Journal of Business Research xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Journal of Business Research

Case-based asymmetric modeling of firms with high versus low outcomes in implementing changes in direction☆

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ARTICLE INFO

Article history:
Received 1 September 2014
Received in revised form 1 May 2015
Accepted 1 May 2015
Available online xxxx

Keywords:
Innovation performance
Search scope
SMEs
Emerging market firms
fsQCA

ABSTRACT

The study builds on and extends prior work on the search scope and innovation performance of small and medium-sized enterprises. Specifically, this study explores combinational causes leading to high innovation performance for emerging market firms using fuzzy-set qualitative comparative analysis (fsQCA). By calibrating the data, constructing the truth table and producing the fsQCA results on the data of small and medium-sized enterprises from China, this study highlights the combination of several causes that the innovation performance of firms depends on. The findings of this study reveal that the strong presence of R&D capability and firm size is necessary, while upward search scope is a sufficient condition for strong innovation performance. The article closes with implications for theory and practice and avenues for future work.

1. Introduction

Several studies demonstrate direct effects of antecedents to innovation performance of firms (Crossan & Apaydin, 2010; Damanpour & Aravind, 2006; Ahuja, Lampert, & Tandon, 2008). Ren, Eisingerich, and Tsai (2015) for instance find that inter-organizational relationships, including connections with downstream customers and upstream suppliers have a significant impact on innovation performance. Although Ren et al. (2015) stress the significant effects of inter-firm relationships on innovation performance; their results inevitably suffer from the limitations of multiple regression analysis (MRA) (Armstrong, 2012; Woodside, 2013a,b). For example, Soyer and Hogarth (2012) suggest the underestimation of uncertainty in forecasting regression analyses because of various misleading illusions, such as regressions providing the best linear but unbiased estimations and complexity illusion (Armstrong, 2012). Furthermore, MRA is a net-effect estimation of research approach which deals with symmetrical relationships when the use of algorithms (recipes) more accurately estimates the realities of asymmetrical relationships (Woodside, 2013a).

In light of these limitations, there are calls to move beyond MRA to craft and test theory by using algorithms (Fiss, 2011; McClelland, 1998; Ragin, 2008; Woodside, 2013a,b, 2014). Qualitative comparative analysis (QCA) is grounded in set theory and is useful for analyzing asymmetrical complex causal relationship versus the analysis of net effects (Ragin, 2008; Woodside, 2013a,b). This study responds to the calls for the use of fuzzy-set qualitative comparative analysis (fsQCA) as Fiss (2011) and Woodside (2013a,b, 2014) propose. The study employs fsQCA using Ren et al.'s (2015) dataset and illustrates how this set-theory technique can supplement correlational techniques by offering a more holistic, combinatorial view (Skarmeas, Leonidou, & Saridakis, 2014) to this particular study of the causal relationship between search scope and innovation performance of firms. As Huff and Huff (2000) convincingly argue, this is of particular importance in business contexts that are characterized by strategic change. Importantly, the findings show that the fsQCA method offers a more detailed picture and allows for rich insights that increase understanding of the complex causal relationships and the effects of causal recipes of high innovation performance.

This study contributes to the literature in two critical ways. First, the findings show the importance of understanding the complex configurations regarding the relationship between search scope and innovation performance of firms. Second, in terms of method, the study offers

☆ The authors thank JBR Editor Arch Woodside for his continued support and constructive and very helpful comments. They thank Gerard George, Singapore Management University, and Matthias Seifert, IE Business School, for their critical feedback on an earlier version of this manuscript. The authors gratefully acknowledge funding from the National Natural Science Foundation of China (project no. 70902074) and the Social and Humanity Foundation of Ministry of Education of China (project no. 09YJC790185).

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http://dx.doi.org/10.1016/j.jbusres.2015.05.007
0148-2963/

additional support for Ragin's (2008) and Woodside's (2013a, 2014) findings that fsQCA is relevant in providing and shedding light on combinational causal relationships. The paper proceeds as follows. The data, method, findings, and limitations of Ren et al.'s (2015) analyses are summarized in the next section. The third section explores and discusses fsQCA. The fourth section reports a re-analysis of Ren et al.'s (2015) data using fsQCA. The final section offers a discussion of implications for theory and practice as well as future research.

2. The revisit of search scope and innovation performance

2.1. Ren et al.'s (2015) data, method and findings

Ren et al. (2015) examine the associations between search scope, R&D capability, and innovation performance for firms from emerging markets. They highlight the important roles of inter-organizational relationships (see also Freeman, 1991; Pittaway et al., 2004; Powell & Grodal, 2005; Tsai & Eisingerich, 2010), including connections with downstream customers (Greer & Lei, 2012; Ngo & O'Cass, 2013) and upstream suppliers (Johnsen, 2009; Subroto & Sivakumar, 2010), in influencing firms' innovation performance. Although a large body of prior work studied the effects of inter-firm connections on firm innovativeness and innovation performance, the results of prior studies on the links between search scope, R&D capability, and innovation performance were still inconclusive. Ren et al. (2015) therefore sought to shed additional light on the question as to whether firms from emerging markets such as China are more likely to benefit from greater innovation performance when they work with a selected few firms or a broader base of exchange partners, such as suppliers and customers. Put differently, does reliance on a limited number of customers and/or suppliers hinder or facilitate the innovation of emerging-market firms?

Ren et al. (2015) used a sample of 176 Chinese listed SMEs and longitudinal panel data. By employing MRA, they estimated the GEE models and the fixed effects of linear panel data regression models. The dependent variable is firm innovation performance measured by the firms' yearly total patent application; the independent variables are R&D capability measured by the firms' yearly research and development expenditure, upward search scope measured as the purchasing from top five suppliers as a proportion of the firms' total purchasing cost, and downward search scope measured as sales to the top five customers as a proportion of the firms' total sales. Finally, the control variables include firm size measured by firm total assets and profit. Ren et al.'s (2015) results show that upward and downward search scopes along the supply chain strengthen the positive effect of R&D capability on the innovation performance of emerging-market firms (see Fig. 1). Furthermore, search scope along the supply chain has a positive moderating effect on innovation performance. While Ren et al. (2015) contribute to the innovation literature by enhancing our understanding of the role of search scope along the supply chain on the relationship between R&D capability and innovation performance for SMEs in emerging markets, its findings also suffer from a number of limitations.

2.2. Ren et al.'s (2015) limitations

Ren et al. (2015) conducted a series of tests to examine the robustness of their findings. First, Ren et al. (2015) examine the sensitivity to changes in their models by estimating the random effect model and the pooled data models. They examine the possibility of reverse causality by reversing the models and examining the results thereof. In addition to this, Ren et al. (2015) performed a cross-validation test with holdout samples to address the previously noted limitations of regression analyses (Armstrong, 2012). However, even with these efforts and additional tests, the limitations of MRA cannot be avoided completely. Ragin (2008) discusses and summarizes the critical problems of a net-effects approach as follows. First, the net effects of MRA are dependent upon model specifications, which means results can be

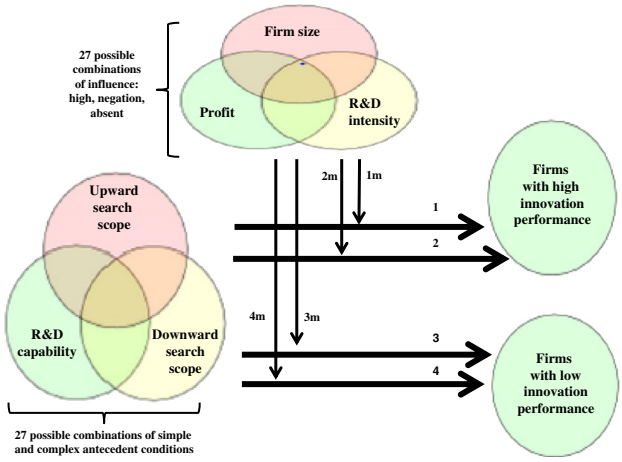

Fig. 1. Asymmetric modeling of the influence of complex antecedent conditions. Notes. Key: "m" = modification. Arrows indicate the highest consistency paths. Asymmetric modeling includes constructing usually 2 + unique models for both firms with high versus firms with low innovation performances.

powerfully swayed by correlations between different variables, including competing variables (Ragin, 2008). Second, MRA aims to research symmetric relationships instead of asymmetric relationships. The objective of net-effects analysis is centered on the task of estimating context independent net-effects, whereas MRA is unable to assess the consequences of different combinations of causal effects effectively. Woodside (2013a) eloquently underscored the importance of moving beyond studying simple symmetric relationships and moving towards shedding light on context independent occurring net-effects. As Woodside (2013a) notes "… reality usually includes more than one combination of conditions that lead to an outcome" and "many relationships among a dependent variable and independent variable are not linear and not well described by correlation coefficients." Ragin (2008, p. 182) concludes that the net-effects of MRA approach is particularly weak when used to study combinations of case characteristics, especially when dealing with overlapping inequalities. To avoid the above limitations of MRA, this study attempts to conduct an analysis by fsQCA on the associations that Ren et al. (2015) propose and show how this asymmetric analysis technique can provide more detailed results and deeper understanding of the effects of search scope on innovation performance.

3. Overview of the fsQCA technique

QCA was developed originally for the analysis of configurations of crisp set memberships (i.e., conventional Boolean sets) (Ragin, 1987, 2000, 2009a). Fuzzy sets extend crisp sets by permitting membership scores in the interval between 0 and 1 based on fuzzy-set theory (Zadeh, 1965). In general, fsQCA is an analysis of set relationships. A set can be a group of elements or a group of values (Skarmeas et al., 2014). In a fuzzy-set analysis, both the outcome and the causal conditions are represented by using fuzzy sets (Ragin, 2009a).

Researchers apply QCA primarily in political science and sociology researchers (e.g., Amenta & Halfmann, 2000; Amenta, Carruthers, & Zylan, 1992; Blake & Adolino, 2001; Cress & Snow, 1996; Kiser, Drass, & Brustein, 1995; Redding & Viterna, 1999; Vis, 2011). Management scholars call for the application of this methodology (Fiss, 2011; Woodside, 2013a, 2014). Some researchers apply QCA in the fields of organization science (Fiss, 2007, 2011; Greckhamer, 2011; Greckhamer, Misangyi, Elms, & Lacey, 2008), marketing (Chang, Ting-Hsiang, & Woodside, 2013; Woodside, 2013b; Woodside & Zhang, 2012, 2013; Wu, Yeh, Huan, & Woodside, 2014), innovation (Cheng, Chang, & Li, 2013; Ganter & Hecker, 2014; Meuer, 2014; Ordanini, Parasuraman, & Rubera, 2014; Stanko & Olleros, 2013) and corporate social

Please cite this article as: Ren, S., et al., Case-based asymmetric modeling of firms with high versus low outcomes in implementing changes in direction, *Journal of Business Research* (2015), http://dx.doi.org/10.1016/j.jbusres.2015.05.007