Economic Research-Ekonomska Istraživanja ›
Volume 32, 2019 - Issue 1

Open access

Listen

Article

A Comparative Analysis of R.E.I.T.s, R.E.O.C.s and P.R.E.O.C.s Using a Stochastic Frontier Approach

Andrius Grybauskas & Vaida Pilinkienė

Pages 1542-1560 | Received 12 Nov 2018, Accepted 05 Mar 2019, Published online: 18 Jul 2019

Cite this article https://doi.org/10.1080/1331677X.2019.1632728 Check for updates

Abstract

Although the first real estate investment trust (R.E.I.T.) was created in 1960s, according to the la ystems on their sto ting the advanta to react with legislati fficiencies and com as well as real e e European Union ctions while trying to e structure on, all types of real e me period of 2014- had a lower

models and partially in fourth, had a stronger economy of scale effect when their assets size increased, and remained competitively profitable though were outperformed in the profit and revenue area.

Keywords: stochastic frontier | real estate (R.E.) | real estate investment trusts (R.E.I.T.) | real estate operating companies (R.E.O.C.) | private real estate operating companies (P.R.E.O.C.)

JEL classifications: C58 | O16 | R3 | R1

1. Introduction

The concept of real estate investment trusts (R.E.I.T.s) started early in 1960s when President Eisenhower signed the Public Law 86-779 into play, which gave an opportunity to invest in large-scale income producing real estate (R.E.). Fast forward to 2017, there were more than 477 R.E.I.T.s globally, which represented 41% of all listed R.E. operating companies (National Association of Real Estate Investment Trusts, 2017). However, only 13 out of 28 European countries in 2018 had an existing law structure and operating property investment trusts, including fairly recent R.E.I.T. system members like Germany and Italy which joined in 2007 (National Association of Real Estate Investment Trusts, 2017). In the developed part of Europe, R.E.I.T.s' market share by market capitalisation in 2017 was only 57.16%, and 42.84% were occupied by Non-R.E.I.T.s,[1] while in emerging markets the R.E.I.T.s share size was as low as 20.9%. Compared that to the U.S., R.E.I.T.s market share by market capitalisation was 99.41%, while No

One of t ed property operatin 997 had found th 997) researc to different type cs over the years u the cost efficienc with most firms fac

Similarly er and

and Wang (2016), Falkenbach and Niskanen (2012), Isik and Topuz (2010), and Ambrose and Linneman (1997), argued that tax-exempt REITs were significantly less reliant on leverage than their tax counterparts, were better suited in finding new capital funds and seizing the moment of opportunities, and had better liquidity, superior source of capital and cost efficiency (Hoesli & Oikarinen, 2014). Brounen, Mahieu, and Veld (2013) stated that the firms which did transit to R.E.I.T. regime experienced a decrease in their leverage, a slight jump in stock turnover levels and larger dividend pay-outs.

Despite the many benefits, the majority of European countries have been resilient to the idea of publicly-traded R.E. trusts, as Clayton, Eichholtz, Geltner, and Miller (2007) states, for fear it will distort the competition when national R.E.I.T.s multiply. Furthermore, the high yield on R.E.I.T. stocks endures a high degree of risk, which makes R.E.I.T. stocks extremely volatile (Kawaguchi, Jarjisu, & Shilling, 2012). It was found that R.E.I.T.s volatility increases with firm leverage, higher inflation shocks and the use of short-term debt (Li, 2012). The two studies – one carried out by Miller and Springer (2007) and another by Vogel (1997) – stated that the empirical findings contradict previous studies on economies of scale. The latter study postulated that the existing growth in the R.E.I.T. industry arose because of external factors but not due to the exceptional operating performance, meanwhile the Miller and Springer's (2007) stochastic modelling case showed no signs of existing economies of scale and even found some evidence of existing diseconomies. The papers presented by Gentry et al. (2003) and Brounen, Ling, and Vaessen (2016) who used interest rate proxies, also indicated that since R.E.I.T.s were considerably leveraged, they were quite sensitive to interest rate and bond yield changes, which at an aggregate level made the R.E. market more un sing bubble crisis in

Neverth a full-scale compari cused on the R.E.I.T.s tive conc nplement R.E. Trus ficial and sustaina ct an econom ting compani od.

Consequ nsidered for

creating a new legal entrance for R.E.I.T.s to come into place to the rest of emerging European markets is desired.

The study concludes that on average R.E.I.T.s were more cost efficient than Non-R.E.I.T.s in three out of four models and retained a lower short-term to long-term liability ratio. The R.E.I.T.s seem to be a more sustainable approach to R.E. market development, so the possibility of implementing such structure in individual countries should be thoroughly discussed at economic and political levels.

The remainder of this article is structured as follows. Section 2 analyses the existing theoretical literature of the relatable studies that were conducted earlier. Section 3 describes the data collected and the econometrical methodology used for modelling efficiencies. Section 4 presents the results and interprets their meanings. Section 5 provides the recommendations and concludes the findings of the empirical research.

2. Theoretical background and literature overview

The research on R.E.I.T.s is much more limited than the research on other economic issues, especially in terms of comparative cost efficiencies among different types of R.E. companies. Scherer (1995) was the first to point out that when R.E.I.T.s merge, economies of scales occur. Two years later an empirical study by Bers and Springer (1997) was published to test the hypothesis. Three-hundred and thirty-four observations were collected for the period of 1992–1994, and the significant evidence of R.E.I.T rger R.E. compani existed, althoug nce in leverage nother discover act of time variable lem to the S.N.I recorded in 1993, w nt amounted to 1.2; t ient equal to 1.06, an Total percenta ol factors for

In all the cases, the majority of firms emitted considerable benefits to the market. Ambrose, Ehrlich, Hughes, and Wachter (2000) similarly analysed R.E.I.T. income growth and profitability in 1990s. Their research implied that for smaller property operating companies, net operating income growth rates exceeded average growth rates in the markets, therefore below average in size R.E.I.T.s were generating revenue and operating economies. Interestingly, the authors did not find any economies of scales for larger R.E.I.T.s. A different perspective was provided by Ambrose and Linneman (1997) stating the natural implication that larger R.E.I.T.s in regard to capital cost had a double economy of scale. Building on past research, Ambrose et al. (2005) found that large Trusts had an increasing growth opportunity while succeeding at lowering costs, thus concluding a direct relationship between firm profitability and firm size. Additionally, an inverse relationship was found between REIT size and weighted average cost of capital (W.A.C.C.), which meant that larger corporations managed to lower systematic risks. The same economies of scale were found in Asian R.E.I.T.s by Sing, Sham, and Tsai (2009). With employment of semi-log quadratic models, positive scaling effects were found in all the types of expenses, except for property management fees, after controlling for exogenous factors, like a country, a year, a diversification strategy and growth. However, no advantages in revenue, operating income and equity costs for larger Asian R.E.I.T.s were discovered.

Contrary to the researchers mentioned before, Anderson and Shelor (1999) found that R.E.I.T.s were generally inefficient over the period of 1992 to 1996, with the efficiency scores presented between 44.1% and 60.5%. Strangely, three years later, Anderson et al. (2002), using a different sample size of 173 companies for a different time period of 1995 g returns to scale. M y, where with sto of economi cy increased over tim also affirm like merg nd Liang (1995), v 988), found that larg s risky as smaller

Sadly, m he research

In this article

European R.E.I.T.s are Schacht and Wimschulte (2008), who studied German companies in terms of liquidity and risk/return characteristics. Their results showed that G.-R.E.I.T.s had the opportunities to accumulate substantial capital in the medium term and thus facilitate a more cointegrated German property and the capital market. Newell, Adair, and Nguyen (2013), who delivered a S.I.C. (French-called R.E.I.T.s) analysis for the period 2003–2012, found robust evidence that French R.E.I.T.s gave superior risk-adjusted returns and served as a great portfolio diversification tool. Newell and Marzuki (2018), who analysed S.I.C.I.M.I.s (Spanish R.E.I.T.s), stated that over the period of 2014 to 2018, the Spanish R.E.I.T.s gave good risk-adjusted returns compared to bonds, and were deeply contributing to diversification of mixed portfolios.

Although all of the above-mentioned studies do provide substantial arguments for implementation of the R.E.I.T. system in the rest of Europe, they do not compare all three types of property income generating companies, which are as follows:

1. L.R.E.I.T.s (listed real estate investment trusts, R.E.I.T.s),

2. L.R.E.O.C.s (listed real estate operating companies, R.E.O.C.s),

3. P.R.E.O.C.s (private real estate companies, can also be abbreviated to P.R.E.C.s).

Comparative knowledge on different types of R.E. companies is very limited. A paper was published by Ambrose et al. (2016) where both L.R.E.O.C.s and L.R.E.I.T.s that strictly operated in the EU were analysed, and a sample of 236 companies was collected. Evidently, it was found that larger companies were more profitable and endured lower expenses. The additional findings revealed that economies of scales existed b did not result in companies from the traded R.E. performa of four U.S. R.E. sect egardless of secto assive portfo sis points annualis E.I.T.s served a nalysing R.E.I.T.s provided a significa Bo-Sin et al.

Singapore, concluded that Trusts should not be viewed as a complete substitute for direct property investment. Brounen et al. (2016) carefully studied 732 listed R.E. companies in 10 different countries and analysed what effects interest rate loadings had on daily operations of the firms. Their findings suggest that interest rate sensitivity is more prominent for private R.E. companies with large parts of short-debt maturities and low occupancy ratios.

Generalising the past studies, it can be stated that they contain certain problems and limitations. Firstly, although some studies compared R.E.I.T.s to private companies or R.E.I.T.s to other publicly listed R.E. firms, the comparisons were not made for efficiency estimates and a full 3-type comparison was not conducted. For this reason, it is hard to say to which extent one group of companies surpasses others. The other problems identified in some of the studies were a small sample size and a possible inconsistency in the financial reporting of expenses and revenues, which authors themselves admit. These inaccuracies might have caused some biases in the results estimated for the sampled countries. Additionally, most of the studies are quite old (from the 1990s) or for some countries non-existent at all. A concise and easy on the eye comparison of the most impactful research papers on R.E.I.T.s over the period of the last 20 years is presented in Table 1.

Table 1. Most impactful previous research on R.E.I.T.s performance.

Download CSV Display Table

3. Data

As th fits of creati European markets nada, the U.K., Ge stonia, Bulgaria venia, Latvia, H as collected

In this article

and P.R.E.O.C.s. Even though some countries did not have R.E.I.T.s at all, they were chosen purposely to see how an existing firm structure compares to the countries that have R.E.I.T.s. In order for the information to be as precise as possible, the credible databases were chosen: for listed R.E.I.T.s and R.E.O.C.s, the information was obtained from the official Bloomberg terminal and directly from S.E.C. reports, while the information about P.R.E.O.C.s was extracted from the Bureau van Dijk Orbis database. On Orbis database, private companies were filtered by employing the following sector activity tools:

1. L688101 – buying and selling of own R.E.

2. L68202 – renting and operating of own leased residential R.E.

3. F41201 – construction of residential and non-residential buildings

4. L68320 – management of R.E. on a fee contract basis

5. 236210 – industrial building construction

6. 5313 – activities relating to R.E.

The R.E.O.C.s in the U.S. mostly covered R.E. service, brokerage firms, construction and hotel service providing companies, while in Europe the activity landscape of listed R.E.O.C.s was much broader and interconnected to all the sectors. Although there is no empirical research explaining this tendency, one of the plausible explanations is that in 15 E.U. countries R.E.O.C. is the only available stock exchange option that can do busines new in the Europea

If any co sheets or income s sample countrie nue size. The l -2016. The limita at many regulatio ompanies. Many of vest data, some co hree-year period o The

Table 2. Summary statistics for main variables.

Download CSV Display Table

The method chosen for the econometrical model was a stochastic frontier analysis (S.F.A.) method for panel data created by Battese and Coelli (1992). Data envelope analysis and S.F.A. are considered the golden standards in econometrics, however S.F.A. has an edge since it can separate noise from efficiency and can better align with the randomness that exists in the data (Aigner, Lovell, & Schmidt, 1977). The cost S.F.A. function has the following simple and logarithmic forms:

$$C=C\ (y,\ w,\ u,\ v) \ln C=f\ (y,\ w)+\ln\ u+\ln vu\geq 0,$$

(1) where c measures the cost, y stands for the output quantity vector, w is the vector input price, u accounts for cost inefficiency, and v accounts for statistical noise in the model. Rearranging the equation to:

$$C=\ c(w,y)euevu\geq 0,$$

(2) let us use the Shephard technical efficiency (C.E.) calculation for the chosen S.F.A. function in the following form:

$$CE=\ cc(w,y)\ ev=f(x)\ euevc(w,y)\ ev$$

(3)

The S.F.A using the normal (density function

(4) E., and σ stands n of the noise te u, the distribut skewed in the case F.A. It is represer

In this article

$$\ln C = \alpha 0 + \sum_{i=1}^{m} \alpha i \ln yi + \sum_{i=1}^{n} \beta j \ln wj + \sum_{i=1}^{m} \sum_{r=1}^{m} \pi ir \ln qi \ln qr \quad (5)$$

$$\ln c(w,y) = \alpha 0 + \sum_{i=1}^{N} \alpha i \ln wi + \alpha y \ln y + \frac{1}{2} \sum_{i=1}^{N} \sum_{j=1}^{N} \alpha ij \ln wi \ln wj + \frac{1}{2} \alpha yy (\ln y)2 + \sum_{i=1}^{N} \alpha iy \ln wi \ln y, \quad (6)$$

where w denotes the price vector, y – the output vector quantity, β – a calculated coefficient of the translog function for a particular firm, and α – the coefficient for M.L.E. results.

It is of crucial importance to choose the right inputs and outputs for the model to be successful. Regarding the output, some authors, like Bers and Springer (1997), Anderson et al. (2002), Miller et al. (2007), Ambrose et al. (2016) and others, used total assets as their main output, while other authors added total revenue into the mix. Bers and Springer (1998) argued that assets was a reliable output because it was highly correlated with market capitalisation; second, assets showed low variance, therefore results in general were more consistent; and third, the outcomes were on average less biased. For the cost side, various variables were used historically and differed quite a lot among the authors. Combinations of the sum of interest expenses, general administrative expenses, depreciation, property operating expenses, other expenses and total debt were used. For the input prices, proxies were created in all of the prior studies. Miller, Clauretie, and Springer (2006) used proxies of interest expenses divided by total debt (average cost of debt) and average other expenses divided by assets (average prices of other inputs). Another proxy used by Topuz, Darrat, and Shelor (2005) was property operating expenses divided by assets, which showed how much

(7) 

(8) where rf denotes the risk-free rate, rm−rf is the risk premium, and β stands for the unsystematic risk. The risk-free rate is usually considered as the rate of U.S. treasury bills, while rm can be taken as S&P 500 annual total return. The beta coefficient shows corporate rate of return movement to the market changes: if the rate is equal to 1, it is aligned with the market; if it is over 1, it exaggerates the market movements; finally, if it is minus 1, it means that the risk is interchangeable. A couple of studies on the size of the beta coefficient for R.E.I.T.s in the U.S. and Europe can be found. The research by Connors and Jackman (2000) revealed that on average the U.S. R.E.I.T.s had the beta of 0.38, which indicated that R.E. companies fluctuated almost independently from the market. Similarly, Jong and Tik (2015) found that Asian R.E.I.T.s had the beta around 0.46.

The cost of labour price proxy can be obtained just like in Maudos et al.'s (2002) research by dividing personnel expenses by the number of employees. Control variables also have to be included because higher leveraged companies face higher total cost. For this reason, a debt to equity ratio was included in the model. Cost elasticities (scale efficiencies) for translog functions are calculated by taking first degree derivatives in respect to assets: if elasticity is above 1, it shows cost-growth determined diseconomies; if the values are under 1, it shows economies of scales. The formula can be represented by this equation below:

$$\delta \ln Cost \delta Asset = \alpha 1i + 2 * \pi 11i \ln Assets$$

(9)

After spe d for 666 firms in easures the efficienc

lnCost1((Wacc)+β21

(10)

The secc

$$\text{OEAssetsGAemp} + \beta 32 \ln \text{INT\_EXP}$$

$$\text{Total\_debt} + \beta 42 \ln \text{G\_AEmp} + \gamma 12 \text{Debt ratio} + \lambda 12 \text{Time} + v2 + u2$$

(11)

The third and fourth models are the extended translog functions of equations (10) and (11) (due to the notation longitude, mathematical sigma's notations were added):

$$\ln \text{Cost3 (INT exp} + \text{G\_A)} = \alpha 03 + \alpha 13 \ln \text{Assets} + \pi 113 \ln \text{Assets} * \ln \text{Assets} + + \beta 13 \ln(\text{Wacc}) + \beta 23 \ln \text{INT\_EXP Total\_debt} + \beta 33 \ln \text{Other\_OEAssets} + \beta 43 \ln \text{G\_AEmp} + 12 \sum i=1N \sum j=1N \alpha ij \ln wil \ln wj + 12 \alpha yy(\ln y)2 + \sum i=1N \alpha iy \ln wil \ln y + \gamma 13 \text{Debt ratio} + \lambda 13 \text{Time} + v3 + u3$$

(12)

$$\ln \text{Cost4 (INT exp} + \text{G\_A)} = \alpha 04 + \alpha 14 \ln \text{Revenue} + \pi 114 \ln \text{Revenue} * \ln \text{Revenue} + \beta 14 \ln(\text{Wacc}) + \beta 24 \ln \text{INT EXP Totaldebt} + \beta 34 \ln(\text{Other\_OEAssets}) + \beta 44 \ln \text{G\_AEmp} + 12 \sum i=1N \sum j=1N \alpha ij \ln wil \ln wj + 12 \alpha yy(\ln y)2 + \sum i=1N \alpha iy \ln wil \ln y + \gamma 14 \text{Debt ratio} + \lambda 14 \text{Time} + v4 + u4$$

(13)

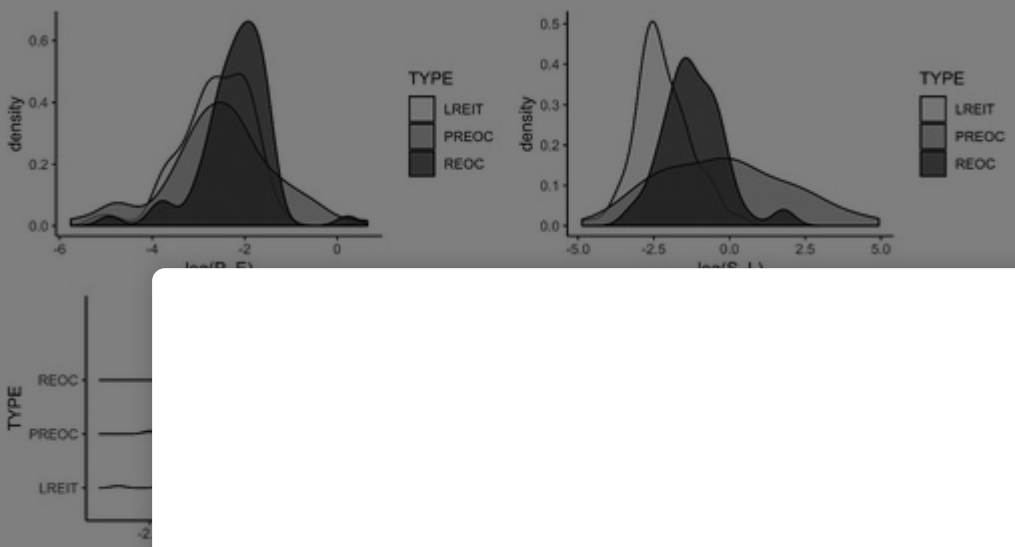
Since we obtained the panel data for the period of 2014 to 2016, a time variable was also included, which measures whether firms manage to become better at increasing their efficiency and debt management through gathering experience and enduring a learning curve over time.

4. Res

The info S/L. D/E) and tot T.s. In our sam urity to long-ter smaller ratio while co er for R.E.O.C.s idering these m curred in

establish a more sustainable growth of the R.E. markets in the developing part of Europe, while still retaining high profits and being in size on par with bigger R.E.O.C.s. According to Huynh, Paligorova, and Petrunia (2018), the explanation behind the significant gaps observed between P.R.E.O.C.s and public companies can be attributed to private firms' shorter life cycles, asymmetric information and higher systemic risk. For the banks the assessment of smaller firms' risk profile is more difficult, therefore for private firms' accessibility of long-term financing is also limited and P.R.E.O.C.s have little choice but to rely on balloon mortgages or other types of short-term financing options which in many cases are more expensive. In most cases under consideration, R.E.I.T.s emitted a smaller variance in the data and were more clustered together, while the other types of firms showed a 29%–44% greater standard deviation. This could be related to Bers and Springer's (1997) finding that R.E.I.T.s do have an optimal size at which they are most cost efficient.

Figure 1. On the top left, a 3-year average (2014-2016) profit to equity ratio, on the top right, a 3-year average shot-term to longterm debt ratio, on the lower left a 3-year average debt to equity ratio, and on the low right, a 3-year average total debt accumulated for different types of RE companies are depicted. Source: Authors' elaboration based on the data gathered from Bloomberg, Bureau Van Dijk and SEC.



The resu ngly, the variable e in Bers and Spri me more efficient be able to

perspective of the board of directors are needed, but the former infrequently occurs in a 10-year period.

Table 3. Stochastic frontier estimation.

Download CSV Display Table

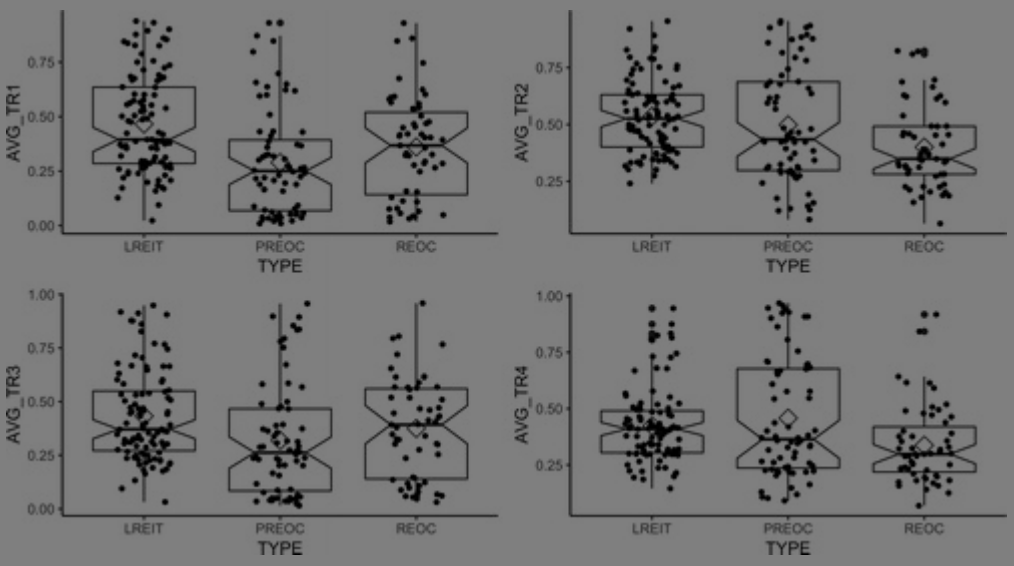
It also confirms that R.E. as a product is a very bureaucratic mechanism which requires many permits from the state and other third parties involved. A time period of three years is too short to have an accumulated experience.

However, a favourable aspect is that throughout the period of 2014–2016, the central banks did not make any significant interest rate changes. This way, the influence of exogenous variables on base interest rates was avoided. If the rates had changed, it could have meant that the firms might have got less cost efficient through time. This is something that was not considered by Miller et al. (2007) who concluded that inefficiency grew over time without taking interest rate changes into account. Another observation was that in all three models' R.E.I.T.s on average outperformed their counterparts in efficiency[2] measures, with better cost management results varying from 7% up to 37.9%. Only in the fourth Translog model, the private firms managed to be 8% more productive, while R.E.O.C. were 20% more inefficient. Higher productivity of P.R.E.O.C.s in the last model, according to Degryse, Goeij, & Kappert (2010), can be explained by the overcompensation mechanism that private enterprises have to adopt. Since P.R
son to listed firms, th
d profit areas to
was consiste
unterparts, reaching
.1, and L.R.E.
ation are depic

Figure 2.
ot for the 1st trans
t for the 2nd translog
r the 3rd translog
lot for the

In this article

4th translog model in different types of RE companies are depicted. Source: Authors' elaboration based on the data gathered from Bloomberg, Bureau Van Dijk and SEC.



Display full size

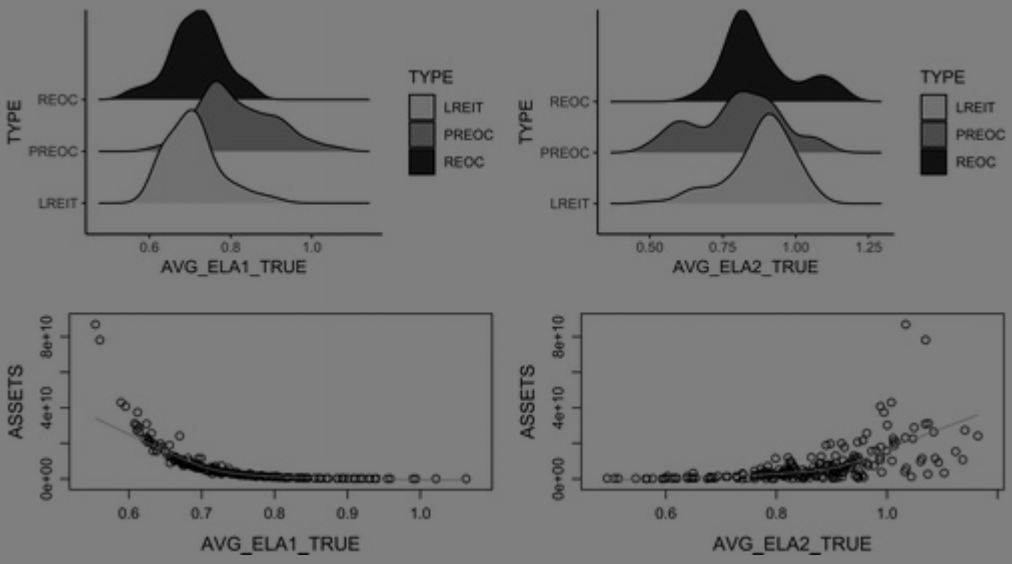
An accurate and a comprehensive comparison of the results acquired from our four translog panel data models with the results obtained by other authors was not possible since all other models only compared R.E.I.T.s among themselves or with other listed income property companies and used different compositions, methodologies, time periods, variable sizes, company types and data sources. Although the models differ by a significant margin, it does seem that in general the efficiencies are somewhat in a similar value ballpark. Topuz et al. (2005) for R.E.I.T. companies estimated the efficiencies varying from 35 to 9% depending on the years chosen; by applying the D.A.E. method, Harris (2012) found the efficiencies varying from 51 to 33%, while for time period of 2013–2016 Ambrose et al. (2016) found the efficiencies to be 32%, 35%, and 36% n of the prior res

Economi y Ambrose et al. (20 kewise, as firms h ternalities bette mounting to 0.74 for served in Figure 3.

Figure 3. sity plot for the first ensity plot

In this article

asset size for the first translog model, and on the lower right, a three-year average efficiency to assets for the second translog model in different types of R.E. companies are depicted. Source: Authors' elaboration based on the data gathered from Bloomberg, Bureau Van Dijk and SEC.



Display full size

R.E.I.T.s had on average 13% and 1.1% larger economies of scales against private firms and R.E.O.C.s, respectively. The gap of 13% comes mainly from P.R.E.O.C.s' inability to find long-term debt financing solutions. This is especially true when we are analysing R.E. business as much of it is based on leverage. When capital financing is limited, growth prospects become narrow. A reversed relationship was found with revenue output, meaning that smaller firms have the biggest growth potential with the average economies of scales of 0.85 for the second model. With regards to the revenue variable, R.E.I.T.s were found to perform poorer in the aspect of growth with the second model v tively. Only two L.L.C sets T.R. model, w ne – R.E.O.C.s nt modellin where econ 3.2% with outpu es for compani enue.

5. Con

In this article

As the emerging economies in Europe are looking for the ways to catch up with the developed part of the world with regards to expanding their R.E. markets, R.E.I.T.s systems were a successful and promising market infrastructure for many countries. Numerous studies dating back to 1998 up to 2016, established concrete evidence that R.E.I.T.s had economies of scales related to their technical, allocative and scale efficiencies. Although previous studies were slightly contradictory, the newest research of Ambrose et al. (2016) once again confirmed that R.E.I.T.s and R.E.O.C.s have a substantial potential for growth. Nevertheless, no study emerged that would differentiate the types of property operating companies (P.R.E.O.C.s, R.E.O.C.S., R.E.I.T.s) and would compare them directly with one another.

For this reason, this study developed four translog stochastic frontier models that measured each company's individual technical efficiency, economies of scales and debt ratios. The stochastic frontier method was chosen instead of D.E.A. because it can separate noise from efficiency and can better align with the randomness that exists in the data even though both D.E.A. and S.F.A. are considered the golden standards for efficiency analysis.

The results show that REITs on average were from 70% to 97.3% less dependent on short-term maturities against their counterparts, were more clustered and similar in size since their standard deviation was from 29% to 44% smaller than that of the other types of firms and had a 70% and 13% smaller debt-to-equity ratio in comparison to P.R.E.O.C.s and L.R.E.O.C.s, respectively. The output of translog functions indicated that R.E.I.T.s on average were from 7% to 37.9% more efficient, and only in the fourth model private c rior research use when firms be cost external nies where with out by 9% and 1.1% ag enue P.R.E ely. Time variable for R.E.I.T.s to be mo ed. Also, since the ate regulatio implement

Policy implications driven from these conclusions are as follows: R.E.I.T.s seem to have a well-documented performance advantages against other types of firms; therefore, it is reasonable to advise for the developing part of Eastern Europe to consider adopting this system into their stock exchange. Nevertheless, some additional circumstances should be considered because peculiarities[3] of a country may determine whether R.E.I.T.s can be successfully implemented. The regulations for R.E.I.T.s differ across Europe, therefore the countries should look carefully at what tax provisions, dividend payment ratios and market concentration levels might suit their markets best.

For further research, we suggest authors to delve into how different tax regimes, dividends, legal provisions, corporate policies or capital inflows can affect R.E.I.T.s efficiencies. Perhaps similar company profiles could be chosen for sector analysis. Additionally, a comparative multi-level analysis of continental differences could show how well R.E.I.T. systems are being integrated in Europe with regards to other countries and whether there exists a significant control parameter variance among different regions.[23]

Notes

1 Non-R.E.I.T.s – public or private companies that are operating in the real estate sector but do not have tax deductibles, annual obligatory dividend distribution from cash flows and are not limited to the amount of which their operations have to come from rental income.

2 The ef echnical efficienc an be called scale eff

3 Notice een 23 Euro s beyond the sc epancies. It is difficu hen analysin

References

1. Aigner, D., Lovell, S., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. Journal of Econometrics, 6(1), 21–37. doi:10.1016/0304-4076(77)90052-5
   Google Scholar

2. Ambrose, B., & Linneman, P. (1997). REIT organizational structure and operating characteristics. Journal of Real Estate Research, 21(3), 141–162.
   Google Scholar

3. Ambrose, B., Ehrlich, R., Hughes, W., & Wachter, M. (2000). REIT economies of scale: Fact or fiction? The Journal of Real Estate Finance and Economics, 20(2), 211–224. doi:10.1023/A:1007881422383
   Web of Science ® | Google Scholar

4. Ambrose, B., Fuerst, F., Mansley, N., & Wang, Z. (2016). Assessing size effects and economies of scale in European real estate companies. Brussels: Publication office of EPRA. Retrieved from http://www.epra.com/research/academic-research
   Google Scholar

5. Ambrose, B., Highfield, M., & Linneman, P. (2005). Real estate and economies of scale: The case of REITs. Real Estate Economics, 33(2), 323–350. doi:10.1111/j.1540-6229.

6. Ander ollowing initial
   Go

7. Ander and econo y. European Journa
   2217(

8. Anderson, R., Springer, T., & Lewis, D. (2003). The cost efficiency of real estate investment trusts: An analysis with Bayesian Stochastic frontier model. The Journal of Real Estate Finance and Economics, 26(1), 65–80. doi:10.1023/A:1021522231824
Web of Science ® | Google Scholar

9. Ascherl, C., & Schaefers, W. (2018). REITs and REOCs and their initial stock market performance: A European perspective. Journal of European Real Estate Research, 11(1), 4–27. doi:10.1108/JERER-10-2016-0036
Web of Science ® | Google Scholar

10. Battese, G. E., & Coelli, T. J. (1992). Frontier production functions, technical efficiency and panel data: With applications to paddy farmers in India. The Journal of Productivity Analysis, 3(1–2), 153–169.
Google Scholar

11. Bers, M., & Springer, M. (1997). Economies-of-scale for real estate investment trusts. Journal of Real Estate Research, 14(3), 275–291.
Google Scholar

12. Bers, M., & Springer, M. (1998). Sources of scale economies for REITs. Real Estate Finance, 3(15), 47–56.
Google Scholar

13. Bo-Sir ce of four Asia-P 31. doi:10

14. Br f public real est http:// Goog

15. Broun regimes an

In this article

Weimer School Session, and at the 2013 Maastricht EPRI REIT Conference.
Google Scholar

16. Clayton, J., Eichholtz, P., Geltner, D., & Miller, N. (2007). Commercial real estate analysis and investments. Stow, OH: LEAP Publishing Services.
Google Scholar

17. Connors, D., & Jackman, L. (2000). The cost of equity capital for REITs: An examination of three asset-pricing models. Retrieved from https://dspace.mit.edu/bitstream/handle/1721.1/32204/48528695-MIT.pdf;sequence=2
Google Scholar

18. Cotter, J., & Richard, R. (2015). A comparative anatomy of residential REITs and private real estate markets: Returns, risks and distributional characteristics. Real Estate Economics, 43(1), 209–240. doi:10.1111/1540-6229.12059
Web of Science ® | Google Scholar

19. Degryse, H., Goeij, P., & Kappert, P. (2010). The impact of firm and industry characteristics on small firm's capital structure. Small Business Economics, 38(4), 431–447. doi:10.1007/s11187-010-9281-8
Web of Science ® | Google Scholar

20. Europ -epra-nareit
month of EPRA.
Retrie
http:// 2017_15068
61911
Go

21. Falken quities: REITs
and R), 173–187.
doi:10

22. Gentry, W. M., Kemsley, D., & Mayer, C. J. (2003). Dividend taxes and share prices: Evidence from real estate investment trusts. Journal of Finance, 58(1), 261–282. doi:10.1111/1540-6261.00524
Web of Science ® | Google Scholar

23. Harris, J. A. (2012). Real estate investment trust performance, efficiency and internationalization (Doctoral dissertation). Retrieved from http://stars.library.ucf.edu/cgi/viewcontent.cgi?article=3363&context=etd
Google Scholar

24. Henningsen, A. (2014). Introduction to econometric production analysis with R. Denmark: University of Copenhagen.
Google Scholar

25. Hoesli, M., & Oikarinen, E. (2014). Are public and private asset returns and risks the same? Evidence from real estate data. Journal of Real Estate Portfolio Management, 22(2), 179–198.
Google Scholar

26. Hoesli, M., & Oikarinen, E. (2014). Are public and private real estate returns and risks the same? Brussels: Publication office of EPRA. Retrieved from http://www.epra.com/research/academic-research
Google Scholar

27. Huynh e and public firms.

28. Isik r presented at
Goog

29. Jong, I uring and after t m Real

Google Scholar

30. Kawaguchi, Y., Jarjisu, S., & Shilling, J. (2012). REIT stock price volatility and the effects of leverage. Real Estate Economics, 45(2), 452–477. doi:10.1111/1540-6229.12153
Web of Science ® | Google Scholar

31. Latipah, S., Tahir, H., & Zahrudin, Z. (2012). Measuring efficiency of real estate investment trust using data envelopment analysis approach. Paper presented at The Fifth Foundation of Islamic Finance Conference, Malaysia.
Google Scholar

32. Li, L. (2012). The determinants of REIT volatility. Connecticut: Real Estate Research Institute. Retrieved from https://www.reri.org/research/articlepdf/wp184.pdf
Google Scholar

33. Maudos, J., Pastor, J. M., Perez, F., & Quesada, J. (2002). Cost and profit efficiency in European banks. Journal of International Financial Markets, Institutions and Money, 12(1), 33–58. doi:10.1016/S1042-4431(01)00051-8
Google Scholar

34. McIntosh, W., Liang, Y., & Thompkins, L. (1991). An examination of the small-firm effect within the REIT industry. Journal of Real Estate Research, 6(1), 9–18.

35. Mcinto
transa onomics,
10(3),

36. Miller, e, and cost
ineffic
http://
Goog

37. Miller, S. M., Clauretie, T. M., & Springer, T. M. (2006). Economies of scale and cost efficiencies: A panel-data stochastic-frontier analysis of real estate investment. The Manchester School, 74(4), 483–499. doi:10.1111/j.1467-9957.2006.00505.x
Web of Science ® | Google Scholar

38. Naranjo, A., & Ling, D. (2003). The dynamics of REIT capital flows and returns. Real Estate Economics, 31(3), 403–436. doi:10.1111/1540-6229.00071
Web of Science ® | Google Scholar

39. National Association of Real Estate Investment Trusts (NARIT). (2017). Global real estate investment. Washington, DC: Publication office of NAREIT. Retrieved from https://www.reit.com/investing/global-real-estate-investment
Google Scholar

40. Newell, G., & Marzuki, J. M. (2018). The emergence of Spanish REITs. Journal of Property Investment & Finance, 36(5), 495–508. doi:10.1108/JPIF-05-2018-0032
Web of Science ® | Google Scholar

41. Newell, G., Adair, A., & Nguyen, T. (2013). The significance and performance of French REITs (SIICs) in a mixed asset portfolio. Journal of Property Investment & Finance, 31(6), 575–588. doi:10.1108/JPIF-01-2011-0004
Google Scholar

42. Schac es and the introd 232–246. doi:10

43. Sc usiness Cre Goog

44. Sing, T ger Asian REITs? 3), 231–241.

Google Scholar

45. Topuz, J., Darrat, A., & Shelor, R. (2005). Technical, allocative and scale efficiencies of REITs: An empirical inquiry. Journal of Business Finance & Accounting, 32(9–10), 1961–1994. doi:10.1111/j.0306-686X.2005.00653.x

Web of Science ® | Google Scholar

46. Van Dirk, B. (2018). Resource for private company data. Accessed September 28, 2018, from https://www.bvdinfo.com/en-gb

Google Scholar

47. Vogel, J. (1997). Why the conventional wisdom about REITs is wrong. Journal of Real Estate Finance, 14(2), 7–12.

Google Scholar