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The Sequence of Sequential Investment and Its Competitive Effect

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Abstract

Differently from a single investment strategy, a sequential investment strategy has the sequence of investments and thus time value is inevitably considered in order to analyze the effect of the sequential investment on firm performance. In the paper, the sequential investment strategy of Korean firms in China is analyzed. Due to their geographical closeness, Korean firms' direct investments to China is an eye-catching strategic behavior. A theoretic model is proposed to tackle the effect of Korean firms' Chinese sequential investments. The model predicts three strategic points. First, the sequence of Korean firms' sequential investments is a linear function. Second, an initial investment and follow-investments are reversely associated and, between them, Korean firms' sequential investments are more sensitively associated with follow-up investments. Third, the more the Korean firms are patient, they are more likely to increase the scale of follow-up investments.

Keywords : Sequential Investment, Strategy, Sequence, Ratio, Effect

1. Introduction

1.1. Background

The most distinguishable difference between a single investment strategy and a sequential investment strategy is that the latter has a sequence of investment. For instance, the single investment strategy makes one-shot investment only but the sequential investment is composed of an initial investment and follow-up investments.

An easily noticeable business strategy of Korean firms, amongst those actively penetrating into Chinese market, is that they prefer sequential investments [1-3] and small- and mid-size firms attempt to invest in China [4]. [5] points out that Korean firms such strategic option is appraised by small-and mid-size firms as a majority of them have taken advantage of the sequence of the sequential investment strategy enjoying China's rapid growth [6].

From the perspective of Korean firms, the sequence of the sequential investment strategy

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provide some strategic advantages. First, they are able to construct portfolios in China as they can have rooms to diversify their business structures through follow-up investments while sharing knowledge [7-9]. Second, between the intervals of subsequent investments in the sequence of the sequential investment strategy, Korean firms can take advantage of market know-how's. [10] points out that the newness of experience in local markets is moderately associated with sequential investments.

Third, Korean firms can circumvent tied-in effect through sequential investments. Actually, this advantage originates from time interval associated with a sequential investment strategy. If Korean firms make one-shot large investments only, then they are tied in the large investments. LG electronics that was tied in feature phone business during the rapid transition to smart phone is a good example for such tied-in effect. By follow-up investments, Korean firms can adjust production scale while tracking market transition.

This paper would like to analyze how the sequence of sequential investment strategy affect Korean firms strategic decisions to earn competitive strategic advantages from their strategic investments. For this purpose, a Cournot type quantity competition model is constructed.

1.2. Main Issues

Three important questions are highlighted with Korean firms' sequential investments in China. First, it is under curiosity how they mix initial investments and follow-up investments. The sequence of sequential investment is obviously begun by intial investments and then follow-up investments eventually become to produce long-term production effects. At the meanwhile, how to mix the scale of initial investments and follow-up investments become to be the key success factor as large-scale initial investments can cause tied-in effect anyway. Also, small-scale initial investments can deteriorate Korean parents' intentions to stay longer in Chinese markets.

Second, it should be tackled if intial investments and follow-up investments are reversely related or positively related. they are positively related, the larger the initial investments are done, the larger the follow-up investments will be and vice versa [11]. If the model can identify how they are associated, then one can easily predict what will be the scale of follow-up investments once initial investments are determined. Third, a sequential investment strategy is generically associated with future value as it is a conditional event given an initial investment. As follow-up investments overlap, Korean firms' patience becomes to affect the length of sequential investment strategy. The theoretic model is designed to answer the three

questions

The Empirical works of the paper examine three key variables. First, it is tested if Korean firms' sequential investments affect their performance. Second, it is tested how the size of Chinese subsidiary investment affect Korean firms' performance as well. Third, the market know-how's of Korean firms are also under curiosity and thus it is gauged they affect Korean firms performance. This paper is organized as follows. Section 2 constructs a theoretic model and provide theoretic predictions on the impact of the sequence of Korean firm's Chinese sequential investments. Section 3 proposes empirical framework along to empirical results. Section 4 summarizes main findings and provides strategic implications.

2. The Sequence of Sequential Investments

2.1 Quantities

j is a local Chinese firm and i is a Korean firm that has penetrated into Chinese market. Both i and j are involved in Cournot type quantity competition. Both firms' technology is measured by the marginal cost of c. For the convenience, their marginal costs are assumed to be identical.

The production of j in equilibrium is defined as Q^j and that of i is defined as Q^i. The inverse demand curve is given to $p = a - Q^i - Q^j$ and a represents market size. Under Cournot competition, i and j have to maximize own profit, which induces their own productions. Under the same marginal cost, i and j solve the maximization problems given to (1) and (2), which produce Q^{i*} and Q^{j*}.

$$\max_{Q^i}(p-c)Q^i \tag{1}$$

$$\max_{Q^j}(p-c)Q^j \tag{2}$$

The productions of i and j in equilibrium is derived as $Q^{i*} = \frac{a-c}{3}$ and $Q^{j*} = \frac{a-c}{3}$, respectively. However, the competitive strategies fo i and j are idiosyncratic; i that needs to penetrate into Chinese through direct investments is supposed to set up sequential investment plans rather than pursuing an one-shot heavy investment. It is a more efficient way to create business portfolios to diversify investment risks. In contrast, j invests one-time investment only. Thus, i's portfolio investment by timing is defined as a sequential investment strategy.

In the model, i and j competes during $t=0,\cdots,n$. At $t=0$, i produces q_0^i and does q_1^i at $t=1$. Sequential investments at $t=0$ and $t=1$ are defined as (3) and it contains an important strategic implication. If $q_0^i+q_1^i \geq Q^{i*}$, then i can dominate j easily. (3) indicates the condition where i can compete against j through the sequence of the sequential investment strategy. If i can compete against j under (3), then one can say that Korean firms are able to compete effectively in Chinese markets.

$$Q^{j*} > q_0^i + q_1^i \tag{3}$$

2.2 The Sequence of a Sequential Investment Strategy

[12] considers when sequential investments can have lags behind of an initial investment, but, in the paper, a follow-up investment is assumed to be subsequent to an initial investment. j produces Q_0^{j*} in each t but i's sequential investment strategy follows the sequence of $q_0^i=\alpha Q^{i*}$ at $t=0$ and $q_0^i=\beta Q^{i*}$ at $t=1$. From $t=2$, j produces $q_0^i+q_1^i$.

Differently from [13] who considers a cancellation option *ex post* an initial investment has been invested , such cancellation option is not allowed in the model because a majority of Korean firms in China have recorded follow-up investments. A discount rate is given to r and so the discount factor is defined as $\delta=\frac{1}{1+r}$. The present value of i is rewritten as (4) and that of j rewritten as (5).

$$\alpha Q^{i*} + \frac{\delta-\delta^n}{1-\delta}\beta Q^{i*} \tag{4}$$

$$\frac{1-\delta^n}{1-\delta} Q^{j*} \tag{5}$$

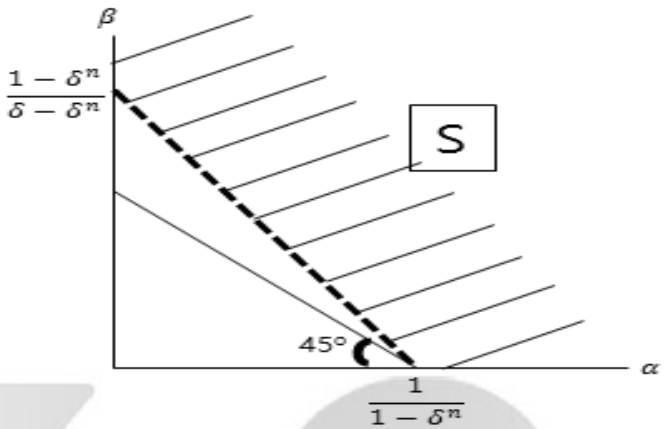
Because i's sequential investment can be evaluated to be effective if (4) is greater than (5) and therefore the likelihood function is defined as (6).

$$\alpha Q^{i*} + \frac{\delta-\delta^n}{1-\delta}\beta Q^{i*} - \frac{1-\delta^n}{1-\delta} Q^{j*} \geq 0 \tag{6}$$

By (1) and (2), $Q^{i*}=Q^{j*}$, which earns (7)

$$\beta \geq \frac{(1-\alpha)(1-\delta^n)}{\delta-\delta^n} \tag{7}$$

Figure 1 depicts the feasible set of implementable sequential investment. In fact, i can implement sequential investments in the area pointed to be 'S'. All the combinations of α and β in 'S' are implementable sequences of i's sequential investment strategy.



[Fig. 1] The Feasible Sequential Investment Strategy

Proposition 1 reveals that the combinations of the initial investment and the follow-up investment are linearly related, which opens a strategic pathway for i to implement its own sequential investment strategy easily. As long as the sequence of i's sequential investment is linearly determined, then i is able to prepare a time scheme to maximize the effectiveness of the sequential investment strategy while pursuing portfolio investments.

Proposition 1. *The most effective sequential investment scheme is linearly derived to be* $\beta = \frac{(1-\alpha)(1-\delta^n)}{\delta-\delta^n}$.

Proof. In the area of 'S', all β is a feasible set for the follow-up investment. i under budget constraint have to find out the most efficient way to implement its sequential investment strategy. Thus, i becomes to choose the combination of α and β along the dashed line in Figure 1. *Q.E.D.*

Proposition 2 demonstrates that there does not exist any sequential investment that neither increases nor decreases both α and β simultaneously. In that, if i is intended to increase β,

then i has to decrease α and vice versa.

Proposition 2. *The combination of α and β is reversely related and i responds to β more sensitively when it develops the scheme for the sequential investment strategy.*

Proof. $\frac{\partial\beta}{\partial\alpha}=-\frac{(1-\delta^n)}{\delta-\delta^n}<0$. Because of $(1-\delta^n)>\delta-\delta^n$, the slope of $\beta=\frac{(1-\alpha)(1-\delta^n)}{\delta-\delta^n}$ is less than one. *Q.E.D.*

Proposition 3 clearly demonstrates that Korean parents become to put more weights on β as they pay higher values on future productions. In contrast, they will increase α if they put weights on short-term productions.

Proposition 3. *The more patience i is, it would lower α while increase β.*

Proof. $\frac{\partial\beta}{\partial\delta}=\frac{n\delta^{n-1}(1-\delta)}{(\delta-\delta^n)^2}<0$. *Q.E.D.*

3. Empirical Work

3.1. Model

Empirical equations are given to (8)-(10) and the set of Korean firms that made sequential investments in China is acquired from '*Foreign Operating Korean Firms Directory 2011/12*' publicly available by KOTRA. The list is also used by [1-3][5]. All financial values for (8)-(10) are obtained through *KIS-Value* and each firm's homepage.

The dependent variable y_i is the sales of Korean firms in 2012. i_d and j_d are the dummies that give the value of one if they are listed in KOSPI or KOSDAQ. k_d is the dummy that gives the value of one if they are one of external audited firms. sz_d is also a dummy variable that gives the value of one if Korean firms have invested in special economic zone in China.

Because chinese economic development is driven by Chinese government, special economic zone is a gateway to penetrate into China, Korean firms' investments in special economic zone is an important variable in understanding Korean firm's Chinse investments.

ns_i represents the total number of sequential investments including both initial investments

and follow-up investments and therefore, ns_i is expected to have positive effect the dependent variable. sz_i is the size of Korean firms' Chinese subsidiaries.

sa_i is the total working years of Korean firms since their initial Chinese subsidiary establishment; hence, it is a proxy to measure their know-how's on Chinese markets. lr_i represents labor equipment ratios and ci_i is capital intensities. em_i is the number of total employees that is used to control firms size effect. (8)-(10) are estimated by OLS (ordinary least squares) and coefficients are tested by White standard error to fix heteroscadasticity.

$$y_i = c + i_d + j_d + k_d + sz_d + ns_i + lr_i + ci_i + em_i + e_i \quad (8)$$

$$y_i = c + i_d + j_d + k_d + sz_d + ns_i + sz_i + lr_i + ci_i + em_i + e_i \quad (9)$$

$$y_i = c + i_d + j_d + k_d + sz_d + ns_i + sz_i + sa_i + lr_i + ci_i + em_i + e_i \quad (10)$$

3.2. Empirical Results

Table 1 summarizes empirical results. A noticeable fact is that KOSPI listed firms are not that different from either KOSDAQ listed firms or external audited firms. This result originates from the fact that external audited firms rather than KOSPI listed firms have pursued sequential investment strategy ever since Korean and China began new diplomatic relationship in 1992 [5]. It turns out that Korean firms' investments to special economic zone are irrelevant to their performances.

The number of total sequential investments has significant and positive effect on Korean firm's performance. Thus, it can be said that Korean firms have tracked the most efficient feasible Chinese sequential investment strategy. The size of Chinese subsidiaries show positive effect; however, Korean firms are not able to earn more even if they penentrate Chinese markets earlier.

[Table 1] OLS: The Contribution of Sequential Investments

변수	(1)	(2)	(3)
c	-00.4474*** (0.0216)	-00.5658*** (0.0576)	-00.5453*** (0.0600)
i_d	0.1061*** (0.01415)	0.0936*** (0.0147)	0.1015*** (0.0158)
j_d	0.0877*** (0.0166)	0.0763*** (0.0168)	0.0844*** (0.0169)
k_d	0.1152*** (0.0112)	0.1036*** (0.0126)	0.1122*** (0.0137)

sz_d	-00.0033 (0.0123)	-00.0060 (0.0122)	-00.0057 (0.0122)
ns_i	0.0060** (0.0030)	0.0061** (0.0029)	0.0068** (0.0030)
sz_i	-	0.0095** (0.0047)	0.0097** (0.0047)
sa_i	-	-	-00.0144 (0.0107)
lr_i	0.1618*** (0.0334)	0.1536*** (0.0331)	0.1492** (0.0309)
ci_i	0.0016*** (0.0007)	0.0016** (0.0006)	0.0015*** (0.0007)
em_i	10.0357*** (0.0499)	10.0032*** (0.0543)	10.0023*** (0.0543)
R^2 관측치	00.8918 130	00.8954 130	00.8966 130

1. : *, **, *** are significant at 10%, 5%, and 1%.

4. Conclusion Remarks

The theoretic model of the paper highlighted a very important understanding on sequential investment strategy. An initial investment and follow-up investment are not supported each other. If any Korean firm decided to commit in Chinse market through a large scale initial investment, then it is motivated to invest relatively smaller scale sequential investments afterwards. Rather, a small scale initial investment plays as a momentum to invite large-scale follow-up investments consistently.

According to empirical results, it is no doubt that Korean firms owe to sequential investments. What is a surprising result is that market know-how did not turn out to be significant while the size of subsidiary can significantly enhance Korean parents' performances. Thus, it cannot be supported that the earlier the Korean firms penetrate into Chinese markets, they are more likely to perform better. Rather, the frequency and the scale of direct investments in China become to affect the performance of Korean firms.

This result suggests that large firms are more likely to perform better through sequential investments in the long run even though they may invest less according to the model's predictions. Actually, small- and mid-size firms had lead sequential investments to China but, during 2000s, large Korean firms started to have enlarged the size of sequential investments. Nevertheless, small- and mid- size firms can still take advantage of sequential investments if they are intended to expand the frequency of sequential investments, which enable them to adjust production scales tracking business trends.

This paper limitedly focused on the sequence of sequential investment strategy. In the future, it will be explored how lagged sequential investment strategy can affect Korean firms' performances while constructing a game-theoretic model to scrutinize the impact of lagged sequential investments.

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