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EFFICIENCY CHARACTERISTICS OF TARGET COMPANIES FOR MERGER AND ACQUISITION: EVIDENCE FROM CHINA

There is evidence of the efficiency of takeover target companies in the incipient Chinese market which has several types of mergers and acquisitions (M&A). These include market-driven takeovers, affiliate-predominated takeovers and government-predominated takeovers. This paper is based on the research in the selected major M&A transactions in China after 2005 when share trading regulations were reformed. Data envelopment analysis (DEA) is applied to compute the pre-merger efficiency of target companies. The research findings provide evidence from China to confirm various efficiency characteristics of different types of takeovers and to verify the effect of the market for corporate control (MCC). Our research reflects a planned economy in transformation, and also demonstrates that DEA can be applied to identify the pre-merger efficiency of targets.

Keywords: mergers and acquisitions, data envelopment analysis, efficiency, profitability, corporate control.

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ПОКАЗНИКИ ЕФЕКТИВНОСТІ КОМПАНІЙ – ОБ'ЄКТІВ ЗЛИТТІВ І ПОГЛИНАНЬ (ЗА ДАНИМИ КИТАЮ)

У статті показано, що в Китаї існує декілька типів злиттів і поглинань в залежності від ефективності об'єкту злиття. Можна виділити такі види: поглинання під впливом ринку, афілійовані поглинання і поглинання за участю уряду. Використано дані щодо великих злиттів і поглинань після 2005 р., коли була реформована торгівля акціями. Застосовано аналіз середі функціонування (DEA) для обчислення ефективності компаній-об'єктів до злиття. Результати підтверджують різні характеристики ефективності у різних типів поглинань і вплив ринку корпоративного контролю. Підкреслено риси перехідної планової економіки і те, як аналіз середі функціонування може бути застосовано для вимірювання ефективності компаній – об'єктів поглинань.

Ключові слова: злиття і поглинання, аналіз середі функціонування, ефективність, прибутковість, корпоративний контроль.

Рис. 1. Табл. 2. Літ. 18.

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ПОКАЗАТЕЛИ ЭФФЕКТИВНОСТИ КОМПАНИЙ – ОБЪЕКТОВ СЛИЯНИЙ И ПОГЛОЩЕНИЙ (ПО ДАННЫМ КИТАЯ)

В статье показано, что в Китае существует несколько типов слияний и поглощений в зависимости от эффективности объекта слияния. Можно выделить такие виды: поглощения под влиянием рынка, аффилированные поглощения и поглощения с участием правительства. Используются данные по крупным слияниям и поглощениям после 2005 г., когда была реформирована торговля акциями. Применен анализ среды функционирования (DEA) для вычисления эффективности компаний-объектов до слияния. Результаты подтверждают различные характеристики эффективности у различных типов поглощений и влияние рынка корпоративного контроля. Подчеркнуты черты переходной плановой экономики и то, как анализ среды функционирования может быть применен для измерения эффективности компаний – объектов поглощений.

Ключевые слова: слияния и поглощения, анализ среды функционирования, эффективность, прибыльность, корпоративный контроль.

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1. Introduction.

Beginning in the 20th century mergers and acquisitions (M&A) have been one of the expansion measurement in the modern global economy. To facilitate mergers and acquisitions, researchers have been trying to identify the characteristics of possible takeover companies (Pasiouras et al., 2010). These characteristics of possible takeover companies are also used in other research, e.g. mechanism of the market for corporate control (Manne, 1965; Franks and Mayer, 1996; Dickerson et al., 2002), and especially in M&A predictions (Palepu, 1986; Kim et al., 1998; Tsagkanos et al., 2006; Brar et al., 2009).

Among the important characteristics of target companies is efficiency which is not only used to identify targets, but also in the determination of the market for corporate control (MCC). According to this hypothesis, many mergers probably are the results of a combination of successful MCC implementation and managerial inefficiency. Dickerson et al. (2002) has remarked on one of the conditions for more effective MCC operations. That is, if poorly performing firms are not taken over, then it is an evidence of a MCC malfunction. Therefore, efficiency is one of the key indexes in this takeover mechanism.

Previous studies related to characteristics of target companies are concerned primarily with large corporate controlled markets such as the USA (Palepu, 1986; Kim et al., 1998) and the UK (Franks and Mayer, 1996; Dickerson et al., 2002). These studies, which primarily use the hypothesis of MCC as a theoretical background (Tsagkanos et al., 2006), assume that the takeover mechanism exists to discipline and replace management teams who engage in inefficient behavior (Palepu, 1986; Dickerson et al., 2002; Brar, 2009). Compared to previous studies which focus on large corporate controlled markets, this paper provides new evidence concerning a developing and transforming economy such as China, which is an incipient but heavy transaction market for M&A, and we will focus on studying the efficiency of target companies in the pre-merger stage, and discuss the effect of the takeover mechanism to discipline and replace inefficient management teams.

Fundamentally, China is in transition which is changing from the planned to market economy. During the transition stage Chinese economy is a kaleidoscope of mixed public and private property forms (Stark, 1996), described as "socialist market economy". Therefore, Chinese M&A activity is complex and different from Western countries which operate under market economy. For example, takeovers driven by government-operated firms and private-operated firms coexist at the market. Stakeholders are also keen to participate in transactions with affiliates to maximum their self-interests since the regulations of corporate governance are still developing. In summary, M&A activities in China can be classified into market-driven takeovers and non-market-driven takeovers. The motivation for market-driven takeovers is to growth expansion, which is common in the West. The non-market-driven takeover, which can be classified into government-predominated takeover and affiliate-predominated takeover, is a unique phenomenon in this socialist transforming economy. All the above 3 alternative types of takeovers are evidence of the transformation of the planned market economy in China.

Since the means of takeover in China are diversified, previous studies are insufficient. Researchers are concerned mostly with market-driven takeovers, as they con-

sider that non-market-driven takeovers are not purely M&A, but are restructuring. Moreover, the year 2005 is a milestone in the economic transformation of China, since the government reformed the share trading regulations which releases the restriction of state-owned shares for transaction; however, studies in the period after 2005 are still very limited. The results of these studies show the inefficient and poor performance of target companies, as most of them are shell companies targeted for reverse listing (Li and Zeng, 2003). We can conclude from the findings that target companies are inefficient; however, this conclusion is not consistent with various conditions in Western countries. Another issue in Chinese M&A research is the difficulty on data gathering, hence most studies cover single year rather than a longer period. Our analysis will be different from previous studies since we focus on transactions after 2005; we sample for longer period, and cover the above mentioned 3 types of takeovers in China.

To objectively measure management efficiency is another aspect of our analysis. Previous studies typically adopt various performance indicators to measure the efficiency, i.e. accounting variables (Palepu, 1986; Kim, 1998; Li and Zeng, 2003; Brar, 2009), non-accounting variables (Tsagkanos, 2006), and share prices (Manne, 1965) etc., however, it is unclear which measure is appropriate. Data envelopment analysis (DEA) is a technique used to assess productive efficiency of homogenous operating units (Charnes, Cooper and Rhodes, 1978). As a measurement of objectivity and ability to handle multiple inputs and outputs that can be measured in different units and transformed to a single indicator, DEA is often used for measuring efficiency and performance.

Although DEA is a good tool to measure efficiency and performance, in M&A studies this methodology is often used to evaluate the M&A impact by comparing the performance prior and after M&A (Worthington, 2001; Kwoka and Pollitt, 2010), researches on usage in the pre-merger stage are rare. However, some researchers have noticed this methodology and advocated its use before M&A. Lozano (2010) applies this methodology as a pre-merger planning tool to estimate the expected cost and profit efficiency gains. In contrast to previous studies which use ratio indicators to identify the efficiency of target companies, our study will apply DEA to evaluate the pre-merger efficiency of target companies in non-ratio form.

In comparison with the above mentioned studies, this paper introduces various innovations. In particular, DEA is used to identify the efficiency of target companies. In comparison with ratio analysis which is restricted to a single input and a single output and chose subjectively, DEA handles multiple inputs and outputs which is more objective. Furthermore, this paper provides evidence on the planned economy in transformation such as China, which is an incipient but active market for M&A. Finally, in contrast to previous Chinese studies concerned mostly with market-driven takeovers, this paper will cover market-driven takeovers and non-market-driven takeovers to present evidence of the transformation of the planned market economy in China. It is worth noting that previous literature mostly has shown the characteristics of targets before the reforming of share trading regulations in 2005, which in part reflects the characteristics of target companies in China. Our study will select transactions after 2005 and use a longer period.

The paper is organized as follows: Section II presents the methodology, the data and variables used. Section III demonstrates the empirical findings. In Section IV we evaluate the results.

2. Methodology, Data Set and Variables.

2.1. Methodology. Our study uses DEA to analyze market-driven takeovers, government-predominated takeovers, and affiliate-predominated takeovers, in order to compare the efficiency of target companies. Since China is a planned economy with market mechanism, the decision for input allocation could be influenced by government policies; therefore, output-orientated measures are used, following Farrell's (1957) original ideas. The output-orientated DEA model under constant returns to scale (CRS) is used to find the overall technical efficiency (OTE) scores of target companies in 3 alternative types of transactions. The OTE of each decision-making unit (DMU) is found compared to the companies in the same industry in the same year.

By adding the convexity constraint: $N1'\lambda=1$ to the CRS model, the variable returns to scale (VRS) DEA model is derived, where N is the number of objects and λ is the $N*1$ vector of constants. Note that OTE can be decomposed into the product of VRS technical efficiency (i.e., pure technical efficiency, PTE) and the scale efficiency (SE); that is $OTE=PTE*SE$.

As the value of SE does not indicate whether a firm is operating in an increasing or decreasing returns stage, the VRS DEA model is altered by substituting $N1'\lambda=1$ restriction with $N1'\lambda<1$, in order to judge the stage returns to scale for the DMU (see Coelli et al. 2005, p. 174 for details).

In order to have sufficient discriminating power a DEA model, the number of DMUs should be no less than twice the number of input and output variables (Gao et al., 2002). We used the Mann-Whitney test to examine the difference in efficiency between 3 kinds of takeovers.

2.2. Data Set and Variables. The M&A data are those companies of A-share at Chinese stock market during 2005–2009. Because information about transactions in China is difficult to collect, researchers often obtain data through various channels (e.g., personal databases and economic journals) and select samples subjectively which will limit the comprehensive usage of the data. To overcome this limitation, our study sources information from alternative databases which provide sufficient information for our analysis. The Guo Tai An (GTA) database is the major source of transactions, and the retrieved data is verified by RESSET, TEJ, WIND and CMARC databases. Since the aim is to identify the efficiency of target companies in the pre-merger stage, data of the year $t-1$ is used relative to the merger news for the first announcement year t . Of the 18,594 transaction records in the GTA database, 129 targets of listed companies in Shanghai and Shenzhen Stock Exchange are identified from transactions which have successfully transferred the corporate controls. To isolate exogenous industry effects from the analysis, our study uses employee and fixed assets as our inputs and net sales as our outputs which are industry-wide variables. The data of input and output variables is stemmed from Taiwan Economic Journal (TEJ) Database, and with the reference to GTA and RESSET Database to supplement the missing data.

As our research just focuses on a specific indicator to represent the overall efficiency of the targets, and OTE can reflect the join effect of PTE and SE, therefore,

we choose OTE as the proxy of managerial ability and corporate efficiency indicator in our analysis. The OTE of each target is calculated based on the benchmarked firms with similar industry sectors and size on the same year. Our analysis selects two input variables and one output variable in the DEA model so that the number of DMUs should be no less than 6 in each DEA model. Filtered by the aforementioned rule of thumb on DEA samplings, there are 93 takeover companies remaining, which consist of 49 market-driven takeovers, 15 affiliate-predominated takeovers and 29 government-predominated takeovers.

3. Empirical Results.

This paper employs DEAP software to analyze the corporate efficiency of Chinese listed companies before takeovers during 2005–2009. Figure 1 presents the empirical findings of the scale of efficiency on the 3 types of takeovers. The results show that the majority of target companies, either market-driven takeover or non-market-driven takeovers, manifest a DRS stage, which indicates that those companies are too large to operate effectively. In order to operate at the most productive scale size, targets exhibiting DRS should scale down its operations.

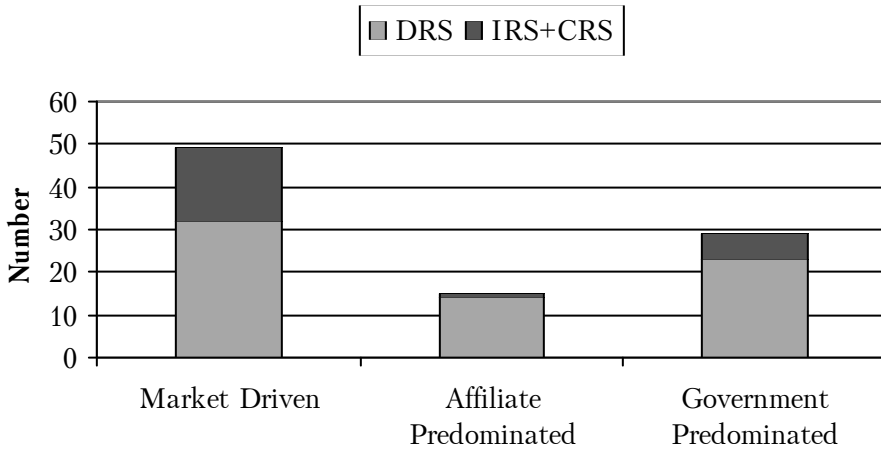


Figure 1. Scale Efficiency of Different Types of M&A

OTE is defined as the corporate efficiency indicator, and the average OTE of DMUs is used as the efficiency benchmark of peers. If OTE of a target company is lower than this benchmark, then it is defined as underperforming and inefficient. Here we also use one standard deviation (SD) of the OTE of DMU as a cutoff point. If OTE of a target company is lower than AVE minus SD, it is defined as extremely underperforming and inefficient. For all takeover companies in Table 1, 54% of them are underperforming in the peer group, however, only 10% fall under the range of extreme inefficiency. The result reveals that those drastically underperforming and inefficient targets are not suited to acquirers' specifications. When the sample is breakdown into 3 types, the results are diversified. The efficiency of target companies in the affiliate-predominated takeovers are the worst among the 3 types of transactions. As we mention previously companies are difficult to list at Chinese stock market, stakeholders would rather make an affiliate transaction to acquire the targets rather than abandon the control right.

Targets of government-predominated takeovers are the best in efficiency, since only 34% of targets are underperforming in their peer group. Essentially, state-owned enterprises dominate business development in China, and most of them are superior to private companies, therefore, the efficiency of government-predominated targets are higher than their peers. Although Chinese economy is retracking from the planned economy to a market one, it is still predominately a planned economy. Most transactions are controlled by the government and not driven by market but by a plan.

The efficiency of target companies in market-driven takeovers is between the previous 2 types of takeovers. On average 57% are underperforming relative to their industry peers, which does not mean that targets are necessarily inefficient. This result is in line with many other studies which have not found poor performance to be a reason for takeovers (Franks and Mayer, 1996). Of the sample, 19% are at the IRS or CRS stage, which indicates those companies either operate under most productive scale sizes or should expand their operation to become scale efficient.

In the context of the above findings on efficiency which will be the proxy of managerial ability, there is no significant evidence of the effective takeover mechanism in China based on the result of all takeovers. This is in line with the view that there is usually not significant evidence of the takeover mechanism in a transforming economy (Zhang, 2008). However, when we breakdown takeovers into the aforementioned 3 different types, the results are diversified. Target companies of the affiliate-predominated takeovers are the most inefficient among the 3. About 80% are below the average efficiency. For other 2 types of takeovers, there are no significant signals on the inefficiency of targets. In summary, following the analysis of Dickerson et al. (2002), we conclude that in China the takeover mechanism of the affiliated transaction can truly discipline and replace inefficient management teams. The above diversified findings present evidence of transformation of a planned market economy in China.

Table 1. The Efficiency and Economic Scale Stage of Different Transactions

Types	Ave OTE (a)	OTE < Ave OTE (b), %	DRS%	OTE < Ave- SD (c), %	DRS%
Market-Driven	0.44	57	81	10	60
Affiliate-Predominated	0.29	80	91	7	100
Government-Predominated	0.59	34	100	14	100
All Samples	0.46	54	88	11	80

Note: (a) The value of average OTE (Ave OTE) is to average OTE of targets within each group.

(b) The average OTE of DMU in the same industry in the same year.

(c) The standard deviation (SD) of the OTE of DMU in the same industry in the same year.

Table 2 shows the P-values of the Mann-Whitney test of corporate efficiency between the 3 types of M&A. The P-values represents a significant gap between different types. The result shows a significant difference in government-predominated takeovers compared to the other two types of transactions. As the average OTE of government-predominated takeovers are higher than other two types, we can conclude

that the efficiency of targets from government-predominated takeovers are significantly higher than others, which is in line with the fact that the state dominates and allocates profitable resources in the socialist economy.

Table 2. The Mann-Whitney test of efficiencies between 3 types of M&As

Pair	n_1	n_2	U	P
Market-Driven vs. Affiliate-Predominated	49	15	466.5	0.117924*
Market-Driven vs. Government-Predominated	49	29	907.5	0.041812**
Affiliate-Predominated vs. Government-Predominated	29	15	343.0	0.001538***

Note: * - represents significance at the 10% level;

** - represents significance at the 5%;

*** - represents significance at the 1% level.

4. Conclusion.

Our paper, in an effort to add to the research literature on takeover target identification, has switched the investigation of this specific issue from large corporate controlled markets to a planned economy in transformation such as China. In contrast to previous Chinese studies concerning mostly market-driven takeovers, this paper covers market-driven takeovers and non-market-driven takeovers to present evidence of the transformation of the planned market economy in China. Moreover, DEA is used to identify the characteristics of efficiency of target companies before M&A, and this efficiency indicator is used to analyze the effect of the takeover mechanism on disciplining and replacing inefficient management teams. Within this framework, the research findings confirm the diversified characteristics of efficiency on different type takeovers. The target companies of government-predominated takeovers are the most efficient among the 3, which reflects the fact that the state dominates and allocates profitable resources in the socialist economy. Targets of affiliate-predominated takeovers are the most inefficient, however, this types of M&A appears to confirm the viewpoint of MCC on the takeover mechanism of disciplining and replacing inefficient management teams. The result on market-driven takeovers is in line with many other studies which have not found poor performance to be a reason for takeovers.

Our study demonstrates that DEA can be applied to identify the pre-merger efficiency of targets, which could be enhanced as a target searching tool before M&A. In more general terms, our study has made the effort to integrate certain new data and methods into the analysis of the M&A compared to that used in previous studies. These findings can be also used with reference to other countries with a transforming economy.

Acknowledgements. *This research is supported by the Ministry of Education of China, Humanities and Social Science Project (No.08JC630003).*

References:

Brar, G., Giamouridis, D., Liodakis, M. (2009). Predicting European Takeover Targets. *European Financial Management*, 15(2): 430–450.

Charnes, A., Cooper, W., Rhodes, E. (1978). Measuring Efficiency of Decision-Making Units. *European Journal of Operational Research*, 2: 429–44.

- Coelli, T. J., Rao, D. S. P., O'Donnell, C. J., Battese, G. E.* (2005). *An Introduction to Efficiency and Productivity Analysis*, 2nd ed., New York: Springer.
- Dickerson, A. P., Gibson, H. D., Tsakalotos, E.* (2002). Takeover Risk and the Market for Corporate Control: the Experience of British Firms in the 1970s and 1980s. *International Journal of Industrial Organization*, 20(8): 1167–1195.
- Farrell, M. J.* (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society, Series A*, 120(3): 253–290.
- Franks, J., Mayer, C.* (1996). Hostile Takeovers and the Correction of Managerial Failure. *Journal of Financial Economics*, 40: 163–181.
- Gao, Q., Huang, X. N., Toshiyuki, S.* (2003). *Management Performance Evaluation Data Envelopment Analysis*, Taipei, Hwa Tai Publishing Co.
- Kim, W. G., Arbel, A.* (1998). Predicting merger targets of hospitality firms (a Logit model). *Hospitality Management*, 17: 303–318.
- Kwoka, J., Pollitt, M.* (2010). Do Mergers Improve Efficiency? Evidence from Restructuring the US Electric Power Sector. *International Journal of Industrial Organization*, 28: 645–656.
- Li, S., Zeng, Z.* (2003). Characteristics of Takeover Targets in China Equity Market (in Chinese). *Economic Research*, 11: 54–64.
- Lozano, S., Villa, G.* (2010). DEA-based Pre-merger Planning Tool. *Journal of the Operational Research Society*, 61: 1485–1497.
- Manne, H. G.* (1965). Mergers and the Market for Corporate Control. *Journal of Political Economy*: 110–120.
- Palepu, K. G.* (1986). Predicting Takeover Targets: A Methodological and Empirical Analysis. *Journal of Accounting and Economics*, 8: 3–35.
- Pasiouras, F., Gaganis, C., Zopounidis, C.* (2010). Multicriteria Classification Models for the Identification of Targets and Acquirers in the Asian Banking Sector. *European Journal of Operational Research*, 204: 328–335.
- Stark, D.* (1996). Recombinant Property in East European Capitalism. *American Journal of Sociology*, 101(4): 993–1027.
- Tsagkanos, A., Georgopoulos, A., Siriopoulos, C.* (2006). Predicting Takeover Targets: New Evidence from a Small Open Economy. *International Research Journal of Finance and Economics*, 4: 183–192.
- Worthington, A. C.* (2001). Efficiency in Pre-Merger and Post-Merger Non-Bank Financial Institutions. *Managerial and Decision Economics*, 22: 439–452.
- Zhang, M. B.* (2008). *The Effective Theory on the Market of Corporate Control and Governance* (in Chinese), Beijing, The Commercial Press.

Стаття надійшла до редакції 15.01.2013.