Innovation and Performance of Manufacturing Firms in Aspirant Markets: An Institutional Environment Approach

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Acknowledgements.

We appreciate constructive comments from the anonymous reviewers and the assigned editor Professor Debmalya Mukherjee. This research was supported by National Natural Science Foundation of China (Grant No. 72091311; 72103183), Center for Transnationals' Studies Foundation of Nankai University (Grant No. ctsnk202102) and Zhejiang Provincial Natural Science Foundation of China (Grant No. LQ20G020004).

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Abstract

The recent years have witnessed an increasing number of manufacturers in developed markets pursuing service-led innovation to secure their sustainable growth and competitive positions. This study compares the manufacturing firm performance outcomes of two types of innovation activities in the value chain (i.e., service innovation and product innovativeness) contingent on institutional environment but in an aspirant market – China. To do so we conducted two studies: A secondary data study (Study 1) used a longitudinal panel dataset of 1,167 manufacturing firms and a robustness study (Study 2) used primary survey data from 171 manufacturing firms. Both studies offer consistent empirical results that in the dysfunctional competition environment, and in contrast to product innovativeness, service innovation is less effective for manufacturing performance but works more effectively for performance in the complicated institutional environment when government support and dysfunctional competition co-exist. The research contributes to the fields of aspirant markets and innovation by developing our understanding of the firm's strategic responses pertaining to innovation in the context of a complicated institutional environment, the latter informed by structuration theory. The paper offers a fine-grained view to manufacturing innovation and provides the practical implications for managers and clear guidance to firms and governments in the aspirant markets in regards to innovation practice, strategy, and policy.

Keywords

Aspirant market; Institutional environment; Structuration theory; Manufacturing firm performance; Product innovativeness; Service innovation

Introduction

In aspirant markets – characterised by upper middle-incomes, steady economic growth and stable but still evolving institutions – firms are seeking to improve performance by moving up the value chain and increasing their competitiveness. Although, originally on a transitional economy trajectory aspirant markets are distinctive and can be distinguished from emerging markets (Bruton, Ahlstrom, & Chen, 2019).[1] Increasingly, in aspirant markets such as China, manufacturing firms in response to their own rising labour costs and global competition have been reducing their reliance on the low-cost production and duplicative imitation (Bruton, Ahlstrom, & Chen, 2019). These firms aim to match the innovation pace of their counterparts in developed economies, who usually create their market competitiveness through focusing on the value-creation activities of product innovativeness or service innovation (Lusch, Vargo, & O'Brien, 2007). For instance, Huawei and Shaangu Power are typical firm examples of focusing on production innovativeness and service-led innovation respectively. Huawei, a Fortune Global 500 enterprise in China, has always put much strategic focus on product innovativeness, and it insists on investing more than 10% of its sales revenue into product-oriented R&D innovation in the past five years. According to *The 2020 EU Industrial R&D Investment Scoreboard* (Grassano *et al*., 2020), Huawei's R&D expenditure in 2019 was RMB 132.7 billion, ranking third worldwide. Different from the strategic focus on product-oriented value creation, Shaangu Power, a major equipment manufacturing firm in China, however, has focused on the value creation by service-related activities and transformed from a single product manufacturer to a system service provider in the energy conversion field (e.g., maintenance services, financial services, and equipment life cycle health management services). The

[1] Bruton, Ahlstrom and Chen (2019, p.1) suggested that economies such as China "should be considered as having emerged and now aspiring", and proposed three characteristics for aspirant markets: (1) The country is an upper middle-income economy seeking to become a high income economy, (2) The economy has positive and steady economic growth and stable institutions, and (3) the economic organization matches the cultural and historical needs of that country and particularly encourages innovation and new venture creation.

business revenue growth rate of its industrial service in 2020 is 19.49%, which is much higher than that of 2.89% of equipment production. However, the institutional environment in which they seek to do this is manifestly different from that of the developed economies (Bruton, Ahlstrom, & Chen, 2019). It is this difference, and the implications for innovation activities and firm performance, that is the core concern of this paper.

The extant literature that focuses on developed economies has long recognized that innovation is a crucial factor in a firm's survival and success (Capon, Farley, & Hoenig, 1990; Droge, Calantone, & Harmancioglu, 2008). Initially, the focus was on product innovativeness. Product innovativeness refers to the value-creation activities related to new product development which emphasizes the "newness" (Danneels & Kleinschmidt, 2001), "radicality" (Tellis, Prabhu, & Chandy, 2009), "uniqueness", "creativity" and "originality" (Henard & Szymanski, 2001; Sheng, Zhou, & Lessassy, 2013) of new products. However, the picture is not universally consistent. Some prior studies indicate a complex, negative, weak or even no relationship between these innovation activities and firm performance (e.g., Kleinschmidt & Cooper, 1991; Hitt, Hoskinsson, & Kim, 1997; Salavou & Avlonitis, 2008).

In more recent years many firms have moved towards service business in order to create more value for the customer and generate greater firm revenues and profits (Eggert *et al*., 2014; Guajardo *et al*., 2012; Lusch, Vargo, & O'Brien, 2007; Ostrom *et al*., 2010). Service innovation is deployed when a manufacturing firm shifts its innovation focus from product innovation only to service related to its products (Visnjic, Wiengarten, & Neely, 2016). Although service innovation is intended to be a strategic move for value creation, it remains a question regarding what outcomes it will bring to the overall firm performance. For example, Eggert *et al*. (2014) in a comprehensive article report 'mixed results at best' (p. 23). In their article, the authors suggest that a more nuanced view of service innovation and firm performance is needed and distinguish between services supporting supplier's products (SSPs) and services supporting

clients' actions (SSCs). In earlier work, Fang, Palmatier, & Steenkamp's (2008) analysis indicates just how complex this relationship between service innovation and performance is with the degree of service innovation, and the industry context, both being significant factors.

The above scene setting draws from the dominant developed economies literature where institutional environment affects are not a key concern. In terms of institutional theory, such firm level practice is framed by regulatory and normative considerations (Scott, 2008). The situation, however, in aspirant markets is different. Here, although the legal systems are often developed to a significant level, and beyond that witnessed in emerging economies, the implementation of these systems can still be erratic and the institutional norms are still evolving (Bruton, Ahlstrom, & Chen, 2019). Institutional voids (Cai *et al.*, 2017; Liu & Atuahene-Gima, 2018) and some opportunistic or unfair competitive firm behaviours, i.e., dysfunctional competition, remain problematic (Boso *et al.*, 2019; Zhang *et al.*, 2019). Additionally, and in contrast to developed economies where private entrepreneurs drive technology development (Bruton, Zahra, & Cai, 2018), the role of government in fostering innovation remains important for aspirant economies (Bruton, Ahlstrom, & Chen, 2019; Scalera, Mukherjee, & Piscitello, 2020). That is, government often provides additional support (institutional support) to firms, for example by aiding their innovation efforts and facilitating access to resources (Sheng, Zhou, & Li, 2011; Wang *et al.*, 2020).

The above context provides the over-arching rational for our research. In a firm, both product-and service-related innovation opportunities may be available to create value and hence improve performance. However, given the limited resources and strategic focus within a firm (Fang, Palmatier, & Steenkamp, 2008; Nezami, Worm, & Palmatier, 2018), these two types of innovation often compete for the scarce resources. This gives rise to our core research question. In aspirant markets, with complex institutional environments, what kind of innovation activity should a firm privilege to best enhance its performance? Structuration theory suggests that a

firm's activity must fit and be commensurate with its particular institutional environment to achieve competitive advantage and thereby enhance performance (Giddens, 1984; Liu & Atuahene-Gima, 2018; Zajac, Kraatz, & Bresser, 2000). Accordingly, and to address the core research question, our paper, examines the moderating effects of two different institutional environments that co-exist in aspirant markets (i) dysfunctional competition to represent institutional voids and (ii) explicit government support, and explores their respective influences on the relationship between product and service innovations and manufacturing firm performance.

To do this, we conduct two empirical studies. In Study 1, we draw upon a secondary longitudinal panel dataset of 1,167 Chinese publicly listed manufacturing firms and integrate it with the marketization index, which is able to reflect regional institutional development in China (Wang, Fan, & Yu, 2016). The focused data set captures innovation activities (product and service) and financial performance. In Study 2, effectively a robustness study, we conduct a primary survey 171 manufacturing firms and further examine the respective institutional environments on innovation activities. These two studies complement and reinforce each other and strengthen the validity of our empirical results.

We investigate our research question in China for two important reasons. First, China, as one of the major manufacturing economies (Eloot, Huang, & Lehnich, 2013; *The Economist*, 2015), has emerged as a leading aspirant market and demonstrates "a strong focus on moving up the value chain and becoming a world technology leader to drive the economy" (Bruton, Ahlstrom, & Chen, 2019, p.6). Unlike traditional emerging economies dominated by duplicative or incremental innovations, China with a high rate of technological change has been focusing on the development of innovative products and services (Sun & Lee, 2013) and provides an important context for innovation studies (Yang *et al*., 2012). Second, China's reforms of economic, legal, and social policies are largely stable with relatively small and consistent

changes over time (Bruton, Ahlstrom, & Chen, 2019). The institutional characteristics of both inefficient markets and active government involvement therefore remains (Banalieva, Eddleston, & Zellweger, 2015). Furthermore, due to the different stages of development across regions, and the differences in interpretation and implementation of state polices by local governments, there is a significant variation in regional institutional environments (Du *et al.*, 2012; Sheng, Zhou, & Li, 2011). In sum, with a complex combination of institutional voids and institutional support (Fang, 2011; Li & Zhang, 2007; Maksimov, Wang, & Luo, 2017; Sheng, Zhou, & Li, 2011; Zhu, Wittmann, & Peng, 2012), China provides the empirical richness to underpin our research on the interactions between institutional environments, innovation activities and manufacturing firm performance in aspirant markets.

Answering our core research question yields three contributions to theory and practice in the fields of aspirant markets and innovation. First, the extant literature has explored how country-level institutional environments affect firm's specific behavior, including internationalization (Bahl, Lahiri, & Mukherjee, 2021; Nuruzzaman, Singh, & Gaur, 2020; Wu & Deng, 2020), cross-board acquisitions (Scalera, Mukherjee, & Piscitello, 2020), stage of development (Hite & Hesterley, 2001) and innovation (Cai *et al*., 2017; Liu & Atuahene-Gima, 2018; Zhang *et al*., 2017). However, these studies either ignore the roles of dysfunctional competition and government support (Bahl, Lahiri, & Mukherjee, 2021; Wu & Deng, 2020), or investigate their individual effects separately (Cai *et al.*, 2017; Du, Kim, & Aldrich, 2016; Liu & Atuahene-Gima, 2018; Nuruzzaman, Singh, & Pattnaik, 2019). By adopting a dual lens we explore the double moderation effects of institutional support (i.e., government support) and institutional voids (i.e., dysfunctional competition) on innovation activities and firm performance. To the authors' best knowledge, our research makes an initial step to examine the three-way interaction effects of different manufacturing innovation activities, complex institutional environments and firm performance, and to do this within aspirant markets.

Second, our study advances our understanding of service innovation and product innovation activities and their interplay on firm performance. In the extant literature, production innovation and service innovation are often combined as a unified innovation activity (Cai *et al.*, 2017; Liu & Atuahene-Gima, 2018). For instance, Cai *et al.* (2017) find that innovation (five items on product / service innovation) is positively associated with new venture competitive advantage in China, and this relationship is moderated by dysfunctional competition. Our two empirical examinations, utilising secondary longitudinal panel data and primary survey data, helps address the issue faced by manufacturing firms in deciding, where choice is possible, whether to adopt both service and product innovation or to opt for one given limited resources and their preferred strategic focus.

Third, the extant literature that explores the moderating effects of institutional environments has mainly focused on the outcome variables such as export performance (Boso *et al.*, 2019), product innovation performance (Liu & Atuahene-Gima, 2018) and competitive advantage (Cai *et al.*, 2017). In this research, overall firm performance is the outcome variable of different innovation activities in particular institutional environments, hence directly linking innovation activity type to firm performance.

The paper is structured into six further parts. First, we introduce the theoretical considerations and our model. Second, we describe the development of our hypotheses. In the third and fourth parts respectively, we detail the primary study method based on a longitudinal data set and the associated results. Complementing the data set analysis is a survey-based robustness study and this is described in part five. The final part is a general discussion highlighting the theoretical contributions, implications for practice, limitations and suggested future research.

Theoretical constructs and related model

Service innovation

In order to satisfy evolving market needs and avoid competitors' territory innovation becomes a crucial factor to a firm's survival and success (Droge, Calantone, & Harmancioglu, 2008). Recognising that product offerings can be uncompetitive, many manufacturing firms in recent years have launched strategic initiatives aimed at their service business (Eggert *et al.*, 2014; Guajardo *et al.*, 2012). Consequently, service innovation in manufacturing firms has received increasing attention in the service and innovation literature (Ostrom *et al.*, 2010). Service innovation is the product of a servitization, by which firms innovate by offering services (Baines *et al.*, 2017; Fang, Palmatier, & Steenkamp, 2008; Oliva & Kallenberg, 2003; Salonen, 2011). Moreover, service innovation is suggested as an effective substitute for product innovation, and "becomes the new flagship for competition" (Eggert, Thiesbrummel, & Deutscher, 2015, p.174). This is a firm strategic shift from the "product-only" model to the "service-oriented" model (Cusumano, Kahl, & Suarez, 2015; Visnjic, Wiengarten, & Neely, 2016). Service innovation involves a broad range of innovative activities from "product-related services" that are directly related to performance of the products (such as repairs, overhauls, warranty, maintenance and upgrades) to "customer-related services" that support customer use of the product (such as documentation, insurance, consulting and training) (Eggert *et al.*, 2014; Raddats & Easingwood, 2010).

"The nature of the services does not remain homogeneous along the innovation trajectory" (Visnjic, Wiengarten, & Neely, 2016, p. 38). Services are either "experiential", "delivered by interpersonal interactions", or "process-based", "delivered with the aid of technology" (Storey *et al.*, 2016, p. 4). Experiential services may suffer from heterogeneity as service provider's performance and tacit knowledge may vary in the process of service delivery (Dotzel, Shankar, & Berry, 2013; Storey *et al.*, 2016). Process-based services, although potentially homogeneous or consistent, are substantially dependent on reliable information and communication networks (Hipp & Grupp, 2005; Storey *et al.*, 2016). Due to their nature, service innovation, of both kinds,

requires an open process as it is driven mainly by customer engagement (Storey *et al.*, 2016). In turn, this demands close links between firms and their customers and a clear understanding of the customers' perceptions of the value they gain from actual use of products and services (Raja *et al.*, 2013).

Past studies generally suggest that service innovation is a strategic factor for creating competitiveness and value (Oliva & Kallenberg, 2003; Salonen, 2011). By improving the effectiveness, efficiency, delivery time, response capabilities and services quality, service innovation increases the satisfaction and loyalty of customers (Oliva & Kallenberg, 2003). Service innovation also provides stable revenue as it helps to resist the economic cycles that impact product purchase (Oliva & Kallenberg, 2003). Therefore, service innovation is generally viewed as a sustainable source of competitiveness (Vargo & Lusch, 2004; Salonen, 2011).

Product innovation

By adopting a product-dominated orientation and product excellence, product innovativeness can still constitute an effective response by manufacturing firms to meet the challenges and dynamics in the market. Over a sustained period, the extant literature has considered product innovation as one of the main drivers to value creation (Visnjic, Wiengarten, & Neely, 2016). Among a variety of product innovation activities, product innovativeness is well recognised as a multidimensional concept (Danneels & Kleinschmidt, 2001; Garcia & Calantone, 2002). Rather than referring to incremental innovation such as modifications and extensions of existing products, product innovativeness emphasises intensity and novelty of product innovation portfolios (Story, Boso, & Cadogan, 2015) and newness (Danneels & Kleinschmidt, 2001) and/or radicality (Tellis, Prabhu, & Chandy, 2009) of new products. It may also involve relentless innovation, which helps firms constantly to stay at the cutting edge of innovation (Hua & Wemmerlov, 2006; Tajeddini, Trueman, & Larsen, 2006). Under most circumstances, firms prioritising and adopting product innovativeness allocate substantial resources to R&D in

order to develop products with new technology, functions and features, which are significantly distinguished from competitors.

In addition to a high degree of novelty, product innovativeness also emphasises the intensity of the new products that are offered by firms (Fang, 2011; Sethi, Smith, & Park, 2001). In competitive markets, in order to meet the diverse market demands, there is a strong need for multiple new product offerings from firms (Story, Boso, & Cadogan, 2015). In this sense, to achieve product innovativeness, a manufacturing firm has to have a well-established innovation system, which aligns multiple strategic logics across the portfolio of new products. This intensity of product innovation helps firms gain from every element of the innovation system, which aims to be more than the sum of gains from each individual product, and consequently enhance firm performance (Milgrom & Roberts, 1994).

Structuration theory

Structuration theory acknowledges a mutual constitution of structure (e.g., institutional environments) and actors (e.g., firms) (Luo, 2006). "Unlike the institutional theory advocating the mimicking effect, where firms have to passively follow institutional rules norms" (Luo, 2006, p.750), structuration theory indicates that "actors are conceptualised not simply as social dupes 'governed' by independent structures, but rather as existential beings who reflexively monitor their conduct and make choices in social settings" (Busco, 2009, p.254). Thus, actors "decide to either reproduce, partially reproduce, or not reproduce the social actions that validate the particular social structure or system" (Ferdoush, 2020, p.98).

In accordance with the above view, firms reflectively focus on different value-creation activities to deal with the existing institutional environments where they can achieve organizational legitimacy and economic values. Firms will not simply imitate the actions of their peers, but adjust their actions according to the external institutional environment. Therefore, in the face of a complex institutional environment, firms are supposed to flexibly

choose appropriate innovation activities (e.g., service innovation, production innovativeness). Specifically, rather than simply reproduce the innovation activities of their counterparts in developed economies, firms in aspirant markets may actively adjust innovation activities that are more suitable for specific institutional structure, where both inefficient markets and active government involvement remains. In other words, the effectiveness of service innovation and production innovativeness activities depends on the perceived institutional environments, and in turn, firms responsively adopt the innovation activities contingent on the external forces imposed by these institutional environments.

Moreover, structuration theory suggests actors' conduct and activities could recursively shape the social system and structure to create a climate in which they could survive and develop (Giddens, 1984). The theory also argues that in the presences of some unintended conditions that are out of the control of actors, such as dysfunctional competition, firms could not change the conditions but they are aware of these conditions and consequences of their activities and thus could react to them in an active manner (Luo, 2006; Ferdoush, 2020). According to this viewpoint, although manufacturing firms in the developed economies have launched a strategic move towards service business (Eggert *et al*., 2014), firms in aspirant markets are aware that the positive effect of service innovation may be impaired by dysfunctional competition (see details below). Therefore, firms will actively seek other innovation activities that can enhance their performance when dysfunctional competition exists. For example, firms can develop highly innovative products that are time-consuming and expensive for competitors to imitate (Sheng, Zhou, & Lessassy, 2013; Liu & Atuahene-Gima, 2018), thereby alleviating the hazardous effect caused by dysfunctional competition. Likewise, firms are aware that government support may reduce dysfunctional competition and its negative effects on service innovation and product innovativeness. Thereby, if governments provide strong support, firms may conduct more innovation activities to achieve superior economic

performance. Accordingly, structuration theory enables us to develop the hypotheses predicting the relationships between institutional environment, innovation activities and their consequences in aspirant markets.

Drawing on the three theoretical constructs – service innovation, product innovation and structuration theory – provides the basis for our conceptual model (Figure 1) and our hypotheses development.

Insert Figure 1 about here

Hypotheses development

In the complex institutional environment that characterises aspirant economies our hypotheses development addresses the two important moderating effects of dysfunctional competition and of government support. Each is discussed in turn.

Moderating effects of dysfunctional competition

Within the field of innovation studies in developed economies, the institutional environment is typically taken to be mature, with actors, groups and organizations operating within appropriate legal and contractual norms (Liu & Atuahene-Gima, 2018; Scott, 2008). The situation, however, is manifestly different in aspirant markets like China. Here, if the institutional norms that enable or support market activity are weak or absent, it would affect market formation, economic growth and development and lead to "institutional voids" (Mair, Martí, & Ventresea, 2012; Maksimov, Wang, & Luo, 2017; Wu *et al.*, 2016). In particular, prior studies recognise that firms may conduct a wide range of dysfunctional competitive behaviours in the under-developed institutional system (such as incomplete or inadequate legal system), and in corrupt systems (such as tacit support from local government officials) (Peng & Heath, 1996). In such systems, property rights are not well protected and thus dysfunctional competition such as violations of patent and copyright and breach of contracts is observable (Cai *et al.*, 2017; Du, Kim, & Aldrich, 2016; Liu & Atuahene-Gima, 2018; Qian, Cao, & Takeuchi, 2013). Moreover,

extant literature has found that dysfunctional competition shows significant impacts on firm's innovation performance; however, the findings are inconsistent (Boso *et al.*, 2019; Cai *et al.*, 2017; Liu & Atuahene-Gima, 2018). In this study, we further investigate the moderating roles of dysfunctional competition in the relationships between innovation activities and firm performance by comparing the effectiveness of two types of manufacturing innovation activities in the presence of such institutional voids.

As discussed earlier, servitization usually includes product-related service and customer-related service (Eggert *et al.*, 2014; Suarez, Cusumano, & Kahl, 2013), which have been shown to provide sustainable sources of competitive advantage and create value for firms (Oliva & Kallenberg, 2003; Vargo & Lusch, 2004; Salonen, 2011). However, the positive effects of both product-related service and customer-related service may be weakened in the dysfunctional competition environment. First, the product-related service, such as repairs, maintenance and overhauls can be seen as a "one-stop shop" solution from one service provider who is the product-offering firm (Ye, Priem, & Alshwer, 2012). In the dysfunctional competition environment, the innovative firm's technologies and ideas may easily leak to others (Liu & Atuahene-Gima, 2018), i.e., unlawful and unfair competitors may imitate their product-related service process innovation at a low costs or risk (Nuruzzaman, Singh, & Pattnaik, 2019). For example, competitors can freeride on the firm's patents, designs, trademarks or even brands with little concerns of legal sanctions, which compromise the distinctiveness of firm's service (Liu & Atuahene-Gima, 2018). If customers choose to use one of the dysfunctional competitors, rather than the product-offering firm, which launched the original service innovation, it would be damaging to that firm. Therefore, the outcome of service innovation to firm performance could be weakened under such a circumstance.

Second, customer-related services, such as consulting, insurance, financing and training, require a clear understanding of customers' needs (Griffin & Hauser, 1993) and perceptions of

value from the use of the products (Raja *et al.*, 2013). To achieve this, an effective communication channel between product-offering firms and customers is further required so information of service demand from customers and service improvement from firms can flow back and forth between customers and firms. In this way, customer needs can be met (e.g. Brady, Davies, & Gann, 2005; Davies, Brady, & Hobday, 2006). However, institutional voids may affect organisational information dissemination activities (Story, Boso, & Cadogan, 2015). In a dysfunctional competition market, due to the distribution channel interrupted by unfair or unlawful behaviours from competitors (Liu & Atuahene-Gima, 2018), firms may be unable to hear the correct feedback about their services or disseminate information about their new service to customers, with the result that customers may find it difficult to access these new services. In addition, customers' satisfaction of service depends on the quality of interactions and relationship experiences with firms (Cannon & Perreault, 1999), which could be problematic when communication is disrupted in dysfunctional competition. Therefore, the effectiveness of service innovation may be significantly undermined in this dysfunctional competition environment.

Overall, driven by customer engagement, service innovation process needs an open system (Storey *et al.*, 2016) and requires a close link between firms and customers (Hipp & Grupp, 2005; Storey *et al.*, 2016). Such an open system and its links may be disrupted by dysfunctional competition. Although service innovation is supposed as sustainable sources of value creation (Oliva & Kallenberg, 2003; Salonen, 2011; Vargo & Lusch, 2004), the positive effect of service innovation will be impaired by the low cost of imitation and the disruption of market information caused by dysfunctional competition. In this case, firms with service innovation as an innovation priority may be disproportionately burdened by the challenges of transforming the innovation efforts to achieve beneficial outcomes within the context of dysfunctional competition. Therefore, we propose:

H1a: The magnitude of the effect of service innovation on firm's performance will be weakened when dysfunctional competition exists.

On the product side, extant literature has addressed that firms in competition can 'copy, emulate or reverse engineer' the product design of an innovator so product innovation may be "a highly risky and less profitable" in such an environment (Li & Atuahene-Gima, 2001, p. 1125). However, some scholars recently suggest that dysfunctional competition, which may force firms to seek a more effective innovation activity (Cai *et al.*, 2017; Liu & Atuahene-Gima, 2018; Sheng, Zhou, & Lessassy, 2013), can foster the positive outcome of product innovativeness. To be specific, when dysfunctional competition exists, firms can adopt innovation activities (e.g., radical innovation) which are too time-consuming and expensive for competitors to imitate (Liu & Atuahene-Gima, 2018; Sheng, Zhou, & Lessassy, 2013). In this situation, firms can achieve more sustainable competition advantage and larger market returns than their competitors that adopt other innovation activities such as service innovation, as the latter are relatively easier to be imitated.

Following this view, we propose that product innovativeness, which commits to R&D and new technology ventures, and requires key proprietary knowledge, may work more effectively to enhance the firm performance due to its inimitability and non-substitutability. Although intellectual property rights may be unprotected, the core advanced technology or secrets in new products is inaccessible to, and hard-to-imitate by, other competitors (Sheng, Zhou, & Lessassy, 2013; Zhou, Yim, & Tse, 2005). Therefore, in an institutional environment with dysfunctional competition, competitors may focus on freeriding service innovation and incremental innovation (i.e., innovation that involves minor enhancements to functional features) rather than product innovativeness, as it is easier to imitate the former (Liu & Atuahene-Gima, 2018; Nuruzzaman, Singh, & Pattnaik, 2019). Therefore, firms that adopt product innovativeness will out-perform their competitors that conduct other innovation activities (Sheng, Zhou, &

Lessassy, 2013; Zhou, Yim, & Tse, 2005). That is, their performances are more likely to be elevated rather than undermined in dysfunctional competition. For example, firms like Huawei have gained industry-leading competitive advantage and achieved impressive market success through comprehensive product innovativeness activities, while other domestic competitors have to concern their unstable competitiveness as dysfunctional competition often leads to their innovation being quickly imitated or copied by rivals (Cai *et al.*, 2017).

Furthermore, the intensity aspect of product innovativeness indicates that firms are able to launch numerous new products in line with their multiple strategic logics (Menguc & Auh, 2006). Such complicated innovation systems, with the diversity of new product offerings, have more capacity to resist against the negative consequences of dysfunctional competition (Sheng, Zhou, & Lessassy, 2013). For example, it will reduce the risks of imitation of a particular new technology or feature in a product by using the profits earned from other innovative products to offsets the loss in a particular one. The more diverse the product innovation portfolios and the greater the intensity of product innovativeness the more effective such innovation activities can be in dysfunctional competition.

According to structuration theory, a firm's strategic activities need to fit its structural parameters (emerging from the institutional environments and systems) (Giddens, 1984). That is, a firm's competitiveness are the outcomes of the interactions between institutions and its activities (Zhang *et al.*, 2017). Thus, the effectiveness of innovation activities depends on how firms perceive their institutional environments. Specifically, the external forces from dysfunctional competition provide opportunities to those manufacturing firms that hold the high advanced technology (e.g., product innovativeness) whilst offering a threat to those that are incapable of creating competitive advantages of inimitability and non-substitutability. In the perceived dysfunctional competition environment, the firms that adopt product innovativeness can produce high product trialling, as well as support variety-seeking customers – both of which

can lead to repeat purchases (Szymanski, Kroff, & Troy, 2007). Thus, in the higher level of dysfunctional competition environment, product innovativeness may increase a firm's competitive advantages of inimitability, which leads to a higher firm performance. Our discussions suggest the following hypothesis:

H1b: The magnitude of the effect of product innovativeness on firm's performance will be enhanced when dysfunctional competition exists.

Moderating effects of government support

In contrast to the developed economies, governments play a strong role in driving the forward development of economy in aspirant markets (Bruton, Ahlstrom, & Chen, 2019). Therefore, it is necessary to explore the effect of government support in these economies (Du, Kim, & Aldrich, 2016; Nuruzzaman, Singh, & Gaur, 2020). Government support refers to the extent to which government provides support for firms in order to offset the negative effects resulting from inadequate or incomplete institutional infrastructure (Li & Atuahene-Gima, 2001; Sheng, Zhou, & Li, 2011; Xin & Pearce, 1996). As discussed above, due to the lack of well-established institutional system, dysfunctional competition may be widespread in the aspirant markets. To protect firms from these dysfunctional competitions and make them compete effectively in rapidly evolving markets, the governments may offer some special supports to firms, such as aiding innovation efforts, alleviating resource constraints, providing market information and additional resources including "direct financing, matching grants, tax rebates or rewarding firms that innovate creatively and intensively" (Story, Boso, & Cadogan, 2015, p. 55). Furthermore, we propose that government support may improve the impact of dysfunctional competitions on the effects of both service innovation and product innovativeness.

Government support helps firms to reduce innovation-associated risks and uncertainties in the dysfunctional competition market (Li & Atuahene-Gima, 2001), enabling firms to convert their innovation efforts in service innovation into new value creation. When dysfunctional

competition exists, the rules for market competition and needs of customers become unpredictable and unclear (Wang, Yeung, & Zhang, 2011; Zhang *et al.*, 2017), which make it difficult for firms to conduct service innovation. Government support, however, helps to re-define economic, social and political orders, and correct market failures such as indivisibilities, inappropriability and uncertainty distorted by dysfunction competition. For example, government support can reduce market uncertainty and risks by helping firms develop a better understanding of policies and providing important information on the trends of industry and market (Shu *et al.*, 2015; Zhang *et al.*, 2017). Thus, government support can relieve the negative impact of dysfunctional competitions on the effects of service innovation.

Moreover, with the government resources, the firms are able to co-innovate the market and develop their knowledge capacity for local market through collaborations with the government (Shu *et al.*, 2015; Wang *et al.*, 2020). Governments often play a key role as providers of the information of innovation (Lemola, 2002), and may also support the communication channels between firms and customers. As information from external ties may be more trustworthy and more useful to customers (Luo, 2003), with the government support, the psychological contracts between firms and markets may be also developed and strengthened. This further helps to build up the customers' loyalty and trust, and thus prohibit firms from losing market shares caused by imitation of competitors in a dysfunctional competition environment (Liu & Atuahene-Gima, 2018). Based on above discussions, we suggest the following hypotheses:

H2a: With the higher level of government support in the presence of dysfunctional competition, service innovation leads to a higher firm performance.

Similarly, government support provides not only favourable policies and information, but also critical external resources for the development of new products (Li & Atuahene-Gima, 2001; Shu *et al.*, 2015; Zhang *et al.*, 2017). Government legal support provides favourable regulations that fix market orders and protect intellectual property rights. In this institutional

environment, the copyright for the new knowledge, new technology, and the efforts put in product innovativeness may be better-protected (Wang *et al*., 2020). In turn, this prompt firms to develop product innovativeness to enhance their performance. In addition, governments are also able to aid direct resources to govern business operation and transactions (Keister & Zhang, 2009; Luo, Xue, & Han, 2010). Although product innovativeness is important to prevent competitors from free-riding in a dysfunctional competition environment, firms that lack financial and technical resources often encounter challenges as product innovativeness is resource-consuming (Zhang *et al.*, 2017). By providing support such as financial aids, tax rebates and skill trainings (Nuruzzaman, Singh, & Gaur, 2020), government can ease the resource constraints faced by firms in the process of implementing product innovativeness. Following structuration theory (Giddens, 1984, 1995), in response to institutional environments, firms attempt to utilize external forces imposed by institutional environments by taking opportunities while avoiding threats in order to enhance performance. Therefore, product innovativeness is a strategic reaction for firms to enjoy the benefits from government support while avoiding threats of imitations caused by dysfunctional competition. Thus, we propose *H2b*:

H2b: With the higher level of government support in the presence of dysfunctional competition, product innovativeness leads to a higher firm performance.

Methods

We employed a longitudinal dataset of 1,167 Chinese publicly listed manufacturing firms from 2007 to 2014 from the *China Stock Market and Accounting Research (CSMAR)* and *Wind database* to test all the hypotheses. Importantly, during this period the conditions that characterise an emerging economy – low income, rapid growth/institutional instability, and reliance on market liberalization – were no longer the case. By 2010 the World Bank was

already classifying China as upper-middle income and GDP growth 2007-2014 declined from 9-6% and remained around this level. According to Bruton, Ahlstrom, & Chen's (2019) definition, China had already met the requirements for an aspirational economy, namely an upper-middle income economy, steady economic growth and stable institutions and a commitment to innovation and new venture creation. Indeed, in their article the authors' make a plea for researchers to recognise and respect this reality for China research, which we have sought to follow when we positioned our research findings.

The data sets of *China Stock Market and Accounting Research (CSMAR)* and *Wind database* contain the detailed information about firms such as financial statement, patent data, and incomes of different businesses, which enable us to capture the constructs of product and service innovation and financial performance. The sample included various manufacturing industries, such as machinery and equipment, electronics, fabricated metal products, and transport machines. Further, we used the marketization index, compiled by the *National Economic Research Institute* (NERI) each year (Fan, Wang, & Zhu, 2011; Wang, Fan, & Yu, 2016), which reflected the development of formal institutions of each province, thereby enabling us to capture the constructs of dysfunctional competition and government support. The marketization index was widely adopted in previous studies (Zhou, Gao, & Zhao, 2017). As the marketization index is updated to 2014, we thus matched the different sources of data, excluded the samples with missing values, and finalized an internally consistent panel data of 1,167 Chinese manufacturing firms distributed across 31 provinces and 45 industries during 2007-2014, totalling 5,868 firm-year observations. In Table 1, we described the key constructs, including their operational definitions and measures.

Insert Table 1 about here

We used the earnings before interest and tax (EBIT), an effective indicator of a firm profitability, to measure *Firm performance* (e.g., Humphery-Jenner, Sautner, & Suchard, 2016).

Generally, EBIT depicts the profit a firm earns from its operations, and it focuses solely on a firm ability of generating earnings from operations while ignoring the tax burden and capital cost. Thus, we believe that EBIT is an effective indicator reflecting the financial performance generated by different innovation activities. *Service innovation* was measured by the service ratio calculated as the percentage of sales revenues in service businesses compared with the total revenues generated from all businesses (Fang, Palmatier, & Steenkamp, 2008). The *Wind database* provided a firm's sales revenue generated from each business segment, and we divided them into service and manufacturing businesses, thereby attaining the service revenues for each manufacturing firm. *Product innovativeness* referred to the products or technologies new to the existing products or industries (Lau, Yam, & Tang, 2011). As product innovativeness was highly correlated with the number of patents (Lau, Yam, & Tang, 2011; Romijn & Albaladejo, 2002), we measured it by the total number of patents applied for a firm in a given year.

The marketization index contained five sub-indices. We selected the sub-index of the development of market intermediaries and legal system to measure the level of *Dysfunction competition*. This sub-index represented the degree of legal system protection available for manufacturers, consumers and intellectual property rights. As defined before, dysfunctional competition referred to the presence of unlawful business practices in the market. That is, an environment with a diminished level of legal protection (as remains the case in an aspirant market) will lead to a high level of dysfunctional competition, as the legal system cannot regulate or punish the unlawful behaviours (Sheng, Zhou, & Lessassy, 2013). To measure *Government support*, we selected a second sub-index the relationship between government and market, which reflected the support and role of governments in economy development and business operations. A higher level of government-market relationship index meant that local

governments could provide efficient services to support firm's operations, such as reduced tax burden, fewer interventions, and more financial support.

Additionally, we controlled several variables, including the firm level variables of *Firm age*, *Firm size*, *Free cash flow*, *Capital intensity*, *Income growth*, and *Fixed assets ratio*, and the regional level variables of *GDP per capita*, *Monetary policy*, and *Fiscal policy*. At the firm level, *Firm age* was measured as the years since incorporation, *Firm size* was measured as the number of employees, *Free cash flow* represented the cash a firm generated after cash outflows to support business operations, *Capital intensity* was measured as the ratio of total assets to operating income, *Income growth* represented operating income growth rate, and *Fixed assets ratio* was measured as the ratio of fixed assets to total assets. At the regional level, we captured the regional economic development by controlling *GDP per capita*, and the financial or fiscal stabilization policies by using the two variables of *Monetary policy* and *Fiscal policy* (Banalieva, Eddleston, & Zellweger, 2015).

Results

Table 2 reported the descriptive statistics and correlations of the variables. An overview of the correlations among independent variables suggested that multicollinearity was not a major concern, and variance inflation factors (VIF) ranged from 1.02 to 4.36, much lower than the accepted cut-off value of 10. We conducted the Hausman test to determine whether to use fixed effects or random effects models. As the Hausman test was significant (p<0.01), we estimated the fixed effects model for firm performance. Model specifications to examine the Hypothesis 1 of the moderating effects of dysfunctional competition were set as follows. Model (1) included industry fixed effects $\omega_{industry}$, year fixed effects ω_{year}, province fixed effects $\omega_{province}$, and year × industry fixed effects $\omega_{year\times\text{industry}}$, $\sum \text{controls}$, referred to a vector of firm-level and regional level control variables, and $\epsilon_{i,t}$, error item.

$$\text{Performance}_{i,t} = \alpha_0 + \alpha_1 \text{Service Innovation}_{i,t} + \alpha_2 \text{Product Innovativeness}_{i,t} +$$

$$\alpha_3 \text{Dysfunctional Competition}_{p,t} + \alpha_4 \text{Service Innovation}_{i,t} \times \text{Dysfunctional Competition}_{p,t} + \alpha_5 \text{Product Innovativeness}_{i,t} \times \text{Dysfunctional Competition}_{p,t} + \alpha_5 \sum \text{controls} + \omega_{\text{industry}} + \omega_{\text{year}} + \omega_{province} + \omega_{year \times \text{industry}} + \epsilon_{i,t} \quad (1)$$

To examine the three-way interactions, we then added all two-way interactions and two three-way interactions into the model (2) and (3), which were rewritten as follows.

$$\text{Performance}_{i,t} = \alpha_0 + \alpha_1 \text{Service Innovation}_{i,t} + \alpha_2 \text{Product Innovativeness}_{i,t} + \alpha_3 \text{Dysfunctional Competition}_{p,t} + \alpha_4 \text{Government Support}_{p,t} + \alpha_5 \text{Service Innovation}_{i,t} \times \text{Dysfunctional Competition}_{p,t} + \alpha_6 \text{Service Innovation}_{i,t} \times \text{Government Support}_{p,t} + \alpha_7 \text{Dysfunctional Competition}_{p,t} \times \text{Government Support}_{p,t} + \alpha_8 \text{Service Innovation}_{i,t} \times \text{Dysfunctional Competition}_{p,t} \times \text{Government Support}_{p,t} + \alpha_9 \sum \text{controls} + \omega_{\text{industry}} + \omega_{\text{year}} + \omega_{province} + \omega_{year \times \text{industry}} + \epsilon_{i,t} \quad (2)$$

$$\text{Performance}_{i,t} = \alpha_0 + \alpha_1 \text{Service Innovation}_{i,t} + \alpha_2 \text{Product Innovativeness}_{i,t} + \alpha_3 \text{Dysfunctional Competition}_{p,t} + \alpha_4 \text{Government Support}_{p,t} + \alpha_5 \text{Product Innovativeness}_{i,t} \times \text{Dysfunctional Competition}_{p,t} + \alpha_6 \text{Product Innovativeness}_{i,t} \times \text{Government Support}_{p,t} + \alpha_7 \text{Dysfunctional Competition}_{p,t} \times \text{Government Support}_{p,t} + \alpha_8 \text{Product Innovativeness}_{i,t} \times \text{Dysfunctional Competition}_{p,t} \times \text{Government Support}_{p,t} + \alpha_9 \sum \text{controls} + \omega_{\text{industry}} + \omega_{\text{year}} + \omega_{province} + \omega_{year \times \text{industry}} + \epsilon_{i,t} \quad (3)$$

Insert Table 2 about here

Hypothesis 1 dealt with the moderating effect of dysfunctional competition on the effectiveness of service innovation and product innovativeness. Table 3 reported the coefficients, robust standard errors, and *p* values of all independent and control variables. In

regressions, we added the control variables first as the baseline model (Model 1), then the independent variables (Model 2), and finally the interaction terms (Model 3). The results showed that the coefficient of the interaction item of dysfunctional competition and service innovation was negatively significant (p<0.1), while the coefficient of the interaction of dysfunctional competition and product innovativeness was positively significant (p<0.01). Therefore, both *Hypothesis 1a* and *Hypothesis 1b* were supported, suggesting the weakening effect of dysfunctional competition on the effectiveness of service innovation while the strengthening effect on the effectiveness of product innovativeness.

Insert Table 3 about here

Hypothesis 2 supposed a three-way interaction highlighting the effectiveness of government support in the presence of dysfunctional competition. All two-way interaction factors were generated and introduced into regression before adding a three-way interaction term. As Table 4 showed, the three-way interaction of service innovation with dysfunctional competition and government support had a significantly positive effect (p<0.05), suggesting the positive role of government in deterring unlawful business conducts, establishing a fair play field, and promoting the effectiveness of service innovation. Thus, *Hypothesis 2a* was supported. The coefficient of the interaction term of product innovativeness with dysfunctional competition and government support was not significant.

Insert Table 4 about here

Moreover, the results in Table 3 and Table 4 showed that the r-squared coefficients were very close in different models. Considering we have added time-, regional-, industry-, and year-industry level fixed effects to control for the omitted variables, little variations of R-square of adding more parameters would be reasonable. We then test whether the interaction terms had

significant explanatory power. The chow-test findings showed that the two-way interaction terms of service innovation and dysfunctional competition (F-value=3.01, p<0.1), product innovativeness and dysfunctional competition (F-value=14.58, p<0.01), and the three-way interaction term of service innovation, dysfunctional competition, and government support (F-value=4.61, p<0.05) were significantly against zero. Therefore, these interaction terms have significant explanatory power, thereby supporting the relevant hypotheses.

We have also tried to deal with the endogeneity issue by adding fixed effects and employing instrumental variable approach. First, to reduce the concern on the omitted variables that might cause endogeneity, we have added industry, province, and time fixed effects to control for all time-invariant industry-level, province-level characteristics, and all time-varying characteristics. Second, following prior studies (e.g., Lin, Lin, & Song, 2010), we used the average values of product innovativeness and service innovation of firms within the same industry-province as instruments. Table 5 reported the IV estimation results. As reported by the underidentification test and weak identification test, these instrumental variables had strong relationships with the explanatory variables. Furthermore, results showed that the coefficient of the interaction term of service innovation and dysfunctional competition was significantly negative at the 1% level (*H1a*), while the coefficient of the interaction term of product innovativeness and dysfunctional competition was significantly positive at the 1% level (*H1b*). Meanwhile, the coefficient of the 3-way interaction term of service innovation, dysfunctional competition, and government support was significantly positive at the 5% level (*H2a*). The above results were consistent with the previous estimations (Table 3 and Table 4), and thus reduced the concern about endogeneity and strengthened the robustness of the findings.

Insert Table 5 about here

Robustness Study

The secondary dataset above provides us with a large sample distributed across various industries and most provinces in China, thereby producing a high external validity. In addition, the longitudinal data, with objective and actual measures over time, can reduce the concern about common method bias and endogeneity, which normally are the limitations of other methods. However, this method may have potential bias in measuring. To ease this concern, we then conducted a robustness study, i.e., survey questionnaires, which allowed us to use theoretically appropriate measures with multiple items for the key variables. Therefore, the two studies complement each other and can enhance the overall validity of results and strengthen the confidence in the findings.

Robustness Study: Methods

In the robustness study, we conducted primary research during 2016 with survey questionnaires in 400 manufacturing firms and further tested all the hypotheses with 171 valid questionnaires Due to the large geographical area of China, it is suggested that some representative cities or provinces be selected for data collection (e.g., Kim & Atuahene-Gima, 2010; Li & Atuahene-Gima, 2001; Zhou & Li, 2012). Following this approach, we selected the three metropolises of Beijing, Tianjin and Jinan for our data collection, where a good number of leading manufacturers are located. Considering both representativeness and accessibility, we initiated a sample list of 400 manufacturing firms based on relevant directories available from the local authority. With the help from a large national institute for managers' training and coaching, we gained access to these 400 manufacturing firms and collected our data.

Our survey questionnaires were developed based on well-established scales from pertinent literature. The scale items were translated by two native speakers of Chinese, and the translations compared and unified. The unified Chinese instrument was reverse translated into English to ensure the accuracy of the Chinese version (Li & Zhang, 2007). To ensure its relevance to the Chinese context (Li & Atuahene-Gima, 2001; Zhou & Li, 2012), we also

conducted a pilot study by inviting ten managers to evaluate the original questionnaire in terms of clarity, appropriateness and contents and the items were refined accordingly.

Due to the cultural impact, the approaches with high personal involvement are helpful to enhance response rate and data quality in the Chinese context (Kim & Atuahene-Gima, 2010; Li & Atuahene-Gima, 2001; Zhou & Li, 2012). Thus, rather than a mail survey, on-site visits, telephone calls and emails (Jean, Sinkovics, & Hiebaum, 2014; Perks, Kahn, & Zhang, 2009) were selected for the survey data collection. The initial contacts were made through telephone calls and/or emails and then data was collected through on-site visits. This allowed us to ensure the quality of the data by assessing the suitability of the participants and offering clarifications to participants if needed. As this was a single-respondent survey, special care was taken with this latter step. As the unit of analysis in this study is the firm, more than 90% of our respondents were senior or middle managers (marketing, R&D or strategy). All the managers had been working in the sample firms for more than three years and therefore knowledgeable about the external environment and innovation activities. Eventually, we received 171 (out of 400) valid questionnaires with a 42.8% response rate, which was approximately similar to the response rates reported in prior studies for firm level (e.g., Li & Atuahene-Gima, 2001; Sheng, Zhou, & Li, 2011; Zhou & Wu, 2010). Table 6 shows the demographic profile of our sample in comparison with a nationwide investigation conducted by the World Bank in 2005. Chi-square tests (p>0.1) indicated that there was no significant distribution difference between these two samples. Moreover, in the World Bank Enterprise Survey[2], 100-employee is a cut-off threshold to identify whether a firm is large or not. As demonstrated by the distribution of firm scale in Table 6, 28.7% firms employ less than 100 people, and almost 50% (46.2%) firms employ more than 300 people. Therefore, our sample contained both small- or medium-sized (i.e., SMEs) and large-sized firms, with the latter being the majority. Table 6 also includes demographic

[2] https://www.enterprisesurveys.org/

profile for the secondary dataset study (i.e., study 1). Considering that the sample firms for the secondary dataset study are all listed companies, it is reasonable that large and mature firms dominate the sample.

Insert Table 6 about here

We used 7-point scale measurements with 1 as the lowest level and 7 as the highest level. Manufacturing firm performance is usually measured in terms of its profit, sales, and market share (March & Sutton, 1997). In our study we measured *Firm performance* with an extended four-item measurement including market share, sales growth, profitability and return on investment, which were also used in prior studies (e.g., Li & Zhang, 2007; Sheng, Zhou, & Li, 2011). The *Cronbach's α* of 0.904 showed a good internal consistency.

Service innovation with a four-item measurement (i.e., product delivery, after-sale service, customer solution, and service quality) was adapted from Kaleka's (2011) and Lusch, Vargo and O'Brien's (2007) studies, which focused on the improved performance on both product-related and customer-related service in manufacturing firms (Raddats & Easingwood, 2010; Eggert, Thiesbrummel, & Deutscher, 2015). Its *Cronbach's α* was 0.892. It should be noted that if a firm pursues product-related services (service as the support for the use of products, e.g., product delivery, after-sale service), it indicates that this firm emphasizes the contribution of basic services rather than pure products in driving the transaction and enhancing competition advantages (Eggert *et al.,* 2014; Kaleka, 2011). That is, it is pursuing the service-led innovation (Sousa & da Silveira, 2017).

The measures of *Product innovativeness* were adapted from Yiu, Lau, & Bruton's (2007) studies. It contained five items that requested respondents to assess firm's advances or achievements in radical technologies or innovative products relative to competitor innovation activity (Story, Boso, & Cadogan, 2015). The *Cronbach's α* was 0.915.

A firm practice was based on managers' perceptions about external environment (Li & Atuahene-Gima, 2001). Following other studies (e.g., Li & Atuahene-Gima, 2001; Li & Zhang, 2007), we measured institution-related variables through asking managers for their perceptions or experience. Thus, we used four items from Li and Atuahene-Gima's (2001) and Li & Zhang's (2007) work to measure the degree of *Dysfunctional competition*. The *Cronbach's α* was 0.756. Another institutional variable of *Government support* was measured by four items, which were adapted from Li and Atuahene-Gima's (2001) and Sheng, Zhou, & Li's (2011) studies. The *Cronbach's α* was 0.909.

We controlled several variables that may have had potential impact on firm performance in our study, namely (1) *Firm age* that usually reflects a firm's industrial experience and is closely related to product or service innovation, and overall performance (Fang, 2011; Perez-Luno, Wiklund, & Cabrera, 2011); (2) *Firm scale* that may affect the resources firms have for product or service innovation (Rosenbusch, Brinckmann, & Bausch, 2011); (3) *Market orientation* that is considered as one of the fundamental prerequisites that determines customer value (Olson, Slater, & Hult, 2006), and two crucial industry factors (4) *Market dynamism* and (5) *Market growth* that significantly influence business activities and operational performance (e.g., Fang, Palmatier, & Steenkamp, 2008).

Confirmatory factor analysis (CFA) was used to test measurement validity (see Appendix A). The measurement model had an overall good fit (χ^2/df =2.211, *SRMR*=0.066). Each item was loaded significantly on its expected variable (p<0.01). Thus, the results of CFA suggested a good convergent validity. In addition, the square root of the *AVE* of each variable was larger than its correlation with other variables (as shown in Table 7), which showed a good discriminant validity.

Insert Table 7 about here

Common method bias. Common method bias is a sharing concern for using survey questionnaires and we adopted several approaches to minimize its potential influence. First, we used Harman's one-factor test. The results of exploratory factor analysis (EFA) illustrated that five factors including one dependent variable and four explanatory variables were identified. They explained 74.99% of the total variance, while the first factor explained only 18.05%. Second, we adopted the approach of "MV" marker variable (Lindell & Whitney, 2001). The variable of *Employee empowerment* was chosen as the marker variable that contained two items and had an acceptable reliability (*Cronbach's α* was 0.779). As shown in Table 7, it was not correlated with most variables including the dependent (p>0.1) (Lindell & Whitney, 2001). The smallest correlation between marker and other variables (γ=0.036) was used to adjust the correlations matrix and statistical significances, and the significance of all correlations remained unchanged. Furthermore, our focus on two-way and three-way interactions reduced the concern about common method bias, as it immunized the possibility for respondents to infer relationships between variables (Allred & Swan, 2014).

Robustness Study: Results

Table 7 reported descriptive statistics and correlation matrix. We mean-centred variables and then generated interaction terms. All VIFs were below the cut-off value of 10, which reduced the concern about multicollinearity.

Table 8 added the controls, the independent, and the interaction terms in turn, the full model (Model 3) indicated that the interaction effect of service innovation and dysfunctional competition was significantly negative (p<0.01). *Hypothesis 1a* was supported. In contrast, the interaction term of product innovativeness and dysfunctional competition had a positive effect on performance (p<0.05). *Hypothesis 1b* was also supported. The results revealed the distinct effectiveness of service and product innovation in the presence of dysfunctional competition.

Insert Table 8 about here

Table 9 reported the regression results of three-way interaction. Through combining Model 3 (two-way interaction model) and Model 4 (three-way interaction model), we examined the interaction effect of service innovation, government support, and dysfunctional competition. The coefficient of three-way interaction term was significantly positive (p<0.1). Thus, *Hypothesis 2a* was supported. Model 5 (two-way interaction model) and Model 6 (three-way interaction model) were combined to examine the interaction of product innovativeness and two institutional variables. The interaction coefficient was not significant in statistics (p>0.1). Thus, *Hypothesis 2b* was not supported.

Insert Table 9 about here

Furthermore, we conducted a simple slope analysis to examine the moderating effects. We separated the significant interaction terms and compared the impacts of service innovation and product innovativeness on performance at low and high levels of dysfunctional competition. We assigned the low level as one standard deviation below the mean and the high level as one standard deviation above the mean. The results were shown in Figure 2. Service innovation illustrated a weaker effect (see Figure 2a) while product innovativeness demonstrated a stronger effect (as shown in Figure 2b) at the high level of dysfunctional competition. Further, Figure 2c depicted the three-way interaction. At the high rather than low level of government support, the negative effect of dysfunctional competition on the effectiveness of service innovation was mitigated. That is, in the presence of dysfunctional competition, service innovation could lead to a higher performance with the higher level of support from governments. We could observe the increasing role of government support for manufacturing service innovation in the dysfunctional environment.

Insert Figure 2 about here

Similarly, we also conducted the chow-tests for moderating effects to check whether the interaction terms had significant explanatory power. The findings showed that the two-way interaction terms of service innovation and dysfunctional competition (F-value=7.10, $p<0.01$), product innovativeness and dysfunctional competition (F-value=4.91, $p<0.05$), and the three-way interaction term of service innovation, dysfunctional competition, and government support (F-value=3.05, $p<0.1$) were significantly against zero.

General discussion

Our research offers a fine-grained view to manufacturing innovation. Findings from both studies suggest that in the dysfunctional competition environment, product innovativeness, rather than service innovation, has positive contributions to manufacturing firm's performance. Novelty and radicality of new products protect firms from unfair or even unlawful competition behaviours of other firms (Sheng, Zhou, & Lessassy, 2013) while the intensity of innovative products enables firms to develop more markets by serving diverse and multiple demands (Hua & Wemmerlov, 2006). Both these aspects of product innovativeness help firms to maintain and develop their response to competitors' changing strategies (Joshi & Campbell, 2003). Informed by structuration theory, firms have a more pressing need to choose product innovativeness in a dysfunctional competition environment. In contrast, dysfunctional competition may undermine the dynamic relationships and interactions between firms and customers and thus service innovation is not suggested to adopt in this environment.

However, the positive linear relationship between product innovativeness and firm performance seems not significant in the more complicated institutional environment when dysfunctional competition and government support co-exist (i.e., *H2b*). Meanwhile, the results also show that the main effects of government support are generally not statistically significant in both studies. Our findings are consistent with that by Guan & Yam (2015), who find that

Chinese government financial incentives sometimes fail to directly enhance innovative performance, or even damage it. For example, government support may draw concerns on "zombie firms" with high debt, low profit and that would go bankrupt due to poor earnings but survive with external support from governments or financial sector (Shen & Chen, 2017). Moreover, government subsidies on these firms often result in poor performance by distorting the investment behaviors (Liu *et al.,* 2019), and cause the problems of over-capacity, which decrease capacity utilization of manufacturing firms and may harm their growth potential (Shen & Chen, 2017). Therefore, although government often provide funding and favorable polices to promote innovation activities, whether firms can directly benefit from these support remains highly uncertain (Chen *et al.*, 2014).

Moreover, Droge, Calantone, & Harmancioglu (2008) confirm that firms have a less pressing need to innovate in an uncompetitive, or less turbulent, environment but can benefit from enhanced market intelligence. This offers a possible explanation to the unsupportive findings on *H2b*. As we have proposed in *H1b*, comparing with service innovation, product innovativeness provide larger competitive advantages and create more sustainable value for manufacturing firms in a dysfunctional competition environment. Government support, however, can moderate the intensity of dysfunctional competition, and thus may reduce the comparative advantage of firms, which are built upon product innovativeness activities. This may reduce the firm's desire for or efforts on the optimal level of innovation such as product innovativeness, which requires higher level of learning and involves higher level of risks. Therefore, in such a mixed institutional environment with dual effects of dysfunctional competition and government support, firms may alternatively shift to service innovation, or incremental innovation (which may require less resources and investment), in response to the less intense dysfunctional competition (Nuruzzaman, Singh, & Pattnaik, 2019). Therefore, under this circumstance we see a strong contribution of service innovation to firm performance

(*H2a*), whilst the positive effect of product innovativeness on firm performance is not significant (*H2b*).

Theoretical contributions

Our research provides the following theoretical contributions. First, by stressing the compatibility between a firm's innovation activities and its external environment, this research contributes to expanding our understanding of innovation activities adopted by manufacturing firms in complex institutional environments. The extant literature based on the institution-based view has proposed that institutional environment factors often profoundly influence firm competitiveness and behavior (Banalieva, Eddleston, & Zellweger, 2015; Peng, Wang, & Jiang, 2008). Sun, Peng, Ren, & Yan (2012) and Scalera, Mukherjee, & Piscitello (2020) further build on a comparative advantage framework, suggesting that strategic choices of firms "can be explained by their comparative ownership advantages stemming from the combination of country- and firm-specific advantages" (Scalera, Mukherjee, & Piscitello, 2020, p.157). Therefore, the competitive advantage of a firm is not only based on its own strategic activities but also closely related to the external institutional environment. In accordance with their viewpoint, and to add rigour, we adopt structuration theory to explore the impact of the interaction of country-specific institutional factors and firm-specific advantages on firm performance. To extend the extant studies, we underline the importance of the compatibility between a firm's strategic activities (e.g., innovation) and the external environment in which the firm is located. That is, firms should flexibly choose innovative activities (e.g., product innovativeness and service innovation) to shape their own competitive advantages and enhance their performance depending on the external institutional environment. For example, our findings suggest that firms can reduce the negative impact of dysfunctional competition on environment firm performance by developing product innovativeness rather than service innovation.

Second, numerous literatures have identified a positive relationship between firm level of innovativeness and a wide range of performance outcomes (e.g., Hult, Hurley, & Knight, 2004; Tellis, Prabhu, & Chandy, 2009) but there are also different voices for the opposite positions (Capon, Farley, & Hoenig, 1990). Thus, further understandings of effectiveness of innovation in different institutional environments are required. This study compares the manufacturing firm performance outcomes of two innovation activities (i.e., service innovation and product innovativeness) in different institutional environments. To do so, we not only examine the single moderation of a particular institutional environment (i.e., dysfunctional competition), but also study the complex in institutional environments by examining the double moderation of dysfunctional competition and government support. Our research model is further tested by two empirical studies with both a large sample of a longitudinal panel dataset with 1,167 Chinese public listed firms and primary data of 171 manufacturing firms, which provide convincing empirical evidence to support our above notion. The findings suggest the organisational innovation-performance relationship is more complex than previously postulated and a particular innovation focus is not always beneficial to firm performance.

Third, global competition landscape has been changing (Sun & Lee, 2013), with aspirant markets playing an increasingly important role (Bruton, Ahlstrom, & Chen, 2019). However, the institutional environments of these aspirant markets are quite different with those of developed countries (Bruton, Ahlstrom, & Chen, 2019), and such unique attributes profoundly impact firm behavior (Bahl, Lahiri, Mukherjee, 2021). Informed by structuration theory, and responding to this need, our study makes a special contribution to expand innovation literature by providing an understanding of interactions of firm innovation activities and environments. In particular, most of the extant studies regard China as an emerging market or post-transition economy (Mukherjee, Makarius, & Stevens, 2021; Scalera, Mukherjee, & Piscitello, 2020; Wu & Deng, 2020), and suggest that firms in these economies “focus more on developing upgrades

to existing products using simpler technologies" (Bahl, Lahiri, Mukherjee, 2021, p.9). Instead, we have selected to Bruton, Ahlstrom, & Chen's (2019) position that China has emerged as an aspirant economy. Here, in response to their own rising labour costs, manufacturing firms have been reducing their reliance on the low-cost production and duplicative imitation. Therefore, we shift our research track to reflect this and examine innovative activities at the higher value chain level: product innovativeness and service innovation. This directly extends the discussion of aspirant economies initiated by Bruton, Ahlstrom, & Chen (2019). A key guidance provided by this research is that rather than simply follow the steps of most firms in developed countries, which may have innovation efforts in service or product areas, firms in the aspirant markets should concentrate their efforts and resources on product innovativeness when their markets are dominated by dysfunctional competition without government interference. In contrast, if the government offers support in a dysfunctional competitive environment, manufacturing firms should then adjust their innovation activities towards service innovation. Therefore, service innovation should be understood and adopted from a structuration perspective, and deployed differently in the aspirant markets, which are normally associated with some unique features that are absent in the developed markets.

The implications for practice

If we generalize findings from this study to a broader context of aspirant markets in which radical or explorative innovations are highlighted, practical guidance for both managers and policy-makers are implied. First, our research suggests that the firms in the aspirant markets should have flexibility in innovation activities in response to the complex of institutional environments. Drawing upon structuration theory, organisational innovation adoption needs to change continuously in response to, and in anticipation of, dynamic business environments (Yang *et al.*, 2012). To be specific, firms should adopt appropriate innovation activities, i.e., service innovation, product innovativeness, or both, according to the environments (e.g., the

level of presence of institutional voids vs. institutional support). In this way, it will also help firms concentrate on their limited resources to further develop their strengths and transform these strengths to source of value creation.

The research also has implications for policy makers. Government plays an important role in innovation (Shu *et al.*, 2015). As dysfunctional competition still remains in under-developed regions, in recognition of the fact that benefits of service innovation to manufacturing firm performance are significantly reduced in the environment of dysfunctional competition, policymakers should identify ways to offer help and supports to these firms. These supports are particularly crucial to those manufactures whose competitive advantages purely rely on service innovation. These supports may include raising the entry bar for markets, raising customer's awareness of authentic products, improving communication channels and creating conditions that enhance firm's access to special resources. These government supports will aid developing relational dynamism between customers and firms and thus help firms with service innovation as priority become more adept in this challenging environment.

Moreover, the role of governments in encouraging innovation has increased in the past few years (Bruton, Ahlstrom, & Chen, 2019). For example, Chinese government has launched the national strategic plan "Made in China 2025" in 2015, in which government strengthens its support roles (e.g., providing funds) for prompting manufacturing innovation. This trend, combined with our findings, provides an important implication for the aspirant economy. For example, government has mainly funded production innovation in the recent years (Guan & Yam, 2015). However, the results of our study show that government support relieves the negative impact of dysfunctional competition on the effectiveness of service innovation, while this effect is not observed in the production innovativeness. These results further indicate that services innovation, comparing to production innovativeness, can benefit more from the government support when dysfunctional competition exists. In this context, the government

needs to make better trade-offs on the allocation of supports and should increase supports for service innovation.

Limitations and suggestions for future research

This study should be viewed in the light of several limitations, which also provide implications for the future research. First, as the most typical aspirant market with dynamic institutions and prominent manufacturing (Bruton, Ahlstrom, & Chen, 2019), China provides an appropriate and interesting context for our topic. However, the level of institutional development may vary across different aspirant markets (Bruton, Ahlstrom, & Li, 2010; Bruton, Ahlstrom, & Chen, 2019). For instance, in contrast to India, Chinese private institutions are relatively weaker while its government role is stronger (Scalera, Mukherjee, piscitello, 2020). This may lead to the discrepancies in the innovation activities and their contribution to firm performance (Story, Boso, & Cadogan, 2015). Thus, our findings should be extended to other aspirant markets with caution.

Second, as a strategic approach to performance improvement, we contrasted service innovation with product innovativeness, which represents a high level of product innovation. We have not yet included other ranges of product innovations in this study. Future research may consider the lower level of product innovation activities and study how firms strike a balance between novel and intensive product innovativeness, lower levels of product innovation and service innovation in their innovation portfolios.

Third, given the limited resources and strategic focus within a firm (Fang, Palmatier, & Steenkamp, 2008; Nezami, Worm, & Palmatier, 2018), this study adopts the substituting view on the relationship of two innovation activities. By comparing the effects of two innovation activities depending on institutional environments, our study helps to expand our understanding of manufacturing firm's performance in relations to service innovation or product innovativeness and provides guidance on which innovation activities a firm should invest and

adopt in a particular institutional environment. In addition, we would like to stress that the substituting view does not recommend a complete or absolute product- or service-led innovation. That is, service innovation and product innovativeness are regarded as the propensity held by a firm to develop service- or product-related components (Sousa & da Silveira, 2017). In this sense, it is likely to see both innovation activities may co-exist within a manufacturing firm, while the firm may choose one as a strategic orientation or priority, and adjust its resources allocation to accommodate this strategic focus accordingly.

However, these two innovations activities may also demonstrate complementary effects in the reality. That is, firms that achieve effective complementarity of both innovation activities may greatly enhance their competitiveness (Boso *et al.*, 2019; Eggert, Thiesbrummel, & Deutscher, 2015; Ulaga & Reinartz, 2011). Therefore, how institutional environments affect the effectiveness of "hybrid innovation" (e.g., the interaction of service innovation and product innovativeness) can be further investigated.

Fourth, this study exclusively focuses on two institutional environments, i.e., dysfunctional competition and government support, and their interaction effects with different innovation activities. Future research may extend the study to a wider range of institutional environments to include more specific institutional characteristics, especially in the context of aspirant markets. Such studies will help firms develop a greater understanding of innovation activities in different environments so firms will be able to direct their innovation efforts and resources to the most appropriate areas. Finally, an important reminder that the all the firms in secondary data study 1 and the majority in the primary research study 2 were large firms. The small and medium sized firm sector, where attitudes to innovation and to innovation practice are significantly different, will require its own study.

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Figure 1. The Conceptual Framework

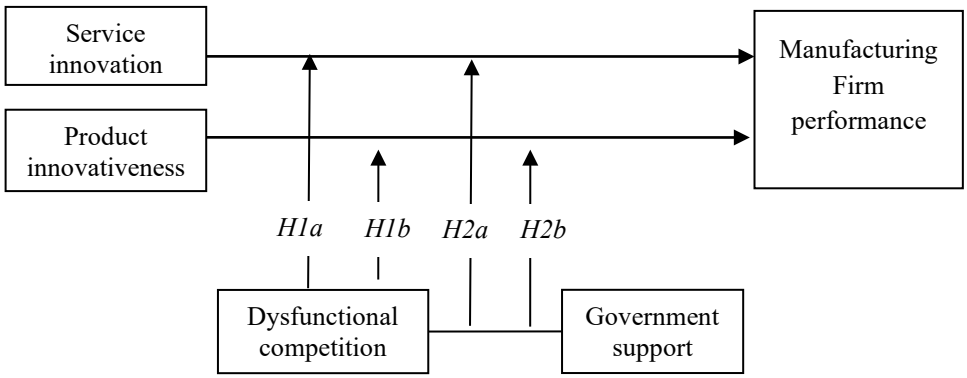

Figure 2a. The Interaction of Service Innovation and Dysfunctional Competition

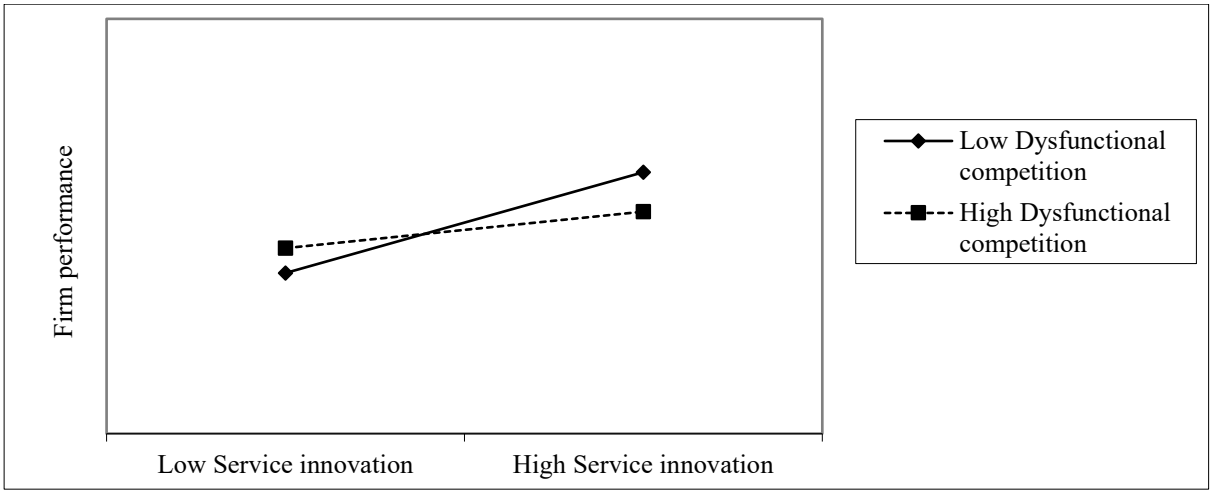

Figure 2b. The Interaction of Product Innovativeness and Dysfunctional Competition

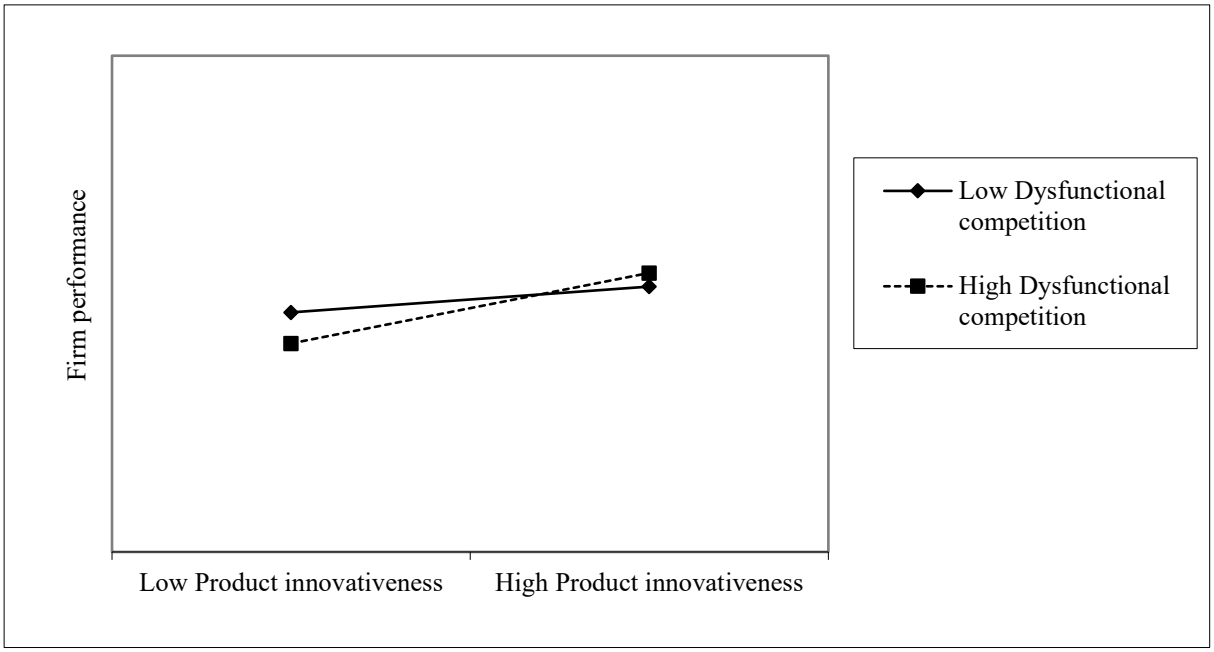

Figure 2c. The Interaction of Service Innovation, Dysfunctional Competition and Government Support

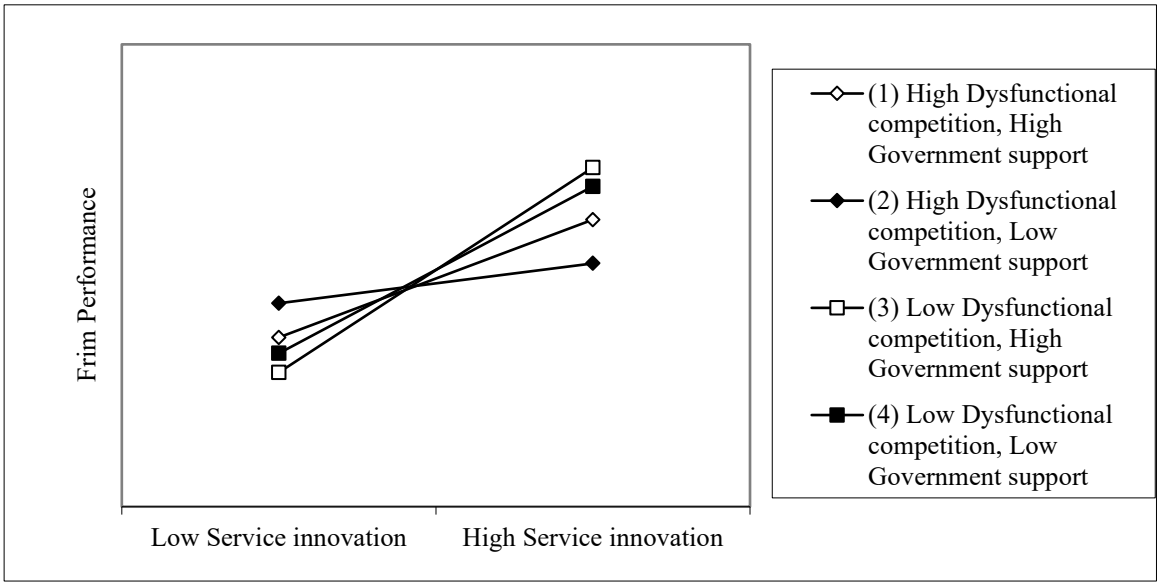

Table 1. Variables and Measures (Study 1)

	Variable Name	Variable definition
Dependent variable	Firm performance	profit before interest and taxes
Independent variable	Service innovation	serviced income as a percentage of main business income
	Product innovativeness	the total number of patent applications per year
	Dysfunctional competition	Negative treatment of the development of market intermediaries and the rating of the legal system environment in the marketization index
	Government support	the relationship between government and market in the marketization index
Controls	Firm age	the natural logarithm of the difference between the year of establishment and the year of observation plus 1
	Firm size	the natural logarithm of the number of employees in the enterprise plus 1
	Free cash flow	(net increase in cash and cash equivalents - net cash flow from financing activities) * current period value / paid-in capital at the end of the period, when the denominator is not published or zero or less than zero, it is expressed as NULL
	Capital intensity	total assets / operating income
	Income growth	operating income growth rate
	Fixed assets ratio	fixed assets / total assets
	GDP per capita	per capita GDP of the firm's region
	Monetary policy	loan balance of financial institutions/GDP in CNY 10,000
	Fiscal policy	fiscal expenditures–fiscal revenues in CNY 10 bill

Table 2. Descriptive Statistics and Correlations (Study 1)

Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Firm performance	18.889	1.325	1.000													
2. Service innovation	0.056	0.193	0.002	1.000												
3. Product innovativeness	29.189	126.581	0.250	0.028	1.000											
4. Dysfunctional competition	-7.835	4.506	0.051	-0.094	-0.009	1.000										
5. Government support	7.270	1.661	-0.056	0.061	-0.006	-0.549	1.000									
6. Firm age	2.674	0.301	0.084	0.040	0.036	-0.052	-0.058	1.000								
7. Firm size	7.731	1.117	0.677	-0.038	0.285	0.118	-0.067	0.116	1.000							
8. Free cash flow	-0.248	0.912	0.076	0.025	0.049	-0.029	0.034	0.104	0.048	1.000						
9. Capital intensity	1.837	1.153	-0.264	0.036	-0.077	0.035	-0.118	-0.005	-0.360	-0.153	1.000					
10. Income growth	0.322	5.170	0.025	0.001	-0.007	0.003	0.015	-0.010	-0.014	0.023	-0.025	1.000				
11. Fixed assets ratio	0.253	0.138	0.065	-0.119	-0.041	0.122	-0.007	0.017	0.250	0.053	-0.186	0.000	1.000			
12. GDP per capita	10.703	0.498	-0.008	0.113	0.031	-0.731	0.284	0.210	-0.113	0.007	0.046	-0.009	-0.136	1.000		
13. Monetary policy	1.080	0.422	-0.004	0.139	0.023	-0.637	0.185	0.072	-0.062	0.053	0.002	-0.030	-0.130	0.618	1.000	
14. Fiscal policy	12.600	7.563	0.029	-0.098	0.028	0.454	-0.407	0.152	0.076	-0.061	0.076	-0.012	0.041	-0.282	-0.456	1.000

Table 3. Moderating Effect of Dysfunctional Competition (Study 1)

Variables	Dependent: Firm Performance		
	Model 1 (baseline)	Model 2	Model 3
Independent			
Service innovation		-0.051	-0.097
		(0.071)	(0.078)
Product innovativeness		0.0006***	0.0007***
		(0.0001)	(0.0001)
Dysfunctional competition		-0.003	-0.002
		(0.012)	(0.012)
Government support		-0.054	-0.052
		(0.040)	(0.040)
Interaction			
H1a (-): Service innovation × Dysfunctional competition			**-0.028*** **(0.016)**
H1b (+): Product innovativeness × Dysfunctional competition			**0.0001*** ** **(0.00003)**
Controls			
Firm age	-0.118**	-0.110**	-0.106**
	(0.048)	(0.048)	(0.048)
Firm size	0.845***	0.825***	0.820***
	(0.014)	(0.014)	(0.014)
Free cash flow	0.068***	0.064***	0.062***
	(0.015)	(0.015)	(0.015)
Capital intensity	-0.037***	-0.040***	-0.039***
	(0.013)	(0.013)	(0.013)
Income growth	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)
Fixed assets ratio	-1.526***	-1.490***	-1.477***
	(0.113)	(0.113)	(0.113)
GDP per capita	0.234	0.204	0.186
	(0.233)	(0.239)	(0.239)
Monetary policy	-0.059	-0.065	-0.060
	(0.121)	(0.121)	(0.121)
Fiscal policy	-0.015*	-0.017**	-0.018**
	(0.008)	(0.008)	(0.008)
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Province fixed effect	Yes	Yes	Yes
Year × Industry fixed effect	Yes	Yes	Yes
N	5379	5379	5379
R^2	0.552	0.554	0.556
Chow-test (F-value)		3.01* (H1a); 14.58*** (H1b)	

*Note.****, $p<0.01$; **, $p<0.05$; *, $p<0.1$.

Standard errors are reported in parentheses.

Table 4. Moderating Effect of Government Support (Study 1)

Variables	Dependent: Firm Performance					
	Model 1(baseline)	Model 2	Model 3	Model 4	Model 5	Model 6
Independent						
Service innovation		-0.051	-0.092	-0.015	-0.039	-0.047
		(0.071)	(0.079)	(0.086)	(0.071)	(0.071)
Product innovativeness		0.0006***	0.001***	0.001***	0.001***	0.001***
		(0.0001)	(0.000)	(0.000)	(0.000)	(0.000)
Dysfunctional competition		-0.003	-0.001	-0.002	-0.003	-0.003
		(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Government support		-0.054	-0.048	-0.044	-0.050	-0.051
		(0.040)	(0.041)	(0.041)	(0.041)	(0.041)
2-way Interactions						
Service innovation × Dysfunctional competition			-0.054**	-0.067***		
			(0.021)	(0.022)		
Service innovation × Government support			-0.134**	-0.148**		
			(0.062)	(0.062)		
Dysfunctional competition × Government support			-0.002	-0.003	-0.002	-0.002
			(0.004)	(0.004)	(0.004)	(0.004)
Product innovativeness × Dysfunctional competition					0.0001***	0.0001***
					(0.00004)	(0.00004)
Product innovativeness × Government support					0.00003	0.00003
					(0.0001)	(0.0001)
3-way Interactions						
H2a (+): Service innovation × Dysfunctional competition × Government support				**0.020****		
				(0.009)		
H2b (+): Product innovativeness × Dysfunctional competition × Government support						**-0.00003**
						(0.00002)
Controls						
Firm age	-0.118**	-0.110**	-0.107**	-0.108**	-0.108**	-0.107**
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
Firm size	0.845***	0.825***	0.823***	0.822***	0.821***	0.821***

	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Free cash flow	0.068***	0.064***	0.063***	0.063***	0.063***	0.063***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Capital intensity	-0.037***	-0.040***	-0.040***	-0.040***	-0.039***	-0.039***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Income growth	0.007***	0.007***	0.007***	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Fixed assets ratio	-1.526***	-1.490***	-1.492***	-1.488***	-1.471***	-1.472***
	(0.113)	(0.113)	(0.113)	(0.113)	(0.113)	(0.113)
GDP per capita	0.234	0.204	0.181	0.207	0.159	0.158
	(0.233)	(0.239)	(0.254)	(0.254)	(0.254)	(0.254)
Monetary policy	-0.059	-0.065	-0.057	-0.044	-0.065	-0.066
	(0.121)	(0.121)	(0.121)	(0.121)	(0.121)	(0.121)
Fiscal policy	-0.015*	-0.017**	-0.017**	-0.016*	-0.018**	-0.018**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year × Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
N	5379	5379	5379	5379	5379	5379
R^2	0.552	0.554	0.555	0.555	0.556	0.556
Chow-test (F-value)			4.61** (H2a); 1.56 (H2b)			

*Note.****, $p<0.01$; **, $p<0.05$; *, $p<0.1$.

Standard errors are reported in parentheses.

Table 5. Instrumental Variable Estimation (Study 1)（2SLS）

Variables	Dependent: Firm Performance				
	Model 1 (baseline)	Model 2	Model 3	Model 4	Model 5
Independent					
Service innovation		-0.257**	-0.361***	-0.316**	-0.287**
		(0.108)	(0.122)	(0.140)	(0.114)
Product innovativeness		0.001***	0.001***	0.001***	0.001***
		(0.000)	(0.000)	(0.000)	(0.000)
Dysfunctional competition		-0.014	-0.010	-0.014	-0.014
		(0.014)	(0.014)	(0.015)	(0.015)
Government support		-0.107**	-0.103**	-0.103**	-0.116**
		(0.048)	(0.048)	(0.052)	(0.052)
2-way Interactions					
H1a (-): Service innovation × Dysfunctional competition			**-0.067*** (0.025)**	-0.087** (0.042)	
Service innovation × Government support				0.079 (0.116)	
Dysfunctional competition × Government support				0.002 (0.006)	0.002 (0.006)
H1b (+): Product innovativeness × Dysfunctional competition			**0.0002*** (0.0001)**		0.0002** (0.00008)
Product innovativeness × Government support					0.0004* (0.0002)
3-way Interactions					

H2a (+): Service innovation × Dysfunctional competition × Government support				**0.036**** **(0.016)**	
H2b (+): Product innovativeness × Dysfunctional competition × Government support					**-0.00007 (0.00004)**
Controls					
Firm age	-0.042	-0.022	-0.018	-0.019	-0.016
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)
Firm size	0.805***	0.766***	0.763***	0.765***	0.759***
	(0.017)	(0.019)	(0.019)	(0.019)	(0.019)
Free cash flow	0.073***	0.065***	0.064***	0.064***	0.062***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Capital intensity	-0.039**	-0.042**	-0.040**	-0.041**	-0.043**
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Income growth	0.005*	0.005*	0.005*	0.005*	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Fixed assets ratio	-1.339***	-1.286***	-1.275***	-1.290***	-1.257***
	(0.138)	(0.140)	(0.140)	(0.140)	(0.141)
GDP per capita	0.180	0.216	0.218	0.224	0.272
	(0.223)	(0.234)	(0.235)	(0.247)	(0.248)
Monetary policy	-0.053	-0.048	-0.028	-0.037	-0.054
	(0.137)	(0.137)	(0.137)	(0.138)	(0.139)
Fiscal policy	-0.013	-0.019*	-0.021**	-0.017*	-0.020**
	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Underidentification test (Anderson canon. corr. LM statistic)		1276.120 *p*=0.000	1270.695 *p*=0.000	1267.730 *p*=0.000	943.281 *p*=0.000

Weak identification test (Cragg-Donald Wald F statistic)		877.633	435.857	347.312	231.146
Industry fixed effect	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes
Province fixed effect	Yes	Yes	Yes	Yes	Yes
Year × Industry fixed effect	Yes	Yes	Yes	Yes	Yes
N	4017	4017	4017	4017	4017
R^2	0.509	0.511	0.512	0.512	0.512
Chow-test (F-value)	7.18***(H1a); 8,84***(H1b); 5.13**(H2a); 2.51(H2b)				

*Note.****, $p<0.01$; **, $p<0.05$; *, $p<0.1$.

Standard errors are reported in parentheses.

All dependent variables, interaction items and control variables in the table lag by one year.

Table 6. Demographic Profile (Study 1 & Study 2)

	Secondary data		Survey				
	Secondary data Study N=5439		Robustness Study *N*=171		the World Bank *N*=12400		Chi-Square Test
Firm age							
Less than 3 years	0	0%	15	8.8%	883	7.1%	$p>0.1$
3-5 years	46	0.9%	26	15.2%	2446	19.7	$p>0.1$
6-8 years	393	7.2%	28	16.4%	2492	20.1%	$p>0.1$
More than 8years	5000	91.9%	102	59.6%	6579	53.1%	$p>0.1$
Firm scale							
Less than 100 people	18	0.3%	49	28.7%	3306	26.7%	$p>0.1$
100-300 people	119	2.2%	43	25.1%	3398	27.4%	$p>0.1$
More than 300 people	5302	97.5%	79	46.2%	5696	45.9%	$p>0.1$

Table 7. Descriptive Statistics and Correlations (Study 2)

Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12
1. firm performance	4.683	1.192	**0.843**	0.501***	0.492***	0.129**	0.358***	0.494***						
2. service innovation	5.212	1.044	0.519***	**0.831**	0.353***	0.139**	0.198***	0.549***						
3. product innovativeness	4.356	1.354	0.510***	0.376***	**0.831**	0.363***	0.481***	0.462***						
4. dysfunctional competition	4.143	1.303	0.160**	0.170**	0.386***	**0.671**	0.240***	0.155**						
5. government support	4.237	1.354	0.381***	0.227***	0.500***	0.267***	**0.849**	0.322***						
6. market orientation	4.608	1.350	0.512***	0.565***	0.481***	0.185**	0.346***	1.000						
7. less than 3 years	0.088	0.284	-0.069	0.016	-0.060	-0.134*	-0.085	0.063	1.000					
8. 3-5 years	0.152	0.360	-0.082	-0.114	-0.027	0.132*	0.161**	0.023	-0.131*	1.000				
9. 6-8 years	0.164	0.371	0.042	0.020	-0.046	-0.076	0.013	-0.068	-0.137*	-0.187**	1.000			
10. less than 10 people	0.023	0.152	-0.162**	0.034	-0.178**	-0.025	-0.113	-0.041	0.226***	-0.066	0.141*	1.000		
11. people; 12	0.263	0.442	-0.039	0.051	-0.128*	0.039	0.018	0.004	0.003	0.302***	0.059	-0.093	1.000	
12. 100-300 people	0.251	0.435	-0.058	-0.115	-0.017	-0.105	-0.044	-0.037	0.106	0.017	0.217***	-0.090	-0.346***	1.000
MV	3.705	1.423	0.073	0.195**	0.111	0.036	-0.072	0.202***	0.065	-0.078	0.098	0.128*	-0.053	0.087

*Note.****, $p<0.01$; **, $p<0.05$; *, $p<0.1$.

Zero-order correlations are below the diagonal; adjusted correlations for potential common method variance (Lindell and Whitney, 2001) are above diagonal; bold numbers on the diagonal show the square root of AVE.

Table 8. Moderating Effect of Dysfunctional Competition (Study 2)

Variables	Dependent: Firm Performance		
	Model 1(baseline)	Model 2	Model 3
Independent			
Service innovation		0.324***	0.331***
		(0.104)	(0.105)
Product innovativeness		0.193**	0.194**
		(0.087)	(0.079)
Dysfunctional competition		-0.085	-0.035
		(0.075)	(0.068)
Interaction			
H1a (-): Service innovation × Dysfunctional competition			**-0.155*** (0.058)**
H1b (+): Product innovativeness × Dysfunctional competition			**0.090** (0.041)**
Controls			
Government support	0.128	0.076	0.059
	(0.082)	(0.073)	(0.068)
Market orientation	0.347***	0.160*	0.159*
	(0.064)	(0.085)	(0.081)
Less than 3 years	-0.201	-0.169	-0.124
	(0.339)	(0.293)	(0.284)
3-5 years	-0.385	-0.174	-0.061
	(0.257)	(0.228)	(0.220)
6-8 years	0.185	0.174	0.218
	(0.170)	(0.177)	(0.173)
Less than 10 people	-1.075*	-1.015*	-1.094*
	(0.580)	(0.593)	(0.564)
10-100 people	-0.202	-0.174	-0.235
	(0.189)	(0.176)	(0.177)
100-300 people	-0.192	-0.160	-0.233
	(0.187)	(0.197)	(0.195)
Market dynamism	0.120	0.173	0.179
	(0.125)	(0.133)	(0.127)
Market growth	0.244	0.106	0.068
	(0.154)	(0.147)	(0.142)
N	171	171	171
R^2	0.375	0.459	0.488
Chow-test (F-value)	7.10***(H1a); 4.91**(H1b)		

*Note.****, $p<0.01$; **, $p<0.05$; *, $p<0.1$.

Robust standard errors are reported in parentheses.

Table 9. Moderating Effect of Government Support (Study 2)

Variables	Dependent: Firm Performance					
	Model 1(baseline)	Model 2	Model 3	Model 4	Model 5	Model 6
Independent						
Service innovation		0.324***	0.311***	0.283**	0.331***	0.333***
		(0.104)	(0.106)	(0.109)	(0.105)	(0.105)
Product innovativeness		0.193**	0.168**	0.167**	0.212**	0.211**
		(0.087)	(0.082)	(0.080)	(0.090)	(0.089)
Dysfunctional competition		-0.085	-0.031	-0.063	-0.079	-0.068
		(0.075)	(0.071)	(0.075)	(0.069)	(0.079)
Government support		0.076	0.031	0.020	0.059	0.063
		(0.073)	(0.083)	(0.080)	(0.081)	(0.082)
2-way Interactions						
Service innovation × Dysfunctional competition			-0.165**	-0.153**		
			(0.066)	(0.063)		
Service innovation × Government support			0.101*	0.124**		
			(0.060)	(0.061)		
Dysfunctional competition × Government support			0.057	0.028	-0.012	-0.012
			(0.037)	(0.038)	(0.056)	(0.056)
Product innovativeness × Dysfunctional competition					0.048	0.047
					(0.061)	(0.060)
Product innovativeness × Government support					0.002	0.002
					(0.051)	(0.051)
3-way Interactions						
H2a (+): Service innovation × Dysfunctional competition × Government support				**0.056***		
				(0.032)		
H2b (+): Product innovativeness × Dysfunctional competition × Government support						**-0.009**
						(0.029)
Controls						
Market orientation	0.369***	0.160*	0.169**	0.182**	0.158*	0.161*
	(0.062)	(0.085)	(0.083)	(0.083)	(0.082)	(0.082)
Less than 3 years	-0.224	-0.169	-0.106	-0.089	-0.176	-0.182
	(0.335)	(0.293)	(0.265)	(0.268)	(0.298)	(0.301)

3-5 years	-0.318	-0.174	-0.074	-0.052	-0.116	-0.124
	(0.247)	(0.228)	(0.226)	(0.226)	(0.228)	(0.231)
6-8 years	0.199	0.174	0.253	0.272	0.200	0.191
	(0.171)	(0.177)	(0.170)	(0.174)	(0.180)	(0.180)
Less than 10 people	-1.171*	-1.015*	-0.966	-0.954	-1.056*	-1.033*
	(0.597)	(0.593)	(0.629)	(0.622)	(0.596)	(0.615)
10-100 people	-0.250	-0.174	-0.163	-0.156	-0.202	-0.197
	(0.185)	(0.176)	(0.173)	(0.173)	(0.185)	(0.184)
100-300 people	-0.219	-0.160	-0.256	-0.235	-0.177	-0.176
	(0.184)	(0.197)	(0.192)	(0.194)	(0.199)	(0.200)
Market dynamism	0.166	0.173	0.151	0.117	0.176	0.183
	(0.129)	(0.133)	(0.131)	(0.132)	(0.135)	(0.136)
Market growth	0.330**	0.106	0.109	0.107	0.098	0.096
	(0.137)	(0.147)	(0.142)	(0.139)	(0.151)	(0.152)
N	171	171	171	171	171	171
R^2	0.375	0.459	0.490	0.499	0.463	0.464
Chow-test (F-value)			3.05* (H2a); 0.10 (H2b)			

*Note.****, $p<0.01$; **, $p<0.05$; *, $p<0.1$.

Robust standard errors are reported in parentheses.

Appendix A: Measurement (Study 2)

Items	Loading	t value	Cronbach's α
Service Innovation: adapted from Kaleka (2011).			0.892
(1) Product delivery (speed and reliability)	0.71	10.36	
(2) Technological support and after-sale service	0.81	12.45	
(3) Customer solution	0.91	15.11	
(4) Overall service quality	0.87	13.89	
Product Innovativeness: adapted from Yiu, Lau, & Bruton (2007).			0.915
(1) Investing heavily in cutting-edge product-oriented R&D	0.82	12.82	
(2) Has maintained industry-lead R&D facilities	0.88	14.24	
(3) Has introduced numerous new products	0.79	12.15	
(4) Has pioneered the development of breakthrough innovation in its industry	0.86	13.71	
(5) Has acquired significantly more patents than its major competitors	0.80	12.39	
Dysfunctional Competition: adapted from Li & Atuahene-Gima (2001), Li & Zhang (2007).			0.756
(1) Unlawful competitive practices	0.80	11.02	
(2) Counterfeiting of products and trademarks	0.79	10.80	
(3) Ineffective legal protection	0.59	7.62	
(4) Increased unfair competitive practices	0.43	5.34	
Government Support: adapted from Li & Atuahene-Gima (2001), Sheng, Zhou, & Li (2011).			0.909
(1) Have implemented policies and programs that have been beneficial to business operations	0.82	12.78	
(2) Have provided needed technology information and other technical support	0.87	13.93	
(3) Have provided important market information	0.88	14.18	
(4) Have played a significant role in providing financial support	0.82	12.67	
Firm Performance: adapted from Li & Zhang (2007), Sheng, Zhou, & Li (2011).			0.904
(1) Market share	0.69	10.04	
(2) Sales growth	0.82	12.90	
(3) Profitability	0.92	15.38	
(4) Return on investment	0.90	14.78	
Goodness Fit: χ^2=395.76, *df*=179, $\chi 2/ df$ =2.211, *SRMR*=0.066			