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A COGNITIVE MAP OF SUSTAINABLE DECISION-MAKING IN ENTREPRENEURSHIP: A CONFIGURATIONAL APPROACH

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Abstract

Purpose Under what conditions do entrepreneurs make the sustainable decisions they need to develop socially and environmentally responsible new businesses? Explanations of sustainable decision-making have involved various cognitive features, however is not yet clear how they play a role in empirical terms and, moreover, how they combine to induce business decisions based on social, environmental and economic considerations. This paper explores how five cognitive factors combine and causally connect to produce sustainable decision-making in entrepreneurship.

Design/methodology/approach This study uses Fuzzy-Set Qualitative Comparative Analysis to examine the decision-making of 37 sustainable entrepreneurs. It focuses on a substantive conception of entrepreneurial behaviour to uncover the cognitive antecedents underlying entrepreneurial decisions that involve the explicit development and implementation of measures, targets and strategies aimed at improving its impact on people and the environment.

Findings The configurational analysis reveals a typology comprising five combinations of cognitive factors constituting a comprehensive cognitive map of sustainable decision-making in entrepreneurship, namely: i. purpose-driven, determined; ii. value-based, vacillating; iii. value-based, unintended; iv. single motive, single solution; and v. purpose-driven, hesitant.

Research limitations/implications This study demonstrates that no single condition is necessary or sufficient for triggering decision-making involving social and environmental concerns, revealing five mental models leading to sustainable decision-making. In doing so, this paper responds to recent calls that stress the need for studies capable of uncovering the complex constellation of cognitive factors underlying and causally linked to entrepreneurial sustainable behaviour. Theoretical and practical implications are discussed.

Originality/value This paper provides a systematic characterization of the cognitive underpinnings of sustainable decision-making and offers a basis for organising the study of sustainable outcomes and configurations of cognitive antecedents. It reconciles prior efforts aimed at characterizing sustainability decisions in the context of SMEs and new enterprises, challenging current models based on awareness, experience, and ethical normative frameworks.

Keywords Sustainable decision-making; cognition; entrepreneurship; configurational methods; fs/QCA

Paper type Research paper

Introduction

Sustainable decision-making in entrepreneurship is the process whereby business founders make choices about current and future business activities that concurrently consider the social, environmental and economic implications of such activities. These decisions tend to prioritize those activities critical to the success of the business, which at the same time do not undermine the ecological and social environments in which the business operates (Shepherd and Patzelt 2011), and/or prioritise those that have the potential to restore or nurture such environments towards recovering the balance between nature, society and economic activity (Parrish 2010).

In the examination of why entrepreneurs engage in sustainability practices, many authors draw from organizational or industry level approaches, often leveraging institutional theory or related macro-level theories (Ervin et al. 2012). However, little is known about the cognitive reasoning of the individuals in pursuit of sustainability-oriented new ventures (Hockerts 2015). Research so far has explored sustainable behaviour and cognition in established firms (e.g. Hockerts 2015; Kurz 2002; Schlange 2009) or the decision-making process leading to ethical or unethical actions in entrepreneurship (e.g. Harris et al. 2009; Shepherd et al. 2013; Surie and Ashley 2008), yet further examination is needed with regards to the cognitive conditions that collectively lead to decisions that consider social and environmental factors in the development of new ventures. Although explanations of sustainable decision-making in entrepreneurship have involved various characteristics, there is little consensus about the centrality of the cognitive factors influencing such decisions (Takahashi and Selfa 2015) and is not yet clear how they play a collective role in substantive terms. Moreover, it is still unclear whether the mental models leading to socially and environmentally responsible decisions across new business founders differ or resemble from each other.

This research tackles these issues by focusing on the cognitive elements underpinning human action and the antecedents of sustainable decision-making in new business development. It uses a configurational comparative method, namely fuzzy-set qualitative comparative analysis (Ragin 2008), to evaluate the different combinations of conditions under which certain individuals make the sustainable decisions they need to develop socially and environmentally responsible new ventures.

Drawing on a purposive sample of 37 sustainable entrepreneurs, this paper explores how five cognitive factors combine and causally connect leading to sustainable decision-making, captured by the extent to which the entrepreneur has developed and implemented sustainability-relevant measures, targets and strategies throughout the venturing process. The analysis yielded five different configurations of cognitive factors leading to sustainable decision-making, namely: i. purpose-driven, determined; ii. value-based, vacillating; iii. value-based, unintended; iv. single motive, single solution; and v. purpose-driven, hesitant, which reflect a typology comprising five distinct sustainability-oriented entrepreneurial mental models. Collectively, they account for most of outcome under examination, constituting a comprehensive cognitive map of sustainable decision-making in new business development.

By developing an empirical typology of sustainable decision-making in entrepreneurship, this paper responds to recent calls that stress the need for studies capable of uncovering the complex constellation of cognitive factors underlying and causally linked to sustainable behaviour (Hockerts 2015). It provides a systematic characterization of the cognitive underpinnings of sustainable decision-making in entrepreneurship and offers a basis for organizing the study of sustainable outcomes and configurations of cognitive antecedents. In doing so, it delivers a theoretical and methodological framework through which complex social

phenomena in management and business venturing in particular can be better understood. In addition, it makes available refined knowledge and theoretical language on complex causation that facilitate further theorizing and research design based on the logic of necessary and sufficient conditions.

The findings also challenge extant models explaining sustainability decisions in entrepreneurship based on ethical normative frameworks (e.g. (Harris et al. 2009)). While the recognition of moral issues within social and ecological problems seem relevant (Patzelt and Shepherd 2010), it will only trigger socially and environmentally responsible decisions in a context where sustainability values and motivation are present. Values and motivation prove having a strong causal relationship with the outcome across the different configurations, contrary to what ethical normative framework would argue.

The Cognitive Infrastructure of Decision-Making in Sustainable Entrepreneurship

Cognition and action are central in entrepreneurship research as they hold key to understanding success factors (Awais Ahmad Tipu and Manzoor Arain 2011). Just like knowledge and mental representations, concepts such as attitudes, motivations, and other mental states constitute the cognitive resources individuals use to interact and deal with the surrounding environment, and make decisions about present and future actions (Gregoire et al. 2015). These are mental constructs that proceed from human nature, subjective interpretations and perceptions that individuals make of their immediate environment, and also the sum of the individual's idiosyncratic experiences (Gregoire et al. 2010), including abilities, routines, intelligence, expertise, desires, among others. In this context, entrepreneurial cognition has been understood as “the knowledge structures that people use to make assessments, judgments, or decisions

involving opportunity evaluation, venture creation, and growth (Mitchell et al. 2002). Within this conception, decision-making heuristics has been identified as a central dimension (Awais Ahmad Tipu and Manzoor Arain 2011).

Sustainability decisions are contextual, value laden, and mostly focused on social actions (Martin 2015). In the context of business management, sustainable decision-making involves arguably a complex constellation of cognitive factors as social, environmental and economic objectives need to be in balance if sustainable value is to be created (Muñoz and Dimov 2015). The attitudes, motivations, and the other mental states required for such decision-making are thus thought to be different from those underpinning the type of decision-making leading to single economic outcomes, as in purely commercial venturing.

Central to this difference are the values underlying sustainability-related decisions (Shepherd et al. 2009). In Parrish's (2010) view, these are mechanisms for enhancing environmental quality and social wellbeing which are embedded in core business activities. Since the aims of such decisions concern environmental protection, social justice and economic development, the values supporting decision-making are likely to differ from those supporting decisions that purely prioritize economic return. The aforementioned factors are the key values of sustainable development, but within these general descriptors, there are very different values at play (Leiserowitz et al. 2006), for example democracy, freedom and human rights (Sharma and Ruud 2003), which act ultimately as guiding principles in the life of the “sustainability-oriented” business owner (Thomas and Walker 2016). Indeed, values seem to be always behind the rise of sustainable entrepreneurship, normally based on equanimity between self, other people, and nature (Parrish 2010). Relatedly, Muñoz and Cohen (2017a) emphasise that value-

laden factors not only guide motivation but also narratives linked to “doing the right thing”, which ultimately enables legitimacy.

The need for such ideologically-charged concepts derives from the notion that sustainability in the business context, Lafferty and Langhelle (1999) argue, cannot be treated as a mere strategic asset but instead as an ethical code for human survival and progress. The predominance of values in entrepreneurial decision-making can be even seen in investment and start-up capital decisions, where sustainable entrepreneurs often face challenges finding investors who understand their businesses and share their values (Cohen 2005). Social or environmental values in this context are seen at odds with investors’ goals of maximizing profit (Cohen et al. 2008).

The entrepreneurship phenomenon involves the recognition of an opportunity for value creation, where the likelihood of recognition largely depend on motivation, awareness and prior knowledge (Ulvenblad et al. 2013). For sustainable entrepreneurs, ecological and social issues constitute opportunities that can be exploited in the market (Keskin et al. 2013). In this vein, Patzelt and Shepherd (2010) emphasize that when it comes to sustainable development, the awareness of ecological and social problems and the threats emerging from such problems is central to the recognizing of opportunities that permits the formation of triple bottom line businesses. Individuals aware of the conditions of their surrounding ecological and social environments, and the severity of the derived social and environmental problems (Muñoz and Dimov 2017), are more likely to perceive changes in those environments and eventually to recognize the opportunities that arise from environmentally- and socially-relevant market failures. As such, compared to individuals whose attention is more focused on the business environment, those individuals focused on ecological and social environments are more likely to

form beliefs about new opportunities for sustainable development, even if they show no intention to personally pursue such opportunities (Shepherd and Patzelt 2011).

Awareness is deeply rooted in knowledge of and attitude towards the role of business in society. In the context of entrepreneurship, sustainability attitudes and convictions are closely connected to the intention of creating a new business, meaning that stronger attitudes towards environmental protection and social responsibility prompts sustainable decision-making within the creation of a new businesses (Kuckertz and Wagner 2010). Here, attitudes not only summarise the individuals' tendencies to view particular matters as positive or negative, but also interact with other cognitive structures influencing judgment and behaviour (Gregoire et al. 2010).

Drawing on cognitive psychology, some authors have argued that the variance regarding the integration of sustainability in the formation of new ventures is explained to a great extent by the individual's motivation. Linnanen (2002), for example, explains this variance based on the fact that individuals pursuing triple bottom line businesses follow a predominant desire to change the world, which is operationalized by prioritizing environmental and social business goals (Schaltegger 2002). Walley and Taylor (2002) complement this view by emphasizing the role of the entrepreneurial mind-set in guiding actions towards sustainability. The authors stress the relevance of the transformative, sustainability-driven mind-set of these entrepreneurs as the mechanism through which they elaborate vision of a sustainable society that requires a systemic transformation. According to the authors, this is the only alternative orientation that combines all three principles; economic, ecological and social-ethical sustainability. More recently in the context of ecologically-oriented entrepreneurship, Kirkwood and Walton (2010) emphasise that these entrepreneurs are motivated by a multiplicity of both ecological and commercial factors

(i.e. green values; earning a living; passion; being their own boss; and seeing a gap in the market), which challenges traditional, and perhaps utopian, views of the phenomenon. The type of motivation, however, is contingent on the stage of the process. Fischer et al. (2017) show that while in early stages sustainable entrepreneurs tend to engage more with responsibility and security goals (i.e. prevention-focused self-regulatory process), in later stages the self-regulatory focus changes towards engaging more with growth and development goals, which is linked to promotion-focused self-regulatory processes.

Following motivation, intentions are central for explaining planned behaviour (Jarvis 2016), which includes managerial decisions related to new business development. They depend on the perception of desirability and feasibility of the business opportunity and the interaction between these two types of perceptions (Fitzsimmons and Douglas 2011). If the business opportunity at hand is complex and its evaluation involves more factors than simply the potential of economic gain (Shepherd and Patzelt 2011), the perceptions of desirability and feasibility of that opportunity are also likely to be more complex. In this vein, Schlange (2009) stresses that the main driver of sustainable decision-making in new business development is the willingness or intention to combine and balance a desire to change the world with a desire to make money. Likewise, Gibbs (2009) proposes that sustainable decision-making in the context of entrepreneurship results from the intention to act upon a combination of green, ethical and social motives. As shown by Reynolds et al. (2017), intention in sustainable entrepreneurship is also a strategic tool enabling legitimacy. Ultimately, underlying such decisions, there is a desire to contribute to solving societal and environmental problems through the development of new businesses (Schaltegger and Wagner 2011).

Positive attitudes and motivation towards sustainable changes require perseverance and determination if change is to be achieved. In order to transform attitude into actual behaviour, individuals need to believe that they can accomplish whatever they set out to accomplish and therefore successfully achieve self-set goals (Shepherd et al. 2013). Psychologists define this cognitive capacity as self-efficacy (Bandura 1982), which more specifically refers to a task-oriented construct that involves the assessment of confident beliefs an individual has about internal and external constraints and possibilities (Drnovšek et al. 2010).

Its centrality for sustainable decision-making stems from the fact that individuals with high self-efficacy exert more control over their own motivation, behaviour, and social environment. Therefore, entrepreneurial individuals with strong values and motivation towards sustainable change are more likely to make the sustainable decisions they need when their self-efficacy levels are also high. This is reinforced by Bryant (2009) in his study of moral awareness amongst entrepreneurs. The author shows that entrepreneurs with stronger self-regulatory features, specifically self-efficacy, are more morally aware and relate such awareness to maintaining personal integrity and building inter-personal trust, values underlying sustainability-related motivations. Likewise, Smith and Woodworth (2012) conclude that individuals with strong belief in their abilities to effect positive social change will be more likely to engage, persist, and perform well in efforts that create social value. On the contrary, individuals exhibiting low levels of self-efficacy are more likely to morally disengage and hence are more likely to act unethically than those high in self-efficacy (Farnese et al. 2011; Finn and Frone 2004).

As evidenced in Table 1, explanations of sustainable decision-making in the business context, and entrepreneurship in particular, have involved many characteristics ranging from values, knowledge, motivation and intention towards sustainable value creation. Beyond

providing a comprehensive overview of the cognitive underpinnings of sustainable entrepreneurship, Table 1 serves to highlight the complexity of the phenomenon, as seen in the mixed evidence supporting the relationship between cognition and entrepreneurial sustainable decision-making.

Table 1. Summary of explanatory variables for sustainable decision-making

| Paper | Aggregated rationale | Aggregated dimension |
|---|--|-----------------------------|
| Martin 2015 Shepherd et al. 2009 Leiserowitz et al. 2006 Thomas and Walker 2016 Lafferty and Langhelle 1999 Cohen 2005 Cohen et al. 2008 Parrish 2010 Muñoz and Cohen 2017a | Sustainability is an ideologically-charged concept. Values and beliefs concerning environmental protection, social justice and economic development tend to be at the basis of the drivers and intentions guiding sustainable entrepreneurship. Stronger values enable specific goal-setting and determination in the pursuit of sustainable ventures. | Values |
| Patzelt and Shepherd 2010 Ulvenblad et al. 2013 Muñoz and Dimov 2017 | Ecological and social issues constitute opportunities that need to be exploited in the market. Individuals aware of those issues are more likely to recognize opportunities and act upon them | Awareness |
| Kuckertz and Wagner 2010 Fischer et al. 2017 Kirkwood and Walton 2010 Walley and Taylor 2002 Schaltegger 2002 Linnanen 2002 | Individuals pursuing sustainability-oriented business opportunities follow a predominant motivation to change the world through the development of new business. This is normally based on a transformative, sustainability-driven mind-set. | Motivation |
| Reynolds et al. 2017 Shepherd and Patzelt 2011 Schlange 2009 Gibbs 2009 | The desire and intention to solve social and environmental problems translate sustainability-driven values and motivation into action. | Intention |
| Shepherd et al. 2013 Smith and Woodworth 2012 Farnese et al. 2011 Finn and Frone 2004 | Sustainability-oriented action requires goal setting and self-determination. Individuals with high self-efficacy exert more control over their own motivation, behaviour, and social environment. Sustainability-minded individuals are more likely to make the sustainable decisions they need when their self-efficacy levels are also high. | Self-efficacy |

So far, the factors highlighted in Table 1 have been investigated independently (Muñoz and Dimov 2015), based on the assumption that each of them are necessary (and sometimes sufficient by themselves) to explain complex decision-making involving oftentimes conflicting aims. This is mostly due to the fact that, although cognition operates at different levels of analysis, management and entrepreneurship cognition research have mostly focused on studying cognition at single levels of human activity.

However, understanding the cognitive dynamics that affect the transformation of attitudes and their influence on judgment and behaviour, requires explanations of how these elements come together to influence human action (Gregoire et al. 2010). This research draws on a more comprehensive approach to cognitive science to explore the effects of multiple cognitive variables on entrepreneurial decision-making.

Method

In elaborating a cognitive map of sustainable decision-making, this study uses Fuzzy-Set Qualitative Comparative Analysis (fs/QCA). Fs/QCA is a set-theoretic method and analytical technique that draws on systematic comparison of causal and outcome conditions to visualize and analyse causal complexity. By using Boolean algebra, counterfactual analysis and logical minimization¹, fs/QCA allows for comparing cases as configurations of factors (Ragin 2000), observing empirical information in a more parsimonious manner, and subsequently making causal interpretations based on the logic of causal necessity and sufficiency (Schneider and Wagemann 2012). Unlike traditional approaches to causal explanations that focus on cases

¹ The minimization logic states that if two Boolean expressions differ in only one causal condition, yet produce the same outcome, then the causal condition that distinguishes the two expressions can be considered irrelevant and can be removed to create a simpler, combined expression (Marx, 2008:263).

displaying a specific outcome and search for antecedent common conditions shared by all instances of the outcome, fs/QCA focuses on and allows for the possibility that the same outcome can follow from different constellation of conditions (Ragin 1999). fs/QCA thus develops a conception of causality that leaves room for complexity and equifinality, which means that different causal paths, each being relevant in a distinct way, may produce the same result.

Case Selection and Data Collection

In configurational comparative studies, case selection is guided by explicit theoretical concerns (Rihoux and Ragin 2009). Once the conceptual framework is established (i.e. cognitive underpinnings of sustainable decision-making in entrepreneurship), two considerations need to be taken into account in defining the sampling strategy. First, the study must define an area of homogeneity, meaning that cases must parallel each other and be comparable in terms of their background characteristics. Allowing for varying degrees of membership, all cases need to be in line with the notion that this form of entrepreneurship involves the use and combination of resources to pursue entrepreneurial opportunities with the aims of addressing social needs (Mair and Noboa 2003) and/or solving environmental problems (Walley and Taylor 2002).

Within this conceptual space, maximum heterogeneity over a minimum number of cases needs to be achieved (Rihoux and Ragin 2009). This means that the sample requires cases with both presence and absence of entrepreneurs establishing sustainability-related strategies, targets and measurement, i.e. positive and negative outcomes. While apparently similar, there is a central difference between the defined area of homogeneity and the variance in outcome. The

former captures the main orientation or focus of the business, which may or may not be translated into specific strategies, targets and measurement.

Case selection in fs/QCA does not rely on random sampling or other mechanistic procedures, but rather on a tentative and iterative process where the criteria of sufficient homogeneity and maximum heterogeneity are constantly pursued (Rihoux and Ragin 2009). The non-parametric nature of fs/QCA minimizes the threat of sample selection biases (Fiss 2011), which generally affect studies that require random sampling (Berk 1983).

In line with the criteria of sufficient homogeneity and maximum heterogeneity, 37 cases were purposively selected from a range of 67 self-identified sustainable ventures, all finalists and runner-up in North American business competitions with emphasis on social and/or environmental issues. All ventures took part in the competitions from 2009 to 2013. A total of 290 business founders were invited to participate and 67 of them responded the survey. All 37 ventures selected for the study (amongst the 67) declared having equal emphasis on social, environmental and economic aspects. While deemed sustainable, the remaining 30 ventures were discarded because the three objectives were not equally in balance². Despite having similar background characteristics (given by the nature and selection process of the competitions), ventures vary greatly, 10 different sectors are represented in this sample (see Table 2). At the time, the median for years of trading for the entire sample was three years. The great majority of the ventures (67%) reported having been trading for three years or less, 10% of the ventures reported having been trading for five to seven years, and 23% of them for four to five years. Sustainability-oriented competitions for entrepreneurs offer an adequate conceptual space for

² Balance of objectives was assessed by asking the founder how important financial, social and environmental goals are for his or her business. Level of importance was captured in a 5-point Likert scale.

balancing the required case selection criteria. All ventures went through a similar evaluation process and then selected based on standardized criteria, however, the participating businesses are different enough since they belong to different industries, have different clients, and are in different stages of development, which inevitably affect the definition of strategies, targets and measurement systems.

The primary method of data collection was a survey questionnaire, which was complemented with follow-up semi-structured interviews with 14 relevant cases. In order to capture sustainable decision-making in *entrepreneurship*, only founders actively involved in the development and management of the business were considered and all of them expressed being in agreement with the following statement: *sustainable entrepreneurship is focused on pursuing business opportunities to bring into existence future products, processes, and services, while contributing to improve the development of society, the economy and the environment*. Survey data was collected in 2013 and follow-up interviews were conducted in 2013 and 2014. Although the configurational analysis was conducted using quantitative evidence, interview data was instrumental since it validates the results of the analysis and assists in the explanation of how different configurations of cognitive factors lead to sustainable decision-making. Additionally, the use of multiple sources of evidence enables data triangulation, which increases the internal and external validity of the study. Semi-structured interviews were conducted using an interview guide focused on reconstructing the entrepreneurial process, i.e. decisions and actions involved in the development of the sustainable venture. Interviews lasted between one and two hours each and were recorded and transcribed.

Outcome and Causal Conditions

In defining sustainable decision-making in entrepreneurship as an outcome, instead of focusing on the individual, this paper focuses on a substantive conception of entrepreneurial behaviour, i.e. what sustainable entrepreneurs actually do in the pursuit and realization of a sustainability-oriented business (Muñoz and Dimov 2015). This entails examining whether central decisions involved in the entrepreneurial process actually address social and environmental issues.

Sustainable decision-making therefore captures the degree to which the sustainable entrepreneur has explicitly developed and implemented measures, targets and strategies aimed at improving its impact on people and the environment. Based on the triad firm, community and value chain, participants were asked about specific actions and the extent to which they have set social and environmental responsibilities to the firm's managerial team, promoted sustainable consumption behaviours amongst its clients, evaluated the quality of production and orientation of the organizations they have established relationships with, developed processes for managing social compliance, and invested in community development activities in the markets you source from and/or operate within. The idea of assessing action by focusing on measures, targets and strategies resonates with current literature (Ormiston and Seymour 2011), which emphasizes the latter as central activities in the creation of sustainable business outcomes.

In defining cognitive conditions for sustainable decision-making in entrepreneurship five cognitive factors were considered, which are widely acknowledge in the literature as central to either mobilizing or constraining entrepreneurial efforts towards sustainable value creation, as shown in the literature review and summarised in Table 1. As illustrated in the conceptual framework presented in Figure 1 below, cognitive factors are connected as building blocks leading to sustainable decision-making in entrepreneurship.

Figure 1. Sustainable decision-making in entrepreneurship: conceptual framework



Sustainability-oriented entrepreneurial values (SOE-values) is measured on a 6-item Likert scale ($\alpha=.71$). *SOE values* has been adapted from Kuckertz and Wagner (2010) and Muñoz and Dimov (2015) and seeks to capture underlying values and convictions related to the role of the entrepreneur's venture in the society. It asks the participants about their degree of agreement with several considerations that an entrepreneur can have in the process of business formation. *Sustainability-oriented opportunity awareness* (SOO-awareness) is measured on 8-item Likert scale ($\alpha=.9$) reflecting the extent to which the entrepreneur is aware of the existence of a business opportunity for sustainable development and manifest an explicit intention of pursuing such opportunity. Based on the work of Tang et al. (2012) on entrepreneurial alertness, *SOO awareness* has been previously used in sustainable entrepreneurship research (e.g. Muñoz and Dimov 2015) to capture the ways in which entrepreneurs sense and respond to economic, social, ecological, and intergenerational anomalies. *Sustainability-oriented entrepreneurial motivation* (SOE-motivation) is measured on an 8-item Likert scale ($\alpha=.84$) reflecting the central drivers of the entrepreneur in the process of setting up the objectives for its new business. The *SOE motivation* was derived from Dyllick and Hockerts (2002), Schlange (2006) and Cohen (2005), and it seeks to capture *SOE-motivation* by focusing on the intended outcomes of the planned action. The eight items pertain objectives normally used in sustainable strategizing representing

momentary aspirations of the entrepreneur, and cover comprehensively all four dimensions of sustainability; i.e. social, economic, environmental and inter-generational. *Sustainability-oriented entrepreneurial intention* (SOE-intention) is measured on a 5-item Likert scale ($\alpha=.8$) and assesses sustainability-oriented problem solving attitude (Larson 2000). SOE intention draws on the work of Liñán and Chen (2009), and assesses the extent to which the entrepreneur has the ability and willingness to pursue sustainability opportunities, reflecting therefore the entrepreneur's intention to act in a particular direction. Participants were asked to state their degree of agreement on statements referring to entrepreneurial attitudes towards the interplay between business development and sustainability. *Sustainability-oriented entrepreneurial self-efficacy* (SOE-efficacy) is measured on a 7-item Likert scale ($\alpha=.8$) adapted from the Panel Study of Entrepreneurial Dynamics (Reynolds 2007), which assesses the degree to which the business founder consider they have the knowledge and skills to successfully establish a business. Examining SOE-efficacy requires a particular focus on the dynamic interaction between the individual and the environment, which explains what cognitive and motivational processes are involved in an individual's decision to engage in entrepreneurial activities and how these processes are shaped by contextual and market factors (Drnovšek et al. 2010). As an adaptation of traditional self-efficacy measures that focus primarily on commercial activities, this scale describes tasks and roles that are typical in the context of new business development, with an emphasis on sustainability. The details of all the measures used in the study are provided in Appendix A.

The selection of outcome and conditions draws on the notion that the distinction between sustainable and other forms of entrepreneurship lies in the qualities and actual decisions of individuals (Light 2009). In developing these measures, I used deductive and inductive

techniques (Hinkin 1998). Deductively, the items were derived from relevant literature and adaptations from extant instruments, which was inductively assisted by data from five semi-structured interviews conducted in an exploratory study. In addressing potential limitations, the content validity of these adapted measures was verified using academic experts in two-stage assessment that involved first reading and thinking aloud, and second, interviews to descriptively evaluate the conceptual relation between constructs and measures, and the extent to which the measures are useful in explaining the different constructs (Hardy et al. 2011). Internal consistency reliability was assessed by means of Cronbach Alpha, whereas construct reliability and criterion validity was assessed by means of composite reliability test (Table B1 in Appendix B). Results confirm the consistency, validity and reliability of the measures. Tables B2 and B3 in Appendix B present descriptive statistics and correlation coefficients between the constructs based on calibrated scores, and the results of a Heterotrait-Monotrait Ratio (HTMT) test (using Partial Least Squares algorithm³). The low values in the correlation and HTMT tests do not raise concerns with discriminant validity among the conditions used in the analysis.

Calibration and Data Analysis

Data calibration is an essential procedure in fs/QCA studies. By means of a simple estimation technique it transforms variable raw scores into set measures, rescaling the original measure into scores ranging from 0.0 to 1.0 (Ragin 2007). This enables to specify the score that would qualify a case for full membership in the set of sustainable decision-making, as well as in the set of each condition, and also the score that would completely exclude it from each of the sets. The

³ Given the small sample size, ad-hoc structural equations algorithms (Partial Least Squares algorithm and bootstrapped Partial Least Squares) were selected for the confirmatory tests.

calibration process requires the definition of thresholds for full inclusion (≥ 0.95), full exclusion (≤ 0.05) and the crossover point (0.5), which acts as an anchor to establish deviation scores. In the present study, calibration seeks to create fuzzy-set scores that represent strong membership in casual conditions and the outcome. Therefore, in calibrating the conditions (5-point scales), 5 was established as the threshold for full inclusion, 3 for full exclusion and 4 as crossover point. In terms of outcome measure (6-point scale) 5,3,1 were established as threshold points. Given the overall emphasis on sustainability across the sample, it is understood that neutral responses reflect reluctance to fully engage with sustainability-oriented cognitive activities or decisions. Doing so permits in addition reducing the possibility of leniency effects (Kane et al. 2005). Skewed ratings represent a risk in survey research on sustainable development in small firms, due to cognitive biases (Roxas and Lindsay 2011). The selected calibration thresholds minimise such risk. Calibration scores are shown in Table 2, where membership in each conceptual category is defined when the case's score surpasses the crossover point (Ragin 2007).

Table 2. Calibration scores

| Case | SOE VALUES | SOE INTENTION | SOE EFFICACY | SOO AWARENESS | SOE MOTIVATION | SDM |
|--------------|-------------------|----------------------|---------------------|----------------------|-----------------------|------------|
| Appliances | 0.891 | 0.051 | 0.141 | 0.571 | 0.501 | 0.181 |
| Appliances | 0.951 | 0.951 | 0.941 | 0.771 | 0.771 | 0.951 |
| Architecture | 0.891 | 0.861 | 0.231 | 0.501 | 0.501 | 0.951 |
| Architecture | 0.951 | 0.951 | 0.571 | 1.001 | 0.941 | 0.821 |
| Consulting | 0.921 | 0.921 | 0.501 | 0.351 | 0.021 | 0.991 |
| Consulting | 0.711 | 0.141 | 0.291 | 0.861 | 0.431 | 0.501 |
| Consulting | 0.711 | 0.861 | 0.431 | 0.941 | 0.861 | 0.951 |
| Consulting | 0.951 | 0.951 | 0.291 | 1.001 | 0.291 | 0.821 |
| Energy | 0.821 | 0.951 | 0.571 | 0.991 | 0.351 | 0.051 |
| Energy | 0.821 | 0.861 | 0.431 | 0.921 | 0.431 | 0.501 |
| Energy | 0.231 | 0.501 | 0.431 | 0.051 | 0.181 | 0.181 |
| Energy | 0.181 | 0.141 | 0.431 | 0.431 | 0.051 | 0.051 |
| Energy | 0.951 | 0.951 | 0.951 | 1.001 | 0.921 | 0.991 |
| Energy | 0.181 | 0.351 | 0.891 | 0.431 | 0.431 | 0.051 |

| | | | | | | |
|------------------|-------|-------|-------|-------|-------|-------|
| Energy | 0.501 | 0.231 | 0.061 | 0.991 | 0.141 | 0.181 |
| Energy | 0.821 | 0.861 | 0.861 | 0.431 | 0.711 | 0.501 |
| Energy | 0.891 | 0.951 | 0.951 | 0.961 | 0.501 | 0.051 |
| Food | 0.951 | 0.351 | 0.891 | 1.001 | 0.951 | 0.991 |
| Food | 0.351 | 0.031 | 0.051 | 0.981 | 0.051 | 0.181 |
| Food | 0.951 | 0.951 | 0.861 | 0.991 | 0.821 | 0.821 |
| Food | 0.921 | 0.501 | 0.291 | 1.001 | 0.861 | 0.821 |
| Food | 0.351 | 0.651 | 0.711 | 0.181 | 0.711 | 0.951 |
| Food | 0.951 | 0.861 | 0.291 | 0.571 | 0.941 | 0.951 |
| Food | 0.951 | 0.861 | 0.771 | 0.951 | 0.951 | 0.501 |
| Local shop | 0.081 | 0.081 | 0.861 | 1.001 | 0.771 | 0.821 |
| Local shop | 0.921 | 0.501 | 0.711 | 0.991 | 0.771 | 0.991 |
| Local shop | 0.891 | 0.501 | 0.051 | 0.991 | 0.651 | 0.951 |
| Digital platform | 0.921 | 0.951 | 0.711 | 0.951 | 0.501 | 0.991 |
| Digital platform | 0.951 | 0.861 | 0.571 | 1.001 | 0.501 | 0.951 |
| Digital platform | 0.821 | 0.651 | 0.231 | 0.431 | 0.001 | 0.181 |
| Digital platform | 0.951 | 0.861 | 0.891 | 0.991 | 0.951 | 0.821 |
| Packaging | 0.711 | 0.051 | 0.941 | 1.001 | 0.711 | 0.051 |
| Packaging | 0.651 | 0.921 | 0.771 | 1.001 | 0.941 | 0.991 |
| Recycling | 0.651 | 0.501 | 0.291 | 0.991 | 0.141 | 0.951 |
| Recycling | 0.651 | 0.891 | 0.291 | 0.991 | 0.951 | 0.181 |
| Water | 0.651 | 0.861 | 0.711 | 0.571 | 0.061 | 0.181 |
| Water | 0.951 | 0.951 | 0.951 | 0.431 | 0.951 | 0.991 |

Once the measures are calibrated and the data collected, fs/QCA constructs a *truth table* listing the different logically possible combinations of causal conditions along with the cases conforming to each combination (Table 3). In order to reduce the truth table to simplified combinations, two thresholds need to be defined. The frequency threshold specifies the minimum amount of cases to be considered in the analysis. Setting a frequency threshold of one observation is acceptable when the aim is to build theory from a relatively small sample (Ragin 2007). The consistency threshold, on the other hand, defines the minimum acceptable level to which a combination of causal conditions is reliably associated with the each of the outcomes. Consistency thresholds of at least 0.8 and up to 0.95 are recommended (Ragin 2006), but should not be applied mechanistically (Crilly 2011). Following this recommendation, thresholds were

selected in line with gaps observed in the distribution of consistency scores (Schneider and Wagemann 2012). The truth table shows the resulting 16 combinations of conditions. 29 cases (78%) exceeded the lowest acceptable consistency, set at 0.8, and 8 cases are below the consistency cut-off line.

Table 3. Truth table

| SOE VALUES | SOE INTENTION | SOE EFFICACY | SOO AWARENESS | SEO MOTIVATION | CASES | SDM | CONS. |
|------------|---------------|--------------|---------------|----------------|-------|-----|-------|
| 1 | 1 | 1 | 0 | 1 | 2 | 1 | 0.940 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0.923 |
| 1 | 1 | 0 | 1 | 1 | 6 | 1 | 0.897 |
| 1 | 1 | 1 | 1 | 1 | 11 | 1 | 0.895 |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0.869 |
| 1 | 1 | 0 | 1 | 0 | 3 | 1 | 0.862 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0.850 |
| 1 | 0 | 1 | 1 | 1 | 2 | 1 | 0.850 |
| 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0.833 |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0.801 |
| 1 | 0 | 0 | 1 | 0 | 2 | 0 | 0.787 |
| 1 | 1 | 1 | 1 | 0 | 2 | 0 | 0.774 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0.772 |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0.746 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0.688 |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0.632 |

Results

This study focuses on the consequences of relevant cognitive variables, and on how these variables act together to produce such consequences. In order to do so, it emphasizes the relevance of distinct types of cognitive combinations, whereby different configurations of variables can lead to the same outcome (i.e. equifinality). Qualitative comparative analysis is well suited to tackling this issue.

One of the major benefits of qualitative comparative analysis in building theory is that it allows for typology mapping, while preserving the integrity of cases as complex configurations of aspects. The concept of typology has been defined as the “conceptually derived interrelated sets of ideal types, each of which represents a unique combination of attributes that are believed to determine the relevant outcome(s)” (Doty 1994:232). Far from viewing typologies as means for ordering and comparing groups of elements and clustering them into categories, typologies need to be understood as complex theoretical statements that, unlike traditional linear or interaction models of causality, can accommodate multiple relationships between their constructs, thus considerable levels of causal complexity (Fiss 2011).

Due to the fact that the purpose of a typology is to simplify the complexity of the real world, the process of typology development generally involves the pragmatic reduction of an extensive set of features to a limited set relevant to the purpose at hand. Instead of developing a monothetic typology, in which each feature is necessary for membership and the set of features is sufficient, this paper proposes an empirical, polythetic typological map of sustainable decision-making, which can be formed from different combinations of cognitive dimensions. This allows the grouping of cases that present similarities, tends to ensure greater parsimony and is considered superior for research actually intended to identify individuals as part of a type (Fiss 2011). Therefore, the cognitive map of sustainable decision-making in new business development derives from the different solution paths detected by the fs/QCA.

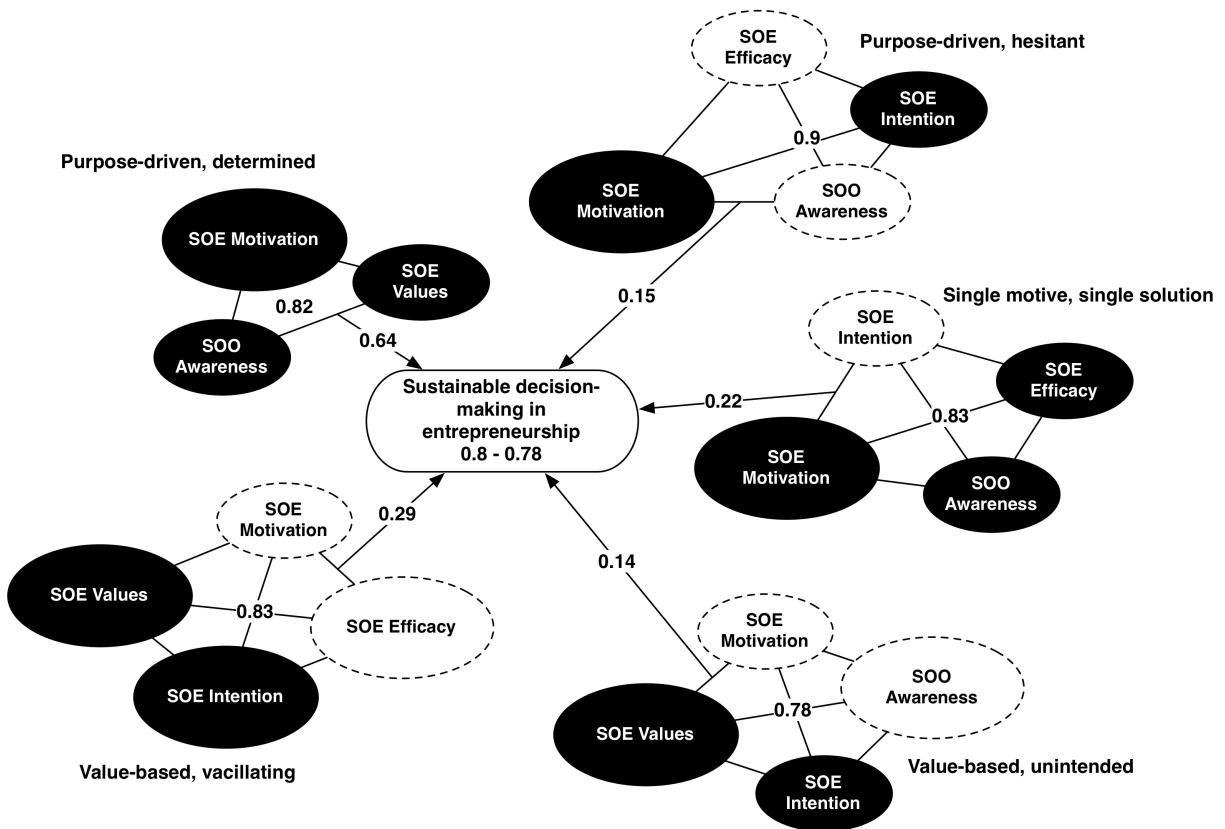
Configurational analysis: a cognitive map of sustainable decision-making in entrepreneurship

The development of a cognitive map of sustainable decision-making in entrepreneurship involves the assessment of the combinatorial effect of cognitive conditions. This configurational

analysis draws on the truth table (3). Using the consistency threshold of 0.8 and a frequency of 1 (i.e. minimum number of cases required for a solution to be considered), fs/QCA applies a Boolean algorithm based on a counterfactual analysis of causal conditions to logically reduce the truth table rows to a solution table comprising simplified combinations of conditions, which can be understood as different causal recipes (Ragin 2008) sufficient for sustainable decision-making. The full solution table is available in Appendix C, which is the basis for the cognitive map.

Sufficiency analysis found no single condition sufficient for sustainable decision-making. The derived explanation is thus equifinal with several quasi-sufficient combinations of conditions leading to sustainable decision-making in entrepreneurship, which are understood as alternative paths for the outcome and they are logically equivalent (Ragin 2006). This confirms that the cognitive conditions linked to sustainable decision-making in entrepreneurship are combinatorial in nature, and that it is possible to distinguish relevant solutions paths or decisive combinations of cognitive dimensions when cases are viewed as configurations of aspects. The five cognitive configurations derive from five distinct causal recipes that explain the development and implementation of measures, targets and strategies aimed at improving the venture's impact on people and the environment. All solutions present clear differences in terms of how conditions combine to produce the outcome and exhibit relatively high levels of coverage, meaning that the paths are distinct and only a few cases may be present in more than one solution. This sets the basis for mapping out the cognitive infrastructure behind sustainable decision-making in entrepreneurship, shown in Figure 2.

Figure 2. Cognitive map of sustainable decision-making in entrepreneurship⁴



N= 37; consistency cutoff= 0.8. Overall consistency= 0.8; overall coverage=0.78

The cognitive map allows for distinguishing core and peripheral conditions within each unique configuration, which is based on how causal components are causally connected to the outcome. In each cognitive combination there are decisive causal ingredients that distinguish configurations, and complementary ingredients that only make sense as contributing factors (Grandori and Furnari 2008; Ragin 2008). As depicted in Figure 2, only SOE-motivation [M], and the combinations of i. presence of *SOE-values* and absence of *SOO-awareness* [$V^*\sim A$] and

⁴ Black circles indicate the presence of the condition, and white circles indicate their absence. Large circles indicate core conditions; small circles indicate peripheral conditions. Numbers inside each combination reflect consistency of the solution, numbers in the connecting line reflect raw coverage of each cognitive combination.

ii. presence of *SOE-values*, presence of *SOE-intention* and absence of *SOE-efficacy* [V*I*~E] are causal mechanisms that exhibit a strong causal relationship with the outcome.

Causal combinations are evaluated in terms of consistency and coverage. Set-theoretic consistency assesses the degree to which the cases sharing a given condition or combination of conditions agree in displaying the outcome in question. It is estimated by dividing the number of cases that are present in a given configuration of conditions and exhibit the outcome by the number of cases that are present in the same configuration but do not exhibit the outcome (Fiss 2011). Set-theoretic coverage, by contrast, assesses the degree to which a causal combination accounts for instances of an outcome (Ragin 2006). If multiple configurations are sufficient for the outcome, raw and unique coverage provide assessments of their empirical relevance (Greckhamer 2011). These set-theoretic measures of fit are descriptive, not inferential, and were developed as methods of exploring cross-case evidence in a configurational way.

The cognitive map (Figure 2) shows that the set relation between configurations of conditions and the outcome is highly consistent, with individual results above 0.78, and an overall consistency of 0.8, which indicates a strong set-theoretical relationship between the solution term and the outcome, as well as between the overall solution and the outcome (Ragin 2006). The total coverage of the solution (i.e. joint importance of all paths) is 0.78, indicating that most of the outcome is explained by the five causal paths and thus the solution as a whole is empirically relevant. An overall solution is considered empirically relevant when the coverage score is ≥ 0.65 . The following section describes and provides illustrative evidence for each of the component parts of the cognitive map.

(1) *Purpose-driven, determined sustainable decision-making* combines the core condition of presence of *SOE-motivation*, with two complementary conditions: presence of *SOE-values* and

presence of *SOO-awareness* [M*V*A]. In this cognitive configuration, *SOE-efficacy* and *SOE-intention* are irrelevant conditions. This part of the map portrays a purpose-based decision-making driven by a single idea that combines strong aspirations regarding sustainable development, as reflected in business objectives, with strong convictions regarding the role of the venture in society and an explicit intention of pursuing a business opportunity that ultimately contributes to sustainable development. Unlike the following cognitive configuration, that continuously develops new sustainability-oriented business ideas, sustainable decision-making of entrepreneurs, when facing social or environmental problems, emerge as a result of profound sustainability motives and real-life experiences, to sub sequentially elaborate a single, concrete solution to that problem. It seems that deeply rooted drivers and motivation reduce the array of possible business solutions and minimize the need for iterating over diverse business ideas. Across the sample, this cognitive type is prominent in those sustainable ventures focused on resolving a particular social and environmental problem and use strategies, measures and targets to demonstrate commitment and determination, which in most cases is used to support sustainable narratives and ignite social movements. Interestingly, a great number of the *purpose-driven, determined* entrepreneurs decided later in the process to get certified as a B Corporation and get B Corp legal status⁵. The following quote of one of the founders of a sustainability-oriented media platform illustrate this cognitive profile: “The only way of putting this business approach into practice is through a rigorous application of a business framework where social, environmental and economic values are not separated as different aspects of the venture’s value proposition. These three functions need to be integrated and fully assessed if one is to maximize social, financial and environmental value creation. ... (our company) is one of the first

⁵ B Corps are for-profit companies that meet rigorous standards of social and environmental performance, accountability, and transparency, which are translated into certifiable practices by the NGO B Labs International.

companies to actually start with that principle (blended value). That's actually how we're doing it. We created ourselves as a company to model, to try to model the emerging, best thinking around triple-bottom line. Yeah, what it means for our company again is setting ourselves up to operate as a triple-bottom line company.”

(2) *Value-based, vacillating sustainable decision-making* combines the core conditions of presence of *SOE-values*, presence of *SOE-intention* and absence of *SOE-efficacy* with one complementary conditions, lack of *SOO-motivation* [V*I*~E*~M]. In solution 2, *SOO-motivation* is considered a complementary ingredient that only makes sense as a contributing factor that reinforce the central features of the core conditions. In this cognitive configuration, *SOO-awareness* is an irrelevant condition. This part of the cognitive map portrays a value-based decision-making, driven by multiple ideas. The following quote of one of the founders of an equity, sustainability-oriented fund illustrates this cognitive profile: “...people say there is a specific need and I’m going to go and fix that need. For me, it was really a lot of different (social) issues that I was trying to tackle at once and then whatever filters out is then the platform from which the company grows. And so I approached it from a very macro level point of view, which I think is different to the way in which a lot of people approach entrepreneurship (...) I never connected to the leadership role necessary to start my own company and I think that’s really important to be able to view yourself as a leader. So working with women who had been running their companies for a long time gave me that extra, I would say, confidence, that I needed.”

(3) *Value-based, unintended sustainable decision-making* combines the core conditions of presence of *SOE-values* and absence of *SOO-awareness*, with two complementary conditions, presence of *SOE-intention*, and absence of *SOE-motivation* [V*~A*I*~M]. As in cognitive map

1, *SOE-efficacy* is an irrelevant condition. This cognitive map portrays a value-based, unintended sustainable decision-making. A founder of a digital crowdfunding platform for social enterprises is part of this group. During the interview, he stated: “I wanted to start my own social enterprise, but the more I thought about the more I didn’t know how to get things started, how to get the initial capital I needed, initial supporters, and the more I thought about it the more I change from my enterprise to thinking about the broader social entrepreneurship ecosystem. There are a lot of good ideas...then I thought, what can we do to help people action on their ideas and making things happen. So we saw the crowdfunding model, the idea that people put a little bit of money for good, so hey, we thought, why don’t we try that model. It was September 2010 when we had the idea or conceptualized. At that point we realized it’s going to be a web-based platform, so we invited engineers, and a couple of friends of mine from UCLA, and talked to them about the project. While I was in grad school I met a guy who has recently moved to San Francisco and he runs this kind of social media for Ashoka, we were connected around the idea of using media for social change, so we contacted him and said ‘hey you do want to come join us for a community building around that kind of stuff?’ he was interested, so we brought him on board.” As shown in the quote above, sustainable decision-making derives from iterating over multiple business ideas, however, there is no clear awareness of that the ideas under consideration entail entrepreneurial opportunities, nor he/she exhibit explicit intention of pursuing which might have been an opportunity.

(4) *Single motive, single solution sustainable decision-making* is understood as the result of three complementary conditions, i.e. presence of *SOO-awareness*, presence of *SOE-efficacy* and absence of *SOE-intention*, and the one core condition of presence of *SOE-motivation* [A*E*~I*M]. As seen in the quote below, from one of the founders of a sustainable forestry

company, this cognitive map portrays a purpose-based, conscious decision-making, which relies primarily on underlying sustainability-oriented attitudes: “My background is actually in community development. During our time in Peace Corps we all saw these logging trucks taking all of these old growth woods out of the region but we also saw some of the community members still continue with the slash and burn agriculture. We kind of came up with the idea of an innovative land lease model that would give an incentive to not deforest the land based upon some incentives as far as profit sharing and utilizing the land in a more sustainable manner. This all came about around 2006. We all finished up in staggered terms and came up with this whole idea and decided to see if we could start a small project in doing that”. Here, sustainable decision-making emerges as result of confidence and *SOO-awareness*, but they exist only under strong *SOE-motivation*. Like the mental model 1 (i.e. Purpose-driven, determined), sustainable decision-making of entrepreneurs, when facing sustainability issues, emerge as a result of profound sustainability motives and deep-life experiences, which leads to a single response and subsequent solution to those issues.

(5) *Purpose-driven, hesitant sustainable decision-making* emerges as a result of three complementary conditions, i.e. presence of *SOE-intention*, absence of *SOE-efficacy* and absence of *SOO-awareness*, and the one core condition of presence of *SOE-motivation* [$I^* \sim E^* \sim A^* M$]. The following quote, from the founder of a bio lubricant company illustrate the purpose-driven hesitant character of this type of decision-making: “I feel extremely strongly about eliminating the toxins present in our lubricants (cadmium, arsenic, etc.). They all cause cancer, and right now in the US we are going to dump 3.6 billion gallons of lubricant and only ten percent of that gets re-refined. That is really the key driver of this work. But the idea, the aha moment came from ‘what else can we made out plant and algae oil besides fuel?’, and we started doing experiments

in the organic lab, we tested some ideas and then we got the results back from the third-party lab - these are unbiased folks that are just doing the numbers - and we said ‘wow’ we really change something here, and then we said ‘wow’ we can actually replace this product”. This cognitive map, as evidenced in the quote above, also portrays a purpose-based, conscious decision-making. However, it emerges as a results of iterating over multiple solutions that rely neither on the entrepreneurs’ confidence nor on their intention to solve a sustainability problem through a new venture.

Confirmatory Analysis of Necessity

An observation across types enables the identification of core cognitive conditions presumably central for sustainable decision-making, for example, SOE-values or SOE-motivation. While relevant, a simple overview of the configurational results may lead to claims of necessity or quasi-necessity, when in fact such causal relationship may not exist. In other words, inferring the necessity of values for sustainable decision-making based only on the merits of its presence in most of the solution terms is analytically inadequate.

One mechanism to avoid the risk of claiming false necessity is the use of a direct test of necessity. A given condition can be considered necessary if, whenever the outcome of interest is present the condition is also present. As Ragin (2006) points out: “an argument of causal necessity is supported when it can be demonstrated that instances of an outcome constitute a subset of instances of a causal condition” (p.297). In set- theoretical terms, this means that the outcome is a subset of the condition.

As table 3 shows, no single condition has been found necessary or quasi-necessary for sustainable decision-making in entrepreneurship. Although *SOE-values* exhibits a high consistency level (≥ 0.88), its empirical relevance is low. The high consistency level of *SOE-values* resonates with most of sustainable entrepreneurship literature (e.g. Kuckertz and Wagner 2010; Miller et al. 2012), however, in light of the results one cannot sustain the argument that strong presence of attitudes and convictions regarding the role of the new business in the society leads (always or almost always) to implementing measures, targets and strategies aimed at improving the business's impact on people and the environment.

Table 3. Confirmatory analysis of necessary conditions

| Condition tested | Consistency | Coverage |
|-------------------------|--------------------|-----------------|
| SOE VALUES [V] | 0.88 | 0.74 |
| SOE INTENTION [I] | 0.80 | 0.76 |
| SOE EFFICACY [E] | 0.68 | 0.75 |
| SOO AWARENESS [A] | 0.86 | 0.68 |
| SOE MOTIVATION [M] | 0.76 | 0.82 |

Outcome variable = sustainable decision-making

These results shed light on an important issue in traditional linear reasoning, which currently dominates our field of research. This is that conditions, assumed to be essential to triggering entrepreneurial effort, are neither necessary nor sufficient for sustainable decision-making. Often times, key conditions only make sense when considered together. In this sense, this analysis extends current purpose-driven entrepreneurship models (e.g. Kuckertz and Wagner 2010; Miller and Wesley 2010), which assume necessary and sufficient effects for the variables under examination.

Robustness tests

In order to assess the robustness of the results, three tests were conducted, namely: sensitivity test, frequency test and negate analysis. Sensitivity test evaluates whether the findings from the configurational analysis are robust to the use of different consistency specifications. This is done by squaring and root squaring the calibrated membership scores, which creates higher and lower degrees of membership in the set of each condition. The use of modifiers (i.e. X_i^2 and $\sqrt{X_i}$) can have a major impact on patterns of necessity and sufficiency, therefore this procedure is central to support the necessity and sufficiency arguments. Squaring fs membership scores moves causal conditions downwards, creating sets with very strong membership. The test shows presence of SOE-motivation [M^2], presence of SOE-intention and absence of SOO-awareness [$I^2 \sim A^2$], and presence of SOE-values, absence of SOE-efficacy and presence of SOO-awareness [$V^2 \sim E^2 \sim A^2$] as core conditions confirming the stability of the main results. However, the analysis derives eight solution terms (instead of five) with similar consistency and coverage scores (0.83, 0.8), affecting negatively thus the parsimony of the solution as a whole. Root-squaring fs membership scores moves causal conditions upwards, creating the sets with more or less strong membership. Similarly, the analysis confirms presence of intention and absence of awareness [$I \sim A$] as core conditions, however, it combines presence of values, intention, awareness and motivation into one single set of core conditions [$V \sim I \sim A \sim M$], disregarding the centrality of motivation as independent core condition. The analysis derives two solution terms (instead of five) with lower consistency and coverage scores (0.79, 0.76), maximizing the (already) limited diversity and affecting the heterogeneity and conceptual richness of the shown causal relationships.

In order to assess the stability of the solutions, I replicated the analysis with a frequency threshold of 2. The test confirms presence of motivation [M], presence of intention and absence

of self-efficacy [$I^*\sim E$] as core conditions. As expected, it also retains solutions 1, 2 and 3 from the main analysis with a similar consistency score, but much lower empirical power (0.69).

Finally, negate analysis evaluates conditions leading to the absence of the outcome. This test permits ruling out alternative explanations and confirming that the explanation of strong sustainable decision-making has higher explanatory power than the explanations for the absence of it. In configurational comparative studies is possible to find combinations of conditions leading to sustainable decision-making, also leading to the non-integration of strategies, actions and measurement. The results show only two solutions with combinations of absent conditions, discarding such possibility. Additionally, the solution's empirical power is much lower (0.22), with only 3 cases are above the consistency cut-off line (0.8). This confirms that finding sufficient conditions for the presence of sustainable decision-making is more effective than looking for conditions for its absence.

Discussion

Despite the increasing scholarly attention to sustainability in the context of entrepreneurship (Hall et al. 2010; Martin 2015; Muñoz and Cohen, 2017b; Wang and Bansal 2012), limited progress has been made in terms of understanding the cognitive conjunctures that account for decisions and actions leading to sustainable outcomes. As seen in table 1 above, different streams of research have tried to tackle this issue, yet none of the factors covered by these studies can by themselves explain sustainable decision-making in entrepreneurship.

The point of departure is that although explanations of sustainable decision-making in entrepreneurship have involved various characteristics, is not yet clear how they play a role in

empirical terms. In elaborating a cognitive map, rather than viewing cross-case patterns through the lens of relationships between variables, this research compares and contrasts configurations of conditions for sustainable decision-making, understood as the development and implementation of measures, targets and strategies aimed at improving the venture's impact on people and the environment. Therefore, the cases were analysed in terms of the aspects they combine respect to the outcome of interest. Based on this analysis, this study demonstrates that no single condition (thought to be essential) is necessary or sufficient for triggering decision-making involving social and environmental concerns. Understanding what precedes these kind of decisions requires combinatorial thinking, because sustainability-oriented decisions not only emerges as a result of a combination of cognitive factors, but also it can follow different non-overlapping mental states, which is recognized as multiple conjunctural causation.

This study revealed not one but five mental models leading to sustainable decision-making. Each of these mental model emerges from distinct combinations of cognitive factors, constituting unique cognitive recipes that explain the development and implementation of measures, targets and strategies aimed at improving its impact on people and the environment. Interestingly, some of the cognitive factors, so far assumed to be necessary or central to sustain such decisions, are not dominant or sufficient by themselves. Their importance is contextual and dependent on the other cognitive factors building up the particular mental configuration.

While revealing this equifinality, this study makes several contributions to literature. First, it reconciles prior efforts aimed at characterizing sustainability decisions in the context of entrepreneurship (e.g. Font et al. 2014; Hostager et al. 1998; Gibbs 2009; Schlange 2009; Walley and Taylor 2002; Wang and Bansal 2012), opening up the field to new ways of observing, understanding and, most importantly, theorizing about the phenomenon.

While all five configurations are relevant by themselves, as they present five different ways of making sustainable decisions, altogether they also constitute one complex theory. Drawing on Doty (1994), Fiss (2011) argues that indeed typologies are a unique form of theory building. They allow for describing the “causal relationships of contextual, structural, and strategic factors, thus offering configurations that can be used to predict variance in an outcome of interest.” (p.393). The cognitive map developed in this research is not a system of classification; on the contrary it constitutes a complex yet parsimonious explanation of distinct cognitive efforts leading to sustainable decision-making. The series of logical arguments that specifies a set of relationships among cognitive constructs and decision-making can indeed be tested. These are fine-grained set of expectations that go far beyond traditional bivariate or interaction theories, which have dominated the field so far (e.g. Kuckertz and Wagner 2010; Muñoz and Dimov 2017; Shepherd et al. 2013).

Entrepreneurship literature, for example, stresses that awareness of the presence of particular opportunities mostly stems from either overall education and life experience, or education and experience specific to a given activity or context (Dimov 2010; Ulvenblad et al. 2013). In sustainable entrepreneurship, this involves particular knowledge of natural and communal environments (Hanohov and Baldacchino 2017; Muñoz and Dimov 2017; Patzelt and Shepherd 2010). Results indicate that although these individuals are aware of their surrounding ecological and social environments, this does not entail nor warrant that they will be aware of the venture opportunities emerging from such contexts. This suggest that the relationship between start-up experience or sustainability-relevant knowledge and those skills that enable entrepreneurial action should not be treated as a linear one, as current literature normally does (e.g. Ulvenblad et al. 2013), but in conjunction with other confounding factors. Interestingly, in this sample of

sustainable entrepreneurs, sustainability-oriented opportunity awareness is absent in two of the solutions and rendered irrelevant in one occasion. When observed in the context of other conditions, it is plausible (and possible) that individuals prompting the development of new sustainable businesses will be driven by a desire to solve problems and ground their decisions on values and convictions related to the role of their venture in society, yet in the presence of a relatively weak awareness of the entrepreneurial nature of the opportunities underlying the social and ecological problems under consideration. Drawing on Morales and Holtschlag's (2013) work, one could argue that the lack of awareness can be counteracted by the prominence of sustainability-related values. These are post-materialist values (e.g. self-expression, ecological balance, quality of life, democracy, human rights), which seem to move entrepreneurs away from traditional commercial activities towards considering alternative, more sustainable approaches to entrepreneurial value creation.

Furthermore, the discovery of ideal-typical cases, comprising alternative cognitive configurations, allows us to discard the imaginary picture of sustainable entrepreneurs being exceptional individuals with a supreme and altruistic set of cognitive factors (i.e. all determined, value-driven, highly motivated, etc.), which has been prominent in social and sustainable entrepreneurship literature alike (Doyle and Ho 2010). By doing so, this piece of research contributes to recent (critical) calls for more research in the area, beyond heroism. As Hall et al. (2010) point out: "Numerous books that sound dire warnings of environmental disaster often end on an optimistic note, concluding that civilization's salvation rests upon the shoulders of heroic social and environmental entrepreneurs....influential practitioner journals advance the idea that entrepreneurship may be a panacea for many social and environmental concerns...yet, despite the promise entrepreneurship holds for fostering sustainable development, there remains

considerable uncertainty regarding the nature of entrepreneurship's role in the area of sustainability and how it may unfold.” (p.440).

The findings also challenge extant models explaining sustainability decisions based on ethical normative frameworks (e.g. Eberhardt-Toth and Wasieleski 2013). Most of them elaborate on ethical decision-making process models (e.g. Harris et al. 2009; Jones 1991; Wempe 2005), therefore, overemphasizing the recognition of moral issues underlying sustainability contexts and the moral intent needed to articulate a sustainability-oriented decision. Results herein demonstrates that recognition and intention may be relevant to triggering socially and environmentally responsible decisions, but only to the extent that sustainability values and motivation are present. Intention is a central component in the explanation of entrepreneurial behaviour (Jarvis 2016), however, its cognitive significance in triggering sustainability-oriented action seems to depend on other cognitive factors, which is only possible to uncover when these are observed together. Values and motivation exhibit strong causal relationships with the outcome across the different configurations yet requiring complementary factors to yield sustainable decision-making, which differ somewhat from the underlying structures supporting current ethical normative frameworks. There are of course unavoidable overlaps between ethical and sustainable decision-making. However, ethical-decision-making though theoretically robust, seems insufficient to cement formal lines of inquiry aimed at explaining sustainable decision-making in specific contexts. This resonates with recent work, which argue that the motivation underlying sustainable action is not merely inspired by ecological, social or ethical values but also by other traditional entrepreneurial drivers such as independence and income (Kirkwood and Walton 2010).

Conclusion

By conducting a systematic comparison of causal and outcome conditions, this paper empirically identifies a number of causal recipes for sustainable decision-making. In the empirical world, the complex constellation of cognitive features combines in unique ways representing a full spectrum of cognitive antecedents and decision forms. This allows for organizing a seemingly intractable heterogeneity into a coherent map that facilitates further understanding and theorizing on this topic.

By revealing this complex set of alternative cognitive antecedents of sustainable decision-making in entrepreneurship, this research opens up new areas of inquiry deserving attention. First, and moving beyond the idealized and heroic view of the phenomenon, future research can explore the counterintuitive side of sustainable entrepreneurial action, revealed herein. How, why and with what consequences some individuals, with no sustainable values, pro-social motivation awareness of social-ecological problems or self-efficacy, engage in such entrepreneurial activities remain largely unresolved. Cognition acts and influences behaviour by creating mental models of the world. Factors explored in this research enable a deeper understanding of the inner cognitive infrastructure supporting sustainable decision-making in entrepreneurship, but can only partially explain the role that such cognitive processes play in our social interactions, whereby sustainable decisions are turned into sustainable products or services and leading eventually to net positive social and environmental impacts. Examining the interactions between the different cognitive models (and their internal cognitive and emotional processes) and the social groups enabling or constraining action will be central to further understanding how sustainable decision-making turns into sustainable outputs, which will require new studies paying attention to contextualized information processing. Finally, there are unavoidable overlaps between

sustainable and ethical decision-making. So far, we have simply assumed that these exist but have not yet examined the particular nature and consequences of such overlaps, and more importantly the consequences (and inevitable tensions) of the presence of non-overlapping spaces within a decision process assumed to lead to outcomes such as social justice, fairness and environmental protection, which are certainly morally non-neutral.

The findings of this study have also profound implications for the practice of sustainable entrepreneurship, and more specifically for the development and implementation of support mechanisms aimed at fostering socially and ecologically friendly venturing. In light of the results, it seems now that most of the tools used by “sustainable” incubators, educational programmes and other instances rely on a narrow view of human cognition that recognises as a sustainable entrepreneur only those with a unique type of sustainable mind-set, which points to highly specific cognitive skills and sets of values. The natural consequence of this view is an overemphasis on values, purpose and motivation in the selection and/or training of the next generation of sustainable entrepreneurs. On the contrary, this study shows that the implementation of sustainability-related actions can emerge from a wide range of individuals with different cognitive structures, where in some cases several value-laden or motivational factors, assumed central, are peripheral at best. This research invites a serious rethinking of the idealized view of sustainability-oriented action. Anyone, anywhere, however hesitant or unaware, can become one.

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Appendices

Appendix A. Full list of items

| | |
|--|--|
| SOE Values ($\alpha=0.71$) | Q. The following statements describe considerations that any entrepreneur can have during the process of development of business ideas, please indicate the extent to which these apply to you? I strongly believe in the power of my business in contributing to solve many of the problems we have as a society My firm has an obligation to society that extends beyond making money The firm I am about to create has to give back to society since it derives its profits from society Regardless of the nature of my business, it has to trade fairly with customers and suppliers Regardless of the nature of my business, it has to make a responsible use of natural resources When I was choosing between the business ideas I had in mind, I always chose the one that contributed to building a better society |
| SOO Awareness ($\alpha=0.9$) | Q. Please think about your awareness or attention to what was occurring by the time you were exploring possible ideas for this business. In this context, to what extent do you agree or disagree with the following statements? I was fully aware of the sustainability problem(s) I was trying to solve I was conscious of the existence of a number of business opportunities that might have been useful for solving the sustainability problem I was fully aware of the business opportunity I was pursuing I spent enough time gathering information about the business opportunity I was conscious of the relation between the business idea and my willingness to solve some sustainability problem All of my ideas and concerns were consciously considered in the business evaluation I considered the potential economic, social and environmental impacts in evaluating the business idea I knew that pursuing this business idea implied more than just making money |
| SOE Motivation ($\alpha=0.84$) | Q. The following objectives can be present in any organization. Please indicate how important these objectives were in starting this new business Improving health and wellbeing Creating and distributing economic value amongst all stakeholders Improving the quality of life in a particular community Creating employment opportunities Protecting or restoring the natural environment Creating ethical and fair products Establishing fair trading with suppliers Promoting democratic business models |
| SOE Intention ($\alpha=0.8$) | Q. The following statements can be used to describe some people. How well would they describe you? I am able to find solutions to current challenges and problems I am regularly coming up with new ideas on how to create a better world I like taking ideas and make something important of them I am constantly seeking business ideas with the potential of making contributions beyond making money I do what it takes to create value for others |

SOE
Efficacy
($\alpha=0.8$)

Q. The following statements can be used to describe some people. How well would they describe you?

- If I work hard, I can successfully start a business
- Overall, my skills and abilities will help me start a business
- My past experience will be very valuable in starting a business
- There is no limit as to how long I would give maximum effort to establish my business
- When I make plans I am almost certain to make them work
- My solid business ethic will help me to develop a meaningful business
- I can persuade others about the importance of my ideas

SDM

Have you:

- Set or taken steps to set social and environmental responsibilities to the firm's managerial team
 - Promoted or taken actions to promote sustainable consumption behaviours amongst its clients
 - Evaluated or taken steps to evaluate the quality of production and orientation of the organizations they have established relationships with
 - Developed or taken steps to develop processes for managing social compliance
 - Invested or taken steps to invest in community development activities in the markets you source from and/or operate within
-

Appendix B. Assessment of discriminant validity

Table B1. Composite reliability

| | |
|------------------|-------|
| 1 SOE Values | 0.875 |
| 2 SOE Intention | 0.867 |
| 3 SOE Efficacy | 0.798 |
| 4 SOO Awareness | 0.914 |
| 5 SOE Motivation | 0.841 |

Table B2. Descriptive statistics and correlations

| | Mean | SD | 1 | 2 | 3 | 4 | 5 |
|------------------|-------|-------|--------|-------|--------|-------|--------|
| 1 SOE Values | 0.746 | 0.261 | | | | | |
| 2 SOE Intention | 0.656 | 0.326 | .583** | | | | |
| 3 SOE Efficacy | 0.563 | 0.298 | 0.095 | 0.306 | | | |
| 4 SOO Awareness | 0.790 | 0.282 | .337* | 0.029 | 0.028 | | |
| 5 SOE Motivation | 0.574 | 0.326 | .378* | 0.294 | .472** | .340* | |
| 6 SDM | 0.622 | 0.377 | .445** | .398* | 0.161 | 0.18 | .489** |

** 0.01, * 0.05

Table B3. Heterotrait-Monotrait Ratio

| | SOO Awareness | SOE Intention | SOE Motivation | SOE Efficacy |
|----------------|---------------|---------------|----------------|--------------|
| SOO Awareness | | | | |
| SOE Intention | 0.194 | | | |
| SOE Motivation | 0.502 | 0.345 | | |
| SOE Efficacy | 0.375 | 0.512 | 0.543 | |
| SOE Values | 0.353 | 0.353 | 0.385 | 0.424 |

Appendix C. Solution table

| Configurations | Configurations for sustainable decision-making in entrepreneurship | | | | |
|------------------------------|--|-------|-------|------|-------|
| | 1 | 2 | 3 | 4 | 5 |
| SOE VALUES | ● | ● | ● | - | - |
| SOE INTENTION | - | ● | ● | ⊗ | ● |
| SOE EFFICACY | - | ⊗ | - | ● | ⊗ |
| SOE AWARENESS | ● | - | ⊗ | ● | ⊗ |
| SOE MOTIVATION | ● | ⊗ | ⊗ | ● | ● |
| Consistency | 0.82 | 0.83 | 0.78 | 0.83 | 0.9 |
| Raw coverage* | 0.64 | 0.29 | 0.14 | 0.22 | 0.15 |
| Unique coverage [†] | 0.32 | 0.039 | 0.006 | 0.03 | 0.024 |
| Overall solution consistency | 0.8 | | | | |
| Overall solution coverage | 0.78 | | | | |

Black circles indicate the presence of the condition, and circles with “X” indicate their absence. Large circles indicate core conditions; small circles indicate peripheral conditions. Blank spaces indicate irrelevant condition (Ragin, 2008; Fiss, 2008).

*Raw coverage refers to the size of the overlap between the size of the causal configuration and the outcome set relative to the size of the outcome set

[†]Unique coverage controls for overlapping explanations by partitioning the raw coverage (Schneider et al. 2010).