

Strategic alliances and firm value creation in China

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Abstract

This study investigates the impact of 306 strategic alliances on the increment of firm value in the case of China. I apply the event study methodology using OLS market model to examine the abnormal returns of sample firms. The results show that the announcements of strategic alliance in China generate significant positive average abnormal return on the announcement date (0.96%) which reaches 1% significance level, suggesting a sizable increment in firm value by the formation of strategic alliance.

The findings referring to alliance-specific characteristics are as follows: The abnormal return for firms entering policy alliance with local governments is significantly higher than the average level of abnormal return of total alliances (1.60% for policy alliances compared with 0.96% for the overall alliances on the announcement date). More specifically, the higher one government is indexed in Chinese administrative ranking, the higher abnormal return its partnering firm can achieve. As for financing alliance, the results provide evidence that the abnormal return of private firms (1.02%) is much greater than the abnormal return of state-owned enterprises (0.25%). Furthermore, there are no significant differences for abnormal returns between domestic alliances and international alliances.

On considering the impact of firm-specific characteristics, the results indicate that the firm value increment by strategic alliance announcements has an inverse relationship with firm size but does not show any correlation with firm's growth opportunity. Contrast to the cases of firms in developed countries, the strategic alliances to low-tech companies contribute to increasing firm value more than the alliances to high-tech do (0.74% compared to 1.11% on the announcement date) in China. In addition, this study shows further evidence that for the firms involving alliances, the average abnormal return for private firms collaborating with state-owned partners reaches 1.15%, which is significantly positive at 1% level.

Keywords Strategic alliance, Abnormal return, Firm value, Chinese characteristics

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1. Introduction

Inter-firm alliances can bring independent firms together to share valuable resources in product design, technology development or marketing & distribution. Forming such alliances enables the enterprise to concentrate on its core competence while obtaining other skills or capabilities it lacks from market (Chan *et al.* 1997). In order to take advantage of potential growing opportunities, modern corporations undertake various actions, including growing internally, issuing licenses, forming strategic alliances, setting up new joint ventures, or acquiring minority interest from other firms. Compared with Mergers and Acquisitions or formations of joint venture, strategic alliance is a relatively flexible and easy operated approach for inter-firm collaboration to seize the growth opportunity (Marciukaiyte *et al.* 2009). Therefore, forging strategic alliances have been employed by more and more corporations in recent years.

The concept of strategic alliance has been defined by many scholars in their studies. Brooke and Oliver (2005) suggest that the alliance is an agreement between parties formed to advance common interests or causes in an attempt to achieve a particular aim. From the perspective of the organizational nature, Gulati *et al.* (1998) define strategic alliance as a voluntary arrangement between firms involving exchange, sharing, or co-development of products, technologies, or services. Of all the definitions for strategic alliance, the one argued by Chiou and White (2005) is most widely cited. They state that:

‘Strategic alliances are inter-corporate, cooperative agreements that lie in a continuum, with informal cooperative agreements (e.g., an implicit, non-contractual agreement between a bank and an insurance company that they will refer customers to each other) at one end of the spectrum, and mergers and acquisitions at the other end of the spectrum, and many different forms between the two extremes.’

There are many ways to categorize different types of strategic alliances. Contractor and Lorange (2002) divide the alliances into five types; technology transfer and improvement, licensing, franchising, joint research and development, joint ventures and marketing agreements. Chan *et al.* (1997) classify strategic alliances by their tactical purposes (e.g. licensing, marketing or distribution, development or research, technology transfer or system integration, combination of previous types

and not specified). According to the intent of the alliance, Lee *et al.* (2013) categorize the strategic alliances into resource alliance, technology alliance and marketing alliance. Based on these alliance classifications and Chinese circumstances, I categorize strategic alliances in the case of Chinese firms into six types such as marketing alliance, technology alliance, technology and marketing alliance, policy alliance and financing alliance.

The objective of this study is to investigate the circumstances whether strategic alliances in China create value for shareholders of partnering listed firms. More particularly, I examine the importance of different factors associated with the characteristics of various types of firms and strategic alliances in determining the value creation across different partitioned alliance groups.

1.1. Motivation for the research

Given the increasing popularity trend of such inter-firm alliance phenomenon, there is an extensive literature dealing with the collaboration among enterprises. However, as the relevant alliance data is much easier to be acquired for equity-related collaboration, such as Mergers and Acquisitions (Campa and Hernando, 2004; Martynova and Renneboog, 2008) and Joint Ventures (Koh and Venkatraman, 1991; Merchant and Schendel, 2000; Meschi and Cheng, 2002 and Gulati *et al.*, 2009), there is only a handful of studies dealing with the impact of strategic alliance announcement and firm value. Several scholars provide empirical evidence of the outcomes of strategic alliance focusing on the US market (Gleason *et al.*, 2003, 2006; and Marciukaityte *et al.*, 2009); Chiou and White (2005) study the evidence of Japanese financial firms; Bruce (2005) analyses the stock reaction using alliance announcement sample from UK; Followed by Lee *et al.* (2013), who use the data with Korea firms to unveil the firm value impact on strategic alliance announcement in developing countries. As far as I aware, there are no studies assessing firm value change for alliance announcement based on the Chinese stock market, possibly because of the unavailability of sufficient data. Given that, it would be very interesting to investigate the influence of strategic alliances on the increase of firm value in China, the largest developing economic entity over the world. As a country still at the initial stage of economic transition, the Chinese capital market is expected to present some unique characteristics different with those showed in mature markets in developed countries. Owing to the uniqueness of strategic alliances between Chinese firms, it would be valuable to explore which factors were more advantageous for firm value increment.

1.2. Contribution of the study

Most of existing literature dealing with inter-firm collaboration concentrates on equity alliances (e.g. formation of joint ventures and mergers & acquisitions). There are only limited studies related to non-equity strategic alliances, most of which examine the announcement effects in the US stock market (Chan *et al.* 1997; Das *et al.* 1998). As far as I am aware, there is only one paper discussing the alliance announcements and their effects on firm value increase in developing country: Lee *et al.* (2003) study the effect of strategic alliance announcements based on the case of Korean firms. To bridge the gap of existing studies, this research is the first one to investigate whether declaring strategic alliances affect the firm value increment in China, the leading developing country of the world, in terms of the unique manual collected announcement sample of strategic alliance formation.

Another significant contribution of this study is to set up & test a series of new hypotheses according to the unique characteristics showed in the Chinese capital market. By adding new classification for strategic alliances tailoring Chinese circumstance, it can be known which types of strategic alliances or factors are particularly advantageous in generating firm value in China. Compared with previous studies, this paper offers a novel perspective on considering the announcement impact of Chinese characteristics on firm value change. I conduct a three-dimension nexus to show the relationship of three most relevant Chinese characteristics (policy influence, private firm status and financing constraint) in analysing the influence of firm value increase. First, I take policy alliance, a unique alliance type in China referring to the collaboration between a listed firm and local government, into consideration. I find evidence that the abnormal returns for firms entering strategic alliances attributable to policy incentives are highest (1.60% at the announced date, compared to 0.96% which is the average level of total sample), implying a specific strong connection between the firm performance and political intervention. Second, due to the difficulty for Chinese private firms in acquiring loans from commercial banks, I conduct a unique comparable analysis for financing alliances to assess the firm performance between domestic enterprises and state-owned ones. Third, owing to the weak position of Chinese private firms in competing with state-owned enterprises, I propose a novel hypothesis from the perspective of ownership structure that the abnormal returns to private firms collaborating with state-owned firms are expected to be much higher than the rest.

1.3. Research scope and methodology

This study mainly focuses on non-equity strategic alliance in the Chinese stock market. When collecting data, I used the announcement notices from Shanghai Stock Exchange and Shenzhen Stock Exchange, the only two stock exchanges in mainland China. As there are few alliance announcements disclosed to public before 2006 (less than ten announcements declared per year), the announcement sample in my study covers a time period from January 1st 2007 to December 31st 2012. By screening all the strategic alliance announcements from the official websites of the two stock exchanges, I finally obtain 306 effective announcement samples related to my research interests. The methodology of event study introduced by MacKinlay (1997) is employed to acquire abnormal returns for individual listed firms. Based on the OLS market model commonly used in existing finance literature (Brown and Warner, 1985), I can obtain the average abnormal returns and cumulative abnormal returns for sample firms during the event window period. In addition, I conduct a cross-sectional analysis to identify the factors that affect the firm value increase by declaring the strategic announcements.

1.4. Main findings

I find that there exists a positive relationship between the announcements for strategic alliance and the firm value performances. Such finding is in line with many studies (Chan *et al.*, 1997; Das *et al.*, 1998; Neill *et al.*, 2001; Chiou and White, 2005; Swaminathan and Moorman, 2009; Ho *et al.*, 2010; Lee *et al.*, 2013), which indicate that announcements for strategic alliance in the US, Japanese and Korean firms generate significant positive abnormal returns at the announcement dates. Also, the research shows that the average abnormal returns for the firms at two days before declaring the alliances are 0.18% and 0.21% respectively, indicating that there is some inside information leaked to public before the announced dates. This is consistent with that of Neill *et al.*, (2001) and Lee *et al.*, (2013).

On considering the impact of alliance-specific characteristics on the effects of the alliances disclosure in the Chinese capital market, my findings strongly support that among all types of strategic alliances, alliances with local governments for political reasons yield the highest significant positive value, 1.60% at the announced date, for the partnering firms. Furthermore, different administrative rankings of partnering governments can affect the firm value increment as well. The higher one government is indexed in Chinese administrative ranking, the higher abnormal return its partnering firm can achieve: 3.00%, 1.90% and 1.25% for the governments in provincial

level, city level and county level, respectively. Within the subgroup of financing alliance, private firms receive larger abnormal returns than state-owned ones (1.02% compared to 0.25% on the announced day), suggesting their poor situation in acquiring loans from commercial banks. This result is consistent with that of Chiou and White (2005) that there exists little difference between the average abnormal return of domestic alliances, 0.89%, and international ones, 0.74%.

The study also contains some interesting findings associated with firm-specific strategic alliances. From the ownership-holding perspective, the average abnormal return for private firms with state-owned partnering firms is significantly positive, reaching 1.15% at 1% significance level, implying such alliances with state-owned enterprises are very important to private firms to change their weak competitive position. However, contrary to the conclusions by Chan *et al.* (1997), the abnormal return of Chinese high-tech companies (0.74%) is lower than the abnormal return of low-tech ones (1.11%). In addition, the study also indicates that firm size is significantly inversely correlated with the abnormal returns on the announced date, with negative coefficient (-2.50) at 5% level. This result is in line with previous studies by Das *et al.* (1998), Chan *et al.* (1997), Chiou and White (2005) and Lee *et al.* (2013). But this study does not show any significant relationship between growth opportunity and firm value increment.

1.5. Study limitations

Although this study unveils the relationship between the strategic alliance announcement and the value creation of Chinese listed firms as well as some important factors affecting wealth effect, there still exist several limitations. First, since there are less than ten strategic alliance activities yearly announced before 2007, sample span for sample announcement is limited to latest 6 years, from 2007 to 2012, which is relatively short compared with the time span used in most of previous studies. Second, some types of non-equity strategic alliance announcements are not considered in the study. For instance, I do not take the alliances with more than two partners involved into account. This can simplify the calculations for the subsequent data analysis, but will squeeze the sample size as well. Third, since some of Chinese strategic alliance announcements contain both technology and marketing clauses, it is difficult to simply categorize them into ‘technology alliance’ or ‘marketing alliance’. So in this study, I do not conduct a comparative research to examine the firm performances between marketing alliances and technology alliances, which is usually discussed in other scholars’ studies (Chan *et al.*, 1997; Lee *et al.*, 2013).

1.6. Structure of the study

The rest of the study is organized as follows. The next chapter provides a look at the theoretical background about the value creation and its contribution to the abnormal returns of individual firms. A description about Chinese characteristics and the empirical findings is also introduced in this chapter. Chapter four presents my hypotheses which are partitioned into three groups: main hypotheses, alliance-specific hypotheses and firm-specific hypotheses. Announcement sample for strategic alliance, data and methodology is described in chapter five. Findings are presented in the sixth chapter and chapter seven concludes.

2. Literature Review

This chapter presents a look at the fundamental literature related to my research problems. First, the theoretical background about why the abnormal returns can be expected from announcing strategic alliances is described in section 2.1. A series of studies provided in section 2.2 summarises some unique Chinese factors that might influence the wealth effect for strategic alliance announcements. Finally, an empirical research discussing the relationship between the abnormal return and firm value creation is present in section 2.3.

2.1. Theoretical background

Why strategic alliance can add firm value? A lot of studies provide explanations on a theoretical basis. Generally speaking, these studies can be categorized from two perspectives: one is that forming strategic alliances can significantly reduce relative costs for partnering firms. Another one is from a resource-based perspective, suggesting that the rationale for the firm value increase by a strategic alliance is the potential synergy for the resources pooling by two alliance partners.

2.1.1. Theory related to resource-sharing

There is one obvious benefit for forging strategic alliance that widely recognized by previous studies: a firm entering strategic alliance can obtain access to strategic capabilities it desires by connecting to its alliance partner with such capabilities (mostly refer to the scarce resources or competitive skills) or pooling its existing resources with the partner owning similar one (Nohira and Garcia-Pont, 2003). Such strategic alliance can create firms' synergies by pooling valuable resources and also, enhance their competitive advantages.

1) Knowledge sharing and integration

The resources pooling by two strategic alliance partners can be various, most of which cannot be measured by economical method, especially for resources gathering related to market information sharing or political connection development. Such resources may create even greater firm value via knowledge sharing. According to theory called optimal knowledge application proposed by Jensen and Meckling (1991), forming a strategic alliance is a more cost-effective way than mergers and acquisitions in knowledge sharing. Grant and Baden-Fuller (2004) also propose a knowledge accessing theory indicating that strategic alliances enhance the efficiency for knowledge application.

However, sometimes cost for knowledge transfer might be very high, especially when the mutual-development for new product or innovative technology are involved in alliance projects, since such strategic alliances always require specific know-how or involve information that is completely sensitive. Consequently, these types of strategic alliances are expected to provide greater value increment for the partners involved in the alliance than those who do not contain the specific know-how or sensitive important information (Chan *et al.* 1997).

From the perspective of knowledge-based theory, Chen and Chen (2003) propose a ‘learning effect’ argument as one of the reasons for firms to build alliance relationships. Some resources pooled by inter-firm collaboration can be readily employed without extra learning process (e.g. marketing information or outsourcing distributions). However, some other resources, especially technology-related ones, still need extensive learning before using them. Take the knowledge transfer for technology as an example. Under technology strategic alliance, some technologies are readily applicable via licensing or outsourcing after reaching the alliance agreement by partnering firms. But others might be useless unless partnering firms take extra effort to learn through their own research. Therefore, learning effect is very important for cooperative partners in the strategic alliance.

2) Resource dependence

According to resource-based theory, an important incentive for partnering firms entering strategic alliances is to seek valuable resources they lack (Pfeffer and Salancik 1978). Although such collaborations are mutually dependent by firm partners, there exist asymmetries between the two parties: one firm might be more dependent on a certain strategic alliance than the other. For instance, small start-up companies might be sought out as strategic alliance partners due to their access to specific technology know-how and strong research capabilities. Many scholars (e.g. Das *et al.*, 1998; Lee *et al.* 2013) find evidence that small size companies have more bargaining power in strategic alliance activities than big ones, since larger companies like to find small companies as the cooperative partner for their specific technological know-how.

Another typical example for resource dependence theory is private firms aligning with state-owned firms in the Chinese capital market. Private enterprises are always more dependent on the alliance with state-owned enterprises because of their governmental background and preferential right for financing from state-owned commercial banks (Lee *et al.* 2013).

2.1.2. Costs in strategic alliances

Apart from the resource-based theoretical framework, the benefits associated with cost reduction for the firms entering strategic alliances are also widely assessed by many studies. Of all costs related to strategic alliance activities, transaction cost, agency cost and cost of opportunistic behaviour are discussed most often by previous literature.

1) Transaction cost

Transaction cost theory, an economic approach to organizational entity, aims to uncover the rationale why structures of institutions are more efficient to govern the economic activities than markets do. Some literature (Pisano, 1990; Chen and Chen, 2003) emphasizes the importance of the structural elements within the strategic alliance (e.g. market imperfection and the control mechanism). Market imperfection indicates that acquiring desired resources from the market might be inefficient compared with resource-sharing alliance among partners, while control mechanism implies an alternative way to allocate resources within the cooperative firms entering an alliance. In principle, market is more efficient governance scheme for resource allocation than that for hierarchy institutional structure of individual firms. However, under some special circumstances, forging a strategic alliance, a hybrid approach compromising of both market and internal structure within the firm, occurs as an efficient way to acquire resources.

One alliance closely associated with transaction cost theory is the strategic alliance activity to partnering firms from high-tech industry. Inter-firm alliances with high-tech firms are likely to have relatively high technology uncertainty (refers to a high probability of unexpected technological changes), which elevates the transaction costs via excessive supervising, monitoring and regulating by market mechanisms (Chen and Chen, 2003). Chan *et al.* (1997) also suggest that a particularly high transfer cost for the strategic alliances with high-tech development or other innovative endeavours requiring explicit knowledge-intensive know-how. In technological alliance activities, partnering firms are more concerned about the control of their propriety for knowledge or skills. Consequently, instead of purchasing technology from market, partnering firms are more likely to choose hierarchical forms of governance (Williamson, 1985; Walker and Weber, 1984).

2) Agency cost

Strategic alliances can add value to a firm by improving its organizational flexibility. Such flexibility can help the partnering firms deal with the changing demand from the marketplace more effectively (Chan *et al.* 1997). Since forging strategic alliance do not create a new integrated organizational entity, forming strategic alliance can dramatically minimize the agency costs for partnering firms. Under the inter-firm collaboration, there always exists an agency cost that the management for the partnering firms are reluctant to release their resources control, but the strategic alliance can avoid such costs (Chan *et al.* 1997). Jensen (1986a, b) also suggests that in joint venture enterprises or an integrated firms, all of profits generated from cooperative activities are directly associated with the firms involved in the collaboration and do not sink under the management's discretionary control. So such agency problem is not likely to arise between the firms under a strategic alliance.

3) Costs for opportunistic behaviour

In addition to transaction cost or agency cost, there are some additional costs related to opportunistic behaviour in network organizations (Klein *et al.*, 1978; Kranton, 1996). Inherently speaking, strategic alliance is an incomplete agreement as the alliance partners can never foresee the possible prospects of their collaboration when two partnering firms reach the agreement. This flexibility in the cooperative activity might cause some problems related to property rights or future profit allocation that are not well defined, hence opportunistic behaviour rises in such case (Das *et al.*, 1998). Such costs are inevitable when the alliance partnering firms search reliable cooperative firms, design collaboration contracts as well as extra boning clauses, and monitor the behaviour of partner firms (Chan *et al.* 1997).

Several studies discuss the mechanism to deter partnering firms' opportunistic behaviour to inter-firm alliance. Parkhe (1993) suggests that one possible way to minimize the negative effect is via a commitment of non-recoverable assets (e.g. advanced technology, specific physical assets which have limited use outside the cooperative activity). Such commitment for non-recoverable assets serves as a pledge against defection for partnering firms, which could effectively reduce the costs generated by opportunistic behaviour. He also comes up with a hypothesis that the probability of opportunistic behaviour can be reduced if the partnering firms saw the potential of their cooperative activity beyond the scope of current agreement they reach. However, such hypothesis, as he notes, is very difficult to test in reality.

2.2. Chinese characteristics

China is one of the fastest growing economic entities around the world, but neither its legal system nor the financial mechanism is maturely developed. Although Chinese private sector has tremendously developed since 1978, when the national people's congress firstly recognised the legal status of private property¹, it still suffers from both political and economic discrimination (Young 1995). From this perspective, there are several studies concentrating on the performance of Chinese private firms by building a Law (policy) – finance – growth nexus. Li *et al.* (2008) study the operation of private firms and its affiliation with policy connection (mainly refers to the Communist Party of China). They find that enterprises with identity of Party membership are much easier to obtain loans from state-owned commercial banks and perform more confidently within the Chinese legal system. Also, they show further evidence that party membership of the enterprise has a closer relationship with firm performance in regions with weaker legal protection. Allen *et al.* (2005) divide the Chinese enterprises into three sectors (state sector, listed sector and private sector). They suggest that diversified financing distributions and governance mechanisms are the principal internal motivations for the value growth of private sector.

Built on previous studies, I propose a policy – finance – private firm nexus to analyse how such three factors influence the enterprises' performance. These three factors are also expected to play an important role on firm value creation by the strategic alliance announcements. Further detailed analyses are provided in the subsequent chapters.

¹ In 1978, National People's Congress approved a constitutional amendment to protect private property rights, marking the first time in PRC history that the legal status of private property was officially endorsed by the Party (Li *et al.*, 2008).

Figure 1: Nexus for Chinese Characteristics

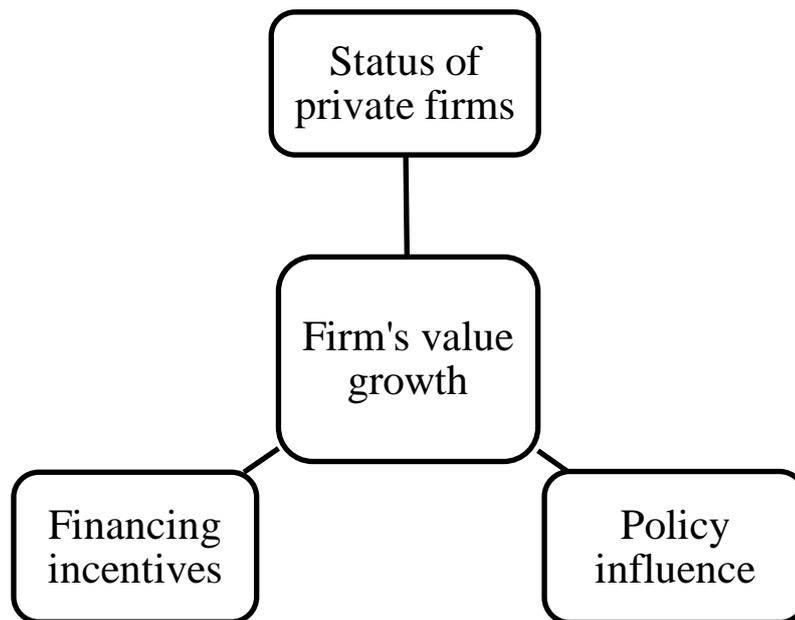


Figure 1 provides a three-dimension nexus for the three most representative characteristics related to the impact of strategic alliance announcement on firm value growth in China.

2.2.1. Importance of political connections in China

It is acknowledged by more and more scholars that political connections can bring value to enterprises. By analysing firms' performance in Indonesia, Fisman (2001) concludes that a large proportion of the value of well-connected Indonesian firms is derived from political connections. Faccio (2006) provides a comprehensive glimpse at political connection of enterprises over the world. In the study, he sets a new way to define firms' political connection: whether one of the firm's large shareholders or top manager is minister, parliament member or has a close relationship with party or top politician. He finds that political connections are more common in the countries with high level of corruption, with severe restriction upon foreign investments and with high transparency.

There has also been a growing amount of economic literature aiming at uncovering the relationship between the political connection and firm value. Agrawal and Knoeber (2001) indicate that building political connection may secure the firm with favourable policy conditions. Fan *et al.* (2007) study the CEOs' political background and suggest that firms led by CEO with political connection are more likely to accept other bureaucrats involved in the decision-making of firm's operation. Khwaja and Mian (2005) find such connection grants firm the valuable resources, especially for the loans

from commercial banks. As for China, the largest transition economic entity, it is even more important for the enterprises to seek policy support from local governments since they control most of fundamental resources Li *et al.* (2008), such as land and taxation, which are indispensable for their business expansions.

According to the circumstance of the Chinese capital market, there is also a specific strategic alliance type that is commonly seen among listed companies in China – building a strategic alliance relationship with local government. On one hand, in order to penetrate into an unfamiliar market, the firms need support from local governments. On the other hand, local governments are very welcome to introduce new enterprises into their administrative region in order to boost the local economic growth. Up till now, the scale of local GDP is still regarded as one of the most important criteria to measure the performance of governments.

2.2.2. Credit constraint and financing distribution

Traditionally regarded as the substitute for state-owned enterprises, Chinese commercial banks have played an increasing important role on financing support for both state-owned enterprises and private enterprises, especially after the Chinese economic transition from the socialist planned economy. Allen *et al.* (2005) suggest that the two most crucial financing sources for Chinese enterprises are bank loans and self-fundraising, and the loans provided by commercial banks account for a sizable fraction of enterprises' financing needs. By studying the constraint factors for the enterprise's development, Stein (2003) finds evidence that financial constraints are a significant obstacle for the firm growth. This situation is especially prevalent in China, in which the firms treat the access to financial markets as a key determinant for the enterprise's development (Héricourt and Ponect, 2009).

In current stage, there still exists significant market imperfection in China. According to Chinese regulation, the largest commercial banks, most of which were predominantly state-owned banks, were not allowed to lend money to private firms for a long time. Before 1998, the four largest state-owned commercial banks (Bank of China, Agriculture Bank of China, China Construction Bank and Industrial and Commercial Bank of China) were only permitted to provide loans to the enterprises which are state-owned (Héricourt and Ponect, 2009). Although such “political pecking order” policy has been cancelled since 1998, it is not easy for private firms to obtain funding from the banks compared with the enterprises owned by the state. Such credit discrimination for private firms causes many problems, such as impeding the firm growth or, even worse, delaying the whole

economic growth (Huang, 2003). Farrell and Lund (2006) provide evidence that, regardless of the fact that the private companies produce more than half of the total GDF of the country, they only obtain less than 30% of loans from society. What is worse, it is very difficult for them to acquire financial support from the Chinese corporate bond market as well. Using a three-year data based on city-level, Wei and Wang (1997) find relatively clear evidence that China's bank loans favour state-owned industrial enterprises more than private ones. They come up with further suggestions that reform for the banking loan sector, especially for its lending policy, should be employed as early as possible.

2.2.3. Current status for Chinese private firms

Nowadays, Chinese economic growth is mainly led by state-owned enterprises. They have stronger financial support and wider political connections than private firms do. In spite of the rapid development of private firms since 1978, the year that legal status of private property was recognised by the Communist Party, the political and economic discrimination for the private enterprises still exist to some extent (Li *et al.*, 2008). According to some ideological reasons, private corporations were still treated as an inferior form of ownership (compared with ownership of state-owned corporations) even till 1990s, not to mention a serious of movements against 'inappropriate' ownership of private firms in 1980s (Li *et al.*, 2008). Also, as the government still controls most of fundamental resources (e.g. land, capital, taxation) that dominate the firm growth, private firms are always in a relatively weak position when competing with state-owned firms which always have more diversified distributions for acquiring resources they lack. Because of this, Héricourt and Poncet (2009) suggest that developing cross-border relationship with enterprises abroad might be a viable approach to overcome legal and financial obstacles they have in local regions.

2.3. Empirical Studies of strategic alliances

A substantial amount of empirical research focuses on analysing the announcement impact upon equity-related announcements, most of which are joint venture formation based on US market. After analysing the firms in US, McConnell and Nantell (1985) find evidence that equity-alliance announcements of the US firms generate significant positive abnormal return on the announcement day. Followed by their study, Koh and Venkatraman (1991) test stock performance by the influence upon the joint venture announcements based on a particular industry (information technology sector). Their finding is consistent with that by McConnell and Nantell (1985), suggesting that the

announcement of joint venture collaboration contributes to a significant increase of the firm value. Based on that, they further categorize the joint venture sample into two groups: one for the partners in the same industry and one in different. They find evidence that horizontal joint ventures (alliance partners in the same industry) have more wealth effect than none-horizontal joint ventures (alliance partners in different industries). By contrast, Mohanram and Nanda (1998) show evidence that alliance partners in the same industry have a negative impact upon the firm value. In sum, most scholars find a positive market reaction by declaring the joint venture formation. However, there are also few cases showing the opposite. For instance, both Lee *et al.* (2013) and Wyatt (1990) and Chung *et al.* (1993) find evidences that the formation of joint ventures negatively affect the value creation of US corporations.

As for the announcement impact of non-equity strategic alliance upon the firm value, two groups of scholars in particular, Chan *et al.* (1997) and Das *et al.* (1998) conduct representative analyses based on the US market. They suggest that, similar with the case of joint venture formations, non-equity strategic alliances significantly increase the firm value on the announcement date as well. In addition, consistent with the findings by McConnell and Nantell (1985) dealing with the joint venture case, the abnormal return yielded by horizontal strategic alliances (firms in the same industry) is much higher than the abnormal return by non-horizontal strategic alliances. Also, Chan *et al.* (1997) further unveil the intrinsic incentives behind the larger value creation from horizontal alliances, suggesting that the huge value increase is tightly associated with either pooling latest skills or technology or strengthening the market position of the firm. In a similar vein, the study of Das *et al.* (1998) also suggest that technology resources are much more important than marketing ones for the same industry. In addition, probably due to the stronger bargaining power small firms have in strategic alliance activities, the abnormal returns of them are much higher than the abnormal returns of larger enterprises.

Very recently, more and more scholars draw their academic attention to the wealth effect of strategic alliance announcements, although most of them still focus on the firms in the US capital market. By analysing the value increment effect of 89 non-equity strategic alliances from the information and technology sector in the US, Neill *et al.* (2001) argue that the alliance announcements yield a positive abnormal returns for firm partners on the announcement date. They also show evidence that there exists the announcements information leakage for a certain period before the announced date. From the perspective of characteristics of strategic alliances, Swaminathan and Moorman (2009) and Ho *et al.* (2010) only focus on the firms declaring

marketing alliances in the US market and find a positive correlation between firm value and alliance announcement.

There are also some scholars who show particular interests in analysing the alliance announcements impact upon the firm performances in the financial services industry. By analysing the announcements sample for financial institutions in Japan, Chiou and White (2005) suggest that the strategic alliance announcements contribute to a positive increase for the firm value in Japanese financial services industry. Gleason *et al.* (2003) analyse the market performances of US financial services firms by dividing them into different industry subgroups (banking, investment services and insurance) and into separate holding periods (6, 12 and 18 months after the announcement). They find that firms participating in strategic alliance enjoy positive significant abnormal returns due to the alliance announcements. Marciukaityte *et al.* (2009) find similar evidence that the market reacts positively to the strategic alliance announcements. More interestingly, they also suggest that the market has a more favourable reaction to the announcements by the financial services firms that are finally acquired by their alliance partners afterwards. Amici *et al.* (2012) specifically focus on the market impact of banking firms in Europe and the US on both strategic alliance and joint venture. In addition to the result of a positive correlation between the announcements and firm value, they also suggest that joint ventures generate more value when there are non-banking financial partners involved in the case.

As for the strategic alliance in developing countries, only one article refers to the case. Lee *et al.* (2013) examine the impact of strategic alliance upon the value increase of firms based on the case of Korea. In consistent with the situation in developed countries, strategic announcements of Korean firms yield significant positive abnormal returns on the announcement day. Also, by considering the partner firms' location and alliances' characteristics, they further show evidence that the marketing alliances with firms particularly from the most advanced G7 countries contribute to a significantly larger increase of firm value.

3. Hypotheses

The hypotheses presented in this chapter are mainly derived from literatures reviewed in Chapter 2. The hypotheses are divided into main hypotheses and characteristic hypotheses. Main hypotheses aim to unveil the announcement impact on the value creation for the listed firms in China. After that, I further categorize the characteristic hypotheses into two subgroups: one refers to hypotheses related to alliance-specific characteristics in order to test which alliance factors have significant impact on firm value increase; another one is for firm characteristics related hypotheses so that we can know how these characteristics are expected to affect the observed results.

3.1. The main hypotheses

From the perspective of corporate governance, the strategic alliance, a bilateral collaboration between the partner firms, is a win-win structurally arrangement that can significantly reduce the cost related to negotiating, coordinating, and supervising the inter-firm transactions. Kogut (1988) and Jarillo (1989) find evidence that instead of short-term cost-effective benefits, firms enter the strategic alliance mainly to seek long-term strategic advantages, which should be recognized by the efficient market. Consequently, there should be a positive market reaction to the strategic alliance announcements and positive abnormal returns around the announcement date (Das *et al.*, 1998).

Although the empirical evidences concerning the value effect of the strategic alliance announcements are varied in different regions, most literature proves a positive correlation between the announcement of a strategic alliance and firm value. Some studies (Neill *et al.*, 2001; Lee *et al.*, 2013) find further evidence that some information about the strategic alliance leaks to public before the announcement date (usually one or two days before). In terms of this, I propose the main research hypotheses as follows:

Hypothesis 1a: For firms entering strategic alliances, abnormal returns attributable to alliance announcements on the announcement date are significantly positive.

Hypothesis 1b: For firms entering strategic alliances, the cumulative abnormal returns attributable to alliance announcements on the announcement date and one day before are higher than the abnormal returns on the announcement date.

3.2. Alliance-specific hypotheses

The above hypotheses aim to test the overall value effect for the strategic alliance announcements. However, according to previous studies as well as the unique economic and political environment in China, some certain types of strategic alliance announcements are expected to have the most important impact upon the value creation for the listed firms. Here I propose three relevant hypotheses to test the wealth effects by certain types of strategic alliance.

3.2.1. Hypothesis for policy strategic alliance

Li *et al.* (2008) emphasise the importance to develop the political relationship for firm's business development, especially in the countries like China, of which the legal environment has not been well-cultivated to guarantee the fair competition. Using identity of party membership in the corporations to measure the political connections, they find evidence that governmental support can help firms obtain resources and behave confidently. Consequently, for enterprises reaching strategic alliance agreement with government, the value increase is expected to be significantly positive. Also, the administrative rankings of different governments and the incentives for firms to build such political alliances might have an impact on firm value creation as well. Therefore, I come up with the first alliance-specific hypotheses:

Hypothesis 2a: Abnormal return attributable to strategic alliance announcements with local governments are greater than abnormal returns attributable to other alliances.

Hypothesis 2b: The higher one government is indexed in Chinese administrative ranking, the higher abnormal return its partnering firm can achieve

Hypothesis 2c: For firms entering policy strategic alliances, the abnormal returns to industry related firms are higher than abnormal returns to non-industry related ones

3.2.2. Hypothesis for financing strategic alliance

Ruan and Xiang (2013) study the determinants for banking loan built on the evidence from Chinese listed firms from 1996 to 2009. Since the regulation preventing Chinese state-owned commercial banks from lending to private companies was abandoned in 1998, the competition has raised between state-owned and private companies in acquiring banking loans. The empirical result shows that state-owned companies and private companies have different channels to obtain loans. State-controlled firms can easily acquire loans from state-owned policy banks and commercial banks, while private firms mainly depend on the financing support from foreign banks. According to this, it is reasonable to assume positive abnormal returns for listed firms declaring strategic alliances with banks for financing reasons.

The Chinese financial system is severely distorted by governmental regulation for a long time (Allen *et al.*, 2005; Li *et al.*, 2008). Despite many healthy privately-controlled firms can operate much more efficient than state-owned ones do, it is very difficult for private corporations to get access to external financing support (Héricourt and Poncet, 2009). Based on this, I expect that when private firms choose to align with commercial banks, their market reactions will be more positive than those of firms controlled by the state.

Hypothesis 3a: For firms entering strategic alliances, abnormal returns attributable to financing alliances are greater than the abnormal returns attributable to other alliances.

Hypothesis 3b: For firms entering financing alliances, abnormal returns to private firms are greater than abnormal returns to state-owned firms.

3.2.3. Hypothesis for international strategic alliance

Following by previous studies (Chiou and White 2005, Amici *et al.*, 2012), it is also expected that the strategic alliances with foreign partners involved have a greater impact on the increment of firm value than those for domestic firms. Gleason *et al.* (2003) suggest that strategic alliance with foreign partners is always treated as a viable strategy for internationalization, especially when the firms do not have enough experience or resources to lead the growth. Apart from the resource incentives, other constraints, such as local regulation, need to be taken into account as well. As domestic financial constraint plays a very important role in restricting firms' development, promoting cross-border relationships with foreign firms can help domestic firms overcome both the financial and legal obstacles in investing abroad. As such, I formulate a hypothesis that is similar to the conclusion made by Amici *et al.* (2012) that international alliances outperform domestic ones, as the firms value the opportunity to new market penetration more.

Hypothesis 4: For firms entering strategic alliances, abnormal returns to the firms with foreign partners are greater than abnormal returns to the firms with domestic ones.

3.3. Firm-specific hypotheses

In addition to the alliance-specific hypotheses, some firm-level variables are also involved in the study. Such control variables include the firm size, investment opportunity, subgroup for private firm entering alliance, and the firm group in high-tech industry.

3.3.1. Hypothesis for high-tech enterprises

By observing the Chinese stock market for the latest tens of years, I find that the high-tech companies, most of which are knowledge-intensive corporations, have remarkable performances than those who are not. As forming strategic alliance activities is regarded as an effective mutual learning process, high-tech companies gain more knowledge resources than low-tech companies do (Morrey *et al.*, 1996). Also, in the high tech industry, most of the firms sign strategic alliance agreements regarding to product development and technology transfer. The study by Schakenraad

and Hagedoorn (1994) shows that firms entering technological and R&D alliances have much more profits than the firms entering the alliances in other fields. Furthermore, as the valuation of high-tech firms is very complicated and costly, the investors always pay more attention to the favourable disclosed information of listed firms, and the announcement of strategic alliance is one of the prominent examples. The high-tech companies should get higher abnormal returns than low-tech companies do. Therefore, I present the next hypothesis:

Hypothesis 5: For firms entering strategic alliances, abnormal returns to high-tech enterprises are greater than abnormal returns to low-tech enterprises.

3.3.2. Hypothesis related to private firm

Preceding chapter describes how Chinese private enterprises suffer from the unfair treatment politically and economically. In principle, many listed company groups are headed by holding companies which are usually controlled or majority-owned by state-controlled enterprises (named by governmental asset management company or investment company, etc.). Compared with private enterprises, state-owned enterprises always enjoy more preferential status both in acquiring banking loans and other possible policy conveniences.

The total company sample is divided into two subgroups, one for private enterprises aligning with state-owned enterprises, and the other for the rest. If a private firm signs a strategic alliance agreement with a state-owned partner, it will be interpreted by investors that the private firms cannot only obtain the technology or capital support from the state-owned enterprises, but also the invisible political connections behind them. So I present the sixth hypothesis:

Hypothesis 6: For firms entering strategic alliances, abnormal returns to private firms with state-owned cooperative partners are greater than the rest.

3.3.3. Hypothesis for firm size

Numerous studies show that the size of the listed firms is also an important factor to influence the abnormal return by declaring the alliance (Das *et al.*, 1998). Although the target sample group of previous studies is different from the sample used in my study (equity alliance rather than non-equity strategic alliance), this hypothesis might hold as well. As larger firms like to seek out smaller and innovative firms for their unique technological competences, the relative bargaining power of the small firm in a strategic alliance will be significantly higher than that of the large partner (McConnell and Nantell, 1985, Das *et al.*, 1998).

Teece (1992) believes that small companies have more flexibility. Compared with large bureaucratic corporations, small firms can acquire benefit much easier due to their high operative efficiency. Chan *et al.* (1997) also indicate that forming strategic alliances can increase firm value through enhanced organizational flexibility. These arguments, along with the opinions associated with resource dependence theory proposed by Pfeffer and Salancik (1978), indicate that larger firms might be more dependent on strategic alliances than the small. So for this hypothesis, I propose differential abnormal return expectations between the large and small partners entering strategic alliances:

Hypothesis 7: The size of firms entering strategic alliances is negatively correlated with abnormal returns attributable to alliance announcements.

3.3.4. Hypothesis related to investment opportunity

Brook and Oliver (2005) indicate that an enterprise with good investment opportunities is the enterprise with positive net present value (NPV) available. In order to measure the investment opportunity of sample firms, the financial ratio of stock price to book value (PTBV) of the firm is employed by previous literature (Brook and Oliver, 2005; Lee *et al.* 2013), suggesting a positive correlation between the ratio and firm value. Firms with high stock price to book value ratio are regarded as growth firms, which mean they have access to positive net present value (NPV) or good growth opportunities. However, by analysing the firm's performance in the US market, Das *et al.* (1998) suggest that there exists a negative relationship between the growth opportunity and the

value change. As for this study, the ratio of stock price to book value (PTBV) is conducted to measure whether the firms involved in strategic alliances have positive value changes.

Hypothesis 8: The growth opportunity of firms entering strategic alliances is positively correlated with abnormal returns attributable to alliance announcements.

4. Sample description

Sample description contains two parts: first I describe a general profile about the approach to obtain the target sample by a certain filter process. Then a comprehensive profile of the sample announcement is provided: I categorize the strategic announcements according to different years, different firm industries, and different alliance types.

4.1. Screening process for target sample

The data collection period can be divided into two phases. The first phase is to summarise an announcement list for strategic alliances. In order to get enough announcements in the Chinese stock market, I review all the announcements published both on the official website of Shanghai Stock Exchange and Shenzhen Stock Exchange, the only two stock exchanges in mainland China, and finally obtain 306 strategic announcements by listed firms from 2007 to 2012². Here is the specific approach that I used to acquire the sample announcements:

First, from the websites of Shanghai Stock Exchange and Shenzhen Stock Exchange, it is possible to find all the public announcements disclosed by listed companies. Then screening by the key words “strategic alliance” and ‘strategic cooperation’³, I can acquire all the related strategic alliance announcements during the sample period. After that, by using specific filtering process of the initial sample group, some announcements that are not directly related to my research interest are excluded. At last, a summary for a company list of all the announcements that I need is available. The filter criteria (the announcements that are not considered in this study) for the announcements are as follows:

- Equity strategic alliances, such as forming a joint venture, increasing capital and regrouping, for the target samples in this research are non-equity strategic alliance announcements
- The strategic alliance announcements that are not complying with the standardized format or structure of listed company announcements. E.g. missing important information about what kind of alliance it is or how they make the alliance

² Before 2007 there is only few strategic announcements published on the official website of Shanghai Stock Exchange and Shenzhen Stock Exchange, indicating that such type of collaboration was not widely recognised among listed companies in China.

³ As the announcements are all published in Chinese, the key words inputting the searching engine of the website also need to be Chinese. In Chinese, there is little difference between ‘Strategic Alliance’ and ‘Strategic Cooperation’.

- One strategic alliance announcement with more than two relevant parties. E.g. a listed firm reaches a strategic alliance announcement with two different companies, respectively
- One listed firm signing more than one strategic alliance announcements in one day just counted once
- The listed firms in strategic alliance announcements with missing necessary accounting data during the sample period
- The strategic alliance agreement is not the initial one. E.g. supplementary agreement for the strategic alliance announcement, progress announcement

Also, I put some special types of the announcements into the sample group:

- The participant parties in the strategic alliance include the parent or subsidiary of a listed firm. E.g. A announced that B, the subsidiary of A, signed a strategic alliance agreement with C
- Some announcements stated that the strategic alliance agreement has not officially signed yet, e.g. letter of intent for the strategic alliance, since such alliance intentions have similar market reactions as strategic alliances do

Figure 2: Steps for screening process



4.2. Sample categorization

Table 1: Strategic alliances by year

<i>Panel A: Strategic alliance announcements by year</i>		
Year of announcement	Number of announcements	Percentage of total
2007	12	3.92 %
2008	15	4.90 %
2009	42	13.73 %
2010	62	20.26 %
2011	65	21.24 %
2012	110	35.95 %
Total	306	100%

<i>Panel B: Some key indexes of sample firms</i>	
Mean ROE	0.141
Mean size (USD)	43552494
Mean P/B ratio	4.138
Mean listed time (year)	7.55

Table 1 describes the time distribution of 306 strategic alliances and some basic indexes of sample firms entering strategic alliance announcements.

Table 1 shows the total sample of strategic alliance announcement from Shanghai Stock Exchange and Shenzhen Stock Exchange from 2007 to 2012 and the selected indexes of the firms. More specifically, Panel A describes the total sample of strategic alliance announcements classified into years. From the panel we can clearly see a significant growing trend for the number of strategic alliance announcements by years (there are only 12 non-equity strategic alliances 6 years ago while in 2012 the amount increased to 110, indicating such type of inter-firm collaboration, strategic alliance, has been more and more prevalent among the listed firms in Shanghai Stock Exchange and Shenzhen Stock Exchange). From the indexes in Panel B, we can have some basic understandings for firms involved in strategic alliances listed on Shanghai Stock Exchange and Shenzhen Stock Exchange. The ratio of ROE and P/B are used to measure firms' probabilities and growth opportunities, respectively. The assets of listed firms at the year-end before the announcement year are conducted to value their average economic scale. Furthermore, the Mean listed time from the date of IPO to the announced date is employed to assess the average listed time of the individual firms.

Classification by industry is showed on Table 2. The types of the industry group are followed by categorization from DataStream database. According to OECD Classification Scheme described in Appendix B, the industry groups are partitioned into two based on whether the companies are technology-based or not (one is High-technology & Medium-high-technology industries and the other is Medium-low-technology & low-technology and other industry). It shows that 118 listed firms (around 1/3 of the total) belong to high-tech group while 188 companies (about 2/3 of the total) are categorized into the firm group of low-tech.

Table 2: Strategic alliance announcements by industry

Industry groups	Number of announcements	Percentage of total
High-technology & Medium-high-technology industries ⁴		
Technology Hardware & Equipment	17	5.56 %
Software & Computer Services	13	4.25 %
Industrial Engineering	27	8.82 %
Chemicals	12	3.92 %
Aerospace & Defence	3	0.98 %
Electronic & Electrical Equipment	26	8.50 %
Pharmaceuticals & Biotechnology	13	4.25 %
Automobiles & Parts	7	2.29 %
High-tech total	118	38.6 %

⁴ The high-tech verse low-tech classification is based on OESD's classification scheme. For more detail please see appendix B.

Table continued

Medium-low-technology & low-technology and other industry		
Media	23	7.52 %
Personal Goods	4	1.31 %
Food Producers	14	4.58 %
Household Goods & Home Construction	4	1.31 %
Electricity	17	5.56 %
Alternative Energy	7	2.29 %
Construction & Materials	34	11.11 %
Health Care Equipment & Services	3	0.98 %
Travel & Leisure	4	1.31 %
Real Estate Investment & Services	23	7.52 %
Financial Services (Sector)	6	1.96 %
Industrial Transportation	12	3.92 %
General Industrials	3	0.98 %
Support Services	7	2.29 %
Leisure Goods	7	2.29 %
Industrial Metals & Mining	8	2.61 %
Banks	6	1.96 %
General Retailers	3	0.98 %
Gas, Water & Multiutilities	1	0.33 %
Food & Drug Retailers	2	0.65 %
Low-tech total	188	61.4 %
Total	306	100.00 %

After analysing all the cooperative agreements of strategic alliance, I classify the sample announcements into different types by purpose based on both the classification in previous studies and Chinese circumstances. Chan *et al.* (1997) classify the announcements into 7 types (i.e., I Licensing, II Marketing or distribution, III Development or research, IV Technology transfer or systems integration, V Combination of II and III, VI Various combination of I – IV, VII Not specified). Cuéllar-Fernández *et al.* (2011) provide a more specified definition for Technology alliance (share technology and technology transfer) and Marketing alliance (distribution, cross selling and marketing / promotion). In this study, I categorize the announcements into 7 types:

Marketing alliance, Technology alliance, Marketing & technology alliance, Financing alliance, Policy alliance, Infrastructure investment alliance and other⁵. More specifically, Marketing alliance refers to distribution and marketing & promotion cooperation (e.g. agreement for the discounted price, distribution sharing, marketing information sharing, OEM agreement, priority position granted as a supplier, brand cooperation). Technology alliance includes technology transfer & sharing and research or development (e.g. product development, commissioned development contract, cooperative laboratory, technological consulting and system integration). Marketing & technology alliance is defined by the agreements which contain both clauses from Marketing and Technology alliance. Financing alliance is specifically defined as the alliance that the listed firms in non-financial industry reach cooperative agreements with commercial banks. Because of the indispensable role the governments play in the economic growth in China, Policy alliances are not infrequent among the Chinese listed firms. It is defined by the strategic alliance between the listed firm and governmental institution (mostly in provincial and county level). Finally, another unique type of strategic alliance, inter-firm collaboration based on infrastructure investment project, is taken into consideration. By reviewing the announcements published on the website of the Stock Exchange, I find it prevalent for some firms reaching strategic alliance agreements with their partners for large-scale projects lasting over years. Here, this type of alliance refers to the long-term infrastructure project with no less than three year building period (e.g. real estate investment, large resource & energy project). Table 3 below provides a summary for the seven alliance types:

Table 3: Strategic alliance announcements by different alliance types

Alliance type	Number of announcements	Percentage of total
Marketing alliance	76	24.92 %
Technology alliance	51	16.50 %
Marketing & technology alliance	47	15.21 %
Financing alliance	42	13.92 %
Policy alliance	63	20.39 %
Alliance for infrastructure alliance	27	8.41 %
Other	2	0.65 %
Total	306	100.00%

⁵ The examples of each type of strategic alliance announcement are provided in appendix A.

5. Methodology

Here I conduct an event study introduced by Craig MacKinlay (1997) to investigate how the stock price performance associated with the strategic alliance announcements in the Shanghai Stock Exchange and Shenzhen Stock Exchange. The rationale of event study is to assess the difference between the actual stock return within the event period and the stock return in terms of the market model for a certain period before the event period. If the result is significant compared with zero indicating normal stock returns without the impact of announcements, it might be reasonable to reach the conclusion that the announcements of strategic alliance do have a certain effect upon the stock performance during the event period.

5.1. Event study

I employ the methods that similar to those showed in the study by Lee *et al.* (2013). First, the announcement day is defined as Day zero⁶, and the estimation window period for market model starts from Day -170 to Day -21 . The chosen 150 days are used to acquire ‘normal returns’ which are influenced by the announcements themselves. Then, the 41-Day event period, 20 days before the announcement date and 20 days after as well as the announced date, is defined as the event window. After that, the abnormal return can be calculated from the event window period (Day -20 to Day $+20$) based on the prediction errors of the market model. The steps to calculate the abnormal return of sample announcements are as follows:

According to 306 strategic alliance announcements from sample period, the daily stock prices from Day -170 to Day $+20$ are acquired via DataStream database. The daily stock returns can be calculated by the natural logarithm of daily stock price differences upon two consecutive trading days,

$$R_{it} = \ln\left(\frac{P_t}{P_{t-1}}\right) * 100\% \quad (1)$$

where R_{it} denotes the daily actual return of individual firm i at Day t while P denotes the daily price for individual firms.

⁶ There are few announcements published during weekend. Regarding to this case, I define the first Monday after the announcement weekend as day zero.

The following market model is used to acquire the coefficients of α_i and β_i .

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (2)$$

where R_{it} denotes the daily actual return of firm i at time t while R_{mt} denotes the market return at Day t . ε_{it} is the error term.

According to the market model, I can obtain the expected returns of individual firms within the event period using estimated $\hat{\alpha}_i$ and $\hat{\beta}_i$ acquired from Equation (2).

$$E(R_{i,t}) = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \quad (3)$$

where $E(R_{i,t})$ denotes the expected return of individual firm i at time t while R_{mt} denotes the market return at day t . $\hat{\alpha}_i$ and $\hat{\beta}_i$ are estimated figure obtained from market model in Equation (2).

Therefore, the daily abnormal return AR of individual firm i at time t can be then acquired as follows:

$$AR_{it} = R_{it} - E(R_{i,t}) = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \quad (4)$$

The daily abnormal return for individual firm can be obtained From Equation (4). By considering the all 306 sample announcements, the average abnormal return can be acquired via calculating the arithmetic mean of the abnormal returns of all the individual firms within the sample period:

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AR_{it} \quad (5)$$

Consequently, the significance for the average abnormal return of sample announcements can be tested via t -statistics:

$$t_{AAR_t} = \frac{AAR_t}{S(AAR_t)} \quad (6)$$

where $S(AAR_t)$ denotes the standard deviation over the estimation period between Day -170 to Day -21 .

Apart from average abnormal return, the accumulative abnormal return CAR is also introduced to investigate the stock price reaction by declaring strategic alliance announcements. It can be acquired by using the following formula:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \quad (7)$$

where t_1 and t_2 denote the initial and the end date of the considered window period, so that ARs can be summed on a certain time basis for all the sample firms entering strategic alliances. Therefore the cumulative average abnormal returns $CAAR(t_1, t_2)$ of individual firm i from date t_1 to date t_2 can be acquired by summing up the average abnormal returns:

$$CAAR(t_1, t_2) = \frac{1}{N} \sum_{i=1}^N CAR_i(t_1, t_2) \quad (8)$$

where N denotes the total number of sample firms. Similar to the significance testing for average abnormal returns (AAR_t), the significance for the cumulative average abnormal return of sample announcements can also be tested via t -statistics:

$$t_{CAAR_{it}} = \frac{CAAR(t_1, t_2)}{\frac{S(CAAR_t)}{\sqrt{N}}} \quad (9)$$

where $S(CAAR_t)$ denotes the standard deviation of cumulative average abnormal return over the estimation period between -220 days and -21 days. N denotes the number of defined event dates.

6. Empirical tests and results

6.1. Event study findings

The event study analysis starts by exploring the abnormal returns for the entire sample during the window period. Table 4 below describes the average daily abnormal returns, standard deviations and the percentage of positive abnormal returns during the 41-Day event period. The t -statistics presented in the last column are conducted to test if the abnormal returns showed a great significance from zero.

From Panel A we can see that the greatest abnormal return occurs at the announcement date: 0.95% for average abnormal return, much higher than the rest, 57.84% of which are positive, with the highest t -value (5.005) reaching 1% level significance. This supports the *Main Hypothesis 1a* that the strategic alliances at the announcement day have a great positive abnormal return which can significantly yield the firm value. Although there are no abnormal returns on other dates before the announcement that are significantly positive, the significance levels increase obviously when the announcement date is approaching, especially for the two days before declaring the strategic alliances. However, the average abnormal returns show a significant downward trend over a couple of days after the announcement: only 41.83% of firms have positive abnormal returns with an average value of -0.15% three days later.

As showed in Panel B, nine window periods are selected to measure the stock performance using cumulative abnormal returns. For the first four window periods, the event windows are equal quarterly partitioned in terms of time order, while the last four periods are defined around the announcement date. Among the four selected event window built on chronology, only the 10-Day window period prior to announcement date reaches the 5% significance level, the abnormal returns of the firms increase as the announced date approaching. As for the window periods surrounded by the announcement date, all the defined period present great significance at 1% level. The greatest significant level occurs from Day -1 to Day 0: The t -value reaches 4.953 and 56.86% announcements have positive abnormal returns. Such finding supports the *Main Hypothesis 1b* that for firms entering strategic alliances, the cumulative abnormal return for the window period between announcement day and one day before are greater than the cumulative abnormal return in other window periods, suggesting that there might be some pre-announcement information leakage before the announcement day.

Table 4: Abnormal returns for different selected event windows

Window period (day)	OLS market model (sample=306) AAR (%)	Abn. Stand.	% >0	t-Value
<i>Panel A: Daily Average Abnormal Returns (AARs)</i>				
-20	-0.07 %	0.019	46.73 %	-1.004
-10	0.04 %	0.023	44.44 %	-0.150
-3	0.04 %	0.024	43.79 %	-0.083
-2	0.18 %	0.026	51.63 %	1.268
-1	0.21 %	0.025	47.71 %	1.434
0	0.95 %	0.034	57.84 %	5.005***
1	0.09 %	0.031	44.77 %	0.109
2	-0.05 %	0.026	45.75 %	-0.399
3	-0.15 %	0.025	41.83 %	-1.148
10	0.11 %	0.024	48.37 %	1.166
20	-0.04 %	0.022	44.44 %	0.155
<i>Panel B: Cumulative average abnormal returns (CAARs)</i>				
-20 to -11	0.04 %	0.069	47.71 %	0.103
-10 to -1	0.92 %	0.076	52.94 %	2.115**
1 to 10	-0.54 %	0.087	44.44 %	-1.077
10 to 20	-0.76 %	0.070	44.12 %	-1.893*
-5 to +5	1.09 %	0.092	52.61 %	2.087**
-3 to +3	1.14 %	0.074	54.58 %	2.673***
-2 to +2	1.31 %	0.064	56.21 %	3.602***
-1 to +1	1.18 %	0.052	57.84 %	3.939***
-1 to 0	1.16 %	0.041	56.86 %	4.953***

Daily average abnormal returns (AARs) and cumulative abnormal returns (CAARs) are calculated by OLS market model.

* represent 10% significance level

** represent 5% significance level

*** represent 1% significance level

Figure 3 describes the variation tendency of average abnormal returns and cumulative abnormal returns from the selected window period: Day -20 to Day +20. There is a significant upward trend for the cumulative abnormal return from about ten days prior to the announcement date, indicating some inside information might be leaked to public before the announcement. The biggest fluctuation for the abnormal returns occurs between Day -1 to Day +1. Especially on Day 0, the average abnormal return sharply increases to about 1%, suggesting that announcements of the strategic alliances do have a positive impact on the firm value creation. After that, the returns receive a substantial call back for the next couple of days after the announcement. At last, the cumulative abnormal returns decrease to stabilize at around 0.5% but still higher on average than those in the time span prior to the event window.

The result by OLS market model strongly supports the main hypotheses that there exists a significant positive abnormal return for the firm around the announcement date as well as a possible information leakage before the announcement. Such result is consistent with many findings (Chan *et al.*, 1997; Das *et al.*, 1998; Chiou and White, 2005; Lee *et al.* 2013).

Figure 3: Abnormal returns for selected event period

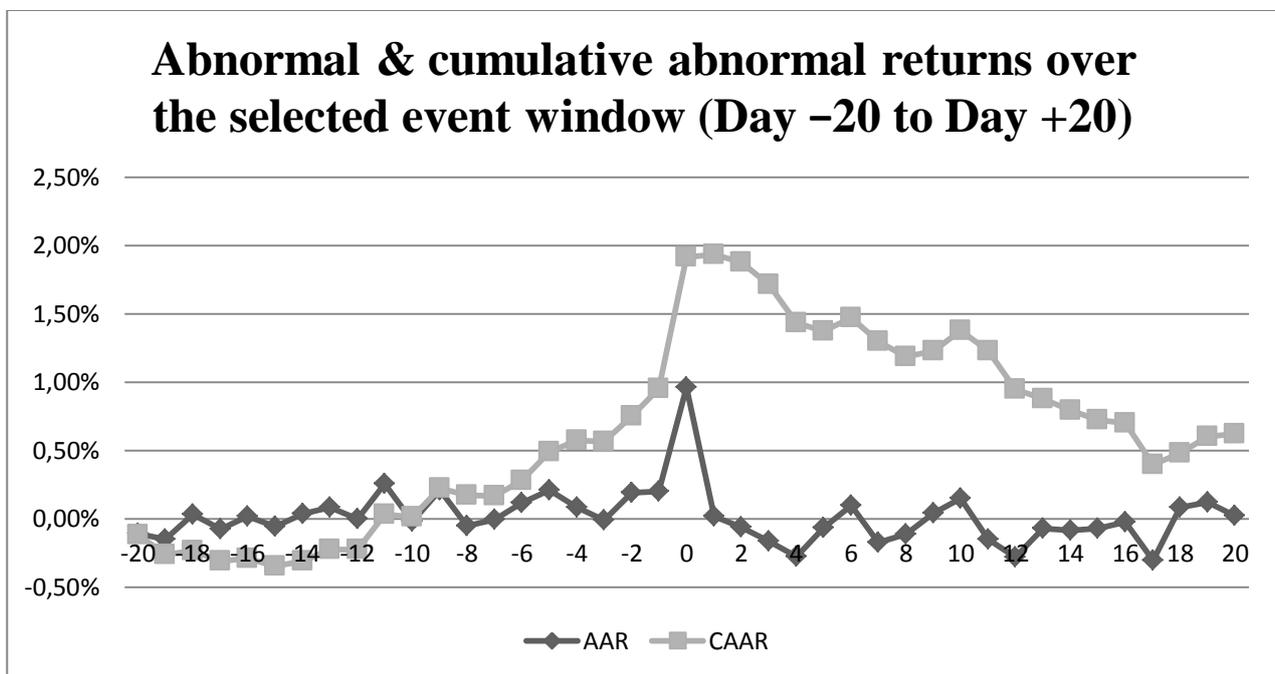


Figure 3 shows trends for daily average abnormal returns and cumulative abnormal return by announcing the strategic alliances over the 41-Day window period

6.2. Cross-sectional analysis

In this section, a linear OLS regression is employed to examine which factors have significant impact on the increment of firm value by declaring the strategic alliance announcements. The model of cross-sectional analysis in my study is conducted as follows:

$$\begin{aligned} AAR_i = & \alpha + \beta_1 Size_i + \beta_2 Growth_i + \beta_3 Profit_i + \beta_4 Age_i + \beta_5 Dummy_{Policy} \\ & + \beta_6 Dummy_{Private/state-owned} + \beta_7 Dummy_{international} + \beta_8 Dummy_{Financing} \\ & + \beta_9 Dummy_{High-tech} + \beta_{10} Dummy_{2012} + \beta_{11} Dummy_{2011} + \beta_{12} Dummy_{2010} \\ & + \beta_{13} Dummy_{2009} + \beta_{14} Dummy_{2008} + \beta_{15} Dummy_{2007} + \tau_i \end{aligned}$$

$$\begin{aligned} CAAR_i = & \gamma + \delta_1 Size_i + \delta_2 Growth_i + \delta_3 Profit_i + \delta_4 Age_i + \delta_5 Dummy_{Policy} \\ & + \delta_6 Dummy_{Private/state-owned} + \delta_7 Dummy_{international} + \delta_8 Dummy_{Financing} \\ & + \delta_9 Dummy_{High-tech} + \delta_{10} Dummy_{2012} + \delta_{11} Dummy_{2011} + \delta_{12} Dummy_{2009} \\ & + \delta_{13} Dummy_{2008} + \delta_{14} Dummy_{2007} + \delta_{15} Dummy_{2007} + \varepsilon_i \end{aligned}$$

where AAR_i is the dependent variable of OLS market model describing the average abnormal return for firm i at the announcement date (Day 0) while $CAAR_i$ is the dependent variable of OLS market model for firm i to show the cumulative average abnormal return from one day before the announcement date to the announcement date (Day -1 to Day 0).

Independent variables include four variables which can best describe the firms' characteristics associated with strategic alliance activities and eleven dummy variables based on the characteristics of the strategic alliance announcements. First of all, I select *Size* as one of the most important control variables in the multilinear regression model which is described as the total asset of the individual firm in logarithm one year before the announcement year. It measures whether the size of sample firms can influence the firm value by declaring strategic alliance announcement (Ammann *et al.*, 2011, Lee *et al.*, 2011). The second control variable, ratio of *Price to Book Value (PVBV)* of assets before the announcement year is used to value the *Growth Opportunity* (Chan *et al.*, 1997, Cuéllar-Fernández *et al.*, 2011). The third control variable is designed to measure the *Profitability* of sample firms. Following the studies of Amici *et al.* (2012), I use *Return on Equity (ROE)* to control the extent of the stock price reaction to the sample firms with different level of capabilities for profits making. In addition, the impact of firms' listing ages, the number of years passed since

the date of the IPO of firms to the date of the alliance announcements, is designed as a control variable (Cuéllar-Fernández. *et al.*, 2011) as well.

The variable, *Dummy_Policy*, which takes 1 for alliances with local governments and 0 otherwise, is specially designed to test the value effect of the firms due to the political-purpose strategic alliance. *Dummy_International* takes 1 for the alliance with firms from overseas (including firms in Hong Kong and Taiwan) and 0 otherwise⁷. This is conducted to investigate whether the firms with international background have a larger value increment than domestic ones. *Dummy_Financing* takes 1 for the firms cooperated with commercial banks for loan support and 0 otherwise. This is designed to measure the stock price impact upon the alliances with the financing purpose. The variable, *Dummy_High-tech* which takes 1 for the firms belonging to high-tech industry and 0 otherwise, is included to examine how these corporations involved in alliance affect the increment of firm value. Finally, I focus on the yearly dummy variables. The six yearly dummies from 2007 to 2012 based on annual distribution of sample announcements are conducted to examine impact of economy cycle upon the wealth effect of listed firms.

Table 6 reports the results of the cross-sectional regression for both AAR_0 and $CAAR_{-1,0}$. Both regression for AAR_0 and regression for $CAAR_{-1,0}$ indicate that the *Size* variable has significant negative coefficients: (-0.007) at 5% level and (-0.011) at 1% level, suggesting that firm size has an inverse relationship with abnormal return both on the announcement date and on one day before the announcement date. This finding supports the *Hypothesis 7* that there exists a negative correlation between the firm size and their abnormal returns. It is consistent with many existing literature (Chan *et al.*, 1997; Das *et al.*, 1998; Chiou and White, 2005; and Lee *et al.*, 2013). No regressions of the two indicate significant coefficients for the variable of *Price to Book Value (PTBV)*, rejecting *Hypothesis 8*. This finding indicates that any potential opportunities for the future growth of listed firms are not significantly related to value change for the firms involved in alliance activities. Such conclusion is in line with that of Lee *et al.* (2013), indicating no significant relationship between the growth opportunity and wealth effect as well. As for the firm profitability, both the regressions have similar negative coefficients, (-0.001), for the control variable of *ROE*, but they are not significant at any level. This finding is consistent with that by Amici *et al.* (2012). Similar with the situation of *ROE*, another control variable, the number of years passed since the date of IPO, also shows an inverse relationship between the *Age* and value increment for both AAR_0 and $CAAR_{-1,0}$, but they are insignificant as well.

⁷ According to Chinese Law, firms based on Taiwan, Hong Kong and Macao are regarded as foreign corporations.

Table 5: Description of variables used in the cross-sectional analysis

Variable name	Variable definitions
<i>Firm Size</i> (<i>Asset</i>)	Total asset of listed firms in logarithm one year before the announcement year.
<i>Growth opportunity</i> (<i>PTBV</i>)	The ratio of Price to Book Value (PVBV) of listed firms one year before the announcement year.
<i>Profitability</i> (<i>ROE</i>)	The ratio of Return to equity (ROE) of listed firms one year before the announcement year.
<i>Firm Age</i> (<i>Year</i>)	The number of years passed of listed firms from the date of IPO to the announced date of strategic alliance.
<i>Dummy_{Policy}</i>	Dummy variable taking the value of 1 if there is a local government partner involving in the alliance, 0 otherwise.
<i>Dummy_{Private/state-owned}</i>	Dummy variable taking the value of 1 if a private firm aligning with a state-owned partner, 0 otherwise.
<i>Dummy_{international}</i>	Dummy variable taking the value of 1 if there is a foreign partner involving in the alliance, 0 otherwise.
<i>Dummy_{Financing}</i>	Dummy variable taking the value of 1 if the alliance is between a firm and commercial bank, 0 otherwise.
<i>Dummy_{High-tech}</i>	Dummy variable taking the value of 1 if the firm entering strategic alliance in high-tech industry, 0 otherwise.
<i>Dummy₂₀₁₂</i>	Dummy variable taking the value of 1 if the strategic alliance is announced in 2012, 0 otherwise.
<i>Dummy₂₀₁₁</i>	Dummy variable taking the value of 1 if the strategic alliance is announced in 2011, 0 otherwise.
<i>Dummy₂₀₁₀</i>	Dummy variable taking the value of 1 if the strategic alliance is announced in 2010, 0 otherwise.
<i>Dummy₂₀₀₉</i>	Dummy variable taking the value of 1 if the strategic alliance is announced in 2009, 0 otherwise.
<i>Dummy₂₀₀₈</i>	Dummy variable taking the value of 1 if the strategic alliance is announced in 2008, 0 otherwise.
<i>Dummy₂₀₀₇</i>	Dummy variable taking the value of 1 if the strategic alliance is announced in 2007, 0 otherwise.

Table 6: Results for cross-sectional OLS regressions

Variables	Regression for abnormal returns upon OLS market model	
	Regression for AAR_0	Regression for $CAAR_{-1,0}$
<i>Constant</i>	0.080 (3.17)***	0.139 (4.55)***
<i>Firm size</i>	-0.007 (-2.50)**	-0.011 (-2.96)***
<i>Growth opportunity</i>	-0.000 (-0.13)	-0.001 (-1.57)
<i>Profitability</i>	-0.001 (-0.36)	-0.001 (-0.32)
<i>Firm age</i>	-0.001 (-1.39)	-0.000 (-0.88)
<i>Dummy_{Policy}</i>	0.011 (2.26)**	0.020 (3.34)***
<i>Dummy_{Private/ state-owned}</i>	-0.003 (-0.58)	0.002 (0.41)
<i>Dummy_{international}</i>	-0.001 (-0.11)	0.001 (0.05)
<i>Dummy_{Financing}</i>	0.001 (0.20)	-0.000 (-0.01)
<i>Dummy_{High-tech}</i>	-0.006 (-1.59)	-0.004 (-0.92)
<i>Dummy_{by year}</i>	<i>Yearly dummy variables are included</i>	
<i>R-squared</i>	0.1145	0.1622
<i>F-value</i>	2.69***	4.03***
<i>Observations</i>	306	306

Table 6 indicates the result of cross-sectional OLS regression for AAR_0 and $CAAR_{-1,0}$. AAR_0 denotes the average abnormal return for firm i on the announcement date (Day 0) while $CAAR_{-1,0}$ denotes the cumulative average abnormal return from one day before the announcement date to the announcement date (Day -1 to Day 0).

* represent 10% significance level

** represent 5% significance level

*** represent 1% significance level

The *Dummy_Policy*, the policy dummy which refers to firms cooperating with government, has highly significant positive coefficient (0.011 for AAR_0 and 0.020 for $CAAR_{-1,0}$) which indicates that policy alliance announcements contribute to the firm value increment more than that by other types of announcements⁸. Such finding strongly supports *Hypothesis 2a* that abnormal returns attributable to strategic alliance announcements with local government are greater than abnormal returns attributable to other alliances. But in the case of *Dummy_financing*, alliance with commercial banks, and *Dummy_international*, alliance with foreign firms, the two regressions show insignificant coefficients for the two control variables, suggesting that strategic alliance for financing purpose and the alliance with foreign enterprises have no significant effect upon the firm value change. Such results favour neither *Hypothesis 3* nor *Hypothesis 4*. *Dummy_High-tech*, another dummy variable, refers to the firms entering the alliances that belong to high-tech industry. It shows non-significant negative coefficients, -0.006 for AAR_0 and -0.004 for $CAAR_{-1,0}$ respectively, rejecting *Hypothesis 5*. Such result is across to the findings by Grant and Baden-Fuller (2004), who come up with a knowledge-based theory for the strategic alliance indicating that due to the lack of sources, technology alliances are much more vital than other alliances in intr-firm collaboration.

⁸ Further analysis for the policy announcement and value creation can be found in the following chapter.

Table 7: The correlation matrix for the variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>AAR</i> ₀	1.0000															
<i>Size</i>	-0.1922	1.0000														
<i>Growth</i>	0.0460	-0.3572	1.0000													
<i>Profit</i>	-0.0684	0.2900	0.0307	1.0000												
<i>Age</i>	-0.1126	0.2753	-0.0055	-0.0018	1.0000											
<i>D_Pol.</i>	0.1090	0.1058	-0.0806	-0.0200	0.1304	1.0000										
<i>D_Pri.</i>	0.0508	-0.2324	0.0707	-0.0370	-0.2178	0.0609	1.0000									
<i>D_Int.</i>	-0.0586	0.0730	0.0987	0.0111	0.2257	-0.1561	-0.2426	1.0000								
<i>D_Fin.</i>	0.0261	-0.1665	0.1147	-0.0168	-0.0624	-0.2059	-0.0025	-0.1613	1.0000							
<i>D_Hig.</i>	-0.0381	-0.2469	0.0977	-0.0271	-0.2158	-0.0779	0.0643	-0.1064	0.0412	1.0000						
<i>D_2012</i>	0.1764	-0.1030	-0.1631	0.1078	-0.0242	0.0733	0.1217	-0.0415	-0.0482	-0.0577	1.0000					
<i>D_2011</i>	0.0195	-0.1395	0.0957	-0.0059	-0.1572	-0.0273	0.1593	-0.0446	-0.0031	0.0411	-0.3891	1.0000				
<i>D_2010</i>	0.1207	0.1869	-0.0361	-0.0082	0.0832	0.1053	-0.1550	0.0116	-0.0635	0.0780	-0.3776	-0.2618	1.0000			
<i>D_2009</i>	-0.1752	0.0890	-0.0165	-0.0267	0.1265	-0.0857	-0.0671	0.1445	-0.0520	-0.1064	-0.2988	-0.2071	-0.2011	1.0000		
<i>D_2008</i>	0.0108	0.0223	0.0172	0.3143	0.0200	-0.0782	-0.1362	-0.0466	0.2131	0.0346	-0.1701	-0.1179	-0.1144	-0.0906	1.0000	
<i>D_2007</i>	0.0713	-0.0210	0.2864	-0.0064	-0.0278	-0.1029	-0.0449	-0.0317	0.1121	0.0446	-0.1514	-0.1049	-0.1018	-0.0806	-0.0459	1.0000

This table describes correlation for all the variables in the multivariable linear regression analysing the average abnormal return on the announced date.

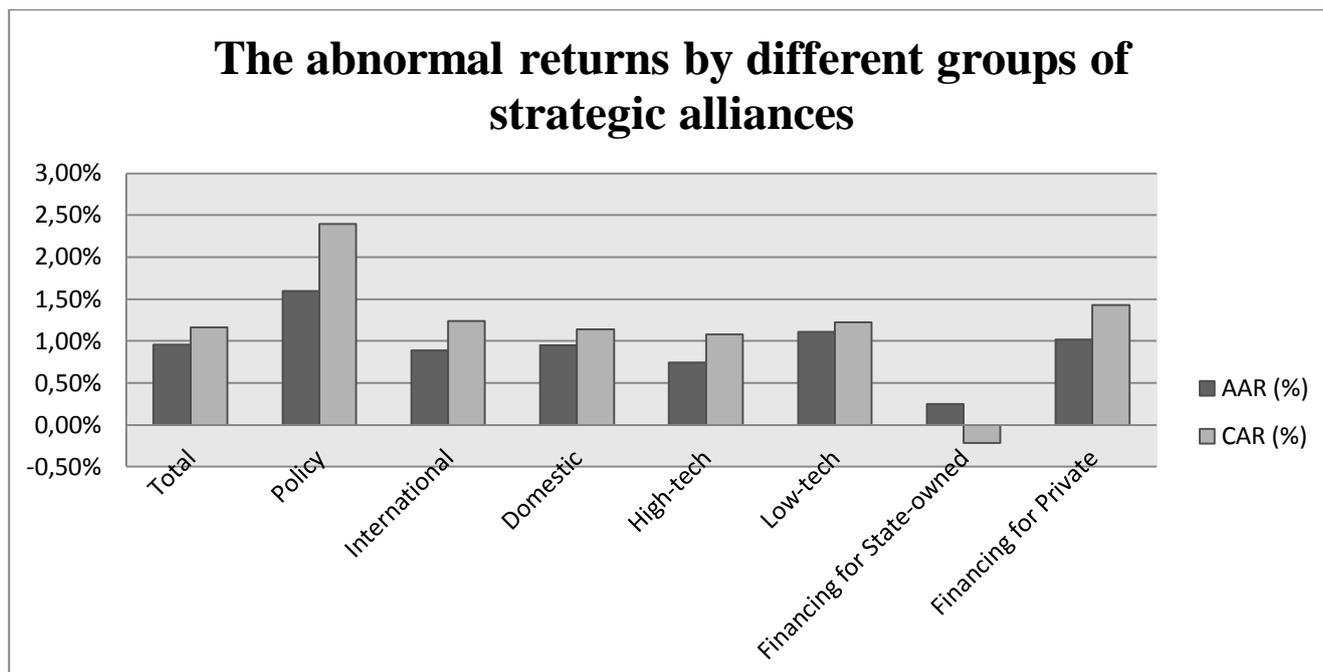
In order to check the multicollinearity among all the variables used in the regression model, a correlation matrix is provided on table 7. It can be seen that all pairs of variables show relatively low coefficient values, indicating low correlations across the variables used in the cross-sectional analysis.

6.3. Value impact upon different subgroups of announcement sample

According to the analysis under the OLS market model, I find significant differences for the abnormal returns among different types of strategic alliance announcements. In order to have further understanding for value creation by different characteristics of strategic alliances, I categorize them into six subgroups according to some unique characteristics of the strategic alliance announcements associated with the hypotheses. After that, the t -value tests for both average abnormal returns on Day 0 and cumulative abnormal returns for Day -1 and Day 0 are conducted to assess their different abnormal return performances.

Compared with the abnormal returns for the total sample announcement, those in the subgroup for policy alliance announcement are much higher than the average level of alliance announcements (1.60% for the AAR_0 and 2.40% for $CAAR_{-1,0}$), suggesting more positive performance expectations for the policy alliance by Chinese investors. This supports *hypothesis 2* that firms entering policy alliance have more abnormal returns than the firms entering other alliances. There is not so much changed between the abnormal returns whether the firms choose to collaborate with domestic partners or foreign ones. This result is not consistent with the finding by Lee *et al.* (2013) which shows that the abnormal return for the alliance with overseas partners is higher than that with marital partners in Korea. This suggests even in developing countries the factors concerning certain alliance types have different impact on firm value creation. Some factors like legal constraint or cultural difference might lower investors' expectations for such alliance. The most noteworthy difference in abnormal returns occurs in the alliances with financing purpose. Table 8 presents clear evidence that the abnormal returns of private firms entering financing alliances are significantly higher than the abnormal returns of state-owned enterprises. Especially for the event period from Day -1 to Day 0, the cumulative average abnormal return of state-owned enterprises even presents a negative coefficient for financing strategic alliance. Such results reject *Hypothesis 3a* that firms with financing alliance have greater abnormal returns but support *Hypothesis 3b* that the financing announcements with private firms involved are significant favourable news to Chinese investors since it is much more difficult for private firms to obtain loans from state-owned commercial banks.

Figure 4: Abnormal returns for different subgroups of strategic alliances



AAR_0 denotes for the average abnormal returns on the announcement day (Day 0) while $CAAR_{-1,0}$ denotes the cumulative average abnormal returns from one day before the announcement to the announcement date (Day -1 to Day 0).

6.3.1. Further analysis for policy alliance

Table 8 shows the abnormal returns and their significant levels for each partitioned subgroup. Firms entering alliance seeking policy support have the highest abnormal return (1.60% of the abnormal return on the announcement day and 2.40% of the cumulative abnormal return for the announcement date and one day before the announcement). This finding indicates that the market has a great positive reaction to the announcements for firms involving strategic alliances with local governments. Based on this, some further research is employed in order to unveil the intrinsic reasons for the high abnormal returns by declaring policy strategic alliances.

Table 8: The abnormal returns for subgroups (different strategic alliance types)

	Total	Policy	Inter.	Domestic	High-tech	Low-tech	Financing (State-owned)	Financing (Private)
<i>Panel A. The AARs of each subgroup and its significance level</i>								
AAR_0	0.96 %	1.60 %	0.89 %	0.95 %	0.74 %	1.11 %	0.25 %	1.02%
Stan.	0.034	0.037	0.038	0.033	0.031	0.035	0.024	0.024
t -value	5.004***	3.457***	1.585	4.652***	4.122***	5.558***	0.671	2.778***
Obs.	306	63	45	263	120	186	30	12
<i>Panel B. The CARs of each subgroup and its significance level</i>								
$CAR_{-1,0}$	1.16 %	2.40 %	1.24 %	1.14 %	1.08 %	1,22 %	-0.22 %	1.43%
Stan.	0.041	0.048	0.042	0.041	0.043	0.040	0.033	0.027
t -value	4.953***	3.981***	1.964**	4.552***	4.365***	5.380***	-0.422	3.442***
Obs.	306	63	45	263	120	186	30	12

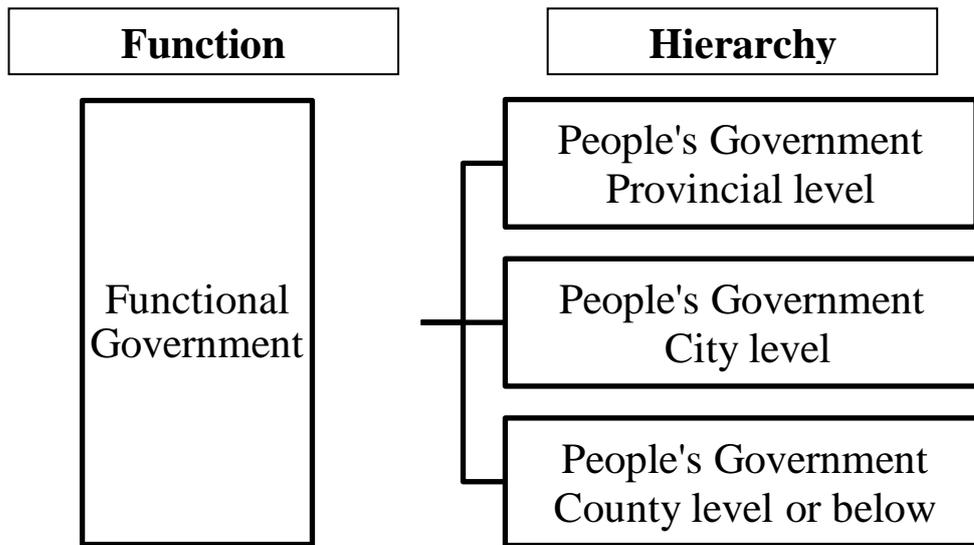
Table 8 describes the average abnormal returns for different types of strategic alliances on the announcement date.

* represent 10% significance level

** represent 5% significance level

*** represent 1% significance level

Figure 5: Description for the structure of Chinese governments



This figure shows the structure for the categorization of policy alliances by the governmental characteristics.

Here I divided the governmental partners into two groups: functional governments and hierarchical ones. Hierarchy governments are defined as the governments which are in overall charge of a certain region. The hierarchy group can be further categorized into three subgroups due to their governmental administrative ranking: Province, City and County or below (there is no firm cooperating with the central government of China). For instance, People's government of Guangdong (a province in China) belongs to provincial group⁹. People's government of Shantou (a city in Guangdong) is in the second level. People's government of Nanao, a county in Shantou, is included in the third ranking, county level and below¹⁰. The functional governments refer to the governments or the social entities with government background that are responsible to a specific field led by a people's government (e.g. Committee for State-owned Assets Supervision and Administration Commission, Committee for Innovative Technology District, Department for Cultural Affairs).

⁹ The municipalities directly ranking under the central government, such as Beijing or Shanghai, have the equal administrative ranking as Provinces do, so they are categorized into province level to.

¹⁰ According to Chinese administrative ranking, some cities are named 'city' but actually they are county-level city. In such cases, these cities are categorized into the subgroup -- county level or below.

It is believed that the main incentive for the firms collaborating with government is to acquire fundamental sources controlled by the government (Li *et al.* 2008). Such valuable sources can take a large variety of forms, such as preferential treatment by governments or the enterprises under their control, taxation deduction or relaxed regulation (Faccio 2006). These benefits are especially important for the infrastructure investment in China because apart from the above mentioned resources, Chinese local governments also have the power of land distribution. Consequently, I further divide the sample firms with policy announcements into two subgroups: one for the firms in infrastructure-related industry¹¹ and the other one for the firms in other industry¹².

Table 9 describes the detailed categorization for policy alliances according to different administrative rankings of partnering governments and industry belongings for listed firms. Panel A shows the average abnormal returns for the alliances with both Functional Government partners and People's Government partners on the announcement day. It indicates that the average abnormal return for functional government is 1.26% at the announcement date, which is much lower than that for the hierarchy ones (1.75%). Such result suggests that functional governments have a weaker effect upon the increment of firm value compared with hierarchical governments do. Furthermore, there also exist significant differences for the abnormal returns within hierarchical government group for governmental partners with different administrative rankings. The higher one government is indexed in Chinese administrative ranking, the higher abnormal return its partnering firm can achieve. (3.00% for provincial level, 1.90% for city level and only 1.25% for county level or below). This finding support *Hypothesis 2b* that within the Hierarchy Government group, the governmental administrative rankings have a positive correlation with the value increase for the firms, indicating that the power of the local government plays a vital role in increasing the partnering firm's wealth effect.

Panel B compares the abnormal return results by considering whether the sample firms belong to infrastructure-related industry or not. It shows that for the firms in infrastructure-related industry, their abnormal returns are higher than those are not. Such result supports *Hypothesis 2c* that the firms aligning with governments for infrastructure investment purpose have more value creation than the firms entering governmental alliance with additional reasons.

¹¹ Infrastructure related industry refers to Real Estate Investment & Services, Construction & materials, Industrial engineering, Industrial Transportation, Travel & Leisure, Electricity and Alternative Energy.

¹² Other industry refers to Food producers, Pharmaceuticals & Biotechnology, Software & Computer Services, Technology, Hardware & Equipment, Electronic & Electrical Equipment and Automobiles & Parts.

Table 9: Sub-categorization for policy alliances

Panel A	Functional Government partners	Hierarchy Government Partners		
			a. Province level	$AAR_0 = 3.00\%$ Obs. =5
Policy Alliance by characteristics	$AAR_0 = 1.26\%$ $t\text{-value} = 1.766^*$ Obs. =19	$AAR_0 = 1.75\%$ $t\text{-value} = 2.929^{***}$ Obs. =44	b. City level	$AAR_0 = 1.90\%$ Obs. =20
			c. County level	$AAR_0 = 1.25\%$ Obs. =19
Panel B	Firms in infrastructure-related industry	Firms in other industry		
Policy Alliance by industry	$AAR_0 = 1.72\%$ $t\text{-value} = 2.743^{***}$ Obs. =37	$AAR_0 = 1.43\%$ $t\text{-value} = 2.021^{**}$ Obs. =26		

* represent 10% significance level

** represent 5% significance level

*** represent 1% significance level

6.3.2. Role of private firms in strategic alliances

From previous chapters, we know that Chinese private firms always suffer from unfair competitions with state-owned enterprises. As state-owned enterprises controlled most of key resources, it is worth to test whether the abnormal returns for private firms are significantly greater than the rest. First, from the perspective of different ownership-holdings structures, all the alliances related to governments and foreign partnering firms are excluded from this sub-sample group. Then the strategic alliances left are categorised into four partitioned groups: strategic alliances between two state-owned enterprises; strategic alliances between two private partnering firms; a private firm reaches an alliance with a state-owned partner and a state-owned firm choose a private company as the strategic partner.

Figure 6 below shows the different proportion of each type of strategic alliance categorising by different partnering firms' ownership characteristics. The most prevalent type of strategic alliance is the alliances between state-owned enterprises, accounting for almost half of total sub-group alliance announcements. Around 1/3 of the alliances are made up by the private firms with the state-owned ones. Strategic alliance between private companies accounts for about 13% of the total alliance

sample, and the type that the state-owned enterprises seeking alliance with private partners is the most infrequent one, only accounting for less than 10% of the announcement sample.

Figure 6: Proportion of strategic alliance by different ownership-holding structures

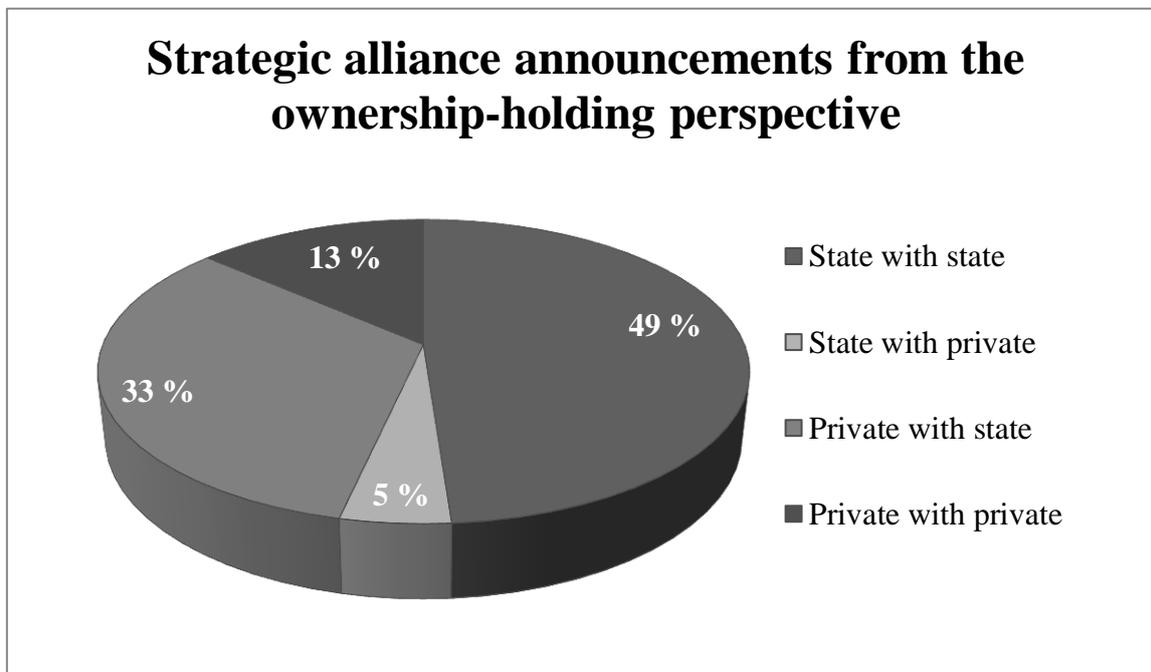


Table 9 shows the acquired abnormal returns from the four types of strategic alliances with different ownership holding combinations. Generally speaking, the Alliance for private firms seeking state-owned enterprises has higher abnormal return (1.15%) than the average level of the abnormal return for other three types (0.87%). Such result supports *hypothesis 6* that abnormal returns for private firms with state-owned cooperative partners are greater than the rest three types, which suggest such alliances are very good news to investors, since the private firms might share the advantages owned by state-owned enterprises through the strategic alliance relationship.

Finally, I change an angle by employing a further comparable analysis for the abnormal returns of the rest three types of strategic alliance (State/State, Private/Private and State/Private). Abnormal returns for ‘Private with Private’ are also very high (1.18%), even higher than those for ‘Private with State’, probably because of some intrinsic advantages of private firms (e.g. operative efficiency or technological-intensity). Compared with the abnormal returns for ‘Private with Private’ alliances, those for ‘State-owned with State-owned’ are much lower. Such result implies a lower market reaction from Chinese investors possible due to the low operative efficiency of state-owned

enterprises. The abnormal returns for ‘state-owned firms collaborating with private ones’ are lowest, suggesting a significant poor position for private firms as partnering firms with state-owned ones in the strategic alliances. Furthermore, only 12 observations under this type also strongly emphasizes that there are not so many state-owned governments willing to cooperate with private firms.

Table 10: Sub-categorization for alliances with different ownership-holding structures

Private firms with state-owned firms	The other three types	
		a. Private firms with private firms
		$AAR_0 = 1.18\%$ Obs. =35
$AAR_0 = 1.15\%$ $t\text{-value} = 3.321^{***}$ Obs. =85	$AAR_0 = 0.87\%$ $t\text{-value} = 3.468^{***}$ Obs. =173	b. State-owned firms with state-owned firms
		$AAR_0 = 0.87\%$ Obs. =126
		c. State-owned firms with private firms
		$AAR_0 = -0.10\%$ Obs. =12

* represent 10% significance level
 ** represent 5% significance level
 *** represent 1% significance level

Table 11: Summary for the hypotheses and test results

<i>Panel A: Main hypotheses test</i>		
Announcement impact on firm performance	<i>H.1a: For firms entering strategic alliances, abnormal returns attributable to alliance announcements on the announcement date are significantly positive.</i>	Support
	<i>H.1b: For firms entering strategic alliances, cumulative abnormal returns attributable to alliance announcements on the announcement date and one day before are higher than the abnormal returns on the announcement date.</i>	Support
<i>Panel B: Alliance-specific hypotheses test</i>		
Policy alliance	<i>H.2a: Abnormal returns attributable to strategic alliance announcements with local governments are greater than abnormal returns attributable to other alliances.</i>	Support
	<i>H.2b: The higher one government is indexed in Chinese administrative ranking, the higher abnormal return its partnering firm can achieve</i>	Support
	<i>H.2c: For firms entering policy strategic alliances, abnormal returns to industry related firms are higher than abnormal returns to non-industry related ones</i>	Support
Financing alliance	<i>H.3a: For firms entering strategic alliances, abnormal returns attributable to financing alliances are greater than abnormal returns attributable to other alliances.</i>	Reject
	<i>H.3b: For firms entering financing strategic alliances, abnormal returns to private enterprises are greater than abnormal returns to state-owned enterprises.</i>	Support
International alliance	<i>H.4: For firms entering strategic alliances, abnormal returns to the firms with foreign partners are greater than those abnormal returns to the firms with domestic ones.</i>	Reject
<i>Panel C: Firm-specific hypotheses test</i>		
High-tech firms	<i>H.5: For firms entering strategic alliances, abnormal returns to high-tech enterprises are greater than abnormal returns to low-tech enterprises.</i>	Reject
Private with State-owned	<i>H.6: For firms entering strategic alliances, abnormal returns to private firms with state-owned cooperative partners are greater than the rest.</i>	Support
Firm size	<i>H.7: The size of firms entering strategic alliances is negatively correlated with abnormal returns attributable to alliance announcements.</i>	Support
Growth opportunity	<i>H.8: The growth opportunity of firms entering strategic alliances is positively correlated with abnormal returns attributable to alliance announcements.</i>	Reject

7. Conclusion

This study provides evidence concerning the impact of strategic alliance announcement on the value creation for partnering firms. I find significant abnormal returns of listed firms from the formation of strategic alliances at the announcement date, but there exist some inside information leakages before the announcement date.

By employing a cross-sectional analysis, I further analysis which factors mainly explain the firm value creation in China. The specific findings can be summarized as follows: First, I find that firms entering policy alliance with governmental partners have the highest abnormal returns. Particularly, the higher one government is indexed in Chinese administrative ranking, the higher abnormal return its partnering firm can obtain. As for firm performance within the subgroup of financing alliance, abnormal returns of private firms are significantly higher than those of state-owned enterprises. However, there are no differences for abnormal returns between international alliances and domestic ones.

From the perspective of different ownership-holding structures, the study shows evidence that abnormal returns for private firms collaborating with state-owned firms are higher than those in other alliance types. Furthermore, unlike the case of firms involved in strategic alliances in advanced countries, alliances announced by low-tech partnering firms lead the value of Chinese firms to rise more than that of high-tech firms. Finally, similar to the conclusions of previous studies, there also exists an inverse relationship between firm size and value increase, but the firm value increment does not have any significant impact upon the growth opportunity of individual firms.

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9. Appendixes

Appendix A: Examples of strategic alliance

Strategic alliance for technology

(Company Code: 002514; Company Name: Shenzhen Baoxin Tech; Alliance Partner: Beijing Fuweihao Tech; Announcement No.: 2012-046)

The announcement of strategic alliance with Beijing Fuweihao Tech

The board director of Shenzhen Baoxin Tech has approved the strategic alliance agreement with Beijing Fuweihao Tech in the 16th board conference.

Shenzhen Baoxin Tech and Beijing Fuweihao Tech will start comprehensive cooperation on (C/C-Si) composite materials and brake rotors to promote the competence and cultivate the new growth point. In order to promote the mutual development and build a long-term mutual-beneficial relationship, the two parties reached the agreement in terms of the principles of equality, voluntariness, fairness, honesty and trust. The main contents are as follows:

1. Shenzhen Baoxin Tech will sign a commissioned contract with Beijing Fuweihao Tech for the (C/C-SiC) composite materials and brake rotors development. In order to make the alliance more efficient, the two parties will deepen the collaboration by sharing technology platform, cultivating new research team and transferring technological achievement they already have.
2. The specific type, requirement, format of (C/C-SiC) composite materials and brake rotors are determined by the goal of product application and general arrangement of project, which will be decided later.
3. The principles and approaches of strategic alliance are as follows (which might be modified during the application process):
 - 1) Forming strategic alliance is the main approach of cooperation. Concerning Beijing Fuweihao Tech as the experiment platform, the two partnering firms will combine their unique advantages to develop new types of brake rotors product. It will accelerate the pace of knowledge transfer from research & development phase to production phase.

- 2) Shenzhen Baoxin Tech will be in charge of laying down the product type and technology requirement while Beijing Fuweihao Tech will be in charge of sample production, calculation and other relative experiment. Shenzhen Baoxin Tech should finance the R&D and own the patent of the final product.
- 3) Both partnering firms should make every effort they can to offer convenience for the product development, including sharing laboratories and relative instruments as well as simulation software.
- 4) Shenzhen Baoxin Tech has the priority to acquire other technology achievements made by Beijing Fuweihao Tech.
- 5) Beijing Fuweihao Tech agrees to share all relative resources (e.g. technology, marketing information and human resources) to Shenzhen Baoxin Tech, assisting Shenzhen Baoxin Tech with the technology integration and staff training.
- 6) All the technology achievements by mutual development are regarded as confidential information and should not be disclosed to a third party.
- 7) The coordinators of two partnering firms need to contact with each other to track the progress of collaboration.
- 8) The strategic alliance is valid for 5 years starting from the sign date.

Shenzhen Baoxin Tech

12.11.2012

Strategic alliance for marketing

(Company Code: 000829; Company Name: Shenzhen Chinatelling; Alliance Partner: Sang Fei Consumer Communications; Announcement No.: 2008-012)

The announcement of strategic alliance with Sang Fei Consumer Communications

Shenzhen Chinatelling Development, a subsidiary of Shenzhen Chinatelling, signed a strategic alliance with Sang Fei Consumer Communications on June 6th 2008 in Shenzhen. The main contents are as follows:

1. The two partnering firms agree to build a long-term strategic alliance relationship. Shenzhen Chinatelling will provide support to promote the marketing share of Sang Fei Consumer

Communications in terms of its rich experience and dominant position in the Chinese mobile market; In return. Sang Fei Consumer Communications will provide qualified product according to Shenzhen Chinatelling's requirement.

2. The alliance between the two partnering firms includes the following fields (but not limit to) product distribution, marketing collaboration, tailored production, terminal promotion and retail website building.
3. Short-term prospect of the strategic alliance: the amount of mobile phone sold in 2008 is expected to reach 600000 with the sales of no less than 600 million RMB.

Shenzhen Chinatelling

6.6.2008

Strategic Alliance for both marketing and technology

(Company Code: 002355; Company Name: Shandong Xingmin Wheel; Alliance Partner: Beiqi Foton Motor; Announcement No.: 2010-044)

The announcement of strategic alliance with Beiqi Foton Motor

Shandong Xingmin Wheel reached a strategic alliance agreement with Beiqi Foton Motor on December 20th 2010 in Beijing. The strategic alliance will deepen the collaboration for both partnering firms. The main clauses are as follows:

1. Quality

- 1) Shandong Xingmin Wheel should meet the piece part requirement by Beiqi Foton Motor and take action to improve the quality of product.
- 2) The delivery inspection procedure of Shandong Xingmin Wheel should comply with national standards, industry standards, and the standards set by Beiqi Foton Motor. Shandong Xingmin Wheel also needs to maintain its industry-leading position for product quality.
- 3) Shandong Xingmin Wheel will appoint technical specialists to support Beiqi Foton Motor for its technology improvement.

- 4) Upon the above clauses. Beiqi Foton Motor will grant the inspection exemption for Shandong Xingmin's product. However. Shandong Xingmin must take the responsibility to guarantee its own product's quality.

2. Cost

- 1) Shandong Xingmin Wheel should take actions to reduce product costs.
- 2) Shandong Xingmin Wheel should show its financial transparency to Beiqi Foton Motor and take continuous inspection for the financial risk of Shandong Xingmin Wheel's. The two partnering firms will mutually decide the pricing and reasonable profit space for the products of Shandong Xingmin Wheel.
- 3) After setting the fundamental price for piece parts. Beiqi Foton Motor should take the charge of adjusting the product price according to the change of material price in terms of the related cost model.
- 4) Beiqi Foton Motor promises to grant some preferential policy to Shandong Xingmin Wheel.

3. Product development

- 1) Shandong Xingmin Wheel should fulfil the new product development tasks appointed by Beiqi Foton Motor on time.
- 2) Shandong Xingmin Wheel should continuously improve its product development capability via technology communication, collaboration and technical staff training.
- 3) Beiqi Foton Motor has the priority to use the product or patent developed by Shandong Xingmin Wheel.
- 4) Shandong Xingmin Wheel should introduce new test installation and build a national automobile test centre by 2012. Beiqi Foton Motor should recognise the test report by Shandong Xingmin Wheel. Meanwhile. Shandong Xingmin and Beiqi Foton Motor should share the test resources developed by the two parties.

4. Orders

- 1) Beiqi Foton Motor promises to not produce piece part products to other suppliers that have competitive relationships with Shandong Xingmin Wheel. Shandong Xingmin Wheel promises that Beiqi Foton Motor has the priority to obtain the piece part product from Shandong Xingmin Wheel.
- 2) Shandong Xingmin Wheel should introduce the advanced order-guarantee-system to improve its supply chain management.

- 3) Beiqi Foton Motor should support Shandong Xingmin Wheel for its order-guarantee-system application.
 - 4) Beiqi Foton Motor should guarantee Shandong Xingmin Wheel with no less than 70% product supply for certain types of vehicles (heavy truck, light truck, Europe V coach and agriculture vehicles).
5. Information sharing
- Product information, technology information, quality information and service information should be shared by the two partnering firms. Both parties have the confidential obligation to keep relative important information private.
6. Globalization
- 1) Beiqi Foton Motor should use the product provided by Shandong Xingmin Wheel as the priority and help it to penetrate into the global market.
 - 2) Shandong Xingmin Wheel should provide full support for Beiqi Foton Motor's overseas marketing and after-sale services.
 - 3) Beiqi Foton Motor should assist Shandong Xingmin Wheel to accomplish the global production distribution, especially for international direct investment overseas. In return, Shandong Xingmin should utilise its existing overseas resource to support Beiqi Foton Motor's globalization.

Shandong Xingmin Wheel

21.12.2010

Strategic alliance for financing

(Company Code: 600637; Company Name: Bestv New Media; Alliance Partner: Bank of China, Shanghai Branch; Announcement No.: 2012-007)

The announcement of strategic alliance with Bank of China (Shanghai Branch)

Bestv New Media and Bank of China (Shanghai Branch) signed a strategic alliance agreement on March 15th 2012 at Shanghai. In order to promote the mutual development and build a long-term mutual-beneficial relationship, the two partnering firms reached the agreement in terms of the principles of equality, voluntariness, fairness, honesty and trust. The main contents are as following:

1. The extent of the entity of the two parties:

The collaboration parties include Bestv New Media as well as its subsidiaries which are holding limits or have the actual controlling power to the companies, and Bank of China (Shanghai Branch) as well as all its affiliated organizations.

2. Alliance relationship:

The two partnering firms should build a long-term collaboration relationship. Bank of China (Shanghai Branch) will treat Bestv New Media as one of the most important clients and offer full support to Bestv New Media's business expansion, especially for the business fields related to financial services including commercial banking, investment banking and insurance. Bestv New Media should regard Bank of China (Shanghai Branch) as one of the most important business partners. Under the same condition, Bestv should offer preferential positioning to Bank of China (Shanghai Branch) as the main collaboration bank.

3. Contents of strategic alliance

The alliance is a comprehensive collaboration which covers credit service, financing service, capital market service, integration marketing service and large-scale activity cooperation. Bank of China (Shanghai Branch) should provide financing support to product development, marketing and other services (IPTV, mobile phone, Tablet Personal Computer, Internet Television and Smart TV) for Bestv New Media.

Special clauses for the credit and financing service: First, according to governmental requirements, relative laws & regulations and articles of company, Bestv New Media should specify its specific credit limit based on its own business need to Bank of China (Shanghai Branch). Second, Bank of China (Shanghai Branch) will provide maximum 4 billion RMB credit support in terms of national policies and laws & regulation requirements. Third, the credit line should be based on the specific credit agreement: for each credit & financing business, Bestv New Media must strictly follow the financing approval procedures.

Bestv New Media

15.3.2012

Strategic alliance with government

(Company Code: 600561, Company Name: Jiangxi Changyun, Alliance Partner: Nancheng County Government, Announcement No.: 2012-046)

The announcement of intention of strategic alliance with Nancheng County Government

Jiangxi Changyun and Nancheng County Government signed a letter of intent for strategic alliance on November 9th 2012. The main contents are as follows:

1. The general description of alliance intention

In order to seek the new growth engine for the county, Nancheng County Government tends to combine its unique resources (Ecological District of Poyang Lake and Haixi Economical Zone), with brand and capital advantages of Jiangxi Changyun. Within the district of Nancheng County, Jiangxi Changyun plans to invest a project called “One Mountain, One River, One Park and One Station” in terms of the model of eco-efficient and low-carbon economy. The project is expected to reach a comprehensive promotion both for social effect and firm value.

2. Cooperation approaches

The main cooperation approaches include land leasing, circulation, acquisition and policy support to accomplish this comprehensive real estate project.

More specifically:

- 1) Nancheng County Government should take the charge of acquisition, remove and supplement of landing as well as all the other staff related to the infrastructure construction. At the same time, the county government also needs to support Jiangxi Changyun with the problems during the land handling, including indispensable resources such as water, electricity and telecommunication.
- 2) As the project investor. Jiangxi Changyun should be in charge of the project planning, financing, and organizing the project development. In return, Jiangxi Changyun should have the majority of project profits as well.

3. Cooperation scope

The development project is mainly surrounded by the theme “One Mountain, One River, One Garden and One Station”. It intends to be divided into three sub-projects:

1. “One Mountain, One River” Development Project
“One Mountain, One River” Development Project refers to the development for scenic and historic area of Magu Mountain, development for the tourist project of Hongmen Reservoir and transfer & investment for the brand of Jiangxi Brewery.
2. “One Park” Development Project

“One Park” Development Project refers to the development of the distribution area of Nancheng County. Jiangxi Changyun plans to invest a comprehensive modern distribution centre in Nancheng County.

3. “One Station” Development Project

“One Station” Development Project refers to build a tourist hub and a transportation station in the centre of Nancheng County.

4. Period of Strategic alliance

Both Nancheng and Jiangxi Changyun need to take their own responsibility and coordinate with each other about the time and procedure of the project development. The specific cooperation period will be decided after further negotiation.

5. Land transfer and circulation

Jiangxi Changyun acquires lands via land transfer and circulation. Further negotiation is needed for the specific scope and size of the land, and will be settled in a written agreement.

By complying with the relative laws and policies, Nancheng County Government will offer the maximum discount for the tax that needs to be paid by Jiangxi Changyun.

This letter of intent of the strategic alliance is just an intention for cooperation and the detail clauses still need to be discussed by the two parties. There are still some uncertainties upon the strategic alliance. The official agreement needs to be signed after revising by the board of directors or the general meeting of shareholders in terms of the Article of Association. According to the progress of the project, Jiangxi Changyun promises to disclose the relative information in time.

Jiangxi Changyun

9.11.2012

Strategic alliance for infrastructure investment

(Company Code: 002059, Company Name: Chaori Solar, Alliance Partner: Yunan Provincial Energy Investment Group, Announcement No.: 2012-044)

The announcement of strategic alliance with Yunan Provincial Energy Investment Group

The board of directors as well as all board members promises that there is no false and misleading statement or material misstatement in the announcement. According to the agreement, from 2012,

both partnering firms should accomplish 800 MV – 100 MV for photovoltaic plant construction in the next 5 years. The main contents are as follows:

1. Model of collaboration

The model of collaboration will be B – T (Build – Transfer), which means Chaori Solar should take charge for the construction and Yunan Provincial Energy Investment Group should be in charge of the plant running.

2. Scale of collaboration

According to the strategic plan, both partnering firms should accomplish 800 MV – 100 MV for photovoltaic plant construction in the next 5 years. More specifically, it is planned to build 100MW in 2012, 100 MV – 150 MW in 2013. The volume in 2014 is expected to reach 150 MV– 200 MV, while 200 MV– 250 MW and 250 MV– 300 MW for 2015 and 2016 respectively.

3. Rights and obligations for Yunan Provincial Energy Investment Group

- 1) Yunan Provincial Energy Investment Group should be in charge of approving and initiating photovoltaic plant project.
- 2) After accomplishing the construction, Yunan Provincial Energy Investment Group should be responsible for the repurchase of photovoltaic plants. In the meantime. Chaori Solar should retrieve the fund of construction.
- 3) Yunan Provincial Energy Investment Group should take charge of coordinating with local governments during the project period.

4. Rights and obligations for Chaori Solar

- 1) Chaori Solar is responsible for design, purchase, construction and test run of photovoltaic plants in Yunnan province.
- 2) Chaori Solar is responsible for the quality, security, price and construction period of the project.

Chaori Solar
26.4.2012

Appendix B

OECD ISIC REV. 3 TECHNOLOGY INTENSITY DEFINITION¹³

Classification of manufacturing industries into categories based on R&D intensities

High-technology industries	Medium-high-technology industries
Aircraft and spacecraft	Electrical machinery and apparatus
Pharmaceuticals	Motor vehicles, trailers and semi-trailers
Office, accounting and computing machinery	Chemicals excluding pharmaceuticals
Radio, TV and communications equipment	Railroad equipment and transport equipment.
Medical, precision and optical instruments	Machinery and equipment
Medium-low-technology industries	Low-technology industries
Building and repairing of ships and boats	Manufacturing, Recycling
Rubber and plastics products	Wood, pulp, paper, paper products, printing and publishing
Coke, refined petroleum products and nuclear fuel	Food products, beverages and tobacco
Other non-metallic mineral products	Textiles, textile products, leather and footwear
Basic metals and fabricated metal products	

¹³ <http://www.oecd.org/sti/ind/48350231.pdf>