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IDENTIFYING STOCK MARKET REACTIONS TO ACQUISITION ANNOUNCEMENTS IN TAIWAN LAND AUCTION

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ABSTRACT

This paper examines the market reactions to acquisition announcements in Taiwan land auctions. Empirical evidence shows that successful bidders can enjoy significant positive abnormal returns as a result of land auction events. Specifically, successful acquisitions in Taiwan land auction have an intra-industry contagion effect. The land size and the market atmosphere before the auction events benefit the stock market reactions.

Keywords: Abnormal return, Land acquisition, Auction, Market reactions, Intra-industry contagion effect, Market atmosphere.

JEL Classification: G14, R51.

Contribution/ Originality

The paper's contribution is on the identification of the main determinants for the economic profits, which are the market conditions, reserve price, and the attributes of the land sites, rather than the characteristics of the successful bidders themselves.

1. INTRODUCTION

In a context of real estate studies, land auctions have received considerable attention, where two main issues have been discussed. The first area of focus for researchers has been on identifying which factors affect auction premiums (Ong *et al.*, 2005; Amidu and Agboola, 2009; Idee *et al.*, 2011; Tse *et al.*, 2011; Breuer *et al.*, 2015). Second issue has involved the equity market performances of successful bidders in response to news about land acquisitions. There are three major empirical studies examining the abnormal returns of successful bidders in land auction

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events (Ching and Fu, 2003; Ooi and Sirmans, 2004; Hui *et al.*, 2010). Using data from Singapore and Hong Kong, these studies suggest that stock market gives a positive response for the winners of land auctions.

The present study analyzes Taiwanese stock market responses to land auction events. The real estate markets in Singapore, Hong Kong, and Taiwan share two notable similarities: the first is that urban land is scarce; the second is that governments or regional managers regularly cover infrastructure expenditures by selling off parcels of land via public auctions. Land auctions in Singapore and Hong Kong have been discussed in previous papers. So far, however, there no studies exploring whether land acquisitions affect the stock returns of successful winners in Taiwan auction markets. It is therefore worth examining how the stocks prices of Taiwan construction firms and financial firms react to announcements of land acquisitions through public auctions.

The land auction enjoys public interests for these events held by the National Property Administration[1] (hereafter NPA, an executive institution of national land auctions) of the Taiwan government. Due to the fact that the winners of Taiwan land auctions are almost entirely made up of financial companies or housing construction firms, these types of companies may be in a position to earn larger profits from participating in Taiwan government's land auctions. Thus, we attempt to examine *whether* or not land auctions create opportunities for these conglomerates or developers to enjoy economic profits, using an event study methodology. Another reason for government land auctions being a matter of public concern in Taiwan is that auctions of larger sized plots of urban land have been infrequent. Except for raising treasury revenues, land auctions can also create efficient land allocations (Ashenfelter and Genesove, 1992). Thus, the land auction markets in Taiwan have received considerable interest from scholars and various industries (Lin and Evans, 2000; Chiang, 2011).

The study identifies market responses of Taiwan land auctions, focusing on following five issues. First, gauging the wealth effects of successful bidders, the study employs the event study methodology to examine *whether or not* successful bidders profit from land auctions. Second, we answer the question of *whether or not* Taiwan's land trading market is a contestable market. Ooi and Sirmans (2004); Ching and Fu (2003) and Hui *et al.* (2010) find that Singapore and Hong Kong are not contestable markets in terms of real estate. Here, we examine the cumulative abnormal returns (i.e., CARs) of the winners of land auctions to settle this issue. Third, this investigation answers the question of *whether or not* there is an intra-industry contagion effect for Taiwan land acquisition events. In other words, other firms, in the same industry as the winners, enjoy abnormal returns (i.e., ARs) from these land auction events. This type of intra-industry contagion effect benefits the short-run market performances of related firms in the same industry and leads market

[1] Taiwan's National Property Administration (NPA), operating under the aegis of the Ministry of Finance, undertakes national property affairs. According to Article 2 of the Organic Act of National Property Administration, the business functions and duties of the NPA include investigations, management, disposals, improvements and utilizations, information systems, evaluations, inspections and overall allocations upon national property, and other affairs related to the national property.

investors to reevaluate these firms' market values (Benveniste *et al.*, 2002; Lowry and Schwert, 2002). Fourth, this study examines the *relationship of risk-return* in the land auction markets. According to Tse *et al.* (2001) the development of a large-scale site which is being auctioned involves taking a greater risk, and therefore the bidders require a relatively higher return to compensate for it. Finally, the present study identifies the *determinants* of the economic profits to analyze which factors are related to market reactions regarding the land auction events. Therefore, this article contributes to the literature on new evidence of Taiwan land auctions.

The remainder of this paper is organized as follows. The following section discusses related studies on land auctions and wealth effects. The third section describes Taiwanese land auctions and the data collections process. After that, we discuss the event-study methodology used to gauge excess returns. Section 5 describes, analyzes, and discusses the empirical results. The final section provides our conclusions.

2. LITERATURE REVIEW

The market reactions to land acquisitions have been widely studied, as illustrated in Glascock *et al.* (1989; 1991); Corgel *et al.* (1995); Sing *et al.* (2002); Ooi and Sirmans (2004); Hui *et al.* (2010); Obidzinski *et al.* (2013) and others. Glascock *et al.* (1989) determine that the acquiring property company can not capture excess returns, in that the seller extracts most of economic profit, especially when sellers has a distinct and rare asset and there are many competitors pursuing the property. Subsequently, Glascock *et al.* (1991) find that there are no wealth effects from the transaction announcements for those firms pursuing an acquisition strategy. Similarly Corgel *et al.* (1995) suggest that the purchase of real estate by real estate investments trusts (REITs) do not provide any significant wealth effects for purchasers, while the sellers can reap statistically significant gains from the announcements of real estate transactions. Likewise, Sing *et al.* (2002) examine the market reactions of Malaysia's REITs and property stocks to acquisition announcements, and find a significantly negative price adjustment in the REIT markets.

In contrast to the findings above, other studies suggest that acquiring companies can capture excess returns. Allen *et al.* (1993) refer to the ability of lessee firms acquiring the use of property to get positive abnormal returns. In the context of REITs, Allen and Sirmans (1987) and Campbell *et al.* (2003) document that REITs enjoy excess abnormal returns when acquiring other REITs or real estate portfolios. Ooi *et al.* (2011) suggest that newly listed REITs can increase stockholder wealth by acquiring a number of properties.

In terms of research on the wealth effects of land auctions, there are numerous studies which suggest that a successful land acquisition benefits the bidders' stock performances. For example, Ching and Fu (2003) and Ooi and Sirmans (2004) find that the announcements of successful land acquisitions resulted in positive abnormal returns for the acquiring companies. Ching and Fu (2003) further find that the expected abnormal returns are positively related with site values and the government's land disposal levels, but negatively related with property market liquidity. Ooi and Sirmans (2004) attribute the expected abnormal returns to corporate characteristics, including the

debt ratios and business foci of the winning bidders. Ma and Chen (2011) investigate how several factors relating to real estate affect the performance of land auctions, specifically looking at behavioral, informative, and fundamental characteristics of real estate.

In addition to the foregoing, the contestable market theory developed by Baumol *et al.* (1982) holds that existing firms only earn zero profit in a perfectly contestable market, whereas economic profits can accrue to existing firms in an imperfectly contestable market. Ching and Fu (2003) are the first to apply the theory of the contestable market to land acquisitions, and their empirical results show evidence of positive expected abnormal returns, revealing that Hong Kong's land market may not be a contestable market.

3. LAND AUCTIONS IN TAIWAN AND DATA COLLECTION

By the end of 2001, Taiwan's government had loosened the regulations governing national lands, especially for non-public usage lands. Accordingly, in 2002, the Taiwan government carried out open auctions using first-price sealed-bids (FPSB) auctions to dispose of national lands. Land auctions attracted a lot of companies to bid on large size plots of national non-public usage land in urban areas in Taiwan[2]. Subsequent gains from the disposal of non-public usage lands have seen a dramatic growth during the period 2004-2009 (see Figure 1). Most of the national non-public usage land sold by the NPA in the past years has fallen into the hands of Taiwanese financial groups or construction firms. Consequently, bidding prices have continued to set records, leading citizens to grumble about unbearable housing prices. The average house price in Taipei City skyrocketed 200% from 2006 to 2009, according to Sinyi Realty, Taiwan's biggest real estate brokerage.

Taiwan's government, in an attempt to alleviate public complaints over high housing prices, decided to hold off on the auctioning of national lands in Taipei City's most prestigious areas, deterring bids from contributing to soaring real estate prices[3]. Thus, the NPA announced that all bidding on national non-public usage lands in Taipei City would be put on hold. Specifically, the NPA announced it would follow the policy of selling small pieces (i.e., less than 500 pings) of land, but keeping the larger ones for the future[4].

[2] According to Article 4 of National Property Act, National land in Taiwan is divided into two categories: public and non-public. The former is managed by the organizations which directly use it; the National Property Administration (NPA) is in charge of the latter. To increase financial revenues and the utilization efficiency of national land, the NPA largely disposed of national non-public usage land by means of tenders from 2004 to 2009.

[3] In February 2010, a 121-ping (one ping equals 3.3 square meters) plot of national non-public usage land in Taipei City was sold for NT$731 million (US$ 22.74 million) at land auction. This transaction set a record for the second-highest unit price (i.e., more than NT$ 6 million per ping) in Taiwan. The record-high price drew criticism from legislators, scholars, and the public.

[4] An amendment to the National Property Act will, in the meantime, keep the ban on the sale of 500-ping or above parcels owned by the state and reserved for non-public usage.

In the present study, land in Taipei city is specifically analyzed because Taipei is the capital of Taiwan and is a leading area in terms of economic development. Specifically, the amount of available land in Taipei is gradually decreasing. Another reason for focusing on Taipei is that trading information of other cities' land auctions is neither as readily available, nor as transparent.

4. METHODOLOGY

This study employs the event study methodology to examine the market reactions to land acquisition announcements in the auctions. A seemingly unrelated regressions (SUR) is for measuring the abnormal returns surrounding the closing date of the land auctions, which is regarded as day 0 in the event study. The study employs a five-day event window around each event (-1, 0, +1, +2, +3 days) relative to the auction date to measure the cumulative abnormal returns, where the five-day window captures the market reactions on the auction date as well as any reactions that may occur on the previous or subsequent days. For comparing with Hong Kong and Singapore, and following the work of Ooi and Sirmans (2004) and Ching and Fu (2003) this study employs the same estimation window of –100 days to +30 days that these previous studies use. The SUR model used in our analysis is:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \sum_{k=1}^{kj}\sum_{e=-1}^{3}\gamma_{kj} D_{ekt} + \varepsilon_{jt} \qquad (1)$$

where R_{jt} and R_{mt} are the period-t returns on the bidder j and the market portfolio, respectively. Empirical value of parameter γ_{ek} is abnormal return or the prediction error for the corresponding day. The coefficients α_j and β_j are the seemingly unrelated regressions' estimates, and ε_{jt} is the residual error of *i.i.d.* normal distribution with a zero mean and a constant variance. K is the number of auction events, while D_{ek} is a dummy variable equal to zero for all the dates, except that it equals unity on the e-th day of the k-th event window.

To test whether the measured abnormal returns are statistically significant, we construct the J_1 and J_2 statistics for the e-th day of all the event windows as detailed in Campbell *et al.* (1996):

$$J_{1,e} = \left(\sum_{i=1}^{W}\sum_{k=1}^{kj}\sigma_{ei}^2\right)^{-\frac{1}{2}}\sum_{i=1}^{W}\sum_{k=1}^{k_i}\gamma_{eki} \qquad (2)$$

$$J_{2,e} = N^{-\frac{1}{2}}\sum_{i=1}^{W}\sum_{k=1}^{k_i}\frac{\gamma_{eki}}{\sigma_{eki}} \qquad (3)$$

Where σ_{eki} is the standard error of the abnormal return estimate λ_{eki}. Our sample consists of 63 estimation equations (W = 63) and 76 events ($N = \sum_{i=1}^{W} K_i = 63$). Under the null hypothesis, the abnormal returns follow a zero-mean normal distribution, and both J_1 and J_2 statistics have an approximate standard normal distribution.

To test the above-mentioned issues relating to land acquisitions and wealth effects, we collected data about land auction events from the NPA website and from numerous local major newspaper databanks. The sample period of the land auctions is from January 1996 to December

2009. The processes of data collection and sample selection are follows. First, this study discarded auctioned sites acquired by natural persons, non-publicly traded companies, and foreign companies because these successful bidders provide no data in terms of public stock trading on Taiwan equity markets. Second, for the original 102 auction events in the sample in cases where a single bidder successfully win more than one site on the same day, these events are incorporated into one event, and the values of all the sites obtained by that bidder are summed up. Finally, due to missing data and incomplete sample, we remove 26 events. As a result, the final sample consists of 76 land auctions. There are 48 sites zoned for residential developments, 25 for commercial developments, and 3 for mixed-use housing developments. These 76 land auctions involved 27 different successful bidders. The winning firms in our sample can be divided into two groups: financial companies and construction companies.

We downloaded daily securities return data for the bidders, other related industrial firms, and the stock market index from the Taiwan Economic Journal (TEJ) Databank. *Return* on Taiwan Stock Exchange Capitalization Weighted Stock Index is used as the *proxy* for *market portfolio return,* which comprised all the stocks listed on the Taiwan Stock Exchange. An examination is also conducted to ensure that the firms did not release any other significant corporate announcements on the event day.

5. EMPIRICAL RESULTS AND DISCUSSIONS

This study analyzes the short-run wealth effects of real estate firms and financial companies following the land auction events in Taiwanese land markets. Both ARs and CARs are calculated to examine the wealth effects, the contestable market theory, the risk effects, and the determinants regarding land auction events.

Taiwanese stock market positively responses to land acquisitions for successful bidders. The abnormal returns surrounding the auction date for the sample of 76 land auctions are set out in Table 1, in which the abnormal returns of the winning bidders and all other construction firms (non-winning bidders) appear in Panels A and B, respectively. First, at the single day level, on day previous to the land auctions (i.e., day -1), the average ARs(-1) is +0.466%. Such a significant pre-announcement response on day -1 (J_1 and J_2 reach a statically significant) suggests the possibility of information leakage of the land auction announcements, implying that investors can forecast possible winners through news releases about public auction events. Second, the average abnormal returns for day 0 and day 1 (i.e., ARs(0) and ARs(1)) are +0.368% and +1.029%, respectively. The average ARs(2) and ARs(3) are +0.493% and +0.207% for day 2 and 3, respectively. Third, the occurrence rates of positive abnormal returns are recorded on day 1 (69.33%), day 2 (57.89%), and day -1 (57.89%). Fourth, except for day +3, both J_1 and J_2 statistics reject the null hypothesis, indicating that the expected economic profits around the auction day are statistically significant. In sum, there are wealth effects for the winning companies following the announcement of successful land acquisitions.

Specifically, the strongest market reaction appears on day 1 rather than on day 0. That is, the largely positive ARs appearing after the announcement day can be explained by the fact that some auction events are transacted after the end of the trading day, in which case the equity market's reactions are delayed until the following trading day. There are several reasons for this delayed market reaction. First, since February 23, 2006, The NPA has changed the *bid opening* time from 10 a.m. to 2:30 p.m. on the auction date. However, the daily transactions in Taiwan's equity market close at 1:30 p.m. Thus, the stock prices do not immediately respond to land acquisition results until the next day. Second, prior to 2006, even though the bid opening time began at 10 a.m., stock prices usually responded to the land acquisition on the auction day in cases where a sole bidder submitted a bid. If the number of bidders increased significantly, the bid opening process took a long time, and stock prices did not respond to the land acquisitions immediately. Third, stock trading in the *Taiwan Stock Exchange* is *constrained by price limits*, leading to slow down the process of price *adjustments.* Overall, market responses to successful land acquisition announcements are delayed in Taiwan's equity markets. Therefore, it is not surprising that day 1 has the highest occurrence rate of positive abnormal returns.

Second issue concerns the intra-industry effects surrounding land auctions, which requires an analysis of the stock price reactions of the real estate construction industry to successful land bid announcements. To test intra-industry effects and avoid potential inaccuracy Ooi and Sirmans (2004) we formulated a portfolio of the real estate construction firms representing the building material and construction sector that are publicly listed on the Taiwan stock markets, excluding successful bidders for the land auction. We adopted the same estimation method for measuring the abnormal returns for the real estate industry portfolio as for the winning firm portfolio.

Panel B of Table 1 shows the empirical results of examining intra-industry contagion effects. First, the mean ARs on day 1 are the highest, at +0.241%, and reach *statistical significance*. Second, if we expand the event window to encompass two days (day 0 to 1), the portfolio of the real estate industry obtains CARs (0,1) of 0.406%. Based on the statistical tests of both J_1 and J_2 statistics, we conclude that positive abnormal returns result for the industry portfolio, surrounding the auction day. Our results suggest that the announcements of successful land bids have a positive impact on the stock prices of the winning firms as well as on other construction firms in the Taiwan real estate industry. That is, Taiwan's real estate construction industry shows an obvious contagion effect. This stands in contrast to Singapore and Hong Kong, where successful land acquisitions are found to have no contagion effect.

Next, we compare the abnormal returns and cumulative abnormal returns of the winning firms for Taiwan, Hong Kong, and Singapore, all of which are summarized in Table 2. The data for Hong Kong and Singapore are gathered by Ching and Fu (2003) and Ooi and Sirmans (2004). During the event window (day -1 to 3), Taiwanese winning firms obtain the highest CARs, at 2.563%, followed by Singaporean winning firms (1.019%) and Hong Kong' winning firms (0.33%). All estimated CARs are statistically significant. The results reflect that the announcements of successful land acquisitions create positive value for these land markets. In particular, the results

show that the positive cumulative returns of Taiwan winning bid firms are the strongest and most significant of the three. Possible explanations are the fact that Taiwan did not release large plots of national non-public usage land until 2001, and that the NPA has been promoting operational and utilization efficiency of national lands by means of public auctions since 2002. Moreover, obtaining lands in urban areas has become more difficult in recent years, and the bidding for national non-public usage land in Taipei City has become a shortcut to wealth of real estate firms and financial companies. In short, the stock market shows a strong, positive, and significant response for the winners of land auctions.

In addition, prior studies on land acquisitions (Ching and Fu, 2003; Ooi and Sirmans, 2004) have presented their empirical results based on the auction-day abnormal return estimates (i.e., ARs(0)) rather than on the event-window cumulative average abnormal return estimates (i.e., CARs). However, Campbell *et al.* (1996) suggest that the length of the event window should be expanded to two days (i.e., CARs(0,+1), to comprise the auction day and the day after the auction day) to capture the total expected economic profits from the land acquisitions. By doing so, Taiwanese winning firms still obtain the highest CARs(0,1) of 1.397%, followed by Singaporean winning firms (0.703%) and Hong Kong winning firms (0.17%). According to the above empirical results, the Taiwanese land market is more imperfectly contestable than both Singapore's and Hong Kong's land markets, since the equity market forecast shows that land acquisitions from public auctions can make a larger and more significant profit for Taiwanese land markets.

Next, the article presents the descriptive statistics and correlations of the numerous measures in Table 3, in which Panel A tabulates the mean values of CARs(-1,+3), the number of bidders for each land auction, the reserve price, the price markup (the ratio of the winning bid to the starting bid), and the land size. The CARs range from -11.18% to 28.82%, the mean CARs is 2.56%, and standard deviation is 6.96%. With regard to the number of bidders, it varies from 1 to 30. The reserve price averages NT$1,530 million, ranging from NT$50.4 million to NT$ 0,330 million for these land auctions. The price markup ranges from 1 to 3.71 and averages 1.69. The land size, measured by ping (i.e., one ping equals 3.3 square meters), ranges from 102 to 9175 ping, and averages 1174.61 ping. These descriptions provide brief outline about Taiwanese land auction.

Panel B of Table 3 presents the paired-wise correlation matrix between the cumulative abnormal returns and four characteristics of the land auctions. We find a positive and significant relation between CARs and the reserve price (ρ = 0.249, p-value = 0.03). Similarly, there is a positive correlation between CARs and land size (ρ = 0.310, p-value = 0.006). The results reflect that large land plots in Taipei City are becoming increasingly unavailable, and there is a limited amount of land with a suitable size for developments. An auction of a larger tract of land can therefore be expected to create a rare opportunity for developers to enjoy a high economic profit, which is consistent with Ching and Fu (2003) empirical results in Hong Kong land markets. Additionally, the correlation matrix reports a strong inverse relationship between the reserve price and the number of bidders (i.e., ρ = -0.385), and shows that land size is also negatively correlated

with the number of bidders (i.e., ρ = -0.316), revealing that small sites could attract many bids because small sites have lower entry barriers.

Based on the dynamics of the first-price sealed-bid auction developed by McAfee and McMillan (1987) competition conditions have an influence on the economic profits of the successful bidders. An increase in the bidder numbers tends to induce an increasing rate of price markup. That is, the successful bidders will still enjoy the economic profits, but the economic profits will be smaller. Our empirical results indicate that the rate of price markup is positively correlated with the bidder numbers (i.e., ρ = 0.624), indicating that the auction land markup price offered by bidders is affected by the competitive conditions. Additionally, the reserve price is positively correlated to the land size. The larger the land area, the higher the reserve price is, as would be expected.

We now focus on how the development risk affects the market reactions to land auctions. Using land size as a proxy for the degree of development risk, we divide our sample into two groups according to the size of the plot of land to be auctioned. A large-scale site auction requires bidders to take a greater development risk (Tse *et al.*, 2001). If the successful bidders' auctioned land size exceeds 600 pings, the winners are classified as belonging to the "High-risk group", whereas the "Low-risk group" is comprised of those winners where the auctioned land is less than 600 pings. Table 4 indicates that the average cumulative abnormal returns CARs (-1,+3) for the firms in the high-risk group is significantly higher (4.155%) than for those in the low-risk group (0.398%). That is, the winning developers of large-scale sites enjoy higher abnormal returns since they bear more development risk. The average winning bid of sites purchased by high-risk group firms also tends to be higher (NT$ 3,482 million) when compared to the average winning bid for sites purchased by the low-risk group's firms (NT$ 619 million). Obviously, a large-scale development carries a greater risk, and therefore requires a relatively higher return to compensate for it. This reveals the fact that large-scale development projects have delivered a proportionate yield to those who invested in them.

To answer the question of what factors affect the winning firms' economic profits, we run six multivariate regressions. Table 6 presents the results of the regressions of cumulative abnormal returns CARs (-1,+3) on the set of the explanatory variables described in Table 5. The coefficient estimates with the ordinary least square (OLS) regressions are shown in columns 1, 3, and 5 and the weighted least square (WLS) regressions are in columns 2, 4, and 6. The first and second regressions include seven explanatory variables; the reserve price, the number of bidders, the price markup, the property focus, the firm size (i.e., ln(capitalization)), the sale agency, and the market factors.

As predicted, a higher reserve price appears to be accompanied by a greater risk, and therefore provides higher economic profits, which is consistent with the findings of Ching and Fu (2003) in the Hong Kong land auction markets. As noted above, the reserve price strongly relates with the land size, so we further used the land size in place of the reserve price. In the third and fourth regressions of Table 6, the coefficient of land size is found to be significant at the 1% significance

level, suggesting that the bidders undertaking development of a relatively large sized plot of land bear a high development risk, and accept a higher abnormal return from such projects.

The last two columns in Table 6 present the empirical results of the market reactions to the NPA of Taiwan banning the sale of land plots of 500 pings or larger. If a plot measures more than 500 ping, we regard it as belonging to the larger site group (i.e., dummy = 1), whereas plots of less than 500 pings are categorized as belonging to the smaller site group. The results show that the estimate of the large site dummy is positive and statistically significant, which indicates this variable affects abnormal returns surrounding the date of land auctions. Market investors give high evaluations to larger size plots of land being auctioned, reflecting that the operation of the reserve policy means that winning bidders are able to acquire larger parcels of land before the new land regulation come into effect.

From regressions 1 to 6, the coefficient estimates of the market factor are significant at the 1% level, revealing that the abnormal returns are positively related to the market factor. In other words, a prosperous market atmosphere (i.e., measured in terms of the percentage change in the building material and construction index over the previous month prior to the land auctions) benefits the market valuations for the winners' stock during the event window periods. Thus, the market factor is important for determining winners' stock prices in the window surrounding the land auctions.

Additionally, we analyze how the winner bidders' characteristics affect market reactions. Ooi and Sirmans (2004) find that companies that focus on property development enjoy higher economic profits, in Singapore. In Taiwan, financial companies (i.e., insurance firms, banks, and security investment companies) do not focus exclusively on property development; however, they can still participate in this activity and enjoy the economic profits. While actual real estate construction companies have comparative advantages in the major stages of the operations that consist of land development, planning and design, construction and delivery of the finished buildings, the financial companies can lower their costs by applying their own finance capabilities to the land auction activities. In our empirical results, the results of a comparison of market reactions between financial companies and real estate firms (i.e., focusing on the difference of the property lines) are statistically insignificant.

Similarly, the other explanatory variables including the number of bidders, price markup, firm size, and sale agency are all statistically insignificant in determining the economic profits of a firm. Therefore, the main determinants of market responses for these successful bidding firms are the market factor, reserve price, and the land sites, rather than the characteristics of the successful bidders themselves.

6. CONCLUSIONS

Literature on the short-run market reactions of successful bidders in land auctions suggests that the winning firms experienced significantly positive abnormal returns around an auction date in both Hong Kong and Singapore. This paper provides additional evidence of land auctions by examining Taiwanese market reactions. Consistent with the findings of Ooi and Sirmans (2004)

and Ching and Fu (2003) in empirical examinations of land auction markets, empirical results show positive abnormal returns for the successful bidders in Taiwan public land auctions, implying that a positive economic profit can be obtained from the announcements of land acquisitions, and revealing that the urban land market is not imperfectly contestable in Taiwan. In addition, in Taiwan, successful land acquisition has a contagion effect on other firms in the same industry, which is a unique characteristic of the stock market in Taiwan; such a contagion effect is not found in the cases of Hong Kong and Singapore. Controlling for other variables, we find that the economic profits from land acquisition tend to be higher when the auctioned site is more expensive and the land area itself is larger. The main determinants of the economic profits are the market conditions, reserve price, and the attributes of the land sites, rather than the characteristics of the successful bidders themselves. These findings reveal that the land size and the market atmosphere are the more important for affecting economic profits from land auctions.

Overall, this study provides three additional observations, comparing to the studies of market reactions to land auctions of Hong Kong and Singapore. A stronger market reaction than that seen in either Hong Kong or Singapore, an obvious intra-industry contagion effect, and several important different determinants regarding land auctions have been shown to exist in Taiwan.

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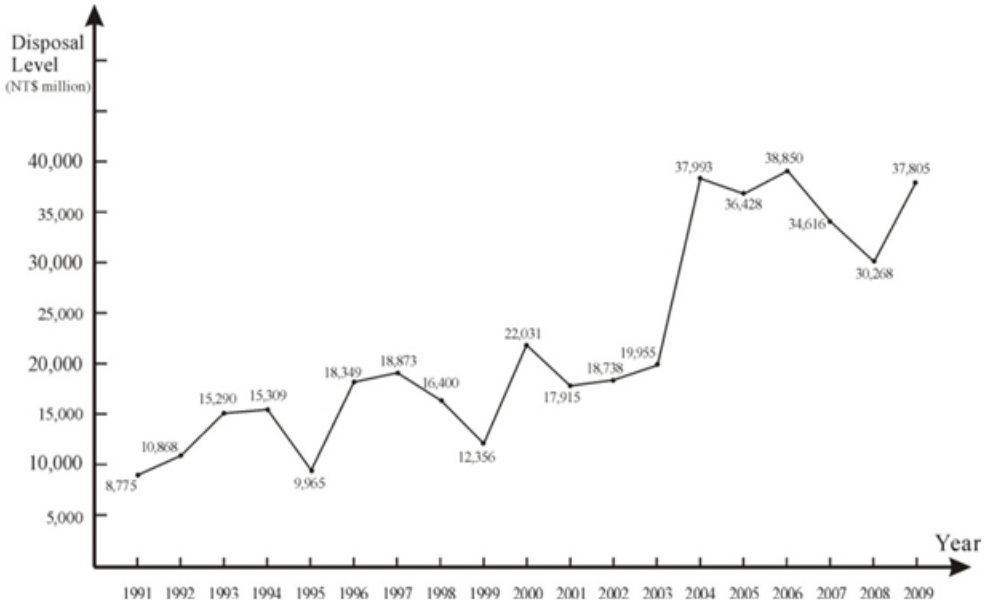

Figure-1. Taiwan national lands disposals. The vertical axis shows the disposal level (NT$ million) of national lands. The data is downloaded from the annual reports of Taiwan NPA.

Table-1. Abnormal returns around the event day of land auctions

	Day of Event Window				
Panel A: Winning bidders	-1	0	1	2	3
mean (%)	0.466	0.368	1.029	0.493	0.207
median (%)	0.157	0.332	0.707	0.284	-0.422
SD (%)	2.537	2.398	2.344	2.822	3.139
positive (%)	57.89	52.63	69.33	57.89	43.42
J_1 Statistic	3.722	2.942	8.223	3.937	1.655
J_2 Statistic	3.724	2.787	8.423	4.061	1.077
Panel B: Real estate construction firms					
mean (%)	0.111	0.165	0.241	-0.081	0.052
median (%)	0.174	0.112	0.011	-0.081	-0.022
SD (%)	1.657	1.819	1.946	1.921	1.921
positive (%)	56.06	57.58	50.00	45.46	45.46
J_1 Statistic	1.072	1.592	2.315	-0.785	0.505
J_2 Statistic	0.875	1.295	2.175	-0.521	0.356

This table shows the abnormal returns of successful bidders and all publicly listed construction firms in Taiwan for a sample of 76 land auctions.

Table-2. The comparisons of CARs of winning firms between Taiwan, Hong Kong, and Singapore

				Day of Event Window		
	-1	0	1	2	3	CARs(-1,3)
Taiwan	0.466	0.368	1.029	0.493	0.207	2.563
Hong Kong	0.360	0.400	- 0.230	0.100	- 0.300	0.330
Singapore	0.139	0.484	0.22	- 0.129	0.306	1.019

The table compares the CARs of winning firms in land auctions between Taiwan, Hong Kong, and Singapore. The data for Hong Kong and Singapore is drawn from Ching *et al*. (2003) and Ooi *et al*. (2004).

Table-3. Descriptive statistics and correlations among measures

Panel A: Descriptive Statistics				
	Mean	Standard Deviation	Minimum	Maximum
CARs (%)	2.56	6.96	-11.18	28.82
Number of bidders	8.54	7.31	1	30
Reserve price (NT$M)	1,530	2,279	50.4	10,330
Price markup	1.69	0.64	1	3.71
Land size (ping)	1,174.61	1,413.98	102	9,175
Panel B: Correlations among measures				
	CARs	Number of Bidders	Reserve Price	Price Markup
Number of Bidders	- 0.021			
Reserve Price	0.249**	-0.385***		
Price Markup	0.049	0.624***	-0.304**	
Land area	0.310***	-0.316***	0.736***	-0.194

This table lists the summary statistics and the correlations among the variables. *** and ** indicate statistical significance at the 1% and 5% level, respectively, in a two tailed test.

Table-4. Average CARs of land acquisitions and development risks

Group	**Number of Sites**	**Winning Bid (NT$ million)**	**Average CARs (%)**	**T-tests**
High-risk	41	3,482	4.155	2.42***
Low-risk	35	619	0.398	
Total	76	4,101	4.553	

This table reports the number of sites, winning bid (NT$ million), and CARs(-1,+3) in the high-risk group and the low-risk group in terms of development risks.

Table-5. Descriptive statistics and definition of the explanatory variables

Explanatory variables	**Definition**	**Mean**	**Standard Deviation**
Reserve price	The starting bid (NT$ million)	1,530	2,279
No. of bidders	The number of bidders for the site	8.544	7.261
Price markup	The ratio of the winning bid to the starting bid	1.698	0.632
Land Area	Ping is a regular land area measurement in Taiwan 1 ping=3.31 square meters	1174.6	1404.6
Large site	Dummy variable, equals 1 if winning plots are more than 500 pings, and 0 otherwise	0.54	0.501
Property focus	Dummy variable, equals 1 if the winning bidder's main business line is in real estate, and 0 otherwise	0.5	0.503
Firm size	Stock market capitalization of the winning developer on the auction day (NT$ million)	80,367	149,101
Market Factors	The percentage change in the Building Material and Construction index over the previous month prior to the land auction (%) as a measure of market atmosphere	2.21	10.79
Sale agency	Dummy variable equals 1 if the development sites sold by NPA or State-owned enterprises, and 0 represents sold by private sectors	0.75	0.436

Table-6. Determinants of cumulative abnormal returns

	1 OLS	**2 WLS**	**3 OLS**	**4 WLS**	**5 OLS**	**6 WLS**
Constant	-0.869 (-0.121)	-4.884 (-0.744)	-2.358 (-0.335)	-5.903 (-0.907)	-4.304 (-0.588)	-7.875 (-1.229)
Reserve price	0.071 (1.944)**	0.064 (2.198) ***				
Land area			0.001 (2.611)***	0.001 (2.425) **		
Large site					4.988 (3.366)***	4.363 (3.027) ***
No. of bidders	-0.025 (-0.199)	-0.033 (-0.282)	-0.006 (-0.047)	-0.023 (-0.195)	0.014 (0.12)	0.004 (0.033)
Price markup	0.17 (0.011)	0.305 (0.228)	-0.203 (-0.144)	-0.071 (-0.054)	-0.793 (-0.577)	-0.572 (-0.443)
Property focus	1.775 (0.884)	1.857 (1.014)	1.928 (0.979)	2.009 (1.103)	3.18 (1.618)	3.284 (1.67)
Firm size	-0.033 (-0.052)	0.355 (0.635)	0.116 (0.192)	0.502 (0.926)	0.126 (0.216)	0.522 (0.986)
Market factors	0.329 (4.989)***	0.279 (4.893) ***	0.333 (5.216)***	0.289 (5.235) ***	0.346 (5.625)***	0.309 (5.814) ***
Sale agency	1.462 (0.86)	1.165 (0.76)	0.938 (0.558)	0.783 (0.51)	1.893 (1.169)	1.686 (1.131)
R^2	0.344	0.368	0.371	0.377	0.407	0.414
Adjusted R^2	0.28	0.303	0.306	0.313	0.346	0.352
F-value	5.104***	5.662***	5.732***	5.884***	6.664***	6.677***
Number of observations	76	76	76	76	76	76

This table reports the empirical results of the OLS and WLS regressions of CARs(-1,+3). Each regression is based on 76 observations from 1996–2009. *** and ** indicate statistical significance at the 1% and 5% level, respectively, in a two tailed test.