wide range of entrepreneurial outcomes that may be observed. Theorizing and sense-making of these observed configurations must then be undertaken to hypothesize and subsequently test to build new more fine-grained theory in our complex and heterogeneous research domain.

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References

- Ahl, H., 2006. Why research on women entrepreneurs needs new directions. *Entrep. Theory Pract.* 30 (5), 595–621.
- Ajzen, I., 1991. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50, 179–211.
- Ajzen, I., Fishbein, M., 1977. Attitude-behavior relations: a theoretical analysis and review of empirical research. *Psychol. Bull.* 84, 888–918.
- Antoncic, B., 2002. Risk taking in intrapreneurship: translating the individual level risk aversion into the organizational risk taking. *J. Enterprising Cult.* 11 (1), 1–23.
- Bandura, A., 1977. Self-efficacy: toward a unifying theory of behavioral change. *Psychol. Rev.* 84, 191–215.
- Baron, R.A., Ensley, M.D., 2006. Opportunity recognition as the detection of meaningful patterns: evidence from comparisons of novice and experienced entrepreneurs. *Manage. Sci.* 529, 1331–1344.
- Battilana, J., Lee, M., 2014. Advancing research on hybrid organizing – insights from the study of social enterprise. *Acad. Manag. Ann.* 8, 397–441.
- Beynon, M.J., Jones, P., Pickernell, D., 2016. Country-based comparison analysis using fsQCA investigating entrepreneurial attitudes and activity. *J. Bus. Res.* 69, 1271–1276.
- Bird, B., 1988. Implementing entrepreneurial ideas: the case for intention. *Acad. Manag. Rev.* 13, 442–453.
- Boyd, N.G., Vozikis, G.S., 1994. The influence of self-efficacy on the development of entrepreneurial intentions and actions. *Entrep. Theory Pract.* 18, 63.
- Brinkmann, J., Grichnik, D., Kapsa, D., 2010. Should entrepreneurs plan or just storm the castle? A meta-analysis on contextual factors impacting the business planning–performance relationship in small firms. *J. Bus. Ventur.* 25, 24–40.
- Brüderl, J., Preisendörfer, P., 1998. Network support and the success of newly founded business. *Small Bus. Econ.* 10 (3), 213–225.
- Buelens, M., Poelmans, S.A., 2004. Enriching the Spence and Robbins' typology of workaholism: demographic, motivational and organizational correlates. *J. Organ. Chang. Manag.* 17 (5), 440–458.
- Carter, S., 2011. The rewards of entrepreneurship: exploring the incomes, wealth, and economic well-being of entrepreneurial households. *Entrep. Theory Pract.* 35 (1), 39–55.
- Choi, Y.R., Lévesque, M., Shepherd, D.A., 2008. When should entrepreneurs expedite or delay opportunity exploitation? *J. Bus. Ventur.* 23, 333–355.
- Choi, Y.R., Shepherd, D.A., 2004. Entrepreneurs' decisions to exploit opportunities. *J. Manage.* 30, 377–395.
- Coad, A., Frankish, J., Roberts, R.G., Storey, D.J., 2013. Growth paths and survival chances: an application of Gambler's Ruin theory. *J. Bus. Ventur.* 28 (5), 615–632.
- Cooney, T.M., 2005. What is an Entrepreneurial Team? *Int. Small Bus. J.* 23 (3), 226–235.
- Cornelissen, J.P., Clarke, J.S., 2010. Imagining and rationalizing opportunities: inductive reasoning and the creation and justification of new ventures. *Acad. Manag. Rev.* 35, 539–557.
- Davidsson, P., Steffens, P., Fitzsimmons, J.R., 2009. Growing profitable or growing from profits: Putting the horse in front of the cart? *J. Bus. Ventur.* 24, 388–406.
- Deci, E., Ryan, R.M., 1985. Intrinsic Motivation and Self-Determination In Human Behavior. Springer Science & Business Media.
- De Noble, A.F., Jung, D., Ehrlich, B., 1999. Entrepreneurial self-efficacy: the development of a measure and its relationship to entrepreneurial intentions and actions. *Entrep. Theory Pract.* 18, 63–77.
- Delmar, F., Shane, S., 2004. Legitimizing first: organizing activities and the survival of new ventures. *J. Bus. Ventur.* 19, 385–410.
- DeTienne, D.R., McKelvie, A., Chandler, G.N., 2015. Making sense of entrepreneurial exit strategies: a typology and test. *J. Bus. Ventur.* 30, 255–272.
- Devece, C., Peris-Ortiz, M., Rueda-Armengot, C., 2016. Entrepreneurship during economic crisis: success factors and paths to failure. *J. Bus. Res.* 69, 5366–5370.
- Doty, D.H., Glick, W.H., 1994. Typologies as a unique form of theory building: toward improved understanding and modeling. *Acad. Manag. Rev.* 19, 230–251.
- Douglas, E.J., 2013. Reconstructing entrepreneurial intentions to identify predisposition for growth. *J. Bus. Ventur.* 28, 633–651.
- Douglas, E.J., Fitzsimmons, J.R., 2013. Intrapreneurial intentions versus entrepreneurial intentions: distinct constructs with different antecedents. *Small Bus. Econ.* 41 (1), 115–132.
- Duberley, J., Carrigan, M., 2013. The career identities of 'mumpreneurs': women's experiences of combining enterprise and motherhood. *Int. Small Bus. J.* 31, 629–651.
- Dutton, J.E., Worline, M.C., Frost, P.J., Lilius, J., 2006. Explaining compassion organizing. *Adm. Sci. Q.* 51, 59–96.
- Fiss, P.C., 2011. Building better causal theories: a fuzzy set approach to typologies in organization research. *Acad. Manag. J.* 54, 393–420.
- Fredrickson, B.L., 1998. What good are positive emotions? *Rev. Gen. Psychol.* 2, 300.
- Frambach, R.T., Fiss, P.C., Ingenbleek, P.T., 2016. How important is customer orientation for firm performance? A fuzzy set analysis of orientations, strategies, and environments. *J. Bus. Res.* 69 (4), 1428–1436.
- Gabriel, A.S., Campbell, J.T., Djurdjevic, E., Johnson, R.E., Rosen, C.C., 2018. Fuzzy Profiles: comparing and contrasting latent profile analysis and fuzzy set qualitative comparative analysis for person-centered research. *Organ. Res. Methods* 21 (4), 877–904.
- Gartner, W.B., 1985. A conceptual framework for describing the phenomenon of new venture creation. *Acad. Manag. Rev.* 10, 696–706.
- Gelman, A., Loken, E., 2014. Data-dependent analysis – a garden of forking paths – explains why many statistically significant comparisons don't hold up. *Am. Sci.* 102 (6), 640.
- Gimeno, J., Folta, T.B., Cooper, A.C., Woo, C.Y., 1997. Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Adm. Sci. Q.* 750–783.
- Greckhamer, T., 2016. CEO compensation in relation to worker compensation across countries: the configurational impact of country-level institutions. *Strateg. Manag. J.* 37, 793–815.
- Greckhamer, T., Furlani, S., Fiss, P.C., Aguilera, R.V., 2018. Studying configurations with qualitative comparative analysis: best practices in strategy and organization research. *Strateg. Organ.* 16 (4), 482–495.
- Grégoire, D.A., Corbett, A.C., McMullen, J.S., 2011. The cognitive perspective in entrepreneurship: an agenda for future research. *J. Manag. Stud.* 48, 1443–1477.
- Hannan, M.T., 2010. Partiality of memberships in categories and audiences. *Annu. Rev. Sociol.* 36, 159–181.
- Harms, R., Kraus, S., Schwarz, S., 2009. The suitability of the configuration approach in entrepreneurship research. *Entrep. Reg. Dev.* 21, 25–49.
- Joardar, A., Wu, S., 2011. Examining the dual forces of individual entrepreneurial orientation and liability of foreignness on international entrepreneurs. *Can. J. Adm. Sci. / Rev. Can. Des Sci. L Adm.* 28, 328–340.
- Kautonen, T., Gelderen, M., Fink, M., 2015. Robustness of the theory of planned behavior in predicting entrepreneurial intentions and actions. *Entrep. Theory Pract.* 39 (3), 655–674.
- Kautonen, T., Luoto, S., Tornikoski, E.T., 2010. Influence of work history on entrepreneurial intentions in 'prime age' and 'third age': a preliminary study. *Int. Small Bus. J.* 28, 583–601.
- Kegel, P., 2016. A comparison of startup entrepreneurial activity between the United States and Japan. *Journal of Management Policy and Practice* 17 (1), 18–26.

- Ketchen, D.J., Shook, C.L., 1996. The application of cluster analysis in strategic management research: an analysis and critique. *Strateg. Manage. J.* 17 (6), 441–458.
- Knight, G., Cavusgil, S.T., 2004. Innovation, organizational capabilities, and the born-global firm. *J. Int. Bus. Stud.* 35 (2), 124–141.
- Krogslund, C., Choi, D.D., Poertner, M., 2015. Fuzzy sets on shaky ground: parameter sensitivity and confirmation bias in fsQCA. *Political Anal.* 23 (1), 21–41.
- Krueger, N.F., Carsrud, A.L., 1993. Entrepreneurial intentions: applying the theory of planned behavior. *Entrep. Reg. Dev.* 5, 315–330.
- Krueger, N.F., Reilly, M.D., Carsrud, A.L., 2000. Competing models of entrepreneurial intentions. *J. Bus. Ventur.* 15, 411–432.
- Kuckertz, A., Prochotta, A., 2018. What's hot in entrepreneurship research 2018? *Hohenheim Entrepreneurship Research Brief 4* (February), 1–7.
- Lee, L., Wong, P.K., Foo, M.D., Leung, A., 2011. Entrepreneurial intentions: the influence of organizational and individual factors. *J. Bus. Ventur.* 26, 124–136.
- Leppänen, P.T., McKenny, A.F., Short, J.C., 2019. Qualitative comparative analysis in entrepreneurship: exploring the technique and noting opportunities for the future. In: Boyd, B., Crook, T.R., Lê, J.K., Smith, A.D. (Eds.), *Standing on the Shoulders of Giants: Traditions and Innovations in Research Methodology*. Emerald Publishing Ltd.
- Levie, J., 2007. Immigration, in-migration, ethnicity and entrepreneurship in the United Kingdom. *Small Bus. Econ.* 28, 143–169.
- Lichtenstein, B.B., Carter, N.M., Dooley, K.J., Gartner, W.B., 2007. Complexity dynamics of nascent entrepreneurship. *J. Bus. Ventur.* 22, 236–261.
- Liñán, F., Fayolle, A., 2015. A systematic literature review on entrepreneurial intentions: citation, thematic analyses, and research agenda. *Int. Entrep. Manag. J.* 11, 907–933.
- Martin, R.L., Osberg, S., 2007. Social entrepreneurship: the case for definition. *Stanford Social Innovation Review* 5, 28–39.
- McMullen, J.S., Shepherd, D.A., 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Acad. Manag. Rev.* 31, 132–152.
- Meyer, A.D., Tsui, A.S., Hinings, C.R., 1993. Configurational approaches to organizational analysis. *Acad. Manag. J.* 36 (6), 1175–1195.
- Miller, T.L., Grimes, M.G., McMullen, J.S., Vogus, T.J., 2012. Venturing for others with heart and head: how compassion encourages social entrepreneurship. *Acad. Manag. Rev.* 37, 616–640.
- Misangyi, V.F., Greckhamer, T., Furnari, S., Fiss, P.C., Crilly, D., Aguilera, R., 2017. Embracing causal complexity: the emergence of a neo-configurational perspective. *J. Manage.* 43 (1), 255–282.
- Muñoz, P., Dimov, D., 2015. The call of the whole in understanding the development of sustainable ventures. *J. Bus. Ventur.* 30, 632–654.
- Muñoz, P., Kibler, E., 2016. Institutional complexity and social entrepreneurship: a fuzzy-set approach. *J. Bus. Res.* 69, 1314–1318.
- Newbert, S.L., Hill, R.P., 2014. Setting the stage for paradigm development: a 'small-tent' approach to social entrepreneurship. *J. Soc. Entrep.* 5, 243–269.
- Nuzzo, R., 2014. Statistical errors. *Nature* 306, 150–152.
- Obschonka, M., Schmitt-Rodermund, E., Silbereisen, R.K., Gosling, S.D., Potter, J., 2013. The regional distribution and correlates of an entrepreneurship-prone personality profile in the United States, Germany, and the United Kingdom: a socioecological perspective. *J. Pers. Soc. Psychol.* 105, 104–122.
- Parker, S.C., 2011. Intrapreneurship or entrepreneurship? *J. Bus. Ventur.* 26 (1), 19–34.
- Ragin, C.C., 1987. *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*. University of California Press, Berkeley, Los Angeles and London.
- Ragin, C.C., 2000. *Fuzzy-set Social Science*. University of Chicago Press, Chicago.
- Ragin, C.C., 2008. *Redesigning Social Inquiry: Fuzzy Sets and Beyond*. Chicago University Press, Chicago.
- Reynolds, P., Bosma, N., Autio, E., Hunt, S., De Bono, N., et al., 2005. Global entrepreneurship monitor: data collection design and implementation 1998–2003. *Small Bus. Econ.* 24 (3), 205–231.
- Schlaegel, C., Koenig, M., 2014. Determinants of entrepreneurial intent: a meta-analytic test and integration of competing models. *Entrep. Theory Pract.* 38, 291–332.
- Schneider, C.Q., 2018. Realists and idealists in QCA. *Political Anal.* 26 (2), 246–254.
- Schneider, C., Wagemann, C., 2012. *Set-theoretic Methods for the Social Sciences*. Cambridge University Press, Cambridge.
- Schreier, M., Prügl, R., 2008. Extending lead-user theory: Antecedents and consequences of consumers' lead users. *J. Prod. Innov. Manage.* 25 (4), 331–346.
- Seligman, M.E., Csikszentmihalyi, M., 2000. Special issue on happiness, excellence, and optimal human functioning. *Am. Psychol.* 55, 5–183.
- Shane, S., Venkataraman, S., 2000. The promise of entrepreneurship as a field of research. *Acad. Manag. Rev.* 25, 217–226.
- Shapiro, A., Sokol, L., 1982. Social dimensions of entrepreneurship. In: Kent, C.A., Sexton, D.L., Vesper, K.H. (Eds.), *Encyclopedia of Entrepreneurship*. Prentice Hall, Englewood Cliffs, NJ, pp. 72–90.
- Shepherd, D.A., 2003. Learning from business failure: propositions of grief recovery for the self-employed. *Acad. Manag. Rev.* 28, 318–328.
- Shepherd, D.A., 2015. Party on! A call for entrepreneurship research that is more interactive, activity based, cognitively hot, compassionate, and prosocial. *J. Bus. Ventur.* 30, 489–507.
- Shepherd, D.A., Suddaby, R., 2017. Theory building: a review and integration. *J. Manage.* 43 (1), 59–86.
- Shepherd, D.A., Wiklund, J., Haynie, J.M., 2009. Moving forward: balancing the financial and emotional costs of business failure. *J. Bus. Ventur.* 24, 134–148.
- Shepherd, D.A., Williams, T.A., 2014. Local venturing as compassion organizing in the aftermath of a natural disaster: the role of localness and community in reducing suffering. *J. Manag. Stud.* 51, 952–994.
- Shepherd, D.A., Williams, T.A., Patzelt, H., 2015. Thinking about entrepreneurial decision making: review and research agenda. *J. Manage.* 41, 11–46.
- Short, J.C., Payne, G.T., Ketchen, D.J., 2008. Research on organizational configurations: past accomplishments and future challenges. *J. Manage.* 34 (6), 1053–1079.
- Simmons, J.P., Nelson, L.D., Simonsohn, U., 2011. False-positive psychology: undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychol. Sci.* 22 (1), 1359–1366.
- Stephan, U., 2018. Entrepreneurs' mental health and well-being: a review and research agenda. *Acad. Manag. Perspect.* 32 (3), 290–322.
- Suddaby, R., 2010. Editor's comments: Construct clarity in theories of management and organization. *Academy of Management Review* 35 (3), 346–357.
- Tanner, S., 2014. QCA is of questionable value for policy research. *Policy Soc.* 33, 287–298.
- Thompson, E.R., 2009. Individual entrepreneurial intent: construct clarification and development of an internationally reliable metric. *Entrep. Theory Pract.* 33, 669–694.
- Ucbasaran, D., Shepherd, D.A., Lockett, A., Lyon, S.J., 2013. Life after business failure: the process and consequences of business failure for entrepreneurs. *J. Manage.* 39 (1), 163–202.
- Venkataraman, S., 1997. The distinctive domain of entrepreneurship research. *Advances in entrepreneurship. Firm Emerg. Growth* 3, 119–138.
- Verkuilen, J., 2005. Assigning membership in a fuzzy set analysis. *Sociol. Methods Res.* 33 (4), 462–496.
- Wasserstein, R.L., Lazar, N.A., 2016. The ASA's statement on p-values: context, process and purpose. *Am. Stat.* 70 (2), 129–133.
- Watkins-Mathys, L., 2012. Age and grey entrepreneurship. *Lessons on Profiting From Diversity*. Palgrave Macmillan, London, pp. 94–113.
- Wauters, B., Lambrecht, J., 2008. Barriers to refugee entrepreneurship in Belgium: towards an explanatory model. *J. Ethn. Migr. Stud.* 34 (6), 895–915.
- Westhead, P., Ucbasaran, D., Wright, M., 2005. Decisions, actions, and performance: do novice, serial, and portfolio entrepreneurs differ? *J. Small Bus. Manag.* 43, 393–417.
- Wiklund, J., Hatak, I., Patzelt, H., Shepherd, D.A., 2018. Mental disorders in the entrepreneurship context: when being different can be an advantage. *Acad. Manag. Perspect.* 32 (2), 182–206.
- Wiklund, J., Nikolaev, B., Shir, N., Foo, M.D., Bradley, S., 2019. Entrepreneurship and well-being. *J. Bus. Ventur.* <https://doi.org/10.1016/j.jbusvent.2019.01.002>.
- Wiklund, J., Patzelt, H., Dimov, D., 2016. Entrepreneurship and psychological disorders: how ADHD can be productively harnessed. *J. Bus. Ventur. Insights* 6, 14–20.
- Wiklund, J., Shepherd, D.A., 2005. Entrepreneurial orientation and small business performance: a configurational approach. *J. Bus. Ventur.* 20, 71–91.
- Williams, T.A., Shepherd, D.A., 2016. Building resilience or providing sustenance: different paths of emergent ventures in the aftermath of the Haiti earthquake. *Acad. Manag. J.* 59, 2069–2102.
- Wood, M.S., Williams, D.W., Drover, W., 2017. Past as prologue: entrepreneurial inaction decisions and subsequent action judgments. *J. Bus. Ventur.* 32, 107–127.
- Woodside, A.G., 2013. Moving beyond multiple regression analysis to algorithms: calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory. *J. Bus. Res.* 66, 463–472.
- Woodside, A.G., Nagy, G., Megehee, C.M., 2018. Applying complexity theory: a primer for identifying and modeling firm anomalies. *J. Innovation Knowl.* 3 (1), 9–25.
- Zhao, H., Seibert, S.E., Lumpkin, G.T., 2010. The relationship of personality to entrepreneurial intentions and performance: a meta-analytic review. *J. Manage.* 36, 381–404.
- Zyphur, M.J., 2009. When mindsets collide: switching analytical mindsets to advance organization science. *Acad. Manag. Rev.* 34, 677–688.