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Opportunities and Threats in Reviewing Entrepreneurship Theory and Practice

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Andreas Rauch¹

Abstract

Reviews have a critical role in knowledge accumulation in entrepreneurship. Good reviews do not just summarize the literature but provide unique contributions on theory testing, theory development, the identification of research gaps, and suggestions for future research. This editorial discusses different forms for reviews, their strengths and weaknesses, and how they best contribute to the field.

Keywords

review, editorial, synthesis

Entrepreneurship Theory and Practice aims to publish original conceptual and empirical research that contributes to the advancement of entrepreneurship. It is an interdisciplinary journal with a broad scope for conceptual and empirical research that develops, tests or extends theory relating to entrepreneurship.

Reviews have become one means to achieve these aims not only in *Entrepreneurship Theory and Practice* but also in other leading management journals. However, we receive and reject many reviews because they do not meet our journal's aims and mission. To assist potential authors to maximize their contribution, I explain how a review article can better match the mission of *Entrepreneurship Theory and Practice*, increasing the likelihood of publication. The aim of this editorial is not to provide a fixed set of tools and attributes that need to be addressed in a review, but to recognize the diversity of high-quality reviews. Particularly meta-analyses are increasingly used to review the literature. For example, a study examining meta-analyses conducted in management identified 196 meta-analyses published between 1982 and 2009 (Aguinis, Dalton, Bosco, Pierce, & Dalton, 2011), a number that has certainly increased since then. Other types of review that are less frequently used, but can provide a contribution to the journal and to the field of entrepreneurship in general, include systematic literature reviews, bibliometric reviews, the synthesis of qualitative research, and historiometric analysis. This editorial describes these five methods pointing to their aims, strengths, and challenges, but does not identify all the

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creative approaches scholars use when conducting literature reviews. In addition to these more established forms for a review, I discuss future trends in knowledge accumulation, pointing to selected forms for the review that have a potential to contribute to the field. As a starting point, Table 1 summarizes the key features of the five established types of review.

Meta-Analysis

Meta-analysis combines the results of empirical studies using statistical methods for the synthesis of the literature. It has a key position in the evolution of knowledge in the entrepreneurship literature. Meta-analysis has been able to address and solve a number of lively debates in the field of entrepreneurship, for example, whether entrepreneurs should plan (Brinckmann, Grichnik, & Kapsa, 2010), whether personality is an important ingredient in the entrepreneurial journey (Rauch & Frese, 2007), and whether human capital and knowledge helps entrepreneurs (Unger, Rauch, Frese, & Rosenbusch, 2011). Often meta-analysis is stimulated by debates raised in qualitative (narrative) reviews and, notably, sometimes a meta-analysis arrives at different conclusions from the original narrative reviews. Because meta-analyses often fail to explain all the variance in reported effect sizes, they often include subgroup analyses to explain the remaining variance and raise many new questions for future research. Such standard meta-analyses provide an overall correlation between two variables at a time and combine this analysis with a subsequent subgroup analysis aiming to test whether the strength of the correlation differs depending on methodological or theoretical characteristics. While these standard meta-analyses have many advantages and have contributed to important debates in the field of entrepreneurship, they can have methodological as well as theoretical flaws. Methodologically, effect size estimates in this type of meta-analysis are often not accurate as there might be systematic errors (although many can be corrected), third variables that affect the effect size estimate, and correlated moderator variables. Theoretically, standard meta-analysis reporting bivariate relationships is unable to address multivariate theory. However, theories in entrepreneurship typically address multivariate relationships. Therefore, a standard bivariate meta-analysis may not meet the mission of *Entrepreneurship Theory and Practice*.

Meta-analysis can provide the type of contribution required by *Entrepreneurship Theory and Practice* through meta-analytical regression analysis (MARA) and meta-analytic structural equation modeling (MASEM). MARA is a multivariate extension of a subgroup moderator analysis (Schmidt, 2017). It is similar to a simple regression analysis, using the effect size estimate as a dependent variable in a regression analysis and the moderator variables as independent variables. MARA provides opportunities to test multiple continuous and categorical moderators and control variables at the same time, and is, therefore, able to test multivariate models and theories and to assess the boundary conditions of these theories. Unfortunately, entrepreneurship research does not have strong categorizations of moderator variables (Welter, 2011), which is an important weakness to overcome as a meta-analysis needs to conceptualize moderators at the level of the study in a meta-analysis. The exceptions are institutional variables that have been used in many meta-analyses (e.g., Saeed, Yousafzai, & Engelen, 2014). A creative example of this approach can be found in Bae, Qian, Miao, and Fiet (2014) who studied the relationship between entrepreneurship education and intentions that a previous meta-analysis had already established (Martin, McNally, & Kay, 2013). However, using MARA and controlling for pre-education entrepreneurial intentions revealed that the hypothesis that entrepreneurship education affects intentions must be rejected. Rather, students with intentions are more likely to self-select into entrepreneurship education suggesting that reversed causal influences take place. In this way, the meta-analysis provided a contribution to the debate about whether or not entrepreneurship education is effective. MARA is increasingly used in meta-analyses in the domain of

Table I. Comparison of Five Types of Review of the Literature.

	Meta-analysis	Systematic literature review	Bibliographic analysis	Synthesis of qualitative research	Historiometric analysis
Description	Secondary quantitative analysis of primary studies	Synthesis of research according to an explicit and reproducible methodology	Description of the profile of publications on the topic, and tendencies within a discipline	Systematic synthesis of qualitative studies	Secondary analysis of historical records such as biographies
Central aim	• Provide generalization of evidence	• Generate an extensive stock of knowledge • Provide generalization • Suggest future avenues	• Quantify processes of written communication in the field • Describe research	• Test and develop theory • Provide generalization (sometimes)	• Provide generalization of evidence • Provide new evidence
Method	Quantitative combinations of results, multivariate analysis	Narrative synthesis	Statistical analysis, e.g., citation analysis	Within-case and cross-case analysis	Deductive and inductive methods
Data	Evidence hierarchy, randomized control trials	Qualitative and quantitative	Databases	Qualitative	Unique/extreme cases, (auto)biographies, diaries, oral histories
Strengths and advantages	Minimizes method bias	Takes context into account	Counts all that can be counted, highly standardized	Takes context as well as processes into account	Assesses long timeframes and context, analyzes extreme cases and behavior
Challenges and weaknesses	Contextual information is lost	Frequency count is vulnerable to various information-processing errors	Dependent on what can be counted and coding decisions	Replication of interpretive synthesis is difficult	Biased interpretations and biased material
			Difficult to propose theoretical contribution	Generalization of interpretive approaches only to theory	

(Continued)

Table I. Continued

	Meta-analysis	Systematic literature review	Bibliographic analysis	Synthesis of qualitative research	Historiometric analysis
Key readings	Hunter and Schmidt (2004)	Tranfield, Denyer, and Smart (2003)	Garfield and Welljams-Dorof (1992)	Hoon (2013); Rauch, van Doorn, and Hulsink (2014)	Crayne and Hunter (2017)
Examples	Rauch, Wiklund, Lumpkin, Shepherd, Wennberg, and Fresé (2009)	Suddaby, and Wiklund (2019)	Lampe, Kraft, and Bausch (2019)	Habersang, Kübeling-Jost, Duchek (2018); Reihlen, and Seckler (2019)	

entrepreneurship. However, it is important to remind that MARA builds on the same assumptions of any regression analysis. For example, the sample size needs to be sufficiently large in relation to the predictor variables (Schmidt, 2017). Considering that the average effect size in management is computed from 18 primary studies (Aguinis et al., 2011), it is clear that most meta-analyses do not have the sample size required to conduct MARA.

MASEM provides a second way for meta-analyses to make a stronger contribution (Viswesvaran & Ones, 1995). MASEM combines meta-analysis with structural equation modeling to test multivariate structural relationships between independent and dependent variables. MASEM requires a correlations matrix that consists of bivariate meta-analyses to use as an input file for a structural equation model. This method is powerful for theory development and theory testing as it allows testing of mediator variables to assess the mechanism by which the independent variables affect the outcomes. Therefore, MASEM can provide the type of contribution that top journals are looking for. Challenges in MASEM include the small number of studies in some subsets of analysis and analysis based on heterogeneous effect sizes, which both reduce the generalization of findings. A good example of a MASEM is a meta-analysis that compares different models of entrepreneurial intentions (Schlaegel & Koenig, 2014). The analysis uses MASEM to compare the theory of planned behavior with the entrepreneurial event model. The results do not only show that the theory of planned behavior explains more variance than the entrepreneurial event model but that an integrated mediation model explains most of the variance in entrepreneurial intentions. The study addressed a lively debate on competing intention models in the domain of entrepreneurship.

In general, meta-analyses in entrepreneurship and management often suffer from major limitations such as effect size heterogeneity and the validity of studies included in the meta-analyses, although many of these issues can be corrected. Essentially, most research in entrepreneurship is not experimental. Therefore, it is often more appropriate to look for variations in outcomes rather than for true effect sizes. Nevertheless, identifying variations in outcomes across a number of studies helps to accumulate knowledge in the domain of entrepreneurship.

Systematic Literature Reviews

Systematic literature reviews use detailed and rigorous methods to summarize results of entrepreneurship studies (Tranfield et al., 2003). Systematic literature reviews are conducted frequently in the entrepreneurship literature. For example, conducting a keyword search in Google Scholar in June 2019 combining the term “systematic literature review” with “entrepreneurship” had more than 9,000 results, with some of the reviews published in top tier management and entrepreneurship journals (e.g., Stephan, 2018; Shepherd et al., 2019). Reviews have become more standardized, transparent, and reproducible, and thus systematic, following the suggestions made by Tranfield et al. (2003). This type of review often highlights gaps in the literature, helps to develop and advance theoretical models, and presents new perspectives on emerging issues leading to valuable suggestions for future research (Denyer & Tranfield, 2006). Some reviews even suggest propositions for future research (Zahra, Sapienza, & Davidsson, 2006). Another advantage is that systematic literature reviews are inclusive as they can combine both quantitative and qualitative studies. These reviews provide important contributions helping to develop theory and research practices in entrepreneurship.

However, systematic literature reviews do face challenges. Ultimately, systematic reviews remain a frequency count similar to many forms of narrative reviews and they often have the same problems associated with narrative reviews including subjective decisions about which studies to include, how to analyze the studies, and how to draw conclusions, the limited information-processing capacities of the reviewers, and limited criteria to help minimize potential biases

(Rauch & Frese, 2006). Often, the information remains descriptive. For example, knowing that seven studies examined a multidimensional conceptualization of failure (Cacciotti & Hayton, 2015) provides little information about the validity of such an approach. In addition, frequency counts stress the role of direct relationships between constructs (e.g., Newman, Obschonka, Schwarz, Cohen, & Nielsen, 2019), although we know from other forms of reviews that moderator variables are often present (Rauch & Frese, 2007). Another issue with systematic reviews is that while the literature search and study location process is often systematic, and therefore replicable, the coding and analysis are often less systematic. This provides some flexibility for the reviewers but at the expense of bias and misinterpretation and, therefore, insights can be idiosyncratic. Therefore, the interpretation of some systematic literature reviews requires caution. Nevertheless, many carefully conducted systematic literature reviews have provided valuable contributions to the field and such reviews will continue to do so. A good example for a systematic literature review is provided by Stephan (2018). The review provides an extensive documentation of the coding procedure and it includes coding scheme and a discussion of coding decisions. Thereby, it allows for replication. The review also provides a framework that does not only map previous research but also helps to develop theory and to identify areas for future research.

Bibliometric Analysis

Bibliometric reviews tend to look back and describe what has been done, who has influenced the field, or which networks have been established in the scientific entrepreneurship literature. Bibliometric analysis uses a set of techniques to quantitatively and qualitatively analyze the literature in a field, including citation analysis and content analysis (Garfield & Welljams-Dorof, 1992). Bibliometric analysis is achieving momentum because there are more and more tools available to analyze databases and citations in a quantitative way. The aim is often to look for regularities in a field, for example, by conducting a citation analysis, and to uncover the structure and theoretical foundations of a field, which also helps develop predictions. Information related to the content of the literature can also be examined. Such an overview provided by bibliometric analysis can be valuable particularly if a field is fragmented, involving different and competing conceptualizations, methodologies, and frameworks and when there is a lack of agreement on many key issues.

There are numerous articles in entrepreneurship using bibliometric analysis. For example, Andrade-Valbuena, Merigo-Lindahl, and Olavarrieta (2019) counted 24 published articles in the domain of entrepreneurship using bibliometric analysis, showing that it is a common form of review in the entrepreneurship literature. However, these articles are usually not published in the top journals of the field, possibly because most approaches use the method to describe a specific area in the discipline (Xi, Kraus, Filser, & Kellermanns, 2015) or count publications and citations in the field (Lampe et al., 2019). While it can be insightful to uncover central research topics and theoretical foundations in entrepreneurship, these reviews are descriptive and it is, therefore, difficult for them to contribute to and advance major debates in the field. Yet, it is unclear whether bibliometric analysis is merely a method for categorizing information or if it is useful to explain and predict phenomena. To a certain extent, a theory-driven approach to bibliometric analysis involving hypothesis testing is possible. For example, one bibliometric study presented a model and hypotheses predicting scholarly influence in management (Podsakoff, MacKenzie, Podsakoff, & Bachrach, 2008). In particular, examining structures and the dynamics in the field, examining the content of publications, and establishing correlations with external indications such as the institutional environment might extend the contribution of bibliometric reviews. For example, De Bakker, Groenewegen, and Den Hond (2005) combined bibliometric analysis with various methods to analyze their datasets on corporate social responsibility and

compare three contrasting views about the development of the field: progression, variegation, and normativism. The study not only shows how the field proceeded in terms of citations but also how it developed over time.

The Synthesis of Qualitative Research

The synthesis of qualitative research is a research design for synthesizing primary qualitative data from case studies and using tools such as causal network technique, content analysis, and cross-case analysis for aggregating the literature. This synthesis shares some features with the systematic literature reviews discussed earlier, such as being systematic and organized, transparent and explicit, and replicable, and synthesizing the results (Briner & Denyer, 2012). This type of review is becoming more prominent as some researchers are uneasy about the dominance of quantitative reviews, which ignore insights from qualitative research (Hoon, 2013; Rauch et al., 2014). The synthesis of qualitative research is more common in medical research (Paterson, 2012), although there are examples in both management research (Mintzberg, Raisinghani, & Théorêt, 1976; Miller & Friesen, 1977) and entrepreneurship research (Habersang et al., 2019). There are a number of different approaches for synthesizing qualitative research to meet the different aims of the reviews. Some reviews synthesize qualitative studies with the aim to test theories and to generalize the findings of qualitative research (Rauch et al., 2014), while other syntheses of qualitative research are more interpretive and aim to develop new theory (Hoon, 2013).

This type of review can provide a contribution if applied with rigor and care. Most importantly, it can address calls for a process view in entrepreneurship (Baron & Markman, 2004) as well as calls to contextualize the domain (Welter, 2011). Specifically, case studies often provide rich and contextualized information about how and when specific conditions interact with the context and aggregating such information helps develop evidence about such processes in entrepreneurial firms (Habersang et al., 2019). It is difficult to cover these issues in a quantitative review where processes can best be covered by coding time points and where the statistical aggregation either eliminates context conditions or addresses them by coding context at the level of the study or the country. Therefore, the synthesis of qualitative research adds to the generation of knowledge in the field. Qualitative research often addresses issues that cannot easily be studied in quantitative research. For example, it is difficult to sample failed firms as many of them simply disappear from data files. But there is a rich body of case descriptions of failed firms. One study synthesized 43 published case studies on organizational failure (Habersang et al., 2019). The well-documented analysis used a combination of inductive and deductive steps to analyze the cases, starting with within-case analysis and aggregating these results in a cross-case analysis. The results revealed that the interplay of distinct rigidity and conflict mechanism explains different pathways of organizational failure.

The quality of the synthesis of qualitative studies is dependent on the skills of the coders and might be more challenging than in quantitative reviews or in bibliometric reviews where software may perform the coding. Interpretive syntheses are often difficult to replicate as they involve a number of decisions and explanations available for phenomena appearing in qualitative case studies. Both types of synthesis of qualitative research require comparative studies.

Historiometric Analysis

Historiometric analysis is a unique approach as it does not aim to analyze the scientific literature but rather it analyzes historical information, which may be extracted from material such as biographies, autobiographies, diaries, oral histories, obituaries, letters, or life stories (Denzin, 1989).

Since this approach does analyze primary data collected by other people, such as a biographer, this approach can be classified as a review. Although this method is suitable for a number of different research questions, historiometric analysis of biographies is specifically well suited to address three issues. First, similar to the synthesis of qualitative research, historiometric analysis can address process issues. This method is well suited to look specifically at long-term processes. For instance, biographies enable reviewers to analyze how the life of a prospective entrepreneur unfolds as the combination of trajectories and transitions initiating turning points in life and redirecting paths. Second, historiometric analysis measures the context and situation-specific aspects of entrepreneurship. Third, it can be used to analyze unique or rare samples. Entrepreneurship provides a number of examples of unique entrepreneurs and their unique activities, and exceptional samples cannot be studied by relying on representative samples. For example, it is a stylized fact that only a small percentage of firms are very successful and research has tried to identify and study these firms. However, since the number of these firms is small, it is difficult to identify them by relying on traditional sampling procedures. Finally, as all these issues are not easily addressed with other forms of review, historiometric analysis provides opportunities to make substantial contributions to the field. However, while this method has been used, for example, in organizational behavior (Bass, Avolio, & Goodheim, 1987; Simonton, 1977), it has, to my knowledge, only occasionally been used in entrepreneurship, such as analyzing the hotel industry (Morrison, 2001; Nickson, 1997), single entrepreneurs (Reveley, 2010), or multiple entrepreneurs (Duchek, 2018; Schoenberger, 2001; Smeth, 2005; Villette & Vuillermot, 2009). For example, resilience, the ability to go on with life, or to continue living a purposeful life after hardship or adversity bringing the organization back to normal functioning (Tedeschi & Calhoun, 2004) develops over time depending on prior experiences, and individual and situational factors. A historiometric analysis, such as the one provided by Duchek (2018), is well suited to cover such long term processes.

To synthesize historiometric information, researchers have used deductive as well as inductive methods for the review. Content analysis is a deductive way of analyzing historiometric information (Crayne & Hunter, 2017). An advantage is that the information extracted can be quantified and quantitative methods for data analysis can be applied. Quality criteria such as validity and (inter-rater) reliability can be used to evaluate the quality of the analysis. However, it is also possible to analyze the research material in an inductive way, using techniques such as grounded theory, meta-synthesis, and meta-ethnography, all aiming to make contributions beyond those achieved in the original studies (Hoon, 2013, p. 527). A problem with inductive reviews is that the coding relies on reviewer skills, and reviewers' interpretations and explanations make replication difficult.

The method is not without problems as the historiometric database moves often between fact and fiction, CV and narrative, and fact-based reconstruction and imaginative construction (Denzin, 1989). Beside these problems with the material, the iterative process of research refinement and interpretation has challenges and biases (Crayne & Hunter, 2017). Therefore, the analysis depends heavily on both the reviewer and the data sources themselves. The data sources might contain information gaps or errors and are often based on conventions of how historical material is presented. Therefore, establishing the validity of inferences becomes a critical exercise in the analysis. Historical data are still correlational and, thus, the internal validity might be low. For example, the relationships reported might be affected by omitted variables and, therefore, any causal interpretation should be conducted with extreme care. Thus, the analyzer must be well aware of these issues and take care to avoid them entirely (Crayne & Hunter, 2017, p. 26). For a top-tier publication it is imperative to implement multiple measures to reduce potential overinterpretation of historiometric data (Crayne & Hunter, 2017).

Future Trends in Knowledge Accumulation

There are additional forms of knowledge accumulation specifically promising for the field of entrepreneurship. Some have been used in specific contexts, but have not been systematically developed as a specific form of the review. In the field of entrepreneurship, it is particularly worthwhile to consider two specific trends: the use of large datasets and the use of computerized (text) analysis.

Datasets play an important role in the entrepreneurship literature. Some datasets have been developed specifically in the context of entrepreneurship at a global scale (e.g., Panel Study of Entrepreneurial Dynamics, Global Entrepreneurship Monitor [GEM]) or on entrepreneurship dynamics within specific countries (e.g., Kauffman Firm Survey, Comprehensive Australian Study of Entrepreneurial Emergence). Other databases that have not been developed specifically for the context of entrepreneurship have been used to test entrepreneurship hypotheses (e.g., Organization for Economic Co-operation and Development Employment Outlook, European Community Household Panel). These databases provide unique opportunities for reviews in the entrepreneurship literature. First, reviews can summarize the results of studies using one specific dataset. An example is the study by Bosma (2013), who reviewed academic papers published between 2004 and 2011 that used GEM data. Such analysis helps identify some stylized facts, such that early-stage entrepreneurial activity varies across countries, that there is a U-shaped relationship between entrepreneurship activity and economic growth, and that a considerable proportion of entrepreneurial activity is performed out of necessity, particularly in less developed economies. Second, and alternatively, one can review results from multiple different datasets to address one specific research problem. For example, researchers have used different datasets to study the relationship between entrepreneurship and earnings. Åstebro and Chen (2014) compared results across 24 commonly used databases. They found that 12 databases supported the proposition that entrepreneurs earn less than employees and that 12 other databases did not find support for this proposition. These differences are surprising because many of these databases are representative of the populations under investigation and, therefore, should lead to comparable results. Obviously, comparing such databases indicates that there are complexities involved in studying entrepreneurial rewards (Carter, 2011, p. 40) and these complexities involve methodological issues (Carter, 2011) as well as theoretical moderators (such as income underreporting by entrepreneurs) affecting the results (Åstebro & Chen, 2014). Accordingly, this type of review helps to address lively debates in the field of entrepreneurship. Finally, databases not related to entrepreneurship can often provide relevant information. For example, Stephan (2018) reviewed the literature on entrepreneurs' mental health and well-being and many studies included in the review were panel studies that did not sample entrepreneurs but representative samples of the population, allowing Stephan to study a phenomenon that is highly relevant for entrepreneurship. This type of review can be useful as it is possible to address issues that are not commonly addressed in entrepreneurship research, such as drug abuse or even suicide (e.g., Heinz, Freeman, Harpaz-Rotem, & Pietrzak, 2017). Thus, reviewing databases can provide significant contributions to the field by providing stylized facts, resolving debates, and addressing new research questions. Notably, analyzing databases involves the risk that reported results might not be independent if they appear in different publications relying on the same database, a problem that needs to be adjusted for.

Computerized analysis is another trend that uses predominantly text analysis tools based in machine learning to articulate meaning embedded in the text. Since such analytical tools can test a large amount of data, they provide new opportunities to review text sources that could not have been analyzed with more traditional text analytical tools. For example, in entrepreneurship, researchers have used computerized text analysis to analyze shareholder letters of firms (Short,

Broberg, Cogiser, & Brigham, 2010), press releases (von Bloh, Broekel, Özgun, & Sternberg, 2019), and crowdfunding campaigns (Kaminski & Hopp, 2019). Computerized tools offer several advantages compared to more traditional forms of review. First, they help to identify relevant data, which is important given the large and growing number of scientific publications, and there are several automated processes available to locate data (O'Mara-Eves, Thomas, McNaught, Miwa, & Ananiadou, 2015). Second, computerized analysis helps analyze new data sources that were difficult to access because of the sheer amount of data involved, such as the data information repository made available by the internet or analysis that relies on multiple types of data, such as texts, videos, or verbal information (Kaminski & Hopp, 2019). Finally, there are different sets of rules—algorithms—available to analyze the data, ranging from basic methods that look, for example, at frequencies to more complex models such as natural language processing, which analyzes multiple word phrases and enables researchers to capture the syntactic relations that bind words to produce meaning (Pandey & Pandey, 2019), or sentiment analysis that helps understand an opinion about a given subject from written or spoken language. Computerized text analysis provides opportunities to arrive at new interpretations and assigned meanings. One important decision in the analysis refers to the choice of using supervised versus unsupervised machine learning to analyze the data. Supervised methods allow the researcher to construct a classification scheme first, whereas unsupervised methods read all the texts first and then suggest which classification scheme(s) might apply. In the domain of entrepreneurship, this type of research is just evolving and has potential to contribute to knowledge accumulation in the field as it can process huge amounts of data including data sources that might have been untapped, and it can assign meanings to the data that can only be extracted with computerized text analysis. An example of applying computerized analysis is Kaminski and Hopp (2019). Using computerized text analysis, the authors analyzed 20,188 crowdfunding campaigns. The study used two algorithms—neural network and natural language processing—to analyze text, speech, and video material. The results indicated that positive language and showcasing the product were most predictive for receiving funding. Like all methods, computerized text analysis also has disadvantages. Using big data creates ethical issues about the access to such data. It is also difficult to define the boundaries of a research question and thus to define the corpus of text documents that needs to be analyzed. While this is always an issue with text analysis, in computerized text analysis it is unclear what the requirements are so that the method works well. Finally, there are numerous algorithms available for the actual data processing and analysis; each of them has uncertainties regarding reliability and how different algorithms affect the outcomes. Finally, computerized text analysis involves many subjective decisions and, thus, is often less objective than assumed.

In summary, this editorial shows that there are a number of different forms of knowledge accumulation. Some of them are well established and some more recent forms are developing as there is no agreed upon methodology. While a researcher may have personal preferences for one or another form of review, this does not mean that one form is better than others. Rather, the value of a certain form of review depends on the goals the review wants to achieve, whether generalization, theory testing, theory development, or mapping the field. A diversity of approaches for a review is required and helps accumulate the diversity of knowledge typically found in entrepreneurship research.

Some methods for the review help establish actionable design templates to combine the scientific evidence with practice recommendations (Tranfield et al., 2003), helping to achieve what Strokes (1997) called use-inspired research: combining scientific rigor and practical relevance. Thus, the accumulation of knowledge in the field of entrepreneurship is important for both the theoretical advancement of the field and for developing practice implications.

Concluding Remarks

Reviews can provide important contributions for entrepreneurship and are, therefore, attractive to many top-tier journals in the field such as *Entrepreneurship Theory and Practice*. At the same time, editors receive too many poorly conducted reviews, with many not accepted. Many reviews face a dilemma between summarizing what has been done in past research and contributing to advancing the field of research. This editorial shows how reviews can go beyond purely descriptive aims and discusses how reviews can provide a substantial contribution to the entrepreneurship literature. The contribution or worth of a review depends on several issues: the quality of the material being reviewed, the type of review conducted, the rigor with which the review is conducted, and the reviewers' skills and competencies.

The five types of reviews discussed here—meta-analysis, systematic literature review, bibliometric review, the synthesis of qualitative research, and historiometric analysis—reflect those that are most popular in the management literature, but this list is certainly not exhaustive. There are many different forms for a review serving different aims, with some even combining qualitative and quantitative research (Dixon-Woods, Agarwal, Young, Jones, & Sutton, 2004; Paterson, 2012). There are also new developments in the field involving large datasets and computerized (text) analysis that provide new opportunities to conduct reviews in the domain. Selecting an appropriate method for a review depends on the aims of the researcher, but these aims also need to meet the aims of the journal the review is submitted to. The intention is to inspire creativity in reviews, not to discourage the submission of reviews. Reviews can be powerful and can produce novel insights into phenomena in the domain of entrepreneurship, helping achieve the mission of *Entrepreneurship Theory and Practice*. I hope this editorial provides clarity for authors aiming to contribute to the field of entrepreneurship by conducting a literature review.

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Franchisees and Loan Default on Third-Party Guarantee Loans: Evidence From the United States

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Abstract

We test the inefficient risk-bearing hypothesis—that third-party loan guarantors bear a higher risk on loans to franchisees than on loans to independent businesses—by assessing whether franchisees default more than independent businesses on third-party guarantee loans. In a sample of 428,233 SBA 7(a) loans disbursed between 2000 and 2016, franchisee loans, compared to independent business loans, with a higher percentage of the loan guarantee or made 1 to 2 years before a recession have a higher likelihood of default. The findings imply a distinctive loan default risk profile for franchisee loans.

Keywords

loan guarantees, SBA, franchisee, loan default

Recognizing both the value of small and medium enterprise (SME) growth and the difficulties SMEs encounter in securing business loans, many governments around the world have initiated third-party loan guarantee programs that guarantee a portion of principal in case of loan default (Beck, Klapper, & Mendoza, 2008). In the United States, the program is administered by the Small Business Administration (SBA; 2017a, 2017b). Despite a significant expanse and the scope of the SBA program, its economic value continues to be questioned in part because of its level of loan defaults (Ippolito, 2017).

Among the third-party guarantee loans to SMEs, franchisee loans represent a distinct resource and governance profile (Barthélemy, 2008) and may, therefore, imply a distinct loan default risk profile. Relative to independent businesses, not only do franchisees make higher initial outlays in starting a business (Castrogiovanni, Justis, & Julian, 1993), but they also make higher investments in intangible and transaction-specific assets requiring a higher loan guarantee percentage (Minkler & Park, 1994).¹ Compounding this higher debt risk from a larger loan size and less liquid intangible and transaction specific assets, moral hazard from the franchisor (e.g., opening more franchise outlets close to existing franchisees, opening company-owned outlets, increasing royalty and advertising contributions) could further exacerbate the risk of loan default. Due to

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the higher business risk for a franchise unit relative to an independent business unit (Roh, 2002), higher cash flow risk (Bürkle & Posselt, 2008, p. 40), and poorer survival prospects of franchisees (Bates, 1995, p. 377; Welsh, Desplaces, & Davis, 2011), the likelihood of franchisee loan default is higher.

Thus, relative to loans to independent businesses, loans to franchisees are susceptible to a higher risk bearing for third-party loan guarantors. Inefficient risk bearing refers to a misallocation of returns in proportion to risks (Brickley, Dark, & Weisbach, 1991; Garg & Rasheed, 2003; Ippolito, 2017; Lafontaine & Slade, 2014). Third-party guarantee loan programs seldom consider such differences in loan default risk profiles between independent businesses and franchisees. In this study, we test the inefficient risk-bearing framework to explain differences in third-party loan default rates between franchisees and independent businesses. Our research questions explore the following issues: whether franchisees are more likely to default third-party guarantee loans than independent businesses and whether the likelihood of loan default increases for franchisee loans with a higher loan guarantee percentage or for franchisee loans made prior to a recession.

Addressing the proposed research questions is of both academic and practical importance. Although previous franchising literature has focused on the agency problem between the franchisor and the franchisee (Antia, Mani, & Wathne, 2017; Lafontaine, 1992), the possibility that a franchisor and franchisees could jointly increase inefficient risk bearing for loan guarantor is seldom studied. The distinct risk profiles of franchisee and independent businesses that are held in the loan portfolios of loan guarantors call for a closer assessment of conditions under which franchisee loans are more likely to default than those awarded to independent businesses. From a practical perspective, our research addresses the programmatic concerns of third-party loan guarantors. Loans to franchisees represent a significant portion of the volume and number of SBA loans (Prakash, 2016). Even with an in-depth professional evaluation of the creditworthiness required for SBA loans, the SBA experienced guaranteed business charge-offs on 7(a) loans in 2017 in excess of \$690 million. Given the higher default rates of franchisee loans, especially those with a higher loan guarantee percentage and those made before a recession, the SBA program must evaluate the loan covenants, ranging from longer repayment periods to lower interest rates for franchisees.

Theoretical Background and Hypotheses

Franchising as a hybrid organizational form includes both markets (the exchange of inputs and outputs between franchisors and franchisees) and hierarchies (franchisors provide managerial assistance and monitoring to franchisees). For franchisors, franchising provides a means to overcome adverse selection and moral hazard in selecting, assimilating, and monitoring managers and in overcoming limits to growth by accessing and leveraging franchisee resources (Shane, 1996). Not only do franchisees receive franchisor guidance and benefit from an established and tested business model, but franchisors also accept and enforce routines of best practices to lower incompetence and overconfidence problems among entrepreneurs (Knott, 2003).

Loan Default on Third-Party Guarantee Franchisee Loans

Because inefficient risk bearing is greater for franchisee loans than for independent businesses, we propose that third-party guarantee loans made to franchisees have a higher likelihood of default, relative to those made to independent businesses (Brickley et al., 1991; Garg & Rasheed, 2003; Ippolito, 2017; Lafontaine & Slade, 2014). Franchisors require significant resource outlays from their franchisee units, translating into higher loan amounts (Wimmer & Garen, 1997;

Windsperger, 2004). Larger loans require higher principal and interest payments that at times may be difficult to meet with the volatile cash flows and liquidity constraints that small businesses face (Barro, 1976; Moffatt, 2005; Petersen & Rajan, 1994).

Additionally, franchising requires the development of system-specific know-how and investments for activities such as site selection, outlet layout, service and product delivery, purchase of system inputs from the franchisor (e.g., point-of-sales systems), technical training and support, chain-level and local marketing, and advertising. Such asset specificity pertains to the degree to which a particular investment is intended for a unique rather than general application (Williamson, 1983) or to a specific time period (Zaheer & Venkatraman, 1994). Developing these transaction-specific assets through cooperation between franchisors and franchisees is central to value creation in franchising.

Intangibility stems from investments in system-specific know-how related to the business concept, branding, store layout, training, marketing, and advertising, among others. Higher asset specificity and intangibility relative to independent businesses increase the default risk due to lower liquidity of the franchisee loans.

On the one hand, past studies have noted that successful franchisees are able to copy, transfer, and recombine knowledge-based resources within a given franchise chain (Argote & Darr, 2000; Dant, Paswan, & Kaufman, 1996; El Akremi et al., 2015; Gillis & Combs, 2009; Knott, 2003; Winter & Szulanski, 2001). Because franchises are “nested” within franchise chains that utilize similar processes and operate in an identical product space, franchisees are able to identify and integrate performance-enhancing business practices better than stand-alone owner-operators, especially in the retail and service industries (El Akremi et al., 2015).

Studies that focus on risk-adjusted financial measures of franchisor performance lend weight to this proposition. One examination of publicly traded franchisor versus non-franchisor restaurant firm performance from 1995 to 2008 found that franchisor-owned restaurants outperformed non-franchisor restaurants across five performance measures (Madanoglu, Lee, & Castrogiovanni, 2011). Noting that previous studies had speculated that the relationship between franchising and firm performance was contingent on a host of intra-industry factors (Combs, Michael, & Castrogiovanni, 2004; Ketchen, Combs, & Upson, 2006), Madanoglu et al. (2011) provided robust evidence of a “general franchising effect” among publicly traded franchisors within the restaurant industry suggesting that they had a higher return adjusted for risk than non-franchising firms.

On the other hand, it is not clear whether franchisees outperform independent businesses. In a sample of firms founded between 1984 and 1987, Bates (1995) found that “net income in 1987 among firms formed during the 1984 to 1987 period . . . averaged -\$4,102 for retailing franchises and \$14,572 for cohort independent business startups. For these same retailing firms that were operating in 1987, 45.1 percent of the young franchises had gone out of business by 1991, versus 23.4 percent of the independent young retail firms” (page 26). In a related sample, Bates (1998) finds that franchisees have lower survival rates than independent start-ups. Relatedly, other researchers have highlighted a higher likelihood of default for franchisees (Nitani & Riding, 2015) or no distinct performance advantage for restaurant franchisees (Alon, Drtina, & Gilbert, 2006). Welsh et al. (2011) using a sample of ventures from U.S.-based Kauffman Foundation Firm Survey conclude that “franchises have impediments that may affect their survival in the first year of operation” (page 3). A summary of this literature shows that the franchisees may not outperform independent businesses and, consistent with Bates’s (1995, p. 26) comparison to independent businesses franchisees, may “fit the high risk, low return profile.”

In addition, Knott (2003) proposes that franchising provides a disciplining mechanism for entrepreneurs with limited human capital or for those who are overconfident. The success of the franchise network stems from the ability of the franchisor’s ability to imbed and enforce routines

(Knott, 2003). Although the isolating mechanisms set by a transfer of routines could lead to competitive advantage, the significantly high rate of franchisor failure (Bates, 1995; Welsh et al., 2011) suggests that transfer and enforcement of explicit routines may not be possible in a significant portion of franchisor networks. Alternatively, franchise owners may not be willing or able to imbed such routines (cf. Knott, 2003), resulting in failure of franchise units and thereby increasing franchisee loan default risk. Guided by these research results and theory building efforts, we propose the following:

Hypothesis 1: *SBA loans that are awarded to franchisee businesses are more likely to default than loans awarded to independent businesses.*

Inefficient Risk Bearing and Higher Guarantee Percentage on Franchisee Loans

We further postulate that the default risk for franchisee loan may exacerbate with a higher loan guarantee percentage on the loan principal. When franchisees offer their relatively high levels of intangible assets and assets with greater specificity as collateral, few private lenders may be willing to lend money (Brown, Martinsson, & Petersen, 2012; Cosci, Meliciani, & Sabato, 2016; Hall, Moncada-Patern' o-Castello, Montresor, & Vezzani, 2016). With a higher loan guarantee percentage, a significant portion of the loan is uncollateralized, and the uncollateralized portion is guaranteed by the third-party guarantor. Intangible and asset-specific investments are costly to monitor for the third-party guarantors and costly to liquidate in the event of loan default (Long & Malitz, 1985), resulting in higher risk bearing by third-party loan guarantors.

Continuing from the rationale for Hypothesis 1, a higher guarantee percentage tied to more intangible and asset-specific investments may increase the likelihood of default for franchisees. Although third-party loan guarantees also apply to intangible and asset-specific investments of independent private businesses, we expect the prevalence of such investments to be higher among franchisees. Compared to loans to independent businesses, a higher guarantee percentage is necessary for franchisees to underwrite their intangible, asset-specific investments with their relatively higher risk.

Anticipating a higher loan guarantee percentage for their franchise units, franchisors may also act opportunistically by requiring greater asset specificity (Badrinarayanan, Suh, & Kim, 2016; Combs & Ketchen, 1999; Minkler & Park, 1994) and more intangible assets (Caves & Murphy, 1976) that could benefit the franchise network but increase the inefficient risk bearing for the loan guarantor. Resource-scarce franchisors could further increase the debt risk of a franchise unit to SBA. They do so by requiring more asset-specific investments and intangible assets from their franchisees (Mumdziev & Windsperger, 2011) that require a higher loan guarantee percentage. Such investments on the part of franchisees increase the upside for the franchise network, with much of the downside cost borne by the SBA that must guarantee a higher percentage of the loan. In sum, these arguments and those presented under Hypothesis 1 are the basis of the second hypothesis:

Hypothesis 2: *A higher loan percentage moderates the relationship between SBA loans and the likelihood of default, with a higher guarantee percentage being associated with a higher default rate for franchisee businesses than for non-franchisee businesses.*

Franchisee Versus Independent Business Loans Made Prior to a Recession

Continuing from arguments related to Hypothesis 1, the inefficient risk bearing by the loan guarantor may be higher for loans made in periods prior to a recession, specifically the loans disbursed at the peak of macroeconomic activity. Periods prior to a recession are generally marked by aggressive expansion, wherein franchisees may ramp up demand for loans that would be at a greater risk default during the ensuing economic contraction. Loans guaranteed by the SBA in a period prior to a recession are associated with increased risk of default for franchisee loans (cf., Bates, 1995; Grace & Weaver, 2011; Hsu, Kaufmann, & Srinivasan, 2017).

The increased risk of greater loan default when the loans are awarded in years immediately preceding a recession is associated with three factors. First, macroeconomic risk is higher prior to a recession and, as such, credit rationing increases and treasury departments generally increase interest rates during this period to curb inflation. Commercial lenders are especially risk averse to lending during this period because the risk exposure to loan guarantees is higher. As discussed in Alon, Madanoglu, and Shoham (2017), with increasing interest rates franchisors prefer independently owned franchisees (Martin & Justis, 1993) and conversely, franchisors open more company-owned units when the cost of capital is low (Gonzalez-Diaz & Solis-Rodriguez, 2012). Second, at the height of an economic expansion, the franchisor network is expanding at a rapid pace (Alon & McKee, 1999; Shane, 1996) and more marginal franchisees and franchising opportunities (e.g., low sales areas) are included in the network to maintain expansion rates. Based on the susceptibility to moral hazards from franchisors, as more franchise units are established, inefficient risk bearing increases for franchisees. Because the assets are overpriced at the peak of an economic cycle, the risks associated with the intangibility and specificity of assets are also the highest. As franchisors expand their network at the height of the economic activity, their ability to monitor franchise units may decline (Alon et al., 2017), further increasing the risk of default. Third, resource-scarce franchisors who have access to fewer opportunities for expansion in the prerecessionary period would more aggressively endorse franchisees for SBA-backed loans, further increasing risk bearing for loan guarantors.

Based on the preceding discussion, our third hypothesis is stated as follows²:

Hypothesis 3: SBA loans awarded prior to an economic crisis to franchisee businesses are more likely to default than loans made prior to an economic crisis to non-franchisee businesses.

Data and Methods

The data consist of the sample of all SBA 7(a) loans from fiscal years 2000 to 2016 (loans approved between January 1, 2000, and September 9, 2015, including both dates)³. On November 16, 2016, we downloaded the file made available through the Freedom of Information Act on SBA's website. Because franchising is predominantly present in the retail and services, we include loans to retail and service firms but drop loans: (a) with duration greater than 300 months (because SBA 7(a) loans are for a maximum period of 25 years)⁴; (b) with canceled or exempt status; and (c) with SBA guarantee percentage greater than 100% of the loan amount. We also drop franchisee loans for franchisor firms with fewer than five loans. Based on casewise deletions, our final sample includes 428,233 loans.

Validity of the Sample and Theoretical Constructs

The sample of SBA 7(a) loans from 2000 to 2016 used in this study shows evidence of relatively higher loan amounts for franchisee loans and indirectly shows higher asset specificity and asset intangibility in franchisees, proxied by a higher SBA guarantee percentage. Average loan size is higher for franchisees than for non-franchisees. In Table 1a (Table 1), the *t* test shows that the log of loan amount was lower for independent businesses ($p < .001$). While the balance sheets of private firms are not publicly available and no standard accounting rules exist on reporting of intangibility or asset specificity, traditional lenders would generally undervalue such assets because of their limited liquidation value. As such, SBA would have to increase the guarantee percentage for such loans. In our sample, the mean SBA guarantee percentage for loans to individual businesses was 62.40% ($SD = 15.50\%$), whereas it was 72.80% ($SD = 13.30\%$) for franchisee loans (mean difference -10.40% , $p < .001$; Table 1(a)).

Measures

Our outcome variable is months to loan default, a censored variable. If a loan is paid in full or if its term continued beyond 2016, it is coded as censored. If a loan is charged off, it is coded as default (=1), and duration to default is calculated as the count of months to default. There were two other loan outcomes, canceled and exempt. Exempt status loans are "loans that have been approved but have not been canceled, paid in full, or charged off are exempt from disclosure under FOIA Exemption 4." Both canceled and exempt loans outcomes were coded as missing and therefore dropped from the analysis.

The predictor variable is whether the business is a franchisee (=1 if yes, else =0 if it is an independent business).⁵ The SBA guarantee percentage is operationalized as the amount of the loan guaranteed by SBA divided by the total loan amount.

For testing Hypothesis 3, we use the recession years in the United States from the National Bureau of Economic Research (NBER). The NBER defines an economic recession as "a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales." During the period represented in the sample, there were two recessionary periods, 2001–2002 and 2008–2009 recession, specifically from March 2001 to November 2001 and from December 2007 to June 2009. Due to variations in timings of initiation, application, and approval of loans, we coded the year 2000 as 1 for loans in the prerecession period before the 2001 and 2002 recession⁶ and coded years 2006 and 2007 as 1 for loans in the prerecession period before the 2008 and 2009 recession years. If the loan originated during other years, it was coded as zero. In the robustness check, using three alternate prerecession codings, our inferences were consistent with the main results.

To control for alternative explanations, we include the log of the gross approval amount for a loan (in \$'000s), as larger loans are more likely to default. Because the number of jobs supported by the loan may affect loan covenants, we include this variable as a control (Riding & Haines Jr., 2001). Note that number of jobs created is the sum of jobs created and jobs retained and is based on lender reporting in the SBA loan application; however, this information is not reviewed, audited, or validated by the SBA. While the number of jobs created is not a long-term indicator of the ability to pay back the loan, the losses from loan default could be discounted by the SBA in lieu of jobs created at the time of loan decision (Bradshaw, 2002). We control for whether the loan is a revolving line of credit (=1, else =0 for term loan). The default of such loans may be driven by closeness to bankruptcy because only under precarious financial situation would a firm default its revolving dues (Allen et al., 2004). As the number of loans from a franchise network

Table I. *T* test differences between franchisees and non-franchisees

		Non-franchisee				Franchisee				Mean difference (standard error)		t test
		N	Mean	SD	N	Mean	SD					
1	Loan default	4,02,533	0.25	0.433	25,700	0.233	0.423	0.017 (0.003)	6.180***			
2	Duration to default (months)	4,02,533	87.116	60.192	25,700	104.409	60.698	-17.292 (0.388)	-44.630***			
3	SBA guarantee percentage	4,02,533	0.624	0.155	25,700	0.728	0.133	-0.104 (0.001)	-100.000***			
4	Loan prior to economic crisis	4,02,533	0.29	0.454	25,700	0.184	0.387	0.106 (0.003)	36.680***			
5	Log of gross approval amount for the loan (\$ '000s)	4,02,533	4.11	1.343	25,700	5.103	1.091	-0.993 (0.009)	-120.000***			
6	Number of jobs supported	4,02,533	7.998	38.385	25,700	13.091	37.401	-5.093 (0.250)	-20.333***			
7	Revolver loan	4,02,533	0.366	0.482	25,700	0.093	0.29	0.273 (0.003)	89.854***			
B. Sample Descriptives		Variable	Mean	SD	1	2	3	4	5	6	7	8
1	Loan default	0.249	0.433	1								
2	Duration to default (months)	88.154	60.362	-0.330***	1							
3	Franchise	0.06	0.238	-0.001***	0.068***	1						
4	SBA guarantee percentage	0.631	0.156	0.002	0.293***	0.158***	1					
5	Economic crisis	0.284	0.451	0.186***	-0.121***	-0.056***	-0.136***	1				
6	Log of gross approval amount for the loan (\$ '000s)	4.169	1.35	-0.102***	0.499***	0.175***	0.368***	-0.102***	1			
7	Number of jobs supported	8.304	38.911	-0.011***	0.019***	0.031***	0.003***	0.001	0.091***	1		
8	Revolver loan	0.35	0.477	-0.013***	-0.262***	-0.138***	-0.568***	0.085***	-0.362***	-0.013***	1	
9	Count of franchisor loans	650.82	1085.408	0.050***	-0.127***	-0.893***	-0.204***	0.162***	-0.206***	-0.016***	0.172***	

SBA, small business administration.

Note. N = 42823. Individual ownership type, three-digit North American Industry Classification System (NAICS) dummies, and loan delivery method dummies included in the table but not presented due to space reasons.

* $p < .05$ (two-tailed).

could have performance implications for loan default (Perrigot, Cliquet, & Mesbah, 2004), we include the count of franchise loans.

In addition to these controls, we include ownership, loan delivery method, and three-digit North American Industry Classification System (NAICS) dummies. To control for ownership influence, we include dummies for Individual, Partnership, or Corporation. These modes of ownership vary based on limited versus unlimited liabilities and bankruptcy laws also vary across these modes of ownership (Van Auken, Kaufmann, & Herrmann, 2009), thus influencing the motivations for loans default. To control for the fixed effects from the subprograms in the SBA 7(a) loan program, we control for the loan delivery method.⁷ To control for industry effects, we include three-digit NAICS dummies. Furthermore, distinctive ownership, lending, and location conditions could create unique conditions for loan approval and default. Therefore, we clustered the standard errors around franchisor-bank name-borrower state-city.

Method

To test the proposed hypotheses, we draw on survival analysis. Because the likelihood of default is less likely in early years and more likely in later years, we use a Weibull hazard function that models for the parametric nature of the survival function. The distribution of time to loan default, T , for a franchisee or non-franchisee firm is written as

$In(T) = \beta_0 + \beta_1(isFranchisee) + \beta_2(isFranchisee \times SBA\ Loan\ Guarantee\ %) + \beta_3(isFranchisee \times Loan\ during\ pre-Economic\ Crisis) + \beta_4(Controls) + \sigma\varepsilon$ where β s represent the coefficients of covariates, ε is the extreme minimum value distribution stated from $G(0, \sigma)$, and σ represents the shape parameter. The shape parameter is based on the multiplicative effect of covariates on the time scale and thereby accounts for accelerated time to failure. The effect of a covariate in the proportional hazard model is multiplicative on the hazard scale. For the Weibull model with a predictor x , the proportional hazard model is

$$h(t, x, \beta, \lambda) = \lambda t^{\lambda-1} e^{-\lambda(\beta_0 + \beta_1 x)} = \lambda t^{\lambda-1} e^{-\lambda\beta_0} e^{-\lambda\beta_1 x} = \lambda \gamma t^{\lambda-1} e^{-\lambda\beta_1 x} = h_0(t) e^{\theta_1 x}$$

where the baseline hazard function is $h_0(t) = \lambda \gamma t^{\lambda-1}$ and $\gamma = e^{-\frac{\beta_0}{\sigma}} = e^{\theta_0}$, $\theta_1 = -\beta_1/\sigma$, λ (or, $\gamma = 1/\sigma$) is a shape parameter, and θ_1 is the shape parameter. The accelerated failure time form of the hazard function can be written as

$$h(t, x, \beta, \lambda) = \lambda t^{\lambda-1} e^{-\lambda(\beta_0 + \beta_1(isFranchisee) + \beta_2(isFranchisee \times SBA\ Loan\ Guarantee\ %) + \beta_3(isFranchisee \times Loan\ during\ pre-Economic\ Crisis) + \beta_4(Controls)))} = \lambda \gamma (te^{-\beta_1})^{\lambda-1} e^{-\beta_2(isFranchisee)} e^{-\beta_3(isFranchisee \times SBA\ Loan\ Guarantee\ %)} e^{-\beta_4(isFranchisee \times Loan\ during\ pre-Economic\ Crisis)} e^{-\beta_5(Controls)}$$

Results

Table 1b presents correlations among the variables. An illustrative list of the top 100 franchisors by the number of SBA loans and defaults is shown in Table A1 (Online Supplemental Material).

Inferences for Hypothesis 1. In Table 2, franchisees were more likely to default than non-franchisees (Table 2, Model 1: hazard ratio = 4.95, $p < .001$). However, in Table 1(a), franchisees have lower loan default rates (Table 1(a), t test = 6.18, $p < .01$) and longer duration to default (t test = -44.63, $p < .01$). Comparing Model 1 in Table 2 with Model 1 in Online Supplemental Table A2, without adjustment for controls or loan characteristics, consistent with Table 1a, franchisees were less likely to default, showing that these estimates unadjusted for other confounders

Table 2. Weibull Regression Results (Hazard Ratios Reported).

VARIABLES	(0)	(1)	(2)	(3)	(4)	(5)
Franchisee	4.9540*** (0.344)	2.3761*** (0.163)	1.5732*** (0.168)	2.5227*** (0.172)	2.5227*** (0.172)	2.7493*** (0.084)
SBA guarantee percentage		4.9280*** (0.553)	1.1629 (0.131)			4.1350*** (0.489)
Loan made 2 years before economic crisis		1.9184*** (0.021)		1.8814*** (0.022)	1.8814*** (0.022)	1.9026*** (0.022)
Franchisee × SBA guarantee percentage			4.7566*** (0.509)		4.7566*** (0.509)	4.6549*** (0.516)
Franchisee × loan made 2 years before economic crisis				1.0795*** (0.037)	1.0795*** (0.037)	1.1583*** (0.040)
Log of gross approval amount for the loan (\$'000s)	0.8326*** (0.005)	0.8236*** (0.004)	0.8407*** (0.005)	0.8272*** (0.005)	0.8272*** (0.005)	0.8417*** (0.005)
Number of jobs supported	1.0000	0.9999	0.9999	1.0000	0.9999	0.9999
Revolver loan	0.8827*** (0.017)	0.8779*** (0.017)	0.8766*** (0.016)	0.8744*** (0.017)	0.8697*** (0.016)	0.8719*** (0.016)
Count of franchisor loans	1.0000*** (0.000)	1.0000*** (0.000)	1.0000*** (0.000)	1.0000*** (0.000)	1.0000*** (0.000)	1.0000*** (0.000)
Business type dummies	Included	Included	Included	Included	Included	Included
Loan delivery method dummies	Included	Included	Included	Included	Included	Included
Three-digit NAICS dummies		0.0001*** (0.000)	0.0001*** (0.000)	0.0001*** (0.000)	0.0001*** (0.000)	0.0001*** (0.000)
Constant						0.0001*** (0.000)
Number of clusters	157,520	157,520	157,520	157,520	157,520	157,520
Number of loans	428,233	428,233	428,233	428,233	428,233	428,233

(Continued)

Table 2. Continued

	(0)	(1)	(2)	(3)	(4)	(5)
Number of default loans	106,716	106,716	106,716	106,716	106,716	106,716
χ^2	26,710	27,859	35,080	27,658	35,323	34,966
Degrees of freedom	79	80	82	82	82	84
p value	<.001	<.001	<.001	<.001	<.001	<.001
Shape parameter	1.421	1.430	1.445	1.432	1.442	1.446

NAICS, North American Industry Classification System; SBA, small business administration.

Note. Robust see in parentheses.

* $p < .01$. ** $p < .05$. *** $p < .1$.

imply that franchisee loans are less likely to default. To further parse out the role of confounders in reversing the direction of effects, we conduct two analyses.

First, we find that size of the loan as a moderator drives a higher likelihood of loan default for franchisees, in models with and without controls (Online Supplemental Table A2; Models 2 and 4). Perhaps loan size could be a sign “switching” variable in this relationship, that is, larger loans made to franchisees are more likely to default.

Second, in Table A2(b), we find that franchisees were more likely to default ($5.87; p < .001$) after matching franchisee and independent business loans for SBA guarantee percentage, if the loan is made prior to economic crisis, log of gross approval amount, number of jobs supported, revolver loan, delivery method, and borrower state. Using the three-digit NAICS as an additional matching variable in the aforementioned list of matching variables, the t stat was $3.86 (p < .001)$. Therefore, in comparing loans to franchisees and independent businesses based on matched characteristics, franchisee loans are more likely to default.

Overall, after adjusting for confounders, the effect is consistent with Hypothesis 1 and, without adjusting for confounders, the effect is the opposite of Hypothesis 1. Based on the analyses in Tables 2 and A2(b) and based on Bates (1995) and Welsh et al. (2011), franchisee loans, after adjusting for loan-related factors, seem to default at a higher rate. However, to err on the side of caution, we do not infer support for Hypothesis 1 because heterogeneity in loan characteristics does not lend to unambiguous support for Hypothesis 1.

Inferences for Hypotheses 2 and 3. Hypothesis 2 proposed that franchisees with higher SBA guarantee percentage were more likely to default (Table 2, Model 3: hazard ratio = $4.76, p < .01$). Hypothesis 3 proposed that loans made to franchisees about 2 years prior to recession would have higher odds of default (Table 2, Model 4: hazard ratio = $1.08, p < .05$). The direction and effects are consistent in the full model (Model 5). Figures in A1 are based on the specification in the final model (Model 5).⁸ Online Supplemental Figure A1(a) shows that non-franchisees have lower odds of default than franchisees. Loans made to franchisees before a recession are more likely to default (Online Supplemental Figure A1(b))).

In summary, we find support for Hypothesis 2 and Hypothesis 3 and do not make an inference for Hypothesis 1. In the inference for Hypothesis 2, for a 10% increase in SBA guarantee percentage, franchisee loans have a 1.48 times higher default rate per year relative to the control population of independent business loans. For Hypothesis 3, regarding loans made within the 1- to 2-year period prior to a recession, there is 7.95% higher chance of default per year relative to the control population of independent business loans.

Robustness Checks

We present a variety of robustness checks in the Online Supplemental Material. In Online Supplemental Table A3, we provide results for Cox regression, accelerated failure time model, two alternate clustering specifications, and three alternate codings for loans made before a recession. Online Supplemental Table A4 presents the endogeneity estimates using a two-stage residual (2SRI) specification (Terza, Bradford, & Dismuke, 2008; Terza, Basu, & Rathouz, 2008). Online Supplemental Table A5 provides estimates for franchisee subsample by the volume of loans, and Online Supplemental Table A6 provides estimates based on controls for local and industry conditions. Finally, in Online Supplemental Table A7 we present estimates for the restaurant industry subsample, and in Online Supplemental Table A8 we present estimates of a three-way interaction among “franchisee loans \times SBA guarantee percentage \times loan made prior to a recession.” In this broad range of robustness checks, our inferences are generally consistent with the main inferences for Hypothesis 2 and Hypothesis 3. For an additional discussion on these robustness tests, refer to the Online Supplemental Material.

Discussion

Due to the lack of conclusive evidence on whether franchisee loans are more likely to default than independent businesses, we do not make an inference in either direction for Hypothesis 1. The results, robust to alternate specifications, show that franchisee loans with a higher SBA loan guarantee percentage are more likely to default and that SBA loans made to franchisees prior to an economic crisis are also more likely to default. Despite the large sample size where statistical significance is generally found, the effects sizes are meaningful.

Our goal in this research note was not to extend or develop theory but to test for differences in franchisee and independent business loan default rates through the lens of an inefficient risk-bearing framework. By testing the inefficient risk-bearing hypothesis in the context of third-party loan guarantee literature, our findings provide a foundational basis for future theory development at the intersection of inefficient risk-bearing literature and third-party loan guarantee programs. The risk of franchisee loan default is exacerbated for franchisees by the comparatively greater loan guarantee percentage. Factors prompting the need for the greater loan guarantee percentage include their higher asset specificity and intangibility, which they can be forced to jettison during and following a recession. Further, as discussed in the finance literature (Brickley & Dark, 1987; Brickley et al., 1991), inefficient risk bearing could be an important lens through which to study franchisors free riding on the loan guarantees by increasing inefficient risk bearing on SBA. Moral hazard problems associated with franchisors requiring higher investments in intangible and asset-specific assets from the franchise units, knowing that these less collateralized assets would be guaranteed by the SBA, also seems an important area of future theory building.

Alon, Boulanger, Misati, and Madanoglu (2015), drawing on a sample of 271 diverse U.S. franchise chains between 2000 and 2008, found that average total investment, industry type, number of company-owned outlets, and importance of experience in the specific industry are predictors of franchisor SBA loan default. Moving from a franchisor-level analysis in Alon et al. (2015), we focused on the variation in default rates between franchisee and independent business loans. Nitani and Riding (2015) found that in Canada's national small business financing program, firm age was the most important predictor of loan default and the program supported job creation. We replicate their findings in the U.S. context by focusing on a distinct group of loan recipients among small businesses—franchisees—and highlight the relevance of loan guarantee percentage and the role of macroeconomic factors at the time of loan approval. Bates (1995) stated that franchising lowers the chance of survival due to business and legal difficulties the franchisee must overcome, and Alon et al. (2006) in the restaurant industry failed to uncover any sustainable profit advantage for franchised firms. Consistent with these findings, we find support for higher odds of default for franchisee loans with a higher loan guarantee percentage and for loans made prior to a recession.

Also related to the practical implications of our findings, without adjusting for the loan-specific characteristics, we cannot infer if franchisees are more likely to default than independent businesses on their SBA loans. However, for franchisees with a higher loan percentage guarantee and for franchisee loans made prior to recession, default rates are higher. SBA loan guarantee decisions are based on a distinctive blend of economic and noneconomic criteria (Lee, 2018). Therefore, the economic implications may be to have more stringent covenants for franchisee loans with a higher loan guarantee percentages or made prior to a recession. However, the non-economic goals of the SBA (e.g., promoting job growth, maintaining the vitality of local economy) must also be considered. In line with the economic and noneconomic objectives of the SBA, perhaps more favorable terms would be advisable to assist franchisees' higher loan guarantee percentages or franchisees receiving loans prior to a recession. The findings also call for an

improved understanding of borrower profiles and attributes of loans to change the terms of loans for franchisees in terms of coverage ratio and guarantee limits. Based on our research findings, franchisees when receiving a higher loan guarantee percentages or loans prior to recession would also be advised to adopt a defensive posture to lower the odds of default.

Limitations and Directions for Future Research

Some of the limitations of our study are as follows. First, although we control for a variety of confounders, we are unable to capture finer-grained data at the franchisee unit level. Unfortunately, such data are seldom available, especially related to franchisee financial performance. To the best of our knowledge, the sales tax data from Texas retailers (Kahn & Lafontaine, 2004; Lafontaine & Shaw, 2016) are the only publicly available data on the financial performance at the franchise unit level. Future studies could rely on qualitative studies to further explore resource allocation patterns and management decisions. Second, while our data are limited to loan guarantee programs in the United States to improve generalizability, we call for future studies to replicate our findings in different geographic contexts. Future studies could also utilize a two-part model of selection to understand better the selection of loan recipients from the pool of SBA applications (extensive margin effect) and the loan amounts received (intensive margin effect). Our findings also call for a closer look at the expansion of franchisors internationally (Byrd & Ross, 2015; Dupuis & Prime, 1996). Franchisees with overseas franchisors may face additional risks due to cultural, physical, and psychological distances from the franchisor's home country, limiting the franchisor's ability to monitor and transfer routines (Madanoglu, Alon, & Shoham, 2017).

Overall, this study contributes to our understanding of the differences between franchisee and independent business SBA loan default. Suggesting that loans to franchisees represent a distinctive risk profile, we find that loans to franchisees with increasing loan guarantee amounts or those made during a period prior to recessionary times are more likely to default. We hope that the findings prime future research on risk exposure from SBA loans for both franchisees and their third-party loan guarantors.

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Notes

1. Our sample of 428,233 SBA 7(a) franchisee loans dispersed between 2000 and 2016 had a higher loan amount and required a higher loan guarantee percentage. The SBA 7(a) loan program provides loans up

to \$5 million for financing start-up costs, purchasing equipment, purchasing land (including construction costs), repairing or upgrading existing equipment or capital, purchasing or expanding an existing business, refinancing debt, and purchasing furniture, fixtures, supplies, or materials. The SBA does not directly provide loans to the applicants, but loans are guaranteed through banks or an SBA lender. The applicants must pursue other modes of financing before applying for SBA loan and have invested equity in the business. The 7(a) program provides a longer term of financing, flexibility, and lower payments, compared to other financing options. The loan payments are made on a monthly basis, including payment toward interest and principal. There are specialized 7(a) loans for exporting, for locating a business in an underserved community, for veterans, and for short-term or cyclical working capital needs.

2. Hypothesis 3 tests for differences in default rates for loans made during prerecession time between franchisee and non-franchisee loans and other periods. Thus, the null hypothesis is as follows: There is no difference between franchisee businesses and independent businesses in their default rates for SBA loans awarded prior to economic crisis or during other periods.
3. Because the disbursement of the loan occurs after the date of approval, we use the reported fiscal year for a loan as the year of the loan in conducting our analysis.
4. “Up to 25 years for real estate acquisition or construction. Most other SBA loans are limited to 10 years. Working capital loans are generally limited to seven years.” (Source: https://www.sba.gov/sites/default/files/SDOLoanFactSheet_Oct_2011.pdf)
5. A loan with a franchisor code and with at least five loans associated with a franchisor code were included in the sample to represent franchisee loans. Those with a franchisor code but fewer than five loans were dropped from the analysis as these small franchisors may not represent a typical franchise network.
6. Note that loan data for year 1999 is not provided by SBA; therefore, we could only use a 1-year window for the 2001–2002 recession.
7. CA = Community Advantage; CLP = Certified Lenders Program; COMM EXPRES = Community Express (inactive); DFP = Dealer Floor Plan (inactive); DIRECT = Direct Loan (inactive); EWCP = Export Working Capital Program; EXP CO GTY = Co-guaranty with Export-Import Bank (inactive); EXPRES EXP = Export Express; GO LOANS = Gulf Opportunity Loan (inactive); INTER TRDE = International Trade; OTH 7A = Other 7(a) Loan; PATRIOT EX = Patriot Express (inactive); PLP = Preferred Lender Program; RLA = Rural Lender Advantage (inactive); SBA EXPRES = SBA Express; SLA = Small Loan Advantage; USCAIP = US Community Adjustment and Investment Program; and Y2K = Y2K Loan (inactive)
8. Due to the convergence issue in plotting estimates from Weibull regression, we used the Cox regression estimates to plot these figures.

Supplemental Material

Supplemental material for this article is available online.

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A Growth Mindset Intervention: Enhancing Students' Entrepreneurial Self-Efficacy and Career Development

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Abstract

Despite mounting interest in growth mindset interventions, this approach has yet to be applied to the domain of entrepreneurship. In the present research, we developed and tested if a growth mindset intervention could be leveraged to promote students' entrepreneurial self-efficacy and if this, in turn, predicted career development (i.e., academic interest, career interest, task persistence, and academic performance). We report on our findings, from an Open Science Framework (OSF) preregistered study, that is a randomized controlled trial implementing a growth mindset intervention. We randomly assigned undergraduate students ($N = 238$) in an introduction to entrepreneurship class to either the growth mindset intervention or to a knowledge-based attention-matched control. Students in the growth mindset intervention, relative to the control, reported greater entrepreneurial self-efficacy and task persistence on their main class project. The intervention also indirectly improved academic and career interest via entrepreneurial self-efficacy. However, the intervention failed to directly or indirectly impact performance on a classroom assignment. Additionally, and somewhat surprisingly, gender and past experience in the field failed to moderate any effects of the intervention on outcomes. Theoretical implications, limitations, and future directions are discussed.

Keywords

growth mindset, self-efficacy, entrepreneurship, career development

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Introduction

We need empirically-based and theoretically-driven solutions in entrepreneurship education to enhance students' career development, which encompasses interest in the field as well as persistence and performance (Béchard & Grégoire, 2005; Fayolle, 2013; Lent, Brown, & Hackett, 1994; McMullan & Long, 1987). In the current work, we seek to advance existing research in two key ways. First, continuing in the tradition of numerous theoretical perspectives (e.g., achievement motivation theory; Wigfield & Eccles, 2000; entrepreneurial education and intentions; Wilson, Kickul, & Marlino, 2007; theory of planned behavior; Ajzen, 1991), we illustrate the importance of self-efficacy for career development. Second, we offer growth mindsets, beliefs about the potential to develop entrepreneurship abilities, as one theoretical approach that can be easily incorporated into entrepreneurship education that will enhance entrepreneurial self-efficacy with downstream implications for career development. To examine our hypotheses, we empirically tested, with a rigorous randomized design and preregistered open science approach, a scalable online growth mindset intervention integrated into the classroom curriculum.

An Implicit Theory Approach

Mindset interventions are grounded in the venerable literature on implicit theories, which are knowledge structures about the malleability of an attribute that organize the way people ascribe meaning to events (Dweck & Leggett, 1988). Research on implicit theories distinguishes between two main beliefs, what has now been termed mindsets: an incremental theory or growth mindset, and an entity theory or fixed mindset (Dweck & Leggett, 1988). Individuals with a growth mindset believe that human attributes (e.g., athletic ability, intelligence) are malleable and therefore can be developed through hard work and effective strategies. In contrast, individuals with a fixed mindset believe that human attributes are fixed and therefore cannot be honed or changed. A few things to keep in mind about implicit theories, or mindsets, is that they are domain specific, distinct from personality constructs such as the big five and cognitive ability, and can be shifted with one-shot laboratory experiments (e.g., Burnette, 2010) or longer-term interventions (Aronson, Fried, & Good, 2002; Blackwell, Trzesniewski, & Dweck, 2007). Additionally, these implicit beliefs are distinct from the more general lay use of the term mindset—an associated set of attitudes or way of approaching a task (e.g., McGrath & MacMillan, 2000). Finally, implicit theory-related mindsets predict self-regulatory strategies, especially when challenges arise. For example, students with growth mindsets set goals focused on learning, adopt mastery-oriented approaches like seeking help from others, persist, and remain efficacious when faced with obstacles. In contrast, students with fixed mindsets focus on outperforming their peers, proving their ability, and avoiding mistakes (for a meta-analytic review, see Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013).

In the current work, in examining how to increase students' career development, we focus on how growth mindsets are an important antecedent of entrepreneurial self-efficacy beliefs, which in turn have implications for academic and career interest as well as persistence when challenges arise. Social cognitive theory provides some general guidance about possible sources of sense of efficacy more generally. Namely, Bandura (1986) proposed four sources: mastery experiences, vicarious experiences, verbal persuasion, and physiological arousal, with mastery experiences postulated as a key facilitator. However, when mastery experiences are limited (e.g., novices), persuasion is a more critical process.

Growth mindset messaging implies that everyone has the capacity to succeed even when challenges arise or experience is lacking, and represents a potent and implicit message that development is possible. A growth mindset message is a persuasive tool, especially for students

in introductory classes who may not have had a number of opportunities for mastery experiences. For example, when presented with failure feedback after working on a challenging academic task, a student with a growth mindset reported that he or she had the skills to reach their goal (strong self-efficacy), whereas a student with a fixed mindset noted that they “wouldn’t feel smart enough to make it” on future tasks (Dweck, 2000, p. 46). Drawing on the theoretical as well as empirical evidence, our primary hypothesis is as follows.

Hypothesis 1: *Growth mindset messaging, relative to an attention-matched control, increases entrepreneurial self-efficacy.*

Additionally, we suggest that confidence in one’s ability is a powerful motivator of interest and persistence—key components of career development (Lent et al., 1994). When people affirmatively answer the question, “can I do this task?” (self-efficacy), they are much more interested and motivated to pursue the task and are more likely to persist in the face of setbacks—with implications for performance. For example, achievement motivation theory posits that in addition to evaluating the value of an activity, one’s expectations about the potential for success are critical for understanding an individual’s choice, persistence, and performance (Wigfield & Eccles, 2000). Related, the theory of planned behavior incorporates the concept of perceived behavioral control, which originates from self-efficacy theory, and is also a critical predictor of intentions and behavior (Armitage & Conner, 2001). Overall, generally, self-efficacy can positively relate to interest—and, this is especially true when considering career interest (Bierer, Prayson, & Dannefer, 2015).

The entrepreneurial intentions literature also notes the importance of entrepreneurial self-efficacy for choosing to start or run a business (Zhao, Seibert, & Hills, 2005). Similarly, and of relevance to the current work, many theories of career development highlight the importance of self-efficacy. For example, Vroom’s (1964) model suggests that decisions about careers are driven, in large part, by the subjective probability that certain acts produce particular outcomes. And, scholars in social cognitive career theory (e.g., Lent et al., 1994) note that, “people form enduring interest in an activity when they view themselves competent at it ...” (Lent & Brown, 1996, p. 313). In sum, numerous theoretical perspectives highlight the importance of self-efficacy for the outcomes of focus in the current work. More specifically, we posit the following hypotheses.

Hypothesis 2: *We expect entrepreneurial self-efficacy to predict academic and career interest.*

Hypothesis 3: *We expect there to be a significant indirect effect of the growth mindset intervention on academic and career interest via entrepreneurial self-efficacy.*

In addition, we explore the total effects of our mindset intervention for career development outcomes. First, we expect that growth mindset interventions can also be leveraged to foster not only entrepreneurial self-efficacy but also academic interest and career interest in the domain of entrepreneurship (Lent et al., 1994; Sadler, Sonnert, Hazari, & Tai, 2012). A fundamental predictor of interest is one’s evaluation of the potential to learn the subject (Eccles, 2005). Although numerous aspects go into the evaluation of whether one is interested in learning and/or starting a business (e.g., previous knowledge; Miralles, Giones, & Riverola, 2016), we suggest that growth mindsets also predict students’ interest in the field of entrepreneurship. For example, middle-school students’ growth mindsets about science ability correlated positively with whether they thought they could become a scientist (Hill, Corbett, & St. Rose, 2010). We draw on this

empirical finding to suggest that students' growth mindsets about entrepreneurship will influence academic and career interest.

Hypothesis 4: *We expected students in the growth mindset intervention, relative to the control, to report greater academic and career interest.*

Additionally, we also examined how students perform on their main class assignment as a function of the intervention as well as via their entrepreneurial self-efficacy and task persistence. Recent work suggests that there are small effects of growth mindsets on academic achievement (Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018) and that these relations do not hold for all students (Chao, Visaria, Mukhopadhyay, & Dehejia, 2017). However, research generally supports the idea that mindsets matter for psychological processes (i.e., efficacy) and behavioral outcomes (i.e., persistence) and there is robust support for the importance of self-efficacy for goal persistence and motivation to continue when challenges arise (e.g., Pajares, 1996). For example, students with growth, relative to fixed mindsets, report more mastery-oriented regulatory strategies and are less likely to disengage when challenges arise (Burnette et al., 2013). And, we know that being tenacious is a critical component of becoming a successful entrepreneur (Shane, Locke, & Collins, 2003; Timmons & Spinelli, 2009). In sum, although the link between growth mindsets and academic performance has been called into question (see Sisk et al., 2018), evidence supports the idea that growth mindsets foster efficacy and persistence. And, this steadfast goal pursuit predicts better performance. Accordingly, we offer our next hypothesis.

Hypothesis 5: *We expected an indirect effect of intervention condition on students' performance on their main class project via a serial process such that students in the growth, relative to control, condition report greater entrepreneurial self-efficacy, which predicts task persistence, which, in turn, predicts better task performance¹.*

Finally, mindsets do not function alone in shaping outcomes. Rather, these variables are affected by and operate in concert with other aspects of the self, such as gender and past experiences. Women are generally less likely than their male counterparts to engage in entrepreneurship, and those who do participate run smaller businesses, get less funding, are less profitable, have slower growth, and are more likely to partake due to necessity (Brush, Kelley, & Duffy, 2012; Jennings & Brush, 2013; Kauffman Foundation, 2016). One theoretical explanation for their underrepresentation is that women often find themselves threatened by the possibility of confirming negative stereotypes associated with their gender. This phenomenon, termed "identity threat," can undermine motivation and performance (Steele, Spencer, & Aronson, 2002). Identity threat can lead women to experience self-efficacy concerns. For example, in the domain of computer science, when stereotypical cues are salient in the environment, women are less likely to expect to succeed (Cheryan, Plaut, Davies, & Steele, 2009; Cheryan, Ziegler, Montoya, & Jiang, 2017). This effect has also been shown in entrepreneurship (Gupta, Turban, & Bhawe, 2008; Gupta, Goktan, & Gunay, 2014; Pollack, Burnette, & Hoyt, 2012).

However, much of the identity threat work relates to women in the current work force where the conditions may be quite different than in an introductory entrepreneurship classroom setting where it is implied that everyone has an opportunity to succeed. Nonetheless, gender differences still emerge, albeit for potentially different theoretical reasons. For example, social cognitive theory and gender development (Bussey & Bandura, 1999) highlight how modeling can impact motivations (Bandura, 1986). In the current work, that may translate into females seeing fewer females succeeding and being rewarded at higher levels of entrepreneurship education and thus reporting less interest in the field, relative to males who have more same-sex role models.

Although there are many interrelated reasons why women are underrepresented in entrepreneurship, lack of early exposure is another often cited one (e.g., Cheryan et al., 2017).

Additionally, lack of experience may serve as a deterrent in general, not just for women, as it undermines self-efficacy and subsequent interest. With relevance to the present work, growth mindsets may help promote entrepreneurial self-efficacy by helping reframe what potential challenges, like lack of role models and inexperience, *mean*. A growth mindset message implies that everyone, regardless of identity or previous experiences, has the capacity to learn and improve. Indeed, across a range of contexts, growth mindsets are especially relevant in times of ego threats (Burnette et al., 2013; Pollack et al., 2012) and are especially powerful for students at risk academically (e.g., Sisk et al., 2018).

Hypothesis 6: *We examine if the effects of the intervention on entrepreneurial self-efficacy and career development outcomes are stronger for females, relative to males, and for students with less, relative to more, entrepreneurial experience.*

Overview of Current Work

In summary, we extend the implicit theory framework to the field of entrepreneurship and merge it with social cognitive self-efficacy theory and the career development literature. This amalgamation and novel theoretical approach led us to postulate that growth mindset messaging is a persuasive technique for fostering entrepreneurial self-efficacy with downstream implications for career development-related outcomes. To examine our hypotheses, we developed a theoretically-driven, and scalable, growth mindset intervention and administered it in a large introductory entrepreneurship class using a randomized design. We focused our efforts on an introductory class in college for two main reasons. First, unlike math and many other STEM disciplines, entrepreneurship is not part of the core curriculum in high school education (Carmichael, Martino, Porter-Magee, & Wilson, 2010). Thus, students are often first introduced to it in college, making it an ideal time to improve career development (Chambliss & Takacs, 2014). Second, the rate of entrepreneurship activity for younger entrepreneurs has declined roughly 10% since 1996 (Fairlie, Morelix, & Tareque, 2017). Accordingly, the student population is an important demographic that warrants attention.

Methods

We used the Open Science Framework (OSF), which is a tool that promotes open science by enabling researchers to publicly post different aspects and products of the research lifecycle (Anderson, Wennberg, & McMullen, 2019; Foster & Deardorff, 2017). It is widely acknowledged that OSF preregistration is consistent with best practices in the literature to increase transparency in research and decrease questionable research practices (QRPs; Anderson et al., 2019; Banks et al., 2016; Yamada, 2018). In the current work, we preregistered our primary hypotheses, exploratory questions, methods, and data analytic approach before undertaking data collection (<https://osf.io/tmna5>). This research was conducted in accordance with the standards of a University Institutional Review Board pertaining to research with human subjects, and the authors are not aware of any conflicts of interest.

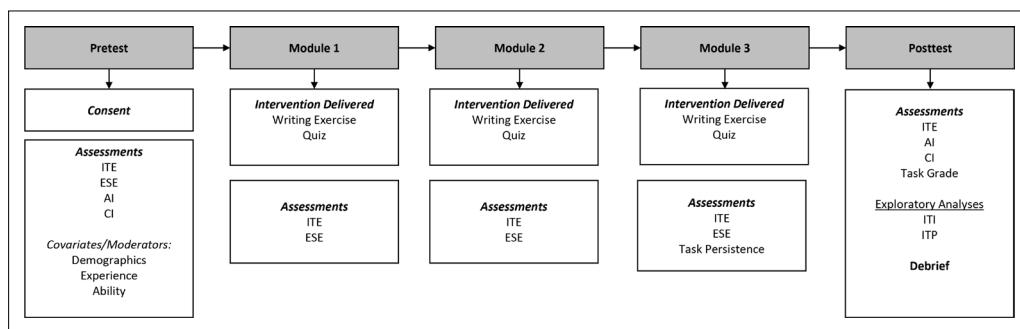


Figure 1. Timeline.

Note. ITE, implicit theory of entrepreneurship; ESE, entrepreneurial self-efficacy; AI, academic interest; CI, career interest. Experience included personal and family. Ability included potential for classroom success as well as ability relative to other subjects. For posttest, we also assessed ITI, implicit theory of intelligence and ITP, implicit theory of people to examine if the intervention impacted other mindsets as well.

Consent refers to a consent for data inclusion (see Methods section on page 10 for details)—and, we did ask for consent before each Module (although it is only shown once in this Figure, at the Pretest).

Participants, Consent, and Confidentiality

We recruited undergraduate college students at a large public university to participate in our study. The class was an introduction to entrepreneurship class taught during a fall semester. The class was composed of first year students (2%), sophomores (28%), juniors (49%), and seniors (21%). Roughly 90% of the students enrolled were in-state residents. There were no prerequisites needed for the class. However, the class was required for all Bachelor of Science in Business Administration majors in the College of Management. Of the students in the class, 75% reported majoring in an area within the College of Management, whereas 25% reported majoring in an area outside the College of Management. Accordingly, while there likely was some self-selection of students enrolling in this class as an elective, the majority of students were directed to take the class from degree requirements.

We integrated the study-related materials into the curriculum and both the intervention and control conditions contained material typically covered in this professor's class. Federal regulations, with regard to research with human subjects, exempt research conducted in established or commonly accepted educational settings, involving normal educational practices, such as the comparison among instructional techniques or curricula. Because we qualified for this, the Institutional Review Board requested that we ask for “consent of data inclusion,” rather than “consent to participate”—we asked for this consent at the start of the study and the start of each subsequent module (see Figure 1 for a summary of our timeline).

Throughout the intervention, students completed all modules online. A research team, independent of the instructor introduced the modules, administered the surveys, and controlled the data. We asked participants to not discuss the content and the professor was not aware of student condition and did not see student responses or data. In the consent form, it was clear that all responses would be confidential and not shared with the professor of the class. At the conclusion of the study, with feedback from the research team, the professor debriefed the students and made materials from both conditions available to all students.

Three students did not consent for inclusion of their data at all time periods and we deleted them entirely. Additionally, some students refused at the module-level and we deleted just that particular time period (pretest, $n = 3$; Module 1, $n = 10$; Module 2, $n = 15$; Module 3, $n = 22$). Participants with complete data did not differ from participants missing one or more modules on any assessments at pretest, and there is no differential attrition by condition, chi-square = .059, $p = .808$ ($n = 15$ were missing some data in growth mindset intervention condition; $n = 16$ were missing some data in the attention-matched control).

RCTs, like what we conducted in the current work, often result in some missing data, including participants missing treatment, or intervention sessions. A solution to this problem is a statistical concept called intention-to-treat (ITT) analysis which is an approach that includes every participant who is randomized to a condition. Thus, ITT ignores deviations or withdrawals and anything else that happens after randomization. The advantage of this type of analysis is that it maintains the balance generated from the original random assignment procedure and the estimate of treatment effects are more conservative (Gupta, 2011). Thus, we took an ITT approach, including all students who were randomized to a condition, regardless of whether they completed all “treatment” sessions.² The final sample included 238 students³ (65% male, $n = 155$).⁴ The mean age was 20.52 ($SD = 2.192$). The majority reported their race/ethnicity as White (76.9%), but the sample also included individuals who reported their ethnicity as Asian (8.4%), Multiracial (8.8%), Black (3.4%), Latino or Hispanic (2.5%).

Procedures

In designing our procedures, we relied on well-established methods for implementing mindset interventions (e.g., Blackwell et al., 2007; Paunesku et al., 2015; Yeager, Lee, & Jamieson, 2016). We randomly assigned students to the growth mindset of entrepreneurship condition ($n = 120$) or the attention-matched control condition that focused on knowledge regarding the myths of entrepreneurship ($n = 118$). Both conditions were matched in terms of time, type of content, and flow (see Appendices 1 and 2). For students in the growth mindset condition, we created a short scalable intervention consisting of three modules lasting approximately 45 minutes in total, with all information delivered online—making this easy to integrate into classrooms and entrepreneurship curricula. The three modules had a consistent structure and included standard implementation procedures from past growth mindset interventions in classroom settings (e.g., Blackwell et al., 2007; Yeager et al., 2016). Each module had a direct message about the changeable nature of entrepreneurial ability either through an informative video or scientific article. And, each module included a video teaching about research on growth mindsets (e.g., explaining the associated benefits) and providing real-world examples. Also, each module consisted of a tip aimed at fostering a growth mindset. And, as the final component of each module, students completed a short multiple-choice quiz and an interactive writing activity (i.e., pen pal activity) based on the content of the module. For the pen pal activity, the participants wrote to “Riley,” a struggling student interested in entrepreneurship, and explained what they had learned about the growth mindset of entrepreneurship. This writing exercise required participants to explain mindsets and entrepreneurship in their own words.⁵

Students in the attention-matched control condition received information that debunked common myths in the field of entrepreneurship and followed a similar structure. The first module focused on the myth of entrepreneurs as risk-takers, the second module explained how myths can negatively affect entrepreneurial success, and the third module explored the inefficiencies of the workplace. And, finally, students also wrote to “Riley” about what they had learned regarding the myths of entrepreneurship.

Before participating in these modules, the research team asked students to complete pretest questions via an online survey. Following the pretest assessment, the research team emailed participants every 2 weeks to complete the module for that week. Each participant had approximately 7 days to complete the module. Two weeks after completing the final module, participants completed the posttest measures (see Figure 1 for timeline of assessments).⁶

Measures

We assessed our manipulation check (i.e., growth mindsets) at all time periods. We assessed our mediator (i.e., entrepreneurial self-efficacy) at pretest and after each module. We assessed students' task persistence on their class assignment at Module 3 as that was when students were working on that task. We tested our primary outcomes of academic and career interest at pretest and posttest. We used this structure to avoid temporal overlap between the assessments of our mediator and our primary outcomes.⁶

Pretest assessments. We assessed the following at pretest to confirm random assignment and for use as covariates in tests of endogeneity (Antonakis, Bendahan, Jacquart, & Lalivé, 2010).

Implicit theory of entrepreneurship. We used the implicit theory, or mindset measure, from Pollack et al. (2012) who created an adapted scale based on (Dweck, 2000) for the domain of entrepreneurship by replacing the word "intelligence" with "entrepreneurial ability." An example item included: "To be honest, you can't really change your entrepreneurial ability." For this measure, captured on a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), we recoded so that higher scores on this scale represent a stronger growth mindset of entrepreneurship ($\alpha = .893$).

Entrepreneurial self-efficacy. Participants responded to a standard five-item measure (Zhao et al., 2005), captured on a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), that assessed their beliefs about their capacity to succeed as an entrepreneur (e.g., "I am confident in my ability to successfully commercialize an idea or new development"). Higher scores on this scale represent greater entrepreneurial self-efficacy ($\alpha = .845$).

Regarding these first two measures, implicit theories of entrepreneurship and entrepreneurial self-efficacy, we did confirm that they loaded on two separate factors (see Table 1 for loadings).⁷

Academic interest. Participants completed a 12-item scale measuring academic interest in the subject of entrepreneurship (e.g., "I'm excited about the subject of entrepreneurship," "I think what we are learning in this course is important") adapted from past achievement motivation theory work (Wigfield & Eccles, 2000). Higher scores on this, captured on a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), represent greater academic interest ($\alpha = .930$).

Career interest. Participants completed an adapted eight-item scale drawing on the work of Zhao et al. (2005) as well as Krueger, Reilly, and Carsrud (2000). This scale measured interest in entrepreneurship-related activities (e.g., "I am interested in acquiring a small business in the next 5 to 10 years," "It is likely that I will personally own a small business in the relatively near future"). Higher scores on this, captured on a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), represent greater career interest ($\alpha = .954$).

Table 1. Factor Loadings for Entrepreneurial Self-Efficacy (ESE) and Implicit Theories of Entrepreneurship (ITE).

	ITE	ESE
	Eigenvalue = 3.15 (39%)	Eigenvalue = 2.37 (30%)
Your entrepreneurial ability is something about you that you can't change very much.	.94	.13
You have a certain amount of entrepreneurial ability, and you can't really do much to change it.	.84	.03
To be honest, you can't really change your entrepreneurial ability.	.79	.09
I am confident in my ability to successfully identify new business opportunities.	-.20	.83
I am confident in my ability to create new products.	-.13	.79
I am confident in my ability to successfully perform the various roles and tasks of entrepreneurship.	-.13	.72
I am confident in my ability to successfully commercialize an idea or new development.	-.14	.66
I am confident in my ability to think creatively.	-.14	.46

Entrepreneurship personal experience. We adapted the face-valid single item (from Pollack et al., 2012), captured on a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), to assess entrepreneurial experience (e.g., “I have a lot of experience being an entrepreneur”).

Covariates. For use in endogeneity analyses, in addition to assessing demographics, we also examined family experience and self-reported assessments of one’s own entrepreneurial ability. For sake of time, we used single face-valid assessments. First, for family entrepreneurial experience, we asked the following: “People in my immediate family have a lot of experience being entrepreneurs”) rated on a 1 (Strongly Disagree) to 7 (Strongly Agree) scale. Second, to examine self-confidence in classroom success, we asked: “How successful do you think you will be in your entrepreneurship class?” rated on a scale ranging from 1 (Not at all Successful) to 7 (Very Successful).⁸ Third, students reported on the following question that assessed relative ability: “Compared to most of your other school subjects, how good do you think you will be at entrepreneurship?” rated on a scale from 1 (A Lot Worse) to 7 (A Lot Better). We used these three single items, in addition to gender and personal experience as covariates, in our exploratory analyses to examine if our results of intervention effects hold above and beyond these additional potential predictors of interest in the field.

Postmodule assessments. After each module, we assessed growth mindsets of entrepreneurship to confirm the manipulation worked and we also assessed entrepreneurial self-efficacy to examine this as a process variable, taking an average of the items across the modules to get a sense of the students’ mid-semester growth mindsets of entrepreneurship ($\alpha = .966$) and entrepreneurial self-efficacy ($\alpha = .949$). We also report growth curve analyses looking at change over time for each of the postmodule assessments. In addition, at the conclusion of Module 3, when students were working on their main class assignment, we assessed task persistence.

Task persistence. We assessed students’ persistence on their primary project for the semester—an activity that involved identifying and exploring an idea for value creation (i.e., an

ideation traction project).⁹ We measured the student's self-reported willingness to persist on the academic project despite challenges by adapting a measure used in past mindset work (e.g., Burnette, 2010). More specifically, these six items, captured on a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), started with the following prompt: "If you encounter challenges in preparation for your ideation traction activity, how likely are you to...". Three of the items included mastery-oriented responses (e.g., exert more effort) and three of the items included helpless-oriented responses (e.g., give up). We recoded such that higher numbers represent greater task persistence ($\alpha = .798$).

Follow-up assessments

Implicit theory of entrepreneurship. We used the same scale here as above ($\alpha = .951$).

Academic interest. We used the same scale here as above ($\alpha = .939$).

Career interest. We used the same scale here as above ($\alpha = .963$).

Task grade (academic performance). To assess academic performance, we requested grades on the ideation traction project. We focused on this performance outcome rather than final grades, because our assessment of persistence related to this specific task. The professor calculated grades for this project based on the number of website unique page views, visitors' time spent on the page, as well as "likes" and "follows" across platforms including Facebook and Twitter.

Additional mindsets (intelligence, person). We also assessed mindsets of intelligence (Dweck, Chiu, & Hong, 1995; $\alpha = .963$) and mindsets about the nature of people (Chiu, Hong, & Dweck, 1997; $\alpha = .919$) at follow-up to explore if we uniquely manipulated theories of entrepreneurship. These were captured on a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), and we recoded items such that higher scores represent stronger growth mindsets.

Results

Table 2 shows the descriptive statistics and correlations for assessments included in analyses and assessments across modules. Confirming random assignment, there are no statistically significant differences based on condition on relevant outcomes assessed at pretest. Our analytic approach described below follows our OSF preregistered plan.¹⁰ We also included exploratory analyses—some of which are preregistered and some of which were not. We clearly denote this in the results. We first present the manipulation check and then report results for each hypothesis, concluding with exploratory analyses.

Manipulation Check

An independent samples *t*-test revealed a significant effect of intervention condition on mindsets immediately postmodule, $t(232) = -5.46$, $p < .001$, with participants in the growth mindset condition ($n = 117$; $M = 6.16$, $SD = .91$) reporting significantly stronger growth mindsets of entrepreneurship than those in control condition ($n = 117$; $M = 5.37$, $SD = 1.27$). Additionally, the effect on growth mindsets held at follow-up, $t(234) = -4.945$, $p < .001$, with participants in the growth mindset condition ($n = 119$; $M = 6.21$, $SD = 1.26$) reporting significantly stronger growth mindsets of entrepreneurship than those in control condition ($n = 117$; $M = 5.34$, $SD = 1.43$). We

Table 2. Means, Standard Deviations, and Correlations Across Modules.

	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
1. Condition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2. ITE - Pre	5.36	1.26	-.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3. ITE - M1	5.64	1.25	.14*	.46**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4. ITE - M2	5.96	1.19	.39**	.39**	.70**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5. ITE - M3	5.82	1.31	.38**	.27**	.69**	.81**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6. ITE - Avg	5.77	1.17	.34**	.42**	.89**	.92**	.92**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7. ITE - Follow	5.78	1.41	.31**	.23**	.49**	.64**	.64**	.65**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8. ESE - Pre	5.06	0.99	.04	.09	.17*	.19**	.23**	.20**	.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9. ESE - M1	5.19	1.02	.06	.21**	.22**	.25**	.25**	.24**	.15*	.15*	.53**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10. ESE - M2	5.37	0.88	.18**	.12	.27**	.31**	.37**	.34**	.24**	.24**	.53**	.70**	-	-	-	-	-	-	-	-	-	-	-	-	-	
11. ESE - M3	5.52	1.03	.17*	.05	.25**	.31**	.36**	.34**	.25**	.25**	.44**	.65**	.70**	-	-	-	-	-	-	-	-	-	-	-	-	
12. ESE - Avg	5.36	0.87	.16*	.13*	.24**	.32**	.37**	.30**	.23**	.23**	.55**	.89**	.89**	.89**	-	-	-	-	-	-	-	-	-	-	-	
13. Al - Pre	5.73	0.92	-.05	.19**	.25**	.28**	.29**	.28**	.17**	.17**	.53**	.35**	.37**	.38**	.38**	.40**	-	-	-	-	-	-	-	-	-	
14. Al - Follow	5.51	1.03	-.05	.13*	.23**	.24**	.24**	.24**	.15*	.15*	.42**	.52**	.51**	.47**	.53**	.53**	.60**	-	-	-	-	-	-	-	-	
15. Cl - Pre	4.66	1.44	-.12	.03	.01	.03	.06	.03	.05	.05	.52**	.33**	.33**	.31**	.36**	.36**	.57**	.56**	-	-	-	-	-	-	-	-
16. Cl - Follow	4.72	1.50	-.03	.08	.10	.12	.12	.12	.09	.09	.46**	.39**	.43**	.39**	.44**	.44**	.47**	.67**	.79**	-	-	-	-	-	-	-
17. Task Persist	5.18	0.94	.24**	.09	.36**	.36**	.42**	.42**	.32**	.33**	.36**	.39**	.48**	.48**	.47**	.28**	.30**	.16*	.21**	-	-	-	-	-	-	-
18. Perf	92.57	7.42	.07	.08	.13*	.17*	.18**	.16*	-.10	-.02	.15*	-.03	.02	.00	.01	.04	.00	.12	.14*	.06	.02	-	-	-	-	-
19. Gender	-	-	.03	-.07	.06	-.03	.03	.02	.02	.02	.15*	-.03	.02	.00	.01	.04	.00	.12	.14*	.06	.02	-	-	-	-	-
20. ITI	5.56	1.53	.31**	.24**	.33**	.47**	.52**	.49**	.57*	.09	.19**	.22**	.25**	.24**	.19**	.24**	.11	.13*	.28**	.07	.05	-	-	-	-	-
21. ITP	5.11	1.44	.29**	.20**	.31**	.41**	.48**	.43**	.19**	.28	.32**	.30**	.34**	.15*	.20**	.07	.13*	.33**	.05	.09	.68**	-	-	-	-	-
22. Pers. Exp.	3.13	1.61	-.04	-.07	.08	.01	.08	.05	.01	.42**	.25**	.29**	.26**	.28**	.19**	.33**	.46**	.46**	.05	-.01	-.12	.04	.12	-	-	-
23. Cl_FE	4.26	2.03	-.06	-.04	-.08	-.04	.00	-.05	.04	.26**	.11	.09	.12	.13*	.13*	.31**	.27**	.16*	-.16*	-.02	.10	.08	.37**	-	-	-
24. C2_PS	6.25	0.77	.03	.15*	.15*	.24**	.31**	.19**	.24**	.11	.36**	.24**	.31**	.34**	.34**	.28**	.27**	.27**	.05	-.04	.09	.09	.24	.19	-	-
25. C3_RA	5.10	1.19	-.03	.04	.24**	.24**	.17*	.18**	.19*	.13	.46**	.34**	.32**	.34**	.37**	.44**	.50**	.40**	.24**	-.05	-.11	.11	.12	.36**	.23**	.45**

Note: Condition is coded such that fixed mindset = 0; growth mindset = 1; ITE - Pre = implicit theory of entrepreneurship assessed pre-intervention; ITE - M1-M3 = implicit theory of entrepreneurship assessed at each module; ITE - Follow = implicit theory of entrepreneurship assessed post-intervention; ESE - M1-M3 = entrepreneurial self-efficacy averaged across the modules; ESE - Pre = entrepreneurial self-efficacy assessed pre-intervention and at follow-up; Cl = career interest assessed pre-intervention and at follow-up; Task persist = persistence on task; Perf = performance/grade on ideation project; gender is coded such that 0 = female and 1 = male (used as a moderator and covariate); ITI = implicit person theory assessed at follow-up; ITP = implicit person theory assessed at follow-up; Pers. Exp. = single item assessment of personal experience with entrepreneurship at pretest (used as a moderator and covariate) Cl_FE = family experience single item assessment at pretest (used as a covariate for endogeneity tests); C2_PS = potential for classroom success single item assessment at pretest used as a covariate for endogeneity tests.

*p < .05. **p < .01.

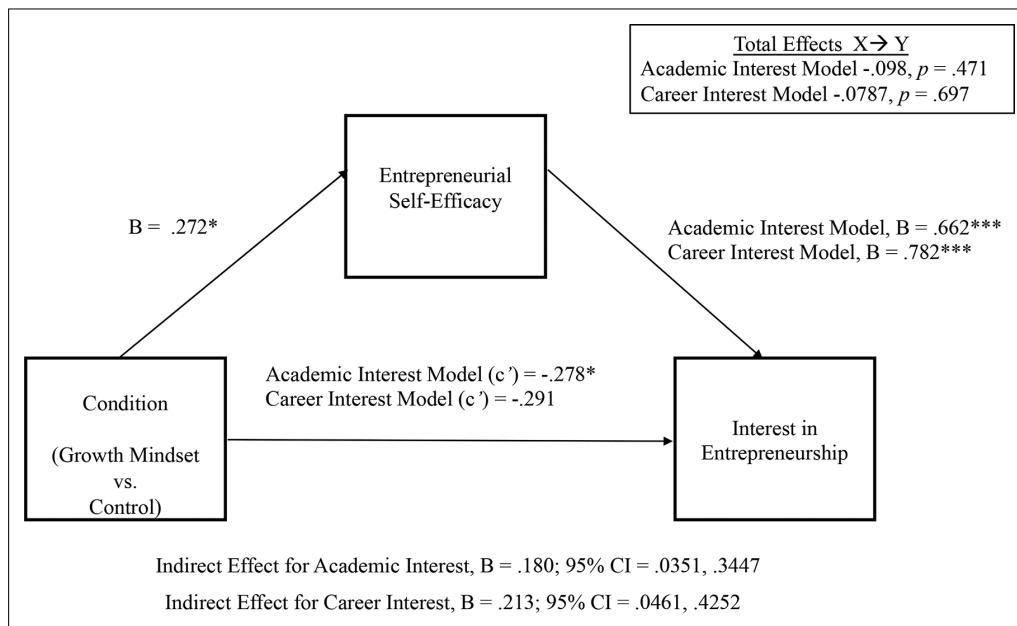


Figure 2. The mediating effect of entrepreneurial self-efficacy on the relation between condition and interest in entrepreneurship (academic and career).

Note.*($p < .05$), **($p < .01$), ***($p < .001$).

report growth curve analyses below, which articulate effects on mindsets after each individual module.

Mindsets, Entrepreneurial Self-Efficacy, and Interest (Hypotheses 1–4)

We used PROCESS macro model 4 (Hayes, 2017) to test two models in which the growth mindset intervention, relative to the control predicts entrepreneurial self-efficacy, which in turn predicts interest—one predicting academic interest, the other career interest (Figure 2). We used follow-up assessments of interest and the mean score of entrepreneurial self-efficacy across the modules—providing a long-lag examination of this process model.

For academic interest, in support of Hypothesis 1, students in the mindset condition, relative to the attention-matched control, reported stronger entrepreneurial self-efficacy, $B = .272$, $t(230) = 2.404$, $p = .017$; 95% CI [.0490, .4943]. And, as predicated in Hypothesis 2, entrepreneurial self-efficacy significantly predicted academic interest, controlling for condition, $B = .662$, $t(229) = 9.946$, $p < .001$; 95% CI [.5309, .7931]. With regard to Hypothesis 3, the growth mindset intervention significantly indirectly predicted academic interest via entrepreneurial self-efficacy, $B = .180$; 95% CI [.0351, .3447]. But, in contrast to Hypothesis 4, analyses indicated that the total effect of condition on academic interest was not significant, $B = -.098$, $t(230) = -.723$, $p = .471$; 95% CI [−.3668, .1699]. Surprisingly, the direct effect is significant and negative, $B = -.278$, $t(229) = -2.41$, $p = .0168$; 95% CI [−.5058, −.0507].

For career interest, results are similar (Figure 2). As reported above, the growth mindset intervention, relative to the control condition, strengthened entrepreneurial self-efficacy, $B = .272$, $t(230) = 2.404$, $p = .017$; 95% CI [.0490, .4943]. Entrepreneurial self-efficacy significantly predicted career interest, controlling for condition, $B = .782$, $t(229) = 7.543$, $p < .001$; 95% CI

[.5708, .9867], and growth mindsets significantly indirectly predicted career interest via entrepreneurial self-efficacy, $B = .213$; 95% CI [.0461, .4252]. These three analyses support Hypotheses 1–3. However, with regard to Hypothesis 4, the total effect of condition on career interest also was not significant, $B = -.0787$, $t(230) = -.397$, $p = .692$; 95% CI [−.4691, .3118]. Additionally, although the direct effect is again negative, it is not statistically significant, $B = -.291$, $t(229) = -1.62$, $p = .1070$; 95% CI [−.6457, −.0634].

Task Persistence and Task Performance (Hypothesis 5)

Next, we examined our hypothesis involving serial mediation and also report on the total effect of the intervention on task persistence and task performance. As outlined by Miller, Dannals, and Zlatev (2017) in their call for more long-lagged interventions examining the process of both psychological and behavioral change in improving academic performance, we expected the shift in entrepreneurial self-efficacy due to the intervention to predict task persistence, which in turn, would predict better task performance (i.e., grade on the class assignment). First, as noted above, condition predicted entrepreneurial self-efficacy, $B = .25$, $t(213) = 2.15$, $p = .032$; 95% CI [.0215, .4844], entrepreneurial self-efficacy significantly predicted task persistence, $B = .48$, $t(213) = 7.45$, $p < .001$; 95% CI [.3560, .6123]. However, task persistence did not predict task performance, $B = -.07$, $t(213) = -.104$, $p = .917$; 95% CI [−1.3375, 1.2037], and thus condition also failed to significantly indirectly predict task performance via the proposed serial process. Condition also did not indirectly predict task performance via entrepreneurial self-efficacy. And, analyses indicated that the total effect of condition on task performance was not significant, $B = 1.14$, $t(213) = 1.09$, $p = .279$; 95% CI [−.9288, 3.206]. However, the intervention did have a total effect on task persistence, $B = .34$, $t(213) = 3.00$, $p = .003$; 95% CI [.1156, .5596] with students in the growth mindset condition, relative to the attention-matched control, reporting persisting longer on their classroom assignment when facing challenges. In summary, we find limited support for Hypothesis 5—we do not find support for a serial process model predicting classroom performance, but the intervention does have a total effect on task persistence.

Moderation (Hypothesis 6)

We explored two moderators noted in Hypothesis 6. First, to examine if any effects of the intervention on outcomes are moderated by gender,¹¹ we ran a MANOVA¹² with entrepreneurial self-efficacy, mindsets, academic interest, career interest, task persistence, and task performance as the outcomes. The overall Wilks' Lambda test of the interaction was not significant for any outcomes, $F(6, 201) = 1.179$, $p = .319$. The only main effect of sex was for career interest, with males reporting stronger interest ($M = 4.845$; $SD = 1.39$) than females ($M = 4.299$, $SD = 1.68$).

Second, to examine if any effects of the intervention on outcomes are moderated by experience, we ran PROCESS model 1 (Hayes, 2017) with the single entrepreneurial experience item and condition as the predictors with each outcome (i.e., growth mindset of entrepreneurship, entrepreneurial self-efficacy, academic interest, career interest, persistence, and task performance). Experience does predict¹³ greater entrepreneurial self-efficacy, $B = .152$, $t(231) = 4.42$, $p < .001$; CI [.0840, .2196], academic interest, $B = .200$, $t(233) = 4.93$, $p < .001$; CI [.1202, .2800], and career interest, $B = .415$, $t(233) = 7.53$, $p < .001$; CI [.3067, .5239]. However, there were no significant interactions of experience with intervention condition for any of the outcomes.

Preregistered Exploratory Research Question

We also explored if the intervention impacted other mindsets at follow-up. Based on past research, mindsets are domain specific (i.e., differentiated rather than connected). Here, we assessed the two most commonly manipulated theories: mindsets of intelligence, and mindsets of people (Molden & Dweck, 2006). We ran a MANOVA with these two additional mindsets as outcomes and intervention condition as the predictor. This analysis revealed a significant overall effect, Wilks' Lambda = .892, $F(2, 233) = 14.13, p < .001$, partial eta-squared = .11 and significant univariate tests—namely students in the growth mindset condition reported stronger growth mindsets of intelligence, $F(1, 234) = 24.75, p < .001$, partial eta-squared = .096, as well as people, $F(1, 234) = 21.860, p < .001$, partial eta-squared = .085. This is in addition to the effect of the intervention on mindsets of entrepreneurship as reported above.

Non-Preregistered Exploratory Analyses

Growth curve analyses. We specified separate models for the growth mindset of entrepreneurship and entrepreneurial self-efficacy measures using only participants with complete data across these measures at all time points. The process was parallel for both outcomes and thus only the differences are noted. A null model was initially specified to use as a baseline comparison. The $-2 \log$ likelihood statistics indicated that adding a random intercept and error for time significantly improved the fit over the null model. Likewise, adding the linear effect of time improved models for both mindsets and entrepreneurial self-efficacy. A subsequent test of quadratic and cubic terms found that only the quadratic model improved the model fit for the mindset outcome over the linear effect and neither improved the model fit for the entrepreneurial self-efficacy outcome over the linear effect. Thus, for testing the hypothesized main effects and interactions, only a linear trend for entrepreneurial self-efficacy was retained in the model whereas both linear and quadratic trends were retained for the mindset outcome.

The main effect for intervention condition along with the interaction between intervention condition and time was then added to the retained models. As expected, in both cases a significant interaction was found. A test of simple effects at each time point reveals that the intervention resulted in a significant effect following Module 2 for both mindsets and entrepreneurial self-efficacy. As expected, the effect of time within the attention-matched control condition was not significant for mindsets whereas both the linear and quadratic trends were significant within the intervention condition. For entrepreneurial self-efficacy, individuals in both conditions reported greater entrepreneurial self-efficacy throughout the intervention but, as expected, the individuals in the intervention saw greater improvements in entrepreneurial self-efficacy than those in the attention-matched control condition (see Figures 3 and 4, Table 3 for more information).

Endogeneity analyses. We took two approaches to test for endogeneity. First, we evaluated the possibility of a reversed causal relationship between entrepreneurial self-efficacy and both academic interest and career interest using the same process model with the mediator and outcome switched. The results of both models indicated that neither academic interest nor career interest is predicted by the intervention: academic interest, $B = -.10, t(230) = -0.72, p = .47$; 95% CI [-0.37, 0.17]; career interest, $B = -.08, t(230) = -0.40, p = .69$; 95% CI [-0.47, 0.31]. Additionally, although both predict entrepreneurial self-efficacy when controlling for the effect of the intervention: academic interest, $B = .46, t(230) = 9.95, p < .001$; 95% CI [0.37, 0.55]; career interest, $B = .25, t(230) = 7.54, p < .001$; 95% CI [0.19, 0.32], the indirect effect revealed that neither academic interest, $B = -.04$; 95% CI [-0.16, 0.08], or career interest, $B = -.02$; 95% CI [-0.12, 0.07], mediated the effect of the intervention on entrepreneurial self-efficacy.

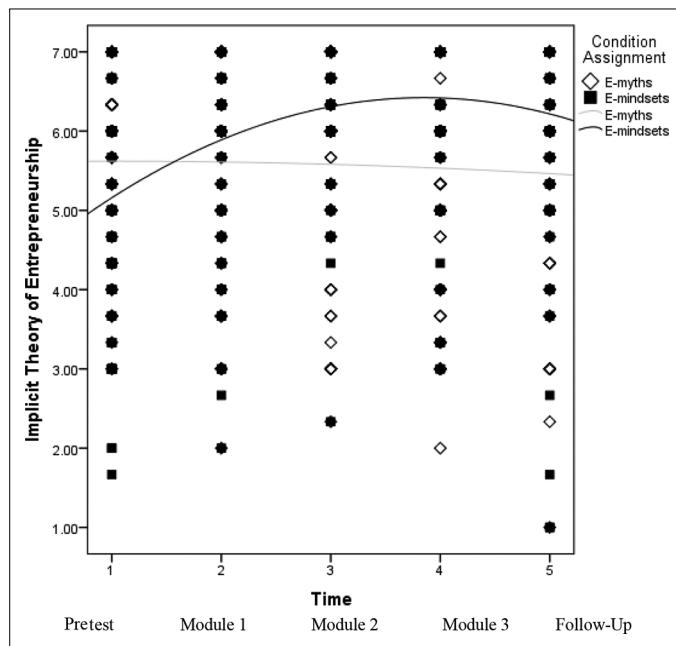


Figure 3. Growth curve analyses for mindset outcome.

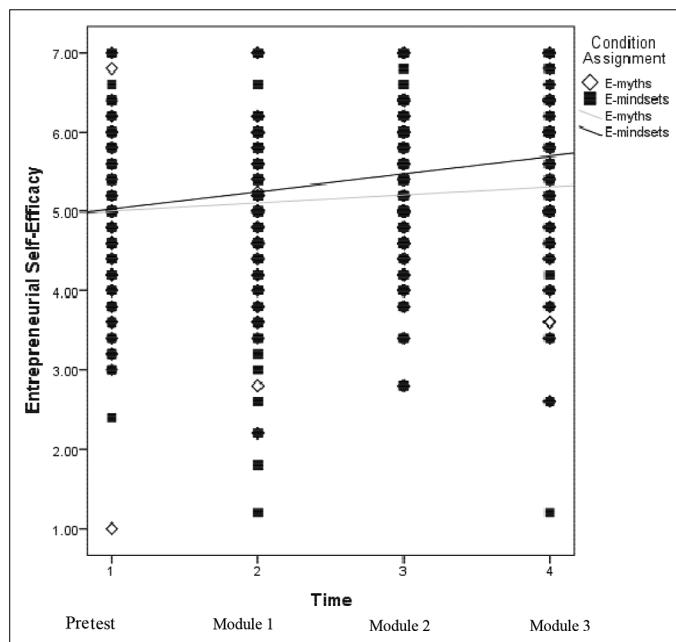


Figure 4. Growth curve analyses for entrepreneurial self-efficacy outcome.

Table 3. Growth Curve Models and Effects for Mindset and Entrepreneurial Self-Efficacy.

	Growth mindset			Entrepreneurial self-efficacy				
	-2LL	$\Delta\chi^2$	p	-2LL	$\Delta\chi^2$	p		
Null Model	3166.39	-	-	2224.30				
Random Intercept	2841.90	324.49	<.001	1956.95	267.35	<.001		
Random Intercept and Time	2738.86	103.04	<.001	1917.58	39.37	<.001		
Linear Trend for Time	2724.93	13.93	<.001	1880.76	36.82	<.001		
Quadratic Trend for Time	2691.18	33.75	<.001	1894.55	-	-		
Cubic Trend for Time	2696.95	-	-	1891.64	-	-		
	est.	SE	t	p	est.	SE	t	p
Condition	0.47	.18	2.57	.01	.10	.16	.60	.55
Time	0.77	.09	9.07	<.001	.22	.03	6.74	<.001
Condition*Time	-0.30	.05	-6.38	<.001	-.12	.05	-2.50	.01
Time*Time	-0.08	.01	-6.48	<.001	-	-	-	-
Simple Effect of Intervention	est.	SE	t	p	est.	SE	t	p
at Pretest	0.46	.17	2.63	.01	-.05	.14	-0.34	.74
at Module 1	-0.26	.16	-1.62	.11	-.08	.15	-0.54	.59
at Module 2	-0.75	.14	-5.23	<.001	-.33	.12	-2.63	.009
at Module 3	-0.87	.16	-5.49	<.001	-.36	.15	-2.45	.02
at Posttest	-0.76	.18	-4.12	<.001	-	-	-	-
Simple Effect of Time (Linear)	est.	SE	t	p	est.	SE	t	p
Control	0.02	.11	0.18	.85	.10	.04	2.94	.004
Intervention	1.20	.12	10.09	<.001	.22	.03	7.02	<.001
Simple Effect of Time (Quadratic)	est.	SE	t	p				
Control	-0.01	.02	-0.57	.57				
Intervention	-0.16	.02	-8.27	<.001				

Note. The quadratic trend did not significantly improve the model for entrepreneurial self-efficacy and therefore is not included in subsequent analyses.

Second, we evaluated if the overall model holds when controlling for variables assessed at pretest that are related to career development outcomes (i.e., gender, personal and family experience in entrepreneurship, entrepreneurship ability and knowledge). We again replicated the original and statistically significant PROCESS mediation models but included these additional variables as covariates in the analyses (Table 4). The indirect effect of the intervention on interest through entrepreneurial self-efficacy was smaller but remained significant for both academic interest, $B = .12$; 95% CI [0.03, 0.23], and career interest, $B = .13$; 95% CI [0.02, 0.27]. In addition, entrepreneurial self-efficacy was still a significant predictor of both academic interest, $B = .45$, $t(230) = 6.41$, $p < .001$; 95% CI [0.31, 0.59], and career interest, $B = .48$, $t(230) = 4.49$, $p < .001$; 95% CI [0.27, 0.69]. This indicates that even when including other variables that may be relevant for predicting interest in the field, the effect of the intervention is still based on an

Table 4. Endogeneity Tests of Covariates.

Reverse Causation Model	Academic interest					Career interest				
	B	t	p	LL	UL	B	t	p	LL	UL
Intervention	.32	3.34	.001	.13	.50	.29	2.88	.004	.09	0.49
Interest	.46	.05	<.001	.37	.55	.25	7.54	<.001	.19	0.32
Total	.27	2.40	.02	.05	.49	.27	2.40	.02	.05	0.49
Direct Effect	.32	3.34	.001	.13	.50	.29	2.88	.004	.09	0.49
Indirect	-.04			-.16	.08	-.02			-.12	0.08
Covariate Model	B	t	p	LL	UL	B	t	p	LL	UL
Intervention	-.20	-1.92	.06	-0.42	0.01	-.16	-0.95	.35	-0.48	0.17
Entrepreneurial Self-Efficacy	.45	6.41	<.001	0.31	0.59	.48	4.49	<.001	0.27	0.69
Gender	.12	1.18	.24	-0.08	0.32	-.16	-1.00	.32	-0.46	-0.15
Personal Experience	.07	1.92	.06	-0.002	0.15	.27	4.62	<.001	0.15	0.38
Family Experience	-.01	-0.30	.77	-0.07	0.05	.07	1.51	.13	-0.02	0.15
Potential Class Success	.12	1.45	.15	-0.04	0.28	.05	0.41	.68	-0.19	0.29
Relative Ability	.25	4.54	<.001	0.14	0.36	.22	2.63	.01	.06	.38
Total Effect	-.09	-0.77	.44	-0.32	0.14	-.03	-0.17	.86	-0.36	0.30
Direct Effect	-.21	-1.92	.06	-0.42	0.01	-.16	-0.95	.35	-0.48	0.17
Indirect Effect	.12			0.03	0.23	.13			0.02	0.27

increase in entrepreneurial self-efficacy. These two endogeneity tests increase confidence in our results.

Discussion

Overview

In summary, we demonstrated that (a) growth mindsets of entrepreneurship are malleable, (b) the growth mindset intervention, relative to an attention-matched control condition, is effective at fostering entrepreneurial self-efficacy, and (c) entrepreneurial self-efficacy has downstream implications for career development outcomes. In addition to the psychological benefits (i.e., stronger growth mindsets and entrepreneurial self-efficacy) of the intervention, we also see enhanced persistence on an academic task in the face of potential challenges—an outcome with great relevance for continuing long-term in the field. However, we failed to move the needle (even indirectly) on task performance—at least as assessed on students’ class-based ideation traction project. Although this lack of effect is in line with more recent work calling into question the potential for growth mindset interventions to impact academic performance-related outcomes (e.g., grades; Sisk et al., 2018), in the current work we had a ceiling effect for grades and lack of variability (i.e., $M = 92.57$; $SD = 7.42$). Finally, we found that the intervention is equally effective for females and males and for those with more or less experience. This null finding may be due to the specific setting of the intervention in which the professor and students hopefully provide more support for equal opportunities for careers regardless of gender or previous experiences.

Additional findings worth noting are three somewhat unexpected results. First, we failed to get a total effect of the intervention on academic or career interest. This may be due, in part, to

our rigorous attention-matched control that provided information regarding myths in the field. Indeed, within the entrepreneurial intention literature, human capital theory explains why education improves the desire to start or own a business (Becker, 1964). That is, information can improve attitudes about the field and promote intentions to engage in such activities. Thus, our attention-matched control, in combination with the fact that we targeted students in a class, may have attenuated any effect of a growth mindset intervention on academic and career interest.

Second, when entrepreneurial self-efficacy was in the equation predicting academic interest, it unsuppressed a negative association between the intervention and the outcome. Thus, the part of the mindset intervention that is independent of entrepreneurial self-efficacy, is negatively predicting academic interest and is trending negative for career interest ($p = .107$). Although this also helps explain the lack of hypothesized total effect for interest, future research should look into what part of the intervention might be inhibiting interest. One fruitful theory to draw on in this exploration is theory of planned behavior. For example, in the awareness education literature, controllability beliefs can have an impact on the intention to choose (or not choose) entrepreneurship as a career path (Fretschner & Weber, 2013). Another potential explanation is methodological and related to our sample—the intervention took place in a required course where many of the students may not be inherently interested in pursuing entrepreneurship. Thus, the negative direct relation could be a spillover effect related to students generally not being interested in the subject that the mindset intervention exacerbated.¹⁴

The third somewhat unexpected result is that our intervention moved not only mindsets of entrepreneurship but also mindsets of intelligence and people. Typically, these mindsets are domain specific. Put differently, these mindsets are differentiated (rather than connected). However, in retrospect, when teaching about what mindsets are in the current work, we included general research on the importance of growth mindsets which is typically anchored in academic settings, with a focus on mindsets of intelligence. Additionally, entrepreneurship is a domain in which intelligence and personality are thought to be key components of success (Sternberg, 2004; Zhao & Seibert, 2006). Discussing the malleable nature of entrepreneurial ability may implicitly imply that intelligence and personality are also malleable. Thus, it may be that mindsets of entrepreneurship are not as domain specific as other types of mindsets—and, it also could be that the message we manipulated about mindsets of entrepreneurship provided a connection to other mindsets in way that extant work has not yet done. Future work should explore if a combined intervention—one that explicitly targets entrepreneurial, intelligence, and person mindsets—is effective at promoting not only interest in the field but also academic achievement.

Further interesting results include the growth curve analyses which highlight the importance of multiple interactions with students in promoting a growth mindset and entrepreneurial self-efficacy. That is, a single interaction with the intervention did not result in significant differences, but differences did emerge over time. Efforts to promote growth mindsets and self-efficacy in other areas should consider adopting this approach as single session interventions may fail to have the intended effect. We also note that entrepreneurial self-efficacy remained on a positive trajectory throughout the intervention, suggesting that additional modules may have continued to increase entrepreneurial self-efficacy. Future work could seek to identify the optimal number of interactions needed to successfully implement a mindset intervention. Finally, tests of endogeneity provide some confidence in the proposed causal paths and offer a robustness test showing that effects on the intervention hold when controlling for other relevant predictors of career development.

Overall, the intervention successfully changed beliefs—namely, it fostered stronger growth mindsets and greater entrepreneurial self-efficacy. In addition, students in the intervention condition, relative to the control, reported persisting longer on their academic task. All of these outcomes have important implications for career development.

Theory-Based Implications

Our research complements theoretical perspectives on entrepreneurial self-efficacy and awareness education in entrepreneurship. First, the findings provide compelling evidence that a growth mindset intervention positively impacted students' entrepreneurial self-efficacy that, in turn, positively predicted academic interest as well as career interest in entrepreneurship.

Overall, our work extends models of self-efficacy in which the antecedents to self-efficacy include gender (Wilson et al., 2007), or learning and experience (Zhao et al., 2005) by offering a psychological process that can be shifted by brief, scalable, online interventions that can be easily incorporated into classrooms and curricula. It also speaks to the potential of growth mindset messaging as one of the four antecedents of efficacy—namely growth mindsets offer a form of verbal persuasion.

Our work also extends existing knowledge regarding predictors of interest in entrepreneurship. One of the main insights that extant research consistently illustrates is how human capital and entrepreneurial self-efficacy can contribute to entrepreneurial interest and intentions. In the current work, our approach supports both of these ideas. For example, our growth curve models highlight a general increase in entrepreneurial self-efficacy across the semester, suggesting that education can affect one of the critical psychological processes for intentions to engage in starting or owning a business. And, importantly, we show this linear increase to be even stronger in the growth mindset intervention condition. Here, total effects of the intervention on entrepreneurial self-efficacy and indirect effects on academic and career interest hold when controlling for other key predictors of career development including sociocultural (e.g., gender; Wilson et al., 2007), personal and family experience (Carr & Sequeira, 2007), and ability or knowledge (Thébaud, 2010). Overall, the current work highlights how growth mindset messaging may be a promising avenue, especially when combined with educational activities, in fostering greater entrepreneurial self-efficacy with important implications for career development-related outcomes that go beyond just intentions to start or own a business, including academic interest and task persistence, for example.

Additionally, the current research makes important theoretical contributions to the implicit theory, or mindset, literature. Our findings demonstrate the importance of these belief systems in the domain of entrepreneurship. And, moreover, we illuminate one of the psychological processes involved in the link between mindsets and academic and career interest in entrepreneurship, namely entrepreneurial self-efficacy. A greater theoretical understanding of the mechanisms of change can go far in helping improve the implementation of interventions. Related, our work contributes to the growing body of work questioning whether growth mindset interventions are able to move the needle on academic performance outcomes (Sisk et al., 2018). Growth mindset interventions may be better served when the goal is to increase efficacy, interest in the field, and persistence when challenges arise, rather than academic performance—outcomes that may be every bit as important to educators fostering a passion for learning.

Practical Implications

As academics and researchers in the domain of entrepreneurship, we know that entrepreneurship can be taught—and, now we have empirical evidence that we can change students' beliefs about the malleability of their own entrepreneurial ability. Although it is often assumed that students in our classes must feel the same way—that is, with time, effort, and energy, entrepreneurship is a skill that can be improved, our work shows that there are easy, inexpensive, and scalable ways to strengthen these beliefs and that these beliefs matter. A vast array of research shows that growth mindsets enable individuals to persist despite difficult situations and respond more adaptively to

challenges (Dweck, 2000; 2006). And, we bolster that finding in the current work—students in the growth mindset intervention, relative to the attention-matched control, reported greater persistence in the face of setbacks. Therefore, one practical implication of the present work is that we now know that the venerable line of research on mindsets is adaptable to the context of entrepreneurship. Accordingly, it seems plausible that academics in the classroom as well as practitioners engaged in training aspiring entrepreneurs can now draw on this literature in developing educational materials.

For example, our research shows that one promising approach to increasing the entrepreneurship pipeline is through disputing the notion that innate talent is the primary driver of success—instead, we should promote growth mindsets about the nature of entrepreneurial ability. In summary, academics, practitioners, and policy makers alike—anyone who has interest in increasing the degree to which students show career inclinations toward entrepreneurship—can cultivate growth mindsets among students with an inexpensive, scalable, and efficient intervention.

Limitations and Future Directions for Research

With regard to the participants and setting of the current work, we note the following limitations as well as future directions for research. Although we deliberately implemented the intervention with students because of our focus on career development for this population, we recommend that future work build on our findings to examine how growth mindsets of entrepreneurship function in populations that are more diverse in terms of age, geography, race and ethnicity, and socioeconomic status. Related, a limitation of the current work is the educational status of our participants and the fact that we did not track multiple years of educational (i.e., class) choices. In the future, starting earlier in the academic pipeline could be fruitful and could shed light on which students opt into entrepreneurial classes. And, tracking participants' curricular as well as extracurricular activities with regard to entrepreneurship through graduation and into their first job role would help us move beyond intentions to behavior and address the intention to behavior gap limitation of the current work (Bae, Qian, Miao, & Fiet, 2014). This longitudinal approach can also help to address the issue of how long effects from mindset interventions last. Although the current work only examines outcomes across a semester, the results of these interventions can last well beyond the conclusion of the program (e.g., Schleider & Weisz, 2018). This is in large part because mindset interventions are recognized as wise interventions that change reinforcing processes and thus effects tend to be sustained well into the future (Walton, 2014; Walton & Wilson, 2018).

With regard to the design and measures in the current work, we note the following limitations as well as future directions for research. Employing a thorough and multifaceted intervention, like the one in the current work, makes it unclear which element(s) are necessary and which are sufficient for promoting growth mindsets. Future research should investigate which components of mindset interventions are required to reliably promote growth mindsets. For example, does teaching about mindsets and offering a tip enhance the strength of the manipulation? Or is the standard approach with a malleable message and "saying is believing" message adequate? Additionally, with regard to the design of these types of interventions, they are susceptible to "contamination" because it can be difficult to confine the growth mindset message only to those in the intervention condition. For example, there is potential that some students, who are working together in a course over an entire semester, discussed with each other the information they received in their modules. Contamination is difficult to detect and can reduce effect size estimates, introduce bias, and decrease power (Keogh-Brown et al., 2007). Last, with relevance for measures, we note that although interventionists often use single item measures to reduce the burden on participants over time (West et al., 2014), other researchers have raised questions about the validity of such an approach (see Bergkvist & Rossiter, 2007)—in our work, such a critique is only relevant for the test of moderation using experience and

for analyses with the covariates. Our primary analyses relied on validated multi-item assessments. In the future, subsequent work should replicate our work as well as extend our efforts by incorporating the full assessments of all constructs.

With regard to the delivery structure of the intervention in the current work, we note the following limitations as well as future directions for research. In integrating the intervention into the classroom—although such an approach enhanced recruitment, participation, and retention—we relied heavily on the professor to deliver the knowledge-related materials in the attention-matched control. The professor and many of the experts debunking the myths were White males and we needed to match the two conditions. Thus, future research could fruitfully explore if growth mindset interventions are more impactful, for example for females, to the degree that they match in terms of identity of participants (Van Auken, Fry, & Stephens, 2006). Based on gender development theory for example, role models who are similar should make the message more persuasive (Van Auken et al., 2006).¹⁵

Additionally, we suggest that future work should focus more directly on interventions designed to enhance entrepreneurial self-efficacy. The growth mindset intervention in this research was crafted to capitalize on the verbal persuasion route to increasing self-efficacy. This route might be even more powerful with the inclusion of story-telling, as this process also strengthens growth mindsets (Yeager et al., 2016a; 2016b). A specific illustration of how this might work is the story of Daymond John, a star on the television show Shark Tank and founder of the \$6B brand FUBU. As Draymond John tells the story, he worked at Red Lobster while he labored to gain the skills and tools needed to launch his venture (Elkins, 2017). We encourage making this story, and others like it, a part of future interventions to potentially strengthen growth mindsets and their subsequent impact.

Furthermore, future interventions might leverage other sources of self-efficacy to promote entrepreneurial self-efficacy and in turn bolster entrepreneurial career development. For example, researchers might investigate the utility of incorporating vicarious experiences to augment the primarily verbal persuasion-based mindset interventions (Bandura, 1986; 2001).¹⁶ And, future inquiry of such interventions should seek to be vigilant for potential unintended effects akin to the inhibition of interest that we found in this work once we accounted for entrepreneurial self-efficacy. Related, from an achievement motivation theory perspective, perceptions of ability, expectations of success, and value for an activity all factor into a person's decision regarding a course of action (Wigfield & Eccles, 2000). As we focused on only a part of this equation, future work is encouraged to build on our findings. Overall, before implementing growth mindset interventions on a large scale, we hope our initial work encourages entrepreneurship researchers to explore ways to strengthen effects and bolster and extend the evidence provided in the current research.

Conclusion

It is intuitively appealing to think that simple exposure to content in the domain of entrepreneurship through the increased number of classes offered at universities is enough to drive students' academic and career interest in entrepreneurship. And, we do have some evidence that supports the idea that mere exposure to knowledge and participation in programmatic offerings related to entrepreneurship can drive intentions and entrepreneurial self-efficacy (Peterman & Kennedy, 2003). In the current work, we offered a low-cost approach integrated into the classroom that can enhance the impact of providing learning opportunities. We presented evidence that cultivating a growth mindset of entrepreneurship—a belief that with time, effort, and the right strategies an individual can improve entrepreneurship ability—has promise for increasing students' career development in entrepreneurship above and beyond simply learning about entrepreneurship.

And, we empirically illustrated this using a short, scalable intervention that it is feasible to integrate in the classroom. We hope our work provides the foundation for additional empirical inquiry that helps bolster our findings that (a) growth mindsets of entrepreneurship are malleable, and (b) encouraging a growth-oriented mindset facilitates students' entrepreneurial self-efficacy and persistence on classroom tasks when challenges arise.

Appendix I. Growth mindset intervention modules.

Module	Content	Delivery method	Minutes	Example quotes
Module 1: The basics of mindsets	Step 1. Everyone has the ability to be an entrepreneur	White Male Professor (Video)	1	"Well the fact is, we all have the ability to innovate. You see, it resides in all of us, in something I call the entrepreneurial mindset."
	Step 2.What are mindsets?	Powtoons Animation (Video)	2	"People in a fixed mindset believe that abilities are fixed. Everyone has a certain amount and that's that. People in a growth mindset believe that abilities can be developed."
	Step 3.What do people with growth mindsets do?	White Female Professor (Video)	2	"The first is to remember to focus on the process. The second is when you face challenges, remember to look at them as learning opportunities. The third is what we call saying is believing."
	Step 4.Comprehension check	N/A	N/A	N/A
	Step 5.Survey	N/A	N/A	N/A
Module 2: Entrepreneurial mindsets	Step 1. Entrepreneurial ability is changeable	Short Article	N/A	"Entrepreneurial ability seems to be malleable and can be developed over time." "An individual's entrepreneurial skills can be improved."
	Step 2.Why are growth mindsets useful in overcoming obstacles?	Powtoons Animation (Video)	2	"The more you challenge your mind to learn, the more brain cells you grow, leading to a stronger, smarter brain. As a result, things that once seemed hard actually become easier."
	Step 3. How to overcome obstacles	White Male Professor (Video)	1	"If you ever feel stuck on a concept, don't be afraid to try a new learning strategy or ask someone for help."
	Step 4.Comprehension check	N/A	N/A	N/A
	Step 5.Survey	N/A	N/A	N/A
Module 3: Overcoming obstacles	Step 1. Mindsets for entrepreneurs	White Male Professor (Video)	11	"Hard work + correct strategy lead to success in the domain of entrepreneurship" "Not yet and not that."
	Step 2.Activity	N/A	N/A	N/A
	Step 3.Survey	N/A	N/A	N/A

Appendix 2. Control condition modules.

Module	Content	Delivery method	Minutes	Example quotes
Module 1: The myths of entrepreneurship	Step 1. The myths of entrepreneurs as risk takers	White Male Professor (Video)	1	<i>"I'd like to purge the myth that entrepreneurs are risk seekers...entrepreneurship is not inherently risky."</i>
	Step 2. Strategies to mitigate risk	Powtoons Animation (Video)	2	<i>"By being aware and choosing the best strategy for the risk in question, you can keep your operation going smoothly by effectively reducing the threat that the risk poses"</i>
	Step 3. Mitigating risk	White Male Speaker (Video)	1	<i>"The more prepared you are, the less risk there is. Most people think 'I'm just gonna wing it' and that's why it's risky."</i>
	Step 4. Comprehension check	N/A	N/A	N/A
	Step 5. Survey	N/A	N/A	N/A
Module 2: Other myths of entrepreneurship	Step 1. Myths of entrepreneurship	Short Article	N/A	<i>"It takes a lot of money to finance a new business."</i>
	Step 2. Why rejecting myths is important	Powtoons Animation (Video)	2	<i>"Keeping yourself correctly informed about how to start a business is a good way to get ahead and reach your full potential as an entrepreneur"</i>
	Step 3. Reaching our full potential	White Female Speaker (Video)	1	<i>"If you feel like you're feeling smaller about what's possible for you, the number one thing I'd say to do is go find people who dream bigger than you and surround yourself with those folks."</i>
	Step 4. Comprehension check	N/A	N/A	
	Step 5. Survey	N/A	N/A	
Module 3: Overcoming myths	Step 1. How to bust the myths of entrepreneurship	Powtoons Animation (Video)	3	<i>"The peak age for starting a company is mid to late 30 s or 40 s."</i>
	Step 2. Activity	N/A	N/A	N/A
	Step 3. Survey	N/A	N/A	N/A

Appendix 3. Intervention details and measures.

Growth Mindset of Entrepreneurship Condition Website: *Available from corresponding author.*

Myths of Entrepreneurship Control Condition Website: *Available from corresponding author.*

Measures

Implicit Theory of Entrepreneurship (mindset) (Pollack et al., 2012)

Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)

1. You have a certain amount of entrepreneurial ability, and you can't really do much to change it.
2. Your entrepreneurial ability is something about you that you can't change very much.
3. To be honest, you can't really change your entrepreneurial ability.

Entrepreneurial Self-Efficacy (Zhao et al., 2005)

Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)

1. I am confident in my ability to successfully perform the various roles and tasks of entrepreneurship.
2. I am confident in my ability to successfully identify new business opportunities.
3. I am confident in my ability to create new products.
4. I am confident in my ability to think creatively.
5. I am confident in my ability to successfully commercialize an idea or new development.

Academic Interest (Wigfield & Eccles, 2000)

Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)

1. I like learning new entrepreneurship information.
2. In this class, I am interested in learning how to become an entrepreneur.
3. I think the field of entrepreneurship is very interesting.
4. The discipline of entrepreneurship fascinates me.
5. I'm excited about the subject of entrepreneurship.
6. I think what we are learning in this course is important.
7. I think what we are studying in Introduction to Entrepreneurship is useful for me to know.
8. I find the content of this course personally meaningful.
9. I think the field of entrepreneurship is an important discipline.
10. I plan on continuing with my entrepreneurial education after this class.
11. I am likely to have a concentration or minor in entrepreneurship when I graduate.
12. I will likely take another entrepreneurship class next semester.

Career Interest (Hao Zhao, Seibert, & Lumpkin, 2010; Krueger et al., 2000)

Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)

1. I will probably own my own business 1 day.
2. It is likely that I will personally own a small business in the relatively near future.
3. I am interested in starting a business in the next 5 to 10 years.
4. I am interested in acquiring a small business in the next 5 to 10 years.
5. I am interested in starting and building a high-growth business in the next 5 to 10 years.

6. I am interested in acquiring and building a company into a high-growth business in the next 5
7. to 10 years. The idea of owning my own business is very appealing to me.
8. It is a high probability that in the foreseeable future I will start my own business.

Entrepreneurial Experience (Pollack et al., 2012)*Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)*

1. I have a lot of experience being an entrepreneur.

Demographics (i.e., gender, race, grade point average, year in school)**Task Persistence** (Burnette, 2010)*Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)*

If you encounter challenges in preparation for your ideation traction activity (the main activity in class), how likely are you to:

1. Exert more effort to preparing for your ideation traction activity.
2. Seek advice/feedback from others.
3. Find different ways to be more motivated to prepare for your ideation traction activity.
4. Give up on your ideation traction activity (r).
5. Change your ideation traction activity to something easier (r).
6. Focus your energy on something other than your ideation traction activity (r).

Implicit Theories of Intelligence (Dweck et al., 1995)*Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)*

1. You have a certain amount of intelligence, and you can't really do much to change it.
2. Your intelligence is something about you that you can't change very much.
3. You can learn new things, but you can't really change your basic intelligence.
4. To be honest, you can't really change how intelligent you are.

Implicit Person Theories (Chiu et al., 1997)*Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)*

1. The kind of person someone is, is something very basic about them, and can't be changed very much.
2. People can do things differently, but the important parts of who they are can't really be changed.
3. Everyone is a certain kind of person, and there is not much that can be done to really change that.

Covariates**Entrepreneurial Family Experience***Measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)*

1. People in my immediate family have a lot of experience being entrepreneurs.

Potential for Success in Entrepreneurship Class*Measured on a scale of 1 (Not at All Successful) to 7 (Very Successful)*

1. How successful do you think you will be in your entrepreneurship class?

Entrepreneurial Relative Ability*Measured on a scale of 1 (A Lot Worse) to 7 (A Lot Better)*

1. Some students are better in one subject than in another. For example, you might be better in science than in art. Compared to most of your other school subjects, how good do you think you will be at entrepreneurship?

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Notes

1. We also report total effects of the intervention on task persistence and task performance.
2. Effects are the same when running analyses with only students who received full treatment.
3. We also noted in our preregistration that we would delete data for any students who failed the post-module assessments/attention checks but no students failed all of these. Although, we did delete two participants who received parts of both interventions due to sharing a link.
4. Five participants identified as nonbinary or failed to provide data.
5. The OSF preregistration (<https://osf.io/tmna5>) contains supplemental materials as well as the “dear Riley” instructions.
6. Appendix 3 lists all our items included in the measures.
7. Although we used scales from past research, we confirmed that implicit theories, or mindsets, and entrepreneurial self-efficacy loaded on two separate factors. We employed a factor analysis using varimax rotation and maximum likelihood extraction to determine if the mindset and entrepreneurial self-efficacy scales were unique. The expected two-factor solution emerged and these were the only two factors with an eigenvalue above 1.00. The items for each scale were grouped on the same factor with minimal cross-loadings between the scales.
8. This item was a face-valid assessment used for this class developed from achievement motivation theory.
9. Students, individually, developed an idea for value creation. Then, individually, each person created a website and worked to drive potential customer (user) traffic to that website as a customer discovery and voice-of-customer activity (i.e., traction). Overall, the “project” was designed to enable students to envision, develop, and test whether their idea gained traction in their target audience. Metrics such as website views and unique visitors’ time spent on the website were tracked using Google Analytics which each student enabled on their websites. Students also linked to a platform designed specifically for this class that tracked metrics including Facebook “likes” as well as Twitter “followers.”
10. Although we use preregistered analyses, the order and presentation of hypotheses is slightly different from the OSF. Ordering was altered based on reviewer recommendations.
11. We deleted nonbinary reports ($n = 1$; 4 missing) and focused on the dichotomy of female and male.
12. We preregistered that we would run PROCESS model 1 for all interactions but decided to run a more conservative test for gender as a moderator given the categorical nature of both variables.

13. To explore the main effects, we ran PROCESS model 1 with mean centering. Also, see Table 2 for simple correlations of experience with efficacy and interest—both academic and career.
14. We appreciate the feedback on these first two points from one of our anonymous reviewers.
15. Thanks to one of our anonymous reviewers for insights here.
16. Thanks to one of our anonymous reviewers for insights here.

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Many Roads Lead to Rome: How Human, Social, and Financial Capital Are Related to New Venture Survival

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Abstract

Given variance in entrepreneurs' capital endowments, the question of sufficient (or insufficient) starting conditions enabling a pathway to survival is critical in entrepreneurship. Drawing on the subjectivist theory of entrepreneurship (STE), we adopt a configurational approach. Our results show how combinations of human and social capital are related to survival while overreliance on financial capital is not. From a subjectivist perspective, we reveal a potential gap between identifying and exploiting an opportunity. The findings provide some novel insights that help reframe conflicting results as to whether capital endowments are substitutes or complements.

Keywords

subjectivist theory of entrepreneurship, subjectivism, survival, configurational analysis, human capital, social capital, financial capital

There might be a large gap between seeing (an opportunity) and acting (on an opportunity). The subjectivist theory of entrepreneurship (STE) understands entrepreneurial behavior as a function of differences in knowledge, resources, opportunity costs, and expectations between founders (Kor, Mahoney, & Michael, 2007). STE argues that a founder will detect and act on opportunities in a subjective way (Shepherd, McMullen, & Jennings, 2007). Therefore, individuals create firms because they subjectively detect an opportunity from a resource point of view and subjectively consider the opportunity to be a good fit for themselves. The founder's personality, human capital (HC), mindset, and judgment all lead to the discovery or framing of an opportunity (Foss, Klein, Kor, & Mahoney, 2008) and, subsequently, to the conviction of having identified an opportunity that is specific to that person (first-person opportunity; Shepherd et al., 2007).

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Therefore, the path to a new venture (involving exploration) is largely subjective and driven by idiosyncratic insights and convictions (Buenstorf, 2007).

From the perspective of STE, the ability to act on an opportunity is also subjectivist (Buenstorf, 2007)—that is, it depends on the resources initially possessed by the founder (Kor et al., 2007). The possession and use of resources are decisive for the survival of the firm. However, in Penrose's (1959) terms, it is the service of resources for a specific context that defines the value of a resource. Insofar as the exploitation of entrepreneurial opportunities is subjective, it depends on the resource base of the founder and whether that base is functional for the new venture (Penrose, 1959).

Entrepreneurship is commonly understood as a process that brings together sets of resources or forms of capital to pursue an opportunity (Ireland, Hitt, & Sirmon, 2003).¹ What an individual founder brings to the table of the entrepreneurship game will affect venture emergence and survival. However, by entering into entrepreneurship, founders² are entering a substantial learning situation (Gibb & Ritchie, 1982) with an incomplete resource base (Timmons & Spinelli, 2003). This situation emphasizes the necessity to identify functional resource combinations.

Thus, when considering the outcome of new venture emergence from a subjectivist perspective, a failed venture is largely a subjective misfit between a resource base sufficient for opportunity detection and one that is sufficient for opportunity exploitation. In other words, there is a gap between the resource base that allows a founder to detect an opportunity and the resource base sufficient for survival. Although research recognizes a subjectivist perception–pursuit nexus in entrepreneurship (Buenstorf, 2007), we argue for the existence of a perception–pursuit gap, namely, the difference between seeing an opportunity and being able to exploit it. That is, the resources of the founder useful for detecting an opportunity might not be sufficient to ensure survival of the firm (Penrose, 1959). If we assume that a founder started a firm because he or she detected a first-person opportunity (i.e., subjectively), our research investigates the initial resource base sufficient to exploit the opportunity and to survive from a subjectivist perspective.

In our study, we focus on the initial resource base of solo founders. The individual founder is the primary resource for the new venture (Kor et al., 2007). The resource base is generally incomplete and solo founders will most likely not offset their own insufficiencies with the addition of other team members (Brush, Greene, & Hart, 2001). Solo founders are therefore an appropriate case for applying the STE. Research investigating the problem of resource sufficiency in entrepreneurship has examined paths to resource completion across ventures (Ronstadt, 1988), the temporary compensation of a type of resource that is lacking with another (Brüderl & Preisendorfer, 1998), and the attraction of resource types through the possession of others (Aldrich, Zimmer, & Jones, 1986). However, one important question remains: *What (minimum) sufficient resource base in terms of HC, social capital (SC), and financial capital (FC) does a founder need to have to survive?* We attempt to close this research gap.

The assessment of whether resource bundles held by a founder are sufficient for new venture survival requires moving beyond investigation of individual resources to an examination of the starting conditions as combinations of attributes (Fiss, 2007). We assume that for founders, a (restricted) variety of initial capital endowments produce similar outcomes (Marlin, Ketchen, & Lamont, 2007). In other words, different but sufficient resource bundles exist instead of a single set of isolated valuable resources. Entrepreneurship research has strongly advocated the use of configurational approaches (Muñoz & Dimov, 2015; Wiklund & Shepherd, 2005). Our research is a response to this call and extends research by investigating resources through a configurational approach. Our central goal is to show that entrepreneurs can start with different, sufficient resources to realize the survival of new ventures.³

Our study has several implications. Theoretically, it contributes to the STE by proposing that a perception–pursuit gap exists to explain the sufficiency of a founder’s resources to identify an opportunity and the insufficiency to exploit an opportunity. As we investigate the configurations of resources that are potentially and initially sufficient for pathways to survival and subsequent firm development (Brush et al., 2001), our research contributes to reframing some of the controversial issues regarding substitutes and complements in entrepreneurship research by showing the possibility of multiple, but limited, alternative paths to new venture survival. From a methodological perspective, our research overcomes some of the inconsistencies of net effect–based methods and shows options for future research. Finally, we present practical implications that can aid entrepreneurs in overcoming some resource constraints by combining other resources.

Theory and Background Literature

The Subjectivist Theory of Entrepreneurship, Founders’ Capital, and New Venture Survival

Subjectivism assumes that individuals have different preferences, knowledge, and expectations, and therefore, their decision-making is not entirely determined by external events (Foss et al., 2008). The STE focuses on the individual’s knowledge and resources, sees them as a function of an individual’s experience, and examines their role in opportunity pursuit (Kor et al., 2007). According to this theory, the decision to explore a specific opportunity for productive use is reliant on the founder’s subjective preferences, knowledge, expectations, and insights (i.e., perceptions). Shane’s (2003) definition of entrepreneurship, focused on opportunity identification and exploitation, reflects this position: Entrepreneurs perceive opportunities subjectively and convince themselves that a particular opportunity is specific to themselves (i.e., first-person opportunity). In turn, they act on this opportunity if they perceive that it surpasses their subjective opportunity costs and if they believe they possess the capability to exploit the opportunity (Buenstorf, 2007; Foss et al., 2008).

However, the subjective detection of an opportunity is not the same as exploiting that opportunity. According to Penrose (1959, p. 24–25), “It is never resources themselves that are the inputs in the productive process, but only the services that the resource can render.” That is, the capacity to fully exploit resources is specific to the entrepreneur, who is the perception–pursuit nexus (Buenstorf, 2007). While entrepreneurship literature has explored the identification and decision to pursue an opportunity from a subjectivist perspective, it has yet to examine the capacity to exploit this opportunity. Such a gap provokes the question, what different resource combinations ensure new venture survival?

STE suggests that venture creation is best understood as a process with various patterns of attributes; therefore, the configurational approach should also help to reframe questions about resources in terms of complements and substitutes. The indeterminate nature of the contributions by individual and joint resources (Bingham & Eisenhardt, 2008) suggests at least two potential sources are subjectively related to the founder. One is the suboptimal use of the resource (Penrose, 1959), that is, the founder does not extract the optimum from a resource. Another is the suboptimal combination of different resources that fails to capture potential complementarities (Sirmon, Hitt, & Ireland, 2007), that is, the founder is not able to combine resources in an optimal way.⁴

From a subjectivist perspective, two resources are not necessarily substitutes or complements, but their different idiosyncratic combinations may produce similar outcomes. Since the attraction of resources is at least as important as initial insights and capital, one question arises: What are the initial capital endowments needed to ensure venture survival?

Forms of Capital and New Venture Survival

HC and new venture survival. HC comprises the subjective skills and knowledge accumulated through training or through experiences (Becker, 1964). In this sense, HC can be functional for discovering opportunities and for acting on them. On the basis of HC theory, entrepreneurship studies have distinguished between general and specific HC (Unger, Rauch, Frese, & Rosenbusch, 2011). General HC draws on the founder's education while specific HC is task related.

In the entrepreneurship context the specificity of HC can vary, as management experience comes from running organizations in general. Industry experience leads to insights and knowledge specific to particular organizations, while entrepreneurial experience is specific to running a new venture (Unger et al., 2011). The entrepreneurial experience of the founder's parents may also contribute to entrepreneurial HC through knowledge spillover and role modeling (Bosma, Hessels, Schutjens, Praag, & Verheul, 2012).

HC theory predicts that higher levels of knowledge, skills, and other competencies are associated with better performance outcomes (Ployhart & Moliterno, 2011). Therefore, in the longer term, HC should contribute to new venture survival and a deficit of HC to venture failure (Dimov, 2010). The more specific the HC is to the entrepreneurial task, the greater the benefits of HC should be (Unger et al., 2011). The development of HC is, by definition, intertwined with the person. The founder's HC should therefore influence what opportunities are subjectively identified and, potentially, successfully exploited.

Prior research has shown a rather weak relationship between HC and new venture performance (Davidsson & Honig, 2003). Some studies have found that specific HC is more strongly related to performance than general HC (Unger et al., 2011); however, other studies have shown that while both forms of HC contribute to survival, only general HC leads to growth (Rauch & Rijsdijk, 2013). The effect of entrepreneurial experience on new venture survival is relatively unknown (Bosma, van Praag, Thurik, & de Wit, 2004). That is, research findings are rather mixed, showing that the weak and often neutral relationship between HC and firm performance is either moderated or mediated (Bruderl, Preisendorfer, & Ziegler, 1992; Dimov, 2010).

Given the current knowledge on HC and new venture survival, we can conclude that first, HC attributes in isolation have very little explanatory power and the overall configuration of this resource points to the importance of subjective HC (Davidsson & Gordon, 2012). Second, certain HC attributes may be more valuable at different stages of a venture's life and/or have different decay times (Reuber & Fischer, 1999). While specific HC may be highly functional, vital for opportunity recognition, and readily available at the beginning of a venture, general HC may provide founders more options to deal with issues in the long run, an understanding of how to productively use resources, and therefore benefit the survival of the new venture (Kor et al., 2007; Rauch & Rijsdijk, 2013). However, having more options to deal with uncertain future events is of little value if a founder has no capacity to deal with current entrepreneurial tasks. The subjective development of HC will lead to subjective insights for opportunity identification and a subjective capacity to exploit an opportunity.

SC and new venture survival. SC refers to "resources embedded in a social structure which are accessed and/or mobilized in purposive action" (Lin, 1999, p. 35) and is created through investment in social relationships. The SC activities of founders can be distinguished in terms of investment in (building) SC and exploitation of SC. In general, SC theory can "describe the instrumental benefits of social relationships" (Aldrich & Martinez, 2001, p. 47) that are specific to the individual and, as such, are subjective. Therefore, SC allows the achievement of objectives that are otherwise difficult to attain, on the assumption that the social resources of entrepreneurs are more important than personal resources (Lin, 1999). In particular, actors can extract benefits

from their social structures, networks, and memberships. SC is the outcome of an individual's social interactions and the capacity to build valuable relationships from these interactions. If SC is understood as a process of interactions with other entrepreneurs or individuals, it can play a subjective role in opportunity recognition (Felin & Zenger, 2009). Differences in SC lead to subjective insights into opportunities. Moreover, heterogeneity of SC leads to subjective heterogeneity of access to resources. Therefore, SC can alter the productive use of resources.

Relationships indeed grant access to complementary resources, and different relationships provide access to different resources at different stages of entrepreneurial firms (Mahmood, Zhu, & Zajac, 2011). It can generally be assumed that mobilizing or exploiting SC is more important than investing in SC (Brüderl & Preisendorfer, 1998). However, discontinuing investment in SC may lead to development barriers for the entrepreneurial firm (Lechner & Dowling, 2003).

Coleman (1988) argues that SC alone can be sufficient and effective for new venture survival. However, although there is a strong relationship between the mobilization of SC and survival of new venture (Brüderl & Preisendorfer, 1998), what is the relationship between HC and SC? SC helps to attract other resources; thus, research suggests that SC is more important than HC to a firm's performance (Davidsson & Honig, 2003), but is it sufficient to ensure new venture survival?

The network compensation hypothesis states that entrepreneurs who lack HC or FC may try to compensate with SC. This hypothesis could not be confirmed for FC and appears to be only partially confirmed for HC (Brüderl & Preisendorfer, 1998). As such, there is little evidence that SC can substitute for the other two forms of capital. However, the question of substitutes and complements may be misleading, as SC functionally completes the resource base and its value is subjectively dependent on other starting conditions, which calls for a configurational approach.

FC and new venture survival. FC is a generic type of resource because it can be converted into other types of resource, thereby mitigating its constraints (Wiklund & Shepherd, 2005). Wealthy individuals appear to be less affected by financial constraints because greater capital is available to finance their firms' operations (Colombo & Grilli, 2005).

With regard to new venture survival, FC may buffer the liabilities of newness and smallness. Moreover, available capital buys time, which the entrepreneur can use to learn and overcome challenges (Cooper, Gimeno-Gascon, & Woo, 1994) and explore in depth more opportunities (Cosh, Cumming, & Hughes, 2009). Even if growth patterns are random, FC will affect how long founders can "play the entrepreneurship game" (Coad, Frankish, Roberts, & Storey, 2013) and therefore have an impact on new venture survival.

Prior research has found a relationship between the amount of FC and new venture survival (Cooper et al., 1994): FC and (lack of) financial constraints are associated with survival (Holtz-Eakin, Joulfaian, & Rosen, 1994). As FC can be used to acquire other forms of capital (including hiring a highly connected individual), it alone may be sufficient for survival. However, the existence of other explanatory variables contributing to new venture survival makes this hypothesis unlikely (Coad et al., 2013). While FC cannot be considered subjective, its use value is because the way in which it is used depends on one's particular insights and competencies. First, research shows that surviving firms have differing FC endowments from those of firms that did not survive. Second, it appears that possession of HC also affects the possession of FC (Brüderl & Preisendorfer, 1998). Thus, while HC and FC are often proposed as substitutes, they exert the strongest effects when they are conjoined (Chandler & Hanks, 1998). Again, configurational analysis can provide insights into the resource combinations that are sufficient for survival with and without FC.

In essence, a simple cumulative view of the forms of capital available to an entrepreneur neglects the potential in resource combinations and their specific usefulness for the founder.

Research suggests that possession of the maximum amount of all three forms of capital is unlikely (Brüderl & Preisendorfer, 1998; Brush et al., 2001). However, research on substitutes and complements has tended to investigate pairs of factors without considering the complexity of resource combinations that is required in a configurational approach.

Therefore, an exploration of sufficient configurations for survival of a new venture from a subjectivist perspective can examine the contribution of the three forms of capital in a holistic way. If we adopt a subjectivist perspective, a configuration of the different forms of capital is subjective and likely to affect what opportunities are recognized by a founder as feasible for exploitation. It is the combination and interaction between resources that render them more specific and in the case of a founder more subjective in a way that they will frame the type of opportunities one sees and is able to exploit. Hence, we contribute to the entrepreneurship literature by addressing the central question of what minimum and sufficient resource base (in terms of HC, SC, and FC) is needed by a founder to ensure new venture survival.

Method

Data

We used data from two longitudinal studies on the new venture start-up process, the Panel Study of Entrepreneurial Dynamics II (PSED II, conducted during 2005–2008 in the United States) and the Comprehensive Australian Study of Entrepreneurial Emergence (CAUSEE, conducted during 2007–2013 in Australia). Both databases investigated the entrepreneurial activities of a cohort of nascent entrepreneurs over time. While their datasets differ in focus (e.g., more emphasis on bricolage in CAUSEE, stronger focus on motivational factors in PSED), they share the same theoretical underpinnings regarding the role of HC, SC, and FC in venture emergence. Indeed, both datasets contain information on the three capital endowments held by nascent entrepreneurs at the beginning of their new venture. Both studies shared the same theoretical assumptions about the subdimensions and specifications of HC (i.e., founder's education, parental start-up experience, managerial experience, industry experience, and start-up experience) and SC (i.e., investment in SC and mobilized SC).⁵

Sampling Strategy

A subjectivist framework implies to choose the individual founder as the level of analysis for all measures (Davidsson & Wiklund, 2001). A founder's choice for a particular start-up configuration will depend on his or her subjective evaluation and perception of resource endowments and opportunities. As such, this approach requires that only solo founders are taken into consideration, omitting group or team start-ups. For our sampling strategy, we followed Davidsson and Gordon's (2012) suggestion to avoid problems with using longitudinal data in entrepreneurship. We further applied the approach proposed by Shim and Davidsson (2018) to correct the datasets for bias from overrepresentation of long-duration cases, before merging both datasets.⁶

Sample Descriptive Statistics

To harmonize PSED II and CAUSEE into one dataset, we followed the methodological suggestion of Reynolds, Hechavarria, Tian, Samuelsson, and Davidsson (2016). As the Boolean logic of our configurational analysis requires the assignment of observations to particular sets, and because such set membership allocations are sensitive to cultural or social contexts, we merged the datasets after calibration (see "Data Calibration" section). In doing so, we generated a harmonized dataset of 670 solo founders covering 5 years (276 PSED II, 41.2%; 394 CAUSEE, 58.8%),

from an initial sample size of 3,282 observations (which included team-founded ventures, low-intensity founders, long-duration cases, and cases with missing variables). Our sample contains 209 (31.2%) “surviving” entrepreneurs and 461 (68.8%) individuals who terminated their ventures (sample characteristics can be found in Supplemental Appendix 1).

Measures

Dependent Variable: New Venture Survival

We named the dependent variable *New Venture Survival* to examine whether founders’ HC, SC, and FC positively affect survival outcomes, including the emergence of an operational venture (Davidsson & Gordon, 2012) and its survival (Aspelund, Berg-Utby, & Skjevdal, 2005). This variable measures the founder’s ability to create and maintain an operational business (Davidsson, 2016). In particular, it captures operational ventures (a) for which the founder works full-time, (b) that generate monthly revenues exceeding monthly expenses for more than 6 months within a 12-month period, and (c) the perseverance of the entrepreneur as reflected by the operational business existing for at least 5 years (Supplemental Appendix 2 shows the survey items used from PSED II and CAUSEE).

Independent Variables

Human capital. Entrepreneurship studies theorize the founder’s HC as consisting of the measured finer grained subdimensions of general HC and specific HC, which is based on its potential task-specific use (Rauch & Rijssdijk, 2013). Similar to other studies, our measure of HC was based on (a) education, (b) parental start-up experience, (c) managerial experience, (d) industry experience, and (e) start-up experience (Unger et al., 2011). We measured education in terms of the highest degree obtained. Parental start-up experience was a binary measure of whether the founder grew up in a family with parents as active entrepreneurs (Delmar & Shane, 2004; Shane & Stuart, 2002). Managerial experience, an indicator that assesses a founder’s knowledge on how to manage operations, was measured as a numeric value in years. We assessed industry experience as a numeric value measuring the years of work experience in the industry within which the new venture competes. As a task-related experience, we included a dichotomous indicator of past start-up experience as a proxy for learning and for the knowledge gained from past experiences (Cassar, 2014; Delmar & Shane, 2006).⁷

Social capital. We defined the SC construct by the value embedded in a set of social relationships with individuals or collectives (Adler & Kwon, 2002; Granovetter, 1985). Accordingly, we measured investment in (building) SC (SC investment) and exploitation of SC (mobilized SC; Lin, Ensel, & Vaughn, 1981). We operationalized mobilized SC as the effective use of external partners in the new venture process (Brüderl & Preisendorfer, 1998). Therefore, we used a numeric value for the number of helpers a founder was able to mobilize to provide significant support for the new venture without payment (Westlund & Bolton, 2003). SC investment measures the degree to which collectives and communities are available to founders in the form of support to achieve certain entrepreneurial goals (Stam, Arzlanian, & Elfring, 2014). These communities may consist of (a) community groups, (b) bankers and other investors, (c) state and government, (d) trade or industry association, (e) Internet-based networks, and (f) face-to-face business networks. Here, we used a dichotomous variable for each type of community and these variables were then summed to create a single measure.

Financial capital. Finally, we evaluated FC by assessing the extent to which a founder was able to use internal and external sources of funding. Accordingly, we assessed the role of available financial means for the new venture and whether founders have used such means. The specific measures captured the use of (a) personally secured bank loans by the founder; (b) other personal loans, overdrafts, or other credit facilities from a bank; (c) equity from venture capital firms; (d) equity from any other organizations; and (e) delayed payment terms from suppliers, through dichotomous variables that were then summed.

Data Calibration

Qualitative comparative analysis (QCA) treats the conditions (HC, SC, and FC) that lead to an outcome (*New Firm Survival*) as a set, with each case having a set membership. In this study, we applied both crisp and fuzzy sets. We used the former to calibrate the probability that a company will still operate 5 years after its founding, and to code the start-up experience. Both are binary measures, and thus we calibrated them as crisp sets. Given the data structure of CAUSEE, we also calibrated parental start-up experience and mobilized SC into crisp sets.

The fuzzy set calibration makes use of external information in terms of the degree to which the cases satisfy membership criteria (Fiss, 2011). In general, we used three qualitative thresholds: full membership (0.95), the crossover point (0.50), and full non-membership (0.05; Ragin, 2000; 2008). To justify membership values, we followed both direct and indirect methods based on theory and prior research. Supplemental Appendix 3 provides detailed information on the descriptive data for the calibrated sample and the set membership conditions for all variables.

We calibrated the outcome *New Venture Survival* as a crisp set with survival coded as 1 (0 = failure). We calibrated education by the highest degree obtained. Graduate training or a master's degree was the threshold for membership in the set of highly educated solo founders in PSED II, while in CAUSEE, a university degree was the fully-in threshold.

We measured HC in terms of years of managerial experience and years of industry experience. We used the 75th percentile for both measures to classify founders with highly relevant experience and the 25th percentile for those with less work experience. If a founder had worked at least 10 years in the industry of the new venture, we considered set membership in the group of founders with high industry experience. For managerial experience, we set the boundary condition of 20 years for set membership in the group of founders with highly relevant managerial experience. In addition, we calibrated start-up experience as a crisp set coded as "fully in" for founders with start-up experience and "fully out" for those without start-up experience.

For SC, our calibration approach followed the structure of both datasets. When data had binary codes (e.g., mobilized SC in terms of help: yes/no), we calibrated crisp sets. For SC investment, we used continuous variables that allowed fuzzy-set calibration using the 75th and 25th percentile as cutoff values for fully-in and fully-out set membership.

Finally, we calibrated FC, a continuous variable, using the same logic as that for the threshold of fully-in membership. In particular, we assessed whether a founder had access to and used all available sources. At the other end of this continuum were founders who had no access to and did not use any sources—external or internal. The fuzzy set area involved founders who had used at least one source of funding.

Configurational Analysis

Configurational analyses have been widely used in entrepreneurship research. In line with the logic of QCA and prior studies, we used the three antecedent factors of HC, SC, and FC to derive alternative causal pathways leading to *New Venture Survival*. According to the logic of set

analysis, an antecedent factor is sufficient for achieving an outcome if the occurrence of the factor is always accompanied by survival (Greckhamer, Misangyi, Elms, & Lacey, 2007). This logic suggests that a combination of HC, SC, and FC is sufficient for achieving *New Venture Survival* when scores for the three antecedent factors are consistently less than or equal to the membership in the survivor set. “Consistency” means the degree to which the scores approximate a perfect subset relationship. We used a relatively conservative consistency cutoff value of 0.90 instead of the commonly suggested value of 0.80 to consider highly consistent configurations (Ragin, 2008). In addition, we required a minimum of five cases in each configuration to ensure that singular and idiosyncratic cases were not given equal relevance in repeated patterns of solo founders’ start-up choices.

QCA provides three types of solutions: complex, parsimonious, and intermediate solutions (Ragin, 2000). We identified the conditions that were considered central or peripheral by using a counterfactual analysis (Schneider & Wagemann, 2012): First, we identified sufficient configurations with a complex solution; second, we conducted a counterfactual analysis using a parsimonious solution that incorporated the logically possible configurations for which no cases exist, or combinations of antecedent conditions—the so-called remainders—that were not observed in the dataset; and finally, we used the intermediate solution to distinguish between “easy” and “strong” assumptions.

Results

To understand *New Venture Survival* in depth, we ran our analysis twice, once for the outcome *New Venture Survival* and once for *New Venture Failure*. This approach allowed us to identify the antecedent factors central to both survival and failure and the conditions that were indifferent to these factors. We also compared solo founders’ capital endowment sufficient for *New Venture Survival* with the HC, SC, and FC configurations that led to failure. Table 1 shows five consistent paths to *New Venture Survival* and Table 2 shows three consistent configurations leading to new venture failure.

Tables 1 and 2 report the consistencies and coverage of the overall solutions as well as for each configuration. We focused on the derived complex solution because, in contrast to the parsimonious and intermediate solutions, this solution did not allow for simplifying assumptions. We show the raw coverage (rcov) of the five configurations for new venture survival (three failure configurations, respectively) that expressed the proportion of memberships of all entrepreneurs accounted for by each particular resource combination. Further, we defined unique coverage (ucov) as the proportion of membership in an outcome that was attributable only to a particular configuration and showed the relative importance of each particular configuration (Ragin, 2006).

The overall solution involved only configurations that exceeded a coverage threshold of 0.90. The overall solution coverage for the four pathways were 0.195 (survival) and 0.059 (failure), with an overall solution consistency of 0.872 (survival) and 0.879 (failure), indicating sufficient coverage and consistency. Taken together, these figures indicate that the causal combinations of both new venture survival and failure are informative.

Our findings for *New Venture Survival* show five distinct pathways. The first pathway, configuration A, highlights the importance of managerial experience, SC investment, and FC. The founders in this configuration know, through extensive experience, how to manage a business and at the same time are invested in establishing and cultivating social ties with other individuals and collectives. Configuration A is the only survival configuration for which access to financial means is present. This pathway showed consistency (cons = .897) and explained 6.1% of common cases of resource bundles leading to *New Venture Survival* (rcov = .061, ucov = .032).

Table 1. Configurations for Nascent Entrepreneurship (Outcome New Venture Survival).

Capital	Specification	Configurations for New Venture Survival				
		A	B	C	D	E
Human capital	Education	○	○	○	●	●
	Parental start-up experience	○	○	●	○	●
	Managerial experience	●	●	●	●	●
	Industry experience	—	●	●	●	○
	Start-up experience	○	●	○	○	●
	Mobilized SC	○	●	○	●	●
Social capital	SC investment	●	—	●	●	●
	/.	●	○	○	○	○
Financial capital	Raw coverage (<i>rcov</i>)	0.061	0.074	0.058	0.050	0.041
	Unique coverage (<i>ucov</i>)	0.032	0.050	0.028	0.025	0.025
	Consistency (<i>cons</i>)	0.897	0.884	0.913	0.910	0.924
	Overall solution consistency	0.195	-	-	-	-
	Overall solution coverage	0.872	-	-	-	-

SC, social capital.

Note. Central conditions are represented by ● (presence) and ○ (absence); —neither presence nor absence required; frequency cutoff: 5; consistency cutoff: 0.901. All five configurations are consistent at the mentioned level; they depict the sufficient pathway for new venture survival.

Table 2. Configurations for Nascent Entrepreneurship (Outcome New Venture Failure).

Capital	Specification	Configurations for New Venture Failure		
		A	B	C
Human capital	Education	●	○	●
	Parental start-up experience	○	●	●
	Managerial experience	○	○	○
	Industry experience	○	●	○
	Start-up experience	●	○	●
	Mobilized SC	○	○	●
Social capital	SC investment	○	○	○
	/.	●	●	●
Financial capital	Raw coverage (<i>rcov</i>)	0.028	0.040	0.034
	Unique coverage (<i>ucov</i>)	0.006	0.019	0.011
	Consistency (<i>cons</i>)	0.926	0.946	0.903
	Overall solution consistency	0.059	-	-
	Overall solution coverage	0.879	-	-

SC, social capital.

Note. Central conditions are represented by ● (presence) and ○ (absence); frequency cutoff: 5; consistency cutoff: 0.903. All three configurations are consistent at the mentioned level; they depict the sufficient pathway for new venture survival.

The second pathway, configuration B, again highlights the importance of managerial experience but also includes industry-specific experience associated with the founder's firsthand start-up experience. It differs from configuration A in that extensive experience, including start-up experience and mobilized SC, can compensate for lack of financial means. This pathway showed consistency ($\text{cons} = .884$) and explained 7.4% of cases engaged in nascent entrepreneurial activities ($\text{rcov} = .074$, $\text{ucov} = .050$).

Configuration C includes founders with managerial and industry experience, with parents who had start-up experience but who had no start-up experience of their own and limited access to financial means. Configuration C covered 5.8% of all cases with high value in the outcome variable. Consistency and coverage were both significant in this configuration ($\text{cons} = .913$; $\text{rcov} = .058$, $\text{ucov} = .028$).

Configuration D is similar to configuration C but does not include parental start-up experience. Instead, these solo founders (5.0% of all founders) must compensate for the lack of start-up experience with higher education. In addition, a successful founding from this configuration required a mobilized SC. Configuration D showed a sufficient degree of consistency and coverage ($\text{cons} = .910$; $\text{rcov} = .050$, $\text{ucov} = .025$).

Configuration E also includes solo founders with broad experience and SC but without experience in the industry; they also lacked FC. This configuration reveals that education, parental start-up experience, own start-up experience, and knowledge on how to run a business are decisive to survival despite a lack of experience in the industry in which the new business is competing. This configuration covered 4.1% of all cases and showed consistency with sufficient coverage ($\text{cons} = .924$; $\text{rcov} = .041$, $\text{ucov} = .025$).

Next, to contrast the findings for *New Venture Survival*, we assessed the sufficient conditions for failure. We identified three configurations that lack managerial and industry experience (with the exception of configuration B, for which industry experience is present). The resource pattern for failure showed significant differences from the pattern for *New Venture Survival* with respect to the combination of HC and SC. In general, founders who were most likely to fail started their new venture with a high level of education (A and C) but without managerial or industry experience. A lack of both SC investment and mobilized SC also inhibited founders from compensating for their shortcomings in HC. All three configurations (A, B, and C) have and use FC, but the lack of task-specific managerial and industry knowledge makes the financial investment ineffective. We now discuss these findings in greater detail.

Supplementary Analysis

Before interpreting our findings, we investigated the net effects of HC, SC, and FC on *New Venture Survival* (for a detailed description of the methods used, see Supplemental Appendix 4). We theorized that all three types of resources have direct effects but lower explanatory power than our configurations. To test this proposition, we conducted a binomial logistic regression using our eight independent constructs and the outcome variable *New Venture Survival*. As there is evidence of gender effects on the probability of establishing a new business (Wilson, Kickul, & Marlino, 2007), we introduced gender as a control variable. In addition, we assumed that the likelihood of founding a new business is negatively associated with age (Davidsson & Honig, 2003). Other known influences on entrepreneurial activities are ethnic background (Aldrich & Waldinger, 1990), migration background (Levie, 2007), and the business sector in which the new venture operates (De Massis, Kotlar, Wright, & Kellermanns, 2018). Therefore, we controlled for possible effects from these dimensions.

In analyzing the impact of HC on the probability of *New Venture Survival*, we found that education ($\beta = .042$; $p < .010$), managerial experience ($\beta = .132$; $p < .010$), industry experience

($\beta = .601; p < .010$), SC investment ($\beta = .376; p < .010$), and start-up experience ($\beta = 1.039; p < .001$) played significant roles, as expected. In addition, we checked the odds ratios. Values of $Exp(B)$ less than/greater than 1 correspond to a decrease/increase in the odds of the dependent variable, while values close to 1 indicate that unit changes in this independent variable do not affect the probability of *New Venture Survival*.

For HC, we found a positive but weak relationship between education and odds of survival ($Exp(B) = 1.043$), as expected. We found the same but with slightly higher values for managerial experience ($Exp(B) = 1.141$), industry experience ($Exp(B) = 1.823$), and start-up experience ($Exp(B) = 2.828$). These findings so far mirror the findings of our QCA.

Further, we found a positive effect of parental start-up experience ($\beta = .406; ns; Exp(B) = 1.501$) on *New Venture Survival* that was below the expected significant level. This can be explained by the fact that both configurations for success and failure include this condition, indicating that parental start-up experience alone is not a reliable predictor of *New Venture Survival*. Our configurations demonstrate the context (in terms of research bundles) in which parental start-up experience can support survival (configurations C and D in Table 1).

The moderate effect size of managerial experience ($\beta = .132; p < .05; Exp(B) = 1.141$) indicates that it is a relevant predictor of *New Venture Survival*. Indeed, our configurational analysis indicates that managerial experience is a necessary condition, that is, it is always present when survival occurs. However, its effect size was weaker than that of start-up experience, which was not a necessary condition. In conclusion, it is necessary to have managerial experience even when the founder has start-up experience. We found that start-up experience specific to the industry of the new venture is a stronger predictor of *New Venture Survival*.

The results for FC were unclear ($\beta = -0.013; ns; Exp(B) = 0.987$); we found nonsignificant results, which at first glance contradicts those of the QCA. However, closer examination reveals that FC in the configurational analysis was related to survival only in a small number of cases. Consequently, its direct effects in the regression-based analysis were indiscernible, as some cases in both datasets showed the same relationships with the dependent variable. Based on our previously outlined theory, such cases remain meaningful and show a distinct pathway to *New Venture Survival*. A similar case occurs when considering only mobilized SC ($\beta = 0.137; ns; Exp(B) = 1.147$). The variables show nonsignificant results that can again be explained by the few surviving cases who have based their strategy on this form of capital.

Taken together, the results of the logistic regression corroborated our theorizing by highlighting ill-defined results for some resources. Past research using net effect analysis of isolated resources has generally revealed the relative importance of HC, SC, and FC, but does not unpack the complexity of effects of capital endowments at the beginning of nascent activities and on future survival of the new venture. Table 3 shows the results of the binomial logistic regression.

Discussion

We discuss our findings by referring first to our overall hypothesis, that is, resources in isolation do not sufficiently explain new venture survival. We focus our discussion further on the founding conditions and the identification of multiple successful paths to survival. We use these insights to contribute and extend the STE by introducing the potential gap between seeing and acting upon entrepreneurial opportunities. Finally, we discuss the role of FC in relation to HC and SC for venture survival. We further condense each finding into a proposition.

Table 3. Binomial Logistic Regression of New Venture Survival.

Independent variable	Dependent variable			
	Model without controls		Model with controls	
	Survival	Exp(B)	Survival	Exp(B)
Human capital				
Education	-0.089 (0.101)	0.915	0.042* (0.015)	1.043
Parental start-up experience	0.397 (0.217)	1.487	0.406 (0.243)	1.501
Managerial experience	0.045** (0.009)	1.046	0.132* (0.072)	1.141
Industry experience	0.283* (0.255)	1.420	0.601** (0.244)	1.823
Start-up experience	0.746*** (0.211)	2.109	1.039*** (0.138)	2.828
Social capital				
Mobilized SC	0.409 (0.104)	1.505	0.102 (0.252)	1.107
SC investment	0.202* (0.265)	1.224	0.376* (0.186)	1.457
Financial capital				
	-0.012 (0.018)	0.988	-0.013 (0.024)	0.987
Control variables				
Age	-	-	-0.016 (0.020)	0.984
Gender ($f = m$)	-	-	-0.137 (0.117)	0.872
Foreign born	-	-	-0.383 (0.226)	0.682
Ethnicity	-	-	0.000 (0.192)	1.000
Business sector	-	-	0.002 (0.012)	1.002
$-2 \log likelihood$	553.214	-	445.524	-
Model χ^2	44.326***	-	107.689***	-
df	16	-	8	-
Overall hit rate	62.9%	-	77.7%	-
Cox and Snell R^2	0.091	-	0.286	-
Nagelkerke R^2	0.127	-	0.389	-
Constant	-0.516*** (0.097)	-	-3.473*** (0.031)	-
Observations	670	-	670	-

Note. Merged Panel Study of Entrepreneurial Dynamics II (PSED II) and Comprehensive Australian Study of Entrepreneurial Emergence (CAUSEE) dataset; uncalibrated data; binomial logistic regression with survival as dependent variable. Standard errors are in parentheses: * $p < .05$. ** $p < .01$. *** $p < .001$.

Sufficiency of Isolated Resources

Research dedicated specifically to either HC, SC, or FC suggests that each form of capital is sufficient to improve performance, most likely up to the point of ensuring new venture survival. From an additive and cumulative perspective, other variables can enable a certain target to be achieved “earlier.”⁸

However, our configuration analysis shows that no form of capital on its own is sufficient for firm survival: Only different configurations of capital constitute a sufficient start base for survival. Therefore, arguments regarding self-sufficiency and substitutes and complements are somewhat misleading as resources create value through their interactions with other resources in appropriate configurations.

Causal-symmetric relationships among variables are neither theoretically claimed nor necessarily observable in reality. Instead, it is necessary to understand how and why various endowments are successful in entrepreneurial ventures. The question of which resources are associated with new venture survival is misleading, as effective resource bundles are likely to be asymmetric. Experience can lead to particular insights; however, it is more likely that a mix of different experiences and related accumulation of capital leads to the subjective identification of particular opportunities and the capacity to exploit them:

Proposition 1: *Neither HC, SC, nor FC is singularly sufficient for new venture survival.*

Founding Conditions and Survival Paths

The particular value of one resource can be understood better if it is considered part of a bundle of supplementary resources, as the combination of resources and their interplay are more important for generating value than any one resource in isolation (Bingham & Eisenhardt, 2008). Thus, the value of a specific resource needs to be understood within the specific configuration in which it is embedded, making its use value subjectivist (Penrose, 1959). In this sense, the question of substitutes and complements also needs to be reframed.

A founder starts in a substantial learning situation with an incomplete resource base. Path approaches assume that founders can start from different positions and embark on different paths to assemble the resources required for firm survival and growth (Brush et al., 2001). However, this fact does not explain whether there is a minimum of resources needed to actually start and survive.

We examined the founder-related variables that are most commonly measured in entrepreneurship research to explain firm survival. From 8 variables, 256 different resource bundles are possible. However, only five were clearly related to survival. Such a finding suggests that sufficient and insufficient starting conditions exist and that not every road will bring a founder from the starting point to a desired destination—many but not all roads lead to Rome.

Moreover, we found three configurations that are clearly related to failure. Given that they are not the perfect opposite of the survival conditions, survival and failure are not symmetrical. Different capital configurations lead to subjectivist identification of opportunity, but not all configurations are sufficient for opportunity exploitation. Therefore, identifying those conditions that are sufficient for survival is critical; our research is a step forward in this direction. While path models indicate different development patterns (Brush et al., 2001), we identify the starting conditions necessary for embarking and continuing on that path.

Proposition 2: *Survival is a function of a reduced set of different starting configurations (out of all possible configurations). Failure is not symmetrical to survival; that is, specific configurations sufficient for survival exist.*

Subjectivist Theory of Entrepreneurship and New Venture Survival

While the STE has mainly focused on how venture emergence is driven by idiosyncratic insights and convictions (Buenstorf, 2007), our research contributes to the theory by exploring the functional resource bundles a founder will need for venture survival. As founders differ in knowledge, resources, opportunity costs, and expectations (Kor et al., 2007), the capacity to exploit opportunities is also subjective: This capacity depends on the resource base of the founder and

on whether that base is functional for the new venture (Penrose, 1959). For example, industry experience might give a founder particular insights that lead to the discovery of an opportunity—insights that another founder lacking the industry experience may not have. However, according to our results, only a founder who has both industry and managerial experience is capable of acting on an opportunity. If we assume that a founder started a firm because he or she detected a first-person opportunity (i.e., subjectively), our research complements this view by addressing the question, what is the idiosyncratic initial resource base required to exploit the opportunity and to survive?

Proposition 3: *The idiosyncratic resource base sufficient for opportunity identification may not be sufficient for opportunity exploitation, thus creating a subjectivist perception–pursuit gap.*

Difference Between Seeing and Acting

The capacity for exploiting an opportunity is related to the services that the resources can render to the founder in a subjectivist way (Penrose, 1959). As founders start with an incomplete resource base, they must be capable of attracting other resources to survive, which is again subjectivist.

If we compare the failure configuration C with survival configuration E, and failure configuration B with survival configuration C, we can derive several notable conclusions. The two pairs of configurations are similar but different, with the presence of managerial experience and SC investment in the surviving conditions and their absence in the failing conditions (also, FC is present in the failing conditions but absent in the surviving conditions). We could argue that both pairs of configurations are sufficient for identifying an opportunity (education, parental start-up experience, own start-up experience, and mobilized SC in one case; parental start-up experience and industry experience in the other case). However, the lack of managerial experience and SC investment makes these configurations insufficient for exploitation and cannot be compensated by FC.⁹ The initial resource base is thus insufficient for managing the firm and transforming resources in time (i.e., transforming FC into other forms of capital).

Based on the STE, we could argue that more HC and SC help the founder identify less contested opportunities (Richardson, 1960), and less contested opportunities should increase the probability of survival because of limited competition (Gavetti, 2012). Moreover, HC and SC reduce the perception–pursuit gap, as these resources subjectively have high use value for the founder. So, the question can be reframed as, what are the perception–pursuit gaps that are acceptable to the founder in the decision to exploit an opportunity?

Proposition 4: *The idiosyncratic resource base of a founder is directly related to the contestedness of the identified opportunities and to the perception–pursuit gap. The greater a founder's HC and SC, the less contested the opportunity and the narrower the perception–pursuit gap, positively influencing venture survival.*

Survival Paths Versus Gambler's Ruin Hypothesis

Firm failure can be a ticking time bomb. The founder's initial resource base needs to be sufficient to exploit an opportunity while he or she acquires additional necessary resources. Most firms fail within 5 years (Khelil, 2016). Although research on paths taken to acquire a complete resource set does not set minimum requirements for the initial resource set (Brush et al., 2001), the issue

is which paths lead to firm survival. That is, what configuration of resources allows the founder to acquire missing resources before the game is over?

While the gambler's ruin hypothesis assumes that founders with sufficient FC can sit for a long time at the table despite the lack of other resources (in effect waiting for other competing firms to fail), our analysis contradicts this hypothesis. FC in the absence of HC and SC is a route to failure. HC and SC may help the founder acquire FC, but FC alone cannot compensate for other resource constraints in sufficient time. Our configurations suggest that having only FC is strongly related to failure; therefore, although the starting conditions of an entrepreneur are important, not all conditions are sufficient for survival. FC appears to be the least useful at the start of a venture.

Proposition 5: *In isolation, FC is the least useful resource for a founder at the beginning of a new venture.*

HC Bundles: Building Effective HC

Our configurational analysis shows the overriding importance of managerial experience to survival. Research considers industry experience more specific for new ventures and, therefore, as more important. However, success depends on the type of experience. We found that while industry experience was relevant when accompanied by management experience, it by itself was not sufficient and in fact is associated with failure. Similarly, entrepreneurial experience, while being the most specific variable in relation to a new venture, is related to failure if it is not accompanied by other forms of specific HC. Start-up experience requires at least some form of previous managerial experience to be effective. From a subjectivist perspective, industry experience can lead to subjective insights into an opportunity but it is more likely that through managerial experience, entrepreneurs develop the capacity to understand the use value of resources (Kor & Mahoney, 2000) and to effectively manage these resources in order to achieve new venture survival. This conclusion is in line with research showing that start-up experience does not directly influence survival (Bosma et al., 2004) but can enhance other forms of HC (Kirschenhofer & Lechner, 2012).

In general, different forms of HC need to come together to create a sufficient starting base. The clearest pattern is managerial experience and industry experience, which can be enhanced by direct entrepreneurial experience and also entrepreneurial parents. However, education can give wider options for more specific HC. Thus, all else being equal, founders need to have three forms of HC (of the five analyzed), comprised of all forms of specific HC or a mix of specific and general HC.

Proposition 6: *Multiple forms of HC are necessary for firm survival.*

Research Limitations and Future Research

We focused on solo founders as the starting point of our research. As diversity of experience and forms of capital are related to survival, this research could be extended to the team level (Foss et al., 2008). We could expect that team diversity can help reduce the perception–pursuit gap. We have also not directly addressed entrepreneurial learning, which is an intermediary condition for transforming experience into knowledge (Keith & Frese, 2008). Our arguments centered on sufficient resources required for opportunity exploitation from a subjectivist

perspective. Future research could examine opportunity identification in more depth. We proposed that HC in combination with SC enables the identification of more or less contested opportunities.

Our configurations provide important insights that may help to reframe the literature on the usefulness of HC and SC. A clear pattern emerges from our findings: HC and SC are jointly important for survival. Such a pattern is in contrast with research that considers HC more important than SC (Davidsson & Honig, 2003). However, such a view is simplistic. Most human experiences that lead to HC also create SC. Thus, HC necessarily involves a varying SC component (Adler & Kwon, 2002).

Managerial experience creates SC within the firm but also outside it with other stakeholders, including competitors. Industry experience can have the same effects, but when combined with managerial experience, industry experience creates stronger and more functional SC than that created by industry experience alone—managerial experience likely leads to higher centrality in networks (i.e., more relevant relationships). Entrepreneurial experience creates SC even if the value of the subsequent venture depends on similarities to the previous one. This is demonstrated by conditions for failure, in which start-up experience is present without industry experience and vice versa. Future research could investigate how HC creates functional SC for founders, especially how multiple forms of HC might be used to create multiple forms of SC. More specifically, future research could investigate differences in SC due to differences in experience, personality, and learning capacity.

Research shows that SC is mostly acquired through weak ties (Granovetter, 1985); the lack of investment in SC is fatal to a new venture. There is only one configuration in which FC leads to survival—that which combines managerial experience and SC investment. A founder with strong HC is likely to possess a certain stock of SC sufficient to get a new venture off the ground. Limited initial SC may be a barrier to the future development of the firm (Hite & Hesterly, 2001; Lechner & Dowling, 2003). Thus, SC investment is important for the founder because it will provide functional SC in the future (Lin, 1999) and it also appears to contribute to new venture survival over time. This finding confirms SC theory that a mix of strong and weak ties is necessary for firm development (Elfring & Hulsink, 2007; Hite & Hesterly, 2001; Lechner & Dowling, 2003). Future research could study what type of SC investment is particularly relevant for new venture survival.

The QCA approach allows analysis of both qualitative and quantitative data (Delbridge & Fiss, 2013; Fiss, 2007; 2011). Its strength is its ability to delve deeper into a topic by examining a single case. However, because we used quantitative data from PSED II and CAUSEE, such rich data were not available and our understanding of the particular pathways to success is limited. Further analysis would require qualitative data. Given the structure of the available datasets, we had to limit our study period to 5 years. However, a more definitive study could follow the sample over a longer period.

Another limitation from the limited information in the PSED II and CAUSEE datasets is that we were unable to examine specific contexts of each case. As a feature of the qualitative nature of QCA, context is important and could be incorporated in subsequent studies. Our study investigated initial resource endowments required by entrepreneurs for firm survival. We focused on the joint relationships between HC, SC, and FC from a subjectivist perspective. Alternative and complementary explanations were beyond the scope of our research. However, future research could examine alternative explanations using research models.

Similarly, HC, SC, and FC endowments say little about how entrepreneurs behave. Entrepreneurial orientation is related to firm survival (Lechner & Gudmundsson, 2014); however, it has not been considered in studies on capital endowments of entrepreneurs. This would be a fruitful route of inquiry.

Finally, the performance variable chosen was firm survival, which may be considered the minimum threshold of success for a new venture. It is likely that there are different pathways to survival, while outcome variables (e.g., growth) can be used to differentiate between firms that thrive and firms that merely continue to exist. Further research would be helpful for confirming the generalizability of our findings.

Contributions and Implications

This research contributes to entrepreneurship theory in three ways. First, we advocate a deeper analysis of initial capital endowments that founders require to achieve survival in the long run. We argue that there are methods of detailed analyses of resource combinations to provide information that regression-based methods cannot provide. We show that the contribution of one resource cannot be sufficiently understood when analyzed in isolation. Therefore, we move the focus from individual resources to resource combinations (Penrose, 1959) to complement research of the resource-based view (Barney, 1986; 1991), which tends to focus on a type of resource in isolation (Newbert, 2007).

Second, we contribute to the STE rooted in Penrose's (1959) influential work on firm growth. According to Penrose, the development of the firm depends on the resources controlled by the firm and the capacity to manage these resources. The STE has largely focused on how entrepreneurship is a subjective process of opportunity discovery based on experience and expectations (Kor et al., 2007) and has been thus far limited to subjective opportunity identification. We contribute to this literature by framing HC and SC as concrete factors that are subjective to the founder and functional for venture emergence and survival. Moreover, we look at configurations, that is, combinations of forms of capital that are the subjective starting base for entrepreneurship. Then, we focus on what configurations are necessary for exploiting an opportunity and associated with new venture survival. We also examined the subjective forms of capital that lead to the effective management of resources. Therefore, we extend the perception–pursuit nexus by proposing a perception–pursuit gap to identify the subjective configurations that are sufficient for both venture emergence and survival. Consequently, we extend the theory of subjectivist entrepreneurship by moving from subjective insights into new venture emergence to the subjective capacity to effectively exploit that opportunity. We complement the STE (Kor et al., 2007) and propose that the probability of failure is linked to the perception–pursuit gap.

Third, our study contributes to the research on development paths of entrepreneurial firms (Brush et al., 2001) by showing that different paths can lead to survival, but only through a reduced set of possibilities. Thus, both sufficient and insufficient starting conditions exist for firm survival. Fourth, in contrast to previous research findings on FC constraints, we argue that perceived capital constraints hide other forms of deficiencies because FC at the start of a venture is the least useful form of capital. Such a view highlights the notion of time in entrepreneurship or management in general. While theoretically all forms of capital may sooner or later lead to an operative and self-sustaining business, the question is what combinations of resources will enable a founder to reach these goals in time. Given this, the question of the speed with which other forms of capital should be acquired might be beneficial to study in the future.

Moreover, it might be that abundance of FC is related to overconfidence and that founders with FC are less aware of the perception–pursuit gap. Literature on serial entrepreneurs suggests that ease of access to FC is related to not only overconfidence but also a less strict evaluation of a potential opportunity relative to novice entrepreneurs (Kirschenhofer & Lechner, 2012). Future research could more investigate the specific role of FC in the perception–pursuit gap.

From a methodological perspective, this research has a few implications. A configurational analysis does not require a normally distributed data. Configurational approaches are based on

the fundamental premise that patterns of attributes will exhibit different features depending on how they are arranged (Fiss, 2007). Thus, configurational theory stresses nonlinearity, synergistic effects, and equifinality. Methodologically, configurational approaches are always superior to econometric methods if theory does not imply linearity, additive effects, and unifinality (Ragin, 2008). Our research demonstrates the potential of configurational approaches for STE.

We also argue that the application of regression analysis and QCA has one key advantage: While QCA cannot provide the effect sizes of measures in the way a regression-based analysis can, it can identify various resource interactions. Given the moderate frequency of each configuration, our findings imply that even interaction effects in regression models may not detect the complementary effects of variables. Replication studies of previous research with configurational analysis might be a promising research endeavor. Moreover, our research helps to reconcile contradictory findings, link separate findings (those focused on each resource type in isolation) on HC, SC, and FC, and reframe the question of complementary or substitution relationships; finally, our research relaxes assumptions about optimal resource endowments in favor of initial necessary capital endowments.

This research has practical implications. Entrepreneurs need to be aware that identifying an opportunity, on the one hand, and exploiting it, on the other, may require different resource sets. There may be a gap between what the founder has and what is required to exploit an opportunity. Consequently, the decision of when to start a business is less dependent on the capacity to see an opportunity and more dependent on the capacity to act on it. Further, money is unlikely to be the answer. Indeed, our research demonstrated that FC is an ineffective substitute in core configurations. Our findings help venture capitalists or other finance suppliers to identify which founder has the relevant resource bundles that are associated with higher probability of survival. Hence, our findings and research insights can inform the search process for valuable start-up investment opportunities for venture capitalists or other investors. Moreover, the potential gap between seeing and being able to act on an opportunity indicates that training and mentoring of founders after having identified an opportunity might be particularly valuable. For instance, accelerator programs claim to fulfill this function by improving the HC, SC, and the access to FC for founders. In general, the opportunity–pursuit gap would point to training activities during the venturing process.

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Notes

1. As capital is considered a potentially valuable resource, we use the terms “capital” and “resources” interchangeably.
2. Following the implications of STE, our study focuses on solo founders and not on founder teams because as a subjective act, opportunity recognition at the individual level differs significantly from that at the collective level.

3. Commonly used statistical methods in entrepreneurial research include multiple regression analysis, analysis of variance, correlation analysis, and structural equation modeling (Dean, Shook, & Payne, 2007; Mullen, Budeva, & Doney, 2009). These methods assume unifinality, additive effects, and causal-symmetric and linear relationships between the independent and dependent variables and, relative to configurational analysis, do not allow the analysis of interdependencies in causal conditions. By contrast, configurational analysis considers all potential resource combinations and derives sufficient conditions for new venture survival (and failure).
4. Resource complementarities exist when two or more resources generate more value when effectively combined than “the sum of the amounts of value they could create independently” (Adegbesan, 2009, p. 463). Consequently, differential outcomes may result from differing complementarities. However, even negative effects are plausible when resources are substitutes (Siggelkow, 2002).
5. A good overview on the methodology and access to data and questionnaires is available at <https://eprints.qut.edu.au/49327/>.
6. A description of the correction process is available in Shim and Davidsson (2018). We employed the proposed inverse probability weighting as a suitable adjustment for datasets with left truncation issues (for further information on length biased toward long duration start-ups in PSED and CAUSEE, see Shim & Davidsson, 2018).
7. Similar to other studies (Bitler, Moskowitz, & Vissing-Jørgensen, 2005), we created dummy variables for current employment status. We extracted individuals with full-time work (35 hr per week) as well as those who already own a business in which they worked full-time (35 hr per week). We assumed that other work responsibilities, especially for those who work on a full-time basis, would have negative impacts on the ability to mobilize resources for new ventures.
8. For example, in a regression analysis each factor contributes positively or negatively to the steepness of the slope: A single variable may be sufficient to hit a certain (performance) level.
9. Failing configuration A differs from configuration C in that it lacks parental start-up experience and mobilized SC. In terms of capital, it is an even poorer configuration, reinforcing the arguments of sufficiency for opportunity identification and insufficiency for exploitation.

Supplemental Material

Supplemental material for this article is available online.

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The Liability of Volatility and How it Changes Over Time Among New Ventures

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Abstract

This article theorizes how short-term revenue volatility affects new venture viability and how such volatility develops over time. Tracking the bank accounts of 6,578 new ventures over a 10-year period, we find that, even after controlling for a range of other factors, short-term revenue volatility is a strong predictor of venture exit. Although short-term revenue volatility is associated with the depletion of buffer resources and financial default, surviving ventures do not, on average, decrease their short-term revenue volatility over time. However, short-term revenue volatility decreases at the cohort level due to higher exit rates of volatile ventures.

Keywords

liability of newness, adaptation, selection, evolutionary theory, liability of smallness

Introduction

Short-term volatility is recognized as a serious issue for new ventures because it is believed to lead to involuntary firm exits (Bruton & Bamford, 2016; Hisrich, Peters, & Shepherd, 2013; Wiklund, Baker, & Shepherd, 2010). However, our knowledge of these linkages is based largely on anecdotal evidence and untested assumptions. Such evidence can be misleading (Wiklund, 1999). We do not know whether short-term volatility is associated with higher mortality rates among new ventures, whether it is higher among newer than older ventures, or how it develops over time. Whereas constructs such as new venture size and growth have received considerable attention (e.g., Aldrich & Auster, 1986; Coad, 2018; Delmar, McKelvie, & Wennberg, 2013; McKelvie & Wiklund, 2010; McKelvie, Brattström, & Wennberg, 2017; Wennberg, Delmar, & McKelvie, 2016), the extant literature provides only scattered theorizing about the effect of

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short-term volatility. So, although short-term volatility is believed to be important, there remain both theoretical and empirical gaps in our understanding of how it impacts on new ventures and how it develops over time. To build a reliable body of knowledge, we need large-scale longitudinal studies that span levels of analysis (Davidsson & Wiklund, 2001; Low & MacMillan, 1988).

This study begins to address these research gaps by theorizing and empirically investigating how short-term revenue volatility, as measured by volatility in monthly revenue streams, affects new venture viability and how this type of volatility develops over time in a cohort of new ventures. Like studies of longer term volatility, commonly captured by venture growth and decline (i.e., negative growth) based on annual data, there are several potential measures that are subject to volatility such as revenue, assets, number of employees, and profit (Shepherd & Wiklund, 2009). We focus on revenue because this is the most commonly used measure in such studies (Shepherd & Wiklund, 2009) and, as we outline in this article, there are theoretical reasons to believe that it affects new venture viability. We study a cohort of 6,578 new ventures that all started trading in early 2004. We track these ventures' bank accounts over a 10-year period or until they go out of business. The study analyzes both firm-level developments and aggregated cohort effects (i.e., how the composition of ventures in the cohort changes over time).

The article makes important theoretical contributions. First, by setting out the theoretical links connecting short-term revenue volatility to new venture viability, we contribute to the liability-of-newness literature (Stinchcombe, 1965). Previous studies have shown that there is a liability of smallness, which is separate from, yet intertwined with, the liability of newness (Aldrich & Auster, 1986; Coad, 2018). A major contribution to this literature is to show that short-term revenue volatility is a separate liability in its own right and to outline how the liability of volatility is related to the liabilities of newness and smallness. Our findings are of particular relevance to entrepreneurship research using financial measures to theorize on new venture viability (e.g., Storey, Keasey, Watson, & Wynarczyk, 1987; Wiklund et al., 2010; Wennberg et al., 2016).

Second, we contribute to the literature on evolutionary theory in the domain of entrepreneurship and organization studies (Aldrich & Ruef, 2006; Hannan & Freeman, 1977). In seeking to explain changes in the composition of cohorts of organizations over time, this literature importantly distinguishes between adaptation and selection mechanisms. To date, however, studies addressing these mechanisms simultaneously have tended to rely on theoretical arguments or computer simulations (e.g., Bruderer & Singh, 1996; Levinthal & Marino, 2015). Empirical studies have examined relatively large ventures (compared to the typical start-up) and changes to salient attributes, such as types of services offered or the types of niches occupied (Baum & Singh, 1996; Delacroix & Swaminathan, 1991; Usher & Evans, 1996). Such studies are informative but limited in their ability to assess whether adaptation in salient traits is the outcome of strategic foresight rather than imitation of successful firms. Our study remedies this limitation by providing insights into changes to attributes that are not easily observable for outsiders. Our study also contributes important insights into the longitudinal effects of adaptation and selection in the early parts of the venture life cycle, which have been highlighted as important areas for research (Delmar et al., 2013).

The remainder of the article proceeds as follows. The section "Theoretical Background and Hypotheses" provides the theoretical background and develops our hypotheses. The section "Data and Methodology" sets out the data and methodologies used to test the hypotheses. The section "Results" provides results, with these being discussed in the section "Discussion" and summarized in the concluding section "Conclusions and Practical Implications."

Theoretical Background and Hypotheses

As long ago as 1955, Beesley (1955) observed that the mortality rate of young manufacturing firms in Birmingham, United Kingdom, was considerably higher than that of their older counterparts. A decade later, Stinchcombe (1965) theorized that this was a characteristic of organizations more broadly, particularly of those that broke with tradition and adopted new forms. He referred to this as the “liability of newness” and argued that it reflected challenges that were specific to new organizations: the designing of new roles and routines, learning and establishing such roles and routines, developing social relations and trust between strangers inside the organization, and developing stable relationships with external stakeholders. In this article, we focus on new ventures, rather than the more specific cases of the liability of new forms or the more general case of new organizations.

While subsequent research has firmly demonstrated that new ventures experience considerably higher mortality rates than their older counterparts (Box, 2008; Thornhill & Amit, 2003; Yang & Aldrich, 2017), the specific mechanisms that underpin this outcome are still not sufficiently understood. Existing research suggests that the survival chances of new ventures can be increased by access to buffer resources such as cash reserves and/or a willingness to work extensive hours with little or no compensation (Shane, 2008; Wiklund et al., 2010). The consequence is that, for ventures with such buffers, the liability of newness has been described as a liability of adolescence, where the mortality rate of new ventures starts at a lower rate, grows as the buffers become exhausted, and then falls as the ventures become established (Brüderl & Schüssler, 1990; Fichman & Levinthal, 1991; Le Mens, Hannan, & Pólos, 2011).¹ New ventures tend to be supported by some buffer resources that allow for the initial establishment of routines and provide protection against fluctuations in venture performance, so raising their short-run survival rates (Frid, Wyman, & Coffey, 2016; Storey, 2011; Wiklund et al., 2010).

Because larger firms tend to have more buffer resources than smaller ones, venture size has been identified as an important factor explaining mortality rates in its own right and is referred to as the liability of smallness (Aldrich & Auster, 1986; Freeman, Carroll, & Hannan, 1983). Since most new ventures are also small, age and size are correlated so that the liability of smallness is intertwined with the liability of newness (Coad, 2018). The links between smallness and newness are both empirical (observed correlation between age and size) and theoretical, since the perils of being small also apply to why it is perilous to be new—such as the difficulty of recruiting employees and raising capital (Aldrich & Auster, 1986).

Ultimately, however, small and large ventures alike must generate a positive cash flow to survive (Venkataraman, Van De Ven, Buckeye, & Hudson, 1990). Cash flow is the total amount of money going into, and coming out of, a business in a given time period. It is positive when cash revenue exceeds outgoing payments and negative in the reverse case. Yang and Aldrich (2017) showed that although a range of other factors matter in establishing a new venture, achieving a positive cash flow for a single month was the single most important factor. This reduced the mortality rate of new ventures by 65%, whereas 10 years of industry work experience reduced the hazard of failing by 20% and previous startup experience had no significant effect.

Cash flow is consequently an important aspect of new venture viability, but we know little about how either revenue streams or expenses develop over time and how this is linked to new venture viability. While there is some quantitative research on how accounting and financial measures, including revenue, influence new venture survival, such studies are limited to annual data that lack measures of short-term flows (Delmar et al., 2013; Storey et al., 1987; Wiklund et al., 2010). This is a key limitation because it is widely believed that short-term revenue volatility (i.e., volatility within a year, such as monthly fluctuations) creates cash flow problems and

that such volatility, therefore, constitutes one of the most important threats to new ventures (Hisrich et al., 2013; Bruton & Bamford, 2016). Unfortunately, these beliefs have yet to be tested in large-scale longitudinal research.

Knowledge of how short-term revenue volatility develops over time is therefore crucial for our understanding of the liability of newness. Without it we do not know whether such volatility differs between new ventures and more established ventures. To better understand the differences between new and established ventures, we must move beyond the firm as the unit of analysis and also assess developments at the cohort level. For example, if there are differences in volatility between new and older firms, is this difference due to changes in individual firms or to selection/retention mechanisms that influence the composition of firms in a cohort, or some combination of the two? In the following sections, we home in on short-term revenue volatility, its effect on new venture performance, and how it develops over time.

Short-Term Revenue Volatility and Venture Exits

New ventures close for a variety of reasons (Gimeno, Folta, Cooper, & Woo, 1997; Jenkins & McKelvie, 2016; Wennberg & DeTienne, 2014). In some cases, this is because the venture is unable to meet its financial obligations, forcing the owner(s) to close the business. Some such exits reflect insolvency and, in a minority of cases, lead to bankruptcy for the owner(s). “Voluntary exits” are more typical. These take place when business ownership compares unfavorably to other options open to the founder(s), such as an alternative job, an alternative investment, retirement, or unemployment. Consequently, anything that lowers the perceived value of the venture in comparison to alternatives for the founder(s) will lower the venture’s relative viability (Coad, 2014). In this subsection, we theorize how short-term revenue volatility, *ceteris paribus*, is related, first to new venture viability and then to financial buffer resources.

Short-term revenue volatility and relative venture viability. We now identify four possible reasons why short-term revenue volatility might be expected to decrease a venture’s relative viability. The first is that *volatility makes it harder to plan ahead*: A volatile revenue stream makes it harder for a firm to evaluate its “average” size or “steady-state” scale of operations, because this changes from one month to the next. *A fortiori*, revenue volatility makes it more difficult to predict future demand for a firm’s products or services, thus making planning more difficult (cf., Bloom, 2014; Bo, 2001; Tuli, Bharadwaj, & Kohli, 2010). A firm that cannot accurately judge its needs in the short term will have difficulties planning for the longer term. A firm whose revenue streams fluctuate in the short term may also be distracted by flickering indicators and attempts at interpreting inconstant “micro-trends,” straining the entrepreneur’s cognitive abilities, and thereby devoting excessive attention to short-term issues. Consequently, less attention is directed toward the longer term strategic aspects of the venture’s operations, reducing the venture’s viability.

The second reason is that *volatility adds psychological stress*: Higher demand uncertainty leads to uncertainty over the amount and type of work that is required. While it is commonly known that high workloads can lead to high levels of stress, low workloads, especially in ambiguous circumstances, can also be stressful (Bruursema, Kessler, & Spector, 2011; Crawford, Lepine, & Rich, 2010). Demand uncertainty may also lead to unreliable remuneration or ultimately uncertainty about the existence of the job itself. Qualitative research suggests that variable and uncertain demand is a source of stress for entrepreneurs (Stephan, 2018) and a range of studies show that uncertainty is positively related to stress and negatively related to job satisfaction and commitment (e.g., Ashford, Lee, & Bobko, 1989; Paulsen et al., 2005; Pollard, 2001). For all these reasons, increased short-term revenue volatility will, *ceteris paribus*, reduce the

entrepreneurs' perceived value of the job provided by the venture in terms of their psychic utility and mental health, which in turn will reduce their commitment to the venture.

Third, *volatility adds a risk premium*: For two otherwise equal investments, the risk premium for a more volatile one will be higher (Bloom, 2014). Consequently, the valuation of a venture by its founder(s) will, *ceteris paribus*, be negatively influenced by short-term revenue volatility (Rountree, Weston, & Allayannis, 2008), which in turn reduces the venture's relative viability. Such volatility also leads to higher risk premia among any existing or potential external investors and may increase the cost of borrowing as lenders too may charge a risk premium.

Fourth, *volatility raises average costs*: In addition to the increased cost of credit, volatility in revenue streams may lead to higher average costs because the firm must continually adapt its scale of operations (e.g., paying employees overtime rates in some months and paying them to stay on with less work in leaner months; disrupting work and reassigning tasks while fluctuating between overuse and underuse of machines). Irrespective of any induced uncertainty, each time a firm changes its scale of operations, it incurs adjustment costs (e.g., costs of hiring new employees, costs of firing, costs of paying overtime, costs of inefficient overuse or underuse of machines, warehouse and storage costs). Adjustment costs are often assumed to be quadratic in any time period: Hence it is better to smooth any changes in inputs in response to demand shocks over a longer period of time, because larger changes in capital and machinery have disproportionately larger adjustment costs (Hamerossen & Pfann, 1996). Even when keeping the workforce constant, volatility will (as argued in the preceding text) induce stress, which comes at a cost in terms of increased risks of mistakes and injuries. Consequently, both unusually high and unusually low workloads reduce the perceived value of the jobs offered to any existing or potential employees hurting recruitment and/or retention. Finally, some aspects of revenue volatility increase costs via increased uncertainty (e.g., planning for contingencies that do not occur), while others increase costs even in situations of no uncertainty (e.g., adjustment costs of adapting to anticipated changes).

In short, all four reasons imply that, *ceteris paribus*, short-term revenue volatility will be negatively related to the relative viability of a new venture. We therefore hypothesize that:

Hypothesis 1 (H1): Short-term revenue volatility is negatively related to new venture survival.

Short-term revenue volatility and financial buffer resources. Maintaining a positive cash flow is essential for firms to survive over the long term (Venkataraman et al., 1990). However, survival is enhanced when ventures have access to financial buffers, so when cash flow turns negative, cash reserves become the first resort. Wiklund et al. (2010) suggested that high liquidity is beneficial to new ventures, in part because it protects against the volatility of revenue streams. A second very important financial buffer is provided by personal or family funding (Yang & Aldrich, 2017), but this is unavailable to low-wealth founders (Hvide & Møen, 2010). A third financial buffer is funding provided by an external financial institution in the form of a loan or overdraft.

When all such buffers are exhausted, ventures become vulnerable to the threat of having to cease trading, that is, they are at the boundary of their viability in an absolute sense (Coad, 2014). However, even when buffers are exhausted, the owners may favor continuing to trade over closing the venture, especially if they view the current conditions as temporary. In order to do so, however, they will have to rely on desperate measures, such as engaging in unauthorized borrowing from their bank by exceeding their overdraft limit. This type of borrowing is associated with punitive interest rates and a letter from the bank that such borrowing is unwelcome. This kind of risky financial activity is consequently a strong indicator that a venture has exhausted its available short-term financial buffer resources and balances on the boundary of absolute viability.

Short-term revenue volatility leads to the depletion of buffer resources for three reasons. First, any additional costs induced by volatility (as outlined in the previous section) contributes to the depletion of a venture's resources. Second, because a proportion of firm expenditure tends to be fixed, volatile revenue streams increase the risk of cash flow turning negative (Bruton & Bamford, 2016; Hisrich et al., 2013). Third, firms with higher revenue volatility generally need to set aside more resources, for example, by adding inventories to accommodate spikes in demand, which makes firms more vulnerable, should sufficient revenue streams not materialize (Bo, 2001). Resources dedicated to buffers against spikes in demand lock up cash, which could otherwise have been used as a buffer against negative cash flow (Hisrich et al., 2013). Given that the typical U.S. small business has less cash on hand than is needed to cover 1 month of expenses in the event of a total disruption in revenues (Farrell, Wheat, & Mac, 2016), revenue volatility, even over very short periods of time, can generate cash shortages for new ventures that exhaust their cash reserves, forcing them into unauthorized borrowing.

If, as we have theorized in the preceding text, volatility increases the risk of exhausting buffer resources, then there should be a positive relationship between short-term revenue volatility and the proportion of time a new venture spends in excess of the overdraft limit. We therefore hypothesize that:

Hypothesis 2 (H2): *Short-term revenue volatility is positively related to the proportion of time that new ventures spend in excess of the overdraft limit.*

If, as we have hypothesized, short-term revenue volatility is negatively related to new venture survival, then this could explain why younger ventures have higher mortality rates than their older counterparts (Stinchcombe, 1965). However, for this to be the case, short-term revenue volatility needs to decrease with time and/or its effect needs to become less adverse with time. We now theorize how short-term revenue volatility evolves over time in a cohort of new ventures.

Changes in Cohorts of Organizations: Selection and Adaptation

The characteristics of a cohort can change through selection or adaptation mechanisms, or a combination of both (Aldrich & Ruef, 2006; Baldwin & Rafiquzzaman, 1995; Hannan & Freeman, 1977). Selection refers to the removal of selected members from the cohort through exits,² and adaptation refers to changes in individual organizations that influence how it is interacting with its environment, including its relations and interactions with other organizations (Hodgson, 2013). In a pure model of selection, ventures cannot change their underlying capabilities, and instead the population evolution is driven by the selective elimination of ventures with lower "fitness" (Jovanovic, 1982). In contrast, in a pure model of adaptation, the ventures never die, but individual ventures and their owners can adapt and learn (Cope, 2005; Ericson & Pakes, 1995; Minniti & Bygrave, 2001; Politis, 2005), thus changing the aggregate cohort composition. Adaptation and selection may pull in different directions, but together they explain all changes at the cohort level (Hodgson, Herman, & Dollimore, 2017).

Mathematical decomposition of adaptation and selection. The evolution of a cohort's short-term revenue volatility can be mathematically decomposed into adaptation and selection as follows. At the start of the period, denoted by time t , the average volatility of ventures i in the cohort of N ventures can be written as follows:

$$\overline{\text{vol}}_t = \frac{\sum_{i=1}^N \text{vol}_{it}}{N} \quad (1)$$

The average volatility of the M surviving ventures (with $M \leq N$) at the end of the period (i.e., at time $t+\tau$) can be written as:

$$\overline{\text{vol}_{t+\tau}} = \frac{\sum_{i=1}^M \text{vol}_{i,t+\tau}}{M} \quad (2)$$

This change in average volatility can be due to two factors: selection and adaptation. Selection refers to the change in average volatility that is due to the selection of M surviving ventures from the N initial ventures. The average volatility, evaluated at the initial period t , of the M surviving ventures, can be written as:

$$\overline{\text{vol}_{t,M}} = \frac{\sum_{i=1}^M \text{vol}_{it}}{M} \quad (3)$$

Hence, the contribution of selection to changes in average volatility is the difference between (1) and (3), that is, the effect of selection on average volatility is equal to:

$$\frac{\sum_{i=1}^M \text{vol}_{it}}{M} - \frac{\sum_{i=1}^N \text{vol}_{it}}{N} \quad (4)$$

which can be positive or negative, depending on whether the first term (initial average volatility, evaluated at time t , of the M ventures that survive until $t+\tau$) is larger than the second term (initial average volatility of all N ventures).

The contribution of adaptation refers to the changes over time within the same group of surviving ventures M , from the start of the period (equation (3)) to the end of the period (equation (2)), that is, the effect of adaptation is equal to:

$$\frac{\sum_{i=1}^M \text{vol}_{i,t+\tau}}{M} - \frac{\sum_{i=1}^M \text{vol}_{it}}{M} \quad (5)$$

Selection effects and adaptation effects are therefore conceptually distinct and, between them, account for all the change from average volatility at the beginning of the period (equation (1)) to average volatility at the end of the period (equation (2)).

Adaptation mechanisms and short-term revenue volatility. The literature highlighting adaptation mechanisms suggests that entrepreneurs and their organizations are able to learn and adapt their behavior to better cope with internal and external challenges (e.g., Covin, Green, & Slevin, 2006; Minniti & Bygrave, 2001; Yli-Renko, Autio, & Sapienza, 2001; Zahra, Ireland, & Hitt, 2000). For performance-improving adaptation to occur, two conditions must be met. First, organizations must be flexible enough to allow for the implementation of change initiatives. Although this may be a problem for established organizations because of factors such as sunk costs, internal political resistance, and taken-for-granted ways of thinking (Hannan & Freeman, 1977), it is less relevant for new ventures. Second, organizational decision makers must be able to evaluate, with some level of accuracy, the appropriateness of change initiatives. The literature on organizational learning and entrepreneurial learning argues that new ventures are able to change and to do so with some accuracy based on the feedback they receive (Minniti & Bygrave, 2001). This literature claims not only that entrepreneurs learn from previous experiences (Baù, Sieger, Eddleston, & Chirico, 2017) but also that new ventures learn differently and more effectively than established organizations (e.g., Sapienza, Autio, George, & Zahra, 2006; Zahra et al., 2000).

If short-term revenue volatility has a negative effect on viability, then “learning” by new ventures might be reflected in reductions in volatility. This might require ventures to establish and maintain stable and recurrent relationships with customers which, in turn, lowers customers’ perceived uncertainty (Shepherd, Douglas, & Shanley, 2000). Routinization of organizational activities is the key to stable operations and forms the foundation for stable relationships with customers (Stinchcombe, 1965; Yang & Aldrich, 2017). Furthermore, the learning and adaptation literature suggests that, with time, the founder(s) and employees accumulate experience, which reduces the likelihood of unexpected disruptions to business operations. They may also learn about how customer preferences change, how to accommodate such changes, and how to shift demand from peaks to troughs.

In addition, stable revenue streams depend on new venture capabilities of billing, collections, and cash management (Wu & Knott, 2006), which we refer to as working cash management. Evidence, albeit from self-report data, of working cash management among small- and medium-sized enterprises (SMEs) is provided by Howorth and Westhead (2003). They find a great variability in practices among small and young ventures. Thus, given new venture learning, such practices would be expected to improve with time among surviving new ventures. Overall, therefore we hypothesize that:

Hypothesis 3a (H3a): Adaptation effects decrease average short-term revenue volatility in a cohort of new ventures.

Selection mechanisms and short-term revenue volatility. Change in the composition of a cohort of ventures also occurs because the ventures exhibiting traits lowering their viability are eliminated from the cohort more frequently. As outlined in the theorizing leading up to Hypothesis 1, there are several reasons why short-term revenue volatility would be associated with increased mortality rates. Consequently, if Hypothesis 1—that short-term revenue volatility is adversely related to new venture survival—is true, then, in a cohort of new ventures, those with higher short-term revenue volatility would face higher risks of being selected out of the cohort, contributing to the lowering of the average short-term revenue volatility among those that remain in the cohort. Evolutionary theory therefore suggests that adverse selection based on short-term revenue volatility at the individual firm level should translate into a reduction in the average short-term revenue volatility at the cohort level of analysis. We therefore hypothesize:

Hypothesis 3b (H3b): Selection effects decrease average short-term revenue volatility in a cohort of new ventures.

Data and Methodology

Sample and Data

This study uses the dataset developed by Coad, Frankish, Roberts, and Storey (2016), which tracks 6,578 new ventures over a 10-year period.³ The dataset relies on data from the customer records of Barclays Bank. The only poststart data used in this study are those on financial transactions, with all other data being collected at, or immediately prior to, start. The new ventures are drawn from all sectors, except financial services, and all regions in England and Wales. The ventures started trading between May and June of 2004. This dataset comprises new venture account openings—it is not limited to those new ventures obtaining a bank service such as a loan

or overdraft.⁴ The dataset captures a large and representative sample of new ventures including the “short-life” new ventures (Batjargal et al., 2013; Coad et al., 2016).

Dependent and Independent Variables

Survival is the dependent variable in Hypothesis 1 and refers to the venture continuing operations, that is, the absence of exit. We do not distinguish between different types of exit (cf. Headd, 2003; Wennberg, Wiklund, DeTienne, & Cardon, 2010), nor do we frame exit in terms of individual- or firm-level failure (Jenkins & McKelvie, 2016). Every 6 months, all dormant accounts were identified. If they continued to be dormant for another 6 months, it was assumed the exit took place at the start of the first 6-month period. We checked exit routes and excluded ventures that were still trading but had switched to another bank.

Our dependent variable for the testing of Hypothesis 2 is time spent in excess of overdraft (*OD XS time*), which is the proportion of time a new venture spends in excess of the allowed overdraft limit each year. For example, if a venture spends 15 days in excess of the overdraft limit, then this would correspond to a value of 0.04 (i.e., 15/365).

Our main explanatory variable is short-term revenue volatility (*Volatility*). We operationalize short-term revenue volatility as the standard deviation in monthly credit turnover⁵ over a 12-month period divided by the mean monthly turnover for that period.⁶ This serves as a close approximation to sales revenue volatility, inclusive of taxes, and so is the term used throughout the article. The measure is conceptually distinct from the size of the new venture in the sense that it is the fluctuations relative to size that are captured, rather than standard deviation in an absolute sense.

Control Variables

The size and growth of new ventures have been put forward as key determinants of a firm’s survival chances (Le Mens et al., 2011). Our indicator of size is (the natural logarithm of) credit turnover over a period of 12 months appropriately deflated to remove inflation⁷ (*Log_revenues*). Growth of revenues (*Gr_revenues*) for venture i in year t is measured in the usual way by taking log-differences (Törnqvist, Vartia, & Vartia, 1985): $\text{Growth}(i,t) = \log(\text{size}(i,t)) - \log(\text{size}(i,t-1))$. Our measure is reliable and comprehensive because it does not rely on self-reports since every financial transaction going through this account is documented.

We also control for the “usual suspects” that previous work has identified as having an influence on new venture survival (and entrepreneurial performance more generally). These include legal form, age, industry, and region of the firm; and number, age, education, and previous business experience of the owner(s). Legal form has been shown to be a significant determinant of new venture outcomes, with companies and partnerships generally having higher survival rates than sole proprietorships (Storey, 1994). Likewise, firm age is known to affect viability (Stinchcombe, 1965). We therefore control for legal form (*LegalF*) and firm age (*Firm age*). We also include region and industry dummies (*Region* and *Industry*) in our regressions (Ahlers, Cumming, Günther, & Schweizer, 2015) to control for region-specific and industry-specific components of survival (e.g., Botham & Graves, 2011; Dencker, Gruber, & Shah, 2009).

Founder age is expected to have a broadly positive relationship with new venture survival (Baù et al., 2017) being lowest amongst the young and inexperienced (Parker, 2018); hence, we control for founder age (*Founder age*) and founder age squared (*Founder age_sq*). The number and the gender of owner(s) are controlled for (*No. owners*, *Male owners* and *Female owners*), because a case has been made that they affect new venture survival (Klotz, Hmieski, Bradley, & Busenitz, 2014). The education of the founder (Parker, 2018) and also the amount of previous

(personal or parental) business experience (Dencker et al., 2009; Gimeno et al., 1997) are seen by some to capture different dimensions of human capital, and perhaps higher levels of entrepreneurial skills and capabilities, thus enhancing the survival of the business (variables *Education*, *Parental bus. exp.*, and *Personal bus. exp.*).⁸ There is more mixed evidence on the role played by sources of advice used by founders and new venture survival and performance (Chrisman & McMullan, 2004; Rotger, Gørtz, & Storey, 2012), but to allow for a possible influence of these variables we include dummies for eight different sources of advice (*Sources of advice*). We also include control variables relating to financial management that have not usually been included in previous investigations for reasons of data limitations; these variables relate to the authorized and unauthorized use of overdraft facilities: *OD limit*, *OD limit use*, *OD limit extent*, *OD XS*, and *OD XS time*. All variables used are further explained in Table 1, and descriptive statistics are provided in Table 2.

Statistical Tests and Hypothesis Testing

Hypothesis 1 is tested by investigating the relationship between *Volatility* and new venture survival, controlling for a range of other possible influences. Because *Volatility* is calculated over a 1-year period based on monthly revenue, it requires a new venture to survive for the full period to allow for meaningful calculation. Consequently, we investigate the relationship between lagged short-term revenue volatility and survival, for each year. That is, we investigate the relationship between *Volatility* in year $t-1$ and survival in year t . *Survival* is a dichotomous variable, observed for each year, so we use discrete-time logistic duration models (Coad, Frankish, Roberts, & Storey, 2013; Jenkins, 1995; Wiklund et al., 2010). Hypothesis 2 is tested by investigating the relationship between *Volatility* and *OD XS time*, controlling for other influences.

Results are shown in Table 3 and illustrated in Figure 1. Ordinary least squares (OLS) regressions for testing Hypothesis 1 are presented,⁹ together with panel “within” regressions that control for possible unobserved time-invariant components in overdraft behavior, by including firm-specific “fixed effects” (Wooldridge, 2010). Possible multicollinearity was investigated by inspecting the correlation matrix and the variance inflation factor (VIF) statistics and was deemed not problematic (analyses available from the authors). The inclusion of lagged variables means we can only present regression results from Year 3 onward.

Selection was investigated by comparing those ventures that got selected out of the cohort with those that survived, and the effects of adaptation by comparing surviving ventures to themselves over time (as outlined in the section “Short-Term Revenue Volatility and Venture Exits”). Support for Hypotheses 3a and 3b would require that any decrease in *Volatility* over time, due to selection or adaptation, should be statistically significantly different from zero. The results are presented in Table 4 and Figure 2. To address issues associated with regression to the mean (Chen & Chen, 2010), we assess the general trend in adaptation for those surviving for the full duration of our study, presented in Figure 3.

Results

Short-Term Revenue Volatility and Venture Performance

Table 3 Column (2) shows our baseline results that *Volatility* in 1 year is a strong predictor of new venture exit the following year. Hypothesis 1 is therefore supported. Figure 1 depicts the mortality rates for the new ventures in our sample from Year 3 to Year 10 for new ventures with low (high) *Volatility*, using estimates from cross-sectional year-wise regressions (not shown here), based on whether the observation is in the lowest (highest) tercile of the *Volatility* distribution for

Table 1. Variable Definitions.

Variable	Description
Volatility	Short-term revenue volatility (<i>SD</i> of monthly turnover/mean monthly turnover)
Log_revenues	Natural logarithm of credit turnover during focal year. Values are expressed in 2004 GDP by applying the World Bank's Consumer Price Index deflator for the UK, taking 2004 as the benchmark.
Gr_revenues	Change in natural logarithm of credit turnover between focal year and previous year
LegalF	Legal form of business: 1 = Company ^a , 2 = Partnership, 3 = Sole Trader
Industry ^b	Business activity: 1 = Agriculture, 2 = Manufacturing, 3 = Construction, 4 = Retail, 5 = Transport, 6 = Accommodation, 7 = Information, 8 = Real Estate, 9 = Professional, 10 = Administrative,
Region ^b	11 = Education, 12 = Health, 13 = Arts, 14 = Other. Converted into dummy variables, one for each industry. Region: 1 = East Midlands, 2 = East of England, 3 = London, 4 = North East, 5 = North West, 6 = South East, 7 = South West, 8 = West Midlands, 9 = Yorkshire and The Humber, 10 = Wales. Converted into dummy variables, one for each region.
Firm age ^b	Dummy variable for each individual year.
No. owners	Number of owners
Male owners	Male owner(s) only: 0 = No, 1 = Yes
Female owners	Female owner(s) only: 0 = No, 1 = Yes
Founder age	Mean age of owner(s) at startup
Founder age_sq	Square of Founder age
Education	Highest level of educational attainment by owner(s), in terms of the National Vocational Qualification (NVQ) scale: 1 = <NVQ2 ^a , 2 = NVQ2, 3 = NVQ3, 4 = NVQ4+
Parental bus. exp.	Previous business experience, Family: 0 = No, 1 = Yes
Personal bus. exp.	Previous business experience, Owner: 0 = No, 1 = Yes
Sources of advice	
EABL	Advice/support, Enterprise Agency/Businesslink: 0 = No, 1 = Yes
Accountant	Advice/support, Accountant: 0 = No, 1 = Yes
Solicitor	Advice/support, Solicitor: 0 = No, 1 = Yes
College	Advice/support, College: 0 = No, 1 = Yes

(Continued)

Table I. Continued

Variable	Description
SR seminar	Advice/support, (Barclays) Start Right Seminar: 0 = No, 1 = Yes
PYBT	Advice/support, Prince's Youth Business Trust: 0 = No, 1 = Yes
Family	Advice/support, Family/friends: 0 = No, 1 = Yes
Other	Advice/support, Other source(s): 0 = No, 1 = Yes
OD limit	Approved overdraft limit available during (all or part of) year: 0 = No, 1 = Yes
OD limit use	Use of approved overdraft limit during focal year: 0 = No, 1 = Yes
OD limit extent	Average maximum proportion of approved overdraft limit used during focal year
OD XS	Excess use of overdraft during year x: 0 = No, 1 = Yes
OD XS time	Proportion of time spent in excess of overdraft limit during focal year
FinDef	Binary variable. Takes value one if the firm is recorded as entering financial default at any point in the year; otherwise takes value 0. Used as an alternative dependent variable in the robustness analysis.

GDP: gross domestic product; SD, standard deviation.

^aUsed as reference in regression thus omitted.

^bIncluded in regression, but results not reported due to space limitations.

Table 2. Summary Statistics for Year 1.

Variable	Mean	Median	SD	Skewness	Kurtosis	Min	Max	N
Founder age	39.039	38.157	10.224	0.424	2.753	16.197	78.160	6,569
No. owners	1.322	1	0.578	2.128	9.410	1	6	6,561
Male owners	0.669	1	0.471	-0.719	1.517	0	1	6,561
Female owners	0.190	0	0.393	1.576	3.485	0	1	6,578
Education_1	0.228	0	0.419	1.300	2.689	0	1	6,578
Education_2	0.332	0	0.471	0.716	1.512	0	1	6,578
Education_3	0.171	0	0.377	1.747	4.053	0	1	6,578
Education_4	0.270	0	0.444	1.037	2.075	0	1	6,578
Parental bus. exp.	0.633	1	0.482	-0.552	1.305	0	1	6,578
Personal bus. exp.	0.720	1	0.449	-0.982	1.965	0	1	6,578
Sources of advice								
EABL	0.102	0	0.303	2.625	7.888	0	1	6,578
Accountant	0.362	0	0.480	0.577	1.332	0	1	6,578
Solicitor	0.049	0	0.215	4.188	18.544	0	1	6,578
College	0.040	0	0.196	4.696	23.053	0	1	6,578
SR seminar	0.007	0	0.086	11.457	132.252	0	1	6,578
PYBT	0.014	0	0.116	8.422	71.924	0	1	6,578
Family	0.300	0	0.458	0.871	1.758	0	1	6,578
Other	0.064	0	0.245	3.563	13.693	0	1	6,578
LegalF_1 (Company)	0.372	0	0.483	0.530	1.281	0	1	6,578
LegalF_2 (Partnership)	0.133	0	0.340	2.155	5.646	0	1	6,578
LegalF_3 (Sole trader)	0.495	0	0.500	0.022	1.000	0	1	6,578
Revenue (2004 GBP)	114110	38734	508723	46.439	2805	31	31963724	5,523
Volatility	0.843	0.676	0.601	1.679	6.282	0	3.464	5,523
OD limit	0.195	0	0.396	1.538	3.366	0	1	6,578
OD limit use	0.186	0	0.389	1.611	3.596	0	1	5,523
OD limit extent	0.041	0	0.118	3.658	17.714	0	0.93	5,523
OD XS	0.407	0	0.491	0.377	1.142	0	1	5,523
OD XS time	0.041	0	0.103	3.754	19.837	0	1	5,523

SD, standard deviation.

the preceding year. While *Volatility* has large and statistically significant effects on *Survival*, there is no strong relationship between the studied human capital variables (i.e., previous business start-up experience or education) and new venture survival.¹⁰ In further analysis (not shown here), the coefficients, and thus the odds ratios, for the impact of *Volatility* on venture survival was relatively stable over the years and there was no clear trend in its development.¹¹ Thus, there is no indication that the adverse effects of short-term revenue volatility on venture survival tend to decrease with time.

Columns (8) and (9) of Table 3 show that *Volatility* is positively related to *OD XS time*, and this effect is statistically significant. Hypothesis 2 is supported and implies that an increase in *Volatility* of one standard deviation is associated with an increase of time in unauthorized overdraft excess of 7.67 days.¹²

Table 3. Regression Results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Survival	Survival	Survival	Survival	Survival	FinDef	OD XS time	OD XS time	OD XS time
Model	Controls	All	Small	Large	Nonzero	All	Controls, OLS	All, OLS	All, FE
Founder age	0.0614** (0.0144)	0.0683** (0.0147)	0.0752** (0.0199)	0.0747** (0.0220)	0.0727** (0.0265)	-0.0290 (0.0341)	-0.00148 (0.000792)	-0.00174** (0.000787)	
Founder age_sq	-0.000638*** (0.000170)	-0.000702*** (0.000236)	-0.000783*** (0.000258)	-0.000759*** (0.000313)	-0.000810*** (0.000416)	0.000231 (9.09e-06)	5.60e-06 (9.04e-06)	8.16e-06 (9.04e-06)	
No. owners	-0.0283 (0.0497)	0.0166 (0.0504)	-0.0332 (0.0910)	0.0504 (0.0622)	0.129 (0.0973)	-0.170 (0.126)	-0.000832 (0.001188)	-0.00304 (0.00186)	
Male owners	-0.296*** (0.0812)	-0.279*** (0.0819)	-0.369** (0.149)	-0.221* (0.102)	-0.253 (0.158)	0.0189 (0.184)	0.00760* (0.00331)	0.00668* (0.00328)	
Female owners	-0.474*** (0.0944)	-0.487*** (0.0954)	-0.645*** (0.159)	-0.363*** (0.131)	-0.615** (0.181)	-0.0200 (0.215)	-0.00344 (0.00421)	-0.00326 (0.00419)	
Education_2	0.0261 (0.0605)	0.0319 (0.0612)	-0.0153 (0.0858)	0.0523 (0.0894)	-0.170 (0.114)	-0.213 (0.124)	-0.00907** (0.00301)	-0.00890** (0.00298)	
Education_3	-0.0393 (0.0714)	-0.00417 (0.0723)	-0.0258 (0.105)	-0.00973 (0.102)	-0.0625 (0.137)	-0.252 (0.152)	-0.0116** (0.00341)	-0.0113** (0.00339)	
Education_4	-0.0522 (0.0674)	0.0410 (0.0689)	-0.00486 (0.101)	0.0744 (0.0966)	0.0798 (0.133)	-0.111 (0.142)	-0.00979** (0.00326)	-0.0138** (0.00325)	
Parental bus. exp.	0.00278 (0.0470)	1.79e-05 (0.0479)	0.00479 (0.0674)	-0.00263 (0.0697)	-0.0985 (0.0905)	-0.104 (0.0993)	0.00259 (0.00213)	0.00260 (0.00211)	
Personal bus. exp.	-0.0132 (0.0532)	0.0127 (0.0541)	-0.00107 (0.0709)	-0.00417 (0.0852)	-0.0402 (0.0996)	-0.0237 (0.118)	0.0116** (0.00260)	0.0103** (0.00257)	
Sources of advice									
EABL	0.101 (0.0794)	0.0751 (0.0814)	0.220* (0.105)	-0.175 (0.126)	0.131 (0.152)	0.0218 (0.167)	0.00637 (0.00392)	0.00703 (0.00390)	
Accountant	0.0168	0.0138	0.0587	-0.0168	-0.196*	-0.112	0.00698** (0.00681**)	0.00698** (0.00681**)	

(Continued)

Table 3. Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Solicitor	(0.0483) -0.0963	(0.0491) -0.0681	(0.0732) -0.219	(0.0686) 0.0579	(0.0911) 0.0514	(0.105) 0.495*	(0.00222) -0.00258	(0.00220) -0.00361	
College	(0.106) 0.318** (0.121)	(0.108) 0.316** (0.126)	(0.169) 0.410* (0.166)	(0.152) 0.158 (0.188)	(0.205) 0.177 (0.222)	(0.212) 0.299 (0.214)	(0.00499) 0.00108 (0.00551)	(0.00493) 0.00244 (0.00545)	
SR seminar	-0.188	-0.157	-0.442	0.408	-0.821	-0.368	0.0632** 0.0588*		
PYBT	(0.296) 0.122	(0.311) 0.106	(0.397) 0.0677	(0.489) -0.0499	(0.491) -0.116	(0.543) -0.406	(0.0244) 0.0363*	(0.0242) 0.0350*	
Family	(0.243) 0.0105	(0.253) -0.00247	(0.277) 0.0104	(0.624) -0.00824	(0.478) -0.0673	(0.511) -0.0179	(0.0176) 0.00737** 0.00789**	(0.0172) 0.00789** 0.00789**	
Other	(0.0514) -0.0835	(0.0521) -0.0897	(0.0731) -0.163	(0.0759) -0.0619	(0.0939) -0.133	(0.108) 0.350*	(0.00254) 0.00675	(0.00252) 0.00645	
LegalF_2 (Partnership)	(0.0935) -0.347**	(0.0953) -0.486**	(0.125) -0.337**	(0.149) -0.601**	(0.178) -0.564**	(0.177) -0.234	(0.00461) -0.00330	(0.00460) 0.00335	
LegalF_3 (Sole trader)	(0.0788) 0.0771	(0.0797) -0.0192	(0.138) 0.0726	(0.104) -0.123	(0.155) -0.0702	(0.188) 0.0962	(0.00364) 0.00576*	(0.00364) 0.00645	
Log_revenues (lagged)	(0.0585) 0.198**	(0.0596) 0.0681**	(0.0900) 0.136**	(0.0835) 0.0536	(0.1113) 0.145**	(0.122) 0.147**	(0.00276) -0.0134** -0.0134**	(0.00276) 0.00992** -0.00256**	
Gr_revenues (lagged)	(0.0186) 0.354**	(0.0194) 0.272**	(0.0339) 0.208**	(0.0324) 0.265**	(0.0410) 0.484**	(0.0403) -0.0979	(0.00101) -0.0233** -0.0196**	(0.00102) -0.00322 -0.00245	
Volatility (lagged)	(0.0327) -0.648**	(0.0300) -0.478**	(0.0442) -0.853**	(0.0459) -0.053**	(0.0735) -1.121**	(0.0535) 0.154*	(0.00227) 0.0348** 0.0340**	(0.00227) 0.00346 0.00340**	
OD limit (lagged)	0.102	0.0606	-0.0719	0.117	0.182	0.653**	0.0632** 0.0637**	0.00268) 0.00227 0.00245	
OD limit use (lagged)	(0.100) -0.0645	(0.100) -0.00530	(0.179) 0.142	(0.127) -0.0525	(0.183) 0.234	(0.191) 0.378	(0.00613) -0.0307** -0.0322**	(0.00607) -0.0409** -0.0409**	

(Continued)

Table 3. Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
OD limit extent (lagged)	(0.117) 0.0475	(0.117) -0.0560	(0.213) -0.153	(0.145) 0.00644	(0.216) -0.334	(0.205) 0.468	(0.00652) -0.0732**	(0.00646) -0.0681**	(0.00695) -0.0872**
OD XS (lagged)	(0.157) -0.302***	(0.158) -0.302***	(0.279) -0.213***	(0.195) -0.373***	(0.290) -0.235*	(0.264) 1.701***	(0.00484) 1.701***	(0.00480) 1.701***	(0.00797) 1.701***
OD XS time (lagged)	(0.0511) -1.797***	(0.0520) -1.613***	(0.0756) -1.607***	(0.0731) -1.737***	(0.0970) -1.690***	(0.149) 3.218***			
Observations	10,144 18,219	(0.145) 18,219	(0.191) 7,803	(0.231) 10,416	(0.282) 10,960	(0.206) 18,219	19,425 19,425	19,425 4,146	
Number of panel ID									
Adjusted R ²						0.132	0.147	0.146	
Pseudo R ²	0.131	0.150	0.131	0.172	0.181	0.228			
Log likelihood	-6997	-6841	-3263	-3530	-2257	-1920	10526	10697	20302
Log likelihood, constant only	-8052	-8052	-3757	-4263	-2756	-2488	9122	9122	18756

Note. Constant term, region and industry dummies, and firm age dummies (i.e., year dummies) are included in the regressions, but not reported here. Robust standard errors in parentheses.

Key to significance stars: *** p < .01, * p < .05.

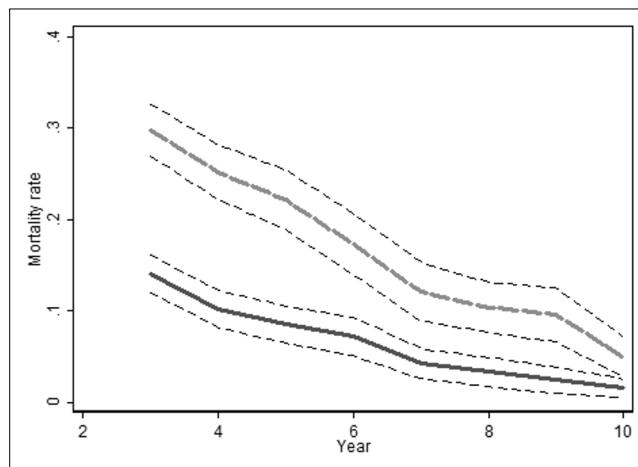


Figure 1. Mortality rates across years, for firms with high or low *Volatility*.

Mortality rates in year t based on marginal effects of being in a high or low *Volatility* tercile in year $t-1$, where all other variables are fixed at their mean values. Thick solid line: ventures in the lowest tercile of *Volatility*. Thick dashed line: ventures in the highest tercile of *Volatility*. Thin dashed lines denote 95% confidence intervals. New ventures are classified as having low (high) *Volatility*, based on whether the observation is in the lowest (highest) tercile of the *Volatility* distribution for that specific year.

Robustness Analysis for Firm-Level Regressions

Columns (3) and (4) show similar results for subsamples of small and large firms (i.e., those with below- or above-median sales in their first year). One possible concern could be that some firms have revenue models that are affected by intermittent seasonal demand, such that they have zero sales in some months and positive sales in other months. We verify that seasonality is not a major factor by repeating the analysis on a restricted subsample of firms with nonzero sales in each of the 12 months in a year. Column (5) of Table 3 presents these results, for the subsample of firms with nonzero revenues in each of the 12 months of the year. For this subsample, the coefficient on *Volatility* remains negative and significant and actually increases substantially in magnitude. This provides assurance that our results are not being driven by a category of firms with zero sales in some months, but that *Volatility* is detrimental to survival even among a subsample of firms that have nonzero revenues in every month of the year. To address concerns that our results are influenced by “successful exits,” we repeat our survival regressions by taking financial default (*FinDef*), rather than *Survival*, as an alternative dependent variable (see Table 1 for a variable description). Column (6) shows that *Volatility* is statistically significantly related to entry into financial default.

Finally we explored the robustness of our results by repeating our analysis on industry-disaggregated subsamples and obtained broadly similar results.¹³ To address the concern that industry dummies are an imperfect way to account for sectoral heterogeneity, we also created a firm-specific baseline short-term revenue volatility (taking the average for *Volatility* in a firm’s first 5 years) and then regressed survival on a firm’s idiosyncratic deviations from its firm-specific volatility benchmark. This further confirmed that higher-than-usual short-term revenue volatility decreases a firm’s survival chances. We also repeated our analysis by dropping outliers at both ends of the *Volatility* distribution (with thresholds of 1% and 5% at each end) and again obtained similar results, which are available from the authors upon request.

Table 4. Decomposing the Changes in the Cohort's Average Volatility Into Between and Within Effects, During the Period T:t + s.

	<i>s = 2</i>	<i>s = 3</i>	<i>s = 4</i>	<i>s = 5</i>	<i>s = 6</i>	<i>s = 7</i>	<i>s = 8</i>	<i>s = 9</i>	<i>s = 10</i>
Average initial volatility	0.843	0.843	0.843	0.843	0.843	0.843	0.843	0.843	0.843
<i>SE of the mean</i>	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
No. obs	5,523	5,523	5,523	5,523	5,523	5,523	5,523	5,523	5,523
Average initial volatility (at <i>t</i> = 1) of survivors until year <i>s</i>	0.774	0.765	0.745	0.733	0.730	0.727	0.728	0.729	0.732
<i>SE of the mean</i>	0.009	0.010	0.011	0.011	0.012	0.013	0.014	0.014	0.015
No. obs	4,161	3,209	2,592	2,151	1,822	1,604	1,424	1,311	1,208
Average final volatility (at <i>t</i> = <i>s</i>) of survivors until year <i>s</i>	0.823	0.809	0.794	0.791	0.777	0.734	0.707	0.716	0.703
<i>SE of the mean</i>	0.010	0.012	0.013	0.014	0.015	0.015	0.016	0.017	0.017
No. obs	4,161	3,209	2,592	2,151	1,822	1,604	1,424	1,311	1,208
Share of the reduction in volatility due to selection	334.16%	226.84%	197.97%	211.19%	171.28%	106.22%	84.67%	89.50%	78.87%
t-test p values for selection	**	**	**	**	**	**	**	**	**
Share of the reduction in volatility due to adaptation	-234.16%	-126.84%	-97.97%	-111.19%	-71.28%	-6.22%	15.33%	10.50%	21.13%
t-test p values for adaptation	NA								

NA, not applicable; SE, standard error.

** $p < .01$, * $p < .05$, NS $p > .05$,

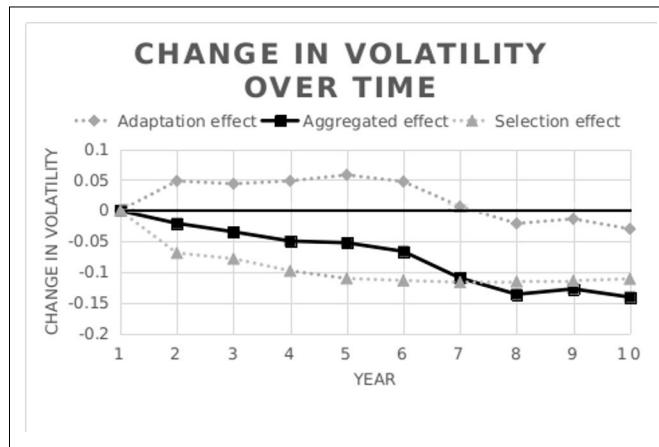


Figure 2. Decomposing the aggregate change in *Volatility* into selection effects and adaptation effects.

Selection and Adaptation

Figure 2 and Table 4 present the evolution of *Volatility* over different timescales as outlined in the section “Short-Term Revenue Volatility and Venture Exits”; *t* tests show that the reduction of *Volatility* due to selection is statistically significant in each year. They also show that the reduction in *Volatility* due to adaptation is never statistically significant. In fact, at shorter timescales of 1–6 years, *Volatility* appears to be rising slightly within surviving new ventures, instead of decreasing, indicating “negative” adaptation effects.

Our interpretation of this is based on the idea that less *Volatility* is preferable, given how strongly *Volatility* predicts venture exit. However, if there is an element of randomness to short-term revenue volatility, which is reasonable, then an increase in such volatility among survivors could be explained by regression to the mean effects (Chen & Chen, 2010).¹⁴ Table 4 and Figure 2

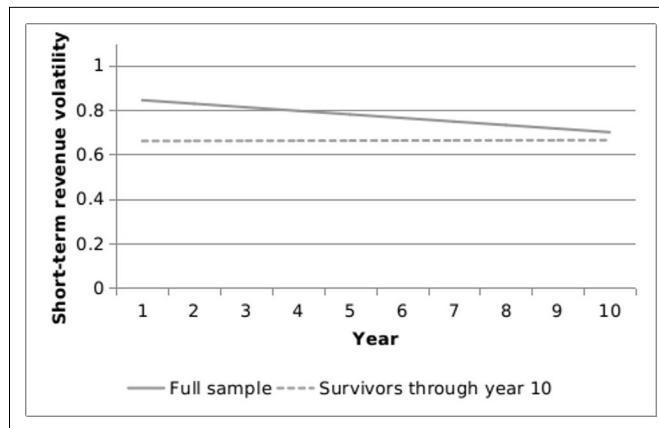


Figure 3. Trends in short-term revenue volatility.

Regression lines come from pooled OLS of *Volatility* on years since entry, for the two groups.

do not therefore disprove nonrandom adaptation effects but suggest that if such effects exist, they are offset by a regression to the mean effect.

To test for other signs of positive adaptation effects, we investigated the trend in *Volatility* among those we know survived for the full 10-year period. This graph is presented in Figure 3, where it is juxtaposed to the development of *Volatility* for the whole sample (including those new ventures that are eventually selected out of the sample). For the balanced panel of new ventures that survive for the entire period, the trend is actually slightly *positive*, but it is not statistically significant.¹⁵ Thus, there is no evidence that adaptation effects lead to a statistically significant reduction in *Volatility*. Consequently, Table 4 and Figures 2 and 3 all support the hypothesis that selection effects reduce short-term revenue volatility over time but reject the hypothesis that adaptation effects reduce short-term revenue volatility. Therefore, we find support for Hypothesis 3b but not for Hypothesis 3a.

For the full sample (unbalanced panel, where ventures in the cohort exit due to attrition), the trend in Figure 3 is statistically highly significant, but the effect size is small:¹⁶ Over a 10-year period, average *Volatility* decreases by 0.16, which corresponds to roughly a quarter of a standard deviation. Such a reduction in *Volatility* is small but meaningful. A reduction in *Volatility* of 0.16 corresponds to a reduction in the odds of dying (based on the average effect of *Volatility* over the studied period) of roughly 10%.

Discussion

This study takes important steps toward obtaining a better understanding of the effects of short-term revenue volatility and how such volatility develops over time in a cohort of new ventures. We now review and interpret our findings and suggest directions for future research. We begin with the study's implications for theories of the liability of newness and smallness. A second subsection examines its links to performance and uncertainty. In the third subsection, we offer our views on how it links with evolutionary theory. We then discuss the generalizability of our results.

Short-Term Revenue Volatility and the Liabilities of Newness and Smallness

This article has made the case that short-term revenue volatility is a liability in its own right, which is distinct from, but related to, the liabilities of smallness and newness. We show that venture age, size, and short-term revenue volatility are interrelated; but they are also distinct constructs in the sense that they are conceptually easy to distinguish, they are not perfectly empirically correlated, they contribute distinct risks (i.e., each is associated with higher mortality risks holding the others constant), and the liabilities associated with them are based on different theoretical foundations (although with some similarities).

Smallness is associated with higher mortality rates because small ventures have fewer buffer resources and because their stakeholders, such as customers, lenders, and employees perceive them as riskier (Aldrich & Auster, 1986; Freeman et al., 1983). We theorize that short-term revenue volatility is associated with higher mortality rates because such volatility requires more buffer resources and, similarly to smallness, such volatility increases perceived risks among stakeholders. We also theorize that short-term revenue volatility decreases the perceived value of a new venture in the eyes of the owner(s), thus reducing its viability (Coad, 2014). For these reasons, there are similarities between the theoretical underpinnings of the liability of volatility and those of the liabilities of newness and smallness, but these underpinnings are distinct.

Empirically, there are links, but also differences, between the constructs. The differences are clearest when analyses at the cohort and at the firm level are juxtaposed. At the cohort level,

short-term revenue volatility is correlated both with age and with size (for the latter, see the Correlation table in the Supplementary Appendix). At the firm level, however, there is no evidence that firms learn to reduce short-term revenue volatility, or its adverse effects, over time. Smallness, by contrast, has been shown to be related to age at both levels of analysis (Coad, 2018).

It is noteworthy that short-term revenue volatility in one year is a strong predictor of venture exit in the following year, and the effect size is comparable to that of size. The effect of size (*Log_revenues*) decreases substantially when *Volatility* is included (see Table 3, Columns 1 and 2) and yearly logistic regressions (results available from the authors) show that size is only intermittently statistically significant when *Volatility* is also included in the model, implying that an important benefit of size is that it provides more stable revenue streams.

The robustness of the negative association between short-term revenue volatility and subsequent survival makes a strong case for further research on the liability of volatility. Research over the past decade has established the importance of investigating different aspects of growth and size and how they relate to and interact with other performance indicators such as profitability, liquidity, assets, and leverage in the new venture context (Delmar et al., 2013; Shepherd & Wiklund, 2009; Wiklund et al., 2010). Analogously, future research on the liability of volatility should incorporate additional aspects of short-term volatility (e.g., of costs, profits, cash flow, and buffer resources) and assess their combined effects on new venture performance and viability. It is also important to assess volatility over different time periods. While we have made the case that volatility over short timeframes (i.e., within a year) is important and underresearched, it is becoming increasingly clear that annual revenue exhibits a fair amount of volatility too (McKelvie & Wiklund, 2010). It is therefore important to study also the volatility of growth and whether the liability of volatility extends to longer time periods. Finally, future research on the liability of volatility should address not only the outcomes of volatility but also volatility as an outcome (cf. McKelvie & Wiklund, 2010).

The Effects of Short-Term Revenue Volatility on Performance and Its Links to Uncertainty

In addition to predicting new venture exit, we find that short-term revenue volatility also predicts the time a venture spends in excess of its overdraft limit. This suggests that part of the negative effect of short-term revenue volatility on venture survival reflects the depletion of financial buffers, supporting such untested claims in previous studies (Wiklund et al., 2010). Although our regression-based findings are unable to establish the precise causal mechanisms (depletion of resource buffers, reduced perceived value, or other explanations), we know that short-term revenue volatility precedes exit (i.e., it is the effect of *Volatility* in the preceding year on the *Survival* in the focal year that we study).

The inclusion of a large set of controls, and the additional robustness tests, reveal that short-term revenue volatility has a negative effect on new venture survival even for new ventures that are comparatively large, growing, and are able to meet their immediate financial obligations. The finding that short-term revenue volatility predicts new venture exit, even after controlling for borrowing behavior, suggests that short-term revenue volatility reduces the relative viability of the ventures, rather than acting solely to exhaust buffer resources. That is, many entrepreneurs who face short-term revenue volatility may opt for closing their ventures even though some buffer resources remain. In this case, additional credit or cash reserves may not increase the likelihood of venture survival; rather, short-term revenue volatility makes the risks and the uncertainty of new venture management more salient and that makes the venture less attractive than other alternatives for the founder (Coad, 2014). Consequently, additional financial buffer resources are

likely to reduce new venture mortality (Wiklund et al., 2010), but not to be a panacea. Furthermore, increased financial buffers will, *ceteris paribus*, reduce profitability (cf. Delmar et al., 2013).

We have theorized four reasons why short-term revenue volatility decreases the relative viability of new ventures: (a) Volatility makes it harder to plan ahead; (b) volatility adds psychological stress; (c) volatility adds a risk premium; and (d) volatility raises average costs. While some of these reasons are conceptually distinct from uncertainty (e.g., various adjustment costs), several are associated with increased levels of uncertainty (e.g., about demand and scale and scope of required resources). The idea that increased perceived uncertainty explains exit is in line with findings that perceived uncertainty inhibits entrepreneurial behavior and that demand uncertainty leads to smaller scale launches (McKelvie, Haynie, & Gustavsson, 2011). If this is the case, then it points to a potential positive feedback loop in that perceived uncertainty leads to smaller start-up size, which leads to more volatility, which leads to increased perceived uncertainty. Our theorizing also suggests that while uncertainty is inherently intertwined with the concept of entrepreneurship (Knight, 1921), more uncertainty may in fact inhibit new venture viability. These findings remain in line with the idea that entrepreneurs have a higher tolerance for uncertainty (or related constructs such as ambiguity and risk).¹⁷ If entrepreneurship is inherently associated with uncertainty, then it follows that entrepreneurs can bear some uncertainty, but it does not follow that they prefer more over less.

We consider it important for future research to clarify how uncertainty influences and interacts with key entrepreneurial processes (McKelvie et al., 2011). Our study points to the importance of asking how short-term revenue volatility influences perceived uncertainty and how such uncertainty influences stress, job satisfaction, and perceived investment value. Finally, we need to better understand the consequences for new venture survival of spikes of extreme volatility compared to long periods of elevated volatility.

Contributions to Evolutionary Theory in Entrepreneurship and Organization Studies

Our results show that selection effects decrease average short-term revenue volatility of the cohort over time, whereas this is not the case for learning or adaptation. It is, of course, possible that surviving ventures comprise subgroups that systematically develop in different directions. For example, some might focus on reducing short-term revenue volatility, whereas others might increase their tolerance for such volatility through building buffer resources. If this were the case, then we would expect to see a trend toward diminished adverse effects of *Volatility* as reflected in the odds ratio in the regression of *Volatility* on new venture survival. We examined this as a robustness test (see Note 11) and found no support for this explanation.

Skepticism about adaptation mechanisms is not new but has been justified previously by pointing to the inherent inertia within large and old organizations (Hannan & Freeman, 1977; 1984). Such inertia is considerably less relevant for new ventures and this is confirmed in our results, which show that short-term revenue volatility does change for individual ventures (but the average across survivors is stable). A potentially more valid argument against adaptation, which better reflects our findings, is the role of uncertainty and complexity in the new venture context (Knight, 1921; McKelvey, 2004). From this perspective, while young ventures are able to change, change is unlikely to improve venture performance in predictable ways because the owners are unable to determine what works and what does not with any level of satisfactory accuracy (Frankish, Roberts, Coad, Spears, & Storey, 2013; Lundmark & Westelius, 2014). Rather, our results indicate that configurations that (for whatever reason) exhibit lower short-term revenue volatility are favored by selection mechanisms. These patterns emerge over time in a cohort of thousands of new ventures, and the specifics of these configurations are likely not something that entrepreneurs would be able to recognize if they “accidentally” manifested in

their own ventures, let alone spot in other ventures and imitate. Thus, the limited learning observed in other studies could be a result of copying the visibly successful (Baum & Singh, 1996; Delacroix & Swaminathan, 1991; Usher & Evans, 1996).

Our results also hint at the possibility of “negative” adaptation during the first few years of venture existence, in the sense that entrepreneurs may systematically tend to “learn” things that negatively affect their ventures’ viability (Lundmark, Krzeminska, & Shepherd, 2019). That is, there may be particular patterns in what entrepreneurs infer from common experiences, and some such inferences may do more harm than good. This is in line with several studies pointing to previous business ownership experience being negatively associated with (Nielsen & Sarasvathy, 2016; Rocha, Carneiro, & Varum, 2015) or being unrelated to venture viability (Yang & Aldrich, 2017). While our results should therefore not be taken as evidence of negative learning, they do, together with other recent research, suggest that such links should be investigated further.

Our findings also provide insights into the longitudinal effects of selection mechanisms in the early years of the venture life cycle (Delmar et al., 2013). When the mortality rates are around 15%–25% and the odds of dying are markedly increased for ventures with high short-term revenue volatility, we would expect to see stronger cohort-level effects due to the weeding out of the new ventures with high short-term revenue volatility. While there is a meaningful reduction in short-term revenue volatility at the cohort level over time, it only corresponds to about a quarter of a standard deviation over a 10-year period. In evolutionary terms this is paradoxical—we have a strong selection mechanism weeding out high-volatility new ventures, but this only translates into a slow reduction in average volatility at the cohort level of analysis. A possible explanation could be the limited “inheritance” of short-term revenue volatility for a given new venture between periods. As a consequence, the selection environment is noisy and only imperfectly penalizes enduring characteristics associated with high short-term revenue volatility (cf. Coad et al., 2016).

Generalizing our Findings

Although this is a large-scale, longitudinal, panel data-based study examining the role of short-term revenue volatility among new ventures, it is of only one cohort. The outcomes we have identified therefore risk being specific to that cohort. We therefore conclude by speculating on the possible impact of two potentially important influences. The first is the role of the global financial crisis (GFC) and the second is the extent to which our findings might apply to different subgroups of new ventures.

In our cohort, slightly less than half survived long enough to enter the GFC of 2008–2009 (Davidsson & Gordon, 2016; Zarutskie & Yang, 2015) and this enabled us to examine whether the characteristics of the cohort changed during the downturn. We found that the cohort’s average short-term revenue volatility decreased more sharply after Year 6 (2009–10) than in the preceding years (see Figure 2). While Davidsson & Gordon’s (2016, p. 933) study of the effect of the GFC on new ventures in Australia found that new ventures were not much affected by the GFC and that “the surprising absence of direct effect of macroeconomic crisis on nascent entrepreneurs and their ventures is the most interesting and most important finding of our study,” Zarutskie and Yang (2015) found that log revenues of new ventures in the United States were 3% lower at the depth of the recession. We cannot rule out macroeconomic influences on our results, but it is noteworthy that the duration of our study includes both macroeconomic munificence and contraction without any dramatic changes to the observed dynamics. Therefore, while there is no reason to believe that studying other cohorts would fundamentally change the main conclusions of this study, replication is vital and would provide a basis for further theorizing on the effects

not only of volatility but also of macroeconomic munificence on new venture viability and performance.

A second inadequately covered issue in the article is the diversity of new ventures and the extent to which our findings apply to individual subgroupings. So, while we include sole traders, partnerships, and companies, we exclude subsidiaries of existing firms and other types of organizations. This could be important in generalizing our findings. For example, subsidiaries have been found to exhibit different dynamics to independent ventures in terms of mortality rates and responses to economic downturns (Bradley, Aldrich, Shepherd, & Wiklund, 2011). Even among independent ventures the role of volatility in influencing survival is likely to be different in high-tech spin-offs or venture capital-backed ventures (Brown & Lee, 2019). A further possible development could be to distinguish between "types" (Wennberg et al., 2010) and "speed" (Coad et al., 2013) of exit to determine whether different factors explain exit types.

Conclusions and Practical Implications

This article shows that short-term revenue volatility is a liability distinct from, but related to, the liabilities of newness and smallness. It finds that short-term revenue volatility is associated with the depletion of buffer resources, with financial default, and with new venture exit, which indicates that there are pressures on new ventures to decrease such volatility or to manage its consequences. However, we find no evidence that surviving ventures, on average, reduce their short-term revenue volatility or that the adverse effect of such volatility decreases over time. Nevertheless, average short-term revenue volatility decreases over time at the cohort level because volatile ventures exhibit higher mortality rates. Our interpretation of these findings is that the complexity and uncertainty of the new venture context makes it difficult for new ventures to reliably improve their performance.

These findings have practical implications for creditors seeking to predict new venture viability and for entrepreneurs who manage new ventures. First and foremost, we show that short-term revenue volatility is a strong predictor of subsequent exit. For creditors such as banks, data on short-term revenue volatility are therefore informative in making short-term credit assessments, but these are "private" to the bank and only become available once the enterprise has begun to trade. For entrepreneurs, we confirm that short-term revenue volatility is associated with the depletion of buffer resources and increased mortality risks. Because our findings indicate that surviving firms do not tend to decrease their short-term revenue volatility over the early years of existence, entrepreneurs may be better advised to protect against it than betting on their ability to reduce it. They can protect against the consequences of short-term revenue volatility by building additional financial buffers, either in the form of additional cash or in the form of an available overdraft. A simple, yet very practical, tip is to seek an overdraft before it is urgently needed.

The robustness and strength of our findings, combined with the dearth of research on short-term volatility, makes a strong case for further research on the liability of volatility. We have outlined several avenues for such research in this article that we hope will inspire and guide future research.

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Notes

1. As the arguments for decreasing mortality rates after the peak suggested by the liability of adolescence are the same as the ones associated with the liability of newness, we continue to refer to it as the liability of newness.
2. As the focal cohort is defined by the time at which the ventures started trading, no new members can be added after this time. In studies of, for example, industries or regions, one has to consider entries too.
3. Our sample's number of ventures differs because a firm with missing sales data in Year 1 was dropped during data cleaning.
4. The United Kingdom, unlike many countries in continental Europe, is not characterized by multiple banking (Ongena & Smith, 2000).
5. That is the value of payments into a current account excluding payments from related accounts, for example, deposit accounts held by the business.
6. We dropped two outliers that had values above the theoretical maximum of 3.4641, which could arise if a firm has negative revenue streams. Negative revenue streams could arise if, for example, a cheque received in the previous period is observed to bounce.
7. Deflation is undertaken using World Bank data for the consumer price index for the United Kingdom (GBR): see <https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=GB> (last accessed July 19, 2018).
8. Higher education levels may also signal that entrepreneurs have attractive outside options and may thus be more prepared to close their venture after unsatisfactory performance than those with fewer options (Gimeno et al., 1997; Parker, 2018).
9. Time spent in excess of the overdraft limit is a right-skewed variable. Further analysis with a $\log(1 + x)$ transformation of the dependent variable was therefore undertaken and yielded similar results.
10. These results are in tune with a growing number of studies that show that human capital measures are weak predictors of new venture performance; see Storey and Greene (2010) for a review and Unger, Rauch, Frese, and Rosenbusch (2011) for a meta study.
11. Further analysis of cross-sectional year-wise regressions shows that the weakest effect was seen in Year 8, -0.55 and the strongest effect in Year 9, -0.89 . The regression line of the fitted coefficient values takes the following form: coefficient for *Volatility* = $-0.5973334 - 0.0130833$ year, where the t-statistic for the coefficient on year is -0.73 . $F(1, 6) = .54$, adjusted R-squared = -0.0710 . Hence the slope of the regression line is far from statistically significant but, if anything, the tendency is toward a more adverse effect of *Volatility* on *Survival*.
12. The coefficient on *Volatility* in Columns (8) and (9) is around 0.035. This means that as *Volatility* increases by one standard deviation (i.e., by 0.601, see Table 2), the OLS regression-dependent variable *OD XS time* would increase by $0.601 \times 0.035 = .021035$. This increase of 0.021 corresponds to an increase of *OD XS time* (in terms of days) of $0.021 \times 365 = 7.665$ days. Hence, a one standard deviation

increase in *Volatility* corresponds to an increase of time in unauthorized overdraft excess of 7.665 days. This is a large effect size, if we consider that the median firm stays in unauthorized overdraft excess for 0 days and the average is 15 days. An increase of 7.665 days corresponds to an increase of over 50% of the average time in excess of new ventures.

13. In all but 2 out of 14 industry subsamples, *Volatility* has a negative and significant effect on subsequent survival (the industries with no statistically significant effects had relatively few observations).
14. Regression to the mean explains why those that exhibit high or low *Volatility* are likely to experience less extreme *Volatility* (not as high and not as low, respectively) in a subsequent time period; however, those with high *Volatility* are more likely to have been weeded out of the sample, thus leaving survivors that are likely to exhibit higher *Volatility* compared to themselves in the previous period.
15. For a pooled OLS regression of *Volatility* on years since entry, with 12,080 observations (i.e., firms surviving until the end of the 10-year period), the regression output is: constant = .657, slope = .00047, $F(1, 12078) = .07$, p value for the F statistic = .788.
16. For a pooled OLS regression of *Volatility* on years since entry, with 25,059 observations, the regression output is: constant = .857, slope = -0.0156, $F(1, 25057) = 121.47$, p value for the F statistic <.0001.
17. Alternative, yet consistent, ideas are that entrepreneurs are more optimistic (Baron, 1998; Storey, 2011) or less able to perceive risk or uncertainty (Simon, Houghton, & Aquino, 2000).

Supplemental Material

Supplemental material for this article is available online.

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Effectual Networks as Complex Adaptive Systems: Exploring Dynamic and Structural Factors of Emergence

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Abstract

The notion of effectual networks is one of the central concepts in the effectuation research. However, there has been little conceptual and empirical work on how they emerge and what structures they have. This article incorporates the concept of complex adaptive systems from complexity theory to understand both their dynamic and structural elements. We examine the effectual networks and networking of 10 startups from Finland and offer a process-system model of effectual networks. We derive propositions that connect dynamic and structural entrepreneur-related factors of their emergence and outline directions for future research at the intersection of effectuation and complexity theory.

Keywords

complexity theory, complex adaptive systems, effectuation, effectual networks

Effectuation research has been developing for about two decades and is recognized as an important paradigmatic shift in understanding entrepreneurial decision-making and behavior (Alsos, Clausen, Mauer, Read, & Sarasvathy, 2019). Despite its considerable progress as a theory, many of its concepts require theoretical and empirical improvements (Arend, Sarooghi, & Burkemper, 2015; McKelvie, Chandler, DeTienne, & Johansson, 2019; Read, Sarasvathy, Dew, & Wiltbank, 2016). For instance, while effectual networks are the key building blocks of the effectuation process aiding decision-making under highly uncertain conditions (see e.g., Sarasvathy & Dew, 2003; 2005), our knowledge about their formation and constitution is still incomplete (Kerr & Covello, 2019). As an illustration, Chandler, DeTienne, McKelvie, and Mumford (2011) argue that the deployment of network alliances and precommitments is equally implemented in both causation and effectuation. Therefore, scholars still have insufficient understanding on how entrepreneurial relations are formed and structured under uncertainty (Burns, Barney, Angus, & Herrick, 2016; Partanen, Chetty, & Rajala, 2014; Sullivan & Ford, 2014).

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Given the iterative, process-based and network-dependent nature of effectuation (Jiang & Rüling, 2019), it is not surprising that effectuation scholars also suggest “to rethink their affiliation with equilibrium... and embrace the many disequilibrating aspects of entrepreneurship” and use “the dissipative structures strand of complexity theory” (Gupta, Chiles, & McMullen, 2016). Complexity theory (Lewin, 1992; Thrift, 1999; Walby, 2007) has started to attract entrepreneurship scholars because of its emphasis on order creation in open, uncertain, nonlinear and dynamic systems, which entrepreneurial ventures are (Lichtenstein, Carter, Dooley, & Gartner, 2007; Maguire, McKelvey, Mirabeau, & Öztas, 2006; McKelvey, 2004). The notion of a *complex adaptive system* (CASs) is one of the key concepts in complexity theory defined as “a group of semi-autonomous agents who interact in interdependent ways to produce system-wide patterns, such that those patterns then influence behavior of the agents” (Dooley, 1996). In relation to human systems, these agents are interdependent individuals or groups whose constant interactions generate patterns of behavior that grow into sustained system-wide characteristics (Dooley & Van de Ven, 1999). Complexity theory in general and CASs in particular do not focus on static states but seek to explain how different systems emerge, adapt, and evolve and how these processes unfold under complex and uncertain conditions (Walby, 2007). Therefore, they can serve as novel and valid instruments for theorizing about effectual networks and comprehending the dynamics of entrepreneurial networks under uncertainty. Therefore, our central research aim is to explore and conceptualize effectual networks as CASs and to identify entrepreneur-related dynamic and structural factors of their emergence.

In this study, we demonstrate a congruence between CASs and effectual networks, and suggest that this consistency makes several important contributions. *First*, by combining conceptual lenses (Okhuysen & Bonardi, 2011), we respond to the aforementioned calls to build a connection between complexity theory and entrepreneurial effectuation. This is especially important for effectuation to gain more maturity and diffuse into other research streams (Alsos et al., 2019; Arend et al., 2015; Matalamäki, 2017). CAS perspective helps to advance the concept of effectual networks because it offers a process-system approach to explore entrepreneur-related factors on how effectual networks emerge; this, in turn, adds more understanding of entrepreneurial networking under conditions of uncertainty (Engel, Kaandorp, & Elfring, 2017). Our synthesizing approach is novel and contributes to the broader process-oriented research on entrepreneurial networks (Jack, 2010; Jack, Moult, Anderson, & Dodd, 2010). The previous studies on entrepreneurial networks focused on either their dynamics (Coviello, 2006; Hite & Hesterly, 2001; Larson & Starr, 1993) or structural characteristics (Díanez-González & Camelo-Ordaz, 2019; Staber, 1993), without producing an integrative picture. Our CAS perspective, in turn, allows for coupling both the structural and dynamic factors of effectual network emergence and, therefore, follows an integral approach focusing both on *what* and *how* of effectual networks (Kerr & Coviello, 2019). It also connects their entrepreneur-level agentic features with system-level reactive features, which allows microlevels of analysis (a node level of an entrepreneur and his/her means) to be related with higher levels of analysis (a structural level of an effectual network as a system). *Second*, combining two theories connects the notions of complexity and uncertainty. While complexity may be one of the main sources of uncertainty (Kauffman, 1993; Simon, 1969), the link between these concepts has not been established in the effectuation and broader entrepreneurship research. Yet, it offers new insights into entrepreneurial network emergence under uncertainty. Below, we introduce complexity theory and provide an overview of CASs and their implications for understanding effectual networks.

Theoretical Background

CASs: Basic Tenets and Stepping Stones I

Although its name might suggest otherwise, complexity theory is not a unified body of theory but a broad array of ideas, concepts, techniques, and theories concerned with complex systems (Hogue & Lord, 2007; Lewin, 1992; Walby, 2007). Lissack (1999, p. 112) argues that it is “a collection of ideas that have in common the notion that within dynamic patterns there may be underlying simplicity that can, in part, be discovered through large quantities of computer power... and through analytic, logical, and conceptual developments...”. The underlying assumption of this theory is the notion of complexity, which refers to inability to evaluate and predict the outcomes of actions because too many parameters interact. Hence, even though the variables can be known, the effects of their interaction cannot be assessed, which, in turn, can be a source of uncertainty (Kauffman, 1993; Simon, 1969).

Recently, complexity theory has been widely used in organizational science to problematize a linear and mechanistic view of organizations (Plowman et al., 2007). From the complexity theory perspective, organizations are best understood as CASs consisting of dynamic networks of relationships (Hogue & Lord, 2007), where complexity arises from the adaptive behavior of the agents (Morel & Ramanujam, 1999). This perspective enables to understand complex organizational dynamics and organizational change. CASs share several common principles.

Sensitivity to initial conditions. This principle suggests that a small event or a precondition can have a variety of implications for the system. It can trigger fundamental changes, have no influence, or can produce changes in CASs disproportional to the event (Schneider & Somers, 2006). A large disproportionate change is frequently exemplified by the butterfly effect, i.e., the idea that a butterfly fluttering in Rio de Janeiro can change the weather in Chicago (Kauffman, 1993). Thus, initial conditions shape a nonlinear system in a unique and unpredictable way. Hence, CASs are predictable in patterns but not predictable in paths.

Nonlinearity. This principle is tightly linked to the previous one. In CASs, nonlinearity is understood as a lack of proportionality between input and output, implying that there is no direct relationship between them (Anderson, 1999). At the same time, nonlinearity is perceived as a result of multiple interactions between the elements of a system that are connected by feedback mechanisms (Morel & Ramanujam, 1999). Kitson et al. (2018, p. 236) explain that generally nonlinearity refers to the “non-predictable nature of the relationships, behaviors and interactions that are created and occur within CAS. It also refers to the fact that small changes in inputs, physical interactions or stimuli can cause large effects or very significant changes in outputs.”

Adaptability. Evolving from the interdependency of individual elements, the emergent characteristic of self-organization allows CASs to adapt to changes in external or internal conditions. The idea of adaptability is associated with the process of learning. The adaptable system is approached as being able to learn from its past experience to better respond to the endogenous and exogenous challenges. Thus, learning is critical for order to emerge, and can be guided by order-generating rules (Hogue & Lord, 2007).

Nonpredictable behavior. CASs are intrinsically nonpredictable in character producing surprising, emergent behavior patterns. It implies that it is impossible to predict the system state at any particular point in time. However, CASs have some degree of stability and are subject to unpredictable developments only periodically (Harvey & Reed, 1994). Patterns of system behavior emerge in an irregular but similar fashion through a process of self-organization, which is

regulated by order-generating rules (Burnes, 2005). Although the complexity theory approach cannot necessarily predict how given systems will evolve, it allows understanding them through formal models and grasping behavioral patterns (Anderson, Meyer, Eisenhardt, Carley, & Pettigrew, 1999).

Connectivity. The connectivity principle suggests that elements of a system are partially connected to each other by positive and negative *feedback loops*. These loops allow a system to adjust to the environment by adapting to both internal and external influences (Anderson, 1999; Coleman, Jr., 1999). “Patterns which enhance a system’s ability to adapt successfully to its environment are stabilized and repeated; those that do not are rejected in favor of radically new ones, almost as if a cosmic game of trial-and-error were being played. Complexity is, therefore, in part, the study of pervasive innovation in the universe” (McElroy, 2000). In other words, systems are organized by means of feedback loops that generate stable structures (Drazin & Sandelands, 1992).

Emergent self-organization. This principle is closely linked to the principle of adaptability. While complex systems have many characteristics, Chiles, Meyer, and Hench (2004, p. 502) describe the concept of emergent self-organization as “anchor point phenomenon.” CASs comprise a large number of elements or agents that interact with one another, determining the so-called “emergent properties” (Morel & Ramanujam, 1999), which evolve as a result of the collective behavior of the system components. In self-organizing systems, order emerges from the actions of interdependent agents who exchange information (Plowman et al., 2007). Interactions between entities at a lower level in the system produce system-level order meaning that a system can be understood through the subcomponent relationships (Anderson, 1999). This order revolves around a so-called **attractor**, which is “a limited area in a system’s state space that it never departs” (Anderson, 1999). An attractor structures nonrandom behavior into a system, as behavioral patterns emerge within the basin of attraction (Schneider & Somers, 2006). This system tends to be highly resistant to change from one attractor toward another (Svyantek & DeShon, 1993). Therefore, patterns reproduced at the microlevel become observable and define the system at the macrolevel (Thiébart & Forgues, 1995).

Coevolution. The principle of coevolution follows from the connectivity of systems components. Being interdependent and connected by feedback loops, the elements of CAS coevolve by mutually influencing each other (Anderson, 1999). Also, not all systems have an equal capacity to evolve (Kauffman, 1993). Highly chaotic or ordered systems tend to fail due to the absence or excessive presence of stable elements. Yet, “poised” systems “....may have special relevance to evolution because they seem to have the optimal capacity for evolving” through the accumulation of useful variations (Kauffman, 1991).

In sum, the complexity theory research focuses on CASs, i.e., networks of interacting agents, providing an explanation of how new things emerge. These elements of agents interact in ways that produce nonlinear, emergent dynamics and generate creativity, learning, and adaptability.

Effectual Networks as CASs

Origins and nature of relations. The notion of effectual networks stems from the theory of effectuation developed by Sarasvathy (2001) within entrepreneurship research. She indicates that “causation processes take a particular effect as given and focus on selecting between means to create that effect. Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means” (Sarasvathy, 2001, p. 245).

Causal logic is more applicable when the future is predictable, the goal can be specified, and preferences about environments in which to operate can be expressed. Hence, the underlying assumptions of effectual logic are conditions of Knightian uncertainty (future is not only unknown but also unknowable), unspecified goals, and environmental isotropy (Sarasvathy, 2001; Welter & Kim, 2018).

The phrase “effectual networks” was coined in the study by Sarasvathy and Dew (2003) where they emphasized non-goal-driven, exploratory, and nonpredictive nature of networks formed under effectuation. Further studies also highlight their differences from more general entrepreneurial networks because they are subject to different assumptions (Engel et al., 2017; Kerr & Coviello, 2019; Sarasvathy & Dew, 2005). According to Slotte-Kock and Coviello (2010), the entrepreneurial network domain is largely informed by the business network approach and the social network approach. These approaches largely assume that network relations can be coordinated through developing a favorable network position according to some resource needs². Taking this stand, Slotte-Kock and Coviello (2010, p. 46) and Hansen (1995, p. 17) argue that entrepreneurial network relations can and should be managed. Also, Larson (1991, p. 174) states that “an entrepreneurial firm’s ability to identify, cultivate, and manage... network partnerships is critical to survival and success.” In this regard, the study by Jack et al. (2010) is highly revealing as it shows how an entrepreneurial network can be instrumentally created through a top-down mechanism and formalized purposeful exchanges. In the entrepreneurial network research tradition, relations are grounded in repeated stable interactions that have a history (Jack, Dodd, & Anderson, 2008; Jack et al., 2010). Hence, trust is recognized as an important mechanism for discouraging opportunistic behavior and decreasing risks (Hoang & Antoncic, 2003; Larson, 1991; Neergaard & Ulhoi, 2006). In addition, the entrepreneurial network research is to a great extent grounded in the resource-based view examining what instrumental resources can be obtained by entrepreneurs from various relations to satisfy known venture needs (see e.g., Greve & Salaff, 2003; Lechner & Dowling, 2003). In general, entrepreneurial networks are viewed as systems that “do not form by chance but can be studied as patterned, predictable exchange structures” (Larson, 1991, p. 173).

Effectual networks are built upon dissimilar assumptions. Due to uncertainty, they are open to a diversity of outcomes and cannot be coordinated by a focal entrepreneur because the motives and incentives of other actors are unknown (Chandler et al., 2011; Wiltbank, Read, Dew, & Sarasvathy, 2009). Past network relations are important to an effectuator because they essentially constitute the “Who I know” component of effectual means (Sarasvathy, 2001). However, the understanding of future is essentially different. In effectual networks, the future is controllable but unpredictable (Sarasvathy, 2008, p. 91), and is open due to the process of cocreating network goals; whereas in goal-driven relations, the future is closed due to their known end goal. Further, effectual networks are those of opportunity rather than networks of trust; although trust can be found empirically in effectual networks, “[t]heoretically speaking, effectual logic does not require any particular assumption about trust *ex ante*” (Sarasvathy & Dew, 2008). Risk cannot be described as an attribute of effectual networking either, because it implies some predictable fact, the negative outcome of which can be quantified with some numerical probability (Knight, 1964). Instead, effectuators follow the principle of affordable loss (Sarasvathy, 2001).

There is a conceptual confusion about what effectual networks really are because they are mentioned in several applications (Kerr & Coviello, 2019). On the one hand, they are understood as initial relations that start the effectuation process, serving as the “Whom I know?” part of entrepreneurial means (Sarasvathy, 2001). However, everyone is born into a network of some kind, and the logic behind its formation may not necessarily be non-goal-driven. On the other hand, no matter how effectual networks are formed (through a random chance, in some path-dependent fashion, or through deliberate action), they are also understood as the resultant networks

of different stakeholders, who (a) actually precommit something to the new venture creation, and (b) participate in the entrepreneurial process by sharing the potential risks and benefits of its failure or success (Read, Song, & Smit, 2009, p. 574; Sarasvathy & Dew, 2005, p. 542). However, the study by Chandler et al. (2011) shows that the criterion for committing something to a new venture is not sufficient to differentiate effectual actions from causal ones, because established precommitments are also present in goal-driven strategic relations. Also, the study by Fischer and Reuber (2011) demonstrates that an actor does not need to be involved in the entrepreneurial process to be a part of the effectual network. Therefore, the two criteria mentioned do not distinguish effectual networks from other entrepreneurial networks. Furthermore, assuming that the stakeholders in the effectual networks can be “*any and all interested people*” (Wiltbank et al., 2009), including “*early partners, customers, suppliers, professional advisors, employees, or the local communities*” (Sarasvathy & Venkataraman, 2011, p. 126), it is difficult to conceptualize effectual networks based only on the instrumental attributes and functions of actors involved into them.

From the previous discussion it follows that effectual networks are distinct from the entrepreneurial networks, as they are built on different assumptions. However, theorization of effectual networks is largely undeveloped in the extant research that is partially attributed to the various applications of the concept. Therefore, there is a need for holistic and process-based understanding of effectual networks that would consider not only their structural elements but also the dynamic processes of their formation and their underlying logic. In other words, not only *what* actors constitute effectual networks but also *how* these networks come into being and evolve should be examined (Kerr & Coviello, 2019). Therefore, using the CAS perspective is beneficial because it enables the description of both the dynamic and structural characteristics of systemic entities. In the next section, we outline in detail these characteristics of effectual networks, allowing us to view them as CASs.

Establishing compatibility between effectual networks and CASs. In this section, we synthesize existing effectuation literature discussing (explicitly or implicitly) effectual networks dynamics, and show their compatibility with the CAS view. We organize our discussion around three phases of effectual network development, which we derived based on the existing literature.

Prenetwork phase. The process of effectual network emergence starts at a microlevel, from the means available to entrepreneurs (Sarasvathy, 2001). The unique combination of these means induces the initial rise of effectual relations and has fundamental implications for further changes therein. Consistent with the CAS perspective, the whole deployment of the future effectual network is **sensitive to these initial conditions** (Schneider & Somers, 2006). Thus, the “Who I am” set of means would refer to personal identity, various life experiences, educational and professional background, and so on. The “What I know” set would relate to everyday life and professional knowledge, expertise, and skills. In the context of networking, it may also imply the networking competences needed for new relationship establishment, and their further maintenance. Finally, the “Whom I know” set would refer to an effectuator’s pre-existing and extant relations. These contacts are important for the network formation, because they can be activated for venture purposes and generate resources otherwise unavailable, and other relations through recommendations and forwarding (Read, Sarasvathy, Dew, & Wiltbank, 2017). Notably, effectual means become those when they are cognitively perceived as such (Fischer & Reuber, 2011). Therefore, potential entrepreneurs scan and evaluate what they have, and what can be useful for future venturing activities. For each entrepreneur, these initial conditions are unique and not fixed; they can change depending on the effectual cycle (Sarasvathy & Dew, 2005), which explains the following **nonlinearity** of their development as CASs (Kitson et al., 2018).

Formation phase. Instead of outlining a picture of a network to enter or create, selectively assessing the positions of the most favorable partners, and establishing relations with some but not others, entrepreneurs interact with all and any interested stakeholders (Read et al., 2009; Sarasvathy & Dew, 2005; Wiltbank et al., 2009), and even strangers (Read et al., 2017). This networking is based on controlling rather than predictive logic (Engel et al., 2017). Read et al. (2017) term these interactions effectual asks, whose nature is very flexible and open allowing entrepreneurs not to fail at very early stages of business creation. Moreover, the degree of this flexibility can be so strong that entrepreneurs may pursue ideas that were not initially in their thoughts, which points to their **adaptability** (Hogue & Lord, 2007). Through series of asks entrepreneurs get advice on their ideas, shape and reshape their future ventures, and cocreate the vision of their businesses (Read et al., 2017); this mechanism resembles the establishment of **feedback loops** in CASs (Coleman, Jr., 1999; Morel & Ramanujam, 1999). This continuous feedback promotes **connectivity** (Anderson, 1999) and makes this cocreation process highly iterative. Consistent with the effectual cycle (Sarasvathy & Dew, 2005), these iterations make the formation of effectual network very sinuous, which corresponds to **nonlinearity** in CASs (Anderson, 1999). Also, the non-goal-driven logic behind networking allows for unexpectedness and the surprise-generating mechanism, embodied in the principle of leveraging contingencies (Sarasvathy, 2001). To exploit these contingencies, create opportunities from them, and be ready for changes, entrepreneurs also need to stay flexible, which requires responsiveness and a “prepared mind” (Dew, 2009; Harmeling & Sarasvathy, 2013). These processes are similar to **adaptability** (Hogue & Lord, 2007) and **nonpredictable behavior** (Harvey & Reed, 1994) present in CASs. Notably, interactions and negotiations may not progress further and may just remain in an effectual churn, “the continuous looping between social interaction... and the reassessment of means and effects achievable, without progression through the effectuation process” (Fischer & Reuber, 2011, p. 10).

Effectual network phase. When interactions accrue frequency and density, when some ideas gain support through positive feedback and others atrophy under negative feedback, relations that emerged randomly start organizing themselves. This process is congruent with **emergent self-organization** in CASs that have no internal or external leaders to set goals and control the system (Chiles et al., 2004; Morel & Ramanujam, 1999). Numerous interactions grow into a chain of interactive precommitments (Sarasvathy, 2008, p. 105); that is, precommitments (actual, not desired or promised) of talent, finance, information, know-how, or time. Notably, the growing number of commitments increases complexity of effectual networks, which leads to an increased uncertainty and unpredictability of relationship outcomes (Kauffman, 1993; Simon, 1969). However, at the same time it serves as an important mechanism of coping with environmental uncertainty (Sarasvathy, 2001, p. 252). Unlike in goal-oriented networking, effectual entrepreneurs are committed not to the known end-result of networking, but to its open future potential, nonredundancy, and opportunities that new relations may bring (Chandler et al., 2011; Read, Dew, Sarasvathy, Song, & Wiltbank, 2009; Sarasvathy & Dew, 2005), which implies flexibility and **adaptability** featured in CASs (Hogue & Lord, 2007). In addition, Sarasvathy (2008, p. 106) stipulates that “[t]he effectual nature of the commitment process allows the members of the network to proceed as though the universe at any given point in time consisted only of the people at the table – as though the external world is relevant only to the extent it is embodied in their aspirations and abilities.” Hence, effectuators rely on immediate reality where the *actual* actors are known right here and right now.

Furthermore, this **nonlinear self-organization** of effectual networks explains both their stability and dynamism. They are brought about through a process of self-selection, as opposed to the careful culling of partners driven by venture goals (Read et al., 2009; Sarasvathy & Dew,

2005; Wiltbank et al., 2009). Partners are interactively self-selected into an effectual network through staking something they can afford to lose (Karri & Goel, 2008; Sarasvathy & Dew, 2008). Since no one can predict the success of the venture idea and return on investment, intelligent altruism (Simon, 1993) becomes a critical behavioral assumption for the self-selection. In this process, the entrepreneurial idea serves as an **attractor**, around which the effectual network organizes itself as CAS (Anderson, 1999).

Coherent with CAS, the emerged system of effectual relations is characterized by the relative stability, strong **connectivity**, and **coevolution** of its elements (Anderson, 1999). Each member of the effectual network not only contributes with resources but also sets up constraints regarding who comes on board next, and how the entrepreneurial venture can potentially be restructured by adding new stakeholders³. This “stacks the deck” and the commitments made create a shared pool of constraints for other choices and commitments (Sarasvathy & Dew, 2003). While still being self-selected into the emergent effectual network, they also have to fit into the system codesigned before them. Hence, partnerships become less uncertain and the goal better defined, which enables the implementation of more causal decisions (Read & Sarasvathy, 2005; Sarasvathy & Dew, 2005).

The effectual network is a cocreated CAS that cannot be centrally coordinated (Sarasvathy & Dew, 2005); however, it starts producing and reproducing patterns of interactions, reshaping existing environments and creating new ones (Wiltbank et al., 2009). This process of dialectic design may also lead to the further development of new markets (Dew, Read, Sarasvathy, & Wiltbank, 2011; Sarasvathy, 2008; Sarasvathy & Dew, 2005). Through an internal reproduction, the new market creates its identity and becomes bounded in some way. These boundaries are porous and difficult to draw because the effectual network evolving into a new market is very open and never finite. As in CASs, its interactions are more important than the boundary, which is at the same time a function and a product of the system. Hence, the boundary does not separate the new market from some outer environment but constitutes it (Cilliers, 2001). Because the boundaries of the emerging new market are constantly renegotiated, its development is compared to the open source phenomenon that allows for “the cooperative shaping of the market rather than a competitive scramble for (predicted to be) valuable resources that drives industry dynamics” (Read et al., 2009).

The earlier discussion shows that effectual networks represent a distinct type of entrepreneurial networks; they are complex and adaptive systems of relations formed under conditions of uncertainty through engaging into the effectual process and following the principles of means-driven action, interactions with all interested stakeholders, affordable loss, and leveraging contingencies. Also, the principles of CASs are visible in effectual networks, which reveals their theoretical compatibility. Table 1 summarizes points of contiguity between CASs and effectual networks and demonstrates their differences. It also sets up the basis for our empirical study, which is discussed in the next section.

Methodology

Rationale Behind the Research Design

The research design of this study is driven by the inductive exploration⁴ of effectual networks as CASs. Our study follows multiple-case study strategy, which suits its theory-building purpose (Eisenhardt & Graebner, 2007). Also, the exploratory course of this study fits the qualitative methodology because it does not imply any hypothesis testing. Additionally, our study focuses on dynamic characteristics of effectual networks; qualitative methods are more appropriate to capture the processes and mechanisms of change in complex systems (Cassell & Symon, 1994;

Table 1. Compatibility Between CAsSs and Effectual Networks.

	Complex adaptive systems	Effectual networks
Nature of the theory and underlying assumptions	Process-based complexity theory is applied to understand systems and their adaptive mechanisms of coping with uncertainty resulting from complexity; complexity is the inability to evaluate and predict the outcomes of actions because too many variables interact; focus on systems/structures; organizations are understood as a collections of strategies and structures	Process-based cognitive theory of effectuation is applied to understand decision-making and behavior under conditions of Knightian uncertainty, lack of goal specificity, and information isotropy
Unit of analysis sensitivity to initial conditions	Organization/unit/system A small change in the initial conditions can lead to a completely different result	Individual entrepreneur The networking process outcome is sensitive to entrepreneurial means: What I am; What I know; Whom I know
Nonlinearity	No direct relationship between input and output; multiple interactions between the elements of a system	Reliance on the immediate reality; resources at hand, and flexible nature of interactive commitments allow iterative feedback loops and for numerous potentially co-created effects
Adaptability	Based on learning from past experience and responding to internal and external changes	Based on cooperative and interactive control of the future rather than predicting it; flexible and adaptive nature of effectual tasks and commitments; reacting to contingencies and exploiting them require a “prepared mind” and adaptive behavior
Nonpredictability	Change cannot be planned because some behaviors are impossible to predict; CAsSs are predictable in pattern but not in path	Effectual logic is based not on prediction but on control of an unpredictable future; non-goal-driven reasoning
Connectivity	Elements of a system are connected through positive and negative feedback loops	Entrepreneurs receive positive and negative feedback on their ventures from other stakeholders; through series of interactive commitments, they establish connectivity between stakeholders and co-create their ventures with them
Self-organization	Irregularly emerging patterns of collective behavior produce system-level order that revolves around an attractor; no controlling or managing body	Interactive commitments and self-selection become patterns of behavior; a new venture or an entrepreneurial idea serve as an attractor; around which effectual networks get self-organized

(Continued)

Table I. Continued

	Complex adaptive systems	Effectual networks
Coevolution	Connected system elements mutually influence each other's development through feedback mechanisms	Effectual asks grow into commitments, which allows for cocreation and codevelopment and any stakeholder can change the process; parts of effectual networks coevolve through the mechanism of inter-related commitments

CAS, complex adaptive system.

Stake, 1995). Also, the adaptive design and open-ended nature of the case study strategy (Yin, 2014) allows for iterative theoretical and empirical choices, which is relevant to our cross-disciplinary and exploratory study. Furthermore, case-study strategy allows for the attention to context, which is important for the network perspective of our research (Halinen & Törnroos, 2005). Besides, qualitative research has a better fit with developing theories (Edmondson & McManus, 2007), such as effectuation (Arend et al., 2015; Matalamäki, 2017; Read et al., 2016).

Case Selection

According to Yin (2014), information from several sources on the phenomenon provides more comprehensive understanding without chance associations. In addition, Eisenhardt (1989) recommends including 4 to 10 cases in multiple-case research. The amount of data from these many cases is enough for analytical generalization but relatively easy to cope with in terms of volume (Patton, 2015; Yin, 2014). Following these lines, this study focuses on the entrepreneurial networks of 10 startup firms from Finland.

These case firms were selected adhering to purposeful sampling coupled with replication logic (Fletcher & Plakoyiannaki, 2011; Yin, 2014). Given that effectuation logic is especially present at the very initial stages of business development (Sarasvathy, 2001; Sarasvathy & Dew, 2005), we selected private startups at the very early entrepreneurial stage to ensure sought processes (by the time of the data collection, the chosen firms had just launched their product or were founded not more than 3 years ago). We did not apply the criterion of expertise because recent studies show that also novice unexperienced entrepreneurs engage into effectuation (Laskovaia, Shirokova, & Morris, 2017). To assure equivalence and comparability between the cases (Patton, 2015; Yin, 2014), we chose the startups from the ICT/smartphone-applications industry. Even though they targeted different customer needs (some developed applications for spray printing, others for video content or food delivery), their final product was the same, a web-based application; hence, our sampling qualifies as homogeneous. However, in making this choice, we do not claim that mechanisms behind entrepreneurial networking and effectual network formation vary greatly across industries.

The study setting for our research has been achieved by attending two entrepreneurial events, namely Slush (www.slush.org) and a workshop organized by Arctic Start Up, a Helsinki-based entrepreneurship support organization (www.arcticstartup.com). During these events, the lead author of this article invited 42 entrepreneurs to participate in this study. After these initial meetings, the potential participants were sent e-mails with a short description of the research project and requests for interview meetings. Ten entrepreneurs agreed to participate in the study. Using snow-ball sampling, we also got access to the other founders of their teams.

Data Collection

We conducted 23 personal interviews with members of entrepreneurial teams (Table 2), i.e., with all the founders of the studied startups. The interviews were conducted during December 2016 and January 2017. The interviews were semi-structured to reveal the situational context and respondents' subjective opinions on the unexplored phenomenon of effectual networks (Gummesson, 2000; Stake, 1995; Yin, 2014). Also, this method provides space for other related topics to emerge during the conversation (Patton, 2015). The interview guide used in this study comprised open-ended questions because they permit the informant to use their own terms (Patton, 2015). Our interviewees did not receive the interview guide in advance.

The dynamic processes within effectual networks were grasped by conducting an event-based study. This method allows us to see how certain events (e.g., getting the first ideas for a future

Table 2. The Data Collection Phase of the Study.

Startup and its core business	Respondents	Time and duration of the interviews
SU1. Web application for connecting people. Legally registered: December 2016	F1: 34-year-old male, background in environmental engineering; F2: 32-year-old male, background in marketing and biology	F1: 3.12.2016 (47 min) F2: 3.12.2016 (50 min)
SU2. Web application for reading codes on documents, letters, and mailers. Legally registered: October 2016	F1: 55-year-old male, background in printing technologies; F2: ca. 55-year-old male, background in postage equipment; F3: ca. 60-year-old male, background in sales	F1: 4.12.2016 (87 min) F2: 4.12.2016 (61 min) F3: 4.12.2016 (72 min)
SU3. Web application for restaurants. Legally registered: November 2016	F1: 25-year-old female, background in branding; F2: 25-year-old male, background in architecture and programming	F1: 5.12.2016 (45 min) F2: 5.12.2016 (65 min)
SU4. Web application for creating video content. Legally registered: May 2016	F1: 35-year-old male; background in marketing, multiple entrepreneur; F2: 36-year-old male, background in video content and advertising	F1: 7.12.2016 (56 min) F2: 20.1.2017 (74 min)
SU5. Spray printing and web application for spray printing. Legally registered: January 2016	F1: 34-year-old male, multiple entrepreneur; F2: 37-year-old male, background in information technologies; F3: 32-year-old female, background in sales and printing	F1: 12.12.2016 (49 min) F2: 12.12.2016 (47 min) F3: 5.1.2017 (62 min)
SU6. Web application for eco food delivery. Legally registered: September 2014	F (sole founder): 28-year-old female, studies business, worked as a flight attendant	F: 15.12.2016 (45 min)
SU7. Web application for creating digital publications. Legally registered: January 2016	F1: 27-year-old male, background in software engineering; F2: 32-year-old male, background in programming; F3: ca. 30-year-old male, background in software engineering	F1: 21.12.2016 (45 min) F2: 22.12.2016 (70 min) F3: 22.12.2016 (85 min)
SU8. Web application for finding a pet-sitter. Legally registered: April 2015	F1: 32-year-old female, background in sales and marketing; F2: 39-year-old male, background in programming	F1: 10.1.2017 (80 min) F2: 9.1.2017 (73 min)
SU9. Web application for creating customer profiles. Legally registered: November 2015	F1: ca. 55-year-old male, multiple entrepreneur; F2: ca. 50-year-old male, background in marketing; F3: ca. 50-year-old male, multiple entrepreneur	F1: 10.1.2017 (88 min) F2: 20.1.2017 (71 min) F3: 27.1.2017 (77 min)
SU10. Web application for customizing shoes. Legally registered: January 2016	F1: 28-year-old male, multiple entrepreneur; F2: 29-year-old male, background in sales	F1: 16.1.2017 (90 min) F2: 17.1.2017 (68 min)

SU, startup; F, founder.

business, inception, launching a product) trigger changes in network relations. The techniques employed were analytical schemes and event trajectories that allowed us to answer not only what changes happened in our informants' networks but also why they happened (Halinen, Törnroos, & Elo, 2013). In many instances, these events were identified by our informants along with their stories; thus, we allowed for their own interpretations of what events were important in the timeline of their ventures. Along with the conversations, four respondents made some drawings presenting their network relations visually and assisted in forming the interview protocols. These drawings were attached to the interview notes and used later in data transcription and analysis; they allowed us to secure all the important nuances about informants' relations. Each interview lasted 45–90 min, was recorded, and then transcribed verbatim. The informants were made aware that they were being recorded. Both data collection and interview transcription were performed by the lead author. The interviews resulted in 1507 min of audio records and 323 pages of transcribed text (Times New Roman, 12-point, line spacing 1.15). To achieve methodological rigor and adequacy of our research procedures, we documented the entire data collection process in a research diary. We made notes on important issues (interview setting, a general atmosphere of a conversation, post-interview talks, and so on). Also, to ensure the accuracy of our transcripts, we returned them to the interviewees for verification and follow-up questions.

Besides the primary data sources, we incorporated information from websites, blogs, social media profiles, and various press releases, about the interviewees, their startups, products, main clients, and suppliers. We consistently used these data to prepare for interviews and double-check the information obtained from the records (Cassell & Symon, 1994). After the interviews, we used these sources to verify the obtained information. For instance, many interviews contained stories about how the informants established their ventures; if possible, we compared this information with that available online. Also, we checked the content of relationships our informants mentioned during interviews through social media sites. Overall, combining interviews and secondary data strengthened the validity and reliability of our research.

Data Analysis

In this study, the unit of analysis is both entrepreneurs and their startups. In small entrepreneurial firms, the individual and organizational levels are the same. For instance, Hite and Hesterly (2001) show that entrepreneurs' networks overlap with those of their ventures. Also, Johannesson (1998, p. 300) indicates that "since the entrepreneur epitomizes the small firm and its physical and human resources, the individual and the organization as units of analysis coincide."

As is natural in qualitative research (Yin, 2014), the informal data analysis started during the interviews; for example, the interviewer, who is also the lead authors of this article, posed clarifying questions and connected certain events with the startups' network development. Further formal data analysis after the interviews involved both authors to avoid ambiguity in interpretations. In the manual analysis, we used within-case and cross-case displays in the form of field notes, matrices, tables, and networks to find patterns and themes in the data (Miles & Huberman, 1994). The electronic data analysis was assisted by NVivo 11. The themes identified in the literature served as a basis for a priori codes, which were then identified in the transcripts (Table 3). Using Fisher's (2012) criteria for causation and effectuation, we were able to distinguish effectual logic in entrepreneurs' networking and focus on it as the primary focus of our study. We also followed Gioia, Corley, and Hamilton (2013), inferring concepts, themes, and aggregate theoretical dimensions from the raw data excerpts. Guided by our theoretical discussion, we organized our data analysis around three phases of effectual network development and looked at this process from the perspective of a focal entrepreneur. The qualitative strategy of our study enabled

Table 3. Data Structure.

	First-order concepts	Second-order themes	Aggregate dimensions
Prenetwork phase	<ul style="list-style-type: none"> • What I am • What I know • Whom I know • Whom I know but don't need at the moment • Whom I know but cannot use at the moment • Whom I know but do not perceive as means • Whom I do not know but would like to know • Urge to use means • Desire to experiment with means 	Actual means Dormant means Nonfunctional means Latent means Unavailable means Willingness to proceed further with the set of means	Structural factors
Formation	<ul style="list-style-type: none"> • Asks crafted for getting feedback • Iterative communication • Loops of evaluation • Offers to potential partners • Affordable loss • Partners co-create an entrepreneurial idea • Partners attracted by an idea 	Effectual asks Feedback loops Stakes that entrepreneurs can afford to lose An entrepreneurial idea as an attractor	
Effectual network phase	<ul style="list-style-type: none"> • Stakes something valuable to relationships • Commitments to give • Established connections • New connections • Self-organized regularities of interactions • Working norms and standards 	Actual commitments Established connections New connections Self-organized patterns of interactions	

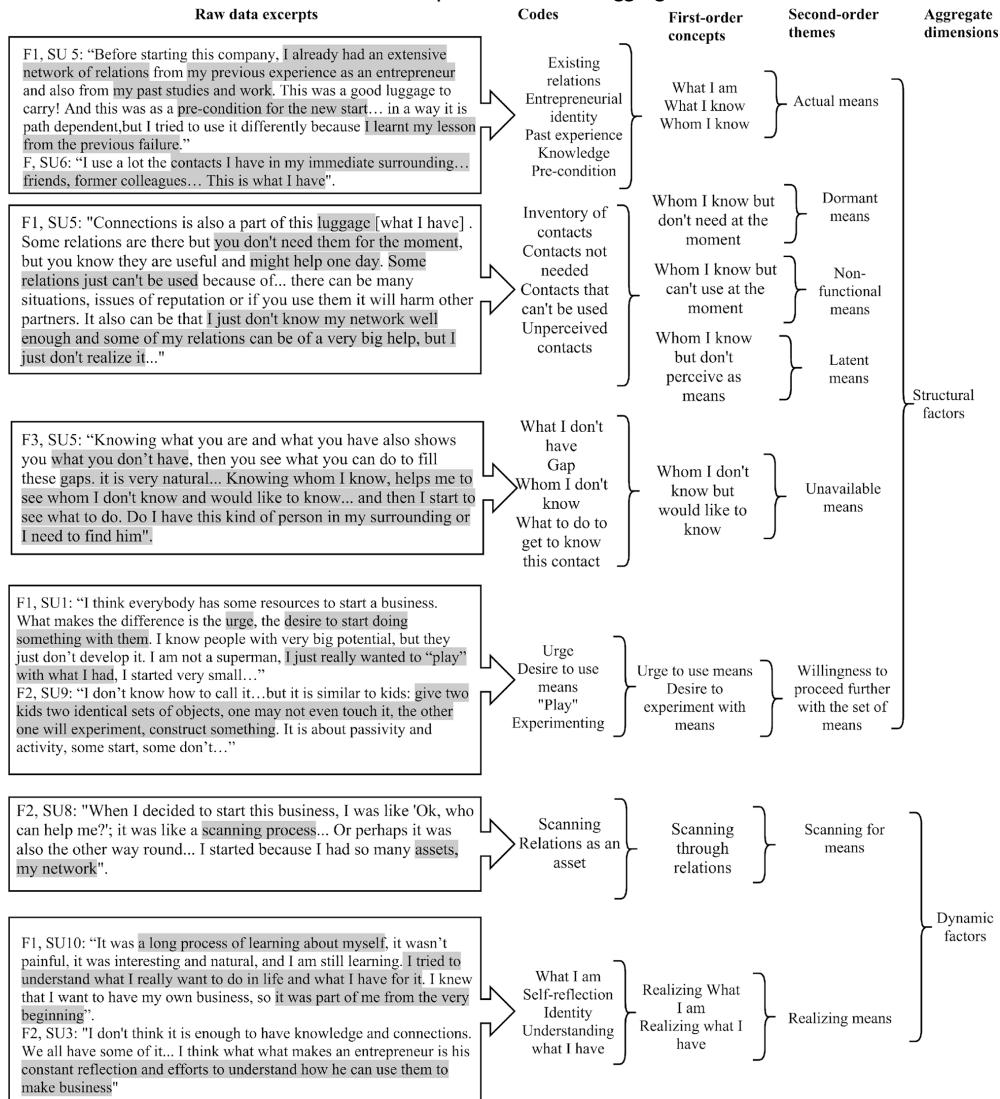
(Continued)

Table 3. Continued

	First-order concepts	Second-order themes	Aggregate dimensions
Prenetwork phase	<ul style="list-style-type: none"> • Scanning through relations • Realizing what I am • Realizing what I have 	Scanning for means	
Formation	<ul style="list-style-type: none"> • Unrestricted and open interactions • Idea validation through feedback from various stakeholders • Realizing relevant contacts • Bundling relations • Growing number of interactions • Achieving new quality of network 	Realizing means Interacting with all and any stakeholders Establishing connectivity among interactions Achieving a critical mass of interactions	Dynamic factors
Effectual network phase	<ul style="list-style-type: none"> • Committing as assuring partnership • Self-selection into a network • Staying in touch with partners • Demonstrating empathy and interest in relations • Evaluating new relations • Achieving the fit with existing connections 	Self-selection Maintaining existing relations Adjusting the fit between existing and new connections	

emerging concepts and themes to be identified in the data. For example, we were able to see evidence of other types of effectual means than just available means.

Consistent with the CAS perspective of our study, we distinguished between structural and dynamic factors for each phase of effectual network formation. We identified structural elements by decomposing complex units of effectual networks into more simple and indivisible elements (e.g., effectual asks, commitments, established connections). Capturing the dynamics of effectual network was a twofold process. Network development through the phases identified in the literature was detected by tracing it backwards into the past, as suggested by Bizzi and Langley (2012). Interview narratives contained information on events and incidents that triggered change in networks. We analyzed these events by applying the tools of analytical schemas and event trajectories (Halinen et al., 2013) to connect them with processual changes in networks. We recognized microdynamics adherent to each phase (e.g., scanning for and realizing means as dynamic factors within prenetwork phases), which enabled us to demonstrate microprocesses within the overall flow of effectual network emergence. Table 3 demonstrates the structure of our data and the inference from the first-order concepts to the second-order themes and the aggregate theoretical dimensions (Tables 4–6); it also integrates all concepts and themes, moving further toward the development of our final model (Figure 1).

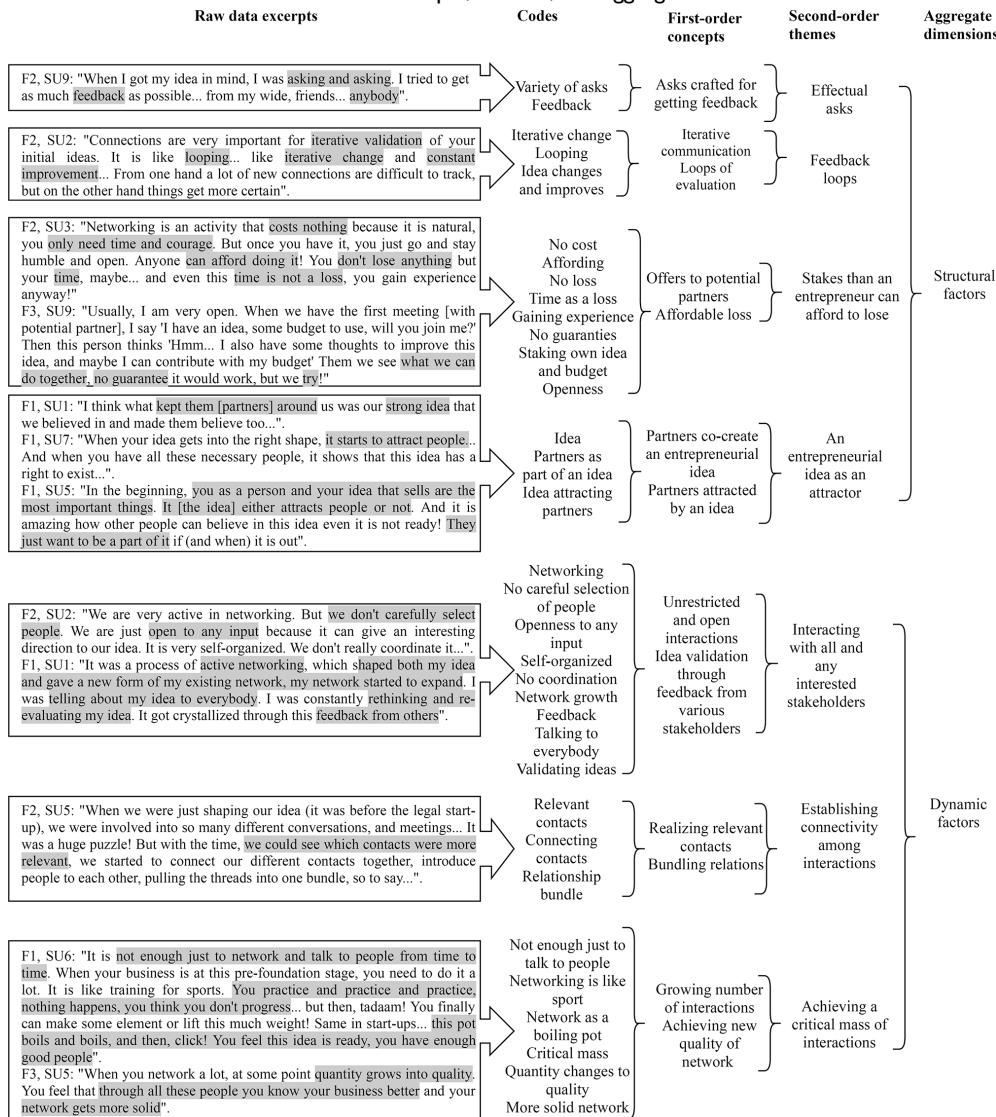
Table 4. Inference From Raw Data to Concepts, Themes, and Aggregate Dimensions—I.

Results and Discussions

The aim of our study is to apply CAs perspective to understand effectual networks and to identify dynamic and structural entrepreneur-related factors that influence their emergence. We frame the presentation of our results and their discussion around the three phases of effectual network emergence.

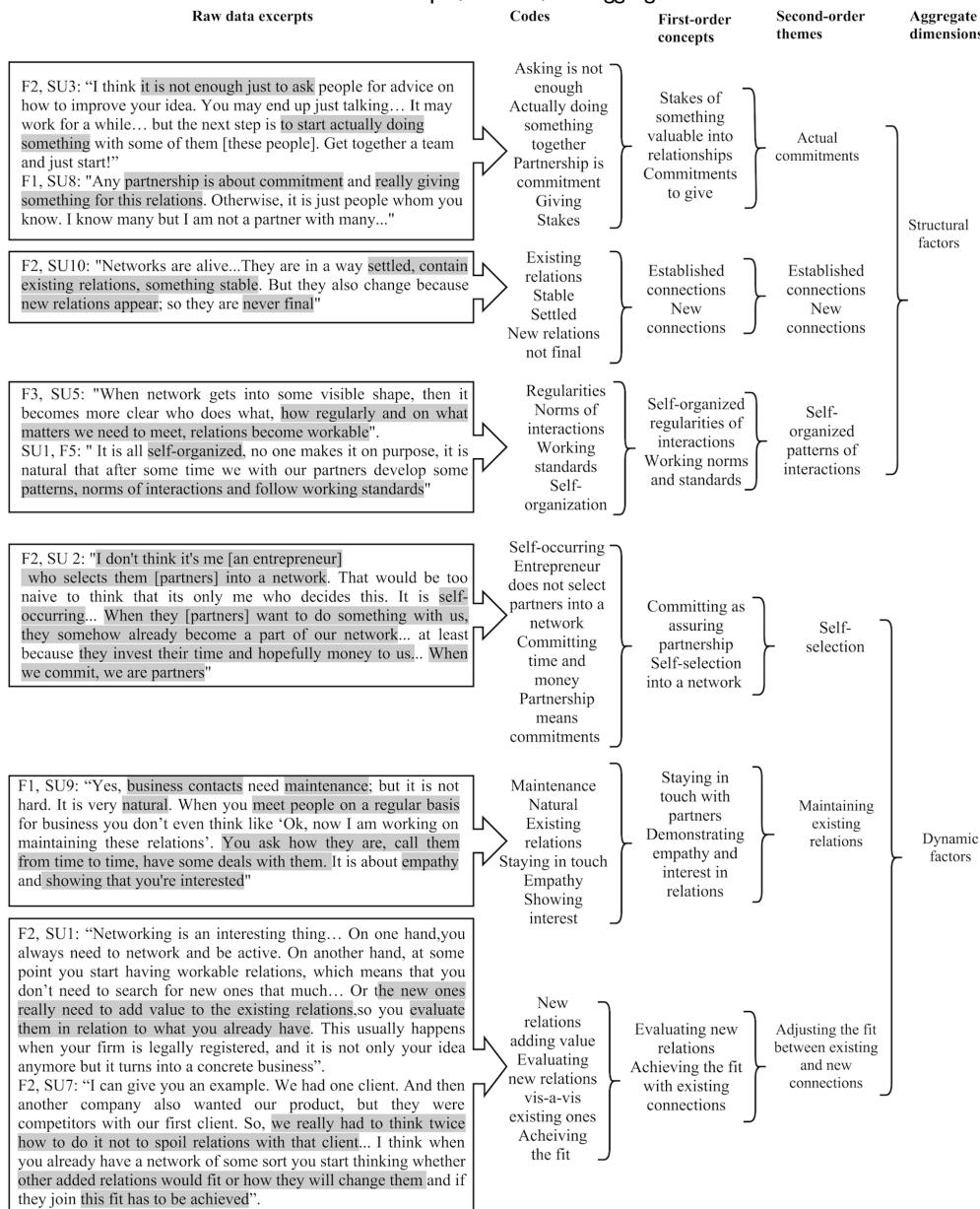
Prenetwork Phase

Our analysis shows (Table 3 and Figure 1) that this phase can be characterized by important initial conditions (Schneider & Somers, 2006) that determine future shapes and crystallizations of effectual networks. These initial conditions are not only structural components setting up the

Table 5. Inference From Raw Data to Concepts, Themes, and Aggregate Dimensions—2.

basis for future systems of effectual network relations, but also triggers for dynamic processes within them. Here, we refer to *entrepreneurial means* available to a potential business founder (Sarasvathy, 2001; 2008) and which they identified through the process of *scanning for means*.

However, just having means has not been enough to trigger the process of effectual network emergence. Consistent with Fischer and Reuber (2011), we found the dynamic cognitive activity of *realizing means* through in-depth self-reflection and comparing yourself with others was an important factor affecting the start of the entire venture creation and effectual network development. As proposed by Sarasvathy (2001; 2008), some existing relations that entrepreneurs identified as the "Whom-I-know" part of the means became a foundation of the future network of relations. Following Read et al. (2017), we relate them to the prenetwork phase, because they are not newly and actively established connections but the given relations that have become initial

Table 6. Inference From Raw Data to Concepts, Themes, and Aggregate Dimensions—3.

preconditions for future networks. The interviewed entrepreneurs identified these existing contacts as the first potential stakeholders to interact with and commence the employment of available means. Our interviews also pointed to another significant structural factor influencing the setting of effectual networks. Consistently, the setting of effectual networks has been highly dependent on the entrepreneurs' *willingness to proceed further with set of means* cognitively identified as useful for future entrepreneurial endeavors. This motivation triggered the further networking, identifying entrepreneurial opportunities and growing effectual networks.

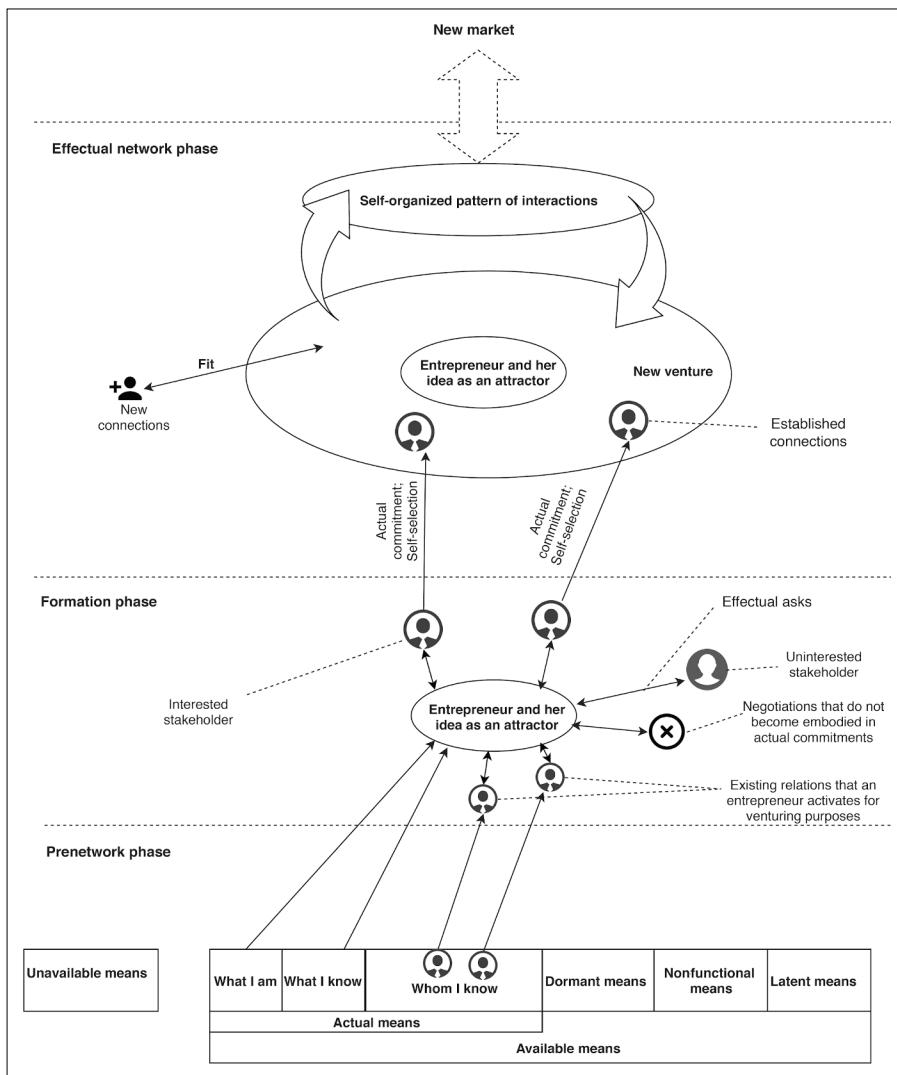


Figure 1. Process-system model of effectual networks as CAs.

Also, our findings point not only to the means described in the effectuation research (Read et al., 2017; Sarasvathy, 2001), which we term *actual means*, but also to the other types of means. Thus, we could also distinguish (a) *dormant means* or sleeping relations that entrepreneurs had but did not need at the moment and kept reserved in an “inventory” for future activation; (b) *nonfunctional means* or contacts entrepreneurs had but could not use at the moment for various reasons; (c) *latent means* or relations entrepreneurs had but did not perceive as valuable for entrepreneurial purposes. Interestingly, entrepreneurs could also perceive the gaps in their existing contacts and identify (d) *unavailable means* or relations they do not have but would like to have. These gaps can either hinder or lock further networking and venturing processes or can motivate them to rescan for available means, through which dormant, nonfunctional and latent means could be shifted into the category of actual means. Alternatively, entrepreneurs might start

actively establishing new relations with various new stakeholders and, thus, expand the set of available means. This is a cross-phase activity linking Prenetwork and Formation phases.

Formation

Our analysis demonstrates (Table 4) that the actual formation of effectual networks starts when entrepreneurs begin actively *networking with all and any stakeholders* and sharing their ideas, which corresponds with Sarasvathy and Dew (2005), Read et al. (2009), and Wiltbank et al. (2009). This networking is a distinctive dynamic factor that fosters the deployment of effectual networks, even though it increases complexity and, consequently, uncertainty of developing relations. In this phase, the initial *effectual asks* are important structural factors because they are already conscious attempts to collect opinions about inceptive entrepreneurial ideas. Consistent with previous research (Dew & Sarasvathy, 2007; Sarasvathy & Dew, 2008), these networking and asks result in rather specific *stakes or offers an entrepreneur can afford to lose*, which initiates a reciprocal mechanism in counterparts, who also assess their affordable loss. These stakes can be in the simple form of time spent with potential partners and/or shared ideas about potential business. Alongside these asks and initial interactions, the focal entrepreneur peers at potential partners and gets to know them through their counter suggestions. These *feedback loops* serve as an important mechanism of decreasing uncertainty in effectual networks.

In addition, we have uncovered another important dynamic factor, namely *establishing connectivity among interactions*. Thus, entrepreneurs begin to relate and link together unbound and unrelated interactions that become concentrated around them, and their *entrepreneurial idea as an attractor*. In this phase, the idea may not be fully fledged and final; however, it needs to be strong enough to attract stakeholders. Furthermore, our interviews demonstrated that *achieving a critical mass of interactions* is one of the decisive dynamic factors in effectual network formation. This microprocess also constitutes an opportunity for the entrepreneurial idea to be proven reasonable.

Effectual Network Phase

In line with Sarasvathy and Dew (2005), Sarasvathy, 2001, 2008), and Read et al. (2009), we have found (Table 6) that the emergence of effectual networks also depends on whether effectual asks and stakes evolve into *actual commitments* (a structural factor of effectual network development) and, thus, initiate a *self-selection* of stakeholders into the effectual network (a dynamic factor). Indeed, some entrepreneurs may not go beyond asking, resulting perhaps in no actual commitments of money, expertise, and/or time.

Consistent with the previous phase, entrepreneurs and their ideas remain the main attractor; this attractor consolidates the network as a system, as suggested by Anderson (1999). Actual commitments made around and about the idea may continue to shape it. Also, this phase often coincides with an event of the establishment of the startup as a legal entity. Unlike in the previous phase, the entrepreneurial idea gains more concrete contours of a venture as a business unit with more specified functions and tasks. Naturally, actual commitments and their fulfillment determine whether relations are workable and what *established connections* the entrepreneurs have. Consistent with Sarasvathy and Dew (2003), these existing relations, in turn, will define what *new connections* will be added to the emergent network. Also, *maintaining established relations* through regular interactions and, at the same time, *adjusting the fit between established and new connections* become crucial dynamic factors of effectual network development.

Further, the resulting relations gain consistency and continuity. Consistent with CASs (Chiles et al., 2004), they start reproducing themselves through *self-organized patterns of interactions*

Table 7. Entrepreneur-related Dynamic and Structural Factors of Effectual Network Emergence.

	Structural factors	Dynamic factors
Prenetwork phase	<ul style="list-style-type: none"> ● Available means: <ul style="list-style-type: none"> ○ Actual means ○ Dormant means ○ Nonfunctional means ○ Latent means ● Unavailable means ● Willingness to proceed further with the set of means 	<ul style="list-style-type: none"> ● Scanning for means ● Realizing means
Formation	<ul style="list-style-type: none"> ● Effectual asks ● Feedback loops ● Stakes that entrepreneurs can afford to lose ● An entrepreneurial idea as an attractor 	<ul style="list-style-type: none"> ● Interacting with all and any stakeholders ● Establishing connectivity among interactions ● Achieving a critical mass of interactions
Effectual network phase	<ul style="list-style-type: none"> ● Actual commitments ● Established connections ● New connections ● Self-organized patterns of interactions 	<ul style="list-style-type: none"> ● Self-selection ● Maintaining established relations ● Adjusting the fit between established and new connections

and communication habits developed by counterparts. These patterns may become apparent in the form of the set regularities of meetings, framed behavior during and outside them, working standards, and norms among partners. However, this does not mean that effectual networks lose flexibility and become rigid. Because the availability of various stakeholders (together with their means and commitments) gives room for maneuver, the network remains adaptive and responsive to external change.

Even though our empirical entrepreneur-centric study does not allow making an inference about effectual networks at a market level of analysis, based on our theoretical discussion, we would speculate that the self-organized patterns of interactions let new effectual networks grow into new markets (Dew et al., 2011; Read et al., 2009; Sarasvathy & Dew, 2005). However, the empirical testing of this idea would require another study at a higher level of analysis.

We summarize the dynamic and structural factors of effectual network development in Table 7. Notably, both dynamic and structural factors unfold in effectual networks in a self-reinforcing and tightly inter-related manner. In other words, dynamic processes within them cannot be understood without structural components, and the nature of these structural elements can be understood only through their developmental dynamics. Additionally, our earlier discussion allows for deriving propositions about effectual networks as CAs. These propositions link together their structure and dynamics. Table 8 groups them into main-effect and moderating/mediating propositions.

Additionally, based on our findings and discussion, we develop a process-system model that visually shows the dynamics of effectual network emergence through three stages (Figure 1). The model does not depict an effectual network at a certain point in time, creating a static snapshot; rather, our propositions and the model allow for tracing the connection between the elements of the network and reveal the process of becoming of an effectual network. Also, the model allows for connecting the stages of network formation with respective units of analysis. Thus, the pre-network phase emphasizes the microlevel of individual entrepreneurs and their means; the

Table 8. Propositions.

	Main effect propositions	Mediating/moderating effect propositions
Prenetwork phase	<p>P1: Unavailable means hinder the emergence of an effectual network. P2a: Large amount of unavailable means triggers the transformation of dormant, nonfunctional, and latent means into actual means. P2b: Actual means support the emergence of an effectual network. P3a: Interacting with all and any stakeholders positively affects the set of available means. P4a: Willingness to proceed further with the set of means positively affects interaction with all and any stakeholders. P4b: Interaction with all and any stakeholders supports the emergence of an effectual network.</p>	<p>P2c: Transformation of means mediates the relationship between unavailable means and the emergence of an effectual network. P3b: Available means moderate the relationship between stakeholders and emergence of an effectual network. P4c: Interaction with all and any stakeholders mediates the relationship between willingness to proceed further with the set of means and emergence of an effectual network.</p>
Formation phase	<p>P5: Networking increases complexity and uncertainty in an emerging effectual network. P6a: Networking with all and any interested stakeholders increases the number of effectual asks and feedback loops. P6b: Increases in the number of effectual asks and feedback loops decreases uncertainty in an emerging effectual network. P7a: An attractor supports the emergence of an effectual network. P8a: A large amount of effectual asks positively affects the formation of an attractor. P9a: A large amount of effectual asks positively affects the process of establishing connectivity among interactions. P9b: Connectivity among interactions supports the emergence of an effectual network. P10a: Interacting with all and any stakeholders increases the number of stakes that entrepreneurs can afford to lose. P10b: Increased number of stakes that entrepreneurs can afford to lose supports the emergence of an effectual network.</p>	<p>P6c: Effectual asks and feedback loops moderate the relationship between networking with stakeholders and uncertainty reduction in an emerging effectual network. P7b: An attractor mediates the relationship between the stakeholders and supporting the emergence of an effectual network. P8b: An attractor mediates the relationship between effectual asks and the emergence of an effectual network. P9c: Connectivity among interactions mediates the relationship between effectual asks and the emergence of an effectual network. P10c: Increased number of stakes that entrepreneurs can afford to lose mediates the relationship between stakeholders and the emergence of an effectual network.</p>

(Continued)

Table 8. Continued

	Main effect propositions	Mediating/moderating effect propositions
Effectual network phase	P1a: Actual commitments positively affect the process of self-selection of stakeholders. P1b: The process of self-selection of stakeholders supports the emergence of an effectual network. P13a: Self-organized patterns of interactions positively affect the fit between new and established connections. P13b: The fit between new and established connections supports the emergence of an effectual network. P14a: Maintaining established relations positively affects formation of self-organized patterns of interaction. P14b: Self-organized patterns of interaction support the emergence of an effectual network. P16a: Actual commitments positively affect achieving a critical mass of interactions. P16b: A critical mass of interactions supports the emergence of an effectual network.	P1c: The process of self-selection of stakeholders mediates the relationship between actual commitments and the emergence of an effectual network. P13c: The fit between new and established connections mediates the relationship between self-organized patterns of interactions and the emergence of an effectual network. P16c: A critical mass of interactions mediates the relationship between actual commitments and the emergence of an effectual network.

formation phase shifts the focus to interactions between entrepreneurs and stakeholders; the effectual network phase focuses on a venture as a unit of analysis. Additionally, this perspective assists in capturing emerging, as well as disappearing, network elements (such as uninterested stakeholders or/and negotiations that do not become embodied in actual commitments in our model), enabling us to understand and explain how it evolves. Stemming from our theoretical discussion, we also propose that effectual networks develop further into new markets (Dew et al., 2011; Read et al., 2009; Sarasvathy & Dew, 2005). In Figure 1, we depict this with a dotted arrow, because our entrepreneur-centric data does not provide clear evidence for it; exploring how effectual networks grow into new markets would imply more complex interfirm level of analysis and require another study.

Because any model seeks to simplify reality and reduce complexity by omitting something, it is impossible to have a perfect model of a complex system that would keep track of all simultaneous, nonlinear interactions between its components (Cilliers, 2001). However, our derived propositions describe fully the intricate interactions of the model components. Therefore, the model itself serves as an illustrative and explanatory tool to complement our propositions and to contemplate effectual networks in a more complete manner. Also, the suggested phases in the process of their emergence and related system characteristics are probabilistic rather than deterministic.

Conclusions

Our study has shown effectual networks through the lens of CASs and demonstrated entrepreneur-related structural and dynamic factors of their development. We have developed several propositions and a process-system model that demonstrate the interdependence of these factors along the three phases of effectual network emergence, namely prenetwork, formation, and effectual network. Our study builds on the dynamic process model of entrepreneurial networking under uncertainty developed by Engel et al. (2017). Their conceptual work is an important step forward in understanding the effectual logic of networking where the focal entrepreneur has the main agency. We also take a process view; however, our empirical study offers a different and novel approach. Adapting CAS perspective allows grasping not only the dynamics of effectual network formation but also seeing it at a system level and capture its structural characteristics. Importantly, we also show various inter-relations between the structure and dynamics along the effectual network emergence. Engel et al. (2017) frame their model around cycles of networking and cycles of goal convergence and means expansion; also, their level of analysis—a focal entrepreneur—does not change. Our model, in turn, builds on stages of effectual network formation and shows the move from microlevels of analysis (entrepreneurial means) toward higher ones (a new venture). Hence, our perspective allows zooming into the microdynamics of network emergence and at the same time zooming out and see them as a part of a bigger system. Additionally, while Engel et al. (2017) connect entrepreneurial networking with uncertainty, the CAS perspective suggests an important link between conditions of complexity and uncertainty. Overall, our work serves as an important stepping stone to advance effectuation and converge it with complexity theory. We now go beyond our empirical results and speculate on new possibilities and implications of complexity theory for the effectuation research.

Network Emergence Under Conditions of Complexity and Uncertainty

Our article shows that complexity theory and effectuation share a common problem space, uncertainty, which stems from inability to predict. The difference they exhibit, however, is that for complexity theory unpredictability comes from too many interactions between perhaps known parameters, their diversity, and the absence of cause-and-effect chains between them; whereas

for effectuation, uncertainty results from unknown and unknowable parameters and their interactions. In the effectual networking context, the adopted CAS perspective allows proposing that involving numerous stakeholders increases the complexity of the process, because more parameters begin to interact and more information asymmetry is created. This, in turn, leads to unpredictability and uncertainty. However, this early engagement of the stakeholders and their dynamic connectivity can mitigate the effects of uncertainty; concurrent processes of relationship expansion and contraction enable adaptive dynamics, responsiveness, and cocreation, which are crucial to effectual commitments and acting upon leveraged contingencies. Hence, paradoxically, the complexity of effectual relations is both a source of uncertainty and a remedy for developing entrepreneurial relations under these uncertain conditions.

Given that effectuation and causation are not mutually exclusive logics (Smolka, Verheul, Burmeister-Lamp, Heugens, & Heygens, 2018), our findings can be taken further to investigate the role of complexity not only in relation to the effectual strategies of entrepreneurs but also in their combination with causation. Aiming for predictability, goal orientation, and certainty, causal strategies may lead to lower levels of complexity and less uncertainty; at the same time, this may cause lack of responsiveness, openness to the unexpected, and undeveloped opportunities. Conversely, effectual strategies result in increased complexity, which allows for flexibility, efficient reactions to change, and control over uncertainty. Hence, future research may examine the levels of complexity and uncertainty when both causation and effectuation are present.

Clarifying the Concept of Effectual Control

Controlling the unpredictable future is one of the key principles of effectuation (Sarasvathy, 2001). Read et al. (2016, p. 531) claim that the nature of this control requires more research attention. Our CAS perspective deepens the understanding of effectual control. We show that entrepreneurs can control an unpredictable future by increasing the complexity of their relations, which paradoxically allows them to cope with uncertainty. We also indicate the adaptive, feedback-based and distributed nature of this control. Our model offers an important component of effectual control in networks, namely an attractor, which is represented by an entrepreneur and his/her entrepreneurial idea. Our propositions show that being uncertain, multidimensional, and changing systems, effectual networks become self-organized through interconnections between committed stakeholders around attractors without any central controlling body.

Future studies can extend our findings and examine the possible drawbacks of this distributed effectual control in situations where some stakeholders wish to maximize their benefit. Assuming that causal and effectual reasoning are combined in entrepreneurial actions (Sarasvathy, 2001; Smolka et al., 2018), the future research can also examine how effectual control coexists with causal control at different levels, and whether this coexistence is harmonious and productive or conflicting and destructive. In addition, scholars could adopt a dynamic perspective on effectual control and see whether it changes from distributed to more localized (e.g., around one or several attractors), and asymmetric along the stages of venture development.

Understanding the Mechanism for the Acquisition of Effectual Expertise

Read et al. (2016, p. 531) stipulate that our understanding of how decision-makers acquire effectual expertise is insufficient, and scholars need to examine specifically the role of deliberate practices in acquiring this expertise. Our model shows that entrepreneurs acquire effectual expertise through positive and negative feedback loops to and from various stakeholders; this iterative looping back and forth is a strong self-reinforcing learning mechanism. Thus, the acquired expertise becomes the basis for the next feedback loop, which, in turn, results in yet further increased

expertise. Following effectual logic entrepreneurs deliberately leverage a variety of interactions in order to gain effectual expertise, increase chances for contingencies, and thus secure conditions for new opportunities. This is closely linked to the theory of expertise by Simon and Chase (1973); they conclude that expertise is gradually gained through acquiring patterns and knowledge on how to react in certain situations; later, future experts store memories of their past actions and reproduce those actions in similar situations. The difference with effectual expertise is, however, that under conditions of complexity and uncertainty the decision-making circumstances will not be similar, and the reproduction of past actions may not be relevant. Yet, addressing all and any stakeholders through series of effectual asks and getting feedback through positive and negative loops may become a deliberate and even routinized pattern of gaining effectual expertise, which is consistent with expertise acquisition literature (Ericsson, 2018). Stemming from these results, the future research can use the CAS perspective to explore system-level acquisition of effectual expertise, for example, at a unit or corporate level. To date, effectuation studies have been concentrated mainly on the cognitive, individual-centric mechanisms of acting and reasoning. However, little is known about how firms as systemic entities can develop effectual expertise and, more importantly, obtain the capability to combine it with causal strategies. Complexity theory and its more specific principles of adaptability, coevolution, and connectivity can be a useful tool for research in this direction.

Understanding the Transformation of Effectual Means Into Causal Resources

Besides, our findings open up and pluralize the concept of effectual means, showing that entrepreneurs not only consider the actual means at hand but also scan for dormant, nonfunctional, latent, and unavailable means. Differentiation between these different types of means can be useful to investigate the transformation of effectual means into causal resources (Read et al., 2016). Realization of what entrepreneurs have allows them to understand what they do not have but need to have. This, in turn, starts another microprocess of identifying a need and developing an action plan to fulfill that need (What should I do to get what I do not have? How can I use what I have to get what I do not have?), which resembles a goal-driven causal process. Future studies can examine in more detail this mechanism of how effectual means at hand become strategic resources to satisfy the need.

Practical Implications

Our study shows that effectual reasoning is suited to entrepreneurs establishing relations under conditions of uncertainty and complexity, which is different from purposeful and instrumental networking. By differentiating between entrepreneur-related dynamic and structural factors, as well as by elaborating the process-system model of effectual networks, we open up how effectual networking is linked with the process of resource leveraging. In the prenetwork phase, entrepreneurs can compile a portfolio of actual and unavailable means. It enables important connections between different types of means and further actions; for example, how unavailable means can be gained by utilizing actual means or addressing others through effectual asks. Additionally, the model may envision various scenarios of how unavailable means can influence the process of network formation and venture development, in case they are gained or not gained. This would also facilitate entrepreneurial opportunity identification and assist in decision-making along the venture creation process. Moreover, the process-system model of effectual networks points toward the need to identify the existing relations, the "Whom-I-know" part of the means, as these represent essential conditions to which the future network is highly sensitive. At the formation phase, it is important for entrepreneurs to interact with any and all stakeholders and stay open to

unexpected connections. It would increase the complexity of relations, help to deal with uncertainty, and bring new opportunities in a very organic way. These intensive interactions could help to achieve a critical mass of interactions, enable connectivity, and test initial entrepreneurial ideas with various stakeholders. In the formation stage, entrepreneurs can utilize an entrepreneurial idea, or an attractor, to group unbound and unrelated interactions, thereby fostering network development. In other words, the entrepreneurial idea can help create a pool of interested stakeholders. Further, at the network stage, entrepreneurs should pay due attention to maintain the established workable relations and fitting new ones into the emergent network.

Limitations

The primary focus of our study is effectual networks. However, we are aware of the growing number of studies examining the interdependency and simultaneity of effectuation and causation (Perry, Chandler, & Markova, 2012; Reymen et al., 2015; Smolka et al., 2018). Hence, our study can be criticized for not viewing a broader picture and not connecting effectual network mechanisms with more causal ones. Our argument concerning this potential criticism is that in order to understand their coexistence, effectual networks need to be conceptualized and described properly. Therefore, our study can serve as an initial step toward further research on coexistence of effectual and causal networks and how they interflow into entrepreneurial networks.

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Notes

1. We chose the concept of CASs instead of complex adaptive networks (CANs) for several reasons. First, the concepts of CAS and CAN are closely related. Yet, according to Choi, Dooley, and Rungtusanatham (2001), the concept of CAS is a wider one. The authors define a CAS as “an interconnected network of multiple entities (or agents) that exhibit adaptive action in response to changes in both the environment and the system of entities itself”. Second, in the extant literature, the concept of CAS appears to be much stronger and more established, providing a more solid link to complexity theory. Hence, selecting the CAN concept would offer a narrower view and a weaker link between CASs and effectual networks.
2. See, e.g., Håkansson and Snehota (1995); Håkansson and Ford (2002); Hinterhuber & Hirsch, 1998; Jarillo (1988); Koon and Low (1997); Ritter, Wilkinson, and Johnston (2004); for business networks and e.g. Burt (1995; 2004); Granovetter (1973; 1985); Uzzi (1997); Podolny (2001); Kilduff and Tsai (2003) for social networks.
3. This happens due to the nature of an effectual commitment, which is defined as “a self-imposed non-negotiable constraint that stacks the deck in favor of or against specific future choices” (Sarasvathy & Dew, 2003).
4. We adhere to the idea that induction and deduction are not exclusive logics of inference, and no study can genuinely separate them (Eisenhardt, 1989; Parkhe, 1993). Thus, our conceptual part has some elements of deduction needed for establishing theoretical basis; however, induction dominates in our

study because the main contribution comes from theory-building process of developing the model and propositions.

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Combining Internal and External R&D: The Effects on Innovation Performance in Family and Nonfamily Firms

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Abstract

We examine the effect of combining internal and external R&D loci on innovation performance in family firms (FFs) and nonfamily firms (non-FFs). Our longitudinal analysis of 27,438 firm-year observations of Spanish manufacturing firms from 1990 to 2016 shows that FFs can better exploit the benefits of simultaneously engaging in internal and external R&D activities, leading to a positive effect on innovation performance. Moreover, the relationship between combined internal and external R&D and innovation performance in FFs is contingent upon firm economic performance. By pointing to the importance of taking into account the combination of internal and external R&D loci to foster innovation in FFs, we challenge current family business innovation research.

Keywords

external R&D, family firm, innovation performance, internal R&D, open innovation, absorptive capacity

The debate on the implications of internalizing innovation activities and outsourcing technology acquisition is ongoing, and the literature on this issue is full of countervailing theoretical arguments and mixed empirical evidence (e.g., Hagedoorn & Wang, 2012; Vega-Jurado, Gutiérrez-Gracia, & Fernández-de-Lucio, 2009). Extant research has built a compelling case for the complementarity between internal and external innovation activities, as the capacity to absorb knowledge from external loci is assumed to be a function of the firm's prior knowledge predominantly stemming from internal R&D (Cassiman & Veugelers, 2006; Cohen & Levinthal, 1989;

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Zahra & George, 2002). However, further work is needed to understand if and how firms can generate such complementarity from combining internal and external R&D.¹

In this study, our first research question focuses on whether and why family firms (FFs) may behave differently from nonfamily firms (non-FFs) in reaping innovation rewards from *combined R&D*, that is, simultaneously engaging in internal and external R&D activities. We posit that in pursuing distinctive goals, the unique set of resources that FFs bundle and leverage will shape the outcome of their innovation activities (Carnes & Ireland, 2013).

The trade-off between affective endowment and financial concerns in FFs often differs from non-FFs (Carney, 2005; Yu, Lumpkin, Sorenson, & Brigham, 2011). FFs are typically motivated by, and committed to, the preservation of their affective endowment (Berrone, Cruz, & Gómez-Mejía, 2012), aiming to meet the goals of both the family and the business systems (Gómez-Mejía, Haynes, Núñez-Nickel, Jacobson, & Moyano-Fuentes, 2007; Zellweger, Chrisman, Chua, & Steier, 2019). The nonfinancial aspects that meet the family's affective needs are the pivotal reference point in these businesses. Strategic choices in FFs will therefore tend to reflect the family's desire to accomplish family-centered noneconomic goals apart from economic utilities (Berrone et al., 2012; Gómez-Mejía et al., 2007), and this holds particularly for their resource deployment and management (Sirmon & Hitt, 2003). As a result, how FFs shape their innovation outcomes based on their distinctive propensity to assimilate and transform external resources, combine them with internal ones, and exploit their available resource stock (Carnes & Ireland, 2013; Sirmon & Hitt, 2003) potentially differs from non-FFs when undertaking both internal and external R&D.

We also address another important research question: Is an FF's advantage in exploiting combined R&D stronger in situations of below-par performance? As mentioned, noneconomic goals are expected to be a primary focus in FFs (Berrone et al., 2012; Kotlar & De Massis, 2013). Nevertheless, the priority of family-centered noneconomic goals reduces when economic conditions threaten FF survival, and thus the long-term benefits for the family (Gómez-Mejía, Patel, & Zellweger, 2018). As FFs facing negative economic prospects are expected to develop a more explorative attitude in making critical decisions regarding external R&D (Patel & Chrisman, 2014), we posit that FFs will be better at transforming the combined internal and external R&D loci into innovation performance compared to situations of high performance relative to the aspiration level.

To examine these research questions, we first rely on the resource-based view (RBV), given that FFs need to pay attention to resource management to transform external resources, combine them with internal resources, and exploit the bundle of tangible and intangible assets (e.g., Carnes & Ireland, 2013; Chrisman, Chua, & Zahra, 2003; Eddleston, Kellermanns, & Sarathy, 2008; Sirmon & Hitt, 2003). Understanding how resources may be drivers of superior innovation outcomes in FFs compared to non-FFs is of particular interest for practice and academic research (Carnes & Ireland, 2013; De Massis, Frattini, & Lichtenthaler, 2013). Assuming that firms in an industry or group are heterogeneous in terms of their resources (Peteraf, 1993), a key determinant of sustained competitive advantage (Wernerfelt, 1984) is holding resources that are valuable, rare, inimitable, and irreplaceable (Barney, 1991).

Second, based on the behavioral theory of the firm (Cyert & March, 1963), we explore how the effect of a combined R&D strategy on innovation performance in FFs might be contingent upon performance aspirations. According to this perspective, the behavior of a firm's dominant coalition affects its decision-making process (Cyert & March, 1963), playing a role in strategic decisions such as those concerning innovation (Classen, Van Gils, Bammens, & Carree, 2012; Kotlar & De Massis, 2013). Under this framework, we suggest that when FFs underperform, family decision-makers are more likely to sacrifice their affective endowment to ensure the firm's future financial wealth (Chrisman & Patel, 2012; Gómez-Mejía et al., 2018). We therefore posit

that negative performance gaps threatening the firm's survival lead the dominant coalition to place more emphasis on economic over family-centered noneconomic goals, resulting in the pursuit of innovation benefits from combining internal and external R&D loci.

This paper contributes to the literature in at least two ways. First, despite the ever-greater focus on understanding technological innovation in FFs (e.g., Chrisman & Patel, 2012; De Massis, Audretsch, Uhlaner, & Kammerlander, 2018a; De Massis, Ding, Kotlar, & Wu, 2018b; De Massis, Frattini, Kotlar, Petruzzelli, & Wright, 2016; Duran, Kammerlander, van Essen, & Zellweger, 2016; Filser, De Massis, Gast, Kraus, & Niemand, 2018), the means with which FFs can facilitate innovation performance have received less attention (e.g., Calabro et al., 2019; De Massis et al., 2013). FFs are particularly efficient in turning innovation inputs into outputs (Duran et al., 2016; Matzler, Veider, Hautz, & Stadler, 2015). External R&D is deemed a critical competence for sustained innovation success, and hence the need to explore the extent to which complementing the internal knowledge base of FFs with externally sourced technology improves their innovation performance over non-FFs. Our analysis therefore contributes to family business literature by analyzing the relative influence of different R&D loci on innovation performance in FFs versus non-FFs. In particular, we provide new insights on resource deployment and leverage, helping explain why FFs are far more efficient at turning combined internal and external innovation inputs into innovation outcomes.

Second, previous studies have drawn on the behavioral framework to address firm strategy formulation (i.e., R&D investment) (Chrisman & Patel, 2012). Our findings advance this research stream by exploring the outcome of strategic choices (i.e., the output of R&D investments) under adverse firm conditions. To the best of our knowledge, no attention has thus far been paid to understanding whether certain contingencies (i.e., performance–aspiration gaps) affect the impact that a combined R&D locus has on innovation performance. In this regard, prior research stresses that under a negative performance–aspiration gap, family decision-makers' behavior becomes more aligned with financial utilities, and the divergence between maintaining current family-centered noneconomic goals and pursuing prospective financial concerns is therefore likely to be mitigated (e.g., Gomez-Mejia et al., 2018). We argue that family decision-makers will exhibit a higher propensity to prioritize financial over family-centered noneconomic goals when the FF performs below aspiration levels (Gomez-Mejia et al., 2018), with positive consequences on innovation performance from combined R&D.

Theoretical Background and Hypotheses Development

Family Firms and Innovation Performance: State of the Art

Before analyzing the relationship between FFs' internal and external R&D loci and innovation performance, we address a number of distinctive traits of FFs that may affect the transformation of innovation inputs into good innovation performance (for a systematic literature review on innovation in FFs, see, e.g., Calabro et al., 2019).

First, FFs are characterized by the family's emotional commitment to the firm. The duality of affective and business relationships allows family members to work with initiative and devotion (Miller, Wright, Breton-Miller, & Scholes, 2015). This creates a deep and shared understanding of how things are done in the firm. As a result, the workforce in FFs possesses high levels of firm-specific tacit knowledge, that is, intangible resources that are difficult to duplicate (Habbershon & Williams, 1999; Sirmon & Hitt, 2003). Such human capital (tacit knowledge), which accumulates during long tenure in the organization, supports knowledge transfer and mutual learning, and is found to increase the innovativeness of FFs (König, Kammerlander, & Enders, 2013). Second, FFs are known for their patient capital, defined as "financial capital that

is invested without threat of liquidity for long periods" (Sirmon & Hitt, 2003, p. 343). Given that patient capital promotes a long-term perspective (Habbershon & Williams, 1999; Sirmon & Hitt, 2003), it may boost innovation capabilities in FFs (De Massis et al., 2018a; Llach & Nordqvist, 2010). Third, the preservation of ties with external stakeholders (e.g., more effective relationships with suppliers) (Habbershon & Williams, 1999; Sirmon & Hitt, 2003) also helps FFs transform R&D resources into innovation outcomes.

Nonetheless, FFs also have certain unique characteristics that may negatively affect innovation performance. To begin with, their desire to maintain ownership and control of the firm in the hands of family members (Gomez-Mejia, Makri, Kintana, & Larraza-Kintana, 2010) leads them to adopt a conservative stance (Habbershon, Williams, & MacMillan, 2003). FFs are often reluctant to recruit outside employees, and the ensuing lack of more talented employees in managing R&D projects (Chang, Wu, & Wong, 2010; Chen & Hsu, 2009) might negatively affect innovation performance. Similarly, some FFs allocate resources for family purposes, giving preferential treatment to family members (Miller et al., 2015). Nepotism often erodes innovation capabilities. Finally, FFs tend to avoid external financing, as this source of capital may threaten the family's control of the firm. However, limited access to external financial resources (Gallo, Tàpies, & Cappuyns, 2004) may ultimately reduce the FF's propensity to select valuable innovation projects.

Family Firms' Internal and External R&D Loci and Innovation Performance

While the importance of combining internal and external knowledge in developing innovative products and processes has been recognized for many years, both theory and practice remain ambiguous as to whether internal and external R&D loci complement each other (Cassiman & Veugelers, 2006). On the one hand, research suggests that firms simultaneously engaging in internal and external R&D sustain innovation, achieving reliability while enabling organizational renewal, thus enjoying enhanced innovation performance (Stettner & Lavie, 2014). It is well documented that rather than solely relying on knowledge from external loci, firms need to engage in their own internal R&D activities to successfully develop new products and services (Cassiman & Veugelers, 2006; Dahlander & Gann, 2010; Krzeminska & Eckert, 2016; Lokshin, Belderbos, & Carree, 2008). Indeed, the role of absorptive capacity as the "ability of a firm to recognize the value of new, external information, assimilate it and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128) becomes essential to successfully develop new products and services (Brinkerink, 2018; Krzeminska & Eckert, 2016; Lane, Koka, & Pathak, 2006; Todorova & Durisin, 2007; Tortoriello, 2015; Tsai, 2001; Volberda, Foss, & Lyles, 2010). Specifically, acquisition and assimilation (i.e., building potential absorptive capacity), and transformation and exploitation (i.e., realized absorptive capacity) enable firms to derive new insights when incorporating transformed knowledge into operations (Zahra & George, 2002; Kotlar, De Massis, Frattini, & Kammerlander, 2019). Finally, economies of scope, which manifest when firms share resources for different R&D activities (Cassiman & Veugelers, 2002; Krzeminska & Eckert, 2016), and knowledge spillovers (Krzeminska & Eckert, 2016) enable firms to achieve better innovation performance when combining internal and external R&D rather than when engaging in either internal or external R&D in isolation.

In contrast, another theoretical orientation casts doubt on the prevailing assumption that combining knowledge generated through internal R&D with knowledge from external R&D leads to better innovation performance. The risks associated with knowledge transfer (Schmiedeberg, 2008) include opportunistic exploitation by a partner (Krzeminska & Eckert, 2016) and questioning the legitimacy of internal R&D efforts when engaging in external R&D, leading to resistance among organizational members seeking to protect their own interests

(Katz & Allen, 1982; Lichtenhaler & Ernst, 2006). These risks help explain a detrimental effect of combined R&D on innovation performance. Similarly, coordination and communication issues, such as the need for (and difficulty of) coordinating internal and external R&D, the risk of a misalignment between internal and external R&D, and communication barriers between both R&D loci, make it difficult to transfer knowledge, especially tacit knowledge (Krzeminska & Eckert, 2016). Lastly, knowledge from external loci is associated not only with increasing identification, assimilation, and utilization costs (Belderbos, Faems, Leten, Looy, & Van Looy, 2010; Laursen & Salter, 2006; Salge, Farchi, Barrett, & Dopson, 2013), but also with potential appropriation concerns (Alexy, George, & Salter, 2013; Almirall & Casadesus-Masanell, 2010).

Extending this line of reasoning, we now propose that compared to non-FFs, FFs will be particularly successful at combining in-house R&D with external know-how, with a positive effect on innovation performance. According to the RBV, the interaction between the family and the business (Habbershon & Williams, 1999) means that FFs own a unique bundle of resources referred to as “familiness.” “Familiness is defined as the unique bundle of resources a particular firm has because of the systems interaction between the family, its individual members, and the business” (Habbershon & Williams, 1999, p. 11). Although this familiness may be seen as a potential source of competitive disadvantage (for instance, FFs may suffer from limited resources given their preference for internal resources), this resource constraint is likely to increase the efficiency and parsimony of their use of resources (Carney, 2005; Sirmon & Hitt, 2003; Zellweger, 2017). Thus, family-provided resources can lead to a competitive advantage for FFs (Zellweger, 2017).

First, in terms of human capital, using resources to satisfy family preferences via nepotism, that is, favoring the hiring of family members over more talented external professionals, may limit the quality and quantity of human capital (Sirmon & Hitt, 2003), robbing the firm of the resources needed to innovate (Miller et al., 2015). This will negatively affect the FF’s assimilation and leverage of external knowledge and its ability to combine such resources into a stock of internal knowledge (negative familiness). However, as part of the FF resource endowment, family members—who in many cases have actually grown up in the FF—have learned skills and practices involving a set of core values that are specific to the firm. This tacit knowledge cannot be easily transferred to other individuals or redeployed outside the business (Sirmon & Hitt, 2003; Tokarczyk, Hansen, Green, & Down, 2007). Therefore, while FFs may have a competitive disadvantage in terms of human capital, they are likely to have deeper levels of tacit knowledge (human capital) than non-FFs (Sirmon & Hitt, 2003), providing the former with distinct intangible resources (positive familiness). As a result, FFs are expected to have stronger absorptive capacity (particularly realized absorptive capacity), which allows them to reinforce current R&D and increase the efficiency of the innovation process (innovation outcomes) (Cohen & Levinthal, 1990; Zahra & George, 2002). Moreover, through their personal identification with the firm (Gómez-Mejía et al., 2007), the extraordinary commitment of family members facilitates strong personal ties among firm members, even creating “cultures in which there are powerful reciprocal loyalties among the family and its staff [...] This can create energized and highly productive human capital resources that non-family firm rivals that are more formalized, bureaucratic, and impersonal would find difficult to imitate” (Miller, Wright, Breton-Miller, & Scholes, 2015, p. 34). The uniqueness of FFs’ internal stock of R&D knowledge should lead to recognizing, understanding, and evaluating relevant external knowledge resources that can be combined with in-house knowledge (Berchicci, 2013; Cohen & Levinthal, 1990; Grimpe & Kaiser, 2010). As the risk of unwanted knowledge when combining internal and external R&D is likely to be lower in FFs, absorptive capacity (realized) will be strengthened in these businesses, with a positive impact on innovation performance.

Second, although the desire to maintain control in the family usually makes FFs more reluctant to resort to external funds, hence limiting the availability of financial capital (negative familiness; Gallo et al., 2004; Zellweger, 2017), FF's transgenerational goals create patient capital (positive familiness). Patient capital is positively related to the development of long-term knowledge, and thus a potential resource advantage "given the risks and lags in revenue generation entailed by many innovations" (Miller et al., 2015). Hence, family members will be more likely to focus on pursuing long-term benefits for both the family and the firm (James, 1999). Overall, patient capital fosters a long-term orientation that will help FFs combine external and internal R&D, obtaining better innovation performance than non-FFs. As Zellweger (2017, p. 139) recently pointed out, "family-provided capital can thus serve as a competitive advantage, as it enables long-term strategies that are difficult to imitate."

Establishing effective, long-term, and trust-based relationships with external stakeholders, such as suppliers (Duran et al., 2016; Sirmon & Hitt, 2003), is crucial for FFs. A long-term perspective "creates leeway for organizational members to engage in grounded non-formalized screening and the exploration of [...] new opportunities, even if those opportunities involve variability and risk" (König et al., 2013, p. 424). FFs' longer-term perspective (Carnes & Ireland, 2013; Le Breton-Miller & Miller, 2006; Zellweger, 2007, 2017) enables them to pursue activities that may be costly in the short run but highly profitable in the long run, such as innovation. In particular, FFs' long-term orientation will influence the nature of relationships they seek to establish with external R&D providers. Guided by their long-term orientation, FFs become more generous and responsive to business partners (Miller et al., 2015), and less inclined to act in ways that might violate a business partner's trust (Duran et al., 2016). FFs are likely to engage with external R&D providers whose knowledge and skills are specifically suited to their needs and long-term vision, and their realized absorptive capacity (i.e., knowledge transformation and exploitation) is therefore likely to be high (Zahra & George, 2002), leading to valuable innovation outcomes (e.g., expanding current products and services, increasing the efficiency of existing processes).

Third, many FFs typically build strong social capital from both intra- and interorganizational relationships (e.g., Arregle, Hitt, Sirmon, & Very, 2007; Sanchez-Ruiz, Daspit, Holt, & Rutherford, 2019; Sirmon & Hitt, 2003; Uhlaner, Matser, Berent-Braun, & Flören, 2015) or "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (Nahapiet & Ghoshal, 1998, p. 243)—see the review by Payne, Moore, Griffis, and Autry (2011). Social capital is a source of positive familiness (Zellweger, 2017) that will facilitate access to external resources (Hitt, Ireland, Camp, & Sexton, 2002), internal coordination, and knowledge creation and accumulation (Arregle et al., 2007; Sirmon, Hitt, & Ireland, 2007). Although this social capital may turn into a competitive disadvantage under certain conditions, such as outdated and closed networks (negative familiness) (Zellweger, 2017), it is a highly powerful resource allowing FFs to establish effective networks (Sirmon & Hitt, 2003) facilitating innovation. As recently highlighted "family firms have privileged network access, as family firm owners' nonfinancial goals direct the attention of family firms to building up and maintaining long-term and trust-based relationships with external stakeholders [...] Family firms are particularly likely to receive valuable support from their network partners" (Duran et al., 2016, pp. 1229–1230). Given that their reputation is closely linked to the family members' identity (Berrone et al., 2012), FFs may care more about their business partners than non-FFs, working harder to align their own and their suppliers' goals (Cennamo, Berrone, Cruz, & Gomez-Mejia, 2012). FFs will therefore be less likely to engage in activities that could damage their reputation (Berrone, Cruz, Gomez-Mejia, & Larraza-Kintana, 2010). Additionally, FFs will look for partners who can help identify promising trends and inventions and provide valuable and timely feedback throughout the

development process. This is also consistent with the recent study of Uhlener et al. (2015) who hypothesize and find partial support for the argument that internal social capital is more likely to lead to the mobilization of external networks in firms with family identity than non-FFs. Thus, when FFs combine internal and external R&D loci, they are expected to select R&D partners that better suit their R&D activities. This will facilitate communication and decision-making with external R&D suppliers, reducing coordination costs. Moreover, strong personal ties established through interfirm socialization have the potential to positively affect their predisposition to not only share proprietary knowledge, but also absorb knowledge inputs from external partners (Husted & Michailova, 2002; Van Wijk, Jansen, & Lyles, 2008). The propensity to select promising partners and better assimilate external resources will therefore enable FFs to achieve better innovation performance than non-FFs.

Finally, family managers, usually highly involved in the decision-making process, have a major concern for control and a long-term perspective (Gómez-Mejía et al., 2007). They are expected to draw up detailed contracts to reduce any potential negative effects when engaging in outsourced R&D, involving a detailed discussion of communication procedures, the roles and responsibilities of parties, extensive contingency planning, and the explicit inclusion of dispute resolution provisions. This will likely reduce potential conflicts with external R&D providers arising from opportunistic behavior (Argyres & Mayer, 2004; 2007). As a result, FFs are expected to be highly efficient in integrating internal and external R&D. Accordingly, we hypothesize:

Hypothesis 1 (H1): Family firms using a combined R&D strategy, that is, simultaneously engaging in internal and external R&D, are more likely to record better innovation performance than nonfamily firms using a combined R&D strategy.

Family Firms' Internal and External R&D Loci and Innovation Performance: The Role of Negative Performance–Aspiration Gaps

Here we argue that below-par performance reinforces the outcomes of innovation performance using combined R&D loci in FFs. FFs are characterized by high ownership concentration (Faccio & Lang, 2002), and the family's entire economic, social, and emotional endowment invested in the firm is consequently at risk when performance is below par (Gómez-Mejía et al., 2010). Negative performance feedback will therefore alarm managers in FFs even more so than in non-FFs. Faced with weaker performance, FFs will be driven more by goals that go beyond affective attachment because meeting the firm's financial obligations will become a necessary condition for family decision-makers to achieve any family-centered noneconomic and economic goals (Gómez-Mejía et al., 2014, 2018).

Drawing on the behavioral perspective, prior studies suggest that faced with performance below aspirations, FFs will invest more in R&D than non-FFs (Chrisman & Patel, 2012), and make exploratory R&D investments (Patel & Chrisman, 2014). Below-par performance levels will be interpreted by the family as threatening the firm's longevity (Gómez-Mejía et al., 2018), intensifying the need to reverse a deteriorating financial situation to preserve socioemotional and financial wealth. As loss-averse FFs will accept more risks to protect their long-term socioemotional endowment than non-FFs, a better reaction to negative performance feedback is expected. In particular, family decision-makers' incentives will be stronger to ensure that the financial resources allocated to acquiring new technologies are harvested efficiently and that new knowledge is used intensively (Carney, 2005). Moreover, family decision-makers are expected to invest effort and time in such knowledge and incorporate it into their self-domain (Ciarrochi &Forgas, 2000). In such circumstance, family members will likely attempt to leverage resources

through the combination of internal and external R&D loci to ensure innovation and firm survival (Kotlar, Fang, De Massis, & Frattini, 2014b), even if R&D outsourcing decisions may imply risks (e.g., questioning the legitimacy of internal R&D efforts, appropriation concerns). In essence, family decision-makers will have a strong incentive to transform and apply new knowledge once assimilated to reinforce existing products, services, and processes. Hence, under below-par performance, FFs are likely to better integrate existing internal R&D knowledge with new knowledge from external R&D loci to build reliable social capital (Matzler et al., 2015), long-lasting relationships with external stakeholders (Miller & Le Breton-Miller, 2005), and more effective networks (Uhlauer et al., 2015). In sum, we expect that improvements in innovation performance from combined R&D loci will be more apparent in FFs dealing with a drop in performance. We therefore posit:

Hypothesis 2 (H2): The positive relationship between family firms' simultaneous use of internal and external R&D and innovation performance is stronger under conditions of a negative performance-aspiration gap.

Methods

Our dataset consists of a panel of 3,547 manufacturing firms (27,438 firm-year observations) over a 26-year period (1990 to 2016) extracted from the Spanish Survey of Business Strategies (SSBS). This is a yearly survey conducted by the SEPI Foundation with the support of the Spanish Ministry of Industry. The SSBS covers a wide range of Spanish firms operating in all manufacturing sectors. One of the SSBS's main features is the representativeness of the reference population composed of Spanish firms with 10 or more employees in one of the two-digit manufacturing subsectors in NACE Rev. 2 (European industrial classification scheme). Firms in the SSBS dataset are selected combining census schemes (for firms with more than 200 employees) and random sampling (for firms with 10 to 200 employees). The SSBS captures information on each firm's services and products, innovation activities, foreign trade (e.g., exports), employment, technological activities, and accounting data (performance, productivity). All the information contained in the SSBS is subject to quality and consistency controls. This dataset has been used by many researchers to study topics related to FFs and innovation strategies (e.g., Diéguez-Soto, Manzaneque, & Rojo-Ramírez, 2016; Greenwood, Díaz, Li, & Lorente, 2010; Kotlar, De Massis, Frattini, Bianchi, & Fang, 2013; 2014b; Mazzelli, Nason, De Massis, & Kotlar, 2018).

Dependent Variable

The dependent variable in the empirical models is *innovation performance*, a dummy variable that indicates whether the firm has introduced a new product or process in a given year. Firm-year observations are therefore coded 1 if the firm has introduced a new product or process, 0 otherwise. Innovation outcome is usually the key dependent variable in empirical studies related to innovation (Crossan & Apaydin, 2010). Given the dummy nature of the dependent variable, we estimate the empirical models to test our hypotheses using a random-effects panel data probit estimator.²

All variable descriptions are provided in the Appendix. We apply a 1-year lag between the dependent variable and other variables to ensure the direction of causality.

Independent Variables

Regarding the explanatory variables of interest, we built three dummy variables: *no R&D*, which takes value 1 when the firm neither conducts nor outsources R&D activities (0 otherwise); *uncombined R&D*, which takes value 1 when the firm conducts R&D activities but does not outsource them to third parties, or outsources R&D activities to third parties but does not conduct them (0 otherwise); finally, *combined R&D*, which takes value 1 when the firm conducts and outsources R&D to third parties (0 otherwise).

Second, we consider that a family controls the firm when their members are actively involved in management. This measure is more appropriate than measures based on ownership given our application of the behavioral and resource-management frameworks (as explained in the “Theoretical Background” section). Accordingly, we define the level of family involvement as a continuous variable counting the number of family members involved in management (*family management*). We thus adopt an objective measure of family influence on decision-making, focusing on the family status of the top management team. This FF definition is consistent with prior family business studies (e.g., Cruz, Gómez-Mejia, & Becerra, 2010; Kotlar et al., 2013; Kotlar, De Massis, Fang, & Frattini, 2014a; Manzaneque, Rojo-Ramírez, Diéguez-Soto, & Martínez-Romero, 2018).

Finally, we assess performance using return on assets (ROA), defined as net operating income divided by total assets. As a measure of performance, ROA is commonly used to analyze firm performance, including FF performance (e.g., Anderson & Reeb, 2003; Miller et al., 2013; Minichilli, Corbetta, & MacMillan, 2010), and particularly manufacturing firms (e.g., Kotlar et al., 2013). As a measure of short-term accounting performance (Short, Ketchen, Palmer, & Hult, 2007), ROA also seems particularly apt to proxy the short-term financial performance of FFs compared to their long-term goals. We look for a negative gap between aspirations and performance measured in terms of any difference with the performance of referent competitors. Following prior research (Chrisman & Patel, 2012; Kotlar et al., 2014b), we construct a continuous variable to measure negative gaps between aspirations and profitability. The negative profitability-aspiration gap is calculated as the absolute difference between the focal firm’s performance (i.e., ROA) and the average performance of other firms in the relevant two-digit National Classification of Economic Activities (CNAE) industry if negative (0 otherwise). This reflects the assumption that in the event of any shortfall between the firm’s performance and the performance of its competitors, decision-makers are more likely to perceive gaps between current performance and aspirations (Iyer & Miller, 2008; Kotlar et al., 2013). To increase the robustness of our findings, we also check that the results using ROE (return on equity)—considered particularly suitable to compare profitability under different economic cycles (e.g., Minichilli, Brogi, & Calabro, 2016)—are qualitatively similar.³

Control Variables

We control for a number of other factors identified in prior literature as having an impact on innovation performance. Specifically, the firm-level characteristics included in the empirical models as control variables are labeled *previous performance*, *current ratio*, *firm size*, *firm age*, *R&D intensity*, *collaboration agreements*, *export intensity*, *foreign ownership*. In addition, all the models include time dummies to control for possible macroeconomic effects on innovation performance, and sector dummies to account for industry differences in innovation (Malerba, 2005).

Regarding firm-level characteristics, previous performance and liquidity are important for firms to have the leeway to invest in R&D (e.g., García-Quevedo, Pellegrino, & Vivarelli, 2014). Performance is measured in terms of ROA, and the ratio of current assets to current liabilities is

included to control for any liquidity effects. Firm size is likely to affect innovation performance. Larger firms may have more market power and enjoy economies of scale and scope, or risk diversification advantages, increasing the profitability of an innovation strategy (Becheikh, Landry, & Amara, 2006; Cohen & Levinthal, 1989; Link & Bozeman, 1991; Shefer & Frenkel, 2005). On the other hand, smaller firms tend to be more flexible and adaptive, and might thus outperform their larger counterparts in terms of innovation efficiency (Acs & Audretsch, 1987). We include firm age to control for the possibility of entrenchment in FFs (Chrisman & Patel, 2012), as younger firms may have different innovation behavior (García-Quevedo et al., 2014). R&D investments are essential for a firm to accumulate higher technological and market capabilities to develop and achieve innovation, and the ratio of the firm's R&D expenditure to total sales serves as a reasonable indicator of innovation input (Block, 2009). Collaboration agreements with other companies or not-for-profit entities are traditionally used to explain innovation results (Faems, Van Looy, & Debackere, 2005). In contrast to R&D outsourcing, where contractors deliver certain technological knowledge, collaborative R&D involves the joint efforts of partners and the cocreation of knowledge (Hagedoorn, Link, & Vonortas, 2000), excluding subcontracting work without active cooperation. Export intensity is used here as a proxy for the extent to which a firm faces international competition (Grimpe & Kaiser, 2010), and thus for the stimulus and demand for new products. Moreover, the firm's presence in foreign markets enables it to acquire knowledge (Zahra, Ireland, & Hitt, 2000) for innovation (Frenz, Girardone, & Iettogillies, 2005), and foreign ownership may influence a firm's R&D decisions (Un, 2011).

Instrumental Variables

We use the Heckman (1979) two-stage procedure (e.g., Gómez-Mejía et al., 2007) to control for the possible endogeneity of family management due to unobservable organizational or environmental characteristics that are not captured in the control variables. This procedure consists of an equation for the outcome (i.e., innovation performance), and an equation for the endogenous regressor (i.e., a first-stage model on whether or not the firm is an FF). The inverse Mills ratio from the first-stage model is included as an additional control in the regression models on innovation performance.

We use two instrumental variables: the fraction of FF industry sales (*industry family firm sales/total industry sales*) and the fraction of FF regional sales (*regional family firm sales/total regional sales*). From a theoretical point of view, we chose these variables as instruments because the literature on institutional pressure suggests that families are more likely to maintain control of their firms when located in areas with a higher concentration of FFs, and when these firms are more widespread in the corresponding industry (Greenwood & Suddaby, 2006). Therefore, both instruments are expected to be related to the probability that a firm in the industry is an FF.⁴ At the same time, there is no theoretical basis to link either of these variables directly with innovation performance.⁵ In addition, similar measures have been used in previous family business (Fang, Kotlar, Memili, Chrisman, & De Massis, 2018) and finance studies (Campa & Kedia, 2002).

Results

Descriptive Analyses

Panels A and B in Table 1 provide the summary statistics of the variables used in the analyses and several differences of means tests to check whether FFs and non-FFs differ in terms of the characteristics considered in these analyses. Most firms in our sample do not perform R&D activities

Table I. Summary Statistics and Mean Difference Tests (Family vs Nonfamily Firms).

Panel A: Summary statistics		Panel B: Descriptive analysis			
Variable	Mean	Std. Dev.	Non-FFs	FFs	t-statistic
Family management	0.767	0.996	(1)	(2)	(1 – 2)
Innovation performance	0.392	0.488	0.440	0.337	17.576
No R&D	0.635	0.481	0.530	0.756	-39.988
Uncombined R&D	0.175	0.38	0.222	0.121	22.187
Combined R&D	0.190	0.392	0.248	0.123	26.743
Negative performance gap	5.288	8.691	5.560	4.976	5.562
R&D intensity (%)	0.701	1.79	0.848	0.533	14.534
Collaboration	0.033	0.18	0.051	0.014	17.208
Export propensity	21.406	27.9	27.231	14.717	38.022
Age	31.222	22.193	33.901	28.147	21.602
Foreign ownership	15.889	35.502	28.491	1.418	68.129
Firm size	0.039	0.101	0.063	0.011	43.911
ROA	11.908	15.873	11.862	11.961	-0.518
Current ratio	2.414	13.326	2.106	2.768	-4.106
<i>Robustness test variables</i>					
Continuous innovation performance	1.221	1.226	1.366	1.053	20.466
Shrinking market share	0.191	0.393	0.164	0.222	-12.020

Note. Panel B shows the results of a t-test comparing the mean values of each variable across two groups: family (FFs) and nonfamily firms (NFFs).

(63.5%), 17.5% pursue either internal or external R&D activities, and the remaining firms (19%) simultaneously perform both internal and external R&D. Therefore, the frequency with which firms combine internal and external R&D is high in our sample. Compared to FFs, non-FFs are characterized by higher innovation performance. Innovation is reported as an activity in 47% of non-FF observations, while this occurs in only 24.4% of FF observations. Moreover, independent of the locus of innovation, the incidence of R&D is substantially higher in non-FFs than in FFs: The average ratio of investments in R&D to total sales (*R&D intensity*) for non-family (family) firms is 0.84% (0.53%). Finally, foreign ownership, export intensity, firm size, and firm age are significantly higher in non-FFs than in FFs.

Table 2 provides the correlation matrix. Regarding the bivariate correlations, worth noting is that the two innovation loci are positively correlated with innovation performance. Interestingly, the R&D locus with the highest correlation with innovation performance is the combination of internal and external R&D (*combined R&D*). Individual values of the variance inflation factor (VIF) that exceed 10, combined with average VIF values over 6, are often regarded as indicating multicollinearity (Neter, Wasserman, & Kutner, 1989). The highest VIF value is 2.5, which is significantly lower than the threshold, suggesting the absence of multicollinearity.

Table 3 cross-tabulates our innovation performance measure (percentage of observations introducing new products or services) with different R&D loci (i.e., different combinations of internal and external R&D). The results indicate, as expected, that noninnovative firms have the lowest innovation performance. In contrast, the most productive innovation strategy would seem combined internal and external R&D, with 74.19% of firms combining both R&D loci

Table 2. Correlation Matrix.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	VIF										
Innovation performance	(1) 1.000														-										
Family management		(2) -0.062***													1.17										
No R&D			(3) -0.393***	0.161 ***											-										
Uncombined R&D				(4) 0.171***	-0.092***	-0.607***									1.57										
Combined R&D					(5) 0.317***	-0.109***	-0.639***	-0.223***							2.50										
Negative performance gap						(6) -0.066***	-0.047***	0.033***	-0.008	-0.032***	1.000				1.80										
R&D intensity							(7) 0.246***	-0.067***	-0.514***	0.130***	0.505***	0.040***	1.000		2.33										
Collaboration								(8) 0.136***	-0.085***	-0.245***	0.057***	0.246***	0.003	0.195***	1.000	1.11									
Export propensity									(9) 0.197***	-0.159***	-0.361***	0.181***	0.269***	-0.022***	0.213***	0.122***	1.34								
Age										(10) 0.099***	-0.077***	-0.227***	0.093***	0.189***	0.003	0.098***	0.100***	1.20							
Foreign ownership											(11) 0.145***	-0.311***	-0.260***	0.175***	0.150***	0.001	0.076***	0.118***	1.39						
Firm size												(12) 0.177***	-0.193***	-0.304***	0.106***	0.270***	-0.039***	0.120***	0.203***	1.40					
ROA												(13) 0.050***	0.012+	0.009	0.000	-0.011+	-0.617***	-0.049***	-0.014*	-0.020***	0.059***	0.015*	0.006	1.84	
Current ratio													(14) -0.021***	0.019***	0.018***	-0.015*	-0.008	-0.003	-0.005	-0.006	-0.007	0.005	-0.019***	-0.017***	1.000
Mean VIF															2.31										

Note. + $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3. Frequency of Innovations Strategies and Innovation Performance.

Innovation strategy	Frequency	Introducing new products or processes (%)
No R&D	17,587 (64.10%)	23.47%
Uncombined R&D	4,660 (16.98%)	59.70%
Combined R&D	5,191 (18.92%)	74.19%
Total	27,438 (100%)	39.22%

(*combined R&D*) and introducing new products and/or processes—a figure that is, on average, about 15% higher than firms relying exclusively on one R&D locus (*uncombined R&D*).

Regression Results

Table 4 reports the results of the random-effects panel data probit regressions. In Model 1, we show the results obtained estimating a model with controls only. The results in this model suggest that large firms and more intensive innovation spenders are likely to enjoy better innovation performance. Similarly, more export-oriented firms are more productive in innovation, presumably due to the more competitive environments they face. In addition, we find a significant and positive relationship between foreign ownership and innovation performance and between collaboration agreements and innovation performance. Past performance also positively impacts innovation performance.

In Model 2, we extend our model specification to include the main independent variables, namely, FF, innovation loci, and below-par performance. This model shows that FFs are nonsignificantly associated with the likelihood of introducing new products or processes. In addition, the coefficients for *uncombined R&D* and *combined R&D* are highly significant and positive. Therefore, regardless of the R&D loci, engaging in innovation is associated with significantly higher innovation performance than either not conducting or outsourcing R&D activities.

While in Model 2 we looked at how *combined R&D* and *uncombined R&D* are related to innovation performance, in Model 3 (columns 3 and 4), we also include the interaction between *family management* and R&D loci. Column 3 presents the parameter estimates and column 4 the corresponding marginal effects.⁶ The term *combined R&D × family management* tests the null hypothesis that the estimated coefficient of *combined R&D* for FFs is equal to the estimated coefficient of *combined R&D* for non-FFs. In column 3, we can see that FFs simultaneously involved in internal and external R&D are more likely to record better innovation performance relative to the reference category (i.e., those firms neither conducting nor outsourcing R&D activities) than non-FFs ($\beta = 0.064, p < .05$). From the marginal effects reported in column 4, we conclude that *combined R&D* leads to a 25.5% increase in the likelihood of innovation performance (relative to firms without R&D activities), plus an additional 2% increase in the FFs' probability of innovation performance. Therefore, the difference between combined R&D strategy users and non-R&D users is larger among FFs than in the group of non-FFs. Also worth noting is that the estimated coefficient of *uncombined R&D × family management* is nonsignificant in column 3. Overall, therefore, Model 3 shows a significant effect of *family management* for *combined R&D* and a nonsignificant effect for *uncombined R&D*. In other words, FFs using an uncombined R&D strategy, that is, either conducting R&D activities but not outsourcing them to third parties, or outsourcing R&D activities to third parties but not conducting them, are associated with an innovation performance likelihood that is not significantly different from that of

Table 4. Random-Effects Panel Data Probit Analysis of Innovation Performance.

	(1) Control variables	(2) Indep. variables	(3) Two-way interact.	(4) Two-way interact. (ME)	(5) Three-way interact.	(6) Three-way interact. (ME)
Family management	-	0.013 (0.014)	0.005 (0.018)	0.002 (0.005)	0.014 (0.018)	0.004 (0.006)
Negative performance gap	-	0.000 (0.002)	0.002 (0.002)	0.001 (0.001)	0.003 (0.002)	0.001 (0.001)
FM × Negative perf. gap	-	-	-0.002 (0.001)	-0.001 (0.0004)	-0.004* (0.002)	-0.001* (0.001)
Uncombined R&D	-	0.648*** (0.046)	0.640*** (0.053)	0.195*** (0.016)	0.650*** (0.054)	0.198*** (0.016)
Uncombined R&D × Family manag.	-	-	0.022 (0.030)	0.007 (0.009)	0.010 (0.034)	0.003 (0.010)
Uncombined R&D × Negative perf. gap	-	-	-0.002 (0.003)	-0.001 (0.001)	-0.004 (0.004)	-0.001 (0.001)
Uncombined R&D × Family manag. × Negative perf. gap	-	-	-	-	0.003 (0.004)	0.001 (0.001)
Combined R&D	-	0.869*** (0.052)	0.835*** (0.058)	0.255*** (0.017)	0.855*** (0.059)	0.260*** (0.018)
Combined R&D × Family manag.	-	-	0.064* (0.032)	0.020* (0.01)	0.029 (0.036)	0.009 (0.011)
Combined R&D × Negative perf. gap	-	-	-0.002 (0.003)	-0.0004 (0.001)	-0.005 (0.004)	-0.002 (0.001)
Combined R&D × Family manag. × Negative perf. gap	-	-	-	-	0.008* (0.008*)	0.002* (0.002*)

(Continued)

Table 4. Continued

	(1) Control variables	(2) Indep. variables	(3) Two-way interact. (ME)	(4) Two-way interact. (ME)	(5) Three-way interact. (ME)	(6) Three-way interact. (ME)
Firm size	1.419*** (0.182)	4.321*** (0.839)	4.239*** (0.844)	1.291 *** (0.257)	4.249*** (0.004)	1.295*** (0.001)
Age	0.001 (0.002)	-0.000 (0.002)	-0.000 (0.001)	-0.0001 (0.001)	-0.000 (0.002)	-0.0001 (0.000)
Age ²	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Foreign ownership	0.002*** (0.001)	0.011*** (0.002)	0.011 *** (0.002)	0.003*** (0.001)	0.011 *** (0.002)	0.003*** (0.001)
Export propensity	0.006*** (0.001)	0.007*** (0.001)	0.007 *** (0.001)	0.002*** (0.001)	0.007 *** (0.001)	0.002*** (0.000)
R&D intensity	0.548*** (0.026)	0.191*** (0.033)	0.190*** (0.033)	0.058*** (0.010)	0.190*** (0.033)	0.058*** (0.010)
Collaboration	0.229*** (0.067)	0.138* (0.066)	0.143* (0.066)	0.043* (0.020)	0.143* (0.066)	0.044* (0.020)
ROA	0.005*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)
Current ratio	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.001 (0.000)	-0.002 (0.001)	-0.001 (0.000)
Inverse Mills ratio	- (0.186)	-0.735*** (0.186)	-0.714*** (0.187)	-0.218*** (0.057)	-0.716*** (0.187)	-0.218*** (0.057)
Intercept	-0.537*** (0.133)	-0.081 (0.168)	-0.088 (0.168)	-	-0.093 (0.169)	-
Firm RE	Yes	Yes	Yes	Yes	Yes	Yes

(Continued)

Table 4. Continued

	(1) Control variables	(2) Indep. variables	(3) Two-way interact.	(4) Two-way interact. (ME)	(5) Three-way interact.	(6) Three-way interact. (ME)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
ln(σ_v^2)	0.036 (0.046)	-0.120* (0.047)	-0.121* (0.047)	-	-0.120* (0.047)	-
σ_v	1.018	0.942	0.941	-	0.942	-
ρ	0.509	0.470	0.470	-	0.470	-
χ^2	1329.312	1710.505	1716.503	-	1719.580	-
N	27,438	27,438	27,438	27,438	27,438	27,438

Note. ME, marginal effects. Standard errors in parentheses; significance: [†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

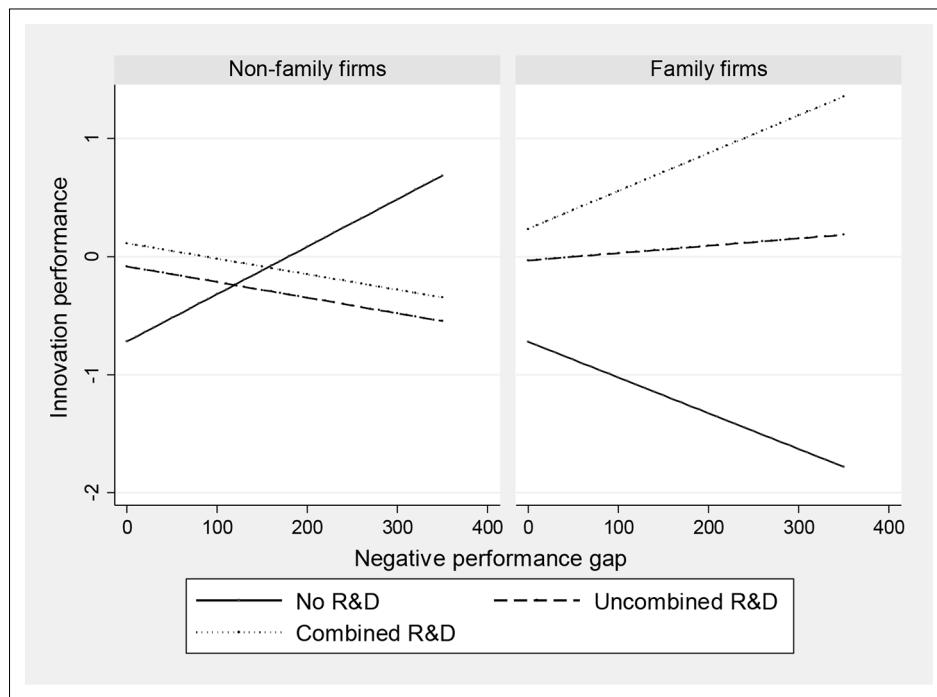


Figure 1. Joint effects of different innovation strategies (based on R&D loci) and performance below aspirations on innovation performance by family firm status.

non-FFs also using uncombined R&D strategies. Thus, it is the use of a combined R&D strategy that makes a difference for FFs in terms of innovation performance.

Column 5 (Table 4) further includes the interaction of the variable measuring below-par performance with the family involvement metrics and the two innovation loci. An examination of the interaction between *combined R&D* and the FF metrics and below-par performance reveals a positive coefficient that is statistically different from 0 ($\beta = 0.008, p < .05$). Thus, consistent with H2, when performance falls below a referent firm's performance, the impact on innovation is significantly larger among those FFs using both external and internal R&D loci. In other words, FFs that use internal and external R&D loci and record below-par performance are significantly more likely to be innovative than non-FFs.

Figure 1 provides a graphic depiction of these findings. We plotted the predicted marginal effects of each innovation source (*no R&D*, *uncombined R&D*, *combined R&D*) on the probability of innovation performance at different levels of the negative performance gap, separately for FFs and non-FFs (and holding control variables constant at mean levels). As the negative performance gap variable is expressed in absolute terms, Figure 1 should be interpreted from left (low negative performance gap) to right (high negative performance gap). Among FFs, when a firm's performance deteriorates relative to its competitors (i.e., as we move to the right on the x-axis), a combined R&D strategy helps FFs achieve higher innovation performance than FFs using either uncombined R&D or no R&D. Therefore, FFs' innovation performance is significantly higher under a scenario of decreasing firm performance when using a combination of external and internal knowledge. In contrast, at relatively high performance levels (i.e., low negative performance gap—left-hand side of the x-axis), the predicted marginal impact on FFs' innovation performance is not significantly different for each R&D source. Deterioration in firm

performance therefore prompts the adoption of higher innovation among FFs when using a combination of external and internal R&D loci. This pattern does not hold among non-FFs (left-hand figure). Thus, FFs under threat have a heightened propensity for change and risk-taking, which implies not only the exploitation but also the exploration of R&D sources with lower control of knowledge.

Robustness Checks

We conduct additional tests to check the robustness of our results. First, we repeat the analyses explicitly considering the dynamism of the innovation activities in which the firm is engaged. We therefore define a categorical variable (*continuous innovation performance*) as the accumulation of the variable innovation performance for year t and $t - 1$. This approach helps overcome certain limitations related to temporal measures of innovation, in line with, for example, Diéguez-Soto et al. (2016) and Laursen, Masciarelli, and Prencipe (2012). This new variable takes the value 0 when the firm has not introduced any innovations in this 2-year period, takes the value 1 when the firm has introduced product or process innovations in 1 year of the 2-year period, and finally, takes the value 2 when the firm has introduced new products or processes in both years. We therefore replace our previous dependent variable (*innovation performance*) with the variable *continuous innovation performance*. The regression results are presented in Table 5. The regression results presented in Model 3 corroborate that FFs involved in both internal and external R&D are more likely to record higher innovation performance than non-FFs ($\beta = 0.018, p < .05$). Moreover, consistent with H2, the new empirical evidence in Model 4 confirms that the interaction between *combined R&D* and the FF metrics and below-par performance has a positive coefficient that is statistically different from 0 ($\beta = 0.004, p < .05$).

In addition, as environmental conditions may impair firm performance, we use an indicator available in the SSBS dataset that reflects changes in the firm's market share, which allows controlling for external shifts in a firm's target market (Shinkle, 2012). For each year, this dataset reports a dummy variable indicating whether the firm's target market share has shrunk (see the Appendix for the definition of variables). The regression results are provided in Table 6, which shows that the inclusion of this variable leads to similar conclusions. Corroborating our line of reasoning, the positive impact of the combined use of external and internal R&D on innovation performance is enhanced when FFs face negative external economic prospects (i.e., a reduction in the firm's market share).

Finally, we use a quasi-experimental matching method (Rosenbaum & Rubin, 1983) to estimate the causal effect of family management on the likelihood of innovation performance among those firms using combined R&D strategies. This ensures checking whether FFs using a combined R&D strategy are more likely to record better innovation performance than non-FFs using a combined R&D strategy (H1). For this purpose, we first derive the propensity scores from the estimation of a probit model where the treatment variable (i.e., whether or not there is family involvement in the firm) is regressed against the same controls employed in the estimation of the first-stage treatment model referred to in the instrumental variables subsection—except for the variable collecting R&D loci (since we apply matching to the subsample of firms using combined R&D strategies). In a second step, we carry out the matching for all pair-wise combinations. Once each treated observation is matched to a control group observation, the difference between innovation performance for the treated (FFs) versus the control (non-FFs) observations is computed. The average treatment effect on the treated (ATT) is then obtained by averaging these differences (Heckman, Lalonde, & Smith, 1999).

Table 7 displays the ATT from alternative propensity score matching methods (nearest-neighbor and kernel-based matching).⁷ In all instances, family management has a significant and

Table 5. Robustness Tests of Family Firm Innovation Performance: Continuous Innovation Performance.

	(1) Control variables	(2) Independent variables	(3) Two-way interactions	(4) Three-way interactions
Family management	0.006 (0.005)	0.004 (0.007)	0.004 (0.007)	0.008 (0.007)
Negative performance gap dummy	-0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
FM × Negative perf. gap dummy		-0.000 (0.001)	-0.001* (0.001)	-0.001* (0.001)
Uncombined R&D	0.392*** (0.019)	0.395*** (0.022)	0.400*** (0.022)	0.400*** (0.022)
Uncombined R&D × FM		0.005 (0.012)	-0.003 (0.014)	-0.003 (0.014)
Uncombined R&D × Negative perf. gap		-0.002 (0.001)	-0.003 ⁺ (0.001)	-0.003 ⁺ (0.001)
Uncombined R&D × FM × Negative perf. gap			0.002 (0.001)	0.002 (0.001)
Combined R&D	0.522*** (0.022)	0.518*** (0.024)	0.518*** (0.024)	0.526*** (0.024)
Combined R&D × FM		0.018* (0.008)	0.002 (0.014)	0.002 (0.014)
Combined R&D × Negative perf. gap		-0.002** (0.001)	0.000* (0.001)	0.000* (0.001)
Combined R&D × FM × Negative perf. gap		- (0.002)	- (0.002)	- (0.002)
Firm size	0.611*** (0.076)	1.741*** (0.336)	1.690*** (0.338)	1.693*** (0.338)
Age	-0.000 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)

(Continued)

Table 5. Continued

	(1) Control variables	(2) Independent variables	(3) Two-way interactions	(4) Three-way interactions
Age ²	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Foreign ownership	0.001*** (0.000)	0.003*** (0.001)	0.005*** (0.001)	0.005*** (0.001)
Export propensity	0.002*** (0.000)	0.003*** (0.000)	0.003*** (0.000)	0.003*** (0.000)
R&D intensity	0.345*** (0.011)	0.135*** (0.014)	0.136*** (0.014)	0.136*** (0.014)
Collaboration	0.142*** (0.026)	0.097*** (0.026)	0.099*** (0.026)	0.099*** (0.026)
ROA	0.002*** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)
Current ratio	-0.000 (0.000)	-0.001 ⁺ (0.000)	-0.001 ⁺ (0.000)	-0.001 ⁺ (0.000)
Inverse Mills ratio		-0.304*** (0.075)	-0.292*** (0.075)	-0.293*** (0.075)
Constant	1.195*** (0.085)	1.492*** (0.096)	1.485*** (0.096)	1.481*** (0.096)
Firm RE	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
σ_v				
ρ	0.524 0.445	0.488 0.413	0.487 0.413	0.487 0.412
χ^2	2360.924 27,438	3216.900 27,438	3224.361 27,438	3222.790 27,438
N				

Note. Standard errors in parentheses; significance: ⁺ $p < .10$, ^{*} $p < .05$, ^{**} $p < .01$, ^{***} $p < .001$.

Table 6. Robustness Tests of Family Firm Innovation Performance: Shrinking Market Share.

	(1) Control variables	(2) Independent variables	(3) Two-way interactions	(4) Three-way interactions
Family management	0.012 (0.014)	0.004 (0.018)	0.006 (0.018)	
Shrinking market share	-0.181*** (0.030)	-0.198*** (0.047)	-0.185*** (0.051)	
FF × Shrinking market share		-0.053 ⁺ (0.030)	-0.067 ⁺ (0.037)	
Uncombined R&D	0.654*** (0.047)	0.598*** (0.053)	0.593*** (0.054)	
Uncombined R&D × FM		0.027 (0.032)	0.037 (0.034)	
Uncombined R&D × Shrinking market share		0.229** (0.075)	0.263** (0.092)	
Uncombined R&D × FM × Shrinking market share		-0.060 (0.076)	-0.060 (0.076)	
Combined R&D	0.857*** (0.054)	0.803*** (0.059)	0.816*** (0.060)	
Combined R&D × FM		0.067* (0.034)	0.047 (0.035)	
Combined R&D × Shrinking market share		0.086 (0.078)	-0.006 (0.093)	
Combined R&D × FM × Shrinking market share		0.171* (0.087)	0.171* (0.087)	
Firm size	1.478*** (0.190)	4.146*** (0.831)	4.159*** (0.834)	
Age	0.002 0.000	0.000 0.000	0.000 0.000	

(Continued)

Table 6. Continued

	(1) Control variables	(2) Independent variables	(3) Two-way interactions	(4) Three-way interactions
Age ²	(0.002) 0.000 (0.000)	(0.002) 0.000 (0.000)	(0.002) 0.000 (0.000)	(0.002) 0.000 (0.000)
Foreign ownership	0.002*** (0.001)	0.011*** (0.002)	0.010*** (0.002)	0.010*** (0.002)
Export propensity	0.006*** (0.001)	0.007*** (0.001)	0.006*** (0.001)	0.006*** (0.001)
R&D intensity	0.567*** (0.028)	0.216*** (0.034)	0.208*** (0.034)	0.205*** (0.034)
Collaboration	0.209*** (0.070)	0.122 ⁺ (0.069)	0.129 ⁺ (0.069)	0.132 ⁺ (0.069)
ROA	0.005*** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)
Current ratio	-0.009*** (0.003)	-0.008** (0.003)	-0.008** (0.003)	-0.008** (0.003)
Inverse Mills ratio	-0.724*** (0.184)	-0.692*** (0.184)	-0.692*** (0.184)	-0.692*** (0.184)
Intercept	-0.551*** (0.139)	-0.065 (0.174)	-0.072 (0.175)	-0.073 (0.175)
Firm RE	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
In(σ^2_v)	0.079 ⁺ (0.048)	-0.083 ⁺ (0.049)	-0.083 ⁺ (0.049)	-0.083 ⁺ (0.049)
σ_v	1.040	0.959	0.959	0.960

(Continued)

Table 6. Continued

	(1) Control variables	(2) Independent variables	(3) Two-way interactions	(4) Three-way interactions
ρ	0.520 259.99 25,330	0.479 640.927 25,330	0.479 654.529 25,330	0.479 658.736 25,330
χ^2				
N				

Note. Standard errors in parentheses; significance: ⁺ $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 7. Robustness Tests of Family Firm Innovation Performance: Average Treatment Effects on the Treated (ATT)—Subsample of Firms Using Combined R&D.

Matching method	Treated	Matched control	ATT
Nearest-neighbor with replacement	0.777	0.727	0.049** (0.022)
Kernel matching:			
<i>Gaussian kernel</i>	0.777	0.726	0.050*** (0.015)
<i>Epanechnikov kernel</i>	0.777	0.727	0.049** (0.017)

Note. Treatment refers to being a family firm. Matching is always carried out with common support. The entries in brackets refer to bootstrapped standard errors (500 replications). * $p < .10$. ** $p < .05$. *** $p < .01$.

positive effect that fluctuates from 4.9 to 5.0 percentage points (the ATT values remain fairly robust to the choice of matching method). Therefore, the likelihood of innovation performance among firms using combined R&D strategies is larger for FFs than for non-FFs. As the average effect on innovation performance of combined R&D strategies among FFs is positive, it implies that FFs using a combined R&D strategy are more likely to record better innovation performance than non-FFs using a combined R&D strategy (H1).

Second, to test the robustness of our results in relation to H2, we estimate the ATT of a combined R&D strategy for the subsample of firms whose performance falls below the referent firms' performance. As Table 8 shows, family management shows a significant and positive ATT, implying that the effects of a combined R&D strategy on innovation performance under a negative aspiration gap are larger for FFs than for non-FFs. Therefore, when performance falls below the referent firms' performance, the positive impact of simultaneously using internal and external R&D loci on innovation performance is significantly larger in FFs. These findings are in line with H2.

Discussion and Conclusion

Drawing on RBV and the behavioral theory of the firm, our study has analyzed whether and why FFs are better at reaping innovation benefits from combined internal and external R&D (vis-à-vis non-FFs), as well as the contingency effect of a performance–aspiration gap on this relationship.

While previous research has found that FFs tend to invest less intensively in innovation than non-FFs (Classen, Carree, Van Gils, & Peters, 2014), other studies find that FFs are particularly efficient in turning innovation inputs into innovation outputs (Duran et al., 2016; Matzler et al.,

Table 8. Robustness Tests of Family Firm Innovation Performance: Average Treatment Effects on the Treated (ATT)—Subsample of Firms Using Combined R&D and With Negative Performance Gap.

Matching method	Treated	Matched control	ATT
Nearest-neighbor with replacement	0.749	0.706	0.043** (0.014)
Kernel matching:			
<i>Gaussian kernel</i>	0.749	0.701	0.049** (0.022)
<i>Epanechnikov kernel</i>	0.749	0.704	0.045* (0.023)

Note. Treatment refers to being a family firm. Matching is always carried out with common support. The entries in brackets refer to bootstrapped standard errors (500 replications). * $p < .10$. ** $p < .05$. *** $p < .01$.

2015). Our study contributes to this research strand by extending our understanding of how their attributes enable FFs to benefit from external knowledge while still preserving their propensity to promote internal innovation activities (Le Breton-Miller & Miller, 2006).

Although internal R&D is traditionally viewed as an important locus of knowledge acquisition, no firm can be entirely self-sufficient in terms of the resources required for innovation (Feranita, Kotlar, & De Massis, 2017). The need for resources leads firms to acquire them from external organizations, to the extent that the sourcing of technology and R&D knowledge from outside parties has been identified as a critical competence for sustained innovation success. Consequently, most firms have increasingly acquired R&D knowledge in recent years. The outsourcing of activities that are also performed internally fosters the growth of the product portfolio, as well as new product success, as this allows a firm to access knowledge developed outside the firm while maintaining its competencies (Grimpe & Kaiser, 2010; Rothaermel, Hitt, & Jobe, 2006).

We have developed arguments explaining how FFs' allocation and management of their stock of resources (e.g., human capital, patient capital, and social capital) leads to enhanced innovation performance due to the combination of in-house R&D and external know-how. Consistent with this logic, our results suggest that FFs are particularly better than non-FFs at turning combined R&D activities into innovation performance. We therefore advance existing literature by understanding the means through which FFs can facilitate innovation performance compared to non-FFs, a topic that has received scant attention despite the abundance of studies on FF innovation (e.g., Calabró et al., 2019; Duran et al., 2016).

Furthermore, we go a step further by offering a deeper understanding of the contingent effect of negative performance gaps with respect to industry competitors on the effectiveness of a combined R&D strategy in FFs. Drawing on behavioral theory, we have identified performance-aspiration gaps as a key contingency influencing the family decision-makers' behavior and ultimately the innovation success of combined R&D. Prior studies have emphasized that, given a negative performance-aspiration gap, divergence among affective goals and financial concerns might be mitigated due to the fact that family decision-makers' behavior is more aligned with future financial wealth to ensure firm survival (Gomez-Mejia et al., 2018). Our results show that when performance is below par, FFs' propensity to convert internal and external R&D loci into innovation outputs is strengthened.

To conclude, our theoretical analysis suggests that FFs' innovation performance from the combination of internal and external R&D loci is understood better when paying careful attention to their resource endowment (H1) and the role of behavioral factors (H2).

Implications

Our results challenge existing research supporting the reluctance of FFs to engage in R&D activities by suggesting that complementing their internal knowledge base with externally sourced technology is an excellent compromise to improve the innovation performance of FFs that typically underplay internal R&D investments. In line with the RBV, FFs are rich in intangible resources (Habbershon & Williams, 1999) and must allocate and deploy these effectively to safeguard them from the possible negative side-effects of combined R&D. Prior literature stresses that FFs are better at exploiting their given R&D investments (Duran et al., 2016), as they are more likely to engage in building social capital that is unique to them (Matzler et al., 2015). In addition, FFs tend to be long-term oriented as well as community oriented, investing in social capital to build long-lasting relationships with external stakeholders (Miller & Le Breton-Miller, 2005), and deemed more likely to benefit from the utilization of such outside networks (Uhlamer et al., 2015). Accordingly, it seems that the management of firm-specific resources (e.g., human

capital, patient capital, social capital) makes a difference in terms of innovation performance when FFs engage in a combined R&D strategy compared to their nonfamily counterparts. The empirical evidence illustrates that family presence may prove an important predictor of the difference in innovation performance compared to non-FFs.

In addition, the economic and family-centered noneconomic goals of FFs may be compromised when they observe below-par performance outcomes (Gomez-Mejia et al., 2010). Our results suggest that the benefits associated with combining internal and external R&D become more evident in FFs seeking to recover innovativeness in the face of declining referent-target aspirations. This result is consistent with the family's need to guarantee the long-term survival of a healthy business to uphold the family dynasty and preserve its legacy, enabling it to survive in highly dynamic and competitive markets, and realize its long-term vision (Gomez-Mejia et al., 2018; James, 1999). Therefore, despite FFs' preference for the in-house development of innovation (Nieto, Santamaría, & Fernández, 2015) and the risks associated with external technology sourcing, FFs need to be enterprising and take risks if they want to achieve superior innovation performance. In this context, FFs may accelerate R&D investments through the use of external R&D loci, which enable them to benefit from the diversity of knowledge amidst negative performance feedback, with ensuing improvements in innovation performance. FFs under threat may have a greater propensity for change and risk-taking. Instead of being at a disadvantage when there is a downturn in the firm's competitive positioning, the simultaneous use of external and internal R&D loci would enable FFs to transform this circumstance into better innovation outputs. This evidence provides new insights into the tensions between economic and socioemotional factors in FFs (Gomez-Mejia et al., 2018; Kotlar, Signori, De Massis, & Vismara, 2018), helping to explain why FFs are particularly more efficient at turning innovation inputs into outputs in the face of negative performance gaps (Duran et al., 2016). Overall, this is a step forward in understanding the distinctive "innovation efficiency" of FFs.

Limitations and Future Research

This study has certain limitations that provide opportunities for further research. As in most prior research on FFs, our definition of FF is based on archival data (e.g., Kotlar et al., 2013, 2014a, 2014b; Miller, Breton-Miller, & Lester, 2010). We are therefore only able to capture the dimension of family involvement, not its essence (Chrisman, Chua, Pearson, & Barnett, 2012). A second limitation refers to the heterogeneity among FFs (e.g., Chrisman, Fang, Kotlar, & De Massis, 2015; Chua, Chrisman, Steier, & Rau, 2012). We have examined a firm-level driver of heterogeneity among FFs, namely, negative performance feedback, and welcome future scholars to consider other possible drivers of such heterogeneity at the firm-, family- or individual-level of analysis to shed further light on how variation among different types of FFs may affect the combined R&D strategy they adopt and their effect on innovation performance. Considering FFs as a heterogeneous group of organizations could provide new insights into the family's influence on strategic decision-making, such as the selection of R&D sources. For instance, this study does not examine how family-specific attributes (e.g., trust-based culture, family structures, functions, interactions, and events) might influence firm innovation performance, which is an area ripe for future research. Third, understanding how factors external to the firm, such as recession or environmental dynamism, might affect the process of combining internal and external R&D requires further inquiry. Likewise, studies using sampling frames other than Spanish manufacturing firms are needed to extend the validity of our findings to firms outside Spain. Lastly, this paper focuses on a specific form through which technology can be acquired from an external locus, namely, R&D contracting. Future research is thus needed to extend our findings to other forms of innovation from external loci, such as in-licensing, joint ventures, nonequity alliances, or mergers.

and acquisitions. Similarly, we suggest future scholars distinguish between product, process, and business model innovation, as this may lead to a more fine-grained understanding of our research topic.

In short, this study uses panel data from a large sample of manufacturing firms to report on the differences between FFs and non-FFs when effectively integrating internal and external R&D as part of a combined R&D strategy. Our findings reveal that FFs can better exploit the benefits of combined R&D loci, highlighting the meaningful role of resource-bundling to better understand FFs' propensity to generate complementarity in terms of innovation. Interestingly, we also find that behavioral factors matter, and FFs' positive relationship between combined R&D and innovation performance is strengthened in times of below-par performance.

Appendix

Definition of variables

<i>Variable</i>	<i>Definition</i>
<i>Panel A: Dependent variable</i>	
Innovation performance	Dummy variable with value 1 if the firm has introduced either a new product or a new process (0, otherwise)
<i>Panel B: Independent and moderating variables</i>	
Family management	Number of members of the owner-family who occupy managerial positions at the firm at year t
No R&D	Dummy variable that equals 1 if the firm does not engage in R&D activities
Uncombined R&D	Dummy variable that equals 1 if the firm engages in either internal R&D activities or sources innovation via contracting mechanisms (i.e., R&D contracting)
Combined R&D	Dummy variable that equals 1 if the firm engages in internal R&D activities and sources innovation via contracting mechanisms
Negative performance gap	Absolute difference between the focal firm's performance (in terms of ROA) and the average performance of other firms in the relevant two-digit CNAE industry if negative, 0 otherwise
<i>Panel C: Control variables</i>	
R&D intensity	Ratio of the firm's investment in R&D activities to total sales
Collaboration	Dummy variable that equals 1 if the firm establishes collaboration agreements (e.g., technological agreements with other firms or research organizations)
Export propensity	Ratio of the firm's sales in foreign markets to total sales
Age	Number of years since the firm's foundation
Foreign ownership	Percentage of firm capital in nondomestic hands
Firm size	Total firm sales (expressed in billion euro)
ROA	Return on assets
Current ratio	Current assets to current liabilities ratio
Year	Year dummies
Industry	Industry dummies

Variable	Definition
<i>Panel C: Robustness test variables</i>	
Continuous innovation performance	Categorical variable collecting the accumulation of innovation performance for year t and $t - 1$. It varies between 0 and 2, with higher values indicating better innovation performance over time
Shrinking market share	Dummy variable that equals 1 if the firm's focal market share is constant or shrinking

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Notes

1. With the term “external R&D” we refer to the firm sourcing innovation from outside parties via contractual agreements (i.e., R&D contracting).
2. The likelihood ratio test (χ^2) formally compares the pooled probit estimator with the random-effects probit estimator. As shown in Tables 4–6, we reject the null hypothesis that the random-effects probit estimator and the pooled estimator are similar. Therefore, this significant likelihood ratio test tells us that it would not be appropriate to use a pooled probit model, as the panel-level variance component is important.
3. Estimation results using ROE are available from the authors upon request.
4. Indeed, the estimation results for the first-stage probit model (available upon request) show that the two instrumental variables are significantly and positively related to the likelihood that the firm is family managed. Combined, these two instruments are highly significant (χ^2 -statistic = 98.88, $p < .001$).
5. The instrumental variables proposed have no significant impact on innovation performance once we include all the control variables in the main empirical model together with the family management variable (results available upon request).
6. Given the nonlinearity of the random-effects model, its estimated coefficients do not capture the marginal effect on innovation performance when an explanatory variable changes. Therefore, marginal effects measure the discrete change in the dependent variable as the binary independent variable changes from 0 to 1.
7. We use the publicly available Stata command developed by Leuven and Sianesi (2003). Caliendo and Kopeinig (2008) summarize and discuss the matching methods employed.

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Understanding Opportunities in Social Entrepreneurship: A Critical Realist Abstraction

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Abstract

This article extends social entrepreneurship (SE) research by drawing upon a critical realist perspective to analyse dynamic structure/agency relations in SE opportunity emergence, illustrated by empirical evidence. Our findings demonstrate an agential aspect (opportunity actualisation following a path-dependent seeding-growing-shaping process) and a structural aspect (institutional, cognitive and embedded structures necessary for SE opportunity emergence) related to SE opportunities. These structures provide three boundary conditions for SE agency: institutional discrimination, an SE belief system and social feasibility. Within this article, we develop a novel theoretical framework to analyse SE opportunities plus, an applicable tool to advance related empirical research.

Keywords

social entrepreneurship, opportunities, critical realism, context, China

Social entrepreneurship (SE) is a rapidly advancing domain of academic inquiry, practice and policy making (Choi & Majumdar, 2014; Domenico, Haugh, & Tracey, 2010; Sassenmannshausen & Volkmann, 2016). Within this article, we focus on a specific element of this research field, that of SE opportunity and its relationship with entrepreneurial action. As such, we develop a theoretical critique of the extant opportunity debate within the SE literature drawing upon a critical realist philosophy to underpin this critique and inform empirical investigation. Consequently, we explore the following research questions: What is SE opportunity? How can it be empirically explored and explained?

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SE can be defined as the pursuit of opportunities to create social value and catalyse social change (Hockerts, 2017; Murphy & Coombes, 2009). The notion of opportunity is therefore, central to definitions of SE. However, contemporary ambiguity in defining and explaining SE opportunities, and in some cases the notable contradictions between extant theory and the distinctive context of SE, demands new approaches to theory building in this domain. Unlike its market-based commercial counterpart, SE provides a qualitatively different context in terms of mission, response to market failure, resource mobilization and performance measurement (Austin, Stevenson, & Wei-Skillern, 2006). This makes the direct transposition of existing entrepreneurial opportunity theories onto SE problematic. We suggest that theory building pertaining to SE opportunity requires more considered engagement with appropriate philosophical discourse and methods to explore structure/agency relations and how opportunities emerge.

To contribute to such theoretical development, we draw upon a critical realist approach to develop a causal explanation of how SE opportunities emerged from our empirical data. To capture the foundations underpinning SE opportunities, we apply the three units of observation suggested by Dimov (2011) to facilitate the empirical identification of SE opportunities and associated behaviors. These constitute: seed venture ideas, entrepreneurial actions pursuing seed venture idea, and market exchange relationships.

The combination of a critical realist approach and the use of Dimov's theoretical framework enable new insights into the explanation of SE opportunities by theorizing their unobservable structures and relations with SE agency by analyzing observable entrepreneurial actions. We examine our research questions through an interpretive research methodology using a case study method, and critical realist analysis, to illustrate the complex and dynamic relations surrounding SE opportunities (Eisenhardt, 1989). The study was conducted in China, where on-going economic and social transitions have fueled an emerging and active social enterprise sector, providing an appropriate social context to study SE (Yu, 2011; Zhao, 2012).

To explore our arguments, the article is structured as follows; initially, we develop our theoretical framework to position our arguments. We then outline our methodology followed by a description of the findings linking them back to the analysis. We then discuss the contribution of the study, limitations and offer final conclusions.

'Opportunity' in Social Entrepreneurship Research

Despite the central role of opportunity in SE, there is a relative paucity of research exploring this issue (Sassmannshausen & Volkmann, 2018). SE opportunities have been deemed to arise within situations which enable positive social impact supported by the required investment (Guclu, Dees, & Anderson, 2002) or simply, as the generation of social value (Monllor, 2010). Such definitions are helpful in terms of considering social value creation as the primary goal in SE opportunities, but they are also misleading as using the outcome of a social object to define the social object is tautologous. The extant literature largely takes SE opportunity as a given, or uses it as a unit of analysis without specifying its meaning or how it can be studied (Hockerts, 2017; Muñoz & Kibler, 2016) while there is a dearth of theory and empirical work exploring processes of opportunity emergence within the SE context.

It is thus, not surprising that SE scholars borrow concepts from market-based commercial entrepreneurship literatures such as opportunity discovery, creation, recognition, identification—often used interchangeably—to study SE opportunities (Engelke, Mauksch, Darkow, & von der Gracht, 2015; Zahra, Rawhouser, Bhawe, Neubaum, & Hayton, 2008). For example, attempts have been made to link SE opportunities and actions to discovery or creation theories. It has been argued that SE opportunities are created by changes to the social, economic and political context (Engelke et al., 2015; Perrini & Vurro, 2006), institutional voids (Zahra et al., 2008) or social

disequilibrium due to market and government failure (Martin & Osberg, 2007; Monllor, 2010). Alternatively, SE opportunities are conceived, developed and refined according to internal cognitive factors such as personal experience and an opportunity-oriented mindset (Guclu et al., 2002).

However, while there is continuing debate and controversy regarding the efficacy and value of diverse arguments regarding opportunity theories (Davidsson, 2017; Foss & Klein, 2017), we argue that such debates cannot be directly transposed into the SE context without serious contradictions between theory and context. Unlike its market-based commercial entrepreneurship counterpart, SE provides a different context in terms of mission, response to market failure, resource mobilization and performance measurement (Austin et al., 2006). A key difference here is that SE opportunities must always contain an objectively existing need for social value creation independent from the social entrepreneur. Whether this need lies in social inequality, poverty, educational deficits or well-being issues, these needs must be in place before SE opportunities can exist or be enacted. These social needs are also likely to be unrelated to economic value creation activities, as those for whom the goods or service are provided are unlikely to have the means to purchase them at market value (Santos, 2012). Moreover, as SE is located in a social or community context, the normative notion of prioritising financial returns is not central to SE opportunities (Engelke et al., 2015; Robinson, 2006).

The two key theories underpinning entrepreneurial opportunity within the broader literature have foundational principles that are contrary to the rationale for SE. Discovery theory suggests that entrepreneurial opportunities are exogenous pre-existing socio-economic situations whereby alert individuals can access relevant information, capitalise upon this information and generate profit (Eckhardt & Shane, 2010; Kirzner, 1997; Shane & Venkataraman, 2000). Accordingly, opportunity discovery is difficult as specialist prior knowledge, skills and insights based on an individual's life experiences (Eckhardt & Shane, 2010; Shane, 2000) act as a foundation to alert them to discovering the opportunity. Whereas, within SE, many social needs related to, for example, homelessness, disabilities, child poverty, environmental issues are common knowledge. This suggest that SE opportunity discovery does not necessitate specialist insight to inform the 'discovery' process. Thus, while those who seek to address these evident problems may, or may not, have the experience and skills to enact the opportunity, the need for action is however, evident within the social realm.

Likewise, creation theory argues that opportunities are socially constructed via subjective beliefs and an iterative process of actions and reactions to generate economic wealth (Alvarez & Barney, 2007; Alvarez, Barney, & Young, 2010; Sarasvathy, Dew, & Velamuri, 2010). While it may be that entrepreneurs are able to develop such beliefs and actions, SE opportunities still cannot be subject to the types of processes that creation theories propose. For example, commercial entrepreneurs may be able to create market demand, but social entrepreneurs cannot do so for their services or products as they necessarily have to respond to, or act upon, objectively existing social needs when forming their ventures. It would be considered ethically abhorrent for a social entrepreneur to create the conditions for a social need so as to develop an opportunity.

Consequently, asking whether opportunities are discovered or created is a problematic starting point for research within SE contexts. However, the extant SE literature largely ignores these conceptual and contextual issues. The contemporary ambiguity in defining and explaining SE opportunities, and in some cases the notable contradictions between definitions, limits empirical investigation demands new theory building in this important field.

In line with Short et al. (2010) and Ramoglou (2013), we suggest that new theory building around SE opportunities should not simply explore the objective/subjective nature of opportunities, but requires more considered engagement with appropriate philosophical discourse to look at how opportunities emerge. We commence this investigation assuming that SE opportunities

are 'the gaps between socially desirable conditions and existing reality' (Guclu et al., 2002, p. 3). As such, social entrepreneurs may draw upon belief systems that generate moral imperatives enabling greater sensitivity to the recognition of social needs (Perrini, Vurro, & Costanzo, 2010). In the broader generic entrepreneurship literature, it has been argued that entrepreneurs form business ideas through recognising structural change, which generates gaps prompting action to exploit such gaps in the market (Eckhardt & Shane, 2010; Eckhardt & Shane, 2013), while entrepreneurial aspirations and decisions to found a new venture are still embedded in the market as a social structure (Sarasvathy, 2008). Here, the real tension reflects the on-going debate regarding the relationship between structure and agency. That is, whether social and economic structure has determinant influences over agency, or the agent's meaningful and intentional actions constitute social structures (Danermark, Ekström, & Jakobsen, 2002). Either way, structure and agency must co-exist in order to make the opportunities emerge, and we can interpret their existence by investigating the relationships between structure and agency within the SE context without being constrained by the above limitations of discovery or creation theories.

Our aim therefore, is to develop an SE opportunity theory that is cognisant of this distinctive context and which enables exploration of both the structural and agential facets at work when SE opportunities emerge. Exploring structure and agency in the distinctive context of SE subsequently requires methodological and theoretical novelty. The fundamental problem that arises is how to incorporate structure and agency, while examining them in consistent and cogent ways that enables robust explanations of SE opportunity. To achieve this objective, we adopt a critical realist approach that incorporates the influence of both structure and agency without adopting conflicting ontological positions (Leca & Naccache, 2006; Mole & Mole, 2010).

A Critical Realist Conceptualisation of SE Opportunity

Critical realism argues that the social world is a stratified, open system of emergent entities with causal powers that generate effects and so engender change (Bhaskar & Lawson, 1998; Mingers, Mutch, & Willcocks, 2013). Such entities can be structured at different levels (psychological, social, organisational, economic) each having its own causal powers and properties that generate real effects and social events (Mingers et al., 2013). Entities can exist in observable or unobservable ways—they can be physical, social or conceptual (Easton, 2010; O'Mahoney & Vincent, 2014). A social event occurs when a set of entities, possessing causal powers, combine and enable or constrain agential action (Hu, 2018). For example, a 'social enterprise' can emerge from the interactions between other entities such as social entrepreneurs but as an emergent entity, a 'social enterprise' can also obtain new causal powers, such as a hybrid organisational form. These cannot be reduced or explained solely through the action of the social entrepreneur. These new causal powers can also provide further enabling or constraining conditions for agency. Accordingly, from a critical realist perspective, an SE opportunity would be described as an emergent social entity that can manifest itself as products or services creating social and economic value. An SE opportunity would have a structure of entities unique to it, with its own causal powers, some of which would be independent of the agent (Archer, 1995; Mole & Mole, 2010).

This conceptualisation means that SE opportunity theory, informed through CR, requires both objective, independent structures and subjective agency to be identified within SE opportunities. In CR, structure and agency are considered as separate strata. Structures always provide the context in which agency occurs, while social interaction between agents constitutes the environment where structures are reproduced or transformed (Danermark et al., 2002). When applied to the SE context, this conceptualisation means that social structures such as objectively existing social needs or problems always provide the context for entrepreneurial actions. Equally, these social

needs can be reshaped or addressed as a result of a social entrepreneur's actions. An SE opportunity therefore, emerges because of the interactions between structure(s) and agency. The implication of our conceptualisation is three-fold.

First, the structure of an SE opportunity can be produced through past human agency, but it obtains new emergent properties that cannot be reduced to, so are accordingly, independent from such agency; for example, poverty is created by past human action and the condition of poverty can be independent from the social entrepreneur that acts upon it. Second, structures can have causal powers that may, or may not, be exercised or indeed, responded to, through human agency—but non-action does not affect its existence (Ramoglou & Tsang, 2016). Hence, an SE opportunity can exist either as actualised or un-actualised. Finally, the structures provide boundary conditions that enable and constrain SE agency (Martin & Wilson, 2016). So, social entrepreneurs can fallibly act upon these structures (Mole & Mole, 2010), and individuals may choose to act differently, or not to act at all, in relation to such structural boundary conditions. An SE opportunity only emerges, or is actualised, when individuals choose to act.

Critical realism holds that the interaction between structure and agency cannot be readily observed through human actions and experiences, but only through social scientific analysis (Archer, 1995; Danermark et al., 2002). In our study, conducting such a scientific analysis on SE opportunities requires two actions: first, the identification of the prerequisite entities causally related to the emergence SE opportunities; and second, to specify the structures of these entities, and their effects upon social entrepreneurial human agency. Subsequently, key questions for critical realist theory development are: What are the necessary conditions (combinations of structural and agential causal powers) for the existence of a particular entity? What causal powers *must* it contain? And how are these causal powers enabled and constrained by the distinctive context within which they are found? It is these principles that guided our over-arching research questions: What is SE opportunity? How can it be empirically examined and explained?

However, as entities that construct SE opportunities are not always observable, their existence must be inferred through observation of effects (Bhaskar, 1978; Zachariadis, Scott, & Barrett, 2013) or through experience of social events (Sayer, 1992). This requires a guiding framework for the empirical method. As current research has little in the way of empirical guidance to what SE opportunities may be, it is necessary to draw on previous theory to guide this empirical work. To do so, we combine a framework by Dimov (2011), which was proposed specifically to enable opportunities to be empirically identified with validity with our critical realist analysis. With some modification in the SE context, this combination enables us to identify three units of observation to empirically observe the effects of actualised opportunities—the empirical effects of structure and causal powers exercised through human agency—in the SE context. The three units of observation are: seed venture ideas, social entrepreneurial actions, and market exchange relationships. The actualisation of entrepreneurial opportunities begins with seed venture ideas where entrepreneurial imagination and beliefs are formed and evolve. These aspirations and beliefs then trigger entrepreneurial actions and their intended outcomes, such as venture types, as the formal cause behind the action (Dimov, 2011). Finally, opportunities emerge while potential market exchange relationships are actualised through the entrepreneurial process.

We regard these three observable dimensions of opportunities as the effects of causal powers exercised by human agency; this enables analysis of the necessary structure-agency relations in SE opportunity emergence. Identifying entities and their structures based on these observation requires the researcher to undertake a process of conceptual abstraction (Bhaskar, 1979; Sayer, 1992). Critical realist abstraction explores the nature of relations between entities (Blundel, 2007; Danermark et al., 2002). According to Bhaskar (1979), the relations of two entities should be described as 'internal' only if an entity can only exist in relation to the other. In other words, entities internally related to a social event, such as an opportunity, are those that cannot be

removed without the event disappearing in its current form (Danermark et al., 2002). For SE opportunities, this means identifying and specifying those entities and their causal powers internally related to SE opportunities and to separate them from contingent relationships unnecessary for the existence of SE opportunities. Combined, the philosophy of CR, with its method for identifying entities internally related to an SE opportunity, and the use of Dimov (2011) framework to guide our empirical observation of the effects of SE opportunity actualisation, provide a framework of conceptual tools to develop an understanding of SE opportunities.

Research Method

The dispositional realist philosophy, developed by Bhaskar (1979) and Archer (1995), underpins the methodological approach within this study. A critical realist methodology requires the development of a causal explanation of an entity; the starting point here being to define how the entity can exist through identifying its internal relations. This involves identifying the structures of the entities identified and causal powers that have the potential to operate within a context. Underpinning this approach to empirical research is the DREI(C) method (Mingers et al., 2013; Pratten, 2007). This method is an exercise to shape the theoretical framing, inform the research methods, the type of analysis required, and aids identification of internal relations and causal explanations. DREI(C) requires the description of the object of enquiry (D) based on the three units of observation identified, uncovering theory-practice contradictions or anomalies. Retroduction (R) is a form of inference adopted in critical realism that aims to explain social events by postulating and identifying causal structures and mechanisms which can produce the events (Sayer, 1992). It offers an explanation of any structure or structures and their causal powers at work through conceptual abstraction. This includes understanding what causal powers participants report within a context that enables or constrains agency; why this might be the case and how participant accounts can be combined to explain the causal processes at work. A retroductive causal explanation should also include the elimination of competing explanations (E) with the completed analysis requiring inference (I) of which causal powers are at work within a context (C).

In this study, we undertook a multiple-case approach built around the DREI(C) methodology. A multiple-case approach facilitates understanding of complex and dynamic relations (Eisenhardt, 1989) and so, is a suitable approach when studying the structure-agency relations underpinning SE opportunities. Moreover, critical realism provides a method of theoretically informed abstraction and a focus upon fundamental internal relationships providing a rigorous analytical method for narrative-based qualitative research (Blundel, 2007; Danermark et al., 2002).

Research Context

Actions are better understood within context (Baker & Welter, 2018). Within SE research context is critical in shaping the emergence of SE opportunities (Corner & Ho, 2010). SE activities require social needs to exist and so, are influenced by government, social and institutional norms at the country-level (Estrin, Mickiewicz, & Stephan, 2013; Stephan, Uhlauer, & Stride, 2015) and community-level resources and networks (Haugh, 2007; Lumpkin, Bacq, & Piddock, 2018; Slade Shantz, Kistruck, & Zietsma, 2018). More specifically, Doherty, Haugh, and Lyon (2014) suggest that SE responds to two types of demands: a market logic to achieve business ends and a social welfare logic to achieve social ends. Drawing from such arguments, we focus upon China given that its economic and social transition since the 1970s provides a facilitative context, which has fostered both types of logics and generated an expanding SE sector (Yu, 2011; Zhao, 2012). China presents a qualitatively different setting that provides rich data for

developing new theories about SE opportunity emergence acknowledging such social needs and changes.

Since 1978, China has shifted from a centrally planned economy to a ‘hybrid’ model, neither fully socialist or capitalist, bringing about significant change in the general business environment (Tan, 2005; 2007). This has prompted a decline in public sector services as the main social welfare provider; creating considerable challenges to the social welfare system (Yu, 2011). Various regulations have been developed to facilitate entrepreneurial engagement in social issues (Ding, 2007; Su, Zhai, & Landström, 2015; Zhou, 2011), such as encouraging corporate social responsibility and foundations (Yu, 2011), as well as enabling social enterprises to obtain legal status without a supervisory body (Zhao, 2012). As a consequence, the economic transition in China nurtures the market logic of entrepreneurial activities with consequences for social norms, while the Chinese social welfare system nurtures a social welfare logic of social needs for SE. Not-for-profit activities, including SE, have emerged in response to this situation (Yu, 2011). Accordingly, China provides a rich environment to analyse emerging SE opportunities; this constitutes an essential step of the DREI(C) methodology we follow.

Sample and Data Collection

To achieve heterogeneity, we adopted maximum variation sampling strategy for data collection, a subcategory of purposeful sampling. This sampling strategy allows the specificity of different cases to be documented, while capturing shared patterns and central themes across diverse cases or participants (Patton, 1990). The study comprised 36 different organisations as ‘cases’, including 22 social enterprises, two for-profit social businesses (C-11, C-19), five non-profit organisations (NPOs) (C-10, C-12, C-14, C-17, C-23) and six supporting organisations (S1-S6). These cases were selected from two Chinese social enterprise databases published online by the British Council in Beijing and Social Enterprise Research Center in Shanghai. Between one and three participants were interviewed in each case. Appendix 1 provides an overview of our participants. Each organisation and participant was allocated a code to respect their anonymity. We conducted 29 semistructured interviews with social enterprise founders and 16 interviews with employees and other key stakeholders such as leaders of supporting organisations to facilitate cross-referencing of perceptions and experiences. We critically evaluated the validity of our findings through comparison of the interview data with on-site observations, participant observations, informal conversations, documents such as newsletters and media reports, and comparisons of founder interviews with other stakeholders.

Data Analysis

Following the DREI(C) methodology, our data analysis began by identifying the observable SE experiences and actions utilising the three units of observation (explanations of seed venture ideas, SE actions, and market exchange relationships). Individual and cross-case analysis was undertaken using NVivo; with coding involving categorising the data into themes, and using critical realist abstraction (Kempster & Parry, 2011) to examine the world views and explanations of those working in SE environments. The focus of this analysis was identifying where causal powers may be acting, or acted upon by participants (Danermark et al., 2002). We began by grouping experiences into the three units of observation (see Appendix 2), in order to capture and sort data and to describe observable SE opportunity experiences. Specifically, we searched for information relating to three questions in each case: How did social entrepreneurs form seed venture ideas? When and how did social entrepreneurs take actions to actualise the seed venture ideas? How did they develop market exchange relationships?

The next step of data analysis organised the material by theoretical themes as first-order concepts. Everyday concepts were identified and transposed into a theoretical form to gain new insight into the focal social event (Danermark et al., 2002). Through an iterative process, we repeatedly compared the data to relevant theories. We coded participant experiences using theoretical concepts such as search for information (Eckhardt & Shane, 2010), serendipity (Dew, 2009), and trial and error (Alvarez et al., 2010). Subsequently, we performed a cross-case analysis to retrodue the entities consistently present within the SE opportunities described; these were then evaluated for their likelihood of having causal powers relevant to all SE opportunities (internally related). This was achieved by comparing and contrasting the data across different cases by asking ‘what cannot be removed without making the objective, that is, SE opportunities, cease to exist in its present form?’ (Danermark et al., 2002, p. 47). Applying this critical realist interrogation, we identified the internally related entities necessary for SE opportunities to emerge within these case studies, that is, the entities that are necessary for SE opportunities to exist. Through cross-case comparison, we also eliminated entities that were external or contingent to the existence of these SE opportunities. These external or contingent entities included demographic characteristics such as gender and industry and theoretical concepts such as entrepreneurial alertness (Kirzner, 1997). This is a crucial stage where competing explanations were eliminated as they did not offer valid explanations in the SE context.

The retrodution process was followed by further comparison between the internal entities, data and literature. Through this, we derived second-order themes across cases (see Appendix 2). Finally, by scrutinising the links between these second-order themes, we retrodue the structures and causal powers contained in the internal entities describing them as third-order abstraction categories across all cases (see right-hand column in Appendix 2). These structures and causal powers were: institutional structure (institutional discrimination), cognitive structure (social entrepreneurial belief system), and embedded structure (social feasibility). From our cases, we were able to conclude that these structures and causal powers were able to explain the relations between SE opportunity structures and agency. Thus, they were viable entities for constructing a new conceptual framework of SE opportunity closely matching the empirical reality of these SE opportunities (Easton, 2010; Wynn & Williams, 2012). Following the example of Gioia, Corley, & Hamilton (2013), we provide the stages of our data analysis in Appendix 2. This table depicts the analysis process identifying which observed SE actions led us to retrodue certain second-order themes, and third-order abstract categories. As such, this table does not provide an overview of all relationships between actions and structures, just the internal relations. While the same actions (first-order concept in Appendix 2) can relate to more than one structure and causal power (second-order theme), the table presents only the links between the actions with the structures and causal power necessary for these actions to take place.

Findings

Our results suggest that the actualisation of a specific SE opportunity by a particular social entrepreneur resulted from diverse path-dependent actions, that is, actions that followed a route set by prior events. As such, SE opportunities were actualised through a path dependent process that we describe as a process of seeding, growing, and shaping. Critical realist abstraction permitted us to analyse SE opportunity emergence through retroduing three internally related structures and their causal powers that enable this observable actualisation process. Combined, these findings serve to create a novel conceptual framework for understanding SE opportunity theorising the relationship between the structure of SE opportunities and agential action in SE opportunity emergence (Figure 1).

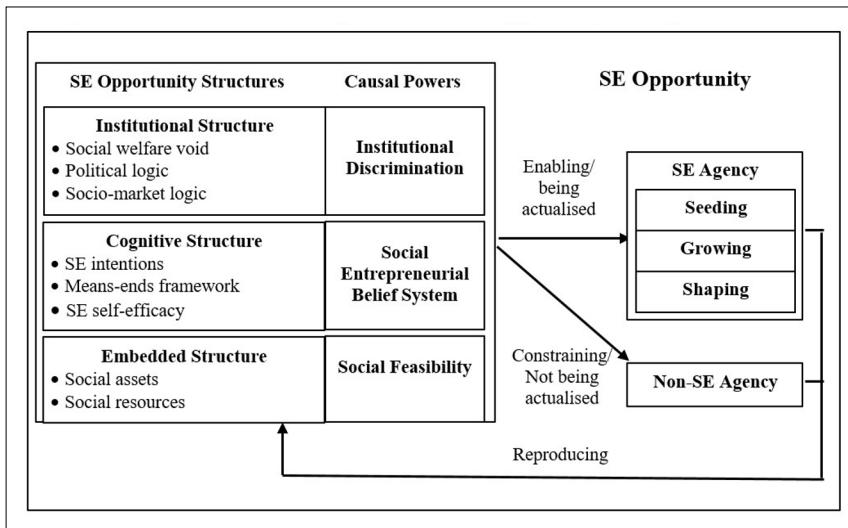


Figure 1. A critical realist explanation of SE opportunity emergence.

Description of SE Opportunity Actualisation

Participant comments suggest that social entrepreneurs had grown and refined the social venture idea through rational planning and decision-making, while also remaining open and adaptive to contingencies. Accordingly, opportunity actualisation contained both teleological and non-teleological aspects (Sarasvathy et al., 2010). For example, P26-1 stated:

“My understanding of the system is ... organic. If I plant a seed, it doesn’t grow straight up. I cannot tell how many branches there will be, that plant will adjust to where the sun is and the wind. I think organic means you go into this, with a very clear idea of what you want to accomplish, ... being ready to take parts you didn’t anticipate. ... Maybe I don’t get what I originally wanted but other doors open”. (P26-1, founder, disability)

From this explanation, we suggest that the actualisation of the SE opportunity is path-dependent, namely dependent on certain conditions (sun and wind) and events (other doors open). Dependent on these, a seed venture idea may or may not sprout. If it does sprout, it “grows” within a particular medium and environment. Similarly, dependent on conditions and events, the SE opportunity can grow into various “shapes” that differ from the original seed idea. This participant’s world view reflects the critical realist term “emergence” whereby the opportunity possesses new properties that cannot be reduced to, or defined by, the seed venture idea (Archer, 1995; Easton, 2010; Wynn & Williams, 2012), hence, there are “*parts you didn’t anticipate*” (P26-1). P26-1 began by looking for sustainable sources of income to support a school for the deaf; but in response to feedback and suggestions, he created a venture that employed deaf people to produce affordable hearing aids. These path dependent actions can be described in terms of three aspects: Seeding, growing, and shaping (see first-order concepts, description of actualisation, in Appendix 2). We now elaborate upon each of these aspects.

Seeding. Seeding refers to forming a seed venture idea through interaction between a social entrepreneur and the environment. These ideas could be vague, such as “do something about

volunteering and children's education" (P5-1). They formed through a process of active information searching and scanning, for example, in the explanation that "*we have to do what is mostly needed by our beneficiaries, and we can know this from ... the government*" (P18-1). These ideas could also emerge through insights gained from prior knowledge and experience, such as: "*having experience in (business and foundations), I can now put them together and really do something for these disabled children*" (P6-1). If such knowledge and experience corridors were absent due to, for example, a lack of prior experience, social entrepreneurs embraced serendipitous discoveries to address such challenges. For instance, an artist claimed to have "accidentally" become the founder of a social enterprise:

"It was all by chance ... I didn't know much about charitable activities, and I had no interests in them. I just participated in an international art exhibition ... tried to teach some disabled people modern art ... But the public and press understood my work ... as something that NPOs [Non-Profit Organisations] would do to solve social problems. Since then I started to know NPOs and incubators. I was told (by the media) that there was an incubator in Shanghai, so I came here and started the social enterprise." (P25-1, founder, disability)

In this case, the seed venture idea gradually evolved through interactions between the social entrepreneur, the media and the public. The SE opportunity involved collective action that steered the participant towards recognising a need to create a social enterprise. Although lacking experience in the sector, he was able to obtain essential information about NPOs, incubators and sources of funding through networking.

Growing. We define "growing" as advancing, refining and acting upon the seed venture idea with resources to trigger actions while adjusting to external contingencies and unexpected risks. Our results suggest that social entrepreneurs advanced, refined and acted upon the seed venture ideas through a series of normative decisions and mission-driven actions. These included market research and business planning, while being adaptive and open to unexpected circumstances. A manifest outcome of such was a *potential* social enterprise, that is, a prospective product or social enterprise that had not yet reached the market.

Social impact creation and moral judgments informed these actions. Participants reported that they were driven by social missions such as "*to enable the elderly to enjoy a happy life at home*" (P4-1) or "*influencing more people to read and think*" (P8-1). Moral judgement appeared to be a high level of adherence to moral obligations to beneficiaries based on the personal circumstances of participants (Mair & Noboa, 2006) rather than external social norms (Hockerts, 2017). For example, P6-1 had met an autistic child and his mother previously noting she: "*didn't know how to help him at that time*". Although they never met again, this moral obligation motivated her over time to finally set up a social enterprise to "*do something for these disabled children*".

With the incentive of social impact creation and moral judgement, social entrepreneurs combined resources such as previous experience, knowledge and networks that had not yet been connected. Participants were urged to draw upon information from various sources from the private and public sectors as well as their own contacts. With all the means and experiences combined, seed ideas were finally transformed into action by establishing social enterprises.

However, as resources were being combined in novel ways, actions taken to achieve social missions occurred within an uncertain environment. Participants reported taking normative actions to mitigate this uncertainty (Alvarez & Barney, 2007; Sarasvathy, 2001), such as risk analysis and evaluation of alternative means. In the situation of goal ambiguity and isotropy (Sarasvathy, 2008) where potential risks or threats were unpredictable, participants experimented with their venture ideas learning as the new social mission took shape. This trial and error

process involved decision making based on affordable losses (Sarasvathy, 2008) as entrepreneurs relied upon recursive attempts to experiment with ideas through available resources, re-inventing business models, rather than insisting upon given goals.

Shaping. Shaping refers to entering and occupying a position in the social market structure through the creation and development of exchange relationships. In our study, these actions helped social entrepreneurs create sustainable products or services that made social impact and allowed their social enterprises to take shape. We found that social entrepreneurs created exchange relationships not only with traditional market actors, such as customers, but also with a wider social sector market (Robinson, 2006) where at least five major actors could be identified, namely beneficiaries, the government, foundations, commercial companies and volunteers.

Beneficiaries were at the center of the exchange relationships given their needs were paramount. Participants reported drawing upon beneficiaries or target community capabilities to develop appropriate products. For example, C24 was a social enterprise offering tailored training workshops for large companies delivered by blind trainers in a completely dark environment. As such, it provides a new employment opportunity for blind people by fully utilising their advantages. Here the capacity of beneficiaries was effectively utilised in the market exchange relationship, while the income is sufficient to support operations and development. Foundations had an important role in idea implementation, capacity building and social investment. Charitable foundations supported social enterprise survival while, in return, social enterprises helped to support the social mission of the foundations. Commercial companies, normally the PR departments of large multinational corporations, participated in the social sector market as channels for stable sales, skills training and volunteering.

Collaborations and partnerships were central to developing social sector market exchange relationships. P25-1, an artist, used the artistic metaphor “social sculpture” to illustrate this point:

My understanding of social sculpture is to see every group of people as a different element of art creation where different stakeholders, such as the government and companies, can be seen as paint, brushes or palettes. So the art creation is to allow these elements combine in different ways to make impact on the society. ... [Together] we are shaping a different art-form of the society. ... I am just a facilitator to guide and connect everyone to try to achieve an idea. (P25-1, founder, disability)

According to this metaphor, every actor in the exchange relationships was part of a greater social sector market collaboration; the traditional boundaries between sellers and buyers in the social sector market became blurred.

Retroducing the Structures and Causal Powers of SE Opportunities

Participant comments suggest that SE opportunity actualisation is a non-linear and path-dependent process of seeding, growing, and shaping which requires interaction between social entrepreneurial agency, the external environment, social networks, contingencies and uncertainty in the social sector market. Opportunity actualisation was also contextualised; thus, the actualisation of a specific SE opportunity by a particular social entrepreneur, under certain circumstances, could not be replicated in other cases. Nevertheless, through critical realist abstraction and elimination of external relations, we are able to identify the internal structures, causal powers and their relations to human agency that explain such a process. Specifically, we identified three structures and their inherent causal powers: the institutional structure (institutional discrimination), cognitive structure (social entrepreneurial belief system), and embedded structure (social

feasibility) as shown in Figure 1. The institutional, cognitive and embedded structures represented a number of entities that were internally related SE opportunities across all cases. We found no SE opportunity could be actualised in absence of any of these three structures. As illustrated by Figure 1, the institutional, cognitive, and embedded structures provided boundary conditions to SE agency and opportunity actualisation.

First, with regard to the institutional structure, we identified several institutions in the Chinese context that generated both enabling and constraining conditions for social entrepreneurs who were forming seed venture ideas aiming to create social and economic value. We termed these conditions “institutional discrimination”. These circumstances were available to all social entrepreneurs, market-based commercial enterprises and NPOs, but not every agent would act upon them. As such, institutional discrimination provided a necessary, but not sufficient, condition for the actualisation of SE opportunities. Second, the “cognitive structure” enabled social entrepreneurs to develop an SE belief system that informed the development of a social enterprise, rather than a commercial venture or NPO. A social entrepreneurial belief system was therefore, also a necessary but not sufficient boundary condition for the actualisation of an SE opportunity. Third, we identified an “embedded structure” in that participants remarked upon the availability of social assets or resources embedded in the interactions between social entrepreneurs and other actors, which influenced whether the SE opportunity could be actualised. Hence, the embedded structure provided another boundary condition, which we termed “social feasibility”, for the actualisation of the SE opportunity. We now turn to each of these structures, and their associated causal powers, to demonstrate why, and how, they form the necessary internal relations that constitute SE opportunities.

Institutional structure and institutional discrimination. China’s institutional environment created a distinct “SE sphere” that enabled social entrepreneurs to develop seed venture ideas and take action. The institutional structure consisted of formal and informal institutions that social entrepreneurs navigated including: social welfare voids; a political logic and a socio-market logic. First, social welfare voids generated a mismatch between the supply and demand of social goods/services prompted by the retreat of the state as a provider; for example, in Case 26 (a venture employing deaf people), a state-owned textile company had closed with many deaf employees made redundant. Second, political logic is represented by the government’s long-term social policies and plans. Participants reported that such policies could be seen as reflection of the trend in socio-economic development. As such, demonstrating consistency with social policies and plans enabled social entrepreneurs to develop venture ideas which would more readily receive government support. As P18-1 said:

“I think we have to firstly understand that non-government organisations are not anti-government organisations. We have to do what are mostly needed by our beneficiaries, and we can know this from what the government pays attention to most. So is a complementary relation. Once you get your position right, there are so many resources you can use”. (P18-1, manager, women empowerment)

In this case, the interpretation of the central government’s No.1 Policy on Agriculture led to an approved project on organic and safe food. We also identified a combined socio-market logic indicating a growing social acceptance of SE. As P22-1 explained:

“We were lucky because the concept “social enterprise” had become more popular at the time we started our organisation [in 2010]. When I was originally trying to set up a business, or even a NPO, nobody would pay attention to me. But because the public and the media now recognise us as a social

enterprise, and we are considered as a new way of solving social problems, so people like to give us resources, and we have received a lot". (P22-1, founder, disability)

Unlike contexts where SE originates either from the existing non-profit sector, adopting a market logic as "commercial non-profits" (Defourny & Nyssens, 2010), or from the existing private sector, adopting a social welfare logic as "social-purposes businesses" (Bacq & Janssen, 2011), the social and market logics in our study were relatively integrated. As P5-1 noted, "*you can't separate a good social product from the market*". This reflects the fact that SE as a practice was not recognised in China until 2004 (Bhatt, Qureshi, & Riaz, 2017; Ding, 2007).

Our findings suggest that the institutional structure had effects on differing types of agency. Specifically, institutional discrimination provided enabling effects on SE agency and constraining effects on non-SE agency, as shown in Figure 1. As illustrated by our findings, favorable policies and social norms could act to release resources and encourage support for social enterprises. For social entrepreneurs, adopting a socio-market logic means "*we can use commercial methods to optimise our working process and to improve efficiency and quality of our products*" (P5-1, founder, rural education). However, non-SE agents could interpret and respond to these institutions differently, which influenced the outcomes (Austin et al., 2006; Monllor, 2010). The socio-market logic was also rejected by some NPOs as "*it is extremely difficult for them to change their grassroots mindset of doing things, they would simply say it is wrong to earn profit ... and see it as a disgraceful thing*" (P6-1, founder, autism). As a consequence, these NPOs focused upon fund raising, choosing not to provide social goods or services through a social enterprise. Nevertheless, no matter how different agents responded to the institutional structure, it would continue to exist independently of their perception—as an objective, independent structure in the critical realist sense.

Cognitive structure and social entrepreneurial belief system. The institutional structure alone could not distinguish SE opportunities from other types of opportunities and non-SE opportunities, as it was available to various agencies such as NPOs. As one participant reported:

We can definitely start up a traditional NPO ... but still I think it is better to try an innovative and self-sustainable way to do it. I studied economics before, so I believe in market, and we don't have to rely on external funding as long as there is demand in the market. That is why I positioned the organisation as a social enterprise. (Participant 13-1, founder, volunteering)

This illustrative quote indicates that a seed venture idea could lead to the creation of a social enterprise, or the creation of a traditional NPO, depending upon how the social entrepreneur chose to implement the idea. Consequently, it is necessary to explore how and when social entrepreneurs chose to act upon seed venture ideas and what structures enabled such choices but constrained others. P24-1 suggested that "*the key thing is that [one must] totally buy the value and have a great passion and desire to get things done*". This illustrates three cognitive entities internally related to an SE opportunity: first, for an SE opportunity to emerge, would-be social entrepreneurs must have intentions ("passion and desire") to act upon seed venture ideas; second, there has to be a willingness to develop means to achieve social and economic ends ("buy the value"); and finally, they need to have self-efficacy in believing their solutions can be successfully implemented to the best of their knowledge and experience ("passion and desire to get things done"). These three cognitive entities combine to form a cognitive structure that enabled SE agency in actualising an opportunity in this case. As illustrated by the above quote, the cognitive structure develops from a social entrepreneur's past experience and prior knowledge. Yet,

it also forms a new causal power: “social entrepreneurial belief system”, which shapes what is considered socially and entrepreneurially possible, thus affecting future agency.

The findings from our cases illustrate that intentions to develop SE opportunities could commence with general emotional empathy, interests or moral judgments (see Appendix 2, first-order concepts that are part of SE intentions), such as to “*influence more people to read and think*” (P8-1), or being passionate about charitable activities (P22-1). The intentions may not have been actualised when formed but could enable future SE agency. For example, P6-1’s intentions to work with autistic children were instigated by previously meeting such a child. This intention was then actualised after she “*felt like having all the experiences of doing business, (working) in the non-profit sector; I can now put all these together and really do something for these disabled children*”. In our cases, we found that social entrepreneurs developed means-ends frameworks, mostly in the form of innovative business plans, existing business models, such as micro-finance and fair trade, or simply a general business idea. But regardless of in which form the means-ends frameworks were developed, social entrepreneur actions and willingness to develop such frameworks was necessary for the actualisation of opportunities. In P6-1’s case above, her initial intentions did not enable SE actions until she was able to develop a solution to address the social problem. This participant cohort also demonstrated a high level of self-efficacy, visible in their expressed confidence regarding potential challenges, gains and losses, such as “*I guess my passion was so strong that I was willing to do this with low capitalisation*” (P26-1, founder, disability), and “*I gave myself 3 years (to run the organisation) ... the worst thing could happen was just failure ... so the loss was just 3 years’ time, which I thought it was totally acceptable*” (P5-1, founder, rural education). This self-efficacy appeared to affect the initiation and persistence of their actions to implement means-ends frameworks.

Embedded structures and social feasibility. While the social entrepreneurial belief system enabled SE agency in implementing seed venture ideas, access to resources embedded in market exchange relations was also necessary for successful actualisation of the SE opportunity. An illustrative example is C24, an international social enterprise franchise. This was introduced to China in 2007, but despite a previously effective business model and support from the franchiser, it initially struggled to achieve its objectives. However, when P24-1 joined the enterprise in 2010, he had local contacts and knowledge such that positive relationships were established with key local stakeholders. We use the term “embedded structures” to describe the aggregation of the resources embedded in these relationships (see opportunity structure in Figure 1), and “social feasibility” (causal power in Figure 1) to refer to the availability of these resources which affect the possibility for the development of SE opportunities.

As part of the embedded structures, we distinguish between social assets and social resources. Social assets were normally intangible valuable resources embedded in a community (Guclu et al., 2002) which although not directly relevant to the social enterprise, form conditions for a feasible opportunity to emerge. For example, P1-1, a social entrepreneur trying to preserve the culture and handicraft of the Miao, one of the many ethnic minorities in China, relied on the richness and uniqueness of Miao’s culture and handicrafts as a social asset to commercialise its cultural products.

The more tangible social resources embedded within exchange relationships were also crucial to SE opportunity actualisation. We found at least three types of social resources: operating resources, information and knowledge, power and influence (see second-order themes in Appendix 2). Tangible operating resources included financial resources, human resources, market channels, equipment, offices and professional advice. This is illustrated by the case of P25-1, the artist who “accidentally” became a social entrepreneur. Here, the introduction of a friend to a non-profit incubator in Shanghai, with close relationships with local government, enabled the

organisation to be successfully registered as a social enterprise. With the support of the incubator, considerable commercial and political resources were realised and the SE opportunity took shape. The second type of social resource, information and knowledge, could be about particular social needs or about technical details, such as that about the application of a particular methods to aid dyslexic children in C8. The third type of social resource was power and influence obtained through exchange relationships. For example in C26, a government stakeholder provided marketing support and equipment which were normally only available to NPOs.

Our cases suggest that the availability of social assets and resources determined the feasibility of establishing market exchange relationships, without which the social enterprises would not be able to survive, and accordingly the SE opportunities would not exist. Depending upon how different agents acted upon these relationships, the embedded structure could enable SE opportunity actualisation through successful market exchange relationships. Failing to do so would lead to the non-actualisation of the opportunity.

Discussion: Developing a Critical Realist Theory of SE Opportunity Emergence

Within this article, we contribute to calls for more empirically informed conceptualisations of SE (Sassmannshausen & Volkmann, 2016) to expand the evidence base regarding SE practice in under-explored countries and contexts (Doherty et al., 2014), while also identifying structural and agential conditions that underpin opportunities (Martin & Wilson, 2016). To contribute to theory development, we draw upon an empirical, critical realist analysis that develops an explanation of SE opportunities in China. Dimov (2011) framework assisted us in analysing the lived SE experiences in opportunity actualisation to empirically analyse actualised opportunities. Furthermore, critical realism enabled us to retrodue the structures and causal powers of the entities necessary for SE opportunities to exist and how these are related to human agency. Our findings highlighted two important aspects of SE opportunities: an agential aspect—SE opportunity actualisation following a path-dependent seeding-growing-shaping process—and a structural aspect—internally related institutional, cognitive and embedded structures necessary for SE opportunities to emerge. While the path-dependency of SE opportunity actualisation is due to social entrepreneurs having particular ways of interacting with the structures, the structures themselves provided three boundary conditions for human agency: institutional discrimination, the social entrepreneurial belief system and social feasibility, which enabled the actualisation of SE opportunities. Integrating both empirical and theoretical conceptualisations using critical realist methods, this theoretical framework extends SE research, helping to describe the phenomenon and developing an understanding of when and how SE opportunities are in existence. As such, this constitutes an applicable tool for researchers and practitioners to examine SE opportunity and develop insight into how it emerges in practice. We now elaborate on the implications of our theoretical framework regarding the dynamic interactions between structure and agency, as well as institutional and collaborative dynamics. We then highlight contributions to SE theory development and limitations of this study.

Dynamic Interactions Between Structure and Agency

Our findings suggest that SE opportunity actualisation is a complex social phenomenon that is not only a path-dependent process, but also involves dynamic interactions between structure and agency. A seed venture idea must have its root in the institutional structure; otherwise, it cannot be sustained. What is being produced at the particular seeding moment can be an inspiration that may, or may not, be considered viable in the future (Davidsson, 2015; Dimov, 2007), so the seed

venture idea may, or may not, be developed into an SE opportunity. As such, SE opportunity emergence must include the possibility of failure caused by either agent error or structural constraints. Similarly, the growing and shaping process of an SE opportunity would comprise acting upon the seed venture idea with internal motives and external resources, adjusting to the external environment and exchanging with other social sector market actors. These actions would be either enabled or constrained by cognitive structures and embedded resources which may, or may not, lead to entrepreneurial failure. When the SE opportunity is actualised, the opportunity can manifest itself as products or services that create both social and economic value in the social sector market. However, whether or not the opportunity is transformed as a social venture—as a new emergent entity with new properties—can be seen as the outcome of further exploiting the actualised SE opportunity.

Our findings enable us to develop a theoretical explanation of SE opportunity as an emergent entity and specify its structures, causal powers and relations with SE actions and outcomes. SE opportunities emerge from the interactions between SE agency and structures at different levels, namely the institutional, cognitive and embedded levels. This theorisation of SE opportunities interweaves institutional situations, cognitive beliefs and social embeddedness (Grimes, McMullen, Vugus, & Miller, 2013). Departing from these notions, and from structuration theory in general, we separate structure and agency by considering them as related, but ontologically different, domains of reality (Danermark et al., 2002; Leca & Naccache, 2006). This separation allows us to logically discuss their interactions and effects upon each other (Mole & Mole, 2010; Volkoff, Strong, & Elmes, 2007).

We acknowledge the co-existence of structure and agency in collectively shaping SE opportunities rather than attributing the opportunities to an isolated form or forms of structure or agency, as suggested in existing literature (Guclu et al., 2002; Martin & Osberg, 2007). First, the three identified structures of SE opportunities derive from human action as SE opportunity occurs in a social world transformed by human actions (Blundel, 2007; Danermark et al., 2002). Rather than argue that they are created by social entrepreneurs, our findings suggest they are emergent social structures and so, subject to new properties and causal powers which cannot be reduced to the properties and causal powers of any individual human action.

Social entrepreneurs may, or may not, be able to perceive the existence of these social structures, but without them, SE opportunities could not exist. In other words, SE agency always occurs in a social world of structural constraints and possibilities (Bhaskar, 1998). Second, our theorisation of SE opportunities does not deny the importance of SE agency. Resonating with those of Perrini and Vurro (2006), our findings acknowledge the importance of individual social entrepreneurs developing and acting upon the structures of SE opportunities. SE opportunity emergence relies on the capability of social entrepreneurs to perceive and act upon structural constraints and possibilities. Third, the findings emphasise the need to acknowledge the role of context in shaping SE opportunities. We argue that SE opportunity actualisation is highly contextualised. The empirical evidence suggests multilevel institutional and social links between social entrepreneurs and the surrounding context and hence, multilevel influences upon SE actions. These might be direct, such as market collaboration, or indirect, such as institutional situations interpreted as social problems, which are also influenced by SE actions - the social sector market being shaped by developing exchange relationships. As such, the actualisation of a specific SE opportunity, by a particular social entrepreneur, under certain circumstances could not be replicated in other cases. In effect, the three structures are subject to contextual influences; they change and evolve in a dynamic social world (Wynn & Williams, 2012), while agents adopt particular ways of acting upon structures.

Institutional and Collaborative Dynamics

Our evidence also extends understanding of how structures work in SE opportunity emergence, particularly at the institutional and embedded levels. First, the findings suggest that institutional voids underpin SE opportunity emergence and indeed, SE in general. The term “institutional void” normally refers to the absence of institutional arrangements for market functioning and development (Mair & Marti, 2009; Stephan et al., 2015). In existing research, institutional voids are mainly presented as an inhibitor of Western-style market functioning, development, and participation (Mair, Martí, & Ventresca, 2012). Yet, our findings suggest that these constraining effects in a commercial market actually assist social entrepreneurs to develop opportunities which could support the emergence of a new social sector market in China. Consequently, institutional voids appear as a form of “opportunity space” for social entrepreneurs and a fertile ground for SE opportunity emergence (Baker, Gedajlovic, & Lubatkin, 2005; Bothello, Nason, & Schnyder, 2019; Mair et al., 2012).

Second, the evidence pertaining to the political and socio-market logics adds new insights into the role of institutional logics in SE opportunity emergence and SE in general. The extant literature suggests that SE responds to two conflicting institutional logics, a market logic to achieve business ends and a social welfare logic to achieve social ends (Doherty et al., 2014; Pache & Santos, 2013). Social entrepreneurs respond to the tension between these logics by, for example, creating a common organisational identity (Battilana & Dorado, 2010) or diverse compromise strategies (Mitzinneck & Besharov, 2018). However, we found that the institutional environment in China enables more integrated—rather than conflicting—socio-market logics to develop. Furthermore, social entrepreneurs also respond to other existing institutional logics, such as the political logic in China, when actualising SE opportunities. These findings have implications for future research in understanding the hybridity in SE as a multidimensional space with complementary logics that go beyond the combination of two conflicting logics (Besharov & Smith, 2014).

Finally, an important element of our argument is that opportunity actualisation is a path-dependent process that cannot be reduced to a single idea, person, cognitive process or other single contextual situation. The complex structure-agency relations and SE actions identified (see Appendix 2), and the contextual diversity encompassing them suggest that SE opportunity emergence does not only require an individual social entrepreneur responding to internal beliefs, but also to be embedded in the broader social sector market and wider institutional context (de Bruin, Shaw, & Lewis, 2017). Accordingly, actualising SE opportunities requires greater complexity in managing relationships within communities (Austin et al., 2006; Haugh, 2007; Lumpkin et al., 2018) and research into SE opportunities must involve some elements of connectedness (Hu, 2018). In this vein, SE opportunities can be seen as “co-created between the entrepreneur, customers, suppliers, and other stakeholders in the context” (Alvarez & Barney, 2014, p. 164), but this co-creation must also occur in a structured social world, with objective social needs existing and driving the interaction between social entrepreneurs and institutional, cognitive and embedded social structures.

Contributions to SE Theory Development

Drawing from our discussion, we identify a number of contributions to SE theory development. Thus, we contribute to a greater understanding of SE opportunities and the structure-agency relations that enable SE opportunity actualisation. We provide a novel critical realist analysis of SE opportunity actualisation which enriches the SE literature where opportunities are usually taken as a given. Further, we address the lack of a clear explanation of the SE opportunity

phenomenon (Engelke et al., 2015; Mair & Martí, 2006; Perrini & Vurro, 2006). We achieve this by noting two critical structural and agential aspects of SE opportunities and analysing their relations in SE opportunity emergence through a novel critical realist perspective and methodology. We have argued that structure and agency are equally important and inter-related. SE opportunity emergence relies on the capability of agents to produce and act upon structures following the seeding-growing-shaping process, while the structures themselves provide boundary conditions for human agency that enable the actualisation of SE opportunities. Drawing these insights together, we suggest that future research on SE opportunities needs to go beyond the “social entrepreneur—SE opportunity” nexus (Arend, 2013) and consider wider institutional and community dynamics.

In addition, we address empirical challenges SE scholars encounter when studying opportunities; for instance, how to reliably examine SE opportunities and so, distinguish them from other opportunities. This represents a contribution to the development of rigorous research design and research methods in studying complex social events that incorporates the influence of both structure and agency without adopting conflicting ontological positions. We contribute to addressing these challenges through critical realist abstraction where SE opportunities are seen as an emergent conceptual entity that can be empirically examined through a set of observable phenomena before and after their actualisation. Empirically, this enables an explicit and direct focus on the data specifically relevant to entrepreneurial opportunities.

Critical realism holds that human knowledge is not only fallible, but also needs to be contextualised (Al-Amoudi & Willmott, 2011; Bhaskar, 1998). So, our theorisation of opportunities in the SE context cannot exhaust the structures and causal powers in the market focused commercial entrepreneurship context and our research findings are situated in the SE context thus, could not be directly transposed into general market-based entrepreneurial opportunity theorising. However, we hope our conceptualisation of opportunities and methodology could provide useful theoretical and empirical tools for the general entrepreneurship literature by exploring structure-agency relationships. We argue that there will be different structures and causal powers presenting when theorising opportunities in the market-based commercial entrepreneurship context, we argue this study has provided a useful example to explore the dynamic structure/agency relations in an empirical setting.

Limitations

In terms of limitations, this study does not seek for generalisation, as critical realism holds that social events occur in an open system and human knowledge is essentially fallible (Kempster & Parry, 2011; Sayer, 1992; Wynn & Williams, 2012). As such, we do not claim that the analysis of these findings should be considered as the only explanation of SE opportunity emergence, or that it has fully explained the SE opportunity as a complex social event in its every aspect. The theoretical framework developed in this study serves as explanation in the context of SE in China which may require further refinement from future research.

Conclusion

This article offers a distinct contribution to debate by theoretically analysing and empirically illustrating SE opportunity emergence. As such, it addresses contemporary ambiguity in analysing opportunity issues within the distinctive context of SE. It extends SE research by developing a novel theoretical model to explain the nature and dynamic structure/agency relations in SE opportunity emergence through drawing upon an empirical investigation informed by a critical realist philosophy and methodology. It has also provides a description of SE opportunity

actualisation that addresses some of the empirical challenges SE scholars encounter when analysing opportunities. We believe this theoretical framework and methodology provides useful conceptual and applicable tools for future researchers upon how SE opportunities can be studied, especially in under-researched contexts. We also hope this study will inspire other researchers to adopt critical realism for research topics that requires in-depth and comprehensive explanation.

Appendix I Participant Demographics.

Case	Social sector	Participant	Role	Case	Social sector	Participant	Role
Case 1 (Pilot)	Culture preservation	1-1, F	Founder	Case 18	Women empowerment	18-1, F	Manager
Case 2 (Pilot)	Microfinance	2-1, M	Manager	Case 19	Food safety, agriculture	19-1, M	Founder
Case 3 (Pilot)	Fair trade	3-1, F	Founder	Case 20	Education, employability	20-1, M	Founder
Case 4	Age care	4-1, F 4-2, F	Founder Employee	Case 21	Disability	21-1, F	Founder
Case 5	Rural education	5-1, M 5-2, F	Founder Employee	Case 22	Disability	22-1, M	Founder
Case 6	Autism	6-1, F 6-2, F	Founder Manager	Case 23	Food safety	23-1, F	Founder
Case 7	Fair trade	7-1, F	Founder	Case 24	Disability	24-1, F 24-2, F	Founder Line manager
Case 8	Dyslexia	8-1, F 8-2, F	Founder Manager	Case 25	Autism	25-1, M	Founder
Case 9	Disability	9-1, F	Founder	Case 26	Disability	26-1, M	Founder
Case 10	CSR	10-1, F	Founder	Case 27	Autism	27-1, M	Founder
Case 11	Autism	11-1, M 11-2, M 11-3, F	Founder Manager Manager	Case 28	Disability	28-1, M	Founder
Case 12	Autism	12-1, M	Manager	Case 29	Poverty, sustainability	29-1, M	Founder
Case 13	Volunteering	13-1, M	Founder	Stakeholder 1	SE training	S1-1, F S1-2, M	Former SE director SE training officer
Case 14	Disability	14-1, M	Founder	Stakeholder 2	SE funding	S2-1, F	Senior officer
Case 15	Women development	15-1, F	Manager	Stakeholder 3	SE incubator	S3-1, F	Founder
Case 16	Education	16-1, M	Founder	Stakeholder 4	University/SE incubator	S4-1, M	Manager
Case 17	Volunteering	17-1, F	Founder	Stakeholder 5	SE incubator	S5-1, F S5-2, F S5-3, F	Vice-president Manager Manager

Appendix 2: Stages of the Data Analysis Process.

Empirical description of SE opportunities (Three Units of Observation)	First-order concepts (Description of SE Opportunity Actualization)	Second-order themes (Internal related Entities based on Abstraction and Retroduction across Cases)	Third-order abstraction categories (Structures and Causal Powers of SE Opportunity)
How did social entrepreneurs form seed venture ideas?	<ul style="list-style-type: none"> • Searching and Scanning for information about a social problem • Interpretation of social problems based on prior knowledge • Personal experience of social problems • Serendipity: exploiting environmental contingencies and continuous adjustment of ideas based on new means • Social venture capitalists and private foundations providing funding opportunities 	<p align="center">Social Welfare Void</p> <ul style="list-style-type: none"> - Mismatch between supply and demand of social goods <p align="center">Political Logic</p> <ul style="list-style-type: none"> - Government long-term social policies and plans <p align="center">Socio-market Logic</p> <ul style="list-style-type: none"> - Increasing government support on SE - Growing corporate social responsibility - Integration of social and market logics 	Institutional Structure (Institutional discrimination)
When and how did social entrepreneurs take actions to actualize the seed venture ideas?	<ul style="list-style-type: none"> • Actions based on emotional empathy, interests or moral judgments • Mission-driven decisions and actions • Evaluation of possible solutions to the social problem • Business planning • Reinventing existing business models • Trial and error process • Recursive attempts of experimenting ideas • Actions under the principle of affordable loss • Following entrepreneurial instinct based on past experiences • Adjusting social products to situations and contingencies 	<p align="center">SE intentions</p> <ul style="list-style-type: none"> - Emotional empathy - Moral judgment <p align="center">Means-ends framework</p> <ul style="list-style-type: none"> - Actions and willingness of developing means to achieve social missions 	Cognitive Structure (Social Entrepreneurial Belief System)
How did social entrepreneurs develop market exchange relationships?	<ul style="list-style-type: none"> • Community/beneficiary capacities • Purposive selection of target communities/beneficiaries • Mutually selected partnerships • Collaborative product development, • Collective marketing • Social sector market collaboration 	<p align="center">Entrepreneurial self-efficacy</p> <ul style="list-style-type: none"> - Beliefs regarding profit generation - Beliefs regarding controllable loss <p align="center">Social assets</p> <ul style="list-style-type: none"> - Intangible resources embedded in target communities <p align="center">Social resources</p> <ul style="list-style-type: none"> - Operating resources - Information and knowledge - Power and influence <p align="center">Elimination of External and Contingent Relations (gender, age, prior knowledge, entrepreneurial alertness etc.,)</p>	Embedded Structure (Social Feasibility)

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