The role of competitive strategy in the performance impact of exploitation and exploration quality management practices

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Abstract

Purpose: We advance understanding about quality management (QM) practices by clarifying how competitive strategy conditions the impacts of exploitative and explorative QM practices on performance.

Design/methodology/approach: We apply partial least squares structural equation modeling (PLS-SEM) to data from a sample of German pharmaceutical firms.

Findings: The results show that the impact of exploitative and explorative QM practices on firm performance is contingent on the competitive strategy pursued. Explorative QM practices are significantly more relevant for firms following a differentiation strategy, whereas exploitative QM practices are significantly more relevant for cost leaders. Furthermore, for strategically ambidextrous firms that follow simultaneously a cost and a differentiation focus, the interplay of the two QM practices matters.

Originality/Value: This paper contributes to understanding about which kind of management practices, exploitative and/or explorative, have greater performance impacts under certain competitive strategy conditions.

Keywords: quality management, exploitative, explorative, competitive strategy, pharmaceutical industry, contingency.

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1. INTRODUCTION

Better understanding whether quality management (QM) affects firm performance has characterized much research since the dawn of the 20th century (Hendricks and Singhal, 1997). While early research raised doubts on a positive performance effect of QM and criticized that the field lacks methodological rigor (Dow *et al.*, 1999), more current research offers support for a positive impact of QM on different performance measures, when QM is considered as an aggregate concept (for an overview see Kaynak, 2003; Ebrahimi and Sadeghi, 2013; Nair, 2006). Yet, QM encapsulates three constituting principles—doing things right, striving for improvement, and fulfilling customer needs (Dean and Bowen, 1994)—that can involve a multitude of specific QM practices (e.g., Zhang *et al.*, 2012; Ebrahimi and Sadeghi, 2013); Ebrahimi and Sadeghi (2013) identified more than 200 QM practices.

Recent works stress the importance of developing a better understanding of *which specific practices* are most effective *under which conditions* (e.g., Zhang *et al.*, 2014b). Thus, albeit the progress that has been made in prior research, not only do we still lack an in-depth understanding of the impact of certain QM practices on performance but, as past studies suggest that certain factors condition the impact of QM on performance (Jinhui Wu *et al.*, 2011; Nair, 2006; Saad and Siha, 2000), it is also important to clarify the role of such factors. Specifically, as some authors (e.g., Herzallah et al., 2014; Herzallah et al., 2017) stress the role of a firm's competitive strategy in understanding the performance impact of QM, this paper aims to close this gap by answering the question of how a firm's competitive strategy conditions the relationship between certain QM practices and firm performance.

We address this research question by extending the work of (Herzallah *et al.*, 2017). Specifically, we argue that the performance impact of a firm's QM practices is based on

failure reduction and conditioned by its competitive strategy. We consider both financial and market performance (Das *et al.*, 2000; Zhang and Xia, 2013). Furthermore, in synthesizing prior works, we apply a categorization of process and customer related QM practices that accounts for a focus on explorative versus exploitative QM (March, 1991; Sitkin *et al.*, 1994; Li *et al.*, 2008; Lavie *et al.*, 2010; Bocanet and Ponsiglione, 2012). Exploitative QM focuses on better leveraging existing resources to reduce costs and increase efficiency as the means to improve performance (Sitkin *et al.*, 1994; Reed *et al.*, 2000; Zhang *et al.*, 2014b). Explorative QM emphasizes innovation or pursuing novel solutions and learning about new alternatives which enhance revenues as the means to strengthen performance (March, 1991; Lavie *et al.*, 2010; Zhang *et al.*, 2014b). Adopting this categorization allows clarifying the strategic performance implications of QM practices, and studying relevant contextual conditions under which different QM practices are effective (Lawrence and Lorsch, 1967; Miller, 1987); the idea being that different contexts under which firms operate require different practices (Zhang *et al.*, 2014b).

We put forward that the performance effects of exploitative and explorative QM practices are contingent on the fit with the firm's strategic focus (Fuentes Fuentes *et al.*, 2006; Zatzick *et al.*, 2012; Yunis *et al.*, 2013). Specifically, we focus on a firm's competitive strategy as a dominant driver of competitive advantage (Miller, 1996; Porter, 1996). We argue that QM practices are mechanisms that characterize how a firm operates, and emphasize that the firm's competitive strategy is the choice of an external positioning which sets the firm's overall direction and affects its management practices. In other words, we put forward that strategic positioning characterizes a firm's condition within QM practices occur. Hence, we suggest a conceptualization in which a firm's QM practices have direct effects on its performance and in which these performance effects are contingent on the firm's competitive strategy. We develop a set of hypotheses that suggest that explorative QM

practices are a more relevant determinant of performance for differentiators, whereas exploitative QM practices are more relevant for cost leaders (Kim and Huh, 2015), and that a combination of both represents best practice for hybrids that combine in their competitive strategy differentiation and cost leadership. We test the hypotheses using partial least squares structural equation modeling (PLS-SEM) on data from a sample of German pharmaceutical firms. This industry is of specific relevance to this study given the number of firms, the mandatory use of QM practices therein (Haleem *et al.*, 2015; Marinkovic *et al.*, 2016; Mehralian *et al.*, 2016; Narayana *et al.*, 2012), and heterogeneity in terms of strategic focus (Garbe and Richter, 2009; Spitz, 2003).

This paper provides two chief contributions: First, we provide an in-depth understanding of the effects of exploitative and explorative QM practices on (financial and market) performance. Second, we advance our understanding of how a firm's competitive strategy conditions the performance impacts of QM practices. Specifically, following Porter's classification, we outline implications for firms in selecting the right mix of exploitative or explorative QM in consideration of their competitive strategic focus. In doing so we answer calls to further clarify understanding about the use of explorative and exploitative QM within the context of a firm's competitive strategy (Kim and Huh, 2015; Herzallah *et al.*, 2017). Specifically, following Porter's (1980; 1985) classification, we distinguish between differentiators, cost leaders and hybrid firms, and we accordingly outline implications for firms in selecting the right mix of exploitative or explorative QM practices in consideration of their competitive strategic focus.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1. Past Research on the impact of QM practices on performance

We reviewed Ebrahimi and Sadeghi (2013)'s work to identify studies referring to financial and market performance as well as to process and customer-related QM practices (Ebrahimi

and Sadeghi, 2013, Table 2). In regards to the latter, most studies bundle several individual QM elements into overarching factors (Kaynak and Hartley, 2008, 2005; Demirbag *et al.*, 2006; Martínez-Costa *et al.*, 2008) with the aim distinguish between different facets of QM, such as 'customer focus' (Adam *et al.*, 1997; Fuentes-Fuentes *et al.*, 2004), and 'process management' or 'process improvement' (Wilson and Collier, 2000; Kaynak, 2003). In aggregating QM practices at a higher level, other studies focus, for example, on total quality management (TQM) (Agus, 2001). These studies mostly analyze the direct relationships of QM practices on performance. Although there are some inconsistencies, especially in regards to nonsignificant effects (for process-related items on performance, see Gadenne and Sharma, 2009; Koc, 2011), the majority of studies finds that QM has a positive effect on performance (e.g., Kaynak, 2003; Demirbag *et al.*, 2006; Kaynak and Hartley, 2008), which is also confirmed by Nair (2006) who meta-analyzed 23 studies. While he concludes that customer focus and process management are both positively correlated with financial (and aggregate) performance (Nair, 2006), he also called for further research to examine moderating effects or contingencies in the QM and performance relationship.

Very few studies take contingencies of the QM and performance relationship into consideration (e.g., Adam *et al.*, 1997; Brah *et al.*, 2000; Das *et al.*, 2000; Wang *et al.*, 2012). Fuentes Fuentes *et al.* (2006) analyze the impact of customer focus and process management on financial performance contingent on business strategy (here cost leadership and differentiation). Their results show that the profitability impact generated by QM practices depends on how these fit with the strategic focus of the firm. Firms pursuing a differentiation strategy generate better financial performance, if emphasizing customer focused practices. For firms following a cost leadership strategy, they show that those practices that related to continuous improvement help achieve better financial performance; yet they do not find a significant contingency of the process management and performance relationship on cost

leadership strategy (Fuentes Fuentes *et al.*, 2006). Douglas and Judge (2001) analyze the impact of TQM encompassing seven QM practices (among them customer-focused practices) on financial performance, contingent on organizational structural control and exploration. Structural control comprises stabilization, standardization, and a focus on reliability of outcomes. Structural exploration comprises creativity, openness and flexibility to new ideas. They postulate that the QM and performance relationship will be stronger for organizations focusing on control as well as for organizations focusing on exploration in their structure. They find empirical support for the moderating impact of organizational structure as hypothesized with respect to financial performance. Moreover, they find that these two structures appear to work synergistically (Douglas and Judge, 2001).

Due to the surprisingly low attention to contingencies in prior QM research, we still do not fully understand how to tailor "…QM practices to fit the organization's situational context…[although] this can help avoid implementation failure and improve performance" (Zhang *et al.*, 2014a, p. 81). In line with prior works, we distinguish explorative and exploitative QM practices (Su and Linderman, 2016; Zhang *et al.*, 2012). These theoretically substantiated categories of QM practices provide the foundation on which to assess whether a firm's strategic focus conditions their performance impact.

While we refer to competitive strategy as a contingency factor, there is another stream of research that considers competitive strategy as a mediator in the relationship between QM practices and performance (Herzallah *et al.*, 2014; Herzallah *et al.*, 2017). Specifically, Herzallah *et al.* (2017) examine to what extent a firm's competitive strategy mediates the relationship between ambidextrous QM and performance. They argue that ambidextrous QM practices positively affect both a firm's cost leadership strategy and its differentiation strategy which then have an impact on performance. They promote the notion that exploitative and explorative QM practices should be considered jointly (see Yalcinkaya *et al.*, 2007) and that

firms should perform explorative and exploitative QM simultaneously; avoiding emphasis on one at the expense of the other. They also indicate that certain combinations of QM practices "best suit" each of the competitive strategies. Based on creating subsample of firms with a particular competitive strategy focus (following Chandrasekaran *et al.*, 2012), they examine descriptive statistics to suggest that firms with a high focus on cost leadership strategy more commonly balance explorative and exploitative QM practices. They also suggest that firms with a high focus on differentiation generally develop higher levels of both QM practices (Herzallah *et al.*, 2017). We build on these suggestions to answer our research question, namely how a firm's competitive strategy conditions the relationship between certain QM practices and firm performance. Hence, we seek to advance understanding about which QM practices contribute to a firm's performance contingent on its competitive strategy.

2.2. Hypotheses on the impact of exploitative and explorative QM practices on performance

Drawing on contingency theory, we suggest that the degree to which firms can profit from a focus on either exploitative or explorative QM practices depends on the strategic focus of the firm. We consider the classification of competitive strategies drawing on Porter's (1980; 1985) framework. This builds on the well-known structure-conduct-performance paradigm (Bain, 1956), meaning that a firm's competitive strategy does not follow the firm's internal business practices but is tailored to the industry structure (e.g., competition, demand) in which it operates. Consequently, we examine exploitative and explorative QM practices' *direct* impact on performance. Furthermore, to understand whether ambidextrous QM matters, we examine the direct impact of the *interplay* between exploitative and explorative QM practices; capturing their interaction. In addition, we consider competitive strategy (i.e. differentiation, cost leadership and the simultaneous pursuit of differentiation and cost leadership elements) as a *contextual* factor. We argue that competitive strategies condition (or

moderate) the performance impact of certain QM practices. Figure 1 presents our conceptual model.

- Insert Figure 1 about here -

Building on March (1991) we refer to exploitative and explorative QM practices as failure reduction processes that improve performance. We reason that exploitative QM practices that focus on better leveraging a firm's existing resources reduce internal failure by identifying all processes, products, and materials that do not fully meet quality requirements. Exploitative QM practices concern all internal activities prior to the sales process of the final product. For instance, better leveraging resources in a firm's operations can include controlling and improving the efficiency of existing processes (Zhang *et al.*, 2014b), thereby reducing scrap and rework issues and accordingly lowering internal failure (Prajogo and Sohal, 2006, 2001) and costs (Reed *et al.*, 1996; Reed *et al.*, 2000). Hence, by better exploiting existing resources, costs are reduced, firms are more efficient, and therefore performance increases (also in the short-term; Lavie *et al.*, 2010). From a product or sales perspective, better exploiting resources relates to improving the reliability of existing products and the quality of existing customer relationships (Sitkin *et al.*, 1994; Zhang *et al.*, 2014b), which can be achieved through customer involvement, customer focus and customer orientation (Zakuan *et al.*, 2010). This reduces external failure; reflected in improved customer satisfaction, increased revenues and strengthened performance (Desphandé *et al.*, 1993; Narver and Slater, 1990). Several studies substantiate and show that there is a positive relationship between exploitative QM practices and performance (Sitkin *et al.*, 1994; Piao, 2014; Yang and Li, 2011; Zhang *et al.*, 2014b). We will follow this logic and hypothesize a positive relationship between exploitative QM practices and performance due to reduced internal and external failure:

Hypothesis 1: There is a positive association between exploitative QM practices and performance.

Explorative QM practices focus on exploring the unknown, identifying and pursuing novel solutions. They involve variation, risk taking, experimentation, discovery and innovation, among others (March, 1991). Firms are thought to become more competitive by exploring new alternatives and therewith by innovating (Posen and Levinthal, 2012; Zhang *et al.*, 2014b). From an operations perspective, this translates into innovative manufacturing and supply chain processes which reduce internal failure in the long-term. For instance, firms operating in industries such as the pharmaceutical industry are obligated to implement approaches which would improve effectiveness and efficiency in operations (Friedli *et al.*, 2010). From a product or sales perspective, this translates into new/innovative products that aim to reduce external failure in the long-term. Either way, novelty is the key to gaining competitive advantage and enhancing performance from this perspective (Piao, 2014; Zhang *et al.*, 2014b; Sitkin *et al.*, 1994). Even if such returns from exploration are risky and remote (Lavie *et al.*, 2010), firms benefit from engaging in explorative practices for responding adequately to environmental changes to maintain competitiveness in the long-run (Kim and Huh, 2015); especially in dynamic environments, i.e. when the amount of change is high and very unpredictable (Jansen *et al.*, 2006), which is the case in, for instance, high-tech industries and the pharmaceutical industry (Li and Liu, 2014). We hypothesize a positive relationship between explorative QM practices and performance due to reduced internal and external failure:

Hypothesis 2: There is a positive association between explorative QM practices and performance.

Even if there is a tension between exploitative and explorative QM practices (Sohani and Singh, 2017), both categories of practices are not mutually exclusive; that is, firms can

deploy both (Gupta *et al.*, 2006). In fact, prior works suggest that exploitation and exploration should be considered jointly: exploitative activities provide financial flows that underpin explorative activities, while explorative practices provide assets and capabilities for the renewal of exploitative practices (e.g., Yalcinkaya *et al.*, 2007; Garcia *et al.*, 2003). As acknowledged by Lavie *et al.* (2010) and Rothaermel and Alexandre (2009), exploration and exploitation should not be viewed as a choice between discrete options, but rather combinations of the two or the appropriate balance between the two can benefit performance (see also Cegarra-Navarro *et al.*, 2018). This logic underpins the ambidexterity perspective; arguing that ambidexterity has a positive impact on performance, which does not receive unambiguous empirical support, however (Herhausen, 2016; Raisch and Birkinshaw, 2008; Wei *et al.*, 2014; Chandrasekaran *et al.*, 2012). We will argue later that some firms can profit more from attributing attention to both QM practices than others when outlining our contingency hypotheses. Still, we posit that, at the core, the interplay between both exploitative and explorative QM practices has a positive impact on a firm's performance and longevity (Kim and Huh, 2015; Piao, 2014; Herzallah *et al.*, 2017), and put forward the following hypothesis:

> *Hypothesis 3: There is a positive association between the interplay of explorative and exploitative QM practices and performance.*

2.3. Hypotheses on the conditional effects of competitive strategy focus

Lacking clear focus might involve the risk of getting "disoriented" (Aghajari and Amat Senin, 2014) and can involve high efforts and costs. A manager of a Standard & Poor's 500 company stated that "It's crazy to tell people they should be focused on becoming more efficient while at the same time you want them to explore untapped growth potential. This is making me nuts" (Rae, 2007).

Because firms have limited resources, the degree to which they can profit from a focus on either exploitative or explorative QM practices depends on contextual factors (Das *et al.*, 2000; Sousa and Voss, 2001; Zatzick *et al.*, 2012). Any investment in exploitative activities by firms may limit their ability to also invest in explorative activities (Oshri *et al.*, 2005). Hence, it is important to understand the contextual factors, which characterize the contexts in which either of the QM practices is most effective. Indeed, several authors suggest that consideration of contextual factors can likely explain the differences in relationships found between QM practices and performance (Powell, 1995; Dow *et al.*, 1999; Sousa and Voss, 2001). Hence, we apply a contingency theoretic argument to capture the impact of contextual conditions under which certain QM practices are more or less effective (Sousa and Voss, 2001, 2008). Contingency theory posits that performance is dependent on the fit between firm's internal features and contextual factors (Lawrence and Lorsch, 1967; Miller, 1987). One of the contextual factors of relevance to QM research is the strategic context (Sousa and Voss, 2008).

Exploitative and explorative QM practices are expected to function differently under different competitive strategies (Kim and Huh, 2015). With some exceptions – see for instance the analysis of different contextual factors in Sila (2007), studies support the existence of strategy context effects, which condition the relationships between QM practices and performance (Fuentes Fuentes *et al.*, 2006; Moreno-Luzón and Peris, 1998; Auh and Menguc, 2005; Yunis *et al.*, 2013; Zatzick *et al.*, 2012). These contextual effects are based on the assumption that there needs to be an alignment between strategy and organizational activities (Miller, 1996; Porter, 1996). In leaning on Porter's (1980; 1985) widely accepted competitive strategy framework, we consider differentiation and cost leadership as strategic foci that affect a firm's competitive advantage and constitute a relevant contextual condition within which QM practices occur. As we will outline below, efficiency-oriented business

strategies (i.e., cost leadership) are related to exploitation and differentiation-oriented business strategies to exploration. Notwithstanding Porter's early arguments concerning the incompatibility between these two strategic foci, other works develop the idea of benefitting from the simultaneous pursuit of both strategic foci (Hill, 1988; Murray, 1988; Raisch and Birkinshaw, 2008). Thus, in addition to *differentiators* and *cost leaders*, we consider a combination of both (*hybrids*) as a strategic focus that deserves attention. Hence, we also integrate strategically ambidextrous, hybrid firms that show high levels of both, cost leadership and differentiation strategies.

A differentiation strategy is characterized by providing products that create a competitive advantage through increasing the perceived value of the product in customers' minds. This is achieved through more uniqueness in products or processes at the external interface with customers. Therewith, it focuses on aspects which are congruent with explorative QM practices (Phillips *et al.*, 1983). Differentiators benefit more from innovations especially in products, but also from business processes that increase the responsiveness to customer preferences (see also Zatzick *et al.*, 2012; Prajogo and Sohal, 2001). Continuously engaging in innovating customer focused processes and providing products that better fit customers' needs is key to the success of a differentiation strategy as it reduces external failure (Prajogo and Sohal, 2006). Explorative QM practices reduce the risk of obsolescence associated with existing technologies and products and therewith reduce the risk of external failure (Sitkin *et al.*, 1994; Kim and Huh, 2015). Hence, we hypothesize that explorative QM practices are particularly suitable to reduce external failure in the context of a differentiation strategy and should therefore provide a relatively better means to increasing the financial and market performance of differentiators.

> *Hypothesis 4a: The positive association between explorative QM practices and performance is stronger for differentiators than for cost leaders.*

Hypothesis 4b: The positive association between explorative QM practices and performance is stronger for differentiators than for hybrids.

On the other hand, we argue that exploitative QM practices are significantly more relevant for the performance outcome of cost leaders. Firms focus on improving processes to make them more efficient when their primary competitive strategy is to pursue cost leadership (Prajogo and Sohal, 2001, 2006; Ruiz Ortega, 2010). Improving the quality of operations and processes contributes to reducing internal failure (reflected in for instance reduced scrap ad rework). Furthermore, improving the reliability of products contributes to reducing external failure (reflected in reduced customer complaints, which positively affects customer satisfaction and, in turn, a firm's competitiveness). These mechanisms contribute to gaining a cost-based advantage that is the ultimate objective of a cost leadership strategy (Reed *et al.*, 1996). Hence, we hypothesize that exploitative QM practices are congruent and fit with a cost leadership strategy and, therefore, should provide a relatively better means to increasing the financial and market performance of cost leaders.

Hypothesis 5a: The positive association between exploitative QM practices and performance is stronger for cost leaders than for differentiators.

Hypothesis 5b: The positive association between exploitative QM practices and performance is stronger for cost leaders than for hybrids.

For strategically ambidextrous firms (hybrids) that pursue both differentiation and cost leadership (Aspara *et al.*, 2011), we assume that drawing on both explorative and exploitative QM practices is relevant to increasing performance (Raisch and Birkinshaw, 2008). Strategically ambidextrous firms are less vulnerable to changes (Claver-Cortés *et al.*, 2012) but they need to reduce costs while investing in customer focused QM practices such as product innovation. This would imply avoiding internal failure by focusing on better exploiting existing resources. At the same time this would imply allocating other resources to

take risks by exploring new alternatives which would allow firms to respond adequately to environmental changes and to avoid external failure (Raisch and Birkinshaw, 2008). In this sense, a combination between both QM practices is positively related to the performance of hybrids (He and Wong, 2004; Lavie *et al.*, 2010).

> *Hypothesis 6a: For strategically ambidextrous firms (hybrids), the positive association between the simultaneous interplay of explorative and exploitative QM practices and performance is stronger than for differentiators.*

> *Hypothesis 6b: For strategically ambidextrous firms (hybrids), the positive association between the simultaneous interplay of explorative and exploitative QM practices and performance is stronger than for cost leaders.*

3. RESEARCH METHODOLOGY

3.1. Sample and data collection

To test our hypotheses, we draw on a sample of 200 German pharmaceutical firms (to identify pharmaceutical firms, we referred to the standard industry classification (SIC) codes and selected those firms with SIC code 2834: Pharmaceutical; an approach that has been applied in similar settings, see Kim and Park (2013)). We focus on firms within the German pharmaceutical industry for several reasons: The use of QM practices is mandatory in this industry (Drew, 1998; Mehralian *et al.*, 2016). Moreover, the German pharmaceutical industry is particularly strong, both in terms of number of competitors and their performance (Destatis, 2018), is one of the largest industries in Germany in terms of revenues according to the German Federal Ministry of Economic Affairs and Energy, and importantly has a substantial number of firms. Known as the "world's pharmacy", Germany is home to Europe's largest – and the world's fourth largest – pharmaceuticals market (Destatis, 2018). Moreover, the industry is also sufficiently heterogeneous in terms of the competitive strategy focus that firms have (Garbe and Richter, 2009; Spitz, 2003) such that it offers a good mix of

firms with either of the three competitive strategy foci that we study. Having an industry and country focus likewise has advantages: It avoids that differences in industry characteristics affect the conditional performance impacts of QM practices. Likewise, we eliminate the effect of differences in country characteristics.

By conducting a survey and collecting data from financial reports, we gathered primary and secondary data on these firms. The survey used a stratified proportional data collection procedure on a sampling frame covering 928 firms provided by Dun and Bradstreet. The sample is stratified by federal state, turnover, and firm size (measured by the total number of employees). In mid 2014, we conducted computer-assisted telephone interviews with CEOs to collect data and obtained valid responses from 200 different firms. Comparing this to the number of qualified contacts (n = 597) corresponded to a response rate of 33.5%, which is acceptable especially when considering the one-time contact and specific target of CEOs (Manfreda *et al.*, 2008). In addition to the survey, we gathered the following information from (financial) reports provided by an official publication of the German government (the Bundesanzeiger, www.bundesanzeiger.de): the share of equity, the total number of employees, the value of total assets, and firm age.

3.2. Analyses

To test our hypotheses, we used PLS-SEM employing the SmartPLS 3 software (Ringle *et al.*, 2015). The PLS-SEM method allows to establish and estimate a path model with latent variables (Hair *et al.*, 2019; Hair *et al.*, 2014). The strength of the estimated relationships depicts the main sources of impact to explain a key target construct of interest (Hair *et al.*, 2012). Due to the early phase of theorizing on the impact of exploitative and explorative QM practices on performance (Richter *et al.*, 2016a; Rigdon, 2016), we opted for using PLS-SEM (rather than another structural equation modelling method, such as covariance-based SEM) as the most suitable method for extending existing theory in management research (Richter *et*

al., 2016b; Svensson, 2015) which our study is about. Furthermore, we regarded PLS-SEM advantageous over covariance-based SEM and also over using a combination of first generation methods such as factor- and regression analyses as it allows to assess multi-group analyses even for smaller subgroups, does not require normality of data and allows the assessment of predictive relevance and power (Hair *et al.*, 2019); all aspects that are applicable to our study.

The analyses involved two key steps (see Figure 2). First, we evaluated a base model to examine the performance effect of exploitative and explorative QM practices in the total sample and to understand its predictive relevance. Second, we assessed the impact of the strategic focus as a contextual factor in QM using multi-group analyses on this base model (Hair *et al.*, 2017; Sarstedt *et al.*, 2011). Hence, we performed subgroup analyses with reference to the competitive strategy pursued by the firms (i.e., one analysis for differentiators, one for cost leaders and one for firms pursuing a hybrid strategy). In turn, this enables testing of the relevance of the three types of QM practice constellations conditional on each strategy focus.

- Insert Figure 2 about here -

3.3. Measures

The latent variables in our model require specific items in each measurement model. Following Diamantopoulos *et al.* (2012), the dependent and independent research variables are measured by means of multiple items on 5-point Likert scales, ranking from 1 ("much below the average") to 5 ("much above the average"). Following Presser *et al.* (2004) and Guest *et al.* (2006), the questionnaire has been validated by pre-tests with managers from different companies not included in the final sample. This pre-test ensures the validity of items used for each construct and the understandability of the questions related to each item.

We selected three (reflective) items related to income, revenue and market share to measure *performance* based on CEO's evaluations (Brah *et al.*, 2000; Demirbag *et al.*, 2006; Douglas and Judge, 2001; Yusuf *et al.*, 2007). To measure exploitative and explorative QM practices, we created our own scale by adapting the customer and process related practices emphasized in previously used scales. We concluded with three items for each of the two constructs for the sake of not increasing questionnaire length, which is of particular importance as we sought responses from CEOs. *Exploitative QM practices* are measured using three (reflective) items related to being in close contact with customers on quality issues, monitoring of processes regarding quality control, and investing efforts in research and control practices on production in order to fully exploit these processes (Ahire and Dreyfus, 2000; Brah *et al.*, 2000; Choi and Eboch, 1998; Demirbag *et al.*, 2006; Douglas and Judge, 2001; Forza and Filippini, 1998; Gadenne and Sharma, 2009; Lakhal *et al.*, 2006; Merino-Díaz De Cerio, 2003; Molina *et al.*, 2007; Sharma, 2006). *Explorative QM practices* are measured using three (reflective) items related to the exploration of new products, efforts to continually improve products as well as an item related to the exploration of new production processes (Arauz *et al.*, 2009; Fuentes Fuentes *et al.*, 2006; Fuentes-Fuentes *et al.*, 2004; Merino-Díaz De Cerio, 2003). In addition, when looking into exploitative and explorative QM practices individually, we also created an interaction term of the two constructs, as we assume that it is the simultaneous interplay of these two QM practices that matters for firms pursuing both, cost leadership and differentiation strategy aspects. This interaction term is formed using the two-stage approach (Hair *et al.*, 2017). Applying a method commonly used in relevant previous studies (Atuahene-Gima, 2005; He and Wong, 2004), we computed a multiplicative interaction of exploitative and explorative QM practices to indicate the firm's overall exploration-exploitation ambidexterity in QM. This reflects the nonsubstitutable and interdependent nature of exploitative and explorative QM practices.

Furthermore, we used information gathered from financial reports to include the following common control variables into the analysis that are known to have an effect on performance (Goerzen and Beamish, 2003; Coad *et al.*, 2018; Ketokivi and Schroeder, 2004; Garbe and Richter, 2009): firm size, measured by the total assets and number of employees (both logarithmized), the share of equity as a single item and the firm's age as a single-item.

Finally, following Porter's (1980; 1985) classification, we sort firms into differentiators and cost leaders. Additionally, we identify strategically ambidextrous firms, namely hybrids, given the growing interest in hybridization (Salavou, 2015). For grouping purposes, we use a dummy coding of factor scores representing differentiation or cost leadership (i.e. firms with an above the average score on differentiation and a below the average score on cost leadership were coded as differentiators and vice versa). To operationalize differentiation strategy, we have drawn on several items from previously used scales (Acquaah and Yasai-Ardekani, 2008; Gabrielsson *et al.*, 2016; Santos-Vijande *et al.*, 2012) that reflect this construct best. Specifically, the items used to operationalize differentiation strategy are a focus on specialized products, offering unique and distinct products, serving high-priced market segments and having a strong reputation in the industry (see Appendix A). Similarly, to operationalize cost leadership strategy we draw on items used previously by several authors (Acquaah and Yasai-Ardekani, 2008; Pertusa-Ortega *et al.*, 2010). Specifically, the items used to operationalize cost leadership are a strong effort to achieve the lowest cost per unit, focusing on pricing below competitors and serving low-priced market segments (see Appendix A). Hybrids are firms that simultaneously performed above average on both sets of characteristics.

This approach allowed to extract groups of data as differentiators (n = 57 firms), cost leaders (n = 67 firms), and hybrids (n = 51 firms). The sample sizes available for the multi-group analyses (i.e., 57, 67 and 51 responses) are appropriate in light of the low complexity

of the model used (Chin, 2010; Hair *et al.*, 2011). Power analyses (Hair *et al.*, 2017) as well as the inverse square root and gamma-exponential methods (Kock and Hadaya, 2016) to determine the minimum sample size needed in PLS-SEM support this notion.

4. RESULTS

4.1. Measurement models

We first evaluated the reliability and validity of measurement models, before starting to interpret structural relationships (Chin, 2010; Hair *et al.*, 2017). All reflective measures (see Appendix B.1) meet the quality criteria defined (Chin, 2010; Hair *et al.*, 2017): Outer loadings (>0.7), indicator reliability (>0.5), average variance extracted (>0.5) and composite reliability (>0.7) correspond to the threshold values for evaluating reliability given in the literature. In addition, all measures meet the heterotrait-monotrait (HTMT) discriminant validity assessment criterion (Henseler *et al.*, 2015; see Appendix B.2).

The following steps were undertaken to account for common method bias: First, survey items related to the dependent and the independent variables were separated within the survey and randomized within blocks to reduce a potential bias from their sequencing. Second, secondary data from financial reports was introduced to the analysis to reduce common method biases (Podsakoff *et al.*, 2003). Third, we assessed the potential influence of common method bias post-hoc by using Harman's single factor test (Podsakoff and Organ, 1986) suggesting that there is no "general factor" in the data. Hence, common method bias likely is not a serious problem in our study.

As we conducted a multi-group analysis, we also tested for measurement invariance using the measurement invariance of composite models (MICOM) approach (Henseler *et al.*, 2016; Schlägel and Sarstedt, 2016). We used identical indicators for the measurement models within the groups, an identical data treatment and identical algorithm settings for all subgroups. In consequence, we have established configural invariance. Moreover, the results

of a permutation test for equal weights between groups show that we have established compositional invariance. Performing a permutation test for equal composite means and variances, we find that we do not have full measurement invariance, yet we have partial measurement invariance. This is sufficient for being able to compare the standardized coefficients across our subgroups of differentiators, cost leaders and hybrids.

4.2. Base model results

Table 1 provides an overview of the results for the base model. In addition to the path coefficients, it provides the R^2 values and some further quality criteria (namely the variance inflation factors, which are all below common thresholds, effect sizes and the Q^2 value based on the blindfolding procedure).

- Insert Table 1 about here -

In the total sample, exploitative QM practices are positively and significantly related to performance (0.297; $p = 0.000$). Therefore, Hypothesis 1 is supported. Explorative QM practices are positively, yet not significantly related to performance (0.113; $p = 0.124$). Thus, Hypothesis 2 is not supported in the total sample. Hypothesis 3 suggests a positive relationship between the interplay of exploitative and explorative QM practices with performance. In the total sample, we find a nonsignificant path coefficient around zero (0.009; $p = 0.883$), which does not support Hypothesis 3. Overall, the model explains a good share of variance in performance, namely 25.3% and has predictive relevance and power. Predictive relevance and power was assessed by means of the blindfolding procedure ($Q^2 = 0.18$) (Hair *et al.*, 2019) and by means of PLSpredict (Shmueli *et al.*, 2019) which analyzes the out-of-sample explanatory power of the model. Focusing on our key target construct performance, we find positive Q^2 values for the three indicators of the performance construct ($Q^2_{market\ share} = 0.021$, $Q^2_{revenue} = 0.053$, and $Q^2_{net\ income} = 0.000$). Since prediction errors are highly symmetrically distributed, we compared the root mean squared error (RMSE) value of

PLS with the lineal regression model (LM) value for each indicator and find that PLS-SEM yields lower prediction errors than the naïve LM benchmark (namely 0.977 < 0.986 for market share; 1.013 < 1.023 for revenue; 1.047 < 1.064 for net income) (Hair *et al.*, 2019; Shmueli *et al.*, 2019).

4.3. Results of moderation analyses

Tables 2 and 3 provide an overview of the results generated by means of our multi-group analyses. More specifically, Table 2 provides the path coefficients and the corresponding *p*-values and R^2-values for the subgroups of firms which either pursue a differentiation, cost leadership or both of these orientations in a hybrid strategy. Table 3 shows differences in path coefficients between the groups as well as the *p*-values indicating whether the differences between path coefficients are significant or not.

- Insert Table 2 about here -

- Insert Table 3 about here -

Hypothesis 4a and Hypothesis 4b suggest that the positive association between explorative QM practices and performance is stronger for differentiators as compared to for cost leaders and hybrids, respectively. Our results show that explorative QM practices are the most important (and a significant) determinant of performance among firms pursuing a differentiation strategy (0.382; *p* = 0.021). Furthermore, comparing differentiators to cost leaders, the path coefficients for the association between explorative QM practices and performance differ by a value of 0.337, which is significant (*p* < 0.05). Hence, Hypothesis 4a is supported. Comparing differentiators to hybrids, there is a notable difference in path coefficients (i.e., 0.272) that, however, is not statistically significant. Therefore, Hypothesis 4b is not supported.

Hypothesis 5a denotes that the positive association between exploitative QM practices and performance is stronger for cost leaders as compared to for differentiators. The results

show that exploitative QM practices are the most important determinant of performance for firms following a cost leadership strategy (0.321; $p < 0.01$). Moreover, comparing cost leaders with differentiators, the path coefficients for the association between exploitative QM practices and performance differ by a value of 0.431, which is significant ($p < 0.05$). Hence, Hypothesis 5a is supported. Comparing cost leaders with hybrids, the path coefficients for the association between exploitative QM practices and performance differ by 0.159 in the assumed direction but this difference is not significant. Hence, Hypothesis 5 is not supported.

Hypothesis 6a and 6b imply that for strategically ambidextrous firms (i.e., hybrids), the simultaneous use of both explorative and exploitative QM practices is of stronger importance as compared to firms opting for one of the competitive strategies. Both QM practices are assumed to interact and this interaction is assumed to positively affect performance more strongly as compared to firms purely concentrating on either cost leadership or differentiation. For hybrid firms, both exploitative and explorative QM seem to be important to performance with path coefficients of 0.133 for explorative QM practices and 0.162 for exploitative QM practices. The highest value is moreover found for the interaction of these practices (0.219). Yet, none of these coefficients shows significance. However, comparing the path coefficients to the ones of differentiators and of cost leaders, there are significant differences between the groups: The relevance of the interaction between exploitative and explorative QM practices is significantly higher for hybrid firms, both when compared to differentiators (difference in path coefficients: 0.482) and to cost leaders (difference in path coefficients: 0.284). Hence, Hypotheses 6a and 6b are (partially) supported. To sum up, our moderation analyses reveal differences among differentiators and cost leaders. However, the results for hybrid firms are not as conclusive, which may be explained by the idiosyncrasies of hybrid firms.

5. DISCUSSION

5.1. Implications for theory

This study makes several contributions to theory: First, we build on recent suggestions to distinguish exploitative and explorative QM practices (Zhang *et al.*, 2014a) and therewith provide valuable insights that advance the literature on exploration and exploitation from a QM perspective (Posen and Levinthal, 2012). Second, using this classification, we contribute to the discussion about whether the performance impact of QM practices is best understood by considering QM practices holistically or not (Kaynak, 2003). Third, by studying the performance impact of QM practices conditionally on a firm's competitive strategy focus, we contribute to closing a gap in the research landscape about the contingent impact of QM practices (Nair, 2006). Fourth, we add clarity to the conceptual associations between competitive strategy and QM practices and advance this emerging stream of research (Herzallah *et al.*, 2017).

More precisely, the first contribution that this paper provides concerns our understanding of the performance impacts of two different types of QM practices: exploitative and explorative QM practices. When examining their performance impacts without consideration of a firm's strategic focus, we find that only exploitative QM practices increase performance; which is in line with the findings in Zhang et al. (2014a), this substantiates the relevance of exploitative QM in dynamic environments. Eliminating scrap and rework issues by means of controlling and improving the efficiency of existing operational processes is advantageous and increases performance (Reed *et al.*, 1996). Furthermore, investing in QM practices to improve the reliability of existing products and the quality of existing customer relationships likewise has beneficial performance effects (Fuentes Fuentes *et al.*, 2006; Reed *et al.*, 1996). Explorative QM practices, in contrast, do not appear to affect performance. However, as our results from subsequent analyses indicate that explorative QM practices matter for firms that pursue a differentiation strategy, seeking

to understand the performance impact of QM practices without accounting the context within which they used may be less useful. Hence, it is important to consider the use of QM practices given the competitive strategy focus that firms have. Only firms pursuing a differentiation strategy are advised to engage in explorative QM practices which contradicts arguments or findings of a general positive impact of explorative QM practices on performance (Hendricks and Singhal, 1997).

Second, the simultaneous pursuit of both practices does not necessarily contribute to increasing performance. This finding is in contrast to views that for QM practices to enhance performance they always must be considered holistically and combined (He and Wong, 2004; Kaynak and Hartley, 2005). Hence, our findings do not support the notion that for QM practices to improve performance they need to function as a whole rather than through its constituent elements. In fact, the simultaneous use of both, exploitative and explorative QM practices in general rather seems to involve the risk of disorientation (Aghajari and Amat Senin, 2014) and does not inevitably contribute to performance. The significant efforts and costs needed for pursuing both practices simultaneously are only fruitful if combined with a hybrid competitive strategy focus as we will discuss later.

Third, as research remains inconclusive in regards to the role of context factors that may condition the performance impact of QM practices (Nair, 2006), we contribute to filling this gap in the research landscape. Our results show that exploitative QM practices are of particular relevance for cost leaders, while explorative QM practices are advantageous for firms pursuing a differentiation strategy. Strategically hybrid firms benefit from the simultaneous pursuit of both QM practices to increase their performance. Precisely, for strategically ambidextrous firms (even when the separate QM-performance effects are not significant) the simultaneous use of QM practices, when assessing their interaction, is stronger as compared to differentiators. This supports the current efforts (Sousa and Voss,

2001) and calls in research (Dow *et al.*, 1999; Nair, 2006; Sousa and Voss, 2008; Herzallah *et al.*, 2017) to account for the context within which QM practices are used to affect performance, as our findings substantiate that the performance impact of QM practices is conditional on a firm's competitive strategy focus. Hence, this present study is among the few studies testing contingencies, such as regional differences (Adam *et al.*, 1997), competitive scope and intensity (Das *et al.*, 2000), similarly market turbulence, competitive intensity and technological turbulence (Wang *et al.*, 2012), and experience with TQM (Brah *et al.*, 2000) and introduce a stronger competitive strategy focus to the QM literature.

Finally, building on recent thinking by Herzallah *et al.* (2017), we adapt and further develop their work and explain how a firm's competitive strategy focus (i.e., drawing on Porter's classification of competitive strategy foci) conditions the performance impacts of QM practices. We reason that QM practices do not determine how a firm develops its strategy. Instead, we argue that the *direct* impacts of a firm's QM practices on performance are conditioned by the competitive strategy that it pursues (i.e., differentiation, cost leadership, hybrid). That is, beyond arguing that the performance impacts of exploitative and explorative QM practices are moderated by the firm's competitive strategy focus, in addition we also more explicitly examine: a) their combined performance impact by incorporating the interaction effect of the two QM practices. This allows assessing both, the individual effects of exploitative and explorative QM practices, as well as the effect that a combination of the two practices has, on performance (Herhausen, 2016) advancing recent conceptualizations (Herzallah *et al.*, 2017); and b) we explicitly account for firms that have a hybrid strategic focus in which both differentiation and cost leadership are pursued. We encourage authors to further discuss and amend these two different conceptualizations opened up in the QM literature.

5.2. Implications for management

Firms within the pharmaceutical industry are characterized by high pressures for integration due to high fixed costs such as R&D (i.e., cost leadership) and high pressures for responsiveness due to high regulation in different environments (i.e. differentiation). Thus, pharmaceutical firms can presumably benefit from a hybrid competitive strategy focus that involves elements of both cost leadership and differentiation (Fortanier *et al.*, 2007). Looking at the performance levels reached by different firms in our sample, this seems to be supported as hybrids show the highest performance ratings, followed by differentiators and then (with a below average performance) cost leaders. Yet, for all strategic foci pursued, managers need to understand which QM practices enhance performance given the competitive strategy pursued. Hence, while a firm's competitive strategy focus will need to align with industry pressures, QM practices need to fit with the pursued strategic focus to be effective.

Our results confirm a positive association between exploitative QM practices and performance. While this is a more generic recommendation, it holds especially true for firms pursuing a cost leadership strategy. They will more than other firms profit from exploiting operations (e.g., by controlling and improving the efficiency of existing operational processes) and product related QM practices (e.g., by investing into improving the reliability of existing products and the quality of existing customer relationships). This is different for explorative QM practices. In light of constrained budgets, only firms pursuing a differentiation strategy are advised to invest into innovative manufacturing and supply chain processes as well as in new/innovative products for customers. For these firms, novelty both in operations and products is key to gain competitive advantage and enhance performance (this corresponds to the findings in Fuentes Fuentes *et al.* (2006)). Finally, the rather high efforts and costs needed for pursuing both QM practices simultaneously are only fruitful if combined with a hybrid competitive strategy focus. Hybrid firms can increase their

performance by focusing simultaneously on both types of QM practices. This is interesting in light of the findings of Douglas and Judge (2001) which provide evidence of a positive contingency effect of the QM and performance relationship for firms fostering both structural control and structural exploration, i.e. in firms working synergistically with both types of structure.

5.3. Limitations and directions for further research

As with any empirical research, our study is not without limitations regarding the construct measurement and the sample. With regards to the constructs focused on, we analyzed an overall performance construct covering three facets (namely the growth of revenue, net income and market share). Distinguishing between short- and long-term performance or cost- and revenue-related performance might be fruitful for future research, as well. We argue that this is fruitful, as, for instance, the effect of explorative QM practices on performance may take a longer time horizon – than the one considered in this study – to unfold or to be measurable in empirical settings which may have impacted our results. Furthermore, future studies may want to expand on the measurement of explorative and exploitative QM practices and, in addition to the process and product foci, may want to add further aspects, such as a team or training focus. Second, the only contextual factor focused on in this study is a firm's competitive strategy focus; in this sense, further research could examine whether other kinds of firm-specific or environmental factors condition the performance impact of certain QM practices (e.g., Auh and Menguc, 2005; Sitkin *et al.*, 1994). Caution should be exercised however, because including too many contextual factors may limit generalizability of the findings and comparisons with other studies (Sousa and Voss, 2008). With regards to the sample, we studied German pharmaceutical firms. Hence, there might be institutional aspects that condition our results such that results could differ across countries and/or industries.

Further research could also be conducted in different industries and countries with a view to assess whether the main findings can be replicated. In this regard, future research might investigate how institutional factors affect the performance impact of QM practices. Thus, linking the results with the new institutional economy is an interesting way to expand the research reported here. Moreover, analyzing the results in a longitudinal framework would allow better understanding whether the temporal sequencing of QM practices matters (as often called for in the field, e.g., see Fynes and Voss, 2002). Finally, we consider mixed methods approaches in which quantitative analyses are combined with in-depth qualitative findings a fruitful avenue to enrich more generalizable findings with a deeper exploration of specific firm contexts.

6. CONCLUSION

We advocate consideration of two crucial perspectives into understanding the performance impact of QM practices. First, rather than viewing QM as a unidimensional, holistic concept, we distinguish exploitative QM practices from explorative ones and substantiate that evaluating the separate performance impacts as well as their combined one is important. Second, we demonstrate that to fully understand the performance impact of QM practices they need to be studied conditional on the context within which they function. We show that aligning QM practices within the competitive strategy focus that a firm pursues is important to benefit from certain QM practices.

The findings of our study are valuable to managers as they provide clear guidance on when to use which kind of QM practices (i.e., exploitative QM practices, explorative QM practices, or both). In using effective QM practices, managers should be aware of the different effects QM practices have conditional on the competitive strategy focus a firm has chosen.
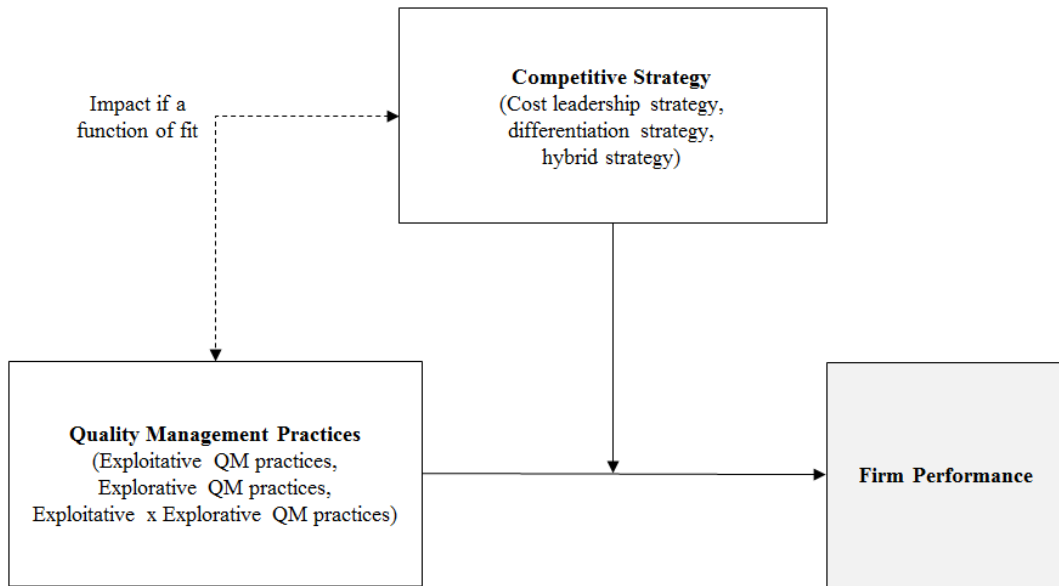
Figure 1. Conceptual model
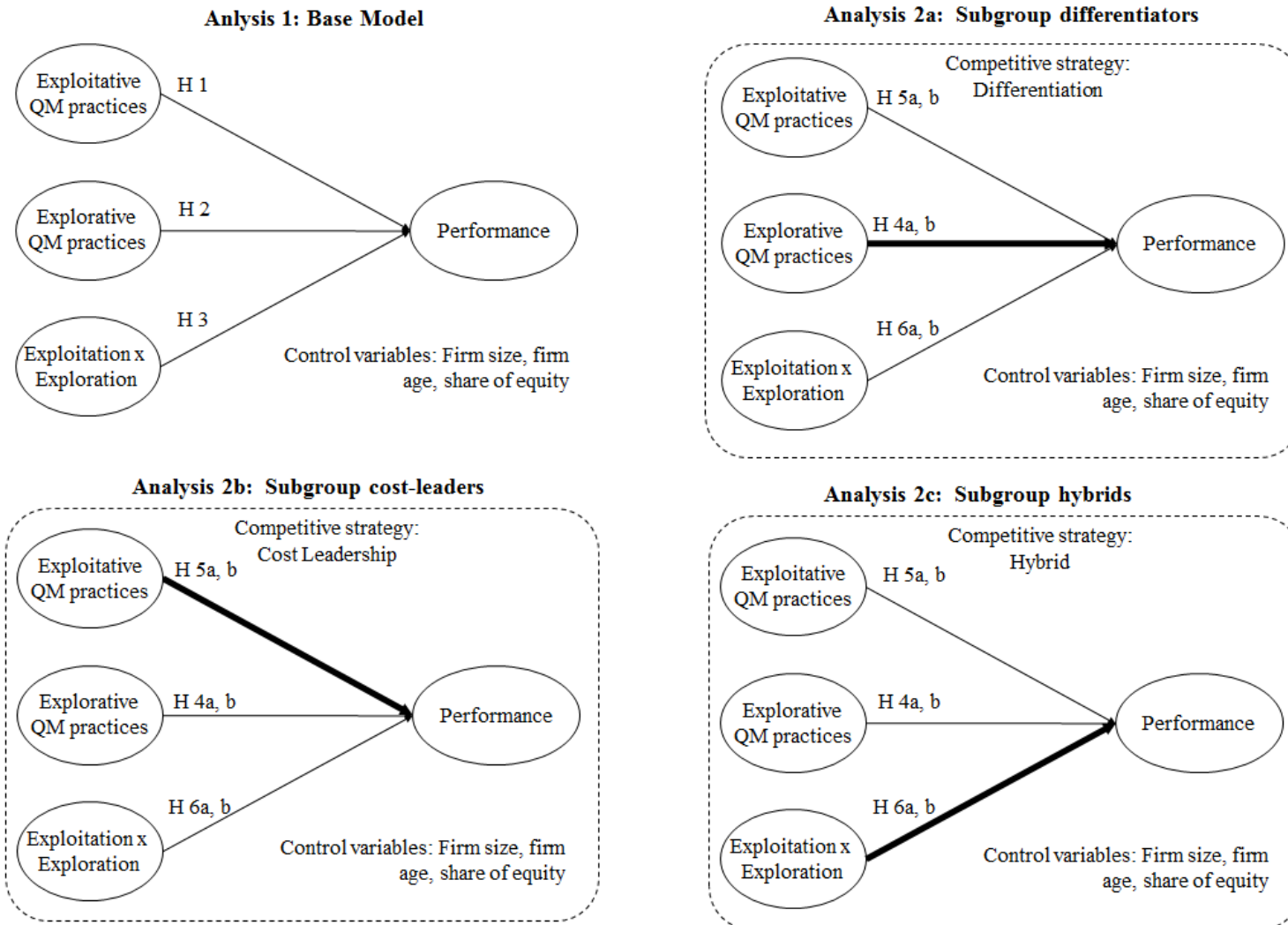
Figure 2. Analysis approach to hypotheses testing

Table 1. PLS-SEM analysis: Base model

Relationship	Path coefficient	*p*-value	VIF	f^2
Exploitative QM practices → Perf	0.297***	0.000	1.646	0.072
Explorative QM practices → Perf	0.113	0.124	1.390	0.012
Exploitative x Explorative → Perf	0.009	0.883	1.105	0.000
Firm size → Perf	0.204**	0.010	1.397	0.040
Firm age → Perf	-0.063	0.428	1.009	0.005
Share of equity → Perf	0.021	0.638	1.004	0.001
R^2	0.253			
Q^2	0.180			

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Perf = performance.

Table 2. PLS-SEM analysis: Contextualized model – group results

Relationship	Differentiators		Cost Leaders		Hybrids	
	Path coefficient	*p*-value	Path coefficient	*p*-value	Path coefficient	*p*-value
Exploitative QM practices → Perf	-0.110	0.596	0.321*	0.005	0.162	0.302
Explorative QM practices → Perf	0.382**	0.021	0.044	0.770	0.133	0.394
Exploitative x Explorative → Perf	-0.263	0.253	-0.065	0.581	0.219	0.194
Firm size → Perf	0.135	0.416	0.177	0.203	0.254	0.246
Firm age → Perf	0.105	0.355	0.050	0.797	-0.341***	0.002
Share of equity → Perf	-0.108	0.527	0.066	0.427	-0.166	0.183
R^2	0.239		0.206		0.384	

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Perf = performance. For the differences in the PLS-MGA, additionally: * $p > .9$; ** $p > .95$; *** $p > .99$. Significant probability levels for the delta in path coefficients depend on the directionality of the effect.

Table 3. PLS-MGA: Contextualized model – group differences

Relationship	Cost Leaders – Differentiators		Cost Leaders – Hybrids		Differentiators - Hybrids	
	Δ Path coefficients	*p*-value	Δ Path coefficients	*p*-value	Δ Path coefficients	*p*-value
Exploitative QM practices → Perf	0.431**	0.038	0.159	0.194	0.272	0.857
Explorative QM practices → Perf	0.337*	0.940	0.089	0.663	0.248	0.130
Exploitative x Explorative → Perf	0.198	0.215	0.284*	0.913	0.482**	0.950
Firm size → Perf	0.042	0.428	0.077	0.667	0.118	0.710
Firm age → Perf	0.054	0.577	0.392**	0.044	0.446***	0.005
Share of equity → Perf	0.174	0.178	0.232*	0.058	0.058	0.389

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Perf = performance. For the differences in the PLS-MGA, additionally: * $p > .9$; ** $p > .95$; *** $p > .99$. Significant probability levels for the delta in path coefficients depend on the directionality of the effect.

Appendix A. Research Constructs and Items

Construct	Definition	Items	References
Differen-tiation Strategy	A differentiation strategy is characterized by providing unique products that create a competitive advantage by increasing the perceived value of the product in customers' minds. By focusing on specialized products, emphasizing products or services for high priced market segments and building and improving brand reputation, firms are able to achieve a competitive advantage over their rivals (Acquaah and Yasai-Ardekani, 2008).	Focus on specialized products

Offering unique products

Serving high-priced market segments

Reputation in industry | (See also Gabrielsson *et al.*, 2016; Powers and Hahn, 2004; Qi *et al.*, 2011; Santos-Vijande *et al.*, 2012) |
| Cost leadership strategy | Following a cost leadership strategy would imply lowering costs and focusing on low-priced market segments. Thus, by pricing below competitors, firms can compete in prices, which would contribute to gaining a competitive advantage (Ruiz-Ortega and García-Villaverde, 2008). | Lowest cost per unit

Pricing below competitors

Low-priced market segments | (See also Acquaah and Yasai-Ardekani, 2008; Amoako-Gyampah and Acquaah, 2008; Pelham and Wilson, 1996; Pertusa-Ortega *et al.*, 2010; Qi *et al.*, 2011) |
| Firm performance | Performance is divided into financial performance operationalized with indicators such as growth in revenues and net-income/profits. Furthermore from a non-financial (and more long-term) perspective performance is operationalized with indicators such as market shares (Venkatraman and Ramanujam, 1986; Roth and Morrison, 1990). | Revenue growth

Net income growth

Market share growth | (See also Brah *et al.*, 2000; Demirbag *et al.*, 2006; Douglas and Judge, 2001; Yusuf *et al.*, 2007) |
| Exploitative QM practices | Exploitative QM practices aim to control, yet also to improve existing processes. From a customer perspective, they comprise the identification and assessment of customer needs or the development of a better understanding of customer expectations (Zhang *et al.*, 2012). | Strict quality control

Process orientated R&D

Extensive customer contact/ service | (See also Ahire and Dreyfus, 2000; Brah *et al.*, 2000; Choi and Eboch, 1998; Demirbag *et al.*, 2006; Douglas and Judge, 2001; Forza and Filippini, 1998; Gadenne and Sharma, 2009; Lakhal *et al.*, 2006; Merino-Díaz De Cerio, 2003; Molina *et al.*, 2007; Sharma, 2006) |
| Explorative QM practices | Explorative QM practices refer to variation, discovery, and innovation activities. They comprise the improvement of processes and products (Zhang *et al.*, 2012). | Innovation in manufacturing process

New product development

Develop and refine established products | (See also Arauz *et al.*, 2009; Fuentes Fuentes *et al.*, 2006; Fuentes-Fuentes *et al.*, 2004; Merino-Díaz De Cerio, 2003) |

Appendix B1. Measures

Construct (Source)	Items	Loading	Item reliability	AVE	Composite reliability (α)	HTMT- (BcA-) confidence interval includes 1
Performance (Survey)	Revenue growth Net income growth Market share growth	0.90 0.85 0.92	0.81 0.72 0.85	0.79	0.92 (0.87)	No
Exploitative QM practices (Survey)	Extensive customer service Process orientated R&D	0.77 0.73 0.71	0.59 0.53 0.50	0.54	0.78 (0.58)	No
Explorative QM practices (Survey)	Strict quality control Develop and refine established products Innovation in manufacturing process New product development	0.82 0.65 0.86	0.67 0.42 0.74	0.61	0.82 (0.67)	No
Firm size (Financial report)	Number of employees (log) Total assets (log)	0.92 0.72	0.85 0.52	0.69	0.81 (0.57)	No
Firm age (Financial report)	Years since establishment	1.00				
Share of equity (Financial report)	Equity/total assets	1.00				

Appendix B2. HTMT Criterion Results

	Performance	Exploitative QM practices	Explorative QM practices
Performance			
Exploitative QM practices	0.63 [0.47; 0.77]		
Explorative QM practices	0.44 [0.26; 0.61]	0.83 [0.64; 0.99]	

All HTMT criterion results are below the more conservative critical level of 0.85; also, the 95% bias-corrected and accelerated (BCa) bootstrap confidence intervals (i.e., based on 5,000 bootstraps) indicate that the HTMT values are significantly lower than 1. None of the intervals includes 1 (see also the table above). Hence, discriminant validity has been established.

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