

INTERNATIONAL REAL ESTATE REVIEW

Do Economies of Scale Exist? : Evidence from Korean REITs**Changha Jin***

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Although real estate investment trusts (REITs) in Korea (K-REITs) have a history of over a decade, little related academic research exists due to many constraints, including the lack of available data. This research is the first attempt to examine a total of 74 REIT companies by using data from the Korea Association of Real Estate Investment Trusts. In this study, we explore the economies of scale of both private and public REITs in Korea. Initially, we construct an equivalent baseline measure for growth prospects, revenue and expenses, and profitability, and thereby compare private and public K-REITs. This study further explores the return determinants for K-REITs with a range of firm-specific and property-specific variables. The results show that the asset size of K-REITs matters in determining growth prospects, wherein revenue and expenses and profitability are interrelated. Furthermore, the ownership structure of K-REITs influences the return measure.

Keywords

Public REITs, Private REITs, Growth Prospects, Economies of Scale

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1. Introduction

Although the real estate industry is known as a regional industry in which international investment is limited due to informational accessibility, informational transparency in the real estate investment trust (REIT) industry has increased in recent years. In order to improve this informational efficiency among academics and practitioners, REITs have emerged over the last few decades from a small sector of the equity market to a significant sector of the global equity market.¹ The shift of investment rebalancing to REITs contributes to enhanced informational accessibility regarding REIT markets, as well as a rebalancing of capital from local real estate to the global real estate industry. The size of the market reflects the current changes. As of the end of 2012, a total of 855 companies were operating across 40 countries, with 2.6 trillion dollars in market size. More specifically, the market size of the REIT industry accounts for approximately 9% of the composition in the Russell 2000 index.

REITs in Korea (K-REITs) were introduced to help financially distressed firms by liquidating holding properties and securitizing their assets in response to the Asian Financial Crisis in the late 1990s. The industry has been a bridge between two parties, namely, investors who required a stable return source and corporate property owners who suffered from financial distress. However, the market size of K-REITs is still relatively small compared to that in other countries such as Singapore, Japan and Australia, each of which has a similar history with REITs.² In comparison to the active research agenda and focus on REITs in countries with advanced markets, a relatively small set of research is available for real estate investment in Korea. While much research has attempted to examine Australian REITs (A-REITs), Singapore REITs (S-REITs), Hong Kong REITs (HK-REITs), and Japan REITs (J-REITs) within a variety of different topics (Dimovski and Brooks 2006, Wong et al. 2013, Newell et al. 2010, Chan et al. 2013), relatively little is known about K-REITs due to the lack of available data.

Thus, we attempt to provide essential information about Korean REITs, including growth prospects, revenue and expenses, and profitability. In this sense, this research first identifies the general characteristics of public and private REITs in Korea by exploring a measure of their growth prospects, together with measures of revenue and expenses, and profitability. Second, we examine whether there are positive effects from economies of scale of public and private K-REITs. In line with previous studies that identify the effects of

¹ As of the end of 2012, the size of the global REIT market included approximately 855 global real estate companies at a total amount of U.S. 66 billion dollars, according to the European Public Real Estate Association (EPRA)

² Together with the inception year, the legal name of REITs in Asian countries are as follows: Australia (LPTs, 1971), Japan (J-REITs, 2000), Singapore (S-REITs, 1999), Malaysia (M-REITs, 2005), and Hong Kong (HK-REITs, 2003).

economies of scale (Bers and Springer 1997, Ambrose et al. 2000; 2005) in the REIT industry, we hypothesize that K-REIT companies grow in size, the efficiency associated with production and operation will improve, thereby allowing K-REITs to become increasingly cost efficient with growth. As part of this analysis, we test the effects of the economies of scale of K-REITs by utilizing measures of growth prospects, revenue and expenses and profitability.³ Furthermore, we also differentiate between the characteristics of publicly-traded and privately-traded REITs. Third, we provide a set of information on K-REITs for global investors to compare with other alternative assets.

Using accounting information, we prepare the groundwork for analysis of growth prospects, and develop measures of revenue and expenses and profitability in order to test whether economies of scale exist in the context of K-REITs. It is worth determining whether publicly listing REITs or pursuing an optimal REIT size is justified in terms of whether size and operational efficiency are positively interrelated. We focus on a total of 74 privately-traded and publicly-traded K-REITs. Our study includes a total of 452 quarterly observations from January 2009 to December 2013. Our analysis is based on data collected from balance sheets⁴ and income statements, which contain information on growth prospects, revenue and expenses, and profitability. Also, we extend our analysis to distinct legal formats of K-REITs, including both ordinary K-REITs and corporate restructuring REITs (CR-REITs), in which REITs are established to improve the financial distress of firms by liquidating their fixed assets, including real estate assets. Thus, we analyze a set of hypotheses related to the growth of K-REITs and economies of scale. First, we focus on economies of scale in terms of determining whether any operational efficiencies exist as a REIT grows in size.

The results confirm the existence of economies of scale in REITs in South Korea as well as in the REITs of other countries. Relatively small K-REITs may expect operational efficiency gains from a growth perspective, as measured by the implied capitalization rate (implied cap rate) and payout ratio. Since larger K-REITs carry lower costs and have lower general and administrative (G&A) expenses, we expect to see increased profitability, including with funds from operations (FFO) yield and from return on equity (ROE). We find that the economies of scale concept is related to the size of K-REITs, and that the effects of size on K-REITs have a relationship with their profitability.

³ See Ambrose and Linneman (2001) and Ambrose et al. (2005)

⁴ Privately-traded REITs in Korea are not under mandatory obligation to provide financial reports to the Korea Security Exchange Commission. The Korea REITs Association cumulates comprehensive accounting information on privately-traded REIT companies, including information that contains financial reporting such as income statements, balance sheets, and statements of cash flow and equity holders.

The next section discusses the relevant literature. Section 3 describes the data and methods used herein, and Section 4 analyzes the results. The final section presents and discusses our findings and the limitations of the paper.

2. Literature Review

Although the relative size of the REIT industry has increased in recent years, the effects of economies of scale have remained unexplored in the existing literature. Given that the relative firm-level size of K-REITs ranges in total assets from \$2.8 million to \$1.026 billion, it is important to determine whether firms in the REIT industry show cost-efficient operations, and furthermore, how these operational and managerial decisions have been embedded in the profitability of REITs. Accordingly, an important implication for K-REITs would be to exploit any benefits from operational efficiency if the economy of scale theory is shown to exist in the context of K-REITs.

2.1 Economies of Scale in REITs

Among the many findings on economies of scale, the work of Allen and Sirmans (1987) finds evidence of economies of scale in the early stages of U.S. REITs during the period of 1977 to 1983. The authors find that the wealth of a shareholder is positively related to the effects of mergers and acquisitions among REITs, and that improved management is a primary source of efficiency gains. Both findings suggest the existence of economies of scale.

In addition, the work of McIntosh, Liang and Thomkins (1991) demonstrates that small REIT firms show higher returns after controlling for market risk factors, which contradicts prior research on economies of scale in the real estate industry. Furthermore, McIntosh, Ott and Liang (1995) argue that REITs do not experience any significant or positive impacts from sale transactions, and instead observe positive impacts only from increased dividend payments.

Capozza and Lee (1995) examine economies of scale by estimating net asset value. They find that large REITs have significant premiums in comparison to small REITs when measured in accordance with net asset value. They categorize the relative asset size of REITs to determine the sources of difference in valuation. They reference leverage, diversification, and the overhead expenses of small firms as the main causes of reducing their net asset value. Subsequent research by Capozza and Seguin (1999) also explores the sources of profits in different types of REITs, and recommends the lower management costs of focused REITs as opposed to diversified REITs.

The work of Bers and Springer (1997) tests whether REITs benefit from an increase in size during the period of 1992 – 1994. They hypothesize that operational management has a direct effect on the performance of REITs. They

utilize the translog cost function to estimate economies of scale. They find that economies of scale are time-dependent and sensitive to firm-specific characteristics such as type of management and leverage level, in addition to finding a marginal impact of geographical and diversification effects.

A study by Ambrose et al. (2000) extends the research on economies of scale into the residential REIT market. The study utilizes the net operating income (NOI) growth rate of residential REITs in testing economies of scale with respect to firm size, branding strategy, and geographic concentration. The findings suggest that small REITs appear to be generating revenue and operating economies, which contradict previous findings on other types of REITs. Furthermore, branding strategy and geographic concentration do not generate higher NOI growth, thus indicating that economies of scale did not continue during the years of 1994 to 1997 in the residential REIT sectors.

Conversely, Ambrose et al. (2005) conduct a comprehensive test on economies of scale in commercial real estate. The comprehensive test examines growth prospects, revenue and expenses, profitability, and cost of capital measures. The study extends the scope of the data to a focus on organizational structure and type of property. The findings suggest that large REITs can reduce general costs, including G&A expenses, and increase profit margins. In addition, the study asserts that large REITs can access lower costs of capital. The study concludes that it is not surprising that REITs experience profitability (measured by ROE) as their size increases, which is evidence of the existence of economies of scale. The study also points out that variations in findings on economies of scale in the U.S. REIT market are attributed to time-dependent market cycles. As pointed out in the previous literature, if economies of scale exist in the real estate industry, then sizable public REITs are preferred among real estate investors for exploiting operational efficiency and profitability. This is grounds for further discussions on government support to improve the legal environment of the REIT industry.

2.2 Legal Platforms of REITs

Accordingly, it is important to understand the motivation behind selecting the legal format of REITs and the source of returns in REITs. Our study includes the type of legal platform in our analysis of REITs, which differentiates between public and private REITs. The work of Pagliari et al. (2005) explores REITs in accordance with the type of legal platform, namely, public versus private. The research finds that the legal format of REITs does not provide much difference in return characteristics, and shows little difference in return measures in the period from 1993 to 2001. However, the findings imply that investors approach the two legal entities differently, and examine both formats for liquidity, governance, transparency, control and executive compensation issues (which are concerns for portfolio investors).

Moreover, the work of Ling and Petrova (2011) identifies motivations for categorizing REITs as either public or private. The research focuses on the main reasons that REIT firms become targets of mergers and acquisitions, and the probability of subtle differences in ensuring that bidders are private or public firms. The study finds that there is a greater possibility of becoming an acquisition target when REITs are smaller, with less liquidity and higher dividend yields. However, the existence of umbrella partnerships (UPREITs) reduces the chances that REITs are targeted for privatization. Also, the study finds that public buyers are more focused on obtaining highly leveraged REITs, which have greater institutional ownership and efficiency of operation.

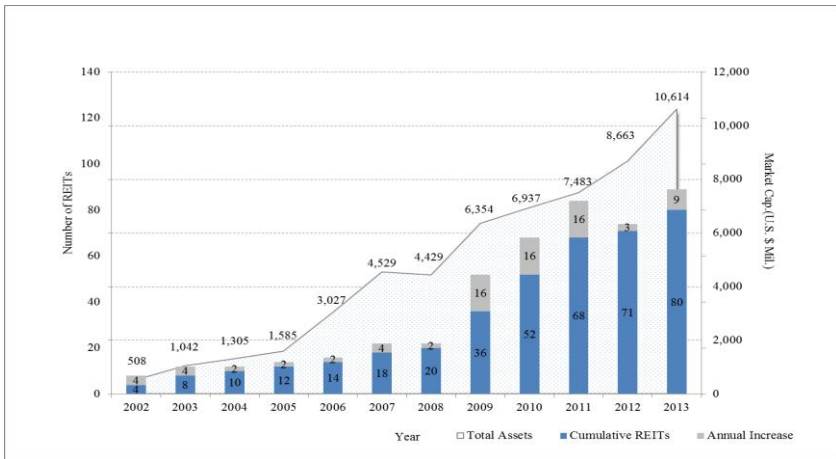
The formation of REITs is important to investors for maximizing long-term shareholder wealth. Public REITs in particular tend to show a high correlation with the overall stock market, which signals to portfolio investors fewer effects from diversification (Clayton and MacKinnon, 2002 and Gyourko and Keim, 1992).

Most of the existing literature mainly focus on U.S. REITs and a few advanced REITs in the Asian market in countries where advanced real estate financial markets have been established. The K-REIT market is relatively small and new in comparison to other mature REIT markets, and thus little research on K-REITs is available. In this sense, research on the economies of scale of K-REITs may provide the groundwork for potential growth to take place in the REIT industry, as well as possible mergers and acquisitions in the REIT industry in Korea. Therefore, we extend the academic boundaries on economies of scale by focusing on the REIT industry in Korea. Given the increase in the market size of REITs in Korea, we contribute with a scholarly response to the question of whether REITs become cost efficient and profitable as their size increases.

3. Data and Methods

While U.S. REITs have a history of approximately 50 years, the REIT industry in Korea was first introduced in 2001 following the Asian Financial Crisis. Since then, the K-REIT industry has rapidly developed to a market size of U.S. \$10.6 billion at the end of 2013, as shown in Figure 1. We examine a total of 74 REIT companies in Korea from March 2009 to December 2013. We obtain quarterly financial information for 74 REITs from the Korea Association of Real Estate Investment Trusts (KAREIT).

In sum, a total of 452 quarterly observations are examined for this research. For each observation, we collect relevant financial information from balance sheets and income statements, together with property information obtained from quarterly reports to shareholders.

Figure 1 Growth of Market Capitalization of REITs in Korea

Source: Korea Association of Real Estate Investment Trusts (KAREIT)

In recent years from 2009 to 2013, we observe increases in the number of REITs. Most of the increases are those of ordinary K-REITs in particular. Government support is the main catalyst for promoting the increased number of REITs in 2009, in a structure wherein underlying assets are considered unsold residential properties. In addition, the total amount of market capitalization has sharply increased since 2006 when the Korea National Pension Fund extended its portfolio composition to alternative investments, including REITs. The creation of K-REITs provides value to institutional investors, governmental regulators, and individual investors. K-REITs have had a critical financing role for large real estate asset holders who consider asset –light strategies to overcome financially distressed situations which was especially true during the financial crisis. Therefore, the launch of a K-REIT system provided financial liquidity to institutional investors and heavy asset holders. The relative market size has expanded since 2006 when the Korea National Pension Fund started to invest in REITs. During the expansion of K-REITs, REIT asset management companies played the critical role of a credible business counterparty to institutional investors.

Two of the asset management companies, Koramco and JR, actively provide high quality asset management services; they are transparent about expense and revenue information, and operate efficiently. As mentioned above, K-REITs have provided liquidity to financially distressed firms since the Asian Financial Crisis. However, K-REITs mostly had a finite-life and were closed-end during the early stages of their growth until the late 2000s. During real estate up-markets, the total return of REITs is primarily from capital gains due to resales. It is not unusual for institutional investors to pursue capital appreciation by holding REITs for a given period of time; that is, approximately 4-6 years, and

then putting them on the market again. However, investors are more likely to invest over a longer time period with public investment by the government. Publicly traded REITs are also found in the real estate residential sector. The public residential housing provider, the Land and Housing Corporation (LH Corporation hereafter), has suffered from high debt to asset ratios that constrain further supplying of public rental housing to low-middle income households. Debt financing from public financial resources are a typical financing means of the LH Corporation in order to supply public rental housing. In 2014, the LH Corporation adopted residential REITs as their main financing recourse, reducing their high debt to asset ratio and targeting stable income returns over a long-term investment horizon. The market size of residential REITs in South Korea has rapidly increased in recent years after residential REITs were launched by LH Corporation. The asset management company operated by LH Corporation has now become second in rank in size of asset under management in the K-REIT market. Table 1 shows the number of REITs under management, with asset size measured in US dollars, and the share of their total net assets in the K-REIT market.

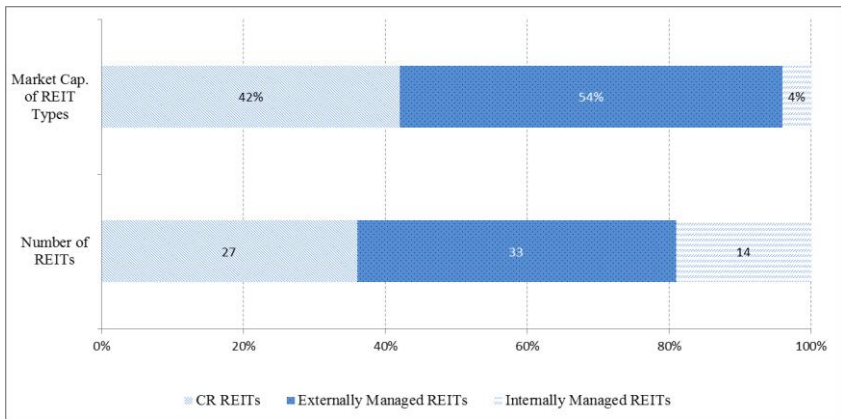
**Table 1 Assets under Management Companies in K-REIT Market
(Current as of June 30, 2015)**

| Asset Management Co. | # of REITs | Net Assets (U.S.\$) | Share of Total Net Assets |
|-----------------------------|-------------------|----------------------------|----------------------------------|
| KORAMCO | 17 | 3,975,027,127 | 28.9% |
| Land & Housing Corp. | 14 | 2,007,399,926 | 14.6% |
| JR AMC | 14 | 1,205,046,345 | 8.76% |
| KREITs & Partner's | 3 | 990,468,928 | 7.20% |
| KT | 4 | 793,713,199 | 5.77% |
| MASTERN | 9 | 696,959,162 | 5.07% |
| KOREIT | 5 | 660,427,167 | 4.80% |
| KB Real Estate Trusts | 8 | 659,394,633 | 4.79% |
| KAIT | 6 | 569,609,998 | 4.14% |
| INTRUST | 7 | 537,525,217 | 3.91% |
| SAENGBO | 4 | 479,763,925 | 3.49% |
| ARA Korea | 3 | 463,796,418 | 3.37% |
| Pacific | 6 | 371,362,102 | 2.70% |
| Korea Land Trust | 3 | 148,957,566 | 1.08% |
| HANA AIM | 2 | 111,789,192 | 0.81% |
| Hana Asset Trust | 1 | 41,179,860 | 0.30% |
| HKK AMC | 2 | 39,140,747 | 0.28% |
| Daehan Real Estate Trusts | 2 | 847,458 | 0.01% |
| Total | 110 | 13,752,408,970 | 100.0% |

Notes: Number of REITs under management and share of total net assets current as of June 30, 2015. Currency conversion valid for June 30, 2015.

As shown in Figure 2, there are two main types of REITs in Korea, including corporate restructuring REITs (CR-REITs) and ordinary REITs (K-REITs).⁵ CR-REITs, which were established to improve the financial distress of firms by liquidation through REITs, have recently extended the structure of their underlying assets to the residential sector to address the liquidation of construction companies in order to purchase sold properties due to the recent downturn in the residential market. While CR-REITs typically adopt external management to help with the financial situation of individual firms, ordinary REITs, or K-REITs, are able to choose either internal or external management. As of the end of 2013, the Korean REIT industry comprised 27 CR-REITs, 33 externally-managed REITs, and 14 internally-managed REITs for a total of 74 REIT firms.

Figure 2 Organizational Structure of REITs in Korea



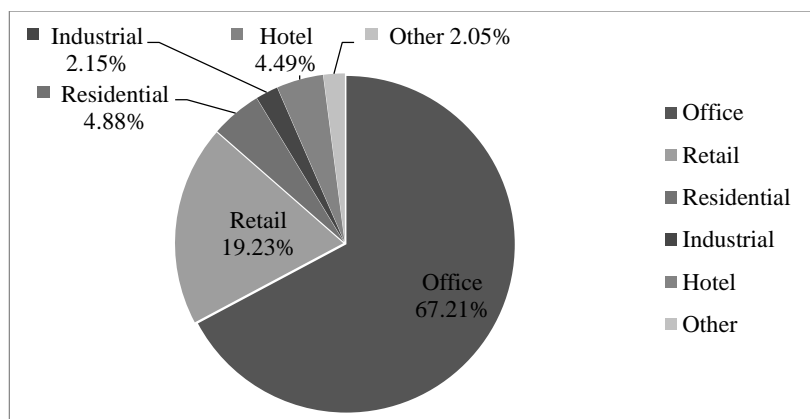
Source: Korea Association of Real Estate Investment Trusts (KAREIT)

⁵ The legal characteristics of K-REITs are as follows. Two types of K-REITs co-exist, including CR-REITs and ordinary K-REITs. The motivation for the formation of these types of REITs in Korea is an essential point of differentiation. CR-REITs help financially distressed firms by liquidating fixed assets to retain earnings, thereby improving their financial situation. Ordinary K-REITs are mainly driven by ordinary securitization processes similar to those of the U.S. REITs. The management structure of the REITs differs in terms of external management or internal management. It is mandatory for CR-REITs to have an external-management structure, while ordinary K-REITs can be under either external or internal management. Ordinary K-REITs pass requisite ownership tests if less than 30% of the REIT stock is held by individuals, while there are no limitations in ownership tests that apply to CR-REITs. Ordinary K-REITs and CR-REITs satisfy requisite asset tests if at least 70% of the assets are related to real estate. Distribution tests require that 90% of the net income of REITs must be distributed to shareholders as dividends. Income tests mandate that at least 80% of the total REIT income should come from real estate and real estate-related securities for both CR-REITs and ordinary K-REITs. While CR-REITs automatically have the benefit of corporate tax exemption, only ordinary K-REITs that are externally managed could apply for corporate tax exemption.

Ninety percent of the total REITs are found in the private market. More rigorous legal constraints are applied to public REITs due to some fraud-related events that took place in 2009. Due to these legal constraints, the formation of privately-held REITs is preferred among investors. However, there is a strong consensus on the benefits of developing REITs in markets that are more public, which lean toward external management.

Figure 3, which is based on data collected from KAREIT, shows the sector composition of K-REITs. The office sector REITs account for approximately 67.21% of the total K-REITs, and is the largest sector of REITs in Korea. The retail sector represents about 19.23%, followed by the hotel and residential sectors of 4.49% and 4.48%, respectively. The industrial REIT sector accounts for 2.15%, followed by 2.05% of other types of REITs, including development REITs. With this collected dataset, we carefully examine various aspects of K-REITs in terms of growth prospects, revenue and expenses, and profitability. We subsequently test the theory of economies of scale in the context of K-REITs. Descriptive statistics for our main variables are presented in Table 2. Our analysis relies on quarterly income statements, which are based on quarterly cash in-and-out flows. We exclude any REITs that focus on development projects, because the profitability of development REITs comes mainly from capital gains at the time of sale. Thus, after excluding the 115 quarterly observations of REITs focused on development projects and an additional 29 omitted observations, there is a total of 452 quarterly observations for our analysis. In Table 2, capitalization is denoted as book value because it is not possible to estimate the market value of private REITs. Among the 74 REITs, the largest REIT estimated is the CR REIT, with a value of approximately 1 billion U.S. dollars. The smallest REIT has an estimated value of approximately 8 million U.S. dollars.

Figure 3 Allocation of Property Types of K-REITs (Current to End of 2013)



Source: Korea Association of Real Estate Investment Trusts (KAREIT)

Table 2 Descriptive Statistics of K-REITs (2009 Q1 – 2013 Q4)

| Variable | Mean | Std. Dev. | Min. | Max. |
|-----------------------|----------|-----------|----------|----------|
| Total Cap. (U.S.\$) | 1.65E+08 | 1.70E+08 | 8.10E+06 | 1.03E+09 |
| Implied Cap. Rate (%) | 0.017 | 0.015 | 0.000 | 0.256 |
| NOI/Sales (%) | 0.663 | 1.645 | 0.078 | 4.768 |
| Revenue/Sales (%) | 0.784 | 0.173 | 0.074 | 1.007 |
| G&A Expenses/Sales | 0.354 | 0.259 | 0.080 | 1.040 |
| ROE (%) | 0.018 | 0.039 | 0.000 | 0.129 |
| FFO Yield (%) | 0.024 | 0.062 | 0.000 | 0.130 |
| ROC (%) | 0.008 | 0.006 | 0.000 | 0.103 |
| Total Deb/Total Asset | 0.523 | 0.192 | 0.037 | 1.001 |
| ST Debt/LT Debt | 0.394 | 1.592 | 0.000 | 13.945 |

Notes: This study includes a total of 452 quarterly observations between 2009 and 2013. The descriptive statistics of the analyzed observations are explained as follows. The first row represents the variable, the observation values of the first and second moments, and the mean and standard deviation. “Total Cap.” is the sum of the book value of common equity outstanding plus the value of preferred shares plus the book value of debt. The value is denoted in millions of dollars for conciseness. We denote log (total cap.) as the natural log of the total cap variable in dollar terms. “Implied Cap. Rate” (ICR) is the implied capitalization rate which represents net operating income (NOI) as a percentage of the real estate value. Capital represents the equity and debt less the cash amount. “NOI/Sales” is denoted as the net operating income as a percentage of sales. Rental “Revenue/Sales” is revenue as a percentage of sales. “G&A Expenses/Sales” is general and administrative expenses as a percentage of sales. “FFO Yield” is defined as the funds from operations as the total amount of equity. “ROE” is defined as net income as a percentage of equity amount. “ROC” is also estimated as a proxy for REIT profitability, which is a measure of the return on the total capital invested. Asset growth measures the annual growth of book value in total assets over the year, and FFO growth is the annual growth of FFO. “Total Debt/Total Asset” measures the book value of total debts denoted as a percentage of the total assets of a REIT in dollar terms. “ST Debt/LT Debt” is the ratio of the book value of short-term debt to that of long-term debt expressed as a percentage

K-REIT Measurement of Growth Prospects

We first measure total capitalization as the total book value of stocks and preferred stocks, and the book value of debt. We measure the implied capitalization rate (implied cap rate) to assess the growth prospects of K-REITs. The implied capitalization rate is derived from a percentage of rental net operating income (NOI) on the value of real property held in specific K-REITs. This implied capitalization is a proxy for the initial rate of return for investors. That is, a higher implied cap rate is a sign that the market discounts the asset value of REITs, while a lower implied cap rate shows a market premium.

$$\text{Total Cap} = \text{Book Value of Common Stock} + \text{Book Value of Debt} \quad (1)$$

$$\text{Implied Cap Rate (ICR)} = \frac{\text{Net Operating Income (NOI)}}{\text{Value of Real Estate}} \quad (2)$$

K-REIT Revenue and Expenses

We measure K-REIT revenue based on NOI as a percentage of the total sales, and rental revenue as a percentage of sales. We further examine K-REIT revenue with rental revenue as a percentage of sales. As a measure of K-REIT expenses, we use G&A expenses as a percentage of sales. The revenue and expense measures are critical for testing the existence of economies of scale in the context of K-REITs, because for large firms, we expect that the revenue measures will increase as costs decrease.

Implicit capitalization is estimated at approximately 1.7% on average, and the NOI per sales is about 66.3% on average, thus implying that 78% of NOI from total sales is available after subtracting the operating costs. The total rental revenue accounts for 79% of the total sales, and operating costs explain for 36.2% of the total sales.

$$\text{NOI to Sales Ratio} = \text{NOI} / \text{Sales} \quad (3)$$

$$\text{Rental Revenue to Sales Ratio} = \text{Rental Revenue} / \text{Sales} \quad (4)$$

$$\text{Expense Ratio} = \text{G\&A Expense} / \text{Sales} \quad (5)$$

K-REIT Profitability

We examine the profitability of K-REITs by using FFO yield⁶ as FFO⁷ as a percentage of the total equity amount of K-REITs. We also use ROE as a measure of K-REIT profitability, defined as net income as a percentage of equity amount. Return on capital (ROC) is also estimated as a proxy for K-REIT profitability. This measure extends invested equity to invested capital by including debt amount. The ROC is the return on the total capital invested in K-REITs. The average quarterly ROE is 1.8%, and 7.48% annually. The FFO yield is 2.4% on a quarterly basis, and 9.95% for the annual yield, which is higher than the ROE values because the measure includes the depreciation amount of the FFO.

⁶ We estimate the FFO yield as FFO as a percentage of the equity amount, which is the book value. This is different from previous studies which generally define FFO as a percentage of REIT market price per share of common equity. Since 90% of the REITs in Korea are not traded on the public market, it is not possible to estimate the market price of REIT shares.

⁷ The funds from the operation measure is defined as GAAP net income + real estate depreciation. An alternative method to calculate the measure involves EBITDA less the value of interest. The FFO measure is also referred to as supplemental earnings, because it counts only realized expenses, and excludes depreciation.

$$\text{FFO Yield} = \text{FFO} / \text{Equity} = (\text{EBITDA} - \text{Int}) / \text{Equity} \quad (6)$$

$$\text{ROE} = \text{Net Income} / \text{Equity} \quad (7)$$

$$\text{ROC} = \text{Return on Capital} = \text{Net Income} / (\text{Equity} + \text{Debt} - \text{Cash}) \quad (8)$$

4. Analysis

Table 3 contains the descriptive statistics for growth prospects, revenue and expenses, and profitability, classified in accordance with the different types of REITs, including office, retail, residential, industrial, hotel, and other REITs.

Table 3 Growth Prospects, Revenue and Expenses, and Profitability Measures by Property Type in K-REITs

| | Office | Retail | Residential | Industrial | Hotel | Other |
|-------------------------------------|--------|--------|-------------|------------|-------|-------|
| Growth Prospect Measure | | | | | | |
| Implied Cap Rate | 0.015 | 0.022 | 0.010 | 0.016 | 0.012 | 0.042 |
| Revenue and Expense Measures | | | | | | |
| NOI/Sales | 0.655 | 0.864 | 0.078 | 0.729 | 0.785 | 0.318 |
| Rental Rev/Sales | 0.712 | 0.952 | 0.218 | 0.996 | 0.963 | 0.671 |
| G&A Exp/Sales | 0.381 | 0.274 | 0.922 | 0.342 | 0.229 | 0.802 |
| REIT Profitability Measures | | | | | | |
| Net Income/Equity | 0.017 | 0.035 | 0.002 | 0.017 | 0.012 | 0.020 |
| FFO Yield | 0.024 | 0.050 | 0.002 | 0.030 | 0.015 | 0.022 |

Notes: The sample includes a total of 452 REIT quarterly observations from 20091Q to 20134Q. We classify the sample of REITs by property type, including office, retail, residential, industrial, hotel, and other. The components include the following measures: implied cap rate and payout ratio as measure of growth prospects; NOI/sales, rental revenue/sales, and G&A expenses/sales as measures of REIT revenue and expenses; and net income/equity and FFO yield as profitability measures of REITs.

The quarterly implied cap rate for hotel and office REITs is 1.3% (5.3% on an annual basis) and 1.5% (6.14% on an annual basis), respectively, thus indicating a possible premium on property valuation for these types of REITs. On the other hand, the quarterly implied cap rate for industrial and retail REITs is 1.6% (6.56% per annum) and 2.2% (9.09% per annum), respectively, thus implying a possible discount in property valuation. NOI to sales ranges from 86.6% for retail REITs to 31.8% for other types of REITs. Rental revenue to sales ranges from 99.6% for industrial REITs to 21.8% for residential REITs. While the

primary source of income for industrial REITs is mainly from rental revenue, this is not the case for residential REITs, which comes from capital gains at the point of sale. While the measure of expenses to sales ranges from 27% for retail REITs to 38% for office REITs, residential and other types of REITs have higher levels of expense ratios due to the structure of their income sources which rely on capital gains at the point of sale. Retail REITs have the highest ROE of 3.5% (11.5% per annum), followed by office and industrial REITs, both of which is 1.7% (6.98% per annum). The FFO yield ranges from 5% (21.55% per annum) for retail REITs to 3.0% (12.55% per annum) for office REITs.

Table 4 shows the descriptive statistics for growth prospects, revenue and expenses, and profitability classified by the vintage year of the REITs from 2005 to 2013. The vintage year represents the year in which a REIT was formed. In the real estate industry, the vintage year is important because the peak or bottom of a real estate cycle impacts the potential return of REITs through overvaluation and undervaluation, which reflects the cyclical behavior of the real estate industry.

Table 4 Growth Prospects, Revenue and Expenses, and Profitability of REITs by Vintage Year

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|-------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Growth Prospect Measure | | | | | | | | | |
| Implied Cap Rate | 0.027 | 0.016 | 0.016 | 0.015 | 0.014 | 0.014 | 0.015 | 0.011 | 0.007 |
| Revenue and Expense Measures | | | | | | | | | |
| NOI/Sales | 0.777 | 0.613 | 0.627 | 0.563 | 0.852 | 0.677 | 0.709 | 0.728 | 0.671 |
| Rental Rev/Sales | 0.993 | 0.708 | 0.694 | 0.598 | 0.931 | 0.678 | 0.820 | 0.820 | 0.859 |
| G&A Exp/Sales | 0.235 | 0.408 | 0.386 | 0.450 | 0.233 | 0.432 | 0.395 | 0.282 | 0.354 |
| REIT Profitability Measures | | | | | | | | | |
| Net Income/Equity | 0.023 | 0.019 | 0.019 | 0.016 | 0.026 | 0.014 | 0.033 | 0.010 | 0.007 |
| FFO Yield | 0.031 | 0.028 | 0.029 | 0.022 | 0.032 | 0.019 | 0.050 | 0.006 | 0.012 |

Notes: The sample includes a total of 452 REIT quarterly observations from 20091Q to 20134Q. For the vintage year analysis, we examine quarterly observations in accordance with the launch year of the REIT. The number of REIT observations per vintage year are denoted in parenthesis: 2005 (20), 2006 (54), 2007 (60), 2008 (29), 2009 (108), 2010 (68), 2011 (85), 2012 (29), and 2013 (19). We classify the sample of REITs by calendar year from 2009 to 2013. The components include the following measures: implied cap rate and payout ratio as measure of growth prospects; NOI/sales, rental revenue/sales, and G&A expenses/sales as measures of REIT revenue and expenses; and net income/equity and FFO yield as profitability measures of REITs.

The quarterly implied cap rate value for the earlier years of 2005, 2006 and 2007 is 2.7% (11.25% per annum), 1.6% (6.14% per annum), and 1.6% (6.56% per annum), respectively, and 1.5% (6.14% per annual basis), 1.11% (4.47%

per annum) and 0.7% (2.83% per annum) for the more recent years of 2011, 2012 and 2013, thus indicating a pattern of decreasing cap rates.

NOI to sales increased from 56.3% in 2008 to 85.2% in 2009. Rental revenue to sales increased from 99.3% in 2005 to 59.8% in 2008. The primary source of income for REITs in 2005 is rental revenue, while REITs in 2008 showed that only 59.8% of their revenue was obtained from rental income. Expense to sales increased from 23.5% in 2005 to 40% and 43% in 2006 and 2010, respectively. REITs in 2005, 2009 and 2012 showed lower ratios of expenses. In terms of the profitability measures, the REITs in 2009 have a higher ROE value of 3.3% (13.87% per annum), followed by 2.6% (10.81% per annum) in 2011. In sum, in terms of profitability, the ROE ranges from 8-12% per annum among the vintage years considered. Similarly, the FFO yield ranges from 9% to 21.55% per annum.

Table 5 presents the descriptive statistics for growth prospects, revenue and expenses, and profitability in accordance with the type of management structure of REITs, namely, internal or external management. CR-REITs are analyzed separately because they must adopt an external-management structure, while ordinary K-REITs can be either externally or internally managed. Ordinary K-REITs and CR-REITs satisfy asset tests as long as at least 70% of the assets are related to real estate. Distribution tests require that 90% of the net income of a REIT must be distributed to shareholders as dividends. Income tests require that at least 80% of the total income should be obtained from real estate and real estate-related securities for both CR-REITs and ordinary K-REITs. While CR-REITs automatically have the benefit of corporate tax exemption, only ordinary K-REITs that are externally managed could apply for corporate tax exemption.

The quarterly implied cap rate value for externally and internally managed K-REITs is 3.8% (16.09% per annum) and 1.3% (5.30 % per annum) respectively, thus implying a possible premium on property valuation for the case of externally managed ordinary K-REITs and CR-REITs. NOI to sales ranges from 28.8% for internally managed K-REITs to 63.1% for externally managed ordinary K-REITs, and is 69.6% for CR-REITs. Rental revenue to sales ranges from 81.7% for internally managed K-REITs to 70.2% for externally managed K-REITs, and is 84.5% for externally managed CR-REITs. Expenses to sales ranges from 38.3% for externally managed K-REITs to 32.1% for externally managed CR-REITs. However, internally managed K-REITs have a higher expense ratio of 61.5%. With regard to the profitability measure of net income/equity, an internal management structure demonstrates higher ROE values of 1.9% (7.6% per annum) and 1.8% (7.20% per annum) respectively for ordinary K-REITs, and 2.8% (11.09% per annum) for CR-REITs. The FFO yield ranges from 1.9% (7.82% per annum) for internally managed K-REITs to 1.8% (7.40% per annum) and 2.8% (11.09%) for externally managed K-REITs and CR-REITs, respectively.

Table 5 Growth Prospects, Revenue and Expenses and Profitability of REITs by Management Type

| | Ordinary K-REITs | | CR-REITs |
|------------------------------|---------------------|---------------------|---------------------|
| | Internal Management | External Management | External Management |
| Growth Prospect Measure | | | |
| Implied Cap Rate | 0.038 | 0.013 | 0.017 |
| Revenue and Expense Measures | | | |
| NOI/Sales | 0.288 | 0.631 | 0.696 |
| Rental Rev/Sales | 0.817 | 0.702 | 0.845 |
| G&A Exp/Sales | 0.615 | 0.383 | 0.321 |
| REIT Profitability Measures | | | |
| Net Income/Equity | 0.018 | 0.012 | 0.012 |
| FFO Yield | 0.019 | 0.018 | 0.028 |

Notes: The sample includes a total of 452 REIT quarterly observations from 20091Q to 20134Q. We classify the sample of REITs by management type from 2009 to 2013. We present the data from the CR-REITs separately because CR-REITs are required to be externally managed. We include 282 ordinary K-REITs that are internally managed and 182 ordinary K-REITs that are externally managed. In addition, 8 CR-REITs are included in the analysis. The components include the following measures: implied cap rate and payout ratio as measure of growth prospects; NOI/sales, rental revenue/sales, and G&A expenses/sales as measures of revenue and expenses; and net income/equity and FFO yield as profitability measures of REITs.

Regression Analysis Controlling for Type of Management

Table 6 presents the results of a regression analysis on the impact of size on growth prospects, revenue and expenses, and profitability of K-REITs. We control for the size and squared size of REITs, denoted with the total capitalization of REITs and the squared total capitalization, and other aspects such as management type and corporate restructuring, and a public dummy if the REITs are publicly listed. We include the total capitalization to measure the effect of long-run average costs which are depicted as a U-shaped curve. We expect that if REIT firms increase in size, the returns will increase due to resource specialization, decrease in input resources, and reduced costs. Thus, the long run average cost curve will have a negative slope if economies of scale exist, but diseconomies of scale for large size REITs exist if the cost increases. Thus the squared term of total capitalization is adopted to measure the economies and diseconomies of scale of K-REITs. In general, we find evidence of economies of scale in our analysis. In terms of the implied capitalization rate, we find a marginally significant coefficient for the linear term of the size factor and an insignificant coefficient for the squared term of the size of the REIT, thus implying that the total capitalization of REITs marginally affects the implied cap rate. Other factors, such as corporate restructuring and external

management, have negative and significant impacts on the implied cap rate, which suggests that CR-REITs and externally-managed REITs are premium REITs with a higher asset price in the market. The primary focus in our research is on economies of scale, wherein we expect that larger REITs will gain operational efficiency through low expense ratios and revenue increases. We provide evidence for the existence of economies of scale of K-REITs with a large market capitalization and evidence of operational inefficiency of medium K-REIT firms. We find that the NOI to sales ratio is negative and significant for the size of REITs and positive and significant for the squared size of REITs, as measured by total capitalization. This implies that as size increases, the NOI to sales ratio becomes lower and shows the lowest NOI to sales ratio when market capitalization is moderate. However, the NOI to sales ratio recovers later for large REIT firms. The U-shaped curve of the effect of size implies that small and larger REIT companies show increasing NOI and rental revenue ratios compared to medium REIT firms. This finding infers the K-REITs with moderate market capitalization show inefficient business operations with higher costs and less rental income compared to small and large firms. Also, the debt ratio has a positive and significant relationship with NOI/sales, meaning that firms with high NOI ratios utilize debt to reduce the cost of capital, or have easy access (relative to other firms) to the use of debt as a financial tool. In addition, both corporate restructuring and external management increase the NOI to sales ratio, thus indicating that external management and CR-REITs are more profitable. However, we find that larger REITs rely less on rental revenue, and instead on other sources of income (such as parking and other fees) in accordance with our detailed analysis on the income statements. This implies that larger REITs generate alternative sources of cash flow in addition to rental revenue. Also, public REITs have lower rental revenue to sales ratios, which implies that the proportion of rental income is lower in private REITs. We hypothesize that larger REIT firms are able to reduce expenses when properties are managed and operational efficiency is increased, thus indicating possible economies of scale. However, we find a positive coefficient of size and negative coefficient of the squared term of total capitalization. This indicates that the G&A expense/sales ratio is lower with small and large firms but medium firms have more expenses which implies inefficient operational management. Externally managed CR-REITs show significant and negative coefficients, thus suggesting that they increase property value through lower expense ratios. The overall evidence supports our expectation that larger REITs have higher NOI to sales ratios with lower expense ratios, thereby demonstrating the existence of economies of scale in the profitability measures. We also examine profitability with ROE (net income to total equity) and FFO yields (FFO to equity amount). For both, we conclude that larger firms have more profitability. The size of REITs has a positive and significant impact on ROE and FFO yields, as well as total debt to capitalization.

Table 6 Growth Prospects, Revenue and Expenses, and Profitability of REITs: Regression Analysis Controlling for Type of Management

| | Growth Prospects | | Revenue and Expenses | | | | | | Profitability | | | |
|---------------------------|------------------|---------|----------------------|---------|------------------|---------|---------------|---------|-------------------|---------|-----------|---------|
| | Implied Cap Rate | | NOI/Sales | | Rental Rev/Sales | | G&A Exp/Sales | | Net Income/Equity | | FFO Yield | |
| | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. |
| Log of Total Cap. | 0.045* | 1.401 | -1.388*** | -4.421 | -2.211*** | -5.631 | 1.517*** | 4.771 | 0.001** | 0.321 | 0.009** | 0.3 |
| Squared Log of Total Cap. | -0.001 | -1.371 | 0.027*** | 4.491 | 0.043*** | 5.591 | -0.03*** | -4.841 | -0.001 | -0.26 | -0.001 | -0.251 |
| Total Debt /Total Cap. | 0.002 | 0.581 | 0.103*** | 3.011 | 0.191*** | 4.361 | -0.099** | -2.811 | 0.012*** | 3.76 | 0.024 | 6.561 |
| Public Dummy | 0 | -0.061 | -0.009 | -0.341 | -1.037*** | -3.651 | 0.001 | 0.071 | -0.001 | -0.881 | -0.002 | -1 |
| Corporate Restructuring | -0.023*** | -5.021 | 0.387*** | 8.551 | 0.241*** | 4.261 | -0.478*** | -10.391 | -0.003 | -0.811 | -0.001 | -0.15 |
| External Management | -0.028*** | -6.061 | 0.339*** | 7.591 | 0.147** | 2.631 | -0.431*** | -9.511 | -0.010** | -2.35 | -0.007 | -1.621 |
| Intercept | -0.555 | -1.331 | 17.651*** | 4.421 | 28.97*** | 5.781 | -18.26*** | -4.491 | -0.02 | -0.321 | -0.13 | -0.311 |
| Adj. R ² | 0.092 | | 0.243 | | 0.285 | | 0.288 | | 0.152 | 0.141 | 0.218 | 0.218 |
| F Statistics | 6.79 | | 25.231*** | | 29.640*** | | 31.470*** | | 13.23*** | | 22.07** | |

Notes: The sample includes a total of 452 REIT quarterly observations from 20091Q to 20134Q. We classify the sample group on whether it is on the public market, and formation of REITs - corporate restructuring or external management. The components include the following measures; Implied Cap. Rate and Payout Ratio as measure of Growth Prospects, NOI/Sales and Rental Revenue/Sales, G&A expenses/Sales as measures of Revenue and Expenses, and Net Income/Equity and FFO Yield as Profitability Measures

Regression Analysis Controlling for Type of REIT

Table 7 shows the results of the regression analysis for the growth prospects, revenue and expenses, and profitability of K-REITs, controlling for the type of REIT firm. The K-REITs are office, retail, industrial, residential, and hotel REITs. Office sector REITs account for approximately 67.21% of the total K-REITs, which is the largest REIT sector in Korea. The retail sector is about 19.23%, and the hotel and residential sectors are 4.49% and 4.48%, respectively, of the total REITs in Korea. The industrial REIT sector accounts for 2.15%, followed by 2.05% of other types of REITs such as development REITs. With regard to the implied capitalization rate, we are unable to determine the size of the REIT firms after controlling for the type of firm, which implies that most large REITs are classified as office REITs. Also, it is worth noting that the total debt to total capitalization rate has a positive and significant impact on the implied cap rate, which means that REITs with high debt ratios are premium REITs. The critical variable in determining the effects of economies of scales is operational efficiency through low expense ratios and increases in revenue.

After controlling for the type of REIT firm, we find that NOI to sales ratios are negative and significant for the size of REITs and positive and significant for the squared size of REITs as measured by total capitalization. Similar to the result in Table 6, a larger firm size means a lower NOI to sales ratio and the lowest NOI to sales ratio is found for medium REIT firms. However, the NOI to sales ratio increases as with larger REIT firms. The U-shaped curve for the effect of firm size implies that K-REITs with moderate market capitalization shows operational inefficiency due to higher costs and less rental income compared to small and large firms.

Also, the debt ratios show a positive and significant relationship with NOI/sales, thus implying that firms with large NOI ratios take advantage of the use of debt. Each type of firm shows a positive and significant coefficient for the NOI/sales ratio, with the exception of the residential type of firm.

We find that firms with high debt to capitalization rates have high revenue per sales ratio, similar to the results shown in Table 6. Retail, industrial, and hotel REITs have high rental revenue to sales ratios, which implies that the proportion of rental income is higher in these types of REITs in comparison to other types of REITs. In contrast, residential REITs show a negative and significant coefficient for the rental revenue ratio.

Table 7 **Growth Prospects, Revenue and Expenses, and Profitability of REITs: Regression Analysis Controlling for Type of REIT**

| | Growth Prospects | | Revenue and Expenses | | | | | | Profitability | | | |
|---------------------------|-------------------------|---------|-----------------------------|---------|------------------|---------|---------------|---------|----------------------|---------|-----------|---------|
| | Implied Cap Rate | | NOI/Sales | | Rental Rev/Sales | | G&A Exp/Sales | | Net Income/Equity | | FFO Yield | |
| | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. |
| Log of (Total Cap.) | 0.015 | 0.421 | -1.477*** | -4.52 | -2.280*** | -6.34 | 1.501*** | 4.51 | -0.039 | -1.18 | -0.035 | -0.92 |
| Squared Log of Total Cap. | -0.001 | -0.411 | 0.029*** | 4.62 | 0.044*** | 6.33 | -0.029*** | -4.61 | 0.001 | 1.21 | 0.001 | 0.94 |
| Total Debt /Total Cap. | 0.007** | 2.001 | 0.136*** | 4.61 | 0.205*** | 6.32 | -0.126*** | -4.2 | 0.018*** | 6.26 | 0.031*** | 9.28 |
| Office | -0.029*** | -5.991 | 0.283*** | 6.5 | 0.047 | 0.97 | -0.385*** | -8.7 | -0.008* | -1.81 | -0.006 | -1.13 |
| Retail | -0.027*** | -5.411 | 0.360*** | 8 | 0.254*** | 5.15 | -0.466*** | -10.18 | -0.006 | -1.44 | -0.005 | -1 |
| Industrial | -0.028*** | -4.41 | 0.300*** | 5.43 | 0.198*** | 3.27 | -0.402*** | -7.16 | -0.011* | -1.86 | -0.003 | -0.48 |
| Residential | -0.029** | -2.11 | -0.373*** | -3.03 | -0.735*** | -5.44 | 0.254** | 2.04 | -0.021* | -1.73 | -0.023 | -1.59 |
| Hotel | -0.031*** | -6.02 | 0.438*** | 9.38 | 0.265*** | 5.17 | -0.544*** | -11.47 | -0.012*** | -2.69 | -0.014*** | -2.69 |
| Intercept | -0.164 | -0.35 | 18.841*** | 4.49 | 29.896*** | 6.49 | -18.001*** | -4.22 | 0.504 | 1.19 | 0.445 | 0.92 |
| Adj. R ² | 0.087 | | 0.356 | | 0.527 | | 0.394 | | 0.11 | | 0.27 | |
| F Statistics | 5.310*** | | 30.70*** | | 61.721*** | | 35.981*** | | 6.920*** | | 14.49*** | |

Notes: The sample includes a total of 452 REIT quarterly observations from 20091Q to 20134Q. We classify the sample to REITs by calendar years 2009 to 2013. For calendar year analysis, we examine the quarterly REIT observations classified by calendar years 2009 to 2013. The components include the following measures; Implied Cap. Rate and Payout Ratio as Growth Prospects measure, NOI/Sales and Rental Revenue/Sales, G&A expenses/Sales as REIT Revenue and Expense measures, and Net Income/Equity and FFO Yield as Profitability measures

Assessing the primary research factor in our hypothesis, after controlling for the type of REIT, we argue that REITs grow in size as G&A expense ratios become lower and statistically significant. The shape of this pattern is an inverse U-shaped curve, which indicates that the economies of scale exist at a certain threshold size and the largest REIT firm can reduce its expense ratio. This evidence supports our expectation that as REITs grow in size, its G&A expenses to total sales ratio becomes lower. We maintain that as REITs grow in size, operational efficiency is enhanced, which is indicative of the possible existence of economies of scale. This negative and significant coefficient has been detected in most types of REITs, with the exception of residential REITs. After controlling for the type of REIT, the overall evidence supports that larger REITs have larger NOI to sales ratios with lower expense ratios. However, we are unable to determine the relationship between REIT size and profitability through our profitability measures of ROE (net income to total equity) and FFO yield (FFO to equity amount). In both measures, we find that the coefficients are insignificant, which implies that larger firms do not necessarily mean increases in profitability. Furthermore, the deliberate use of debt as a financial tool enhances the profitability of ROE and FFO yields in firms.

Data Envelopment Analysis

If the firm has an economy of scale, then it operates at the bottom of the U-shaped curve of the long-run average cost by reducing its operating costs (Charnes et al. 1978, Bers and Springer 1997, Anderson et al. 2002). To measure the efficiency of operation and economies of scale in K-REITs, we use a data envelopment analysis (DEA), which is a linear programming technique to construct an efficient cost frontier (Topus et al. 2005). This method allows analysis of overall technical efficiency, measured by the level of asset size and FFO from the output of REITs. Accordingly, if K-REITs of a certain asset size are able to obtain FFO at minimum operating costs, then the K-REITs are operated on an efficient cost frontier. If REIT firms operate in excess of their optimal level of operating costs, then the firms are defined as inefficient. We adopt the DEA approach to estimate scale efficiency, measuring the efficiency of the decision making unit (DMU). We use the size of total assets and FFO as measures of K-REIT outputs. Input is defined as the total operating expenses incurred by each firm.⁸ In Table 8, we run the DEA to identify whether K-REITs are operating at economies of scale per calendar year. Three possible scenarios of firm operations exist, including increasing, constant, and decreasing returns to scale. The results are reported in Table 8, which includes data from a total of 452 quarterly observations. A total of 215 observations are determined to represent scenarios of increasing returns to scale and 237 observation show scenarios of decreasing returns to scale.

In particular, we examine the economies of scale by annual calendar year from 2009 to 2013. The percentage of existing REITs that were operating at

⁸ Anderson et al. (2002)

increasing returns to scale range is reduced from 63% in 2009 to 43% in 2013. The percentage of REITs operating at decreasing returns to scale is increased from 37% in 2009 to 56% in 2013. The results demonstrate that approximately half of the K-REITs exploit economies of scale by reducing operating costs for any given asset size.

Table 8 Economies of Scale of K-REITs by Calendar Year (2009-2013)

| Year | CRS | DRS | IRS | Total |
|-----------|--------------|---------------|---------------|---------------|
| 2009 | N/A | 11 (37%) | 19 (63%) | 30 (100%) |
| 2010 | N/A | 33 (57%) | 25 (43%) | 58 (100%) |
| 2011 | N/A | 52 (55%) | 42 (45%) | 94 (100%) |
| 2012 | N/A | 75 (57%) | 57 (43%) | 132 (100%) |
| 2013 | 1 (<1%) | 93 (56%) | 72 (43%) | 166 (100%) |
| Avg. Size | \$77,402,369 | \$159,489,819 | \$154,149,658 | \$156,381,715 |

Notes: CRS, DRS, and IRS denote constant, decreasing, and increasing returns to scale, respectively.

The average asset size of REIT firms in scenarios of increasing returns to scale is \$154,149,658, while that in scenarios of decreasing returns to scale is \$159,489,819. Although it is difficult to determine optimal firm size, the DEA methodology evaluates economies of scale for any given firm size. Thus DEA results provide implications for firm expansion. Regardless, we are unable to find a discernible conclusion for the operation of REITs in this study. Further analysis on this finding should be conducted in future studies, which we emphasize below in the recommendations for further research.

5. Conclusion

In recent decades, the REIT industry has rapidly expanded in the financial market, and many academic analyses have been conducted on advanced REITs in various Asian countries. However, there has been little academic research available on the REIT industry in South Korea. In response, this study first conducts a comprehensive analysis on the profitability of K-REITs. Furthermore, we test the existence of economies of scale in K-REITs, in line with the findings of the previous literature, which suggest that as the asset size of a REIT firm increases, increased operational efficiency and reduced costs lead to profitability of the firm. We examine the economies of scale in K-REITs in terms of growth prospects, revenue and expenses, and profitability. We obtain financial information from KAREIT, and explore the different aspects of REITs classified based on type, vintage year, and legal platform (i.e., public vs. private REITs). After establishing all of the relevant accounting information,

we run a regression analysis to determine the relationship between the asset size of REIT firms and their potential for growth and profitability.

Our results suggest that, after controlling for legal structure and management type, larger REITs have operational efficiency in which G&A expenses are reduced, thus improving their profitability compared to medium firms. Furthermore, we find operational efficiency in larger K-REIT firms due to lower expense ratios, even after controlling for type of K-REIT. However, this operational efficiency is not linked to profitability when we control for property types. We argue that economies of scale certainly exist in K-REITs due to the relationship between firm size and expense ratio, as well as revenue and expense measures. However, it is still difficult to define the optimal size of a firm to minimize its cost and maximize its revenue based on our regression analysis. We attribute this result to the fact that the size of this industry is still in the beginning stages in terms of the economies of scale. In this sense, it is important to note that the size of the REIT market has rapidly grown and continues to grow. Thus, the results may also reflect a rapid shift in the REIT industry in Korea. In addition, the real estate market in Korea was affected by the global financial crisis in the late 2000s, the results of which are reflected by the market fluctuations in Korea. Although we support our finding that larger REIT firms exploit economies of scale to their advantage, we also give credit to the value of small REITs. Indeed, we also observe that small firms can be a function of property-specific factors, and large REITs without effective management strategies can generate inefficiencies. In sum, we conclude that there is evidence of economies of scale in K-REITs caused by reducing operational expenses. Thus, general expectations for the REIT market should be on possible mergers and acquisitions, as well as regulations that provide government incentives in accordance with the asset size of REITs. However, this study is limited by data availability because a large number of REIT firms have discontinued operations and there is missing information in the records, such as cash flow data, which are due to structural differences such as development REITs. Due to the administrative constraints of KAREIT, we only have data from 20091Q to 20134Q. We include a total of 452 quarterly observations from 74 REIT companies which exclude 115 quarterly observations categorized as development REITs. Also many private REIT companies do not provide internal information to KAREIT, which is similar to the National Association of Real Estate Investment Trusts (NAREIT) in the U.S. Therefore, due to the limitation of data availability on K-REITs, we are not able to longitudinally examine the economies of scale. However, as Ambrose et al. (2005) assert in their study, the role of the market cycle determines the magnitude of economies of scale. Therefore, it would be worthwhile to examine how the economies of scale vary after controlling for market cycles based on longitudinal data in future research work.

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