Blockchain Announcements and Stock Value: A Technology Management Perspective

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A Technology Management Perspective

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Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this article.

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Blockchain Announcements and Stock Value:

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Abstract

Purpose - This study explores the impact of blockchain announcements on enterprises' stock market value.

Design/methodology/approach - Based on resource-based theory (RBT), we construct a complete framework of the impact mechanism of blockchain announcements on the stock price of the announcing firm using the data of 143 blockchain announcements. An event study methodology is used in this research and the market model, market-adjusted model, and Carhart four-factor model are used to estimate stock abnormal returns after the blockchain announcement; and the cross-sectional regression model is used to test the influencing factors.

Findings - Blockchain announcements elicit a significantly positive market reaction on the release day. Compared to announcements not pertaining to technical innovation, blockchain technical innovation announcements exhibit a more positive market reaction towards the announcing companies. Strategic-level announcements exhibit a more positive market reaction than operational-level announcements. Enterprise characteristics, such as enterprise scale and enterprise innovation ability, do not affect stock market reactions to blockchain announcements.

Practical implications - The findings reveal the economic value of conducting blockchain activities in the Chinese stock market. Our findings can help managers understand the value of implementing blockchain activities in a different market environment and guide them on how to improve the market value of their enterprises through the active implementation of blockchain activities.

Originality/value - To the best of our knowledge, this is the first event study to focus solely on the value of pure blockchain announcements in an emerging market. We consider multiple resource and capability factors that would influence blockchain technology adoption, improve the current understanding of how blockchain announcements affect corporate stock prices, and

[1] We sincerely thank the editor and reviewers for their critical comments, which led to major improvement of this paper.

provide directions for future comparative studies of market reactions to blockchain announcements in different stock markets.

Keywords Blockchain, Stock market reaction, Technology management, Event study

Paper type Research paper

1. Introduction

Blockchain has the potential to increase utility of enterprises, society, and the network participants (Janssen et al., 2020; Choi et al., 2021), and improve supply chain performance (Bai and Sarkis, 2020). In contrast to other information technologies, blockchain serves as a prominent disruptive technology with the advantages of data security, unforgeability and decentralization. The technical characteristics of blockchain determine that it is widely used in supply chain activities such as transaction records (i.e., financial flow management of a supply chain). Blockchain can combine data structures into a chain structure and order them chronologically to integrate their information, effectively overcoming many problems associated with information sharing and integration of technology resources in enterprises (Treiblmaier, 2018). In 2017, Walmart cooperated with IBM to implement blockchain in the food supply chain, thereby improving the traceability of the food supply chain by allowing all participants to share transaction records.

The significant application value of blockchain makes it very popular in terms of stock market investments, and an increasing number of entrepreneurs and investors favour this technology (Cahill et al., 2020). A blockchain announcement issued by an enterprise can be regarded as a comprehensive signal that the enterprise values blockchain and is willing to participate in the technology management (TM) transformation process, which should lead to better future performance for the enterprise. This may attract the attention of investors and be reflected in an increased stock market value for the enterprise (Wijayana and Achjari, 2019). For example, Eastman Kodak Company's stock price increased by 77% when it announced that it would launch KodakCoin, which was based on blockchain[2]. Therefore, it is worthwhile to

[2] Mish Talk. 2018. *Kodak Soars 77% on News it Will Launch "KodakCoin" Cryptocurrency*. Retrieved from https://mishtalk.com/economics/kodak-soars-77-on-news-it-will-launch-kodakcoin-cryptocurrency

study the abnormal stock price returns associated with blockchain announcements and the relevant influencing factors.

Existing studies have emphasized the role of information technology adoption and competency in improving operational performance (Heim and Peng, 2010), however quantitative studies regarding the effect of blockchain on the stock market are scarce. First, blockchain announcements are an important reflection of TM practices but are often ignored in existing research. Second, existing studies on blockchain mainly discuss the impact of the commitment level of a company's investment in blockchain technology (Cheng et al., 2019) or the impact of firm size (e.g., Wadhawan, 2019) on the market's response to blockchain announcements. Klöckner et al. (2021) consider the value of substantiated blockchain initiatives from the IT business value perspective and explore how the design of blockchain use cases, project settings and firm characteristics affect the stock market response to blockchain announcements. However, as far as we know, few blockchain announcement studies have been conducted from Resource-Based Theory (RBT) to construct a complete framework of the impact mechanism of blockchain announcements on the stock price of the announcing firm. Third, current blockchain announcement research often targets the developed stock markets (Cheng et al., 2019; Klöckner et al., 2021), lacking in-depth analysis on the impact of the pure and simple blockchain announcements in emerging markets. However, the difference in business environments is an important reason for inconsistent empirical results (Zhu et al., 2022). For example, the post-hoc analysis of Klöckner et al. (2021) show that the market reaction to blockchain announcements in emerging markets is not completely consistent with that in developed markets. However, they have not examined the factors influencing market reactions to blockchain announcements in emerging markets. Therefore, it is critical and necessary to conduct in-depth research on the market reaction to blockchain announcements in emerging markets.

Considering the above limitations, we select the Chinese A-share market as our research background in order to see any different findings, which might appear in an emerging market environment. The specific reasons for selecting Chinese stock market are as follows. First, thanks to China's restrictions on Bitcoin transactions, taking Chinese A-share market as a research object can effectively exclude the influence of Bitcoin-related tactics, and ensure that

the research results are only driven by blockchain announcements. Second, Chinese A-share market can provide sufficient data regarding blockchain activities. For example, some applications of blockchain in China have been one step ahead of those of other countries[3]. Third, with the support of Chinese government, “non-Bitcoin” blockchain develops fast in China and this renders more available data. According to the "Blockchain White Paper[4]", China's national and local governments issued 217 blockchain-related policies and regulations in 2020, providing a strong policy support for the development of blockchain industry in China. Therefore, the Chinese stock market provides relatively accurate and sufficient data for investigating the market reaction to blockchain announcements, which is of great significance for further enriching the research on blockchain TM in emerging countries.

To identify the factors that affect abnormal returns associated with blockchain announcements, we conducted a pilot study through telephone interviews with executives of two Chinese companies that have been deeply involved in the development of blockchain, i.e., COSMOPlat (part of Haier group) and Aisino. This allowed us to identify five factors that may moderate the impact of blockchain announcements on firms’ stock prices, including partnerships, technological innovation, strategic plan, and enterprise characteristics such as enterprise scale and innovation abilities. Therefore, taking Chinese A-share market as our research background, we focus on addressing the following research questions (RQs) in this study:

RQ1. Does the stock market react to the blockchain announcements of Chinese A-share listed companies?

RQ2. How does the content of blockchain announcements (i.e., blockchain partnerships, blockchain technological innovation, and blockchain strategic plan) affect the market’s reaction to the blockchain announcements of listed companies?

RQ3. How do enterprise characteristics (i.e., enterprise scale and enterprise innovation abilities) affect the market’s reaction to the blockchain announcements of listed companies?

As a remark, for the above five factors, companies cannot accurately estimate the strength of their impact on stock market performance. Instead, we scientifically calculate and examine

[3] See http://www.iprdaily.cn/news_24501.html
[4] See https://www.sohu.com/a/442289282_653604

the influence strength through secondary data analysis. The findings help reveal the factors that influence the impact of blockchain activities and provide a guidance for managers on how to better carry out blockchain TM activities. This demonstrates the practical value of our research. Stripping away the influence of Bitcoin-related content, we examine 143 pure blockchain announcements issued by Chinese A-share listed companies between 2016 and 2021 and draw the following important conclusions.

First, we contribute to TM stream of OM by revealing the value of blockchain technology adoption. We provide and test hypotheses that the examined blockchain announcements are associated with a significant and positive market reaction towards the announcing firm on the day that they are released. To the best of our knowledge, this study should be the first study event study to focus on the value of blockchain announcements in an emerging market. Different from the post-hoc analysis results of Klöckner et al. (2021), we find that in the Chinese stock market, the positive market reaction associated with blockchain announcements is reflected on the announcement day rather than the day after the announcement. Therefore, we have enriched the literature on blockchain technology adoption by taking the stock market of an emerging country as the research object, helping firms to understand the value of blockchain announcements in different market environments.

Second, we study the impacts of pure blockchain announcements on companies' stock market value by stripping away the influence of Bitcoin-related content. To the best of our knowledge, we are the first to apply RBT to study the relationship between blockchain announcements and market reactions in emerging markets and adopt a TM perspective for blockchain announcements. We find that the positive impact of blockchain announcements on stock prices is affected by multiple resources and capabilities. Going beyond the main relation between blockchain adoption and firm performance, we argue that technological innovation and strategic plan play moderating roles in this relation. Specifically, compared to announcements without technological innovation content and operational-level announcements, blockchain technological innovation announcements and strategic-level announcements exhibit a more positive market reaction towards the announcing firm. However, enterprise characteristics including enterprise scale and enterprise innovation ability do not affect stock market reactions to blockchain announcements. Unlike the previous studies that

only consider how a single factor impacts the market response to blockchain announcements (Wadhawan, 2019; Cheng et al., 2019), and different from Klöckner et al. (2021) which consider the impact of the design of blockchain use cases, project-level characteristics and firm-level characteristics, we conduct an analysis of the influence of five factors based on RBT, improving the current understanding of the influencing mechanisms of blockchain announcements on the stock price of the announcing firm.

This paper is structured as follows. Section 2 presents a literature review. Section 3 gives the hypotheses. Section 4 conducts an event study. Section 5 discusses the results. Section 6 summarizes the paper and proposes management insights and future research directions.

2. Literature Review

We review two categories of the previous literature, namely the research on the relationship between technology adoption and enterprise performance, and the research on blockchain TM based on event announcements.

2.1 Relationship between Technology Adoption and Enterprise Performance

TM includes all activities that enterprises carry out to maintain and strengthen their technological competitiveness, including the development, adjustment, and use of scientific and technological capabilities to create or improve products or services (Argote and Hora, 2017). It is an important means by which to achieve organizational strategic objectives and create corporate competitive advantages (Spath et al., 2009), which corresponds to an important stream of OM literature. Research shows that technology adoption is affected by multiple factors, such as company characteristics and strategic resources, and that these factors can affect the performance of a firm's technology adoption (Johnson, et al., 2007).

To further clarify the economic effects of TM, many scholars have explored the relationship between technology adoption and enterprise performance. On the one hand, the use of information technology can improve firms' operational performance (Heim and Peng, 2010) and financial performance (Chen et al., 2021). A meta-analysis by Sabherwal and Jeyaraj (2015) shows that information technology (IT) adoption can strengthen the relationship between IT investment and the business value of IT. Moreover, the smart technology plays an important role in establishing the link between digital transformation and firm performance (AlMulhim, 2021). On the other hand, enterprises need to develop their information technology

competency to enhance their overall performance. Information technology capabilities can interact with supply chain integration to affect an enterprise's operational and financial performance (Liu et al., 2016). Furthermore, technological capabilities can significantly affect logistics 4.0 capabilities (the ability to apply smart technologies in the logistics field), and thus have a significant impact on firm performance (Bag et al., 2020).

The aforementioned research on the relationship between technology adoption and firm performance rarely considers the impact of disruptive technologies such as the blockchain technology (Sabherwal and Jeyaraj 2015; Bag et al., 2020). However, according to RBT, valuable, rare, imperfectly imitable, and non-substitutable resources can provide sustainable competitive advantages for companies (Barney, 1991), and the core of enterprises is their ability to use resources (Barney, 2001). Based on RBT, Treiblmaier (2018) points out that blockchain technology can promote the transformation of resources into capabilities and then into competitive advantages, and that it can change these resources, capabilities, and competitive advantages. Therefore, blockchain technology may fundamentally alter the importance of key resources to achieve sustainable advantages across industries (Treiblmaier, 2018).

Therefore, more and more firms begin to adopt blockchain technology to improve supply chain performance (Bai and Sarkis, 2020). The adoption of blockchain has many potential advantages that benefit business operations and supply chain management. For example, blockchain can ensure trust among partners, speed up payment processing with lessened transaction fees, reduce product costs, and shorten lead times (Bai and Sarkis, 2020). A survey of supply chain practitioners also suggests that they value blockchain adoption, perceive ease to adopt blockchain, and believe that blockchain can help them gain benefits in improving supply chain efficiency (Kamble et al., 2019). In addition, the adoption of blockchain technology allows firms to obtain favourable financing terms at a relatively low cost, which is conductive to operational capabilities (Chod et al., 2020).

However, existing studies tend to adopt the methods of modelling method (Chod et al., 2020) or surveys based on primary data (Kamble et al., 2019); blockchain research using objective secondary data is limited. This presents a methodological gap. Therefore, we use secondary data of stock market as the dependent variable to study the relationship between

blockchain announcements and firms' market performance. We advance the literature of blockchain technology adoption by considering multiple factors related to blockchain TM. Table 1 shows the comparison between this study and the studies on technology adoption and firm performance.

<Insert Table 1 here>

2.2 Blockchain Research Based on Event Announcements

Blockchain is a distributed ledger with digital and decentralized attributes. The technical advantages of blockchain, such as its decentralization, data transparency, and tamper-proof nature, can provide enterprises with opportunities to reduce costs and become independent of intermediary services. Thus, blockchain technology can effectively promote information sharing and collaborative operation among supply chain enterprises, create new business models, and continuously optimize the management of enterprises (Treiblmaier, 2018; Perera et al., 2020). In this regard, blockchain has good applicability to many fields and is widely used in fields related to finance, supply chains, and medical health, among others.

The vast application value of blockchain has made it a hot spot of investment in the capital market (Cheng et al., 2019). Academia has also begun to use stock market data to conduct empirical research on blockchain TM. For example, Cheng et al. (2019) examine the U.S. stock market and find that listed companies are opportunistic in terms of the timing of disclosing information on blockchain activities, while investors often overreact to company's initial blockchain disclosures. Cahill et al. (2020) draw similar conclusions. In addition, they find that the return of a non-speculative announcement (one indicating a greater commitment to investing in blockchain activities) is lower than that of a speculative announcement. Wadhawan (2019) focuses on how firm size affects the market's reaction to blockchain announcements, and finds that small companies tend to gain higher abnormal stock price returns than large companies. Klöckner et al. (2021) examine the stock market in developed countries and find that blockchain announcements are associated with a significant mean abnormal return (0.30%) on the announcement day. They also demonstrate how the design of blockchain use cases (e.g., tracing physical objects and sharing sensitive data), project characteristics (e.g., the consortium size and the involvement of external IT service providers) and firm characteristics (e.g., firm

productivity and innovativeness) affect the stock market response to blockchain announcements.

Table 2 summarizes the comparison between our study and four previous studies on blockchain announcements. As mentioned above, blockchain announcements are an important reflection of TM practice. However, early blockchain research in relation to event announcements tends to be pure financial management research, without considering the impact of factors related to TM (Cheng et al., 2019; Cahill et al., 2020). The main takeaway of this paper differs from previous research positioned in financial management by going beyond studying the main relation between blockchain adoption and firm performance, i.e., we consider the effects of multiple resources and capabilities and argue that technological innovation and strategic plan play moderating roles in this relation. Moreover, current research often explores the market reactions to blockchain announcements in developed stock markets (Wadhawan, 2019; Klöckner et al., 2021). To the best of our knowledge, little research has been conducted to explore the factors affecting the value of blockchain technology adoption based on data from emerging countries. By comparing with research on developed countries' stock markets, we find that under a different market environment, the impacts of firm size and innovativeness on the market reactions to blockchain announcements are different. Therefore, our research significantly enriches the impact mechanism of blockchain technology adoption on firm's stock prices and link it to the TM stream of OM literature.

<Insert Table 2 here>

2.3 Summary of Literature Review

In general, previous related research has four important deficits. First, previous TM literature regarding information technology does not focus on blockchain technology and cannot reveal the economic benefits of blockchain adoption. However, it is worth noting that the adoption of blockchain may lead to the increase or decrease of enterprise resources, capabilities, and competitive advantages (Treiblmaier, 2018). Therefore, it is necessary to conduct in-depth research on the relationship between blockchain technology adoption and firm performance. Second, existing blockchain research based on event analyses of stock prices is often purely financial management research (e.g., Cheng et al., 2019). Although Klöckner et al. (2021) has explored the market reaction to pure blockchain announcements in developed

markets from an IT business value perspective, little in-depth research is conducted on the impact of the pure and simple blockchain announcements in emerging markets. To the best of our knowledge, this is first event study to focus on the blockchain announcements in an emerging market and explore the underlying factors influencing the value of blockchain activities in China. Third, stripping away bitcoin-related contents, we comprehensively consider the impact of the various factors related to blockchain announcement content and enterprise characteristics on the reaction of Chinese stock market from a TM perspective. The introduction of RBT can provide a basis for identifying the potential factors affecting the adoption of blockchain technology. Therefore, focusing on Chinese A-share market, we explore the impact mechanism of pure blockchain announcements on the stock price of the announcing firm from a TM perspective, providing insights into understanding the value of blockchain announcements in different market contexts.

3. Research Hypotheses

3.1 Blockchain Announcement and Market Reaction

According to RBT, the intellectual capital, including technology and intellectual property, owned by an enterprise is its most important resource for promoting organizational performance (Edvinsson and Malone, 1997). Blockchain technology can effectively reduce the involvement of third parties in transactions, thereby ensuring data security, reducing the operating costs of enterprises, and having a positive impact on competitive advantages (Treiblmaier, 2018). Therefore, blockchain technology is an important intellectual capital resource of enterprises.

The technical advantages of blockchain make blockchain widely recognized by managers and scholars. According to a survey conducted by IBM of nearly 3,000 executives around the world, approximately one-third of enterprises are considering or have actively participated in exploring the blockchain field[5]. In addition, many scholars predict that blockchain will have a great impact on firms' stock value (Cheng et al., 2019). However, firms face uncertainties in the process of adopting blockchain technology and investors may hold completely different views towards the future business prospects of firms that adopt blockchain. For example, of

[5] IBM. 2017. Forward Together: Three Ways Blockchain Explorers Chart a New Direction. IBM Institute for Business Value. Armonk, NY.

the individuals who responded to Juniper Research's survey, 76% hold the view that blockchain technology positively affects a firm's operational performance; however, 51% respondents believe that blockchain may cause serious disruptions to the systems of firms' partners or customers (Holden and Moar, 2017). The different attitudes of investors towards blockchain can affect their investment behaviors in the stock market, thus leading to fluctuations in the stock prices of firms that adopt blockchain.

Regarding the Chinese market, during the first 15 trading days after the launch of the Blockchain 50 Index[6], the index showed an upward trend for 12 out of the 15 trading days, indicating that blockchain generally had a positive effect on the overall market value of listed companies. Therefore, we believe that blockchain technology should bring competitive advantages to enterprises, and the involvement of enterprises in the blockchain field should be associated with a positive market reaction towards the announcing firm. Therefore, hypothesis 1 is proposed.

H1: The blockchain announcements of listed companies have a positive effect on company stock prices.

3.2 Influencing Factors and Market Reaction

This section discusses the influence of the content differences of blockchain announcements and that of the differences in the companies that issue these announcements on stock market reactions.

3.2.1 Blockchain Announcement Content

The selected blockchain announcements mainly focus on three aspects: partnerships, technological innovation, and strategic plan. Previous studies have suggested that these factors can influence stock market value separately (Ravichandran et al., 2005; Liu et al., 2020). To determine whether such influence holds in the case of blockchain activities, we examine these three aspects in this section.

[6] The sample space of the Blockchain 50 Index comprises companies listed on the Shenzhen Stock Exchange. The business areas of these enterprises involve the blockchain industry. And its sample is composed of the top 50 stocks according to the average daily market value from high to low over the past six months.

3.2.1.1 Blockchain Partnership and Market Reaction

Enterprises can obtain resources that they lack through cooperation. RBT holds that intangible resources are an important resource of enterprises. The ability to establish relationships between enterprises and the outside world is a kind of intangible resource, which is difficult for competitors to observe and imitate (Galbreath and Galvin, 2006). Therefore, partnership relationships are an important intangible resource for enterprises and can improve enterprise performance (Cao and Zhang, 2011; Liu, et al., 2020; Zheng et al., 2021).

Blockchain is a unique information technology, to which the influence of partnership is very important. On one hand, the introduction of blockchain can improve the information transparency between business partners, thus reducing costs and significantly improving cooperation efficiency (Bai and Sarkis, 2020). On the other hand, cooperation is an effective means by which to internalise external knowledge and new technologies. Enterprises can acquire new technologies by establishing partnership relationships with the representative companies in a given field (Barringer and Harrison, 2000). Therefore, building partnerships in blockchain projects is an efficient approach for enterprises that lack professional technical experience to become involved in blockchain. Therefore, building partnerships in blockchain projects can bring benefits to both cooperating parties in terms of cost reduction and efficiency improvement (Zheng et al., 2021), which is conducive to raising investors' confidence for a firm’s future operations and eliciting a positive market reaction.

However, the cooperation of enterprises in blockchain projects also faces risks. Cooperative partners have their own goals, so the existence of endogenous uncertainties (e.g., the strategic behaviors of firms) and exogenous uncertainties (e.g., changes in technology, market, and regulation) may lead to a deadlock in cooperation (Melese et al., 2017), exposing both parties to cooperation risks and affecting investors' perceptions of the firm. Moreover, the participation of a large number of firms may complicate coordination between them, thus slowing down the development of blockchain (Mishra et al., 2015). Since the value needs to be shared among partners, the value obtained by each firm may become less than conducting R&D themselves.

In our sample, we label an announcement concerning multiple partners participating in blockchain projects as a blockchain cooperation announcement. Although building

partnerships in blockchain projects faces certain risks, we suppose that cooperation is an important approach for firms to participate in blockchain activities to obtain intellectual capital, and the release of a blockchain cooperation announcement should cause a positive market reaction towards the announcing firm. Therefore, hypothesis 2 is proposed.

H2: Blockchain cooperation announcements have a more positive effect on a company's stock price than announcements without information about cooperation.

3.2.1.2 Blockchain Technological Innovation and Market Reaction

Technological innovation is an important source of enterprise competitive advantages and the core of corporate sustainable development (Zhang et al., 2016). According to RBT, when the technology possessed by an organization is very valuable, scarce, and difficult to imitate, technological innovations can create improved competitive advantages and increase the performance of the organization (Irwin et al., 1998). Technological innovation includes the two stages of technology development and technology application (Lynn, 1996). During the technology development stage, R&D investment can increase enterprises' patent output. This can improve companies' innovation performance level and make these companies more likely to be thought of as having improved market prospects and good investment value (Zheng et al., 2016). During the technology application stage, the application of information technology can enhance the core competitiveness of enterprises and have a positive effect on enterprise market value (Ravichandran et al., 2005). Therefore, during the two stages, technological innovation can have a positive influence on organizational performance.

In the case of blockchain technology, R&D and the application of this technology to scenarios can enable the advantages of blockchain to be fully harnessed, and can continuously optimize the OM of enterprises, eventually resulting in improved market performance (Treiblmaier, 2018). We label an announcement concerning the R&D or application of blockchain technology as a blockchain technological innovation announcement (such as an announcement about the establishment of a blockchain research laboratory), and the remaining announcements are labelled as announcements without technical innovation information. Although the inherent risks of significant investment and long R&D cycles of blockchain projects may cause some investors to have a negative view towards blockchain technological innovation, in general, we believe that the disclosure of blockchain technological innovation

information should be associated with a positive market reaction towards the announcing firm. Therefore, hypothesis 3 is proposed.

H3: Blockchain technological innovation announcements have a more positive effect on a company's stock price than announcements without technical innovation information.

3.2.1.3 Blockchain Strategic Plan and Market Reaction

Strategic planning is the process by which companies make systematic decisions for long-term survival and development. The technology-related strategic planning of an enterprise is important, because it can be used to generate a plan that includes the important aspects of technology integration and management to ensure the implementation of the overall strategy of the enterprise through TM (Berrio, 2020). According to RBT, technology resources can moderate organizational performance through the implementation of technology-related strategies and thus help organizations gain competitive advantages (Li et al., 2020).

In terms of blockchain, strategic planning can fully harness the technical advantages of blockchain to help companies obtain competitive advantages. Therefore, an increasing number of companies have regarded their blockchain business development as part of their corporate strategies. According to "Deloitte's 2019 Global Blockchain Survey", 73% of Chinese firms regard blockchain as their strategic focus. However, setting operational goals for blockchain projects is also vital, that is, firms need to ensure that the projects are executed on schedule and achieve a satisfactory level of operational performance through proper project management (Brunswicker and Vanhaverbeke, 2015). Thus, based on whether each announcement concerns an enterprise's long-term strategic plan regarding blockchain, the announcements are divided into strategic-level announcements (e.g., announcements containing the words "strategic investment" and "strategic cooperation") and operational-level announcements (e.g., business cooperation announcements and other implementation announcements regarding strategic plans). We suppose that a company's strategic planning of blockchain embodies its attention to blockchain technology, thus strategic-level announcements should be associated with a more positive market reaction towards the announcing firm. Therefore, hypothesis 4 is proposed.

H4: Strategic-level announcements concerning blockchain are associated with a more positive effect on the related company's stock price than operational-level announcements.

3.2.2 Enterprise Characteristics

When studying the driving factors of implementing technologies, existing literature often considers enterprise characteristics such as enterprise scale (Wadhawan, 2019) and enterprise innovation ability (Shin, 2019). Therefore, we examine the impact of blockchain announcements on market reactions as it relates to these two aspects.

3.2.2.1 Enterprise Scale and Market Reaction

According to RBT, asset size, which is often represented by enterprise scale, is a typical tangible resource of enterprises (Wernerfelt, 1984), and the difference in asset size can be directly reflected in a firm's market performance. Some studies have shown that there is a negative correlation between an enterprise's asset size and its market performance (Bamber, 1987). This is because large companies frequently release information to the public (Meek et al., 1995). When assessing companies, stockholders are so overwhelmed with the massive amount of information that they are not able to effectively process a specific piece of information. In contrast, much less information is available for small companies than large companies (Meek et al., 1995). Therefore, the small amount of available information serves as the only basis through which investors are able to assess small companies, and the assessment results may be directly associated with a stronger increase in corporate stock prices (Wijayana and Achjari, 2019). Moreover, the impact of similar size blockchain initiatives are greater for small firm than large firms. Blockchain initiatives of similar size require a greater percentage of assets for a small firm, which signals a serious commitment and enhance investors' confidence in the successful implementation of blockchain initiatives. Instead, large firms are less affected by a single event (Lo et al., 2018). A counter-argument is that large firms have stronger financial flexiblity and management capabilities (Lo et al., 2018), thus they have more resources to ensure the success of blockchain projects (Jia et al., 2020). In addition, large companies seem to attract more attention from investment analysts and public media, so the stock market reaction might be stronger.

The former view has been confirmed by prior empirical research on blockchain announcements, in which small firms experience a more positive abnormal stock return after announcing their investment in blockchain in their businesses (Wadhawan, 2019; Cahill et al., 2020). We expect that Chinese A-share market exhibits a performance trend that is similar to

that of the global market. Therefore, we use the total assets of each firm in the last fiscal year before the announcement to measure the scale of each firm and propose hypothesis 5.

H5: Blockchain announcements issued by small enterprises are associated with a more positive effect on the related company's stock price than those issued by large enterprises.

3.2.2.2 Enterprise Innovation Ability and Market Reaction

Innovation ability refers to an enterprise's strength and proficiency related to a series of interrelated organizational routines used to develop new products and new processes (Peng et al., 2008). Enterprise innovation ability can directly affect an enterprise's performance, and enterprises with advance R&D capabilities, accumulation of technological capabilities, and technological innovation systems tend to show better operating performance (Shin, 2019). The improvement of a firm's innovation ability can generate resources for organizational restructuring and business process improvement, which is conducive for enterprises to obtain competitive advantages and secure a favourable market position (Huang et al., 2012).

Blockchain is a complex technology, and R&D and innovation related to this technology need the support of enterprise innovation ability. Therefore, an enterprise with a strong innovation ability should have a better technical foundation for engaging in blockchain activities than an ordinary company. Thus, blockchain announcements of an enterprise with a strong innovation ability should exhibit a more positive market reaction towards the announcing firm. However, another view is that managers of mature incumbent enterprises tend to enjoy the profits made by their existing technologies. Thus, they intentionally ignore disruptive technologies (Bower and Christensen, 1995). In contrast, the potential of blockchain is more likely to be valued by emerging enterprises with a weak innovation ability (Bower and Christensen, 1995). Therefore, venture capitalists in the stock market tend to invest in start-ups that use disruptive technologies to enable their strategic innovations (Rossi, et al., 2020). Therefore, blockchain announcements issued by start-ups with a weak innovation ability may elicit a more positive market reaction toward the announcing firm. We echo the former view in this study, that is, enterprise innovation ability should be positively correlated with market reactions to blockchain announcements. Therefore, hypothesis 6 is proposed.

H6: Compared with blockchain announcements issued by companies with a weak innovation ability, those issued by companies with a strong innovation ability are associated with a more positive effect on the related company's stock price.

4. Event Study

4.1 Sample Selection and Description

We collect our sample of announcements from the website of Cninfo (www.cninfo.com.cn). Cinifo is an official listed company information disclosure website in China and contains comprehensive announcement information. The time period for our study is from January 1, 2016 to December 31, 2021. The reason that we choose this period is that before 2016, China paid relatively little attention to blockchain technology. However, ever since the Chinese central bank investigated some key issues in the digital currency field in 2015, an increasing number of companies have become involved in the blockchain field. Therefore, the selected time window is reasonably representative of the market's focus on blockchain.

The technical characteristics of blockchain determine that it is widely used in supply chain activities such as transaction recording. Since transaction is an indispensable part of the operation activities of enterprises, we believe that in addition to the application of cryptocurrency, blockchain applications are highly related to OM in diverse fields. Therefore, we use "blockchain" as a keyword to search the full text of the enterprise announcements published on Cninfo from 2016 to 2021 and initially obtain 13,117 announcements. We also use a variant of the term, "distributed ledger technology", as a keyword for full-text search, but do not obtain additional valid blockchain-related announcements. Our screening criteria and process are as follows:

1) The content of the announcements should be closely related to the blockchain activities. Announcements that generally mention "blockchain and other information technologies" and announcements that emphasize activities related to technologies other than blockchain were excluded.

2) Many announcements may concern the progress or supplementation of blockchain projects. We only adopt the announcements releasing information for the first time, and the announcements releasing information that has been previously released were excluded.

3) The companies issuing each announcement need to have adequate stock return records in the China Stock Market & Accounting Research Database. We require the company to have at least 40 observations in the estimation period before the announcement. If a company publishes other blockchain announcements within 40 trading days before an announcement, that announcement was excluded (Jacobs et al., 2010).

4) To avoid the superimposed influences of multiple earning events, if an enterprise issues other earning announcements within five trading days around the blockchain announcement, such announcements were excluded (Cahill, et al., 2020; Arora et al., 2020).

According to the above rules, the final research sample contains 143 blockchain announcements from 102 companies. Figure 1 shows the data collection and screening process. As shown in Figure 1, the examined direct effects correspond to RQ1 in our paper. The examined moderating effects correspond to the five influencing factors mentioned in RQ2 and RQ3. The control factor represents the control variables introduced to ensure the robustness of our conclusion.

<Insert Figure 1 here>

Table 3 shows a description of our sample. Panel A of Table 3 presents the descriptive statistics of the sample enterprises for the last complete financial year before the respective announcements were made. The mean market value of the sample enterprises is 63503.58 million CNY (9710.03 million USD if USD 1.00=CNY 6.54), their mean total asset value is 55529.25 million CNY (8,490.71 million USD), and their mean operating income is 11848.05 million CNY (1,811.63 million USD). As shown in Panel B, the number of blockchain announcements issued from 2016 to 2021 shows an increasing trend at first and then falls, reaching a peak in 2018. Panel C presents the industry distribution of the sample.

<Insert Table 3 here>

4.2 Methodology

4.2.1 Event Study Method

We use the event study method to estimate the market reaction to a blockchain announcement. This method investigates the stock market's response to an event by calculating the abnormal returns (AR) related to that specific event (Brown and Warner, 1985).

First, the event window period needs to be determined. We convert calendar time to event time in the following way. The release date of a blockchain announcement is designated as day 0. If an announcement is released after the stock market closes on a trading day, or if an announcement is announced on a non-trading day, then the first trading day after that day is regarded as day 0. The last trading day prior to day 0 is set as day -1, the first trading day after day 0 is set as day 1, and so on. Since markets move quickly to completely incorporate the profit performance impact of an event into the stock price (Modi et al., 2015), the impact of an event can be measured by observing the stock price behavior in a relatively short time period (Hendricks and Singhal, 2003). Referring to the previous OM research (e.g., Modi et al., 2015), we focus on the short-term abnormal returns of firms after the blockchain announcement, and present abnormal stock returns over the [-2,2] window.

We use the general market model (Brown and Warner, 1985) to estimate the AR after blockchain announcements. The model is expressed as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

In formula (1), R_{it} is the daily return of stock *i* on day *t*, R_{mt} is the daily market return on day *t*. α_i and β_i are the intercept and slope of stock *i*. ε_{it} is the error term, which reflects the impact of a specific company event. We select an estimation period covering the 200 trading days between day -210 and day -11, and employ the least squares method to estimate $\hat{\alpha}_i$, $\hat{\beta}_i$ and $\hat{S}^2_{\varepsilon_i}$ (the variance of the error term ε_{it}) for this period. The estimation period ends two weeks in advance to ensure that the estimation is not affected by the announcement (Jacobs et al., 2010).

In the event window period, the AR of stock *i* on day *t* can be expressed as the difference between its actual returns and expected returns. Thus, AR is expressed as:

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \tag{2}$$

Denoting the sample size as N, the average abnormal return (AAR) of the sample on day *t* is:

$$AAR_t = \sum_{i=1}^{N} \frac{AR_{it}}{N} \tag{3}$$

The cumulative abnormal return (CAR) during the event window $[t_1,t_2]$ can be calculated as:

$$CAR_{[t_1,t_2]} = \sum_{t=t_1}^{t_2} \overline{AR_t} \tag{4}$$

The standardized AR can be obtained by dividing the AR of each stock (AR_{it}) by the standard deviation $\hat{S}_{\varepsilon_i}$ of its stock return. We assume that the ARs of the selected stocks are independent of each other, with a mean value of 0 and a variance of $\hat{S}_{\varepsilon_i}^2$. According to the central limit theorem, the sum of N standardized ARs approximately follows a normal distribution whose mean value is 0 and variance is N (N ≥ 30). Therefore, a t-test of the AAR on day *t* can be computed as follows:

$$t_{\overline{AR}t} = \sum_{i=1}^{N} \frac{AR_{it} / \hat{S}_{\varepsilon_i}}{\sqrt{N}} \sim N(0,1) \tag{5}$$

Similarly, a t-test of the CAR during the window period can be computed as follows:

$$t_{CAR} = \sum_{i=1}^{N} \frac{\sum_{t=t_1}^{t_2} AR_{it} \Big/ \sqrt{\sum_{t=t_1}^{t_2} \hat{S}_{\varepsilon_i}^2}}{\sqrt{N}} \sim N(0,1) \tag{6}$$

To eliminate the effects of outliers on our test results, we supplement the t-test with two non-parametric tests. We use the Wilcoxon signed-rank test to explore whether the median abnormal return (MAR) of the sample is significantly non-zero. We use a binomial sign test to explore whether the positive rate of the abnormal returns (PRAR) is significantly higher than 50%. Since we speculate that the blockchain announcements are associated with positive market reactions, we adopt one-sided tests for the above three test methods and expect to find consistency among the results of the three test methods.

4.2.2 Cross-sectional Regression Model

To verify whether the factors mentioned in hypotheses 2 through 6 affect the market responses to a blockchain announcement, we adopt a cross-sectional regression model. In this model, the dependent variable is the ARs of the stocks on each announcement day, and the independent variables are the variables based on the hypotheses and control variables.

First, we introduce three independent indicator variables related to the content of the blockchain announcements, which are defined as follows:

Blockchain Partnership (X_1): If an announcement is a blockchain cooperation announcement, this dummy variable is equal to 1; otherwise, it is equal to 0. According to H2, the coefficient of X_1 is expected to be positive.

Blockchain Technological Innovation (X_2): This dummy variable is equal to 1 if an announcement is a blockchain technological innovation announcement and 0 if it is an announcement not pertaining to technical innovation. According to H3, the coefficient of X_2 is expected to be positive.

Blockchain Strategic Plan (X_3): This dummy variable is equal to 1 if an announcement is of a strategic level and 0 if it is of an operational level. According to H4, the coefficient of X_3 is expected to be positive.

Second, we introduce two independent variables related to enterprise characteristics, which are defined as follows:

Enterprise Scale (X_4): This is a numerical variable. We use the natural logarithm of each firm's total assets in the last accounting year prior to the announcement to measure the scale of each company (Lo et al., 2018). According to H5, we expect its coefficient to be negative.

Enterprise Innovation Ability (X_5): This is a numerical variable. We use the ratio of the number of patents to firm assets in the fiscal year preceding the announcement to capture enterprise innovation ability (Klöckner et al., 2021). According to H6, the coefficient of X_5 is expected to be positive.

In addition, we introduce three control variables as follows:

Industry-adjusted Financial Performance (X_6): We use the three-year average industry-adjusted ROA prior to the corresponding announcement to represent a firm's prior financial performance, which can control the effects of corporate profitability (Lo et al., 2018). The industry-adjustment is done at the 3-digit China SIC code level.

Industry Type (X_7): This is a dummy variable indicating the industry type of the company. Service industry is an industry that focuses on intangible service provision, including wholesale and retail, software and IT service, etc., and the variable is equal to 1 if the firm is a service firm; manufacturing industry involves the supply, processing, production and distribution of tangible products, and the variable is equal to 0 if the firm is a manufacturing firm (Liu et al., 2020).

Financial Leverage (X_8): This is a numerical variable that reflects the level of a firm's financial risk, defined as the ratio of a firm's earnings before interest and tax to profit before tax in the last accounting year before the corresponding announcement (Liu et al., 2020).

Then, we obtain the following cross-sectional regression model:

$$CAR_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon_i \quad (7)$$

where CAR_i stands for the AR of stock *i* on day 0, β_0 represents the intercept, and β_1 to β_8 represent the coefficients of the independent variables.

4.2.3 Robustness Tests

(1) Alternative benchmark models

To eliminate the influence of model selection on the results, we use another two models, the market-adjusted model and the Carhart four-factor model, to conduct sensitivity analysis. Through our comparison of the results obtained using different methods, we can verify the robustness of our results.

The market-adjusted model regards market returns as the expected returns of the corresponding stocks, so we can calculate the ARs of each stock by subtracting its market returns of the corresponding announcement day from its actual returns (Jacobs and Singhal, 2014).

The Carhart four-factor model estimates ARs more comprehensively, including the market return factor, size factor, book-to-market factor, and a momentum factor (Fama and French, 1993; Carhart, 1997). The model is expressed as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{i1} MKT_t + \beta_{i2} SMB_t + \beta_{i3} HML_t + \beta_{i4} UMD_t + \varepsilon_{it} \quad (8)$$

In formula (8), R_{it} is the daily return of stock *i* on day *t*, R_{ft} is the market risk-free return on day *t*, MKT_t is the market return minus the market risk-free return on day *t*, SMB_t is the small-minus-big-size portfolio return on day *t*, HML_t is the high-minus-low-book-to-market portfolio return on day *t*, UMD_t is the past-11-month-winners-minus-losers portfolio return (Arora et al., 2020). In the event window period, the AR of stock *i* on day *t* is the difference between its actual returns and expected returns. Thus, the AR is expressed as:

$$AR_{it} = R_{it} - \left(\hat{\alpha}_i + R_{ft} + \hat{\beta}_{i1} MKT_t + \hat{\beta}_{i2} SMB_t + \hat{\beta}_{i3} HML_t + \hat{\beta}_{i4} UMD_t \right) \quad (9)$$

(2) Endogeneity test

We test the endogenous problem attributed to sample selection bias. It is possible that firms may self-select into the sample of firms that are more likely to experience changes in stock market returns after the blockchain event, resulting in sample selection bias. Therefore, we use the propensity score matching (PSM) test to test whether there is sample selection bias in our paper.

We used PSM to create a matching sample of companies similar to the companies in our sample as a control group. These companies are in the same industry as our sample companies but did not issue blockchain announcements during the event period. First, we constructed a propensity score model, using enterprise scale and ROA in the fiscal year as predictors to predict the propensity of the firm receiving the treatment (Schmidt et al., 2020). Then, we matched the companies in the treatment group and the control group based on the propensity score, and tested the statistical difference between the ARs of matched pairs on the announcement day. The ARs were calculated using the market-adjusted model. If the difference is significant, it indicates that the sample selection bias is not an important issue in our research.

4.3 Analysis and Results

We test our hypotheses in the following section. First, we calculate the market's response to the blockchain announcements during the [-2,2] window period. Then, we explore which factors affect this market reaction.

4.3.1 Market Reactions to the Blockchain Announcements

In this section, we calculate the ARs of the 143 blockchain announcements for Days -2 through +2 and conduct statistical tests. The results are presented in Table 4.

<Insert Table 4 here>

Panel A of Table 4 shows the calculation results obtained by the market model. The AAR and MAR of day 0 are 1.359% and 0.583%, respectively, and are both significantly higher than 0 at the 1% level. The PRAR of day 0 is 62.24%, and it is significantly higher than 50% at the 1% level. These results show that blockchain announcements exhibit a significantly positive market reaction towards the "announcing firm" on the announcement day. The AAR on day -1

is 0.342%, which is positive at the 10% level, while the MAR and PRAR are not significantly positive; neither the AAR nor the MAR on day 1 is significantly positive. We find that the positive market reaction associated with blockchain announcements is mainly reflected on the announcement day. Therefore, Day 0 is appropriate to study the ARs associated with blockchain announcements, and a similar window period is also used by Klöckner et al. (2021). As shown in Panel B and Panel C, the calculation results obtained by the market-adjusted model and the Carhart four-factor model are no different than those obtained by the market model. That is, blockchain announcements are associated with a positive and significant market reaction on the announcing day, indicating a very timely response. Therefore, we find support for H1.

Using PSM, we obtain a control group that contains 140 observations. As shown in Panel D of Table 4, the matched firms did not experience significantly positive ARs on the announcement day or during the two-day event window period. We further perform an independent samples test of ARs on Day 0 in the treatment group and the control group, and observe a significantly positive t-statistics (t=3.268，Sig=0.001<0.05). This indicates that the treatment group that issues blockchain announcements is associated with more positive stock market returns on the announcement day compared to the control group, which provides evidence that sample selection bias may not be a significant concern in our research.

4.3.2 Univariate Analysis

To better understand the market reaction to the blockchain announcements, we classify the announcements according to different characteristics and conduct a descriptive analysis. To ensure the reliability of the classification, we classified each announcement separately. For most announcements (130 out of 143 announcements), the co-authors have obtained consistent classification results; for announcements with uncertain classification, the co-authors discussed together and reached agreement on their classification. To control for outliers, following Hendricks and Singhal (2003), we exclude the data of the top 2.5% and bottom 2.5% of the existing samples (8 observations) and perform the univariate analysis. The classification results and descriptive statistics are presented in Table 5. Referring to Schmidt et al. (2020), we include the two-sample t-test and Mann-Whitney U test to test the differences in means and medians of abnormal returns of the split-sample on Day 0.

In Table 5, Panel A shows the AAR and MAR of the blockchain cooperation announcements and those of the announcements without information about cooperation The one-sample test results show that the AAR (MAR) corresponding to the blockchain announcements concerning cooperative relationships is more positive than that corresponding to the non-cooperative announcements. Although both types can elicit a significantly positive market reaction towards the announcing firm, their impact on a firm's abnormal stock returns seems not to be significantly different. Similarly, as shown in Panel D and Panel E, blockchain announcements issued by large and small firms, and blockchain announcements of firms with a strong or weak innovation ability can elicit positive and significant abnormal stock returns on the announcement day. We discuss these findings in detail in Section 4.3.3.

Panel B shows that the AAR (MAR) corresponding to the blockchain technological innovation announcements on Day 0 is 1.867% (1.190%), and that corresponding to the announcements without technical innovation information is -0.136% (-0.101%). The significant and positive two-sample test statistics indicate that blockchain technological innovation announcements seems to elicit a more positive market reaction towards the announcing firm. The technological innovation factor is critical and significantly affects the firm stock value, which supports H3. Similarly, Panel C indicates that the strategic-level blockchain announcements seem to elicit a more positive and significant market reaction towards the announcing firm than the operational-level ones, which supports H4.

<Insert Table 5 here>

4.3.3 Cross-sectional Regression Analysis

In this section, we perform a cross-sectional regression analysis using the trimmed data. Table 6 presents the regression analysis results (regression coefficients with t-statistics in parentheses), where the dependent variable is the AR on day 0. Model 1 includes all the five explanatory variables and Model 2 includes all the explanatory variables and control variables. The results obtained after trimming 2.5% of the data in each tail are similar to those obtained without trimming.

<Insert Table 6 here>

According to the results of Model 2, our findings are as follows: The coefficient of blockchain partnership is negative and nonsignificant, indicating that the firms' ARs have no

obvious correlation with whether the blockchain announcements involve cooperative relationships. Therefore, H2 is rejected.

The coefficient of blockchain technological innovation is positive and significant at the 5% level, manifesting that the blockchain technological innovation announcements are associated with a greater increase in firm's stock prices (a 1.7% higher for mean market reaction) than announcements without technical innovation information, which provides support for H3.

The coefficient of blockchain strategic plan is significantly positive at the 10% level, indicating that the strategic-level blockchain announcements are associated with a greater increase in firm's stock prices (a 1.0% higher for mean market reaction) than the operational-level announcements, which provides support for H4. For the factors of technological innovation and strategic plan, the results of the regression analysis are consistent with those of the univariate analysis, which provides robustness for our findings.

As we have expected, the coefficient of enterprise scale is negative, but it is not significant. This indicates that the stock price increase associated with blockchain announcements has nothing to do with the size of the announcing firm. Therefore, H5 is rejected.

Instead, blockchain announcements issued by enterprises with a weak innovation ability may be more favoured by investors.

Contrary to our expectation but consistent with the univariate analysis results, the coefficient of enterprise innovation ability is not significantly positive. This indicates that when publishing blockchain announcements, enterprises with a strong innovation ability may not exhibit a greater stock price increase than enterprises with a weak innovation ability. Therefore, H6 is rejected. Specifically, the coefficient of enterprise innovation ability is not significant in Model 1. However, after adding the control variables in Model 2, the coefficient appears to be significant at the 10% level. We believe that the slightly different results may be attributed to the introduction of the control variables. Therefore, the 10% significance is not a robust result, and there is insufficient evidence to conclude that the stock market reaction associated with blockchain announcements is related to the innovation ability of the announcing firm.

Considering that COVID-19 has had a significantly negative effect on the world economy, it may also affect the conclusions of our study. Therefore, we exclude the sample

announcements that occur after the outbreak of the pandemic and recalculate using the 105 announcements between January 2016 and February 2020. We find that the results corresponding to the two time periods are similar, so our conclusions are robust and not affected by the stock price fluctuations caused by the pandemic[7].

5. Discussion

The above results show that there is a complicated impact mechanism of blockchain announcements on firms' stock prices, which has not been explored in previous studies. In this section, we discuss these findings and provide explanations for the interesting phenomena presented in this paper.

First, blockchain announcements are an important reflection of TM practices and are associated with a significant and positive market reaction towards the announcing firm on the announcement day in China, which supports H1. The AAR and MAR on the event day are 1.498% and 0.651%, respectively, and are significantly higher than 0 at the 1% (1%) level. On the one hand, our finding is different from the post-hoc analysis results of Klöckner et al. (2021) using 58 blockchain announcements from emerging markets. Klöckner et al. (2021) find that there is a one-day delay in investors' positive reactions to blockchain initiatives in emerging markets, with an AAR of 0.77% on Day 1. Our results show that the market reaction in the Chinese stock market shows a similar trend to that in developed markets, with an AAR of 1.315% and 0.30% on Day 0, respectively. However, the abnormal returns associated with blockchain announcements in the Chinese stock market are higher than those in developed stock markets. On the other hand, our research is different from the financial management research on blockchain conducted by Cheng et al. (2019) and Cahill et al. (2020). They do not exclude the impacts of Bitcoin announcements when studying the market reaction to blockchain announcements. However, due to China's restrictions on Bitcoin transactions, our sample does not include Bitcoin announcements. Therefore, we reasonably estimate the impact of pure blockchain announcements. On the other hand, they do not consider the influencing factors such as enterprise characteristics and strategic resources that affect technology adoption (Johnson, et al., 2007). Instead, we explore the impact of blockchain announcements from a

[7] More detailed information is provided in the supplementary file.

TM perspective. Based on RBT, we explore whether the positive effect of blockchain announcements on firms' stock prices is affected by various resources and capabilities, such as partnership, technological innovation, strategic plan, enterprise scale and enterprise innovation ability, and we provide evidence for supporting Hypotheses H3 and H4.

Second, consistent with H3, blockchain technological innovation announcements exhibit a more positive market reaction towards announcing firms, which reflects the important role that technological innovation plays in the effect of blockchain activities on stock value. A possible explanation for this is that technological innovation is often closely related to companies' core competence (Petersen, et al., 2005). Hence, leading companies can demonstrate their core competence by introducing new technologies with good application prospects and by effectively monitoring the development of new technologies (Petersen, et al., 2005). In the case of blockchain, technological innovation can fully harness the advantages of blockchain, and continuously optimize the OM of enterprises (Treiblmaier, 2018). Therefore, blockchain technology innovation may be especially favoured by investors. This finding is consistent with previous studies that technology adoption can have a positive impact on the business value of enterprises (Ravichandran et al., 2005; Sabherwal and Jeyaraj, 2015). We have however supplemented and advanced this finding by studying the relationship between blockchain announcement and corporate market value. In other words, the conclusion that technological innovation creates improved competitive advantages and improves organizational performance (Irwin et al., 1998) is also applicable to disruptive technologies such as blockchain.

Third, from the perspective of TM strategy, enterprises need to adopt appropriate technology-related strategies to pursue competitive goals and achieve better performance (Das, 2001). In contrast, unplanned and indiscriminate investment in technology may not be associated with improved enterprise performance (Das, 2001). Thus, we consider the influence of a firm's strategic plans regarding blockchain on market reactions and find that strategic-level announcements often elicit a greater stock price increase than operational-level announcements, which supports H4. It may be because strategy entails long-term planning goals, which largely determine how an organization allocates its resources and the course of its overall plan (Porter, 1980). Therefore, a strategic approach to this technology means that an

enterprise may continue to follow the development of blockchain over the long term. This gives investors a positive investment signal and makes the market reaction to a strategic-level announcement more positive. Our finding further reflects the importance of corporate overall TM strategies in the context of blockchain (Berrio, 2020).

Finally, we discuss the hypotheses that are not supported in our research. On the one hand, the blockchain partnership factor (H2) is irrelevant to the effects of blockchain announcements on corporate stock prices. This may be because the characteristics of high investment and high risks of blockchain projects pose significant uncertainty to the cooperation, which may lead to a cooperation failure and affect the development process of blockchain, thus resulting in investors' negative views on the development prospects of the enterprise. This result is somewhat consistent with the results of our pilot study on two Chinese companies. The respondents believe that although firms should eventually build a blockchain ecosystem through cooperation, independent R&D and external cooperation are both important ways for companies to enter the blockchain industry, and these activities are compatible and complementary to each other, which explains why the blockchain partnership factor is not significant.

On the other hand, we find that enterprise characteristics such as enterprise scale and enterprise innovation ability do not affect stock market reactions to blockchain announcements. For the enterprise scale factor, contrary to the findings of previous empirical research on blockchain announcements (Wadhawan, 2019; Cahill et al., 2020), we find that small firms do not experience more positive abnormal stock returns after announcing their entry into blockchain business. A possible explanation is that the conclusion obtained by studying the impact of a single variable without considering the impact of other variables is incomplete, while Wadhawan (2019) and Cahill et al. (2020) do not consider the effects of other variables when studying the effects of firm size. Therefore, this conclusion no longer holds when we consider the combined effects of multiple resource and capacity factors. Another reason might be that previous studies mainly focus on developed stock markets such as the U.S. stock market (Wadhawan, 2019). Since the market environment of emerging countries and developed countries is different, the firm size factor cannot play an important role in Chinese stock market.

For the enterprise innovation ability factor, we have not found support for the view (H6) that enterprises with strong innovation abilities exhibit more positive market reactions than those of other enterprises (Shin, 2019). Interestingly, even if we use the same variable as Klöckner et al. (2021), the negative impact of the innovation ability factor on market reactions to blockchain does not hold in the Chinese stock market. This explains the opposite views of previous research on the impact of firm innovation abilities and reflects investors' different recognition of the value of blockchain announcements in different stock market contexts. This provides a direction for the comparative research on the market reaction to blockchain announcements in different stock markets in the future.

6. Conclusions and Future Research

6.1 Conclusions

We select 143 blockchain announcements made by 102 listed companies as our research sample to study the effects of the blockchain announcements on their stock value. We use secondary data to reveal the impact of blockchain technology adoption on corporate market performance, thereby advancing the empirical research on blockchain technology adoption. Specifically, we find that blockchain announcements have a positive effect on firms' stock prices. This finding is basically consistent with the findings of Cheng et al. (2019) and Klöckner et al. (2021). However, the difference is that we stripped off the impact of Bitcoin announcements, examined the value of "non-Bitcoin" blockchain announcements in an emerging stock market and enriched blockchain TM research. Based on RBT, we find that the positive impact of blockchain announcements on firms' stock prices is affected by a variety of resources and capabilities, including technological innovation and strategic plan. Therefore, we have established a research framework for blockchain technology adoption based on RBT. Our findings can also guide business practices. That is, managers should upgrade the deployment of blockchain in their businesses to a strategic level and focus more on the technological innovation activities of blockchain to better enhance their firm's market value.

6.2 Management Insights

6.2.1 Theoretical Implications

At the theoretical level, we make the following contributions.

First, we contribute to TM stream of OM by way of revealing the value of blockchain technology adoption. The focus of our research is consistent with the TM research that examines the economic value of technology adoption (Sabherwal and Jeyaraj 2015; Bag et al., 2020), while these studies rarely consider the impact of disruptive technologies and do not focus on blockchain. However, blockchain has the potential to increase an enterprise's resources and capabilities, helping it to gain sustainable advantages (Treiblmaier, 2018). Therefore, it is worth studying the relationship between blockchain technology adoption and firm performance, however current research showing the value of blockchain technology adoption lacks the support of secondary data from emerging stock markets (Klöckner et al., 2021). Stripping out Bitcoin announcements, we examine the impact of pure blockchain announcements on the stock market value of Chinese A-share listed firms. To the best of our knowledge, we are the first to study firms' market performance associated with blockchain technology adoption and the influencing factors using secondary data from emerging markets. We have considered multiple factors that may affect technology adoption and promoted the empirical literature on blockchain technology adoption, which helps managers to fully understand the value of blockchain initiatives and the potential influencing factors in different markets.

Second, our research enriches blockchain TM research. When considering the factors that may affect the market's reaction to blockchain announcements, previous studies only discuss whether the content of a blockchain announcement is speculative from a financial perspective (Cheng et al., 2019; Cahill et al., 2020), and do not consider factors that affect technology adoption. Although Klöckner et al. (2021) consider the value of substantiated blockchain initiatives from an IT business value perspective, they do not discuss potential influencing factors based on RBT. However, technology adoption is affected by many factors such as company characteristics and strategic resources (Johnson, et al., 2007). Therefore, based on the RBT, we consider the moderating effects of five factors on market reactions to blockchain announcements from the aspects of tangible resources, intangible resources, and the ability to use resources (Barney, 1991; Barney, 2001). Our findings suggest that the positive impact of blockchain announcements on stock prices is affected by multiple resources and capabilities, including technological innovation and strategic plan. Our research improves the current

understanding of influencing mechanisms of blockchain announcements on the stock price of the announcing firm. With this research, scholars can build a more complete research framework in blockchain TM field.

Third, we discuss the impact of firm characteristics on the market reaction to blockchain announcements. However, it is surprising that firm characteristics such as firm size and firm innovation abilities do not affect the stock returns of Chinese firms that issued the blockchain announcements. This is inconsistent with the findings of previous studies on developed stock markets (Cheng et al., 2019; Cahill et al., 2020; Klöckner et al., 2021), which verifies the important impact of market environments on the market performance associated with blockchain announcements and suggests the need for research using Chinese data. We also provide a research direction for comparative analysis on market reactions to blockchain announcements in different stock markets.

6.2.2 Practical Implications

At the practical level, we provide the following suggestions for companies' blockchain-related business decisions.

First, we investigate the impact of pure blockchain announcements on the stock value of listed companies in the unique context of China and find that blockchain announcements elicit a positive market reaction towards the announcing firm, and give a reference value (1.324%, using the four-factor model) for the subsequent stock price increase. This value is much higher than what Klöckner et al. (2021) obtained using data from developed stock markets (0.30%, using the four-factor model). Therefore, our findings can help managers understand the value of implementing blockchain activities in different market contexts.

Second, we study the factors influencing the market reactions to blockchain announcements, which can reflect investors' focus on blockchain content, thus providing guidance for enterprises in terms of decisions about blockchain adoption. On the one hand, blockchain announcements that involve technological innovation are associated with a greater stock price increase. Therefore, when a firm's R&D investment funds are limited, managers can focus on and invest in the R&D and innovation activities of blockchain technology. This not only helps to give full play to the technological advantages of blockchain for enterprise operations management, but also enables firms to maximize their market value in the process

of technological development. On the other hand, the stock market is selective in reacting to blockchain announcements. Strategic-level announcements are associated with a more positive effect on the related firm's stock price than operational-level announcements. Therefore, managers should upgrade their blockchain activities to a strategic level to express their emphasis on and continuous support for blockchain technology, thereby enhancing investment confidence of the investors. In addition, we have noticed that the cooperation factor does not significantly affect the market performance of firms after issuing blockchain announcements. Therefore, in the process of carrying out blockchain activities, managers can choose whether to cooperate with other firms or not according to their own needs, without too much consideration of the views of investors in the stock market.

Third, discussing the impact of enterprise characteristics on market reactions helps managers understand the type of companies that should actively carry out blockchain business. However, we are surprised to find that in the Chinese stock market, firm characteristics such as firm size and firm innovation abilities do not affect the stock market reaction associated with firm's blockchain announcements. In other words, enterprise characteristics seem to be irrelevant factors for the effects of blockchain technology adoption. It is the content characteristics of blockchain activities that determine its influence on firm's stock value. Therefore, in the Chinese market, regardless of the firm size and innovativeness, it is a good choice for firms to actively and deeply carry out blockchain innovation activities, so as to enhance their market value in the short term.

6.3 Limitations and Future Research

Our study has some deficiencies that necessitate further research in the future. First, our sample size is relatively small. Future researchers could increase the sample size to conduct further research. Second, blockchains can be divided into public and private blockchains (Chod et al., 2020). However, in our sample, there are quite few announcements differentiating the types of blockchain, which is not sufficient for statistical tests. Future research can study how differences in blockchain types affect the stock price of the announcing firm with more available data or using an alternative method (e.g., survey). Third, due to data access issues, our sample only includes companies in Chinese A-share market and does not incorporate representative Chinese companies listed on the U.S. stock markets. The sample range could be

expanded to a global scale for in-depth research or comparative research in the future. Fourth, we only evaluate the short-term performance of enterprises after the blockchain announcement; the long-term performance of blockchain announcements can be studied in future research.

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