Diversification Effects Associated with
Economies of Scale and U.S. REITs Mergers

기업 합병을 통한 부동산 유형의 분산과 규모의 경제 효과
- 미국 부동산 투자회사를 대상으로 -

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< Abstract >

본 연구는 1996년부터 2008년까지 기업 합병을 경험한 104개의 미국 부동산 투자회사를 대상으로 기업 합병으로 발생한 부동산 유형의 분산이 이 회사들의 '규모의 경제'에 어떠한 영향을 미치는가를 분석하였다. 금융 연구에서 파생된 합병에 관한 한 이론은 기업 합병에서 발생한 분산 효과가 구매 기업의 '규모의 경제'를 제약한다는 것으로, 합병 후 구매 기업에 나타나는 주식 시장에서의 가치 감소 현상을 설명한다. 이러한 이론을 바탕으로, 본 연구는 기업 합병으로 증가한 부동산 유형의 분산이 그 구매 부동산 투자 회사의 '규모의 경제'를 감소시킬 것이라는 가설을 세우고 실증적 분석을 하였다.

이벤트 스터디 결과, 분산 증가에 따른 구매회사의 추가적인 가치 감소현상은 나타나지 않았다. 555개의 패널 데이터 분석을 통해 '규모의 경제'를 기업 합병 전과 후로 비교하였을 때, 부동산 유형의 분산이 증가한 합병과 증가하지 않은 합병 모두, '규모의 경제' 성장이 합병 후 나타났다. 그러나 합병 후 분산이 증가한 합병과 증가하지 않은 합병의 비교에서 통계적으로 유의한 수준의 '규모의 경제' 차이가 나타나지 않았다. 따라서 본 연구는 합병으로 증가한 부동산 유형의 분산이 그 구매 부동산 투자 회사의 '규모의 경제'를 감소시키는 증거를 찾지 못했다. 이러한 결과는 구매 회사가 매각 되는 회사의 특화된 전문성의 확보를 통해 부정적인 분산 효과를 감소시킬 수 있다는 시각에 부합한다.

주 제 어 : 미국부동산투자회사, 규모의 경제, 부동산 유형의 분산, 기업 합병
Keywords : U.S. Real Estate Investment Trusts (REITs), Economies of Scale, Property-type
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I. Introduction

A large body of finance literature finds that acquiring firms in "friendly" mergers experience significantly negative abnormal returns. For example, Travlos(1987) and Chang(1998) find significantly negative abnormal returns for acquiring firms, around -1% to -2%, on the announcement of a merger. However, target firms exhibit large positive abnormal returns, over +10%, in merger events (Huang and Walkling, 1987; Hayn, 1989; Servaes, 1991; Jensen and Ruback, 1983).

This persistent finding is attributed to several theories such as pecking order theory, and economies of scale associated with a diversification discount. Pecking order theory is based on asymmetric information, which suggests that managers have superior information about their companies' prospects, risks and values compared to outside investors (Myers and Majluf, 1984). As a result, any announcement of the method of payment in mergers of either stock financing or cash sends signals to investors about the prospects for the company. For instance, if a firm chooses a stock as the method of payment in a merger, investors will infer that the stock is overvalued. Demand for such shares is therefore likely to be low as investors show scepticism about the true value of the stock. This will naturally result in a reduction of the stock's price. Travlos(1987) and Hyun(1993) find evidence of negative market reactions to acquiring firms that choose stock-financed transactions rather than cash offers, consistent with the pecking order theory.

However, economies of scale associated with a diversification discount have also been proposed as a reason for negative shareholder returns for acquiring firms in mergers and positive returns for target firms. For example, Jensen and Ruback (1983) argue that the diversification resulting from mergers limits the benefit of economies of scale and reduces the market power considered to be essential for wealth improvement. Singh and Montgomery(1987), Blackburn, Lang, and Johnson (1990), and Lahey and Conn(1990) find a negative association between market reactions and diversification in mergers. In the real estate literature, Campbell, Ghosh and Sirmans(2001) examine REIT mergers using a standard event study methodology over the period 1994 to 1998. They find that acquiring REIT returns are slightly negative (-0.6%) while target returns are significantly positive (+3%) consistent with the results found in the finance literature. They argue that positive returns for target REITs are attributed to economies of scale. However, the negative returns to acquiring firms are not derived from diseconomies of scale; instead, it is due to the significant geographical diversification associated with most mergers, which reduces opportunities for economies of scale, consistent with the implication of Jensen and Ruback(1983).

Campbell, Ghosh and Sirmans(2001) find evidence of a diversification discount on the basis of geographical diversification. However, they do

not examine the effect of property-type diversification, which I focus on in this study. In terms of diversification, real estate varies by property-type, as well as geography. REITs have a strong tendency to concentrate their investments in a single property-type. According to the National Association of Real Estate Investment Trusts (NAREIT) (1997-2010), more than 90% of the REITs in the U.S. equity REIT sector focus on one property-type. Investors and security analysts prefer to analyze and understand a REIT associated with standard space market segments which match with the property-type focus of the REIT's underlying properties (Geltner and Miller, 2001). Thus, property-type has been considered an important variable along with geographic location when examining the effect of diversification in REIT studies.

Using a sample of 104 U.S. REITs which experienced a merger from 1996 to 2008, I examine how property-type diversification changes which result from REIT mergers affect the economies of scale. Based on economies of scale associated with a diversification discount, I hypothesize that acquiring REITs have significantly lower economies of scale when the merger increases property-type diversification. Conversely, acquiring REITs should have greater economies of scale when the merger does not change property-type diversification.

To investigate the research hypothesis, I examine the difference in the market reactions to the announcements of acquiring REITs between events which increase property-type diversification and those which do not change the property-type diversification. Then, I employ panel data analysis to compare pre- and post-effects of REIT mergers on economies of scale depending on property-type diversification change. Finally, I examine whether scale economies affected by an increase in property-type diversification are significantly less than those with no change of diversification.

This study is organized as follows. The next section reviews the relevant prior literature. The third section describes the data sources and methodology used to examine the economies of scale of sample REITs. In the fourth section, I present the results of the data analysis. The final section states the conclusions.

II. Literature

1. Background to U.S. REITs Consolidation

The U.S. Congress created Real Estate Investment Trusts (REITs) in 1960 through the Real Estate Investment Trust Act, which allows all investors, especially small individual investors, to enjoy the advantages of commercial real estate investments without a direct equity investment. Since REITs are regarded as investment vehicles like mutual funds, the legislation has provided an exemption from corporate income tax to avoid double taxation of REIT shareholders' corporate income. However, this tax treatment requires

regulatory qualifications. First, an ownership test restricts that no more than five individuals should own more than 50% of the REIT's stock (the "five-or-fewer" rule). Second, asset tests requires that no less than 75% of a REIT's total assets must consist of real estate, mortgages, cash, or federal government securities and no less than 75% of the REIT's annual gross income should come from these assets. Third, an income test further requires that passive income sources such as rents or mortgage interest should be the primarily income source of REITs (no less than 75%). Last, a distribution test that requires that a REIT distributes no less than 90% of annual taxable income as dividends to its shareholders.

The regulatory restrictions were enacted to enable small individual investors to access REIT investment. However, in early 1990, a legislative change relaxing the "five-or-fewer" rule, which removed the percentage limitation of shares owned by the large institutional investors, made REITs more attractive to institutional investors. Also, the adoption of the Umbrella Partnership REIT (UPREIT) structure in the early 1990's significantly decreased the cost of going public, as a result, 95 private real estate firms became publicly traded REITs - the REIT initial public offering (IPO) "boom" in 1993-94. These transformations of the REIT industry triggered the explosive growth of large REITs in terms of

〈Figure 1〉 Historical U.S. REIT Industry Market Capitalization
and the number of firms (1972-2010)
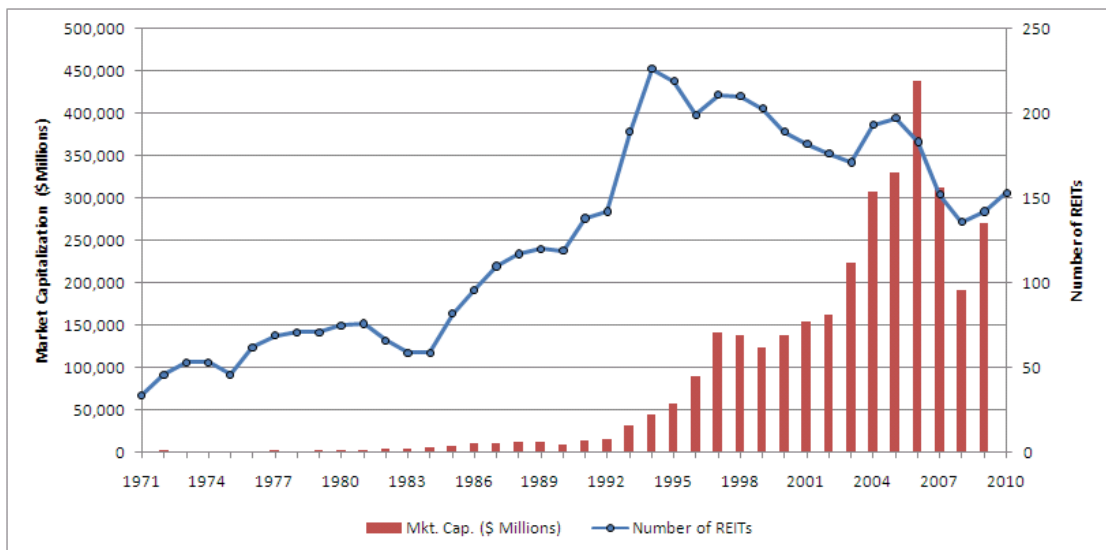
Note: Market capitalization in this graph is the sum of each REIT's market capitalization (market value of total shares outstanding)

Source: National Association of Real Estate Investment Trusts (NAREIT): Industry Data / Market Capitalization of U.S. REIT Industry (http://www.reit.com/IndustryDataPerformance)

market capitalization since the early REITs were considered too small to be attractive to institutional investors (now a primary investor in REITs). A significant number of consolidations have occurred since the mid-1990. As shown in <Figure 1>, both market capitalization and the number of REITs have steadily increased prior to 1995. Since then, however, the number of REITs decreased while the market capitalization of REITs kept rising until 2007 sub-prime mortgage crisis. Geltner and Miller(2001) argue that this trend was the result of mergers.

2. REIT and Diversification

Various topics are investigated in real estate studies associated with diversification. Capozza and Lee(1995) argue that when property portfolios are securitized into equity REITs, the underlying properties may add or lose substantial value since the stock market places higher or lower values on specific types of REITs relative to the local property markets. They find evidence that retail or large REITs trade at significantly higher value while industrial or small REITs trade at discount. However, the premium or discount derived from the net asset value is not converted into cash flow yield. In addition, using property-type diversification of REITs, Geltner and Kluger(1998) present a technique for generating REIT-based pure-play portfolios (in terms of property-type) which replicate the return to a specified target sector without any direct

exposure to others.

Gyourko and Nelling(1996) examine how the property-type and geographical diversifications in the underlying property portfolio of REITs affects the systematic risk of the REIT. They find no meaningful impact for either property-type or geographical diversification in their REIT stock market return. However, Capozza and Seguin (1999) find evidence of the diversification discount. They investigate whether management expertise in terms of focus and diversification strategy affects REIT value and find that the higher corporate-level expenses of diversified REITs significantly offset its gross-cash-flow yields.

Furthemore, Campbell, Gosh, and Sirmans (2001) examine a sample of 85 merger transactions when a publicly traded equity REIT is an acquirer. They find evidence of negative abnormal returns when the mergers increase the geographic diversification of acquirers. Also, Campbell, Petrova, and Sirmans(2003) analyze the market reaction of 209 REIT portfolio acquisitions over 1995 - 2001. They find evidence of significant positive abnormal returns on the acquisition announcement when companies reconfirm their geographic focus in the acquisition. The events that diversify their geographical focus show negative insignificant abnormal returns. However, Ro and Ziobrowski (2011) investigate whether property-type focused REITs perform better than diversified REITs. They find no evidence of superior performance associated with property-type focused REITs but

uncover higher market risk associated with property-type focused REITs.

3. REIT and Economies of Scale

There are two views on the cause of REIT consolidation. Linneman(1997) suggests that REITs consolidate due to existence of scale economies in revenues, expenses, and capital. In contrast, Vogel(1997) challenges this view arguing that REIT growth is not derived from operating efficiency associated with the size of REITs. He suggests that it results from several external events such as the favorable legislative changes and growth in institutional investment. However, a significant number of REIT mergers have occurred since the mid-1990 and numerous studies find evidence of scale economies in REIT industry.

Several studies examine the economies of scale associated with diversification while the relationship remains a debated issue. Bers and Springer(1997) examine the existence of economies of scale in REITs using the translog cost function over the year 1992-1994 and find empirical evidence of scale economies. They also find that the type of management and degree of leverage significantly affects the level of the economies of scale, though property-type diversification and geographical concentration have little additional influence. Furthermore, Bers and Springer(1998a) repeat the investigation of scale economies with more comprehensive REIT data which cover the

extended period from 1992 to 1997. They find larger scale economies for externally-managed, mortgage, low-leveraged, and property-type diversified REITs. Especially, in terms of property-type diversified REITs, they argue that diversified REITs are more likely to increase their holding period in each property-type as diversified REITs expand, which enables them to obtain the efficiencies that are expected for focused REITs.

Ambrose, Ehrlich, Hughes, and Wachter(2000) examine economies of scale using 41 multifamily equity REITs over 1994 - 1997. They do not find evidence of scale economies since NOI growth rates of small REITs are greater than those in the market for a given change in their shadow portfolio. However, according to Ambrose, Highfield, and Linneman(2005), NOI excess gains over the market were large prior to 1996 but are no longer so. Moreover, they argue that interpretation of evidence should be with caution since this study employs a small sample of limited REITs (only residential REITs). Using a more extended sample of 139 REITs from 1990 to 1996, Ambrose and Linneman(2001) find contrary evidence. They investigate economies of scale associated with revenues, expenses and capital. They find evidence of scale economies in terms of profit margins, rental revenue ratios, implied capitalization rates and costs of capital. However, they do not find a significant relationship between firm size and expense ratios.

Anderson, Fok, Springer and Webb(2002) analyze REITs from 1992 to 1996 in terms of both

economies of scale and efficiency using data envelopment analysis (DEA) and find REITs could enhance their performance through expansion. They also employ regression analysis to examine the REIT characteristic which affects the REITs efficiency. They find that the increase in diversification across property-type reduces the performance of REITs while it may improve scale efficiency.

In a recent study, Ambrose, Highfield, and Linneman(2005) provide the most comprehensive investigation of scale economies in REITs. Using an extensive sample period from 1990 to 2001, they find strong evidence of economies of scale in terms of REIT overhead (G&A) expense. Increasing REIT size also lowers average expenses and increases profit margins. Consistent with previous work, they also find that larger REITs have higher liquidity and lower costs of capital. However, they do not test the effect of diversification in REIT economies of scale.

To summarize, prior literature focuses on the investigation of whether the REIT industry has economies of scale and how firm characteristics affect the magnitude of those scale economies. However, there has been little examination of how these merger activities influence the magnitude of scale economies and how property-type diversification changes which result from mergers affect economies of scale in REITs. Therefore, this study fills a gap in the literature by answering these questions.

III. Data and Methodology

1. Data

Following Campbell, Ghosh, and Sirmans(2001), I collect information on announcements about REIT merger events from Dow Jones News Retrieval using the Dow Jones Factiva Online Database service for the years 1996 - 2008. I include announcements found in one of three newswires services: Dow Jones Newswire, Press Release Wires or Reuters Newswires. The announcement day refers to the date of the first report of the portfolio change in one of these publications, which provides the event day if the announcement is made before 3:59 p.m. However, if the event is announced after 3:59 p.m., the event day is considered to be the next trading day after the announcement. If other significant events are announced during the event window, I exclude the event from the sample.

I employ daily return data obtained from the CRSP/Ziman US Real Estate Data Series which provides stock price and shares outstanding for individual REITs trading on the NASDAQ, New York Stock Exchange and American Stock Exchange. This database provides property-type classifications for individual REITs such as health care, industrial and office, residential, lodging and resort, retail, self storage, and diversified.

I obtain the information regarding the size of REIT mergers from press releases, and from 10Q and 10K SEC filings. Property-type diversification

changes caused by mergers are obtained from the SNL Real Estate database and also from 10Q and 10K SEC filings. Other accounting data including general and administrative (G&A) expenses, total revenues, total assets, total debts, long- and short-term debts are obtained from the SNL Real Estate database, COMPUSTAT and 10Q and 10K SEC filings. I collect Funds From Operations (FFO) per share for each REIT from the Institutional Brokers'Estimate System (IBES).

2. Methodology

1) Standard Event Study

Following Mikkelson and Partch(1986), I employ standard event study methodology to estimate the abnormal return for an equally balanced portfolio around the REIT merger event announcement date. I use the market model to estimate the abnormal return in reaction to the event, using daily returns with the following equation:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \qquad (1)$$

where $R_{i,t}$ is the rate of return on security i over the period t, which is one day, $R_{m,t}$ is the rate of return on the equally weighted market index. The CRSP value-weighted market return is used as the market proxy. Daily returns are obtained from the CRSP database. Day 0 is the announcement day, α_i is the estimated intercept, β_i is the estimated slope of the linear

relationship between security i and the return on the market index, and $\varepsilon_{i,t}$ is the unsystematic component of security i's return on day t.

I estimate the market model parameters for security i at time t given the daily return using 60 daily returns from day t-250 through day t-20.

$$\hat{R}_{i,t} = \hat{\alpha}_i + \hat{\beta}_i R_{m,t} \qquad (2)$$

The abnormal return (AR) for security i at time t is given by the following equation:

$$\begin{aligned} AR_{i,t} &= R_{i,t} - \hat{R}_{i,t} \qquad (3) \\ &= R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}) \end{aligned}$$

The market model, equation (1), is applied to all samples and abnormal returns are calculated for each event day associated with the announcement. To compute the cumulative abnormal return (CAR), I use three-day (Day -1, +1), five-day (Days -2, +2), and eleven-day (Days -5, +5) windows for the time horizon of the announcement period. The cumulative abnormal return (CAR) for security i is the sum of $AR_{i,t}$ over the various window periods (3, 5, and 11-day), given by:

$$CAR_{i,t} = \sum_{t=T_1}^{T_2} AR_{i,t} \qquad (4)$$

where T_1 is the first day of the interval and T_2 is the last day of the interval.

The mean cumulative abnormal return (MCAR) for a sample of N securities is given by,

$$MCAR_i = \frac{1}{N}\sum_{t=1}^{N} CAR_i \qquad (5)$$

The expected value of the CAR is not different from zero if there is no abnormal return performance.

2) Panel Data Analysis to Estimate Economies of Scale

To examine economies of scale in sample REITs, I employ panel data analysis using pooled ordinary least squares (OLS) regression,[1] which investigates the effect of firm size associated with both cost and profitability prospects. The regression analyzes 555 REIT year observations between 1996 and 2008 controlling for variables selected on the basis of prior literature, such as growth, leverage, property-type and time effects.

IV. Results

1. Abnormal Returns

<Table 1> presents the summary statistics of sample U.S. REIT merger events consisting of 104 mergers when a REIT is an acquirer and 73

〈Table 1〉 Summary statistics of announcements and deal values of U.S. REIT mergers

Year	Obs.	Deal Value ($M)	
		Mean	Std. Dev.
Panel A: Acquirer REIT			
1996	7	454.14	1,034.52
1997	10	1,499.81	6,342.48
1998	20	949.54	5,303.61
1999	6	324.47	445.01
2000	5	874.88	650.15
2001	7	1,217.50	1,375.57
2002	7	866.13	1,288.71
2003	4	242.95	428.95
2004	7	2,126.54	5,636.21
2005	8	1,633.33	5,406.97
2006	13	1,835.49	7,388.11
2007	8	807.25	1,902.02
2008	2	2,173.55	2,793.07
Total	104	1,169.86	1,572.13
Panel B: Target REIT			
1996	6	463.17	958.03
1997	9	655.82	2,286.49
1998	13	572.68	2,298.52
1999	5	340.72	382.44
2000	4	828.47	899.79
2001	5	1,468.75	631.82
2002	4	391.35	462.69
2003	4	242.95	428.95
2004	6	2,362.52	5,486.86
2005	5	2,007.68	4,234.64
2006	8	2,133.55	5,195.26
2007	4	642.23	438.93
2008	0	-	-
Total	73	1,020.42	1,352.27

Note: $M: Millions of Dollars

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[1] To avoid a concern regarding OLS regression possibly including omitted variables, I conduct Ramsey's RESET test and fail to reject the null hypothesis of no omitted variable. Also, I employ the White test for Heteroscedasticity and fail to reject the null hypothesis of Homoskedasticity.

events when a REIT is a target, over the sample period 1996 - 2008. It also summarizes data on the value of merger deal sizes by year over the sample period. In terms of the number of merger events, the U.S. REIT industry has experienced continuous consolidation activities (73 REIT-to-REIT mergers), which is consistent with the projection of Linneman(1997). It also shows relatively more merger events during the late-1990s and mid-2000s. In terms of merger sizes, the average deal value over the sample period is over $1 billion while the magnitude of the mean deal value varies by year.

<Table 2> shows the distribution of the deal-size and number of merger events by REIT property-type. Acquirer REIT events are segregated in terms of whether the merger increases the property-type diversification or confirms the prior property-type focus. If the transaction expands the operations of the acquirer REIT into a property-

type in which it was not previously operating, the merger is defined as an event which increases property-type diversification. Conversely, if the transaction expands the operations of the acquirer REIT in a property-type in which it was already predominately operating, the merger is defined as an event which confirms property-type diversification. As <Table 2> exhibits, 21 merger events increase the property-type diversification of a REIT acquirer while the other 83 mergers reconfirm the acquirer's prior property-type, and do not change the property-type focus. The occurrence of events that increase property-type diversification is thus less likely than events which do not change property-type focus. This reflects the strong tendency of U.S. REITs to focus on a single property-type as previously mentioned.

However, a diversified REIT provides a more interesting sample for study. This type of REIT possesses various types of properties and

〈Table 2〉 Summary statistics of announcements and deal values of U.S. REIT mergers by property-type

Property-type	Acquirer REIT					
	Total		Merger Div. P-type		Merger Foc. P-type	
	Obs.	Deal V. ($M)	Obs.	Deal V. ($M)	Obs.	Deal V. ($M)
Diversified REIT	5	473.96	5	473.96	0	-
Health Care REIT	9	1,142.72	2	1,876.10	7	933.19
Office/Ind. REIT	20	1,450.41	2	489.50	18	1,557.18
Hotel REIT	7	1,460.07	1	1,216.90	6	1,500.60
Mortgage REIT	1	120.00	0	-	1	120.00
Residential REIT	25	522.20	1	400.00	24	527.30
Retail REIT	34	1,495.09	10	1,872.23	24	1,337.94
Self-Storage REIT	3	1,924.70	0	-	3	1,924.70
Total	104	1,169.86	21	1,306.68	83	1,135.24

Note: $M: Millions   of Dollars

experiences five merger events which increase its property-type diversification. Campbell, White-Huckins and Sirmans(2006) find favorable market reactions when a diversified REIT is a joint venture (JV) partner. They argue that a diversified REIT employs the JV as a vehicle which reduces the effect of the diversification discount by partnering with specialized expertise. Consistent with this argument, a diversified REIT may use a merger as a similar vehicle to expand its diversified property-type.

<Table 3> presents the results of the event study associated with announcements of REIT mergers including both acquirers and targets (Panel A) and acquirers only (Panel B). Each portfolio provides mean cumulative abnormal returns (CARs) for three-day (-1, +1), five-day (-2, +2) and eleven-day (-5, +5) windows around the announcement date. In Panel A, overall abnormal returns for both acquirers and targets show significantly positive abnormal returns in all event windows. However, to confirm the findings in prior literature (i.e. negative abnormal returns for acquirers and positive market reactions for targets in mergers), I separate the 177 REIT mergers, distinguishing between 104 acquirer REITs events and 73 target REITs events. Consistent with prior evidence, acquirer REITs show significantly negative abnormal returns with less than 40% of the returns being positive in all event windows while target REITs have strong significantly large positive abnormal returns, between 5% and 6 %, in all event windows. The difference test between the two groups is statistically significant.

In Panel B of <Table 3>, the overall acquirer

〈Table 3〉 Cumulative abnormal returns (CARs) in percent for REIT shareholders in a sample

REIT Merger Announcements	Obs.	Day (-1, +1)		Day (-2, +2)		Day (-5, +5)	
		CAR	% Pos.	CAR	% Pos.	CAR	% Pos.
Panel A: Acquirer & Targets							
Total Acquirer & Target REITs	177	1.60 ***	51.4	1.76 ***	54.2	1.56 ***	52.0
Acquirer (Buyer REITs)	104	-1.38 ***	34.6	-1.46 ***	39.4	-1.74 ***	39.4
Target (Seller REITs)	73	5.86 ***	68.5	6.35 ***	75.3	6.26 ***	69.9
t - Stats for difference		-6.73 ***		-6.96 ***		-6.42 ***	
Panel B: Acquirers Only							
Total Acquirer REITs	104	-1.38 ***	34.6	-1.46 ***	39.4	-1.74 ***	39.4
Acquirers - Diversified Property-type	21	-0.92 **	42.9	-1.70 ***	33.3	-1.65 *	42.9
Acquirers - Focused Property-type	83	-1.50 ***	32.5	-1.40 ***	41.0	-1.76 ***	38.6
t - Stats for difference		0.60		-0.30		0.09	

Note: ***, **, and * indicates significance at the 1%, 5% and 10% levels, respectively.

REIT announcements exhibit negative abnormal returns with significantly negative values in all event windows. I segregate the acquirer REIT events which increase the property-type diversification from those which reconfirm their property-type focus. The 21 acquirer events that expand operating properties into new property-types show significantly negative abnormal returns in all event windows. In 83 acquirer events which do not change operating property-type focus, the abnormal returns in all every windows are significantly negative at the 1% confidence level. However, the difference test between the two groups is not statistically significant over all event windows. The results indicate that REIT mergers that increase property-type diversification do not have significantly different market reactions from those which do not change property-type focus. Using a standard event study, therefore, I do not find evidence supporting a property-type diversification discount in REIT mergers.

2. Economies of Scale

<Table 4> shows the panel data summary statistics for the primary variables to examine economies of scale and control variables selected on the basis of prior literature. Following extensive studies of scale economies by Altinkihc and Hansen(2000), I employ a simple metric of scale efficiency, which investigates the effect of firm size associated with both cost and profitability parameters. First of all, I employ market capitalization to measure the size of firm. The natural log of market capitalization is included in the analysis to capture the U-shaped curve followed by cost and profitability factors with respect to firm size.

To examine economies of scale in terms of the cost perspective, I employ general and administrative (G&A) expenses as a percentage of total revenue. Several studies (Bers and Springer, 1998b; Ambrose, Highfield and Linneman, 2005) find that the best source of scale economies is G&A expenses since this typically includes office space expenses, employee salaries, underlying expense,

〈Table 4〉 Descriptive statistics of data set for variables in pooled panel data analysis

Variable	Mean	Std. Dev.	Obs.
Market Cap ($ Billion)	2.6	3.3	555
Ln (Cap) (Ln($))	20.99	1.3	555
G&A Expense/Revenue (%)	0.27	0.7	555
FFO Yield (%)	0.10	0.1	555
After Mrg. with Foc. (Ind.)	0.38	0.5	555
After Mrg. with Div. (Ind.)	0.10	0.3	555
Asset Growth (%)	21.38	41.9	555
FFO Growth (%)	24.87	80.8	555
Total Debt / Total Asset (%)	56.79	15.4	555
ST Debt / LT Debt (%)	11.94	22.1	555
Ppt_Health Care REIT (Ind.)	0.05	0.2	555
Ppt_Office / Ind. REIT (Ind.)	0.24	0.4	555
Ppt_Hotel REIT (Ind.)	0.11	0.3	555
Ppt_Mortgage REIT (Ind.)	0.01	0.1	555
Ppt_Residential REIT (Ind.)	0.17	0.4	555
Ppt_Retail REIT (Ind.)	0.28	0.5	555
Ppt_Self-Storage REIT (Ind.)	0.05	0.2	555

etc. which are more fixed cost than variable cost. When this cost parameter is a dependent variable, the significantly negative coefficient on firm size is evidence of scale economies since larger REITs are better at decreasing costs.

In the spirit of Ambrose, Highfield and Linneman(2005), I investigate how firm size is associated with REIT profitability employing Funds From Operations yield (FFO yield). FFO yield denotes FFO as a percentage of the REIT's market price per share of common equity. If economies of scale are evident in REITs, then the FFO yield should increase as size increases since profitability grows with size.

To investigate the effects of a merger and property-type diversification change derived from the merger on economies of scale, I employ two indicator variables, which interact with the firm size. In <Table 4>, 'After Merger with Focus' is a indicator variable equal to 1 if an observation is after the merger of a REIT which has reconfirmed its property-type focus, and 0 otherwise. 'After merger with Diversification' is also an indicator variable equal to 1 if an observation is after the merger of a REIT which

has expanded its property portfolio into a property-type in which it was not previously operating. Thus, the reference group for these indicator variables consists of the observations before the merger of a REIT regardless of property-type diversification change.

I also control for growth, leverage and property-type effects in the scale economies analysis model following Ambrose, Highfield and Linneman(2005). Asset growth is the rate of total asset growth over a year. Similarly, FFO growth is total growth rate in FFO over a year. Total debt as a percentage of total assets and the ratio between short-term and long-term debt are also controlled. I also control for time with a set of indicator variables (not reported). In addition, property-types are controlled as indicator variables based on the property-type diversified REIT.

<Table 5> shows correlation coefficients among the independent variables. The correlation between the asset growth and FFO growth is relatively high indicating that an increase in REIT assets positively affects REIT performance (FFO). Correlation among the other continuous variables is generally low.

⟨Table 5⟩ Descriptive statistics of correlation coefficients among the control variables

	Ln (Cap)	Asset Growth	FFO Growth	Total Debt /Total Asset	ST Debt / LT Debt
Ln (Cap)	1.00	0.00	-0.02	0.31	-0.05
Asset Growth	0.00	1.00	0.31	-0.12	0.17
FFO Growth	-0.02	0.31	1.00	-0.14	0.16
Total Debt / Total Asset	-0.10	-0.12	-0.14	1.00	-0.12
ST Debt / LT Debt	-0.05	0.17	0.16	-0.12	1.00

The information on firm size, cost and profitability in <Table 6> is distributed across time and property-type. The dynamic changes in these variables prompts investigation into whether these changes in firm cost and profitability are derived from economies of scale or simply due to differences over time and property-type.

<Table 7> shows the results of panel data analysis employing pooled OLS regression for the impact of REIT size on expense prospects controlling for asset growth, FFO growth, leverage, time and property-type. The sample includes 555 REIT year observations between 1996 and 2008. The first column (1) shows the results of the

〈Table 6〉 Distribution across time and property-type of mean and standard deviation of firm size, cost and profitability measure

	Market Cap. ($ Billion)		G & A Exp. / Rev. (%)		FFO Yield (%)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Panel A: Year						
1996	8.0	5.9	12.07	8.77	7.10	3.53
1997	12.4	10.9	10.45	6.44	7.01	2.74
1998	12.3	12.8	14.67	7.63	9.63	3.81
1999	12.0	13.6	20.38	12.42	14.66	6.33
2000	14.6	18.6	40.67	17.00	16.63	7.00
2001	17.6	21.4	22.28	24.27	11.01	3.08
2002	19.8	19.7	25.25	31.06	10.57	2.34
2003	27.6	24.6	20.48	26.85	7.83	1.55
2004	38.6	33.2	17.88	20.62	6.47	1.32
2005	42.6	40.6	18.54	20.80	6.68	1.57
2006	58.4	58.8	15.92	13.85	6.02	1.85
2007	48.9	48.5	21.98	19.21	4.00	2.83
2008	28.3	33.5	33.35	23.00	5.00	7.00
Total	25.5	29.8	22.21	45.39	10.35	13.74
Panel B: Property-type						
Diversified	24.5	38.3	22.96	23.75	10.72	7.69
Health Care	17.9	19.5	14.86	35.71	13.15	12.51
Office / Ind.	31.5	32.4	17.96	14.88	9.40	4.11
Hotel	16.0	23.1	36.93	60.43	15.65	13.88
Mortgage	21.7	13.7	43.21	71.85	-23.14	64.41
Residential	29.8	31.6	19.79	14.56	7.53	2.67
Retail	24.0	36.4	25.62	58.29	11.59	19.97
Self-Storage	38.4	43.7	12.21	3.51	7.02	2.80
Total	25.5	29.8	22.21	45.39	10.35	13.74

base regression without controlling for the effects of merger and property-type diversification change. Overall, I find evidence of economies of scale. The results show a significantly negative coefficient for firm size, which indicates that larger REITs enhance firm value by reducing overhead cost. Also, the quadratic variable of the firm size is significantly positive; suggesting that

there is an incorporated nonlinear decrease in the expense ratio as REIT firm size increases. In addition, FFO growth ratio has a significantly negative coefficient, which indicates a negative correlation between FFO growth rates and overhead costs. I also find that expense ratios are positively influenced by debt ratios and vary across property-types.

〈Table 7〉 Panel data analysis employing pooled OLS regression for the impact of REIT size on expense prospect

555 Observations Before & After Merger	G & A Expense / Revenue					
	(1)			(2)		
	Coefficient		t-stat	Coefficient		t-stat
Constant	36.418	***	(6.63)	59.205	***	(10.61)
Ln(Cap)	-3.410	***	(-6.46)	-5.770	***	(-10.58)
Ln(Cap)^2	0.079	***	(6.23)	0.140	***	(10.47)
After Mrg. with Foc.				10.575	***	(10.25)
After Mrg. with Foc.X Ln (Cap)				-0.505	***	(-9.93)
After Mrg. with Div.				6.201	***	(3.9)
After Mrg. with Div. X Ln (Cap)				-0.296	***	(-3.96)
Asset Growth	-0.001		(-0.76)	0.000		(0.08)
FFO Growth	-0.001	*	(-1.73)	-0.001		(-1.51)
Total Debt / Total Asset	0.009	***	(4.58)	0.008	***	(4.12)
ST Debt / LT Debt	0.001		(0.53)	0.001		(0.98)
Ln (Mrg. Valuet)	-0.000		(-0.02)	-0.008	*	(-1.92)
Ln (Mrg. Valuet-1)	0.002		(0.45)	-0.003		(-0.73)
Ppt_Health Care REIT	-0.245		(-1.64)	-0.303	**	(-2.10)
Ppt_Office / Ind. REIT	0.065		(0.60)	-0.197	*	(-1.74)
Ppt_Hotel REIT	0.424	***	(3.42)	0.162		(1.33)
Ppt_Mortgage REIT	1.084	***	(3.29)	0.967	***	(3.20)
Ppt_Residential REIT	0.008		(0.07)	-0.254	**	(-2.16)
Ppt_Retail REIT	-0.088		(-0.84)	-0.203	**	(-1.98)
Ppt_Self-Storage REIT	0.217		(1.32)	0.009		(0.06)
Adjusted R^2	0.201			0.357		
F:	10.294	***		17.150	***	
	(0.00)			(0.00)		

Notes: ***, **, and * indicates significance at the 1%, 5% and 10% levels, respectively. Coefficients are rounded up the fourth decimal points and t-Stats are rounded up the third decimal points.

The second column (2) in <Table 7> presents the results of the regression that includes controlling for the effects of mergers and the property-type diversification change derived from these mergers. Consistent with the result of the base regression in column (1), the presence of scale economies is supported by the significant negative coefficient for firm size and the positive one for the quadratic variable. However, the key variables to interpret in this regression are the 4th through 7th variables, which are all significant, indicating an observation indicator variable of being after the merger and its interaction with the firm size.

First, consider what happens for observations after the merger of a REIT, which reconfirm property-type focus (*After Merger with Focus*). When the other variables are assumed to be held fixed (ceteris paribus), the marginal relationship between expense ratio and firm size (*Ln(Cap)*) for the reference group (observations before merger) is depicted by Graph (a) in <Figure 2> and denoted by equation (6). Moreover, Graph (b) indicates the marginal relationship for observations after the merger with property-type focus, which is represented by equation (7).
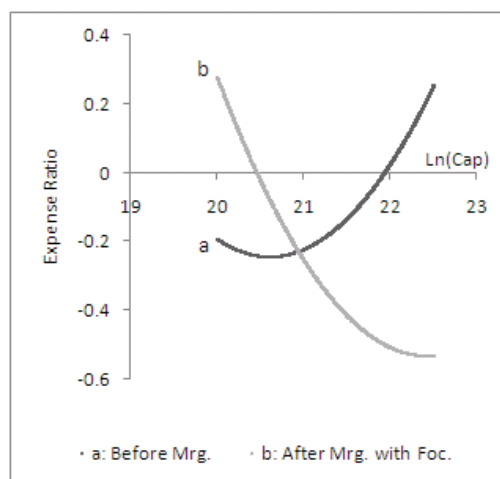
$$0.140Ln(Cap)^2 - 5.770Ln(Cap) + 59.205 \qquad (6)$$

$$0.140Ln(Cap)^2 - (5.770 + 0.505)Ln(Cap) + (59.205 + 10.575) \qquad (7)$$

Comparing Graph (a) and (b) in <Figure 2>, the expense ratios after mergers with no property-type focus change become higher than before mergers at small size firms, but the gap narrows as firm size increases. Beyond some point of firm size, where equation (6) and (7) meet, the expense ratios after the merger are lower than before the merger. If the size factor (*Ln(Cap)*) is larger than 20.94 as a threshold, the G&A expense ratio is less than a comparable observation before merger. In the sample of this study, 70.14% (148 out 211) of the relevant observations have a larger firm size than the threshold, 20.94, which is a $1.24 billion market capitalization. Thus, a significant number of REITs experienced an enhancement of cost reduction due to scale economies resulting from consolidation.

〈Figure 2〉 Marginal relationship between expense ratio and firm size for the merger with property-type focus
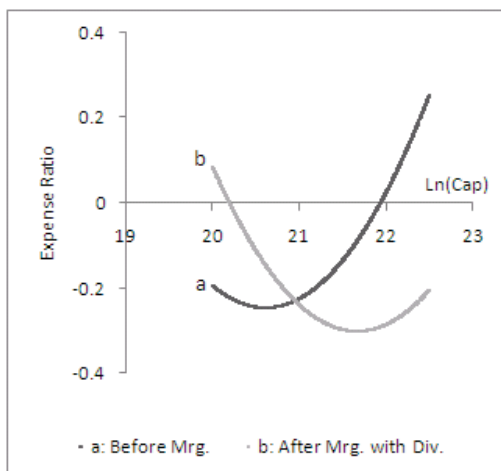

In the case of observations after the merger of REITs which increased property-type diversification

(*After Merger with Diversification*), ceteris paribus, the marginal relationship between expense ratio and firm size (*Ln(Cap)*) for observations after the merger with property-type diversification is depicted by Graph (b) in <Figure 3>. Graph (a) indicates the marginal relationship for the reference group (observations before merger).

The threshold size of firms, where graph (a) and (b) meet in <Figure 3>, is 20.95 ($1.25 billion market capitalization). 60.71% of applicable observations in the sample are over the threshold and enjoy a lower G&A expense ratios. However, I find no evidence supporting the contention that an increase in property-type diversification limits the benefits of economies of scale as argued by Jensen and Ruback(1983).

〈Figure 3〉 Marginal relationship between expense ratio and firm size for the merger with property-type change

· a: Before Mrg.   · b: After Mrg. with Div.

In <Table 7>, compared to the base regression (column 1), the regression in column 2 has more

significant variables with a higher adjusted R^2. Moreover, the variable for the deal value of merger is significantly negative. This indicates that a larger merger size results in lower expense ratios thus greater economies of scale.

<Table 8> reports the results of the regression using FFO yield as a profitability measure. Again, I find evidence of economies of scale. In both regressions in column (1) and (2), the significant size variable indicates that FFO yield is positively influenced by firm size. The significantly negative quadratic variable implies that the firm size expands with an increase in FFO yield at a decreasing rate.

The regression in the second column (2) investigates the effects of merger and property-type diversification change. Consistent with <Table 7>, the important variables are the 4th through 7th variables which are all statistically significant. For observations after the merger of a REIT without a property-type diversification change (*After Merger with Focus*), ceteris paribus, the marginal relationship between profitability and firm size (*Ln(Cap)*) for observations before merger (reference group) is depicted by Graph (a) in <Figure 4> and denoted by equation (8). Graph (b) indicates the marginal relationship for observations after the merger with no property-type change, which is represented by equation (9).

$$-0.023Ln(Cap)^2+0.967Ln(Cap)+10.062 \quad (8)$$

$$-0.023Ln(Cap)^2+(0.967+0.087)Ln(Cap)$$
$$+(10.062-1.838) \qquad (9)$$

Beyond a threshold firm size, where equation (8) and (9) meet, the ratios after the merger are more than before the merger. The threshold size of firms which have larger profitability rations is 21.13 ($1.50 billion market capitalization). In the sample, 62.09% of relevant sample are larger than this threshold and have increased profitability resulting from scale economies using mergers.

Regarding observations after the merger of a REIT, which have increased its property-type diversification (*After Merger with Diversification*), ceteris paribus, the marginal relationship between profitability and firm size (*Ln(Cap)*) for observations

⟨Table 8⟩ Panel data analysis employing pooled OLS regression
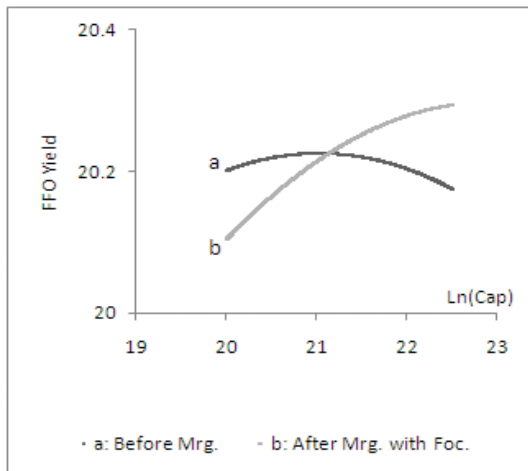for the impact of REIT size on profitability prospect

555 Observations Before & After Merger	FFO Yield					
	(1)			(2)		
	Coefficient		t-stat	Coefficient		t-stat
Constant	6.077	***	(5.56)	10.062	***	(8.69)
Ln(Cap)	0.553	***	(5.27)	0.967	***	(8.55)
Ln(Cap)^2	-0.013	***	(-5.02)	-0.023	***	(-8.43)
After Mrg. with Foc.				-1.838	***	(-8.43)
After Mrg. with Foc. X Ln(Cap)				0.087	***	(8.23)
After Mrg. with Div.				-1.186	***	(-3.66)
After Mrg. with Div. X Ln(Cap)				0.057	***	(3.71)
Asset Growth	-0.000		(-1.83)	-0.000		(-1.31)
FFO Growth	0.000		(0.32)	0.000		(0.67)
Total Debt / Total Asset	0.001	**	(2.46)	0.001	*	(1.83)
ST Debt / LT Debt	0.000		(0.35)	0.000		(0.67)
Ln(Mrg. Valuet)	-0.000		(-0.43)	-0.001		(-1.58)
Ln(Mrg. Valuet-1)	0.000		(0.43)	-0.000		(-0.22)
Ppt_Health Care REIT	-0.008		(-0.27)	-0.015		(-0.50)
Ppt_Office / Ind. REIT	0.004		(0.17)	-0.036		(-1.52)
Ppt_Hotel REIT	0.037		(1.51)	-0.003		(-0.12)
Ppt_Mortgage REIT	-0.342	***	(-5.21)	-0.363	***	(-5.79)
Ppt_Residential REIT	-0.026		(-1.16)	-0.064	***	(-2.62)
Ppt_Retail REIT	-0.010		(-0.47)	-0.027		(-1.28)
Ppt_Self-Storage REIT	0.002		(0.06)	-0.028		(-0.85)
Adjusted R^2	0.171			0.275		
F:	8.617	***		12.060	***	
	(0.00)			(0.00)		

Notes: ***, **, and * indicates significance at the 1%, 5% and 10% levels, respectively. Coefficients are rounded up the fourth decimal points and t-Stats are rounded up the third decimal points.
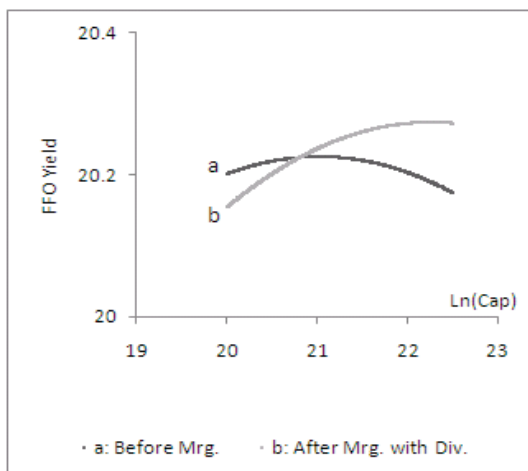
after the merger with property-type diversification is depicted by Graph (b) in <Figure 5>. Graph (a) indicates the marginal relationship for observations before merger (reference).

The threshold size of the firm, where graph (a) and (b) meet in <Figure 5>, is 20.81 ($1.09

〈Figure 4〉 Marginal relationship between profitability and firm size for the merger with property-type focus

· a: Before Mrg.   · b: After Mrg. with Foc.

〈Figure 5〉 Marginal relationship between profitability and firm size for the merger with property-type change

· a: Before Mrg.   · b: After Mrg. with Div.

billion market capitalization). 64.29% of the observations in the sample are larger than this threshold and enjoy an improvement of FFO yield. This percentage is slightly greater than mergers without property-type diversification change, which is not consistent with the research hypothesis.

Overall, REIT mergers result in the significant enhancement of scale economies in terms of both cost and profitability parameters regardless of the property-type diversification change. More than 60% of the sample experienced a decrease in overhead cost and an increase in profitability. However, I find no evidence that property-type diversification reduces economies of scale when comparing the pre- and post-effects of REIT mergers.

To investigate whether scale economies affected by an increase in property-type diversification are significantly less than those with no change of diversification, <Table 9> shows the results of regressions using 267 observations which include 'after REIT mergers' only. Consistent with prior results using the entire sample, both regressions show strong evidence of scale economies in terms of cost and profitability prospects. Since this sample includes observations after REIT mergers only, the variable 'After Merger with Focus' becomes an indicator variable equal to 1 if the REIT has experienced a merger which reconfirms its property-type focus. Hence, the base group for this indicator variable is observations whose REITs have experienced a

merger that has increased property-type diversification. The interaction of this variable with the firm size is '*After Merger with Focus X Ln(Cap)*'.

I find that coefficients of these variables are not statistically significant in both regressions. Under the null hypothesis of a multivariate regression, these coefficients are not different from zero. That is, the average cost or profitability is hypothesized identical for mergers with an increase in property-type diversification and those with no change of diversification at the same level of firm size. The results fail to reject this null hypothesis. Thus, I find that scale economies affected by an increase in property-type diversification are not statistically different from those with no change of diversification.

⟨Table 9⟩ Panel data analysis employing pooled OLS regression
for the impact of REIT size on both expense and profitability prospects

267 Observations After Merger Only	G & A Expense / Revenue		FFO Yield	
	Coefficient	t-stat	Coefficient	t-stat
Constant	117.238 ***	(10.10)	18.457 ***	(7.76)
Ln(Cap)	-10.860 ***	(-10.21)	1.696 ***	(7.78)
Ln(Cap)^2	0.251 ***	(10.23)	-0.039 ***	(-7.76)
After Mrg. with Foc.	2.508	(1.56)	-0.486	(-1.40)
After Mrg. with Foc. X Ln(Cap)	-0.118	(-1.32)	0.023	(1.24)
Asset Growth	-0.000	(-0.39)	-0.000	(-0.73)
FFO Growth	-0.001	(-0.80)	-0.000	(-0.07)
Total Debt / Total Asset	0.006 *	(1.72)	0.001	(1.32)
ST Debt / LT Debt	0.007 *	(1.83)	0.001	(1.43)
Ln(Mrg. Valuet)	-0.007	(-1.32)	-0.001	(-1.22)
Ln(Mrg. Valuet-1)	-0.003	(-0.58)	-0.000	(-0.25)
Ppt_Health Care REIT	-0.368	(-1.13)	-0.042	(-0.63)
Ppt_Office / Ind. REIT	-0.447 *	(-1.93)	-0.054	(-1.13)
Ppt_Hotel REIT	0.010	(0.04)	-0.060	(-1.18)
Ppt_Residential REIT	-0.471 **	(-2.01)	-0.083 *	(-1.74)
Ppt_Retail REIT	-0.404 **	(-2.03)	-0.049	(-1.19)
Ppt_Self-Storage REIT	-0.377	(-1.28)	-0.058	(-0.96)
Adjusted R^2	0.443		0.316	
F:	14.240 ***		8.670 ***	
	(0.00)		(0.00)	

Notes: ***, **, and * indicates significance at the 1%, 5% and 10% levels, respectively. Coefficients are rounded up the fourth decimal points and t-Stats are rounded up the third decimal points.

V. Conclusions

This study examines how property-type diversification changes which result from REIT mergers affect economies of scale from 1996 to 2008 using a sample of 104 U.S. REITs which have experienced a merger. Because it has been argued that the diversification obtained from mergers limits the benefit from economies of scale, I hypothesize that acquiring REITs have significantly less economies of scale when the merger increases property-type diversification. To investigate the research hypothesis, I analyze the sample REITs in terms of market reactions of 177 merger announcements using a standard event study methodology. I also employ a panel data analysis to compare the pre- and post-effects of REIT mergers on economies of scale in cases where the merger reconfirms its property-type focus, and when the merger increases property-type diversification. Finally, I examine whether an increase in property-type diversification derived from a merger significantly lowers economies of scale compared to samples which do not change the property-type focus.

I find no evidence of significantly reduced economies of scale associated with an increase in property-type diversification obtained from mergers. Regardless of property-type diversification changes, REITs appear to experience enhanced scale economies through REIT mergers in terms of both cost and profitability parameters. Using a standard event study, I confirm the persistent finding of negative market reactions for acquirers and positive abnormal returns for target firms. However, I do not find evidence of a property-type diversification discount in REIT merger announcements.

While the evidence is not consistent with the arguments made by Jensen and Ruback(1983), this result is not surprising since a merger could be utilized as a vehicle which reduces the effect of the diversification discount by consolidating the specialized expertise of the target firm. Consistent with this view, Campbell, White-Huckins and Sirmans(2006) argue the diversified REITs employ the expertise of the JV partner to lower the drawbacks resulting from their diversified management. Moreover, Anderson, Fok, Springer and Webb(2002) argue that an increase in diversification across property-types in mergers may improve scale efficiency. Also, Bers and Springer(1997) find property-type and geographical diversification are not significantly associated with economies of scale in REITs while they do not examine the effect of mergers on scale economies.

In addition, I find that both cost and profitability parameters have a corresponding nonlinear relationship with firm size based on the significance of the quadratic effect. I also find that higher FFO growth rates lower expense ratios while larger debt ratios have the opposite effect. However, higher debt ratios positively influence profitability.

The finding of this study suggests practical

implications to emerging country REIT markets such as Korea, Taiwan, Hong Kong, Malaysia and China. According to Ooi, Newell and Sing (2006), the Asian REIT market is anticipated to grow tenfold to US$ 200 billion in the next decade, which will offer more diversified chances to investors. They also argue that more cross-country REITs will be listed in Asia. For example, Fortune REIT, listed in Singapore, obtained properties in Hong Kong and the Babcock & Brown Japan Property Trust was the first property trust which was listed in Australia. As presented by this study, a REIT merger provides the opportunity to enhance scale economies in terms of both cost and profitability parameters. Although capital market conditions and regulatory restrictions of the U.S. are different from those of emerging country REIT markets, a merger is expected to be an important vehicle for the further development in these markets.

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