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**Proactive Entrepreneurial Behaviour, Market Orientation,  
and Innovation Outcomes: A Study of Small- and Medium-  
sized Manufacturing Firms in the UK**

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"Proactive Entrepreneurial Behaviour, Market Orientation, and Innovation Outcomes: A Study of Small- and Medium-sized Manufacturing Firms in the UK"

Thank you very much for giving us more opportunity to revise and resubmit our work. We felt these 5 sets of comments (Editor Yang and four anonymous reviewers) were genuinely helpful and relevant. We have tried to address all of these and explain how we do so in the revision report. We highlight our changes in "blue colour text" to make our changes visible.

We feel that the revised version is consequently much improved and its relevance to EJM hopefully clearer. We are however willing to do more alterations if you or our referees felt we had misunderstood their requests and/or had new suggestions to enhance the readability and relevance of the study to EJM readers.

Author(s)

### General Comments

[Editor Yang] After carefully reading your manuscript and the review reports, I would recommend a conditional acceptance.

[Reviewer: 1] Recommendation: Accept Additional clarifications on the revised paper further strengthen the insights offered by the paper, which justify its publication. Additional literature further demonstrate author(s) deep appreciation of the literature in the area. The methodology adopted is appropriate in exploring the hypothesized nexus. Sure, the findings are well consistent with the themes of the paper. Both the theory and practice implications are adequately demonstrated. The paper has benefited from further editing and clarifications that enhanced its readability and comprehension.

[Reviewer: 3] Recommendation: Accept. The paper offers new information on the relationship between PEB and NPD and the factors affecting it to be curvilinear. The authors have added more discussion on relevant literature in the revised version and, thus, the literature review covers well the prior research on the subject. The authors have revised the manuscript and addressed my prior concerns in this area adequately. As I already stated in my prior review the analysis and results are presented clearly and conclusions tie the elements of the paper adequately. Are these implications consistent with the findings and conclusions of the paper?: The paper identifies clear implications for both practice and further research and they are in line with the findings and conclusions. The manuscript has been copy-edited.

[Reviewer: 4] Recommendation: Accept. The paper contains new and significant information adequate to justify publication. The paper demonstrates an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources. The paper's

argument built on an appropriate base of theory. The results presented clearly and analysed appropriately. The paper identify clearly any implications for practice and/or further research. The paper clearly expresses its case, measured against the technical language of the fields and the expected knowledge of the journal's readership.

*[Author Replies]:* We want to address the above four encouraging comments by taking this opportunity to thank Editor Yang and the three anonymous referees' constructive comments and encouraging words for our efforts.

### Revision Time

[Editor Yang] Please address the concern raised by the reviewer who rejected your paper. If you commit to making these changes, I will editorially review the paper, without sending it to further review, and I am happy to commit to publishing the paper if the minor corrections are carried out. However, please provide a document of changes for my benefit, and make it very clear how you have responded. Furthermore, as these are relatively minor revisions, it will be in your interest to try to complete them as quickly as possible.

*[Author Replies]:* Thank you for the encouraging remarks. We are trying our best to address reviewer 2's comments in the timely fashion. Please see our responses below.

### Constructs - PEB

[Reviewer: 2] Pioneering orientation items = Proactive Entrepreneurial behavior items. You argue that you did research and you gathered primary data, but the measuring items that you used are not true. Yes, but their attempt just for publishing paper, not for doing research well and observe scientific base. Measurement is wrong

*[Author Replies]:* We are very grateful for these comments. To address these comments, we take multiple approaches.

- We revisit our survey design to ensure that all the items that listed in the appendix are consisted with the questions that we sent out to our respondents. We caught some minor differences and correct our appendix accordingly. In particular, for PEB, we found out that the questionnaires sent out to the respondents (final version), does not include the example instructions – (i.e. develop new products) for the first and third items for PEB measurements.
  - We typically initiate actions (~~i.e. develop new products~~) to which our competitors then respond.
  - When facing uncertainty, we typically adopt a proactive posture (~~i.e. introduce new products~~) in order to seize potential opportunities.

This correction actually makes our measurements reflect more on a firm's strategic posture of positioning itself in anticipation of changes in the market by taking an

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3 active role to sharp the future state of its external environment. We are very grateful  
4 that reviewer raised this concern (see Changes made in the appendix).

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6 • We add a footnote to further differentiate between PEB and pioneering orientation  
7 behavior. In particular, we suggest that PEB refers to an array of strategic actions  
8 includes initiation of competitive actions, introduction of new products, and proactive  
9 operating techniques (Covin and Slevin, 1989; Nasution et al., 2011). Pioneering  
10 behaviors place more emphasis on a firm's strategy to become the first one to offer a  
11 distinctively new product to the market (Covin et al., 2000; Mueller et al., 2012).  
12 Thus, the concept of PEB contains the ideas of pioneering behaviors (Lumpkin and  
13 Dess, 1996; Mueller et al., 2012). Focusing on PEB allow us to capture a broader  
14 scope of a firm's strategic posture of positioning itself in anticipation of changes in  
15 the market by taking an active role to sharp the future state of its external environment  
16 (Kreiser et al., 2013; Lumpkin and Dess, 1996). The reason that we add this  
17 discussion in the footnote, instead of main-text, is because this paper is about PEB,  
18 not pioneering orientation behaviors. Therefore, we believe that it is better to discuss  
19 their differences in the footnote to avoid confusion for EJM's readers. We hope that  
20 this is ok. If not, we have more than happy to move it in the main-text (see Page 5,  
21 footnote).
- 22 • We carefully revisit our entire arguments to ensure that they all reflect to PEB, instead  
23 of pioneering orientation. We rephrase the sentences, if it is not clear (see Changes  
24 made throughout the paper).
- 25 • We provide further detailed discussions about our efforts on ensuring the face validity  
26 of our measurement before going full scale. In particular, to ensure the content and  
27 face validity of the measurement, we conducted a pre-test by obtaining comments  
28 from five representatives from different SMEs. We asked them to verify the relevance  
29 and completeness of our measurement by answering all of the survey items and  
30 provided feedbacks. On the basis of their responses, we then refined the questions,  
31 instructions and terminology in light of their suggestions and finalized the survey.  
32 (see Page 15, 2<sup>nd</sup> paragraph).
- 33 • We recognize that limitations on the survey designed are inevitable and suggest future  
34 researchers can improve the measurement of PEB. More specifically, we suggest that  
35 the independent variable chosen for this study – PEB – we adopted and modified the  
36 scales from existing studies. While we have gone through the necessary procedures to  
37 ensure the face validity, and statistical validity and reliability of our scales, however  
38 they may still not capture PEB sufficiently as the nature of (all types of)  
39 entrepreneurial behaviors is complex (Boso et al., 2012; Kreiser et al., 2013; Lumpkin  
40 and Dess, 1996). Future research should attempt to capture the domain of PEB  
41 construct with much richer and more detailed scales.
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54 Finally, we would like to thank Editor Yang and the four anonymous referees for their  
55 constructive comments to help us further improve our paper. We are however willing to do  
56 more alterations if our referees felt we had misunderstood their requests.  
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**End of Report**

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3 **Proactive Entrepreneurial Behaviour, Market Orientation, and Innovation Outcomes:**  
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5 **A Study of Small- and Medium-sized Manufacturing Firms in the UK**  
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9 **ABSTRACT**  
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11 **Purpose:**

12 Drawing from resource-based theory, we study how and under what conditions small- and  
13 medium-sized firms (SMEs) capitalise on their proactive entrepreneurial behaviour (PEB) to  
14 achieve new product development (NPD) performance.  
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17 **Methodology:**

18 Our data were drawn from a cross-sectional questionnaire survey of 401 UK-based SMEs in  
19 the manufacturing sector.  
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22 **Findings:**

23 We identify an upward curvilinear relationship between PEB and NPD performance. Taking  
24 a step further, we propose and confirm that this curvilinear association arises from, in part,  
25 SMEs' innovation capability, which in turn translates into NPD performance. We also find  
26 that this upward curvilinear relationship between PEB and innovation capability flips to a  
27 downward curvilinear relationship when firms pursue a customer and competitor orientation.  
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30 **Originality:**

31 This paper looks beyond the linear relationship that exists among entrepreneurial behaviour,  
32 market orientation and innovation outcomes.  
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42 **Keywords:** Proactive entrepreneurial behaviour; Innovation capability; New product  
43 development; Customer orientation; Competitor orientation  
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## Introduction

The pursuit of innovation is an important tactic that firms employ to compete in an increasingly dynamic and complex global marketplace (Baker and Sinkula, 2009; Hong et al., 2013; Zhou et al., 2005). This is particularly true for small- and medium-sized firms (SMEs) that lack of resource abundance to compete in mature product markets (Li and Atuahene-Gima, 2001). Thus, researchers have devoted significant attention to identifying the drivers of innovation outcomes (e.g. Laforet, 2009; O'Cass and Weerawardena, 2009). A stream of literature focusses specifically on understanding the role of the entrepreneurial behaviour-market orientation interface (E-MO interface) in facilitating innovation outcomes. At the firm level, both entrepreneurial behaviour and market orientation reflect an organisation's deeply-rooted beliefs and values in relation to resource allocation to achieve strategic objectives. Entrepreneurial behavior<sup>1</sup> is manifested through an organisation's strategic posture to pursue business opportunities, while market orientation is demonstrated by an organisation's strategic behaviour of identifying and responding to market demands (Atuahene-Gima and Ko, 2001; Rhee et al., 2010; Schindehutte et al., 2008). This research aims to extend this literature stream by addressing three important gaps.

First, the extant literature highlights the positive relationship between entrepreneurial behaviour and innovation outcomes (see Table 1). Despite recognising that different types of entrepreneurial behaviour place emphasis on different strategic actions (Covin and Slevin, 1989; Lumpkin and Dess, 1996), most studies still focus on examining the impact of a collection of entrepreneurial behaviours, (which together form a unidimensional entrepreneurial strategic posture) on innovation outcomes. Few studies have taken a step

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<sup>1</sup> It should be noted that a relationship exists between entrepreneurial orientation and entrepreneurial behaviour. Entrepreneurial behaviour reflects different individual salient characteristics that are entrepreneurial in nature (autonomy, risk-taking, etc.). An entrepreneurial orientation comprises various types of independent entrepreneurial behaviour (Atuahene-Gima and Ko, 2001; Covin and Slevin, 1989; Mueller et al., 2012). The most popular form of entrepreneurial orientation embraces three types of entrepreneurial behaviour – proactiveness, innovativeness and risk-taking (Li et al., 2006; Renko et al., 2009).

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3 further to explore how a specific type of entrepreneurial behavior actually affects innovation  
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5 outcomes (See Table 1). Furthermore, recent work shows that the impact of entrepreneurial  
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7 behaviour on firms' business performance may not be linear in nature (Kreiser et al., 2013).  
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9 Thus, the issue of whether entrepreneurial behaviour displays a nonlinear relationship with  
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11 innovation outcomes requires examination. Our study fills this important gap by investigating  
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13 the relationship between proactive entrepreneurial behaviour (PEB) – a specific type of  
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15 entrepreneurial behaviour – and new product development (NPD) performance – an ultimate  
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17 innovation outcome.  
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21 “Insert Table 1 about Here”  
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23 Second, prior studies suggest that firms' entrepreneurial behaviour may not  
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25 automatically lead to innovation outcomes (e.g. Baker and Sinkula, 2009; Hong et al., 2013).  
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27 This raises the necessity of identifying and examining potential mediators that can direct the  
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29 curvilinear impact of entrepreneurial behaviour towards innovation outcomes. In this research,  
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31 we propose that innovation capability acts as a mediator in the PEB-NPD performance  
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33 relationship. We argue that the curvilinear impact of PEB is due to innovation capability,  
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35 which in turn contributes to NPD performance. This is the first study to offer and test the  
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37 indirect curvilinear relationship among PEB, innovation capability, and NPD performance.  
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39 Finally, previous studies suggest that market orientation plays a complementary role in  
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41 strengthening the impact of entrepreneurial behaviour on innovation outcomes (e.g.  
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43 Atuahene-Gima and Ko, 2001; Boso et al., 2012; Schindehutte et al., 2008). However, the  
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45 question of whether this positive moderation effect also occurs if the impact of  
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47 entrepreneurial behaviour is nonlinear in nature remains unexplored. To fill this gap, we  
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49 differentiate between customer orientation and competitor orientation that reflects firms'  
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51 market orientation, and examine their moderating influence on the relationship between PEB  
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53 and innovation capability.  
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## Theoretical Background and Hypotheses

### Literature Review

Many studies have specifically examined the impacts of the E-MO interface on innovation outcomes. We categorise their research foci into three general themes. The first theme focuses on understanding the direct impacts of both entrepreneurial behaviour and market orientation on innovation outcomes (e.g. Frishammar and Åke Hörte, 2007; González-Benito et al., 2015; Tajeddini, 2010). The second research theme explores the intermediate mechanisms whereby the E-MO interface affects innovation (e.g. Baker and Sinkula, 2009; Li et al., 2006; Yu et al., 2016). For example, Hong et al. (2013) show that market orientation affects NPD performance via new product development proficiency and product meaningfulness, while entrepreneurial behaviour orientation affects NPD performance via proficient intellectual property management and product novelty.

The third research theme shifts the focus to the interaction effects of entrepreneurial behaviour and market orientation on innovation outcomes (e.g. Nasution et al., 2011; Thourmrungrroje and Racela, 2013; Verhees and Meulenbergh, 2004). The findings regarding whether or not the interaction between entrepreneurial behaviour and market orientation have a desirable, positive effect on innovation outcomes are subject to controversy. For example, Boso et al. (2012) suggest that entrepreneurial behaviour is more likely to be a driver of innovation success when the market-oriented behaviour is strong. In contrast, Morgan et al. (2015) find that entrepreneurial orientation has a positive impact on NPD performance, but that occurs to a lesser degree when firms simultaneously implement market orientation. To extend these three themes, we look beyond the linear relationship between E-MO interface and innovation outcomes. Building on the resource-based theory, we develop a framework (see Figure 1). We elaborate our discussions below.

“Insert Figure 1 about here”

### **Direct Effect of PEB on New Product Development Performance**

Resource-based theory posits that firms’ unique resources are the key drivers of superior performance (Barney et al., 2011). We conceptualise NPD performance as the dependent variable in our framework. This conceptualisation builds on resource-based theory because, according to this theory, performance variables represent the most common ultimate consequences (Amit and Schoemaker, 1993; Murray et al., 2011). In this research, we examine performance related to the introduction of new products. Specifically, we define NPD performance as the degree of success of the new product introduction regarding financial and market performance, which represents one of the ultimate innovation outcomes (Atuahene-Gima and Ko, 2001; Morgan et al., 2015; Schultz et al., 2013).

The independent variable in our framework is PEB. We define PEB as firms’ strategic decision to take the initiative in anticipating and pursuing new opportunities, which represents an important salient characteristic of entrepreneurial behaviour<sup>2</sup> (Covin and Slevin, 1989; Lumpkin and Dess, 1996). According to resource-based theory, PEB reflects a firm’s deeply-rooted beliefs and values that direct its focus towards creating a first-mover advantage to achieve superior performance (Kreiser et al., 2013; Simon et al., 2002; Song et al., 2000), that considers as an important resource of the firm (Lumpkin and Dess, 1996; Zhou et al., 2005). Scholars have applied this concept to describe an SME’s PEB as its propensity to take

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<sup>2</sup> We distinguish between two similar concepts: PEB and pioneering behaviors. PEB refers to an array of strategic actions includes initiation of competitive actions, introduction of new products, and proactive operating techniques (Covin and Slevin, 1989; Nasution et al., 2011). Pioneering behaviors place more emphasis on a firm’s strategy to become the first one to offer a distinctively new product to the market (Covin et al., 2000; Mueller et al., 2012). Thus, the concept of PEB contains the ideas of pioneering behaviors (Lumpkin and Dess, 1996; Mueller et al., 2012). Focusing on PEB allow us to capture a broader scope of a firm’s strategic posture of positioning itself in anticipation of changes in the market by taking an active role to sharp the future state of its external environment (Kreiser et al., 2013; Lumpkin and Dess, 1996)

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3 the forward-looking stance to shape the business environment (Nasution et al., 2011; Rhee et  
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5 al., 2010; Simon et al., 2002).  
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7 Drawing on resource-based theory, that highlights the resources-performance linkage  
8 (Barney et al., 2011), we anticipate a positive relationship between PEB and NPD  
9 performance. First, firms that place a strong emphasis on acting ahead of the competition in  
10 anticipation of future market demand are more likely to direct their resources to support the  
11 introduction of new products (Covin et al., 2000; Mueller et al., 2012). Second, proactive  
12 firms reflect a spirit of being highly opportunity seeking (Lumpkin and Dess, 1996). Such  
13 firms are more likely to direct their resources to support the development of highly innovative  
14 product features (Simon et al., 2002; Song et al., 2000). Both of these factors suggest that  
15 firms that demonstrate strong PEB often face little competition in the marketplace, because  
16 no other companies have similar products (Lieberman and Montgomery, 1988; Song et al.,  
17 2000). Accordingly, their new products are more likely to meet firms' sales, market share and  
18 profit objectives.  
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34 The positive relationship between PEB and NPD performance may not be linear. In  
35 particular, the positive effect of PEB on NPD performance may be weaker if PEB is low,  
36 while this positive effect may become stronger if PEB is high. Unlike large companies that  
37 can use slack resources to support certain non-current strategy-related actions, SMEs with  
38 limited resources are unlikely to support actions unrelated to their strategies (Mazzarol et al.,  
39 2009; McKelvie and Davidsson, 2009). This means that less proactive SMEs are less likely to  
40 allocate resources to support NPD initiatives because their strategic intentions are not  
41 focusing on introducing new products to seize future opportunities. Therefore, they are less  
42 likely to introduce new products with highly innovative features, and so less likely to achieve  
43 strong NPD performance. Thus, the positive effect of PEB on NPD performance is weaker  
44 when PEB is low. In contrast, highly proactive SMEs are more likely to invest substantial  
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resources in supporting NPD initiatives. They are more likely to introduce new products with highly innovative features, which in turn increase the likelihood of achieving strong NPD performance. Furthermore, when highly proactive SMEs constantly engage in NPD-related activities, their ability to evaluate and use new technologies in NPD will improve (Lieberman and Montgomery, 1988; Zhou and Wu, 2010). As a result, they are more able to develop better products with more innovative features, which in turn foster NPD performance. Therefore, PEB may facilitate positive NPD performance at an accelerating rate, when SMEs have strong proactiveness. Collectively, we predict,

Hypothesis 1: PEB has an upward curvilinear relationship with NPD performance in the SME context.

### **Mediating Role of Innovation Capability**

In this study, we propose that innovation capability serves as a mediator between PEB and NPD performance. Innovation capability<sup>3</sup> reflects firms' capacity to develop new solutions and perform innovation activities (Calantone et al., 2002; Ngo and O'Cass, 2012). This consideration is based on the recent extension of resource-based theory, that posits that firms' unique and valuable resources do not automatically lead to superior performance (Murray et al., 2011; Zhou et al., 2008). Instead, firms can use their resources to create certain organizational capabilities, which enable them to perform value-creating tasks effectively and achieve superior performance (Amit and Schoemaker, 1993; Teece et al., 1997). Applying this resource-capability-performance framework, this study proposes

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<sup>3</sup> We distinguish between innovative behaviour (innovativeness) and innovation capability. Innovative behaviour describes firms' deeply-rooted belief and values that direct their focus towards engaging in and supporting innovative activities such as experimentation and NPD (De Clercq et al., 2016; Lumpkin and Dess, 1996). Innovation capability describes firms' capacity to perform innovative activities (Calantone et al., 2002; Ngo and O'Cass, 2012). Thus, innovative behaviour reflects firms' strategic posture, that involves a propensity to be innovative, and so form a type of entrepreneurial behaviour. Innovation capability, on the other hand, represents a type of organisational capability that enables firms to perform value-creative tasks (i.e. innovation activities) effectively. Therefore, we do not consider innovation capability to be a type of entrepreneurial behaviour in this study.

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3 innovation capability to be the type of organizational capability that mediates between PEB  
4 (resources) and NPD performance (performance). This perspective builds on prior research  
5 that emphasized the important contribution of innovation capability to an NPD program's  
6 success (e.g. Ngo and O'Cass, 2012; Verhees and Meulenbergh, 2004), and that PEB drives the  
7 engagement of innovation activities (e.g. Covin et al., 2000; Kreiser et al., 2013).  
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12 We expect a positive relationship between PEB and innovation capability. This  
13 consideration reflects the resource-capability link (Amit and Schoemaker, 1993; Murray et al.,  
14 2011). As firms accumulated rich experience in a particular field, they develop deeper  
15 knowledge and complex routines that enable them to perform field-specific activities and  
16 solve field-specific problems, upon which the (field-specific) capability is based (Levinthal  
17 and March, 1993; Zollo and Winter, 2002). Applying this to our study context, the  
18 development of innovation capability requires firms to accumulate experience through  
19 repeatedly performing innovation-related activities (such as NPD) and develop a deeper  
20 understanding of how they can perform such activities effectively and efficiently (Ngo and  
21 O'Cass, 2012; Teece et al., 1997). PEB constitutes an organizational resource (Lumpkin and  
22 Dess, 1996; Zhou et al., 2005) that direct firms' focus towards initiating NPD programmes in  
23 order to anticipate and pursue new opportunities (Lumpkin and Dess, 1996; Mueller et al.,  
24 2012), and innovation-related activities lie at the heart of such processes (Li and Atuahene-  
25 Gima, 2001; Ngo and O'Cass, 2012). As a result, proactive firms are more likely to acquire  
26 significant experience related to innovation-related activities and develop a strong innovation  
27 capability.  
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32 This positive relationship between PEB and innovation capability may not be linear in  
33 the SME context. Due to resource constraints, SMEs are less likely to invest substantial  
34 resources in supporting organisation-wide activities, if these are inconsistent with their  
35 strategic focus (Mazzarol et al., 2009; McKelvie and Davidsson, 2009). Applying this logic,  
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3 we argue that it is unlikely for less proactive SMEs to allocate many resources to supporting  
4 innovation-related activities because being proactive by introducing new products to seize  
5 new opportunities is not their strategic focus. As a result, they are less likely to accumulate  
6 rich innovation-related experience or develop a strong innovation capability. Thus, the  
7 positive effect of PEB on innovation capability is weaker when PEB is low. In contrast,  
8 highly proactive SMEs are more likely to invest substantial resources in supporting  
9 innovation-related activities to enable them to introduce new products to the marketplace  
10 frequently and so are more likely to accumulate significant innovation-related experience.  
11 Furthermore, as SMEs build up their experience related to innovation activities, they become  
12 more competent regarding organizing innovation-related experience due to the positive link  
13 between experience and learning (Levinthal and March, 1993; Zhou and Wu, 2010). This  
14 self-reinforcing nature makes SMEs more efficient at integrating new innovation-related  
15 experience into their existing knowledge base. Thus, we argue that PEB facilitates innovation  
16 capability at an accelerating rate, when SMEs are proactive.  
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34 We also expect that firms' innovation capability positively affect their NPD  
35 performance. Organisational capabilities enable firms to perform value-creating tasks more  
36 effectively than their competitors (Amit and Schoemaker, 1993; Barney et al., 2011). SMEs  
37 that possess an innovation capability perform innovation activities more efficiently than their  
38 competitors (Calantone et al., 2002; Ngo and O'Cass, 2012). As a result, they are more likely  
39 to develop new products with more innovation features to meet their customers' needs  
40 (Simon et al., 2002; Song et al., 2000). Combining the above arguments, the relationship  
41 among PEB, innovation capability, and performance reflects the resource-capability-  
42 performance link. According to resource-based theory scholars, firms' resources can be used  
43 to support the development of their capacity to perform value-creating tasks (capability) to  
44 improve performance (Amit and Schoemaker, 1993; Murray et al., 2011). Drawing on this  
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3 logic, we suggest that innovation capability should function as a critical intermediate  
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5 mechanism that connects PEB with NPD performance. This upward curvilinear association is  
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7 due to the influence of PEB on innovation capability, which in turn translates into SMEs'  
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9 NPD performance.  
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11 Hypothesis 2: Innovation capability mediates the relationship between PEB and NPD  
12 performance, whereas PEB has an upward curvilinear effect on innovation capability,  
13 and innovation capability has a positive linear effect on NPD performance within the  
14 SME context.  
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### 17 18 **Contingent Role of Market Orientation** 19

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21 Prior work on the resource-capability-performance framework also shows that a range  
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23 of contingency factors may influence the relationship between resources and capability  
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25 (Murray et al., 2011; Zhou et al., 2008). Drawing on this aspect of resource-based theory, we  
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27 further conceptualise two dimensions of market orientation – *customer orientation* and  
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29 *competitor orientation* – as the moderating variables. Customer orientation emphasises the  
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31 role of sufficiently understanding the target customers, while competitor orientation focusses  
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33 on understanding and responding to the competitors' strategies (Gatignon and Xuereb, 1997;  
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35 Zhou et al., 2007). Although both dimensions describe an aspect of corporate culture that  
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37 prioritises the use of market intelligence to create and deliver superior value, they represent  
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39 different norms and beliefs that guide firms' actions (Gatignon and Xuereb, 1997). Zhou et al.  
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41 (2007) suggest that customer-oriented firms focus on analysing their customers' needs and  
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43 wants, while competitor-oriented firms focus on matching the marketing initiatives of their  
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45 competitors. In relation to our study, the prior work suggest that firms' innovation strategies  
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47 may vary in shape depending on whether firms choose to focus on their customers or their  
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49 competitors (Gatignon and Xuereb, 1997; Spanjol et al., 2012; Zhou et al., 2005).  
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54 We predict that customer orientation moderates the upward curvilinear relationship  
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56 between PEB and innovation capability within the SME context. In particular, we posit that  
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3 customer orientation may intensify the positive effect of PEB on innovation capability when  
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5 SMEs have relatively weak PEB. This is because pursuing customer orientation helps less  
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7 proactive SMEs to gain more customer insights (Gonzalez-Benito et al., 2009; Schindehutte  
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9 et al., 2008), which in turn reveals the importance of addressing customers' needs through  
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11 innovation (Song et al., 2000; Zhou et al., 2005). Therefore, they will start to allocate  
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13 resources towards engaging innovation-related activities, which subsequently allows them to  
14  
15 accumulate innovation-related experience. The accumulation of innovation-related  
16  
17 experience allows firms to gain insights into refining and improving the innovation processes  
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19 that serve to improve firms' innovation capability. As a result, the relationship between PEB  
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21 and innovation capability intensifies when SMEs' PEB is relatively weak.  
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25 Customer orientation coupled with strong PEB may also improve SMEs' innovation  
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27 capability. The pursuit of customer orientation enhances proactive SMEs' efforts in collecting  
28  
29 and analysing customer information (Raju et al., 2011), and thus they become better able to  
30  
31 anticipate their customers' needs. This will inspire proactive SMEs to engage more strongly  
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33 in innovation activities related to developing and introducing new products because they find  
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35 taking active role in shaping the future state of their external environment attractive  
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37 (Lieberman and Montgomery, 1988; Lumpkin and Dess, 1996). Such movements will enable  
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39 proactive SMEs to accumulate significant experience about innovation, which in turn fosters  
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41 the enhancement of innovation capability. In general, we argue that proactive SMEs are more  
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43 like to develop a strong innovation capability when customer orientation is strong.  
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47 Combining the above arguments, we predict:

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49 Hypothesis 3: The upward curvilinear effect of PEB on innovation capability is  
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51 stronger (steeper) when customer orientation is high within the SME context.  
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54 On the other hand, we predict that competitor orientation weakens the upward  
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56 curvilinear relationship between PEB and innovation capability within the SME context. In  
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3 particular, we argue that competitor orientation weakens the effect of PEB on innovation  
4 capability when SMEs' PEB is relatively weak. Less proactive SMEs already engage in fewer  
5 innovation-related activities, because they do not consider actively seeking to redefine their  
6 market a high strategic priority (Lumpkin and Dess, 1996; Mueller et al., 2012). When  
7 pursuing competitor orientation, monitoring and responding to competitors' actions become  
8 high priority activities for SMEs (Gatignon and Xuereb, 1997; Zhou et al., 2007). When  
9 SMEs face resources constraint, less proactive SMEs will tend to shift resources from  
10 backing low strategic priority activities towards supporting activities with a high strategic  
11 priority. This means that less proactive SMEs will further reduce their engagement in  
12 innovation-related activities, which in turn reduces their innovation capability. Thus, the  
13 effects of PEB on innovation capability are likely to be lower for SMEs that are less proactive.  
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27 Competitor orientation also weakens the relationship between PEB and innovation  
28 capability when SMEs' PEB is relatively strong. When proactive SMEs pursue competition  
29 orientation, their focus is on responding to their existing competitors' movements (Gatignon  
30 and Xuereb, 1997; Spanjol et al., 2012). As a result, they only develop products that can  
31 compete with those of their competitors. Even though SMEs still proactively introduce new  
32 products, the range of products becomes narrower. This means that proactive SMEs are less  
33 likely to accumulate very much new innovation-related experience. This subsequently  
34 reduces SMEs' chances of combining new innovation-related experiences with their existing  
35 knowledge base about innovation to improve their innovation capability. In general, PEB will  
36 have less effect on innovation capability when SMEs have strong PEB. Combining the above  
37 arguments, we predict:  
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51 Hypothesis 4: The upward curvilinear effect of PEB on innovation capability is  
52 weaker (flatter) when competitor orientation is high within the SME context.  
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## 56 Research Method

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### Measurement and Data Collection

Our data were drawn from a cross-sectional questionnaire survey of UK-based SMEs in the manufacturing sector. We adopted a survey data collection design because 1) no secondary data are available for the key constructs relevant to our test model (see Figure 1) and 2) it allows us to develop a generalizable conclusion about a specific pattern of behaviour by assessing a large number of respondents across different categories (i.e. manufacturing business areas) (Hair et al., 2010). SME manufacturing firms were chosen for this study for two reasons. First, it is very difficult for SME manufacturing firms to compete with large manufacturing firms in the mature marketplace due to their limited resources, so pursuing an innovation strategy is one way to overcome this challenge (Li and Atuahene-Gima, 2001; O'Cass and Weerawardena, 2009). The typical types of innovation that manufacturing firms pursue includes product innovation, process innovation and managerial (or administrative) innovation (Kim et al., 2012). Second, developing and introducing new products quicker and earlier than competitors is a key source of competitive advantage for manufacturing firms (Lieberman and Montgomery, 1988; Song et al., 2000).

We measured all of the variables using multi-item, Likert-type scales adopted from existing studies (see Appendix 1). For *PEB*, we adopted and modified measurement items from prior studies to assess the extent of anticipated changes in the market and firms' active role in shaping the future state of their environment (e.g. Covin and Slevin, 1989; Frishammar and Åke Hörte, 2007; Nasution et al., 2011). We adopted and modified *customer orientation* (the behaviour and beliefs that place a priority on identifying, monitoring and responding to customers' needs) and *competitor orientation* (the behaviour and beliefs that place a priority on identifying, monitoring and responding to competitors' actions) measurements from Spanjol et al. (2012), Narver and Slater (1990) and Gatignon and Xuereb (1997). For *innovation capability*, we used and modified the scale proposed by Ngo and

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3 O'Cass (2012) to assess firms' ability to perform innovation activities (related to  
4 product/services, production processes and management) in comparison to their competitors.  
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7 For *NPD performance*, we adopted and modified the scale proposed by Schultz et al. (2013)  
8 to capture the effect of NPD efforts on profitability, revenue generation and market share. We  
9 use a subjective measure of relative performance because 1) studies show the convergent  
10 validity of subjective and objective performance, 2) objective financial measurement may be  
11 biased according to their purpose, 3) it is difficult to acquire objective measurements in the  
12 SME setting, and 4) managers' subjective perceptions primarily drive managerial decisions  
13 (Gatignon and Xuereb, 1997; Narver and Slater, 1990).  
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23 Finally, based on the prior literature (Gatignon and Xuereb, 1997; Schultz et al., 2013;  
24 Spanjol et al., 2012), six control variables are included in the model: firm size (based on  
25 revenue), age, employee number, product type (within the manufacturing sector), competitive  
26 intensity, market turbulence, and technology turbulence in the model. We applied log  
27 transformation for firm size, age, and employee number. The product types are dummies that  
28 use "others" as the benchmark group. We adopted and modified two items to assess  
29 competitive intensity from Zhou et al. (2005). A sample item is "the competition in our  
30 industry is cutthroat". Finally, we used three items to assess market turbulence and two items  
31 to assess technological turbulence from Schultz et al. (2013). A sample item for market  
32 turbulence is "customer preferences change rapidly", while a sample item for technological  
33 turbulence is "the technology in our industry is changing rapidly". Furthermore, we also  
34 employed innovation orientation as a control variable in this study in order to identify the  
35 unique contribution of a firms' innovation orientation to firm NPD performance (Gatignon  
36 and Xuereb, 1997; Zhou et al., 2005), as well as the development of innovation capability  
37 (Siguaw et al., 2006). We used and modified three items proposed by Stock and Zacharias  
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(2011) to assess firms' innovation orientation. A sample item is "The aim of our company is to generate innovative products".

To ensure the content and face validity of the measurement, we conducted a pre-test by obtaining comments from five representatives from different SMEs. We asked them to verify the relevance and completeness of our measurement by answering all of the survey items and provided feedbacks. On the basis of their responses, we then refined the questions, instructions and terminology in light of their suggestions and finalized the survey. We contacted a marketing company and searched for contact information for UK-based SMEs in the manufacturing sector. We then sent a cover letter to the firm's general manager (or CEO) to ask him/her to complete the questionnaire on behalf of that firm. We obtained 401 usable questionnaires (out of 3286) from SMEs. To ensure that non-response bias is not an issue, we compared the answers between the early and late respondents and found no significant differences between them (Armstrong and Overton, 1977). Table 2 summarizes the characteristics of the respondents.

"Insert Table 2 about Here"

### **Validity and Reliability**

Because we measured all of the constructs based on self-reports, we follow the suggestion to use multiple statistical remedies to rule out potential common method bias (Podsakoff et al., 2003; Podsakoff et al., 2012). First, we performed Harman's single-factor test (Hair et al., 2010). Second, we applied CFA marker variable techniques (Williams et al., 2010) using motivation-enhancing human resource management practices (four items) adopted from Prieto and Santana (2012). A sample item is 'the employees in this organisation receive monetary rewards based on their performance'. Both results suggested that common method variance is not a concern for this study. We also followed Podsakoff et al. (2003) in

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3 using procedural remedies to minimize common method bias such as ensuring the anonymity  
4 and confidentiality of the responses, and emphasized that there were no right or wrong  
5 answers. Lastly, multi-items scales and complex data relationships (i.e. moderating and  
6 nonlinear effects) help to alleviate possible concerns regarding common method bias, because  
7 the respondents cannot guess the research hypotheses or respond in a socially desirable  
8 manner, that would lead to spurious findings (Podsakoff et al., 2012).

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16 “Insert Table 3 about here”  
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18 We assessed the construct validity using confirmatory factor analysis. According to  
19 suggestions by Hair et al. (2010) regarding the comparative fit index (CFI), normed fit index  
20 (NFI), goodness of fit index (GFI), and root mean square error of approximation (RMSEA),  
21 the overall model fits the data satisfactorily ( $X^2 = 250.743$ ;  $df = 80$ ;  $X^2/df = 3.134$ ;  $p = .000$ ;  
22  $NFI = .907$ ;  $CFI = .934$ ;  $GFI = .921$ ;  $RMSEA = .073$ ). We also calculated the value of the  
23 composite reliability (CR) for each construct, and all exceed the .70 benchmark. The average  
24 variance extracted (AVE) for all of the constructs exceeded the .50 benchmark. These results  
25 demonstrate that our measurements possess sufficient convergent validity and reliability.  
26 Furthermore, we calculated the square root value of the AVE for each construct and found  
27 that the resulting value for each construct was greater than all of its correlations with other  
28 constructs, providing support for discriminant validity (Fornell and Larcker, 1981). We  
29 present the above findings in Table 3. Finally, we calculated the variance inflation factors  
30 (VIFs) to assess the possibility of multicollinearity. The results suggested that all of the VIFs  
31 were below 10, which indicates that multicollinearity is not a serious problem in this analysis  
32 (Hair et al., 2010). Based on all of the above points, we argue that our research possesses  
33 both reliability and validity.  
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## 56 Analysis and Results

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To assess our hypotheses, we performed multiple regression analysis using SPSS.

Table 4 presents the results of our analysis.

“Insert Table 4 about here”

Recall that hypothesis 1 proposes an upward curvilinear relationship between PEB and NPD performance. To test this hypothesis, we employed the approach suggested by Aiken and West (1991). In Model 1, we included only the control variable. In Model 2, we added the independent variable-PEB ( $\beta = .329, p < .000$ ) and the quadratic term of PEB ( $\beta = .109, p < .010$ ) since both entries exhibited a positive and significant relationship with NPD performance. Our findings confirm hypothesis 1. To depict this curvilinear relationship, we plot the relationship in Figure 2.

“Insert Figure 2 about here”

Hypothesis 2 predicts that the upward curvilinear effect of PEB on NPD performance is mediated by innovation capability. In particular, there is an upward curvilinear relationship between PEB and innovation capability, and a linear positive relationship between innovation capability and NPD performance. To examine this hypothesis, we followed Hayes and Preacher (2010). First, in Model 4, we estimated the effects of PEB ( $\beta = -.290, p > .100$ ) and the quadratic term of PEB ( $\beta = .088, p < .010$ ) on innovation capability. Given that the quadratic term of PEB is positive and significant, the PEB displayed an upward curvilinear relationship with innovation capability. Second, in Model 3, we found that the effects of innovation capability ( $\beta = .171, p > .010$ ) on NPD performance are positive and significant when accounting for the effect of PEB and the quadratic term of PEB. Third, we calculated the instantaneous indirect effect in relatively low (25<sup>th</sup> percentiles), relatively moderate (50<sup>th</sup> percentiles) and relatively high (75<sup>th</sup> percentiles) situations using a bootstrap analysis with 10,000 samples. Our results suggested that the instantaneous indirect effects in all three situations are positive and significant (relatively low:  $\beta = .029, p < .050$ ; relatively moderate:

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3  $\beta = .052, p < .050$ ; relatively high:  $\beta = .074, p < .050$ ), with a 95% confidence interval which  
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5 does not include zero. Furthermore, we plotted the upward curvilinear relationship between  
6  
7 PEB and innovation capability (see Figure 2). Surprisingly, we found that, at relatively low  
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9 levels of PEB, the curvilinear relationship is displayed as a U-style shaped curve. The  
10  
11 implications of this finding will be discussed later.  
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14 To investigate the moderation effects in hypotheses 3 and 4, we followed the  
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16 approach proposed by prior research (Aiken and West, 1991; Jaccard and Turrisi, 2003) to  
17  
18 estimate three models (Models 5-7). In all three models, we included control variables, PEB,  
19  
20 and the quadratic term of PEB, and also accounted for the effects of customer orientation and  
21  
22 competitor orientation. Finally, we added different combinations of interaction terms in  
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24 Models 3-5. Hypothesis 3 posits that the upward curvilinear effect of PEB on innovation  
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26 capability is stronger (steeper) when customer orientation is high. In Model 5, we added two  
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28 interaction terms: PEB x customer orientation ( $\beta = -.034, p > .100$ ), and the quadratic term of  
29  
30 PEB x customer orientation ( $\beta = -.057, p < .100$ ). The significance of the latter interaction  
31  
32 terms suggests that the upward curvilinear effect of PEB on innovation capability actually  
33  
34 becomes weaker (instead of stronger) when customer orientation is high. Thus, we must  
35  
36 reject hypothesis 3. In Model 6, we added two interaction terms: PEB x competitor  
37  
38 orientation ( $\beta = -.077, p > .100$ ), and the quadratic term of PEB x customer orientation ( $\beta = -$   
39  
40  $.072, p < .050$ ). The significance of the latter interaction terms suggest that the upward  
41  
42 curvilinear effect of PEB on innovation capability becomes weaker when competitor  
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44 orientation is high. Thus, we may accept hypothesis 4.  
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50 We also included all of the interaction terms simultaneously in Model 7, but found  
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52 that their effects became insignificant. Previous research indicates that the simultaneous  
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54 inclusion of multiple interaction terms that share common variables may prevent the  
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56 detection of moderating effects, due to the complex constellation of factors caused by such  
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3 simultaneity (De Clercq et al., 2016). Nevertheless, the consistency of the signs of the  
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5 interaction terms in Models 5-7 provided some indication of robustness (Arnold, 1982; De  
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7 Clercq et al., 2016). Finally, we plot the results from Models 5 and 6 in Figure 2. Surprisingly,  
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9 we find a shape-flip phenomenon in our graphical representation (Haans et al., 2015). In  
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11 particular, PEB displayed a downward curvilinear relationship with innovation capability,  
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13 rather than an upward one, as in our earlier findings. We discuss the implications of these  
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15 findings in detail below.  
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## 21 **Discussion and Concluding Remarks**

### 22 **Academic Contribution**

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25 As a first contribution, we demonstrate an upward curvilinear relationship between  
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27 PEB and NPD performance. These findings advance E-MO interface-innovation outcomes  
28  
29 studies on two related fronts. First, most of these studies acknowledge that the pursuit of  
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31 entrepreneurial behaviour can enhance NPD performance. However, these studies tend to  
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33 conceptualise entrepreneurial behaviour as a unidimensional strategic posture that comprises  
34  
35 multiple types of individual behaviour that are entrepreneurial in nature (see Table 1), when  
36  
37 examining the linear relationship between collective entrepreneurial behaviour and  
38  
39 innovation outcomes. Our study advances the extent literature by proposing and confirming  
40  
41 empirically the nonlinear relationship between a specific type of entrepreneurial behaviour  
42  
43 (i.e. PEB) and NPD performance. Second, the few studies that examine the impact of PEB (as  
44  
45 an individual entrepreneurial behaviour) on NPD performance offer mixed findings. For  
46  
47 example, Frishammar and Åke Hörte (2007) found that firms' proactivity towards  
48  
49 introducing new products has a weak/nonsignificant impact on their NPD performance. In  
50  
51 contrast, Schultz et al. (2013), in their secondary findings, found that proactiveness positively  
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53 affects NPD performance. Our research offers a novel explanation for these mixed results by  
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3 suggesting that the relationship between PEB and NPD performance is of an upward  
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5 curvilinear nature. More specifically, the positive effect of PEB on NPD performance is  
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7 stronger when SMEs are more proactive and weaker when SMEs are less proactive. In  
8  
9 general, our study provides a more nuanced understanding of the relationship between  
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11 entrepreneurial behaviour and NPD performance.  
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14 A second contribution is that we clarify the process whereby PEB affects NPD  
15  
16 performance. First, we confirm that the relationship between PEB and innovation capability  
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18 is nonlinear upward shaped. After plotting this, we also find, surprisingly, that the  
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20 relationship between PEB and innovation capability is negative when PEB is at a relatively  
21  
22 low level. Together with the upward curvilinear effects at moderate and high levels, it forms  
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24 a U-shaped relationship. To explain this finding, we suggest that the development of  
25  
26 innovation capability may require firms to accumulate innovation-related experience by  
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28 proactively introducing new products beyond a certain level, before which any additional  
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30 experience acquired may interfere with their existing knowledge base for performing certain  
31  
32 tasks such as innovation (Edmunds and Morris, 2000). As a result, PEB has a negative effect  
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34 on innovation capability when SMEs are less proactive. Second, our findings suggest that the  
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36 indirect effect of the intermediate mechanisms is significant. These results contribute to the  
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38 E-MO interface-innovation outcomes literature not only by introducing innovation capability  
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40 as a new mediator (Li et al., 2006; Rhee et al., 2010; Yu et al., 2016), but also by further  
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42 explaining the formation processes of the upward curvilinear relationship between PEB and  
43  
44 NPD performance, as we discussed earlier. Furthermore, these findings also suggest that the  
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46 association among resources, capabilities, and performance may not always be linear in  
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48 nature. In doing so, we offer a fresh theoretical angle regarding the application of the  
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50 resource-capability-performance framework and resource-based theory in general (Murray et  
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52 al., 2011; Zhou et al., 2005).  
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3 Our third contribution concerns the role of market orientation in the entrepreneurial  
4 behaviour-innovation outcomes relationship. We differentiate between two types of market  
5 orientation – customer orientation and competitor orientation (Gatignon and Xuereb, 1997;  
6 Zhou et al., 2007) – and examine their impact on the nonlinear relationship between PEB and  
7 innovation capability. We find that competitor orientation negatively moderates this upward  
8 curvilinear relationship, as predicted. Contrary to our prediction, however, we also find that  
9 customer orientation negatively affects the upward curvilinear relationship between PEB and  
10 innovation capability. Furthermore, by plotting these negative moderating effects, we find  
11 that the curvilinear relationship between PEB and innovation capability flips from upward to  
12 downward (see Figure 2). According to Haans et al. (2015), this form of shape-flipping curve  
13 occurs when a very strong moderation effect occurs and causes the curve to flatten out or  
14 steepen significantly, and then change shape. This suggests that both customer orientation  
15 and competitor orientation have a very strong negative moderation effect in causing the U-  
16 shaped relationship between PEB and innovation capability to change shape.  
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34 One possible explanation is that, when pursuing customer orientation, SMEs will shift  
35 their strategic focus from exploring new business opportunities to exploiting their existing  
36 ones. Given SMEs' resource constraints, they may use their resources to support a few  
37 activities that closely conform to their strategic focus (Mazzarol et al., 2009; McKelvie and  
38 Davidsson, 2009). As a result, the pursuit of customer orientation may alter SMEs' resource  
39 allocation decisions to support their objective of delivering better value to their existing  
40 customers (i.e. providing better services), instead of supporting innovation-related activities.  
41 SMEs' decreasing propensity to develop and introduce new products proactively as they  
42 become more customer-oriented will subsequently reduce their ability to accumulate rich  
43 innovation-related experience, which in turn diminishes their innovation capability at an  
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3 accelerating rate. Thus, the upward curvilinear relationship between PEB and innovation  
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5 capability will flip to a downward curvilinear relationship.  
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7 In terms of competitor orientation, its negative influence on PEB and innovation  
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9 capability is stronger than we predicted. SMEs may not only suffer as a result of  
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11 accumulating less new experience about innovation (due to their narrower product range), but  
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13 also need to invest more resources in analysing and monitoring their competitors' movements  
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15 when pursuing high levels of competitor orientation. When SMEs with limited resources  
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17 choose to invest more in analysing and monitoring their competitors' movements, they often  
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19 need to withdraw resources from other activities (Mazzarol et al., 2009; McKelvie and  
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21 Davidsson, 2009). In this situation, SMEs are more likely to decide to withdraw resources  
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23 from innovation-related activities, if they focus on developing a narrow range of products  
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25 only. As SMEs become more competitor-oriented, they will accumulate increasingly less  
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27 innovation-related experience. Consequently, PEB displays a downward curvilinear  
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29 relationship with innovation capability when competitor orientation is strong.  
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34 In general, these findings offer new insights regarding the role of market orientation  
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36 in facilitating entrepreneurial behaviour and innovation outcomes. The results of our research  
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38 challenge the existing studies that advocate the complementary effects of market orientation  
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40 and entrepreneurial behaviour on innovation (e.g. Atuahene-Gima and Ko, 2001;  
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42 Schindehutte et al., 2008; Tajeddini, 2010). PEB reflects SMEs' incentive to capture the first-  
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44 mover advantage (Covin et al., 2000; Lumpkin and Dess, 1996). We suggest that, when  
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46 SMEs pursue PEB, the pursuit of market orientation will impede the effects of PEB on  
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48 innovation outcomes. In this way, we link the studies of the E-MO interface with the first-  
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50 mover advantage literature (e.g. Robinson and Chiang, 2002; Song et al., 2008) in the SME  
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52 context.  
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### Managerial Implications

Our study has several implications for SME owner-managers. First, SME owner-managers should consider carefully the efforts and rewards when adopting PEB. More specifically, SMEs will achieve a disproportionately high level of profitability, revenue generation and market share, when SME owner-managers are highly proactive in exploring new opportunities. Conversely, SMEs can only achieve very weak NPD performance (rewards) when they display a relatively lower degree of proactivity. SMEs with limited resources may be reluctant to invest substantially to support the development of PEB (Covin et al., 2000; Simon et al., 2002). For that reason, we recommend that, if SMEs' owner-managers decide to pursue PEB, they should devote every effort (resources) to ensuring that the firm develops a very high level of proactivity, in order to capitalise on the benefits.

Second, SME owner-managers must be aware that PEB does not automatically lead to superior NPD performance. Without the competence to engage in innovation activities (i.e. product/service and process innovation), a firm cannot realize the value of PEB. Therefore, managers should focus their efforts not only on developing PEB but also on building SMEs' innovation capability. Furthermore, having a high level of PEB can help to facilitate the development of innovation capability, although SME owner-managers also need to realize that PEB can only contribute to the development innovation capability beyond a certain level. Since SMEs usually face resource constraints (Mazzarol et al., 2009; McKelvie and Davidsson, 2009), SME owner-managers should choose to devote resources towards nurturing PEB only if they are committed to building a high degree of propensity to be proactive.

Third, SMEs' owner-managers should recognise the dark side of market orientation. Scholars generally agree that pursuing a market orientation enables firms to acquire information about their customers' needs and monitor their competitors' actions, which can

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3 further the firms' innovation efforts (e.g. Boso et al., 2012; Frishammar and Åke Hörte,  
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5 2007). However, the findings of our research support Morgan et al. (2015)'s suggestions that  
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7 market orientation can sometime reduce the positive effects of entrepreneurial behaviour on  
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9 innovation outcomes. More specifically, we find that, when SMEs pursue PEB and customer  
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11 (or competitor) orientation simultaneously, the upward curvilinear effect of PEB on  
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13 innovation capability will flip to a downward effect. As a result, while each strategic posture  
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15 may make its own unique contribution towards the development of innovation capability,  
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17 SME owner-managers need to be concerned with the impact of implementing PEB and  
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19 (either customer or competitor orientation) simultaneously.  
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### 25 **Limitations and Future Research Opportunities**

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27 First, our research design may restrict us from drawing any definite conclusions about  
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29 the causation effect among the variables over time. Furthermore, this research design may  
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31 also raise concerns about common method variance. Researchers in the future might employ  
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33 a longitudinal research design in order to confirm this causality empirically or use data  
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35 collected from multiple respondents in each firm to combat this limitation. Second, we limit  
36  
37 our investigation to UK-based SMEs in the manufacturing industry. Therefore, the  
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39 generalisability of our findings remains limited to firms within a specific industry, company  
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41 size, and country context. Future studies on different industries, company sizes, or countries  
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43 would help to generalize our findings and expand the boundary conditions. **Third, the**  
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45 **independent variable chosen for this study – PEB – we adopted and modified the scales from**  
46  
47 **existing studies. While we have gone through the necessary procedures to ensure the face**  
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49 **validity, and statistical validity and reliability of our scales, however they may still not**  
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51 **capture PEB sufficiently as the nature of (all types of) entrepreneurial behaviors is complex**  
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53 **(Boso et al., 2012; Kreiser et al., 2013; Lumpkin and Dess, 1996). Future research should**  
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2  
3 attempt to capture the domain of PEB construct with much richer and more detailed scales.  
4

5 Fourth, although we requested in our cover letter that the general manager (or CEO) of the  
6  
7 firm should complete the questionnaire on behalf of his/her organisation, due to the  
8  
9 anonymity and confidentiality of the responses, we cannot eliminate the possibility that the  
10  
11 respondent is not the general manager (or CEO) of the firm. Future researchers should  
12  
13 consider using telephone or in-person surveys to address this research limitation.  
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15

16 Our findings also uncover other future research opportunities. To begin with, the  
17  
18 curvilinear relationship (PEB → NPD performance and PEB → innovation capability)  
19  
20 suggests some research opportunities. Are there any moderators related to market-oriented  
21  
22 behaviour (such as customer market intelligence) that can steepen, flatten or flip-shape these  
23  
24 curvilinear relationships between PEB and innovation capability? Are there any other  
25  
26 mediators that can carry the curvilinear effects from PEB to NPD performance? Furthermore,  
27  
28 the relationship between PEB, innovation capability and NPD performance may be more  
29  
30 complex than we proposed in this study. Future researchers may wish to explore other  
31  
32 potential models for explaining the relationship among these three variables. For example,  
33  
34 feedback loops may exist due to the fact that a strong innovation capability or NPD  
35  
36 performance may provide incentives for firms to pursue PEB. Lastly, future researchers  
37  
38 might investigate other combinations of entrepreneurial behaviour and market orientation. In  
39  
40 general, we hope that further research will continue to explore and document how the E-MO  
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42 interface affects innovation.  
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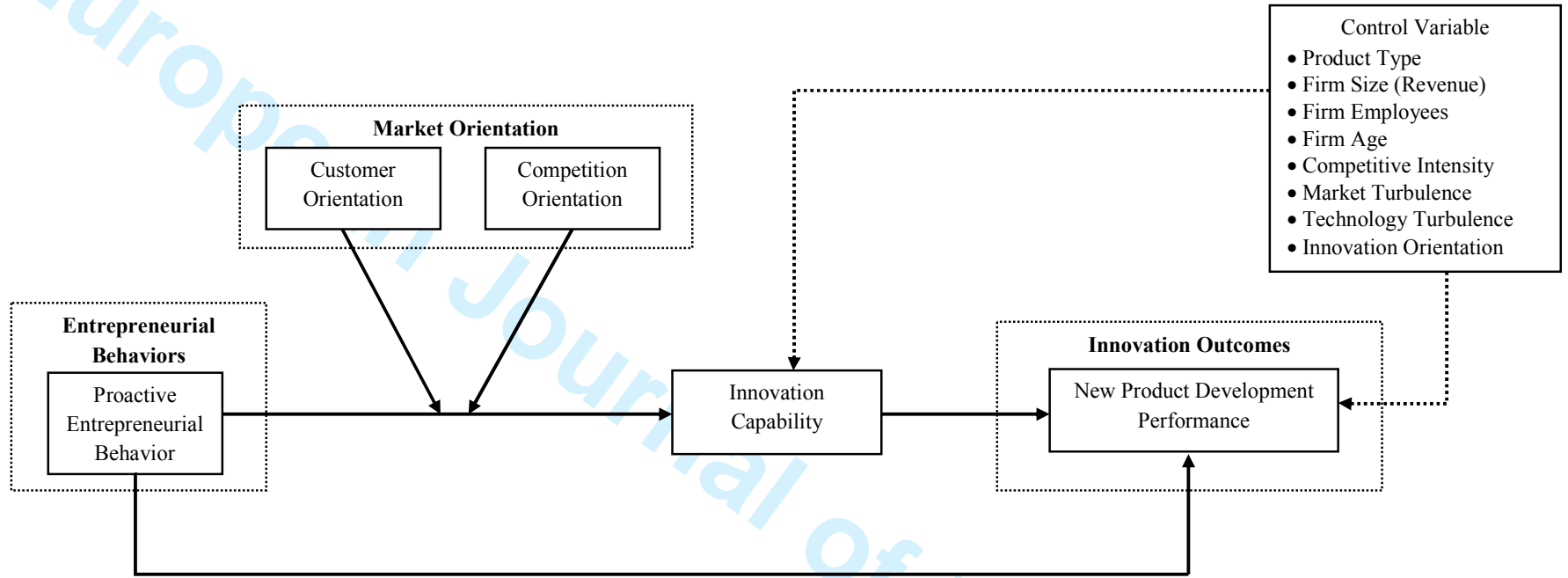
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Figure 1: Conceptual Framework



Note:  
Dashed arrows represent control variable path

**Table 1: Entrepreneurial Behaviors and Innovation Outcomes in E-MO interface Literature**

Entrepreneurial Behavior	Key Studies
<i>A group of independent entrepreneurial behaviors – an unidimensional strategic posture of a firm</i>	
Proactiveness; Innovativeness; Risk taking	Li et al. (2006); Thourmrungrroje and Racela (2013); Schindehutte et al. (2008); Renko et al. (2009); Baker and Sinkula (2009); Hong et al. (2013); Morgan et al. (2015); Yu et al. (2016); González-Benito et al. (2015)
Proactiveness; Risk taking	Avlonitis and Salavou (2007); Rhee et al. (2010)
Proactiveness; Risk taking; Aggressiveness	Atuahene-Gima and Ko (2001)
Proactiveness; Innovativeness; Strategic planning	Tajeddini (2010)
Proactiveness; Innovativeness; Risk taking; Autonomy; Aggressiveness	Boso et al. (2012)
Autonomy; Risk taking; Proactiveness	Nasution <i>et al.</i> (2011)
<i>Individual entrepreneurial behavior</i>	
Proactiveness	Frishammar and Åke Hörte (2007)
Innovativeness	Frishammar and Åke Hörte (2007)
Risk taking	Frishammar and Åke Hörte (2007)
Proactivity in preparing for change	Zhou et al. (2005)
Domain specific innovativeness	Verhees and Meulenber (2004)

**Table 2: Information of Samples**

Characteristics	Percentage
<b>Product Focus</b>	
Metal Product (average annual revenue = £11,040 Millions)	35.7
Machinery and Equipment (average annual revenue = £11,009 Millions)	25.9
Chemical Product (average annual revenue = £13,571 Millions)	10.7
Others (average annual revenue = £9,446 Millions)	27.7
<b>Age (Years)</b>	
Less than 20	27.4
21 ~ 40	40.6
41 and above	31.9
<b>Employee</b>	
0 ~ 10 (Micro)	5.5
11 ~ 50 (Small)	46.6
51 ~ 250 (Medium)	47.9

Table 3: Descriptive Statistics, Correlations and Reliabilities

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Metal Product	---														
2. Machinery and Equipment	-.441*	---													
3. Chemical Product	-.258*	-.205*	---												
4. Firm Size (Revenue)	-.068	.040	.050	---											
5. Firm Employee	-.059	.073	.045	.625*	---										
6. Firm Age	-.034	.057	.112*	.242*	.347*	---									
7. Competitive Intensity	-.003	-.070	-.038	.054	-.006	-.169*	---								
8. Market Turbulence	-.044	-.026	-.069	-.015	-.046	-.088	.360*	---							
9. Technology Turbulence	-.051	.080	-.181*	.019	-.003	-.202*	.272*	.465*	---						
10. Innovation Orientation	-.095	.105*	-.077	.013	.009	-.060	.109*	.233*	.334*	---					
11. Proactive Entrepreneurial Behavior	-.134*	.130*	.010	.168*	.161*	-.065	.106*	.269*	.334*	.553*	<b>.718</b>				
12. Customer Orientation	-.079	-.016	.027	.167*	.156*	-.020	.084	.204*	.257*	.446*	.519*	<b>.713</b>			
13. Competitor Orientation	-.152*	.036	.059	.167*	.120*	-.043	.152*	.193*	.122*	.266*	.356*	.461*	<b>.719</b>		
14. Innovation Capability	.001	-.014	.005	.025	.036	-.043	.015	.166*	.163*	.503*	.502*	.317*	.199*	<b>.742</b>	
15. New Product Development Program Performance	-.123*	.016	.019	.097	.073	-.024	-.051	.135*	.171*	.511*	.533*	.430*	.250*	.470*	<b>.854</b>
Mean	.357	.259	.107	6.758	1.705	1.480	2.859	2.720	3.067	3.364	3.374	3.741	3.347	3.572	3.919
Standard Deviation	.480	.439	.310	.514	.414	.343	.723	.696	.931	.696	.748	.640	.726	.634	.651
Composite Reliability	---	---	---	---	---	---	---	---	---	---	.749	.754	.805	.701	.889
Average Variance Extracted	---	---	---	---	---	---	---	---	---	---	.516	.508	.517	.550	.729

Notes:  
N = 385; \*p < .05  
Average Variance Extracted (AVE) square roots are show in bold on the correlation matrix diagonal  
Firm Age is measured as log(year since establishment)  
Firm Size is measured as log(annual revenue £million in 2015)  
Firm Employee is measured as log(employee number)  
Product Focus dummies: we choose "Others" as the benchmark group

Table 4: Findings

Dependent Variable:	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	New Product Development Program Performance			Innovation Capability			
<b>Control Variables:</b>							
Metal Product	-.142(-2.009)*	-.126(-1.927)†	-.140(-2.164)*	.081(1.225)	.092(1.377)	.073(1.092)	.080(1.193)
Machinery and Equipment	-.139(-1.823)†	-.165(-2.318)*	-.152(-2.157)*	-.078(-1.082)	-.068(-.937)	-.076(-1.055)	-.073(-1.008)
Chemical Product	.022(.220)	-.037(-.388)	-.045(-.485)	.051(.528)	.053(.547)	.030(.313)	.034(.357)
Firm Size	.108(1.560)	.069(1.075)	.074(1.169)	-.029(-.451)	-.032(-.491)	-.040(-.610)	-.038(-.582)
Firm Employees	.050(.567)	-.021(-.256)	-.023(-.283)	.011(.131)	.012(.147)	-.010(-.118)	-.006(-.067)
Firm Age	-.082(-.917)	-.015(-.181)	-.012(-.147)	-.018(-.213)	-.015(-.173)	-.008(-.092)	-.007(-.080)
Competitive Intensity	-.133(-3.170)**	-.118(-3.029)**	-.109(-2.838)**	-.051(-1.293)	-.048(-1.210)	-.048(-1.212)	-.046(-1.155)
Market Turbulence	.054(1.152)	.021(.474)	.013(.292)	.048(1.070)	.049(1.085)	.036(.798)	.038(.830)
Technology Turbulence	.006(.173)	-.021(-.627)	-.014(-.433)	-.039(-1.155)	-.037(-1.069)	-.037(-1.094)	-.036(-1.031)
Innovation Orientation	.474(11.159)***	.304(6.688)***	.252(5.317)***	.306(6.667)***	.305(6.449)***	.301(6.380)***	.304(6.418)***
<b>Independent Variable:</b>							
Proactive Entrepreneurial Behavior (PEB)		.329(7.511)***	-.354(-1.585)	-.290(-1.272)	.323(6.534)***	.325(6.662)***	.333(6.689)***
PEB Squared		.109(3.268)**	.094(2.831)**	.088(2.612)**	.091(1.883)†	.100(2.568)*	.106(2.168)*
<b>Mediator:</b>							
Innovation capability			.171(3.452)**				
<b>Moderator and Interaction:</b>							
Customer Orientation (CO)					.052(.886)	.014(.262)	.043(.691)
Competitor Orientation (CompO)					.008(.181)	.060(1.236)	.040(.738)
PEB x CO					-.034(-.538)		-.012(-.182)
PEB x CompO						-.077(-1.590)	-.085(-1.640)
PEB Squared x CO					-.057(-1.675)†		-.043(-.931)
PEB Squared x CompO						-.072(-2.034)*	-.042(-.825)
Constant	1.929(4.398)***	2.862(6.555)***	2.507(4.738)***	2.803(5.361)***	2.816(6.227)***	2.959(6.564)***	2.909(6.380)***
<b>Model Statistics</b>							
F-Value	16.631	21.435	21.260	17.743	13.453	13.717	12.205
P-Value	.000	.000	.000	.000	.000	.000	.000
R-Square	.299	.399	.417	.354	.359	.364	.365

Note:

\*\*\* p &lt; 0.001; \*\* p &lt; 0.010; \* p &lt; 0.050; † p &lt; 0.100

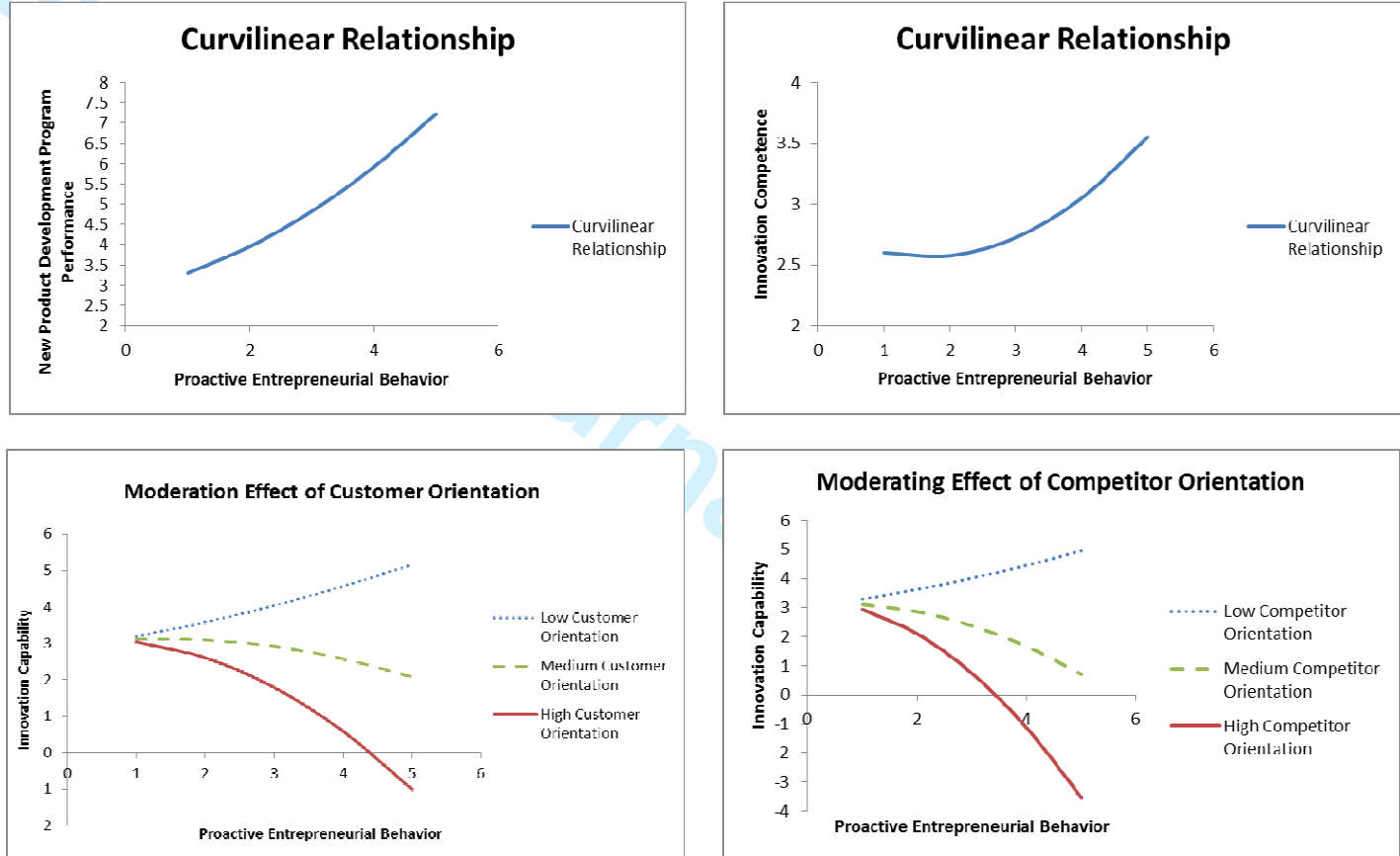
Unstandardized Coefficients are reported with t-value in parathions; Bootstrap N = 10000; BLLCI = bootstrap lower-level confidence interval; BULCI = bootstrap upper-level confidence interval

Model 4 and Model 3 Instantaneous Indirect Effect: Proactive Entrepreneurial Behavior → Innovation capability → New Product Development Program Performance

25<sup>th</sup> percentiles (relatively low) instantaneous indirect effect = .029\* BLLCI (.009) ~ BULCI (.064)50<sup>th</sup> percentiles (relatively moderate) instantaneous indirect effect = .052\* BLLCI (.022) ~ BULCI (.092)75<sup>th</sup> percentiles (relatively high) instantaneous indirect effect = .074\* BLLCI (.031) ~ BULCI (.135)

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Figure 2: Graphical Representation - Moderating Effects





## Appendix 1: Measurement and Factor Loading

	Measurement	Loading*
	<b>Proactive Entrepreneurial Behavior</b>	
	We typically initiate actions to which our competitors then respond.	.437
	We are very often the first business to introduce new products in our industry	.865
	When facing uncertainty, we typically adopt a proactive posture in order to seize potential opportunities.	.780
	<b>Customer Orientation</b>	
	We regularly meet with our customers to learn about their current and potential needs regarding new products.	.796
	We constantly monitor and reinforce our understanding of the current and future needs of our customers.	.723
	We regularly use market research techniques to gather customer information to understand their current and potential needs.	---
	We possess a thorough knowledge about our emerging customers and their needs.	.606
	<b>Competitor Orientation</b>	
	We regularly collect and utilise information about the products and strategies of our competitors.	.554
	We systematically collect and analyse information about potential competitor activities.	.841
	Managers in this firm regularly share information about our current and future competitors.	.844
	Our knowledge of our current and potential competitors' strengths and weaknesses is very thorough.	.584
	<b>Innovation Capability</b>	
	Compared to our competitors, our company is better at product/service innovation.	.873
	Compared to our competitors, our company is better at production process innovation.	.581
	Compared to our competitors, our company is better at managerial innovation.	---
	<b>New Product Development Performance</b>	
	Our new products have contributed to the success of our firm in terms of increased profitability.	.877
	Our new products have contributed to the success of our firm in terms of revenue generation.	.892
	Our new products have contributed to the success of our firm in terms of improving our market share.	.788

\* Factor loadings are standardized

--- Items deleted due to low factor loading