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What Factors Affect the Innovation Performance of Cross-border Technology M&A Enterprises?

-- A Configuration Model based on fsQCA Method

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Abstract: Cross-border technology M&A is recognized as an important strategic decision for enterprises to acquire advanced technologies and establish international competitive advantages. However, existing research does not explain how cross-border technology M&A enterprises can obtain high innovation performance under the influence of different factors. This study uses the fuzzy set qualitative comparative analysis (fsQCA) method to construct an antecedent conditional configuration model of innovation performance after cross-border technology M&A. The configurations consist of five influencing factors, three at enterprise level (knowledge base, R&D investment, relative technology scale) two at institutional level (host country institutional quality, diplomatic relations), and this study analyses how they combine to influence innovation performance after cross-border technology M&A.

Keywords: Cross-border Technology M&A; Innovation Performance; Fuzzy Set Qualitative Comparative Analysis; Chinese Cross-border M&A Enterprises.

1. Introduction

Innovation performance not only has profound strategic significance for the competitive advantage of enterprises, but also plays an vital role in national competitiveness and sustainable development of the economy (Wang and Wang, 2017). However, compared with Western developed countries, Chinese enterprises have insufficient motivation for self-dependent innovation and weak innovation performance (We and Ma, 2021). As a result, a significant issue for Chinese enterprises to explore is how to go about improving innovation performance. However, existing research argues that the innovation resources and technological capabilities needed to achieve innovation are not always created within the enterprise, and there is an increasing emphasis on exploring external knowledge resources beyond the enterprise's boundaries (Tsai et al., 2011; Yan and Chi, 2020). Cross-border technology M&A have become an essential way for most Chinese enterprises to enhance their innovation performance and competitive advantages (Chen et al., 2017; Ma and Liu, 2017; Shin et al., 2017; Wu, 2016).

Existing studies have examined the relationship between cross-border technology M&As and post-merger innovation, but there is no consensus on the findings, with the two main findings indicating 'facilitation' and 'inhibition'. The facilitator findings are that cross-border technology M&As drive innovation by increasing the enterprise's innovation stock, increasing its innovation opportunities, enhancing its absorptive capacity, and expanding its technological knowledge and R&D resources, thus enhancing post-merger innovation performance (Cefis and Marsili, 2014; Cloodt et al., 2006; Stiebale, 2016; Zhao et al., 2019). However, the inhibitor findings are that M&A reduces R&D efficiency, R&D investment rates, and patent citation rates of core technology employees, which is detrimental to post-merger technological innovation (Seru, 2014). The results suggest that cross-border technology M&A and post-merger innovation are not simply causal, and it is necessary to explore what factors influence post-merger innovation.

Research on the relationship between cross-border technology M&A and post-merger innovation and the related factors affecting post-merger innovation have provided some ideas to clarify the issue of innovation in cross-border technology M&A, but have ignored two issues. First, existing research suggests that enterprise-level factors can be a excellent way to mitigate post-merger integration pressures, while few studies have explored the ways in which Chinese cross-border M&A enterprises can cope with legitimacy pressures caused by National Security Review of Foreign Acquisition. In this regard, bilateral diplomatic relations, as an institutional arrangement actively constructed between countries, can enhance the legitimacy of Chinese MNEs in host countries and overcome the liability of foreignness (Li et al., 2018; Zhu et al., 2015), but few studies have introduced the institutional factor of diplomatic relations into the cross-border technology M&A context. Therefore, in this study, we consider diplomatic relations as an institutional-level influence factor. Second, existing studies use traditional research methods to explore the net effect of individual influencing factors or the interaction of two factors, but do not consider multiple factors determining innovation performance after cross-border technology M&A is the result of multiple factors acting together, which makes the findings of single-factor studies contradictory. Moreover, it is difficult to clarify how multiple factors jointly affect the innovation performance of cross-border technology M&A enterprises under traditional empirical research methods. Therefore, it is necessary to investigate the issue of how multiple factors jointly affect the innovation performance after cross-border technology M&A from a holistic perspective. Based on this, to address the shortage of traditional research methods, this study introduces a fuzzy-set qualitative comparative analysis (fsQCA). FsQCA method adopts a configuration perspective and is based on "holism" to analyze the relationship between factor configuration and results, emphasizing the complexity

of causality (Du and Jia, 2017). Therefore, fsQCA can overcome through the limitations of traditional empirical research methods and better explain the issue of innovation performance of cross-border technology M&A enterprises under the joint influence of multiple factors. In summary, this study investigates how five influencing factors at the micro-enterprise level (knowledge base, R&D investment, and relative technological scale) and macro-institutional level (host country institutional quality and diplomatic relations) jointly affect innovation performance after cross-border technology M&A, using the fsQCA approach.

This study contributes to the research on cross-border technology M&A and innovation in the following aspects. First, this study reveals the complex interactions among multiple theoretical perspectives and elaborates the causally complex relationship of innovation performance of cross-border technology M&A enterprises at the theoretical level. Second, this study contributes to innovation research by identifying three equivalent configuration paths for cross-border technology M&A enterprises to obtain high levels of innovation performance. Third, this study introduces the fsQCA approach to the study of innovation performance after cross-border technology M&A, which not only provides a holistic perspective for understanding and explaining the causal complexity of self-dependent innovation after cross-border technology M&A, but also enriches the methodological tools for research in this field.

The rest of the paper is structured as follows. The second section reviews the literature related to this study and describes the research framework. The third section describes the sample, data and fsQCA method. The fourth section discusses the results of fsQCA and presents a configuration analysis. The fifth section summarises the conclusions, significance, and limitations of the study.

2. Literature Review

2.1. Absorptive Capacity

2.1.1. Potential Absorptive Capacity: Knowledge Base

Potential absorptive capacity consists of knowledge acquisition and knowledge assimilation. knowledge acquisition refers to the ability of the enterprise to identify and acquire new knowledge, while knowledge assimilation refers to the effective interpretation and understanding of external knowledge within the enterprise (Zahra and George, 2002). Most prior studies use the knowledge base of the enterprise as a representation of potential absorptive capacity. Existing knowledge as a prerequisite for absorptive capacity is critical for acquirers to acquire and understand the strategic assets of merged enterprises (Ai and Tan, 2017; Deng, 2010). The knowledge base view suggests that new knowledge generation relies on the existing static knowledge stock and dynamic knowledge flow. The existing knowledge stock not only provides the motivation to acquire new knowledge, but also determines the scope and direction of exploring external knowledge (Wu and Shanley, 2009; Zhou et al., 2020). The existing knowledge base of an enterprise represents the transformation ability of an enterprise, which facilitates the understanding and subsequent transformation and utilisation of the knowledge of the merged enterprise and is a prerequisite for innovation (Zhao and Chen, 2019). In addition, the knowledge base of the acquirer represents its innovation potential. The stronger the knowledge base of the acquirer, the greater its ability to combine related domain knowledge in more sophisticated and creative ways, and also the more opportunities it offers for post-merger reorganisation of technological knowledge between the two parties (Prabhu et al., 2005; Wu and Shanley, 2009). Most prior studies explore the relationship between knowledge base and innovation in M&A enterprises, which provides support for this study.

2.1.2. Realized Absorptive Capacity: R&D Investment

Potential absorptive capacity is the premise of realized absorptive capacity, and realized absorptive capacity is the extension of potential absorptive capacity in the process of knowledge absorption. Therefore, realized c absorptive capacity is another vital absorptive capacity to absorb external technology. Realistic absorptive capacity includes knowledge transformation and exploitation. Knowledge transformation refers to the ability to effectively integrate an enterprise's existing knowledge with new knowledge acquired externally, while knowledge exploitation refers to the ability to develop new knowledge by reusing new internal and external knowledge (Zahra and George, 2002). Realized absorptive capacity includes knowledge transformation and exploitation. Knowledge transformation refers to the ability to effectively integrate an enterprise's existing knowledge with new knowledge acquired externally, while knowledge exploitation refers to an enterprise's ability to improve, extend and utilise existing knowledge or create new knowledge by acquiring and transforming external knowledge (Zahra and George, 2002). Most prior studies use the R&D investment of enterprises as a characterisation of realized absorptive capacity. R&D is a vital driver of absorptive capacity, and the integration of the target enterprise's technology requires continuous post-acquisition investment in R&D by the acquirer (Le et al., 2014). By maintaining the necessary internal R&D investment after the acquisition, the acquirer can enhance the technology absorption and integration capability of the acquirer, thus improving the efficiency of the integration and absorption of the target company's technological resources(Zhao et al., 2019). Based on absorptive capacity theory, an enterprise's R&D investment enhances its absorptive capacity, which not only improves its ability to absorb and utilise external knowledge, but also facilitates the generation of new knowledge and new inventions (Tsai et al., 2011). Enterprise with higher R&D intensity tend to have more sophisticated technological knowledge, and they are more likely to recognise the value of new external ideas. This further motivates acquirers to absorb new technical knowledge and to take advantage of the innovation opportunities presented by external knowledge (Hung and Chou, 2013). Therefore, the realisation of post-M&A technological innovation stems from the synergy of M&A acquisition of external knowledge and internal R&D investment. Also, economies of scale and scope of post-M&A technological innovation are realised through the synergistic effect of internal and external R&D (Tang and Wu, 2014). Relevant prior studies have identified R&D investment as a crucial factor influencing innovation after technology M&A and have demonstrated the positive effect of R&D investment through empirical analysis.

2.2. Relative Technological Scale

Whether an enterprise can achieve innovation through external technology M&A or not depends on the effective integration of technology resources and the generation of synergistic effect. After the M&A, the transformation and

absorption of the target enterprise's technological resources and the integration of the technological resources of both parties require communication and cooperation between the relevant technology and R&D departments of both parties, and this process depends on the relative technological scale of both parties (Ahuja and Katila, 2001; Zhang et al., 2020). Prior research has explored the relationship between the relative scale of both parties and M&A performance, but there are contradictory views. The positive view is that larger targets have greater potential so that the acquirer can realize synergies through increased market power and economies of scale or scope (Li and Singal, 2021). By contrast, the majority of studies on relative scale exhibit a negative view. First, the large relative scale of the M&A parties directly affects the integration of the M&A and challenges the absorptive capacity of the acquirer. It is not conducive to the integration and absorption of the target company's knowledge by the acquirer, and reduces the technological synergy effect of both parties to the merger. Second, if the relative technological scale of two parties are large, the acquirer will devote most of its resources to the integration of the two knowledge bases, resulting in less resources flowing into innovation activities and causing a crowding-out effect of innovation resources (Ahuja and Katila, 2001; Cloodt et al., 2006). Third, the relatively large amount of new information and practices faced by the acquirer may disrupt existing innovation procedures and cause disruptions to existing innovation processes and activities (Cloodt et al., 2006; Fisch et al., 2018). Echoing the contradictory view, the empirical findings also show two sides.

2.3. Institutional Factors

North (1990) defined institutions as the rules of the game, which humans design to shape human interactions, and are divided into formal and informal institutions. In addition, Scott (Scott, 1995) defined three pillars of the institutional framework, namely, the regulatory pillar, the cognitive pillar, and the normative pillar, which provide a broad basis for analysing the state of a country's institutions. With the continuous development of institutional theory, more and more scholars are using it to study international business issues (Deng, 2009; Dikova et al., 2019; Kostova et al., 2008; Pattnaik et al., 2015; Wu et al., 2016; Zhang, 2022; Zhang et al., 2011). In international business activities, enterprises' strategies and practices are jointly determined by the institutional profiles of the home and host countries (Zhang et al., 2011). In the context of cross-border M&A, most studies are based on an institutional dichotomous perspective to explore the mechanism of the influence of institutional distance on the effects of cross-border M&A (Dikova et al., 2019; Liou and Rao-Nicholson, 2017; Zhu et al., 2015). However, prior studies ignore the importance of institutional quality of the host country in the context of technology M&A for post-merger innovation. In addition to the objectively existing institutional context, we need to consider the subjective initiative of economic agents. Bilateral diplomatic relations as actively constructed institutional arrangements have been introduced in international business research ((Desbordes and Vicard, 2009; Li et al., 2018; Zhang and Mauck, 2018; Zhu et al., 2015), which is the focus of one of the factors of this study.

2.3.1. Host-country Institutional Quality

The institutional environment of the host country inevitably has an impact on the implementation of cross-border M&A strategies and post-merger integration. Most prior studies emphasise the attractiveness of host country institutional quality to acquirers, arguing that higher institutional quality in host countries is beneficial for cross-border M&A activities. Based on transaction cost theory, a splendid institutional environment provides clear and unambiguous rules for acquisitions, reducing the time and cost for acquirers to interpret complex procedures and relevant laws and regulations (Zhang et al., 2011). In addition, a high-quality regulatory framework can reduce agency and transaction costs, help acquirers overcome information asymmetries, and encourage them to invest in innovative activities (Wu et al., 2016; Zhang et al., 2011). Based on the resource base view perspective, host countries with higher institutional quality can provide acquirers with key innovation elements, such as innovation resources, innovation intermediaries, and host country innovation networks, thereby improving the innovation performance of the parent company (Wu et al., 2016). In addition, host countries with higher institutional quality have a more robust legal system, more transparent regulation, and a better intellectual property protection system, which is conducive to creating and stimulating the innovation environment needed for the acquirer's innovative activities and can protect the acquirer's innovative output (Pattnaik et al., 2015; Wu et al., 2016). Most prior studies also support supports the idea that host country institutional quality has a positive impact on multinational enterprises. Using a sample of cross-border M&A events by Chinese enterprises, Zhang et al.(2011) found that higher institutional quality in host countries reduces the uncertainty and complexity of acquisitions, and therefore acquisitions are more likely to be completed in countries with outstanding institutions.

2.3.2. Diplomatic Relations

As an crucial link between countries, diplomatic relations provide acquirers with valuable knowledge and information about the host country's institutional environment (Zhu et al., 2015). Unlike the objectively existing institutional environment, diplomatic relations are institutional arrangements that are actively constructed between countries and reflect the subjective initiative of economic agents (Bertrand et al., 2016; Wang et al., 2020). Specifically, favourable bilateral diplomatic relations can influence the overseas M&A activities of Chinese enterprises through the following mechanisms. First, based on the legitimacy perspective of institutional theory, friendly bilateral diplomatic relations can reduce M&A uncertainty for the acquirer, improve the acquirer's legitimacy in the host country, and overcome outsider disadvantage (Li et al., 2018; Zhu et al., 2015). Second, friendly diplomatic relations can weaken the negative impact of the host country's poorer institutional environment on M&A activities, can act as a proxy for the host country's institutional risk, and can form an external binding force on the host country's institutional risk, which in turn affects the effectiveness of M&A (Pan and Jin, 2015). Prior empirical studies confirm the positive role of diplomatic relations in cross-border business activities. Bertrand et al.(2016) used political affinity as a proxy for diplomatic relations between the two countries and found that the level of political affinity between the acquirer and the target country was beneficial in reducing the cross-border M&A premium. Using a sample of cross-border M&A events of Chinese listed companies, Zhang and Mauck (2018) found that bilateral diplomatic relations are positively related to both

short- and long-term performance of bidders. Although diplomatic relations as a momentous institutional arrangement facilitates the implementation of cross-border M&A activities, most studies show that the role of diplomatic relations depends on the institutional quality of the host country. When the quality of the host country's institutions is poorer and the fairness of the institutional environment is lower, the more important diplomatic relations are for outward investment (Li et al., 2018). In addition, the lower institutional quality of the host country means that its corruption levels are usually higher. In this environment, diplomatic relations can help cross-border M&A enterprises gain socio-political legitimacy more easily (Zhang, 2022). When the quality of the host country institutional is high, the government's behaviour is governed by strict and fair regulations, and its special preferential treatment for enterprises with superior home country relations is greatly reduced (Meyer et al., 2014; Wang et al., 2020).

2.4. Configurational Framework

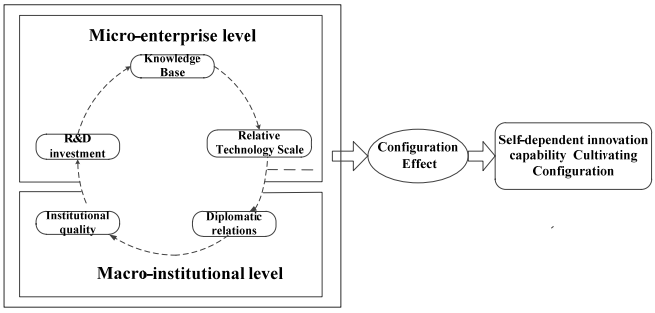


Fig 1. Conceptual framework

Based on the above review, different studies on the same influencing factors have obtained different findings, such as relative technology scale. In addition, what role one factor plays is often linked to other factors, such as relative technological scale and absorptive capacity, host country institution quality, and bilateral diplomatic relations. Therefore, innovation after cross-border technology M&A is the result of multiple factors, and the acquisition of high innovation performance of cross-border technology M&A enterprises is a complex mechanism under the joint influence of multiple factors. Although prior studies have explored the factors influencing innovation performance of cross-border technology M&A enterprises at several levels, they have focused on the net effect of individual influencing factors or the impact of the interaction of two factors on innovation using traditional research methods. In addition, prior studies have neglected the importance of considering the problem from a holistic perspective and the limitations of traditional research methods that cannot clearly explore the mechanism of multifactor interaction. Therefore, this study introduces a holistic framework and argues that acquirer's innovation performance does not rely on a unique condition, but is the result of the joint influence of relevant factors at the micro-enterprise level and macro-institutional level, which is shown in Figure 1. Meanwhile, to make up for the shortcomings of previous research methods, this study introduces the fuzzy set qualitative comparative analysis (fsQCA) method. Therefore, this study uses the fsQCA approach to explore the relationship between the configurations of five factors (knowledge base, R&D investment, relative technology scale, host country institutional quality, and bilateral diplomatic relations) and innovation performance after cross-border technology M&A, and to reveal possible interactions between different theoretical explanations.

3. Discussion

3.1. Theoretical Contributions

This study provides guiding insights for cross-border technology M&A enterprises to achieve high innovation performance and provides some theoretical contributions to research in this area.

First, this study deepens the explanatory effects of theoretical perspectives such as absorptive capacity theory, knowledge base view, synergistic effect theory, and institutional theory on the innovation problems of cross-border technology M&A. At the same time, this study reveals the complex interactions among multiple theoretical perspectives and elaborates the causally complex relationship of innovation performance of cross-border technology M&A enterprises from the theoretical level.

Second, prior studies have empirically examined the factors influencing innovation performance in cross-border technology M&A enterprises, but they focus on the 'net effect' of individual influencing factors. This study constructs a theoretical model of innovation performance in cross-border technology M&A enterprises by integrating influencing factors at enterprise-level and institutional-level. This study extends the prior research from a holistic perspective and finds that innovation performance in cross-border technology M&A enterprises is driven by the interaction between firm-level and institutional-level factors rather than by any single condition. This overcomes the limitations of prior studies and expands the research perspective in this area.

3.2. Managerial Implications

The results of this study have noteworthy implications for cross-border technology M&A enterprises to achieve high innovation performance and some policy implications for developing countries to conduct cross-border technology M&A activities.

First, at the firm level, this study proposes four configuration that can achieve high innovation performance, and cross-border technology M&A enterprises can achieve high innovation performance through any of the four paths. Enterprise managers should choose suitable path according to their own realistic background. In each configuration, we distinguish between core and peripheral conditions, which means that not all influencing factors play the same role. Therefore, when faced with the predicament of limited resources, managers should prioritise the allocation of resources to incentivize the development and use of core conditions as fully as possible. All the paths show that the knowledge base is the core condition in all four configurations of this study. Therefore, for the acquirer, while trying to 'go global', it should pay more attention to the cultivation of its own R&D strength and innovation capacity, and consolidate its own technological innovation base. In terms of relative technology scale, the acquirer should understand and evaluate the technical characteristic and technical strength of the target enterprise in all aspects through industry expert consultation and contact with the target enterprise, and strive to find a target enterprise with a smaller relative technology scale to better utilise the technological synergy effect and reduce the integration

difficulty. In addition, the institutional quality of the host country plays a vital role in post-merger innovation. The acquirer should carefully select the M&A target country and commit to a host country with a better institutional and innovation environment, with the aim of creating favourable conditions for post-merger innovation.

Second, at the government level, the government should pay more attention to effectively helping cross-border technology M&A enterprises to achieve high innovation performance. Enterprises only rely on domestic R&D and innovation resources to carry out R&D and innovation activities has limited effect on the improvement of innovation performance. Open innovation has become a significant way for enterprises to seek overseas innovation resources and integrate internal and external innovation resources to achieve the improvement of independent innovation ability. Therefore, the government should continue to deepen the go global strategy and innovation-driven development strategy, and provide institutional support for enterprises to better seek overseas innovation resources.

4. Conclusion

Cross-border technology M&A are an important strategic decision in international business management, and the path for cross-border technology M&A enterprises to achieve high innovation performance after acquisition is highly complex. Based on different theories, the prior research has discussed the factors affecting the innovation of cross-border technology M&A enterprises, and the research level involves the micro-enterprise level and the macro-institutional level. However, in the innovation research process of cross-border technology M&A enterprises, no single theory can solve the problem of what factors determine high innovation performance of cross-border technology M&A enterprises. Prior research results have explored the 'causal effect' and 'contingency effect' of innovation of cross-border technology M&A enterprises, but ignored the 'joint effect' of various factors. Fragmentation research results lead to the phenomenon of 'not seeing the forest for the trees', which is difficult to truly solve practical problems. To make up for the shortcomings of prior research, this study integrates different theoretical perspectives such as absorptive capacity theory, synergy effect theory and neo-institutional theory to extract and sort out the influencing factors of high innovation performance of cross-border technology M&A enterprises. Based on a holistic perspective, this study considers the influence of enterprise-level and institutional-level factors on innovation performance in cross-border technology M&A enterprises, overcoming the limitations of traditional research and contributing to the research in the field of cross-border technology M&A and technological innovation.

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