Strategy, Operations, and Profitability: The Role of Resource Orchestration

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Abstract

Purpose – Developing and implementing strategies to maximize profitability is a fundamental challenge facing manufacturers. The complexity of orchestrating resources in practice has been overlooked in the operations field and it is now necessary to go beyond the direct effects of individual resources and uncover different resource configurations that maximize profitability.

Design/methodology/approach – Drawing on a sample of US manufacturing firms, multiple regression analysis (MRA) and fuzzy-set Qualitative Comparative Analysis (fsQCA) are performed to examine the effects of resource orchestration on firm profitability over time. By comparing the findings between analyses, the study represents a move away from examining the net effects of resource levers on performance alone.

Findings – The findings characterize the resource conditions for manufacturers' high performance, and also for absence of high performance. Pension and retirement expense is a core resource condition with R&D and SG&A as consistent peripheral conditions for profitability. Moreover, although workforce size was found to have a significant negative effect under MRA, this plays a role in manufacturers' performance as a peripheral resource condition under fsQCA.

Originality/value – Accounting for different resource deployment configurations, this study deepens knowledge of resource orchestration and presents findings that enable manufacturers to maximize profitability. An empirical contribution is offered by the introduction of a new method for examining manufacturing strategy configurations: fsQCA.

Keywords Resource orchestration, fsQCA, Performance, Manufacturing strategy, Configuration analysis, Operations.

Paper type Research paper

Introduction

Manufacturing strategy is defined as the "fit between market requirements and operations resources" (Mirzaei *et al*., 2016, p. 429) and emphasizes the role of operational resources to strengthen competitiveness (e.g., Bourne *et al*., 2003; Cagliano *et al*., 2005; Chatha and Butt, 2015; Lewis *et al*., 2010). To this end, the ability of managers to combine operational resources is highly pertinent to manufacturers (Mirzaei *et al*., 2016; Morrow *et al*., 2007). Resource orchestration theory seeks to explain how managers can effectively do this for performance gains. The complexity of orchestrating resources in practice has been overlooked in the operations field and it is now necessary to go beyond the direct effects of individual resources and uncover different resource configurations that maximize profitability.

Resource orchestration is defined as the combination of resources and managerial acumen to realize superior firm performance (Chadwick *et al*., 2015). The purpose of this study is to examine how operational resources that concern existing offerings and support "technical fitness" (e.g., sales and marketing, design, procurement, manufacturing, logistics and warehousing, human resources, administration and customer support) can be configured for profitability gains (Brennan *et al*., 2015; Raddats *et al*., 2017). Building on the work of Sirmon and Hitt (2009), this study focuses on resource investment (where the firm invests in resources) and resource deployment (how the firm configures resources) as the cornerstones of resource orchestration theory and represent a primary function of effective management. Investments are made to build resources and activities (Dierickx and Cool, 1989; Maritan, 2001). Dedicating funds to specific activities steers further resources such as people, expertise and know-how in anticipation of generating returns that exceed the opportunity cost of the original investment (Maritan, 2001). Deployment is a function of the configuration of those resources in a way that generates the superior return desired by the firm and its managers (Sirmon and Hitt, 2009), considering a breadth of resources across the firm (Sirmon *et al.*, 2011) and in ways that detect resource interconnections over and above individual effects (Hitt et al., 2016). Since any one firm among all firms with high profitability is unlikely to possess high levels across all resource orchestration activities (e.g., Woodside, 2013), two research questions are presented: (1) how do resource investments impact profitability? And, (2) what resource deployment configurations lead to high profitability?

To address these research questions, this study examines the direct effects of resource investments—acquisitions; cost of goods sold; employees; property, plant, and equipment; advertising expense; pension and retirement expense; R&D expense; and selling, general, and administrative expense (minus advertising and R&D expense)—on firm profitability using multiple regression analysis (hereafter MRA), before testing for ‘logical’ possible combinations of resource deployment actions using fuzzy set qualitative comparative analysis (hereafter fsQCA). Thiem *et al*. (2016) argue that regression-based methods and comparative configurational methods should not be seen as substitutes. Rather, both ought to be leveraged for their own strengths to create analytical insights into the problem at hand. By comparing findings across analyses, this study moves away from only examining the net effects of resource levers alone to account for different deployment configurations for profitability.

Three contributions are made. First, this study extends resource-based investigations of manufacturing strategy (e.g., Lewis *et al*., 2010; Ordanini and Rubera, 2008) by positioning managers’ orchestration of resources as central to competitive advantage, rather than merely resource possession in itself, contributing to a more accurate understanding of the role of internal consistency in manufacturing strategy for performance gains (e.g., Cagliano *et al*., 2005). Second, operations management research that has adopted a resource-based theory (RBT) lens typically examines resources as an aggregate dimension onto financial performance, raising contentions that by neglecting other resource characteristics, findings are misspecified and misleading (Longoni and Cagliano, 2016). This has led to a weak application of RBT in practice, which this study seeks to address by providing a practical application for manufacturers to maximize their resource orchestration efforts for profitability. This is achieved by identifying the actual resource orchestration configurations for both high profitability and its absence, providing clear guidance on the resource deployment configurations that manufacturers should pursue. Third, an empirical contribution is offered by responding to increasing interest in the combination of traditionally qualitative and quantitative methods (Hitt *et al*., 2016), such as QCA with more traditional statistical techniques like MRA (Thiem *et al*., 2016; Vis, 2012). Specifically, the study offers new evidence to support the role of configuration analysis in operations management research and establishes fsQCA as a new empirical approach to examine manufacturing strategy (c.f., Cagliano *et al*., 2005).

Next, the resource orchestration literature and its origins are reviewed. Thereafter, theoretical arguments are developed leading to the empirical model; the research methodology is then explained followed by the results from the MRA and fsQCA. The paper closes with a discussion of the research findings and the implications for manufacturers.

Resource orchestration theory

Operations strategy (i.e., the effective use of inputs and process to produce outputs that achieve business goals) and performance management (i.e., focus on results such as competitiveness and financial performance) are two central themes of operations management research and these are particularly aligned to RBT (Hitt *et al*., 2016). Advocates of RBT suggest that the origin of durable competitive advantage is found in the unique combinations of resources. Indeed, firm resources may generate competitive advantages even when combined with less valuable resources (Huesch, 2013). A common perception of RBT, then, is that complementarities among resources must be harnessed and that by exploiting these complementarities, performance gains can be achieved (Huesch, 2013). Since firms pursue different strategies in deploying resources and display unique combinations of resource engagement, resources are likely to be heterogeneously distributed across firms and this may explain performance differences among firms (Aral and Weill, 2007).

Much of the focus of RBT driven studies in the operations management literature, however, is on the possession of inimitable, unique, and valuable resources as a means to generate performance advantages. But this perspective has been criticized for having a limited impact on practice (Lewis *et al*., 2010) and fails to explicitly address the existence, role, and potential benefits of a strategic 'lever' by which resources enhance firm success (Kim, 2006). Rather, it is contended that central to resources generating competitive advantage is management's abilities to deploy these to determine competitive advantage (i.e., managerial resource orchestration as a strategic lever). So, while operational levers are necessary, they must be effectively synchronized to realize advantages (Bianchi *et al*., 2014; Holcomb *et al*., 2009). However, operations management literature and manufacturing strategy studies have typically neglected the effective synchronization of resources for performance gains (Mirzaei *et al*., 2016). For instance, between January 2007 and May 2013, approximately one of every 12 articles published in operations management drew on RBT, but only 9 of these focused on resource management and/or orchestration (Hitt *et al*., 2016). Consequently, there remains a limited ability to capture and interpret “internal links among the elements of manufacturing strategy” (Cagliano *et al*., 2005, p. 702).

This has, however, been advanced in the wider management literature with recent investigations into resource management or asset orchestration (Huesch, 2013; Morrow *et al*., 2007; Sirmon and Hitt, 2009), resource allocation (Aral and Weill, 2007), asset complementarity (Hess and Rothaermel, 2011), or taken collectively: resource orchestration theory, which argues that all levels of the firm must be actively involved in the investment and configuration of the organizational resource-base (Chadwick *et al*., 2015). Resource orchestration, then, is a theoretical extension of RBT by acknowledging the importance of managerial action. Resource orchestration is a firm-level activity comprising of the collective action of managers at all hierarchical levels, but with a focus on the managerial role (e.g., Chadwick *et al*., 2015; Holcomb *et al*., 2009). Resource orchestration theory, as a result, lends itself perfectly to the investigation of manufacturing strategy and its relationship to firm outcomes. For example, manufacturing strategy comprises coordinated managerial actions that direct “the formulation, reformulation and deployment of manufacturing resources” to provide a competitive advantage (Mirzaei *et al*., 2016, p. 431). This sequence reflects the two core dimensions of resource orchestration: investment and deployment. These dimensions represent the cornerstones of resource orchestration theory (Sirmon and Hitt, 2009). Investments are made to build resources and activities (Dierickx and Cool, 1989; Maritan, 2001) in which dedicating funds to specific activities commits additional organizational resources such as people, expertise and know-how in anticipation of generating returns that exceed the opportunity cost of the original investments (Maritan, 2001). Deployment is then the configuration of those resources that generates the superior return desired by the firm (Sirmon and Hitt, 2009).

While the value of resource configurations to produce outputs has been exclaimed by RBT theorists, the actual combination of resources and the number of configurations that might lead to success have rarely been reported (e.g., Bianchi *et al*., 2014). As commented by Holcomb *et al*. (2009), RBT has not fully explored the actions firms take to create and sustain advantages. In adjacent fields to operations management where evidence is available, findings remain ambiguous with both positive and negative effects of resource orchestration presented. For example, Chadwick *et al*. (2015) report that the impact of top managers' strategic emphasis on firm performance is realized through the strategic resources of commitment-based HR systems and CEO emphasis on strategic HRM; Sirmon and Hitt (2009) identify how low and high investment relative to rivals in physical capital and human capital negatively affects firm performance; Huesch (2013) finds no evidence of a joint impact of firm resources and resource deployment models on firm performance; while Morrow *et al*. (2007) suggest that developing new combinations of existing resources (including through acquisition) to introduce new products can raise the performance of failing firms.

Firms with specific resource bundles may improve performance through a range of additional factors such as strategy, engagement in strategic alliances (Hess and Rothaermel, 2011), new product development and licensing (Bianchi *et al*., 2014), and organizational competencies and practices (Aral and Weill, 2007). Typically in such studies, the effect of individual resources—under moderation, mediation, or interaction with additional constructs—is examined against a dependent variable such as performance. As outlined by Huesch (2013, p. 1305), the independent impacts of individual firm resources on firm performance is a cornerstone of the strategy field and "it is commonly assumed that their joint impacts are also positive or synergistic". However, just because one resource variable may be non-significant under an examination of direct effects, a resource can become more valuable when combined with others (Ordanini and Rubera, 2008). This highlights a need to move operations theory beyond an examination of ‘VRIN’ or ‘VRIO’ resources (as depicted in the resource-based view) and their direct effects alone (e.g., Chatha and Butt, 2015; Lewis *et al*., 2010; Ordanini and Rubera, 2008), toward resource orchestration and configurational analysis for a more accurate picture of the role of resources to emerge (Hitt *et al*., 2016).

Thus, there is a need to examine how resource orchestration can help manufacturers achieve performance returns, extending the investigation on *joint* impacts (Huesch, 2013; Lewis *et al*., 2010). In practice, there will likely be more than one combination of resource conditions that lead to high performance. Therefore, examining resource orchestration as configuration, rather than only thinking in terms of relative impacts of resource levers—a weakness of MRA—causal recipes that relate to high profitability can be uncovered. This will provide insight at the firm-level into the extent to which performance advantages depend on the ability of manufacturers to create value from their orchestration of organizational resources.

What resources should be orchestrated as part of a manufacturing strategy?

A narrow focus on purely manufacturing- or operations-related resources alone risks missing a sizeable system of effects relevant to a configuration of resources that drive firm profitability as a vital outcome of efficient and effective manufacturing strategy (Hitt *et al*., 2016). Some authors have considered this in terms of soft and hard operational levers (e.g., Hayes and Wheelwright, 1984). From a soft point of view, resources are focused on value for customers and concerns organizational resources from “sales and marketing, design, procurement, manufacturing, logistics and warehousing, human resources, administration and customer support to understand where this value is created, retained and lost by operations within a firm and up and down the value chain” (Brennan *et al*., 2015, p.1265). Resources relevant to a manufacturing strategy are, therefore, quite broad because they fuel competitiveness, such as the ability to price new offerings based on risk/reward (Cova and Salle, 2008), integrate products into customer systems (Brax and Jonsson, 2009), and develop new processes (Paiola *et al*., 2013) among others (e.g., Raddats *et al*., 2017). Hard levers relate specifically to equipment and plant. As a result, relevant resources include investments in acquisitions, the cost of goods, employees and their associated expenses (indicating an investment that values human resources); property, plant and equipment; advertising; R&D; and general selling and administrative expenses (which represents all commercial expenses of operation, such as expenses not directly related to product production incurred in the regular course of business relating to the securing of operating income). Given constraints originating from the manufacturing environment, these resources are operational levers available to all managers (e.g., Pontrandolfo, 1999). The subsequent pattern of choices made about resource investments and resource deployment is, then, dependent on managerial resource orchestration, which acts as a strategic lever (Kim, 2006). This can explain how the interaction of resources will vary and how the corresponding performance implications of different configurations may vary.

Empirical model

To examine the research questions this study draws on both MRA and fsQCA. Given that their underlying epistemologies differ (Thiem *et al*., 2016) the aim is not to develop and test specific research hypotheses, but to provide a complementary viewpoint on the research subject. Adopting a sequential approach to using the two approaches as recommended by Vis (2012) reflects the formulation, reformulation, and deployment of manufacturing resources in strategy (Mirzaei *et al*., 2016). By going beyond only determining significant relationships between resource investments and performance, the empirical model seeks to examine those operational resources that can be leveraged by managers in resource deployment to improve manufacturers' performance (cf. Rusjan, 2005). The empirical model is illustrated in Figure 1.

…Insert Figure 1 about here…

RQ1: How do resource investments impact profitability?

MRA is used to test if an independent variable, within a set of independent variables, has a positive or negative effect on a dependent variable, net of the other variables (Vis, 2012). First, then, the study examines whether or not objective data on acquisitions; the cost of goods sold; employees; property, plant and equipment; advertising expense; pension and retirement expense; R&D expense; and selling, general and administrative expense (minus advertising and R&D expense to prevent double-counting), relates to firm profitability. These resource investments are expected to have a positive direct effect on firm profitability. For instance, technological resources obtained through R&D are reported to lead to high-impact product innovation through greater flows of new knowledge, increasing the likelihood of generating products that are new to the market (Bianchi *et al*., 2014), and in turn profitability; Sirmon and Hitt (2009) illustrate how lower investment relative to rivals in physical capital (e.g., property, plant, and equipment) may result in older equipment and less effective information technology and ultimately poor performance. They also illustrate how higher investment relative to rivals can also undermine performance, which resonates with costs incurred (e.g., cost of goods sold and selling, general and administrative expense); Vomberg *et al*. (2014) demonstrate how firm size measured by the number of employees can result in inertia and damage performance; DeNisi and Smith (2014) relate bundles of human resource practices (e.g., pension and retirement expense) to firm-level performance; while Bianchi *et al*. (2014) uncover resource combinations of marketing and relational resources (included here as advertising) that generate competitive advantage. Moreover, Morrow *et al*. (2007) demonstrate how acquiring new resources through acquisitions can raise performance. This first element of analysis allows for an assessment of the average effect of the independent variables examined (Vis, 2012)—an approach consistent with existing operations management research that have sought to establish the relevance of resource levers.

RQ2: What resource deployment configurations lead to high profitability?

The second element of the empirical model involves adopting fsQCA to uncover the deployment configurations that shape firm profitability. Specifically, this configurational approach tests if a condition or combination of conditions is minimally necessary and/or sufficient for the outcome to be realized, uncovering patterns in the empirical data that otherwise would have remained hidden (Vis, 2012). The same eight resource investment variables are used in this analysis. Since configurations may be numerous, it is not specified in advance which configurations will be most strongly associated with high firm profitability. As noted by Vis (2012), fsQCA enables the possibility of addressing multiple causations when it is likely that there are several resource configurations leading to performance (i.e., resource orchestration recipes for performance).

fsQCA is applicable to qualitative and quantitative data and is used to investigate configurations of conditions or constructs, based on set theoretics, that have the potential to group together in complex ways (Ragin, 2008). Because theory development relies on treating sets of conditions simultaneously with no assumption as to whether one condition alone is solely sufficient and necessary for the outcome (Woodside, 2013), fsQCA can establish logical connections between combinations of causal conditions and an outcome in ways that MRA cannot achieve (Woodside, 2013) by identifying several combinations of otherwise independent variables (Fiss, 2011).

Methodology

Sample

From the COMPUSTAT database, data on the various resource investment variables and net income for 1559 US manufacturing firms (SIC 20-39; comprising of firms engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products) reported during the 2013 financial year is retrieved. Data on net income is also gathered for 2014 and 2015. For robustness, lagged performance effects from resource investments are examined as investments in production and business operations in manufacturing strategy (at time t) can take time to translate into performance gains, or have longitudinal effects. Variable definitions are provided in Table I along with descriptive statistics. The correlation matrix is presented in Table II. Note that all data is standardized for the purposes of data analysis.

…Insert Table I and Table II about here…

fsQCA research design

Since this study introduces a new convention in statistical analysis to investigate resource orchestration effects on profitability, it is necessary to explain in detail the fsQCA processes and procedures for transparency and to encourage the use of this method in the operations management literature.

fsQCA software QCApro 1.1-1 (Thiem, 2016) is used to empirically test and analyze the logic and causal linkages between the core concepts of resource orchestration. As Baumgartner and Thiem (2017) note, QCApro is considered superior to other QCA software as it is capable of returning the full model space of a solution, which is crucial for causal inferences. Rather than focusing on a conventional correlational analysis between variables, fsQCA using a set-theoretic approach allows the examination of the relationships from the perspective of set membership. The method requires "the construction of quantitative descriptions of the entities, the complex systems, it is comparing, albeit only in terms either of membership or non-membership of a set (crisp-set) or degree of membership of a set (fuzzy set)" (Byrne and Callaghan, 2013, pp. 186-7). For the purposes of this research, fsQCA allows the examination of resource deployment and financial performance of firms (i.e., the configuration of competitive advantage defined as a "constellation of interconnected elements") (Fiss *et al*., 2013, p. 1).

To begin the fsQCA analysis, the data is explored to highlight if there are any cases in the calibrated data that have a set membership score of 0.5 on any of the exogenous factors (i.e., independent variables). Following Fiss (2011), +0.0001 is added to the calibrated variables in order to prevent the deletion of cases with membership scores of 0.5 in the outcome. Next, following the QCApro method, the *parsimonious solution* type is used to understand causal inference because the *complex* and *intermediate solutions* are demonstrably incorrect procedures of causal inference (Baumgartner and Thiem, 2017). For clarity, (1) a c*omplex solution* is a solution without the use of counterfactual analysis of logical remainders; (2) a *parsimonious solution* is a solution where counterfactual analysis uses all simplifying assumptions; and, (3) an *intermediate solution* is a solution with counterfactual analysis of easy counterfactuals. The following recommended steps are adhered to in the fsQCA analysis (Thiem, 2016):

1. Transform exogenous and endogenous factors into fuzzy sets (calibrate function);
2. Reduce cases to remove missing cases (listwise);

3. Check for cases with a set membership score of 0.5 for exogenous factors.
4. Truth table algorithm function logically reduces truth table on the basis of counterfactual analysis for the outcome and the negation of the outcome.

These steps lead to performing the counterfactual analysis, which is possible due to the existence of limited diversity. Limited diversity results in logical remainders (i.e., logical combinations that have no empirical observations) and as such it is essential that counterfactual analysis is employed. In the final step of the analysis, the *parsimonious solution* is presented and has the advantage in identifying all alternative data fit models produced compared to the true causal model. To distinguish between the core and peripheral components of the configurations, the essential prime implicant in the parsimonious solution is viewed as representing the core conditions, and the non-essential prime implicants represent peripheral conditions (Thiem, 2014).

Outcome condition

The study's outcome condition 'high profitability firm performance' is based upon the net income ($m) reported by a company after subtracting expenses and losses from all revenues and gains (see Table I). To specify what constitutes high profitability, the top 50 US manufacturing firms' reported income for 2013-2015 is used as a proxy. Looking at the range of income among the top 50 firms for 2013, 4 firms (8%) exceeded $100,001(m) with 21 firms reporting income between $1,000-$4999(m) (42%), the remaining 25 (50%) firms were spread between $5,000-$100,000(m). Based on the remaining sample, $15,902(m) was the highest value and -$1,561(m) the lowest value for net income (loss). Firms considered to be "fully in" the set of high performing firms were those that reported a net income of $5,100(m) or more based on the top 50 income levels. The crossover point is defined as the midpoint of $0.61(m).

Repeating the use of this proxy measure for the 2014 top 50 US manufacturing firms' reported income, the range of income were as follows: 2 firms (4%) exceeded $100,001(m) with 22 firms reporting income between $1,000-$4999(m) (44%), the remaining 26 (52%) firms were spread between $5,000-$100,000(m). Based on the remaining sample, $18,676(m) was the highest value and -$4,493(m) the lowest value. Firms considered to be "fully in" the set of high performing firms were those that reported a net income of $6,100(m) or more based on the top 50 income levels. The crossover point is defined as the midpoint of $1,300(m).

Likewise, the 2015 top 50 US manufacturing firms' reported income data is used. The ranges were as follows: 1 firm (2%) exceeded $100,001(m) with 24 firms reporting income between $1,000-$4999(m) (48%), the remaining 25 (50%) firms were spread between $5,000-$100,000(m). Based on the remaining sample, $11,792(m) was the highest net income value and -$6,495(m) the lowest. Firms considered to be "fully in" the set of high performing firms were those that reported a net income of $4,430(m) or more based on the top 50 income levels. The crossover point is defined as the midpoint of $0.260(m).

Predictor conditions

The resource variables used in MRA become the predictor conditions (exogenous factors) in fsQCA analysis. The QCA approach examines "any and all combinations of configurations of these attributes, that commonly occur across those cases achieving superior or inferior performance" (Greckhamer *et al*., 2008, p. 698). QCA also includes consideration of the property space constituted by the cases and the theoretically relevant causal factors under examination

(Ragin, 2000), exploring the distribution of cases across this space and systematically identifying causal conditions deemed sufficient for the outcome condition to occur.

Cases in fsQCA are assigned degrees of membership in fuzzy sets representing outcomes and causal conditions through a process of calibration (Ragin, 2000; 2008). The calibration process links cases to the theoretical concepts by infusing sets with thresholds of membership based on empirical and theoretical knowledge; thus not rescaling the quantitative variables from the MRA. This study is limited to examine the outcome of high profitability firm performance; however, QCA does not assume linearity and is thus asymmetric (Ragin, 2008) as causes for low profitability firm performance are not assumed to be the inverse of high profitability.

The fuzzy sets are calibrated by applying a logistic calibration function to each of the predictor conditions (Thiem, 2014): acquisitions; cost of goods sold; number of employees; property, plant and equipment; advertising expenses; pension and retirement expense; R&D expense; and SG&A expense. Here, three qualitative breakpoints are specified that structure each condition based on theoretical and empirical knowledge: knowledge-informed levels of investment leading to the breakpoints for full membership (1), full non-membership (0), and the cross-over point of membership (0.5), the original interval-scale variables are then transformed to fuzzy membership scores (i.e., degrees of set membership).

Results

MRA

Multiple linear regression analysis results are presented in Table III.

…Insert Table III about here…

Analysis for 2013 reveals that the regression model is significant (F = 135.91; $p \leq 0.01$) and the independent variables explain 79% of the variance in the dependent variable (Adjusted R^2). Examination of the results show that while resource investments in acquisitions (β = -0.04) and property, plant, and equipment (β = -0.09) have no significant relationship with net income, investments in cost of goods (β = 0.09; $p \leq 0.05$), advertising (β = 0.24; $p \leq 0.01$), pension and retirement (β = 0.31; $p \leq 0.01$), R&D (β = 0.24; $p \leq 0.01$), and selling, general and administration (β = 0.57; $p \leq 0.01$) all have significant positive direct effects on net income. Investments in workforce size (β = -0.31; $p \leq 0.01$), however, show significant negative effects on profitability.

Lagged performance effects from resource investments are examined at two time points: 2014 (t+1) and 2015 (t+2). Analysis of the results for one year lagged performance (2014) shows that the regression model is significant (F = 99.88; $p \leq 0.01$) with a corresponding Adjusted R^2 value of 0.73. Results for two years lagged performance (2015) also shows that the regression model is significant (F = 65.91; $p \leq 0.01$) with a corresponding Adjusted R^2 value of 0.64). Both Adjusted R^2 values imply there is a lagged effect from resource investments. Examination of the regression models for both time points reveals there are consistent positive effects on performance from resource investments in cost of goods, R&D, and SG&A. It appears that investments in the employee-base do reduce net income in the short-to-medium term (across 2013 and 2014) but this effect dissipates by time t+2 (*n.s.*). Investments in advertising activities at time t translate into performance gains in the immediate term (t = 3.78; p ≤ .01) but this does not hold for time t+1 or t+2. The same is true for other human investments in pension and retirement. Investments in plant, property, and equipment show significant effects only at time t+2 (t = -2.76; $p \leq .01$). Acquisition investments do not have any significant effect at any time point.

fsQCA

The deployment configuration(s) associated with high profitability and configuration(s) associated with the absence of high profitability are now examined. For the results of the fuzzy set analysis, large black circles ("●") indicate the presence of a core resource condition, while small black circles ("•") indicate the presence of a peripheral resource condition. Small empty squares ("▫") indicate the absence of peripheral resource conditions. Blank spaces in a configuration indicate situations in which the causal condition can be either present or absent.

The configuration of high profitability firm performance: Table IV shows the results of the fuzzy set analysis of high profitability firm performance for 2013. The solution coverage is 77% and the consistency of the solution is 76%. Table V shows the results of the fuzzy set analysis of high profitability firm performance for 2014. The solution coverage is 70% and the consistency of the solution is 83%. All are above acceptable levels.

…Insert Table IV and Table V about here…

For 2013, the 77% solution coverage indicates that a high degree of high profitability firm performance is captured within four data fit models. The overall solution coverage is significantly higher than the sum of unique coverage, demonstrating an overlap in configurations. This also becomes apparent from the fact that the raw coverage is much greater for all configurations than the unique coverage. The first configuration is the true causal model (Thiem, 2014) whilst the other three models provide alternatives to it. Configuration 1 has a raw coverage of 45% of high profitability firm performance and a unique coverage of 2%. Configuration 2 has a higher level of raw coverage at 56% of high profitability with lower consistency 74% and a lower unique coverage of 1% with models 3 and 4 reducing across all levels. The role of pension and retirement expense as the essential prime implicant provides understanding into high profitability configurations for firms, while the non-essential prime implicant roles of employee levels, R&D investment, and SG&A expense can be observed across 2013 and 2014 also.

For 2014, it is observed that the overall solution coverage for 2014 is slightly lower at 70% yet, the consistency of it rises to 83% (see Table V). For 2014, configuration 3 is the true causal model, again with pension and retirement expense as essential prime implicant and non-essential implicants of acquisitions and selling, general, and administrative expense (94% consistency, 35% raw coverage, 2% unique coverage). The analysis for 2015 reveals no essential prime implicant to explain high profitability despite allowing for different explanations to emerge across 30 models; hence, there are no findings to present for the configuration of high profitability firm performance in 2015. In conclusion, no dominant configuration arises to explain superior profitability and this implies no lagged effect of resource orchestrations at time t into time t+2.

The absence of the outcome, high profitability firm performance: One of the strengths of fsQCA is casual asymmetry (Ragin, 2008) offering the ability to examine the configurations that lead to the absence of the outcome. Simply put, the inverse of the outcome may proffer different configurations of the resource conditions that led to the presence of the outcome. Hence, the absence of high profitability (2013-2015) is explored. The analysis for 2013 produced two configurations, the first and true causal model (99% coverage/97.4% consistency), suggests that lower profitability occurs when employee levels fall (i.e., attrition of knowledge from the company), with subsequent low investment in pension and retirement expense again featuring as the essential prime implicant, which would equate to a loss of staff expertise to acquire new contracts. In the second configuration pension and retirement expense remains the prime implicant with a lack of plant, property, and equipment investment and suggests that manufacturing firms will experience lower profitability (99.5% coverage/95.9% consistency).

For 2014, eight configurations are found to explain the absence of high profitability firm performance. Here, the prime implicant shifts to the absence of R&D investment with the true causal model emerging as the lack of employee levels, lack of associated pension and retirement expense, lack of acquisitions and SG&A investments (99.5% coverage/95.2% consistency). This suggests that neglecting to invest in R&D projects for firms will accelerate lower profitability and produces a cascade effect on reduced ability to hire skilled staff, less investment in making acquisitions, and reduced selling. This creates the conditions for lower profits. For 2015, despite the 30 models produced when the outcome was present, in the absence of the outcome the only factor found to influence lower profitability for this year is pension and retirement expense.

Comparison with MRA results: These findings shed new light on the MRA results. For 2013 the regression and QCA results are largely consistent, but for the reported negative effect of workforce size under MRA that is, conversely, positive under fsQCA. For 2014, comparison of the results for high profitability and the absence of high profitability with the MRA results also show consistency in the resource investments needed for high performance/avoid absence of high performance; again, apart from the role of workforce size. Specifically, lagged effects seem to be occurring but acquisitions seem to play a bigger role in the configurations than the regression results imply. No effects are found from acquisitions under regression, but there appears to be lagged effects when evaluating against the *high profitability firm performance* configurations and the *absence* configurations. No ideal configurations of resource investments appear to exist for 2015 but the MRA results do suggest some positive lagged impacts from investments in R&D and selling activities and negative effects from operational investments in property, plant, and equipment. In essence, performance here is not due to lagged effects from time t, thus, the top performers do not rely on past (two years removed) resource orchestrations to drive profitability (i.e., they reconfigure their resource deployment over time).

Discussion

Contributions to theory

The manufacturing strategy literature lacks accurate insight on which resources should be developed to accomplish specific purposes; hence, how resources can be orchestrated for profitability gains remains unclear (Brennan *et al*., 2015; Hitt *et al*., 2016; Ordanini and Rubera, 2008; Raddats *et al*., 2017). Based on the regression results, R&D and sales-based expenses (cost of goods, SG&A) enhance profitability across all time periods. Moreover, while increasing the employee-base lowers short-term profitability, this effect is non-significant in later time periods suggesting the potential for longer term payoffs arising from investment in skills and knowledge.

From the findings across the configurations uncovered in the data, it is observed that investment in pension and retirement is a core resource condition for high profitability among manufacturers. Implying that substantial long-term investment in the employee-base of the firm has long term performance implications. R&D investments also appear to be a consistent (but peripheral) condition for success in the configurations identified. In addition, these resources were found to have a significant positive effect on the outcome in MRA, particularly in time t. The configurations show that selling-based (SG&A) expense (the commercial expenses of operation) is a consistent but non-essential resource condition for high profitability across configurations (supporting regression-based conclusions). While advertising is consistently a non-factor across all configurations, it does have some initial short-term impact under regression at time t on profitability. A possible explanation is that maintaining brand awareness impacts profitability initially, while SG&A extends the selling activities of the firm and its impact is more lasting.

While the resource conditions found to have a positive impact on high profitability feature under MRA (R&D, SG&A), the configurations for 2013 and 2014 imply that pension and retirement expense plays a different role in that it becomes a core resource condition in the configurations. Meanwhile, regression variables such as investing in sales and product quality through the cost of goods expense is a long-term resource condition for performance, but this does not hold under configuration analysis when the actual bundling of resources for success is considered. Also, while the number of reported employees was found to have a significant negative effect in MRA at time t and t+1, in contrast, it is a peripheral resource condition across configurations for both high profitability (workforce size at higher levels) and in the absence of high profitability (workforce size at lower levels); the different observations from fsQCA may be explained in terms of the presence of skilled employees offsetting the negative effects reported under MRA. As such, workforce size plays a role in manufacturers' success as part of an orchestration recipe with other resource conditions.

Consistent with the literature in operations management, the configurations identified through fsQCA are equifinal in the sense that they represent equally plausible pathways to high profitability as a measure of firm performance. However, while equally plausible and equifinal in that respect, their contributions to firm performance do differ, with configuration 1 being the most impactful for 2013 (time t) and configuration 3 the least (as indicated by the decreasing magnitudes of the 'raw coverage' values across the three configurations in Table IV). They are further equifinal in the sense that pension and retirement expense is a consistent core condition and R&D and SG&A are consistent peripheral conditions across the other 2013 configurations, but are distinguished by configuration 1 having an additional focus on workforce size. Reflecting on time t+1 (2014, Table V), the configurations are equifinal with pension and retirement expenses representing core resource conditions in all configurations, while SG&A and acquisitions are more important in the true causal model (configuration 3, due to its unique coverage and consistency) than in other configurations. From a theory standpoint, the presence of configurations confirms the notion that resource orchestration recipes can drive profitability. This supports the view that manufacturing strategy is a pattern of manufacturing choices (Miller and Roth, 1994), but extends this thinking by addressing the failure of manufacturing studies particularly to apply RBT as a theoretical framework capable of explaining the relationship between resources and performance (Ordanini and Rubera 2008; Mills *et al*., 2003). Recent notable applications are shedding light on the role of resources (e.g., Chatha and Butt, 2015; Lewis *et al*., 2010; Mirzaei *et al*., 2016). However, building on the findings presented, the argument is made for the application of resource orchestration theory rather than the traditional lenses of RBT (e.g., resource-based view) in studies of manufacturing strategy, as this more accurately captures the formulation, reformulation, and deployment of manufacturing resources for competitive advantage (Mirzaei *et al*., 2016)..

To elaborate, despite being found to be critical to high profitability, managers' resource orchestration efforts have largely been neglected in the operations management literature, which has typically favored the examination of individual resource levers and their effects on performance (Longoni and Cagliano, 2016; Rusjin, 2005). This focus on specific direct relationships to the neglect of resource configurations has been highlighted as a concern in the operations management literature (Kathuria, 2000). Although rare, there are some notable investigations of the concept of the interrelation between resources both in corporate and supply chain capabilities (Kim, 2006) and in manufacturing strategy taxonomies (Kathuria, 2000; Miller and Roth, 1994), however. Nevertheless, with current RBT perspectives in operations research concerned with resource scarcity (Brennan *et al*., 2015), there is a lack of consideration of how 'lower-order' resources–that might not hold any performance effect independently–can be deployed as part of a resource set for performance gains; and this is why there is a need to focus on managers' resource orchestration as a strategic lever (e.g., Kim, 2006), rather than merely manufacturers' resource possession.

It is the specific role of managers in resource orchestration, then, that laterally connects investment and deployment of operations resources and this points to how their traditional detachment may be reconciled (Mirzaei *et al*., 2016). While research interest in the theme of manufacturing strategy is declining in the operations management community (Chatha and Butt, 2015), based on this study there is a clear need for a resurgence of research in this area to specifically explore and expand on the important role of resource orchestration for manufacturers performance.

In turn, this goes beyond a focus on assessing the direct effects of 'VRIN' or 'VRIO' resource levers, which has been heavily criticized as tautological (Lewis *et al*., 2010; Ordanini and Rubera, 2008). Rather, a firm may recombine their resource bundle to generate adjusted configurations of resources, comprising different degrees of emphasis and/or balance between individual resource levers, to accrue greater performance returns (Morrow *et al*., 2007). Thus, through orchestrating new combinations of existing resources in strategy, manufacturers and specifically their operations managers can enhance profitability. This is a distinct move away from the application of both classic and extended RBT to operations that has been described as unresponsive to management action (Lewis *et al*., 2010) and illustrates how managerial orchestration of resources is a strategic lever for performance gains.

Empirical contribution

Adopting configurational analysis through fsQCA provides finer grained insights into the role of individual resource levers as part of a bundle or configuration in resource deployment. Specifically, MRA alone would lead us to conclude that SG&A expense will positively affect profitability over time, yet when part of a bundle of deployable resources this carries less central relevance for profitability. By combining a traditionally qualitative data analysis method with statistical regression analysis, as recommended by Hitt et al. (2016) and Thiem et al. (2016), a clearer picture is offered as to the role and value of resource orchestration for manufacturing strategy. Thus, this study is better positioned relative to existing studies to establish not only the importance of resource orchestration for performance, but also the form that manufacturing strategy should take for high profitability (i.e., what resource investment and deployment should actually look like) and what manufacturing strategy should *not* look like (i.e., in the absence of profitability).

Managerial implications

With the growing impact of resource sustainability on production operations there is a need for operations managers to reconfigure how resources are used (e.g., Koh *et al*., 2016). The findings make a step in this direction by characterizing the resource conditions for manufacturers' high performance, and also for absence of high performance. This extends recent investigation into the value of RBT for practice (Lewis *et al*., 2010) by offering a more practical application of resource theory for manufacturing strategy. Specifically, Longoni and Cagliano (2016, p. 1721) correctly contend that “a firm may have resources that have the potential for generating competitive advantages but not fully realize this potential through its businesses activities”, which they cite as a fatal flaw of existing operations management studies. Indeed, the majority of research investigation has only been concerned with the direct effect of individual resource levers. This has impeded the relevance of RBT for manufacturing strategy by neglecting the multiple and diverse resource characteristics of the firm that operate in combination.

The first practical implication for manufacturers is that while there is no single dominant configuration for time t that leads to high profitability, in the true causal model (configuration 1) the combination of pension and retirement expense, R&D investments, and workforce size plays a role in manufacturers’ success. To note here, had implications for managers solely relied on the findings derived from MRA, manufacturers would be cautioned about the negative effect of workforce size but this would be inaccurate–again emphasizing the importance of understanding recipes for high performance through using fsQCA. For time t+1, the essential prime implicant of pension and retirement expense with non-essential implicants of acquisitions and SG&A expense (true causal model, configuration 3) also differ somewhat from the regression-based findings. As such, managers should not consider resources in isolation but how they can be deployed for success.

Second, just as manufacturers need to be informed about the necessary resource deployment configurations that lead to high performance, it is equally important that they are informed about the resource conditions that will damage their performance, which again is lacking in the practical application of RBT. Two configurations for time t (2013) that would lead to lower profitability are identified and can be characterized by: (1) falling employee levels (i.e., attrition of knowledge from the company), with subsequent low investment in pension and retirement expense, which would equate to, for instance, loss of expertise from staff to acquire new contracts; (2) a lack of plant, property and equipment investment coupled with pension and retirement expense. For time t+1 (2014), the absence of R&D investment and a lack of associated pension and retirement, acquisition, and SG&A investments are associated with absence of high profitability. Manufacturers should modify their resource orchestration activities accordingly to avoid failure and reconfigure their resource investment and deployment for higher profitability.

Future Research

This study evidences different resource deployment configurations that enable manufacturers to maximize their performance potential. In doing so, this study deepens knowledge of resource orchestration and offers an empirical contribution through the introduction of a new method for examining manufacturing strategy configurations: fsQCA. This overcomes the weakness inherent in traditional regression-based models. Such models test for the effects of individual dimensions, omitting their concurrent (ir)relevance. However, in future, scholars may look to consider resource deployment across different stages of firm maturity (the lifecycle of the firm) but do so with great care to account for instances in which firms have multiple products and projects of varying levels of growth, maturity or decline (see e.g. Sirmon et al., 2011). Initial studies should begin with simple firm structures so that lifecycle effects can be captured cleanly.

Conclusion

The aim of this paper was to generate new insights into effective ‘recipes’ of resource orchestration for high profitability. Rather than viewing resource levers as linear, producing an independent effect on profitability irrespective of the manufacturer and their resource deployment (e.g., through MRA), this study allows for understanding more complex causation. The manufacturing strategy literature has reported limited evidence of the role of RBT for profitability because of an emphasis on direct effects in existing studies; in contrast, this study has taken steps to explore the role of resource orchestration recipes that lead to profitability.

Examining the set membership of high profitability using configurational logic reveals different resource deployment configurations that maximize performance over time, as compared to only capturing the individual linear effects of resource investments under MRA. Pension and retirement expense is a core resource condition with R&D, SG&A, and workforce size consistent peripheral resource conditions for profitability. Future research should broaden the use of fsQCA in manufacturing strategy research to gain further insight into the contextual and configurational roles that resource orchestration plays in achieving performance goals.

References

Aral, S. and Weill, P. (2007), “IT assets, organizational capabilities, and firm performance: How resource allocations and organizational differences explain performance variation”, *Organization Science*, Vol. 18 No. 5, pp. 763-780.

Baumgartner, M. and Thiem, A. (2017, in print), "Often trusted but never (properly) tested: Evaluating Qualitative Comparative Analysis." *Sociological Methods & Research*, forthcoming. DOI: 10.1177/0049124117701487.

Bianchi, M., Frattini, F., Lejarraga, J. and Di Minin, A. (2014), “Technology exploitation paths: Combining technological and complementary resources in new product development and licensing”, *Journal of Product Innovation Management*, Vol. 31 S1, pp. 146-169.

Bourne, M., Mills, J. and Faull, N. (2003), “Operations strategy and performance: A resource-based perspective”, *International Journal of Operations and Production Management*, Vol. 23 No. 9, pp. 944-946.

Brax, S. and Jonsson, K. (2009), “Developing integrated solution offerings for remote diagnostics. A comparative case study of two manufacturers”, *International Journal of Operations and Production Management*, Vol. 29 No. 5, pp. 539-560.

Brennan, L., Ferdows, K., Godsell, J., Golini, R., Keegan, R., Kinkel, S., Srai, J.S. and Taylor, M. (2015), “Manufacturing in the world: Where next?”, *International Journal of Operations and Production Management*, Vol. 35 No. 9, pp. 1253-1274.

Byrne, D.S. and Callaghan, G. (2013), *Complexity Theory and the Social Sciences: The State of the Art*, Routledge, London.

Cagliano, R., Acur, N. and Boer, H. (2005), “Patterns of change in manufacturing strategy configurations”, *International Journal of Operations and Production Management*, Vol. 25 No. 7, pp. 701-718.

Chadwick, C., Super, J.F. and Kwon, K. (2015), “Resource orchestration in practice: CEO emphasis on SHRM, commitment-based HR systems, and firm performance”, *Strategic Management Journal*, Vol. 36 No. 3, pp. 360-376.

Chatha, K.A. and Butt, I. (2015), “Themes of study in manufacturing strategy literature”, *International Journal of Operations and Production Management*, Vol. 35 No. 4, pp. 604-698.

Cova, B. and Salle, R. (2008), “Marketing solutions in accordance with the SD logic: Co-creating value with customer network actors”, *Industrial Marketing Management*, Vol. 37 No. 3, pp. 270-277.

DeNisi, A. and Smith, C.E. (2014), “Performance appraisal, performance management, and firm-level performance: A review, a proposed model, and new directions for future research”, *The Academy of Management Annals*, Vol. 8 No. 1, pp. 127-179.

Dierickx, I. and Cool, K. (1989), “Asset stock accumulation and sustainability of competitive advantage”, *Management Science*, Vol. 35 No. 12, pp. 1504–1511.

Fiss, P.C. (2011), “Building better causal theories: A fuzzy set approach to typologies in organization research”, *Academy of Management Journal*, Vol. 54 No. 2, pp. 393-420.

Fiss, P.C., Cambre, B. and Marx, A. (2013), *Configurational Theory and Methods in Organizational Research*, Emerald Group Publishing Limited, Bingley.

Greckhamer, T., Misangyi, V.F., Elms, H. and Lacey, R. (2008), “Using qualitative comparative analysis in strategic management research an examination of combinations of industry, corporate, and business-unit effects”, *Organizational Research Methods*, Vol. 11 No. 4, pp. 695-726.

Hayes, R.H. and Wheelwright, S.C. (1984), *Restoring our Competitive Edge: Competing through Manufacturing*, Wiley, New York, NY.

Hess, A.M. and Rothaermel, F.T. (2011), “When are assets complementary? Star scientists, strategic alliances, and innovation in the pharmaceutical industry”, *Strategic Management Journal*, Vol. 32 No. 8, pp. 895-909.

Hitt, M.A., Xu, K. and Carnes, C.M. (2016), “Resource based theory in operations management research”, *Journal of Operations Management*, Vol. 41 January, pp. 77-94.

Holcomb, T.R., Holmes, R.M. and Connelly, B.L. (2009), “Making the most of what you have: Managerial ability as a source of resource value creation”, *Strategic Management Journal*, Vol. 30 No. 5, pp. 457-485.

Huesch, M.D. (2013), “Are there always synergies between productive resources and resource deployment capabilities?”, *Strategic Management Journal*, Vol. 34 No. 11, pp. 1288-1313.

Kathuria, R. (2000), “Competitive priorities and managerial performance: a taxonomy of small manufacturers”, *Journal of Operations Management*, Vol. 18 No. 11, pp. 627-641.

Kim, S.W. (2006). The effect of supply chain integration on the alignment between corporate competitive capability and supply chain operational capability. *International Journal of Operations & Production Management*, Vol. 26 No. 10, pp. 1084-1107.

Koh, S.C.L., Morris, J., Ebrahimi, S.M., and Obayi, R. (2016), “Integrated resource efficiency: Measurement and management”, *International Journal of Operations and Production Management*, Vol. 36 No. 11, pp. 1576-1600.

Lewis, M., Brandon-Jones, A., Slack, N. and Howard, M. (2010), “Competing through operations and supply: The role of classic and extended resource-based advantage”, *International Journal of Operations and Production Management*, Vol. 30 No. 10, pp. 1032-1058.

Longoni, A. and Cagliano, R. (2016), “Human resource and customer benefits through sustainable operations”, *International Journal of Operations and Production Management*, Vol. 36 No. 12, pp. 1719-1740.

Maritan, C.A. (2001), “Capital investment as investing in organizational capabilities: An empirically grounded process model”, *Academy of Management Journal*, Vol. 44 No. 3, pp. 513–531.

Mills, J., Platts, K. and Bourne, M. (2003), "Applying resource-based theory", *International Journal of Operations and Production Management*, Vol. 23 No. 2, pp. 148-166.

Miller, J.G. and Roth, A.V. (1994), "A taxonomy of manufacturing strategies", *Management Science*, Vol. 40 No. 3, pp. 285-304.

Mirzaei, N.E., Fredriksson, A. and Winroth, M. (2016), "Strategic consensus on manufacturing strategy content", *International Journal of Operations and Production Management,* Vol. 36 No. 4, pp. 429-466.

Morrow, J.L., Sirmon, D.G., Hitt, M.A. and Holcomb, T.R. (2007), "Creating value in the face of declining performance: Firm strategies and organizational recovery", *Strategic Management Journal*, Vol. 28 No. 3, pp. 271-283.

Ordanini, A. and Rubera, G. (2008), "Strategic capabilities and internet resources in procurement", *International Journal of Operations and Production Management,* Vol. 28 No. 1, pp. 27-52.

Paiola, M., Saccani, N., Perona, M. and Gebauer, H. (2013), "Moving from products to solutions: Strategic approaches for developing capabilities", *European Management Journal*, Vol. 31 No. 4, pp. 390-409.

Pontrandolfo, P. (1999), "Global manufacturing: a review and a framework for planning in a global corporation", *International Journal of Production Research*, Vol. 37 No. 1, pp. 1-19.

Raddats, C., Zolkiewski, J., Story, V.M., Burton, J., Baines, T. and Bigdeli, A.Z. (2017), "Interactively developed capabilities: Evidence from dyadic servitization relationships", *International Journal of Operations and Production Management*, Vol. 37 No. 3, pp. 382-400.

Ragin, C.C. (2000), *Fuzzy-Set Social Science*, University of Chicago Press, Chicago.

Ragin, C.C. (2008), *Redesigning Social Inquiry: Fuzzy Sets and Beyond*, University of Chicago Press, Chicago, IL.

Rusjan, B. (2005), “Model for manufacturing strategic decision making”, *International Journal of Operations & Production Management*, Vol. 25 No.8, pp. 740-761

Sirmon, D.G. and Hitt, M.A. (2009), “Contingencies within dynamic managerial capabilities: Interdependent effects of resource investment and deployment on firm performance”, *Strategic Management Journal*, Vol. 30 No. 13, pp. 1375-1394.

Sirmon, D.G., Hittm M.A., Ireland, R.D. and Gilbert, B.A. (2011), “Resource orchestration to create competitive advantage: Breadth, depth, and life cycle effects”, *Journal of Management*, Vol. 37 No. 5, pp. 1390-1412.

Thiem, A. (2014), “Membership function sensitivity of descriptive statistics in fuzzy-set relations”, *International Journal of Social Research Methodology*, Vol. 17 No. 6, pp. 625-642.

Thiem, A. (2016), *QCApro: Professional Functionality for Performing and Evaluating Qualitative Comparative Analysis. R Package Version 1.1-1*. Retrieved March 23, 2017. (http://www.alrik-thiem.net/software/).

Thiem, A., Baumgartner, M. and Bol, D. (2016), “Still lost in translation! A correction of three misunderstandings between configurational comparativists and regressional analysts”, *Comparative Political Studies*, Vol. 49 No. 6, pp. 742-774.

Vis, B. (2012), “The comparative advantages of fsQCA and regression analysis for moderately large-N analyses”, *Sociological Methods and Research*, Vol. 41 No. 1, pp. 168-198.

Vomberg, A., Homburg, C. and Bornemann, T. (2014), “Talented people and strong brands: The contribution of human capital and brand equity to firm value”, *Strategic Management Journal*, Vol. 36 No. 13, pp. 2122-2131.

Woodside, A.G. (2013), “Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory”, *Journal of Business Research*, Vol. 66 No. 4, pp. 463-472.

Figure 1 Resource investment effects (MRA) and deployment configurations (fsQCA)

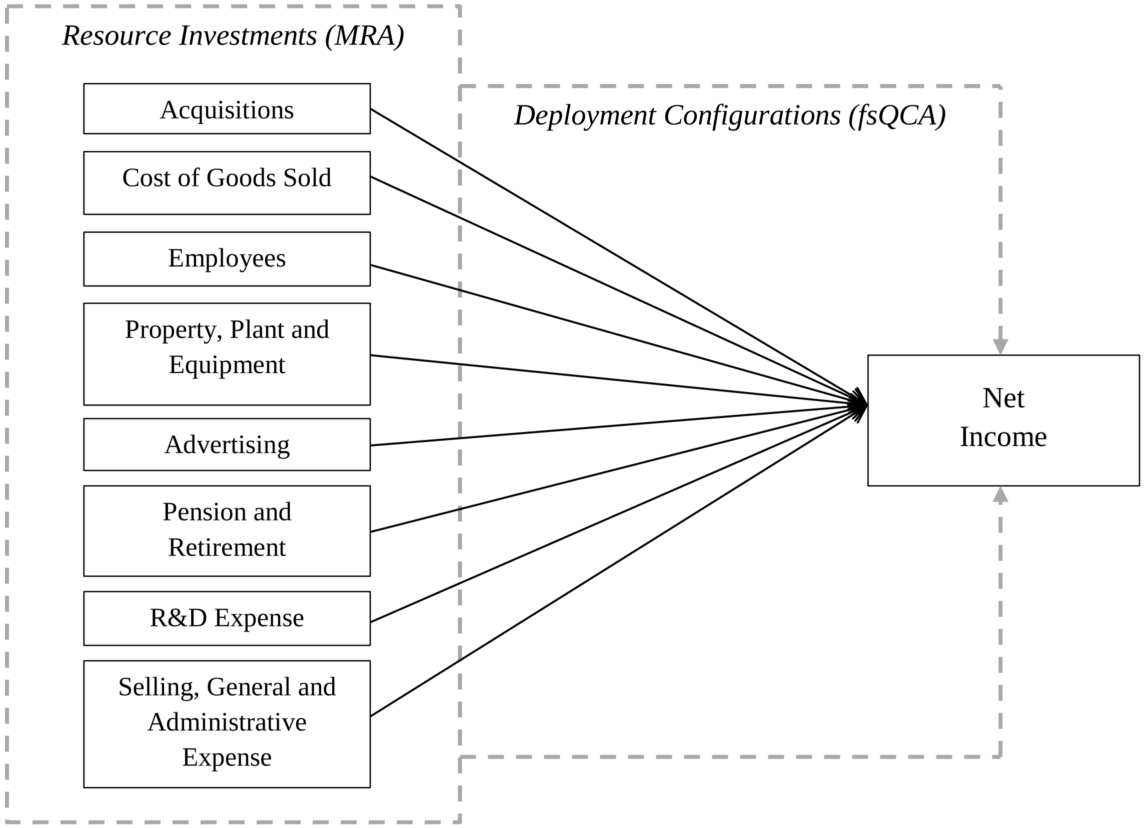

Table I. Measures, data sources, and descriptive statistics

Measure	Operationalization	Mean	SD
Acquisitions ($m)	Cash outflow or funds used for, and/or costs relating to, acquisition of a company in the current year or effects of an acquisition in a prior year carried over to the current year.	83.68	619.91
Cost of Goods Sold ($m)	All expenses directly allocated by the company to production, such as material, labor, and overhead.	4426.32	24695.09
Employees (000s)	The number of company workers as reported to shareholders.	11.39	37.74
Property, Plant and Equipment (gross) ($m)	The cost of fixed property of a company used in the production of revenue before adjustments for accumulated depreciation, depletion, and amortization.	4806.31	28626.65
Advertising Expenses ($m)	The cost of advertising media (radio, television, newspapers, periodicals) and promotional expenses.	172.38	835.74
Pension and Retirement Expense ($m)	The pension and retirement expense of the company and its consolidated subsidiaries included as an expense in the Income Statement.	76.64	340.44
R&D Expense ($m)	All costs that relate to the development of new products or services. The amount reflects the company's contribution to research and development	213.67	945.57
Selling, general, administrative (SG&A) expense (minus Advertising and R&D Expense) ($m)	All commercial expenses of operation (such as, expenses not directly related to product production) incurred in the regular course of business pertaining to the securing of operating income.	588.85	2272.70
Net Income (2013) ($m)	The fiscal period income or loss reported by a company after subtracting expenses and losses from all revenues and gains.	440.90	2158.73
Net Income (2014) ($m)	As above.	368.32	1721.55
Net Income (2015) ($m)	As above.	281.38	1511.71

Table II. Correlation matrix

		X1.	X2.	X3.	X4.	X5.	X6.	X7.	X8.	X9.	X10.	X11.
X1.	Acquisitions	—										
X2.	Cost of Goods Sold	.08**	—									
X3.	Employees	.25**	.62**	—								
X4.	Property, Plant and Equipment (gross)	.12**	.86**	.63**	—							
X5.	Advertising Expenses	.29**	.47**	.66**	.53**	—						
X6.	Pension and Retirement Expense	.09**	.71**	.72**	.70**	.71**	—					
X7.	R&D Expense	.15**	.31**	.60**	.31**	.47**	.60**	—				
X8.	SG&A expense (minus Advertising and R&D Expense)	.24**	.54**	.74**	.55**	.55**	.68**	.66**	—			
X9.	Net Income (2013)	.28**	.70**	.65**	.83**	.60**	.71**	.52**	.68**	—		
X10.	Net Income (2014)	.21**	.62**	.59**	.64**	.58**	.68**	.60**	.70**	.81**	—	
X11.	Net Income (2015)	.29**	.29**	.47**	.29**	.52**	.44**	.61**	.52**	.61**	.76**	—

Notes: ** $p \leq 0.01$.

Table III. Regression results

Independent Variable		**Dependent Variable**	**Standardized Coefficients**	***t*-value**
Acquisitions	→	Net Income (2013)	-.04	-1.49
Cost of Goods Sold	→	Net Income (2013)	.09	2.01*
Employees	→	Net Income (2013)	-.31	-4.92**
Property, Plant and Equipment (gross)	→	Net Income (2013)	-.09	-1.66
Advertising Expenses	→	Net Income (2013)	.24	3.73**
Pension and Retirement Expense	→	Net Income (2013)	.31	5.55**
R&D Expense	→	Net Income (2013)	.24	3.83**
SG&A expense (minus Advertising and R&D Expense)	→	Net Income (2013)	.57	12.40**
Acquisitions	→	Net Income (2014)	.03	1.00
Cost of Goods Sold	→	Net Income (2014)	.17	3.56**
Employees	→	Net Income (2014)	-.23	-3.33**
Property, Plant and Equipment (gross)	→	Net Income (2014)	-.08	-1.34
Advertising Expenses	→	Net Income (2014)	-.11	-1.49
Pension and Retirement Expense	→	Net Income (2014)	.10	1.56
R&D Expense	→	Net Income (2014)	.62	8.77**
SG&A expense (minus Advertising and R&D Expense)	→	Net Income (2014)	.49	9.59**
Acquisitions	→	Net Income (2015)	.00	-.01
Cost of Goods Sold	→	Net Income (2015)	.25	4.42**
Employees	→	Net Income (2015)	.02	.22
Property, Plant and Equipment (gross)	→	Net Income (2015)	-.20	-2.76**
Advertising Expenses	→	Net Income (2015)	-.09	-1.02
Pension and Retirement Expense	→	Net Income (2015)	.05	.68
R&D Expense	→	Net Income (2015)	.63	7.71**
SG&A expense (minus Advertising and R&D Expense)	→	Net Income (2015)	.29	4.94**

Notes: ** $p \leq 0.01$, * $p \leq 0.05$.

Table IV. Configuration of high profitability firm performance, 2013

Configuration	**1**	**2**	**3**	**4**
Resource conditions				
Acquisitions			•	•
Cost of Goods Sold				
Employees	•			
Property, Plant and Equipment	▫			
Advertising				
Pension and Retirement	●	●	●	●
R&D	•	•		•
SG&A expense (minus Advertising and R&D Expense)		•	•	
Raw coverage	0.45	0.56	0.31	0.32
Unique coverage	0.02	0.01	0.01	0.01
Consistency	0.81	0.74	0.71	0.74
Overall solution coverage	0.77			
Overall solution consistency	0.76			

Note: Size of circle distinguishes core (larger) and peripheral (smaller) resource conditions.

Table V. Configuration of high profitability firm performance, 2014

Configuration	**1**	**2**	**3**	**4**
Resource conditions				
Acquisitions			•	•
Cost of Goods Sold				
Employees	•			
Property, Plant and Equipment	▫			
Advertising				
Pension and Retirement	●	●	●	●
R&D	•	•		•
SG&A expense (minus Advertising and R&D Expense)		•	•	
Raw coverage	0.41	0.54	0.35	0.35
Unique coverage	0.01	0.01	0.02	0.01
Consistency	0.86	0.85	0.94	0.93
Overall solution coverage	0.70			
Overall solution consistency	0.83			

Note: Size of circle distinguishes core (larger) and peripheral (smaller) resource conditions.