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

Open access

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

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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

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debt-to-equity ratio, were more efficient at managing costs in three stochastic translog 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 In market share by occupied by Non-R.E. as 20.9%. Compare was 99.41%, while No

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Similarly, some other authors, like Latipah, Tahir, and Zahrudin (2012), Cotter and Richard (2015), Ambrose, Highfield, and Linneman (2005), Ambrose, Fuerst, Mansley, 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) stochast nd even found sc entry et al. (2003) a es, also indicate sensitive to interest e R.E. market more un sing bubble crisis in

Neve a full-scale compari cused on the R.E.I.T.s tive conclusi nplement R.E. Trus ficial and sustaina ct an

Consequently, a conclusion on whether a deeper investigation should be considered 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. com merge, economi Springer (1997) w observat t evidence of R.E.I.T rger R.E. compani existed, althoug nce in lever nother disco act of time variable lem to the S.N.L. se recorded in 1993, wh nt amounted to 1.2; th ient equal to 1.06, an Total

years 1992, 1993, 1994 were as follows: 71%–88%, 84%–90% and 68%–98%, respectively.

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 a

Contrary found that R.E.I.T.s efficiency scores p nderson et al. (2 time period of 1995 g returns to scale y, where with of economi cy increased over tim also affirmed like mergers nd Liang (1995), 988), found

Sadly, most of these studies were conducted on the U.S. companies, while the research on European companies is even more limited. Among the few authors that analysed 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).

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significantly lower under-pricing than the latter, although Chinese scientist Bo-Sin et al. (2008), who studied R.E.I.T.s and private companies in the U.S., Australia, Japan and 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
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3. Data

As the p fits of creating European markets nada, the U.K., Ge stonia,

Latvia, Hungary, Croatia and the Czech Republic. The data for the model was collected for three different types of property-income operating companies: R.E.I.T.s, R.E.O.C.s 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. tructionand hotel se f listed R.E.O.C.s there is no empirica ns is that in 15 E.U. c can do business new in the Europea

If an sheets or income sample countrie nue size. The late -2016. The limitatio at many regulatic ompanies. Many of est data,

period of the data available. In total this article examines 666 observations. The summary statistics of the main variables are displayed in Table 2.

Table 2. Summary statistics for main variables.

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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:

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

(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:

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the case of cost inefficiencies. Translog was chosen as a function type for S.F.A. It is represented by the following equations (Henningsen, 2014):

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

$$\ln c(w,y) = \alpha 0 + \sum i=1N \alpha i \ln wi + \alpha y \ln y + 12 \sum i=1N \sum j=1N \alpha ij \ln wi \ln wj + 12 \alpha yy (\ln y)2 + \sum i=1N \alpha iy \ln wi \ln y, \quad (6)$$

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 administ expenses and tota the prior studies. nses divided by total assets (average Shelor (2005) w ow much propert roxies, Amb hich was calculat

(7) whe f a firm's equity, D (E) and a firm's de e against

total debt, while cost of equity (Re) was calculated by the Nobel Prize awarded capital asset pricing model (C.A.P.M.), expressed in this equation:

$$Re = rf+rm-rf*\beta, \quad (8)$$

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 d t-growth determi scales. The formula

(9)

After d for 666 firms easures the efficienc

lnCost1((Wacc)+β21

(10)

The second model imposes revenue as its quantity variable:

$$\ln Cost2\ (INT\ exp + G\_A) = \alpha 02 + \alpha 12 \ln Revenue + \pi 112 \ln Revenue * \ln Revenue + \beta 12 \ln(WACC) + \beta 22 \ln Other\ OEAssetsGAemp + \beta 32 \ln INT\_EXP\ Total\_debt + \beta 42 \ln G\_AEmp + \gamma 12 Debt\ ratio + \lambda 12 Time + v2 + u2 \quad (11)$$

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):

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

$$\ln Cost4\ (INT\ exp + G\_A) = \alpha 04 + \alpha 14 \ln Revenue + \pi 114 \ln Revenue * \ln Revenue + \beta 14 \ln(Wacc) + \beta 24 \ln INT\ EXP\ Totaldebt + \beta 34 \ln(Other\_OEAssets) + \beta 44 \ln G\_AEmp + 12 \sum i=1N \sum i=1N \alpha ij \ln wi \ln wj + 12 \alpha yy(l \quad (13)$$

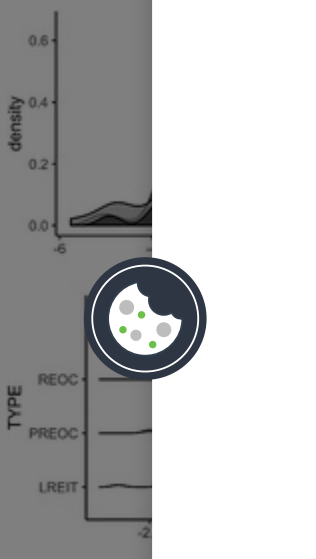
Since we iable was also incl ncreasing their effi nduring a learning

4. Res

The info S/L. D/E) and tota T.s. In our sample s urity to

R.E.O.C.s and 70% higher for private companies compared to R.E.I.T.s. Considering these measurements in a scenario of a financial crisis, similar to one that occurred in 2008, R.E.I.T.s (since they are considerably less leveraged) would have less of a struggle to cope with debt maturity problems. Therefore, at a first glance, they could 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 accumul hors' elaborat nd SEC.



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The results of the four translog models can be observed in Table 3. Interestingly, the variable time was insignificant in all four models at a 0.05% interval, just like in Bers and Springer's (1997) research which suggests that companies do not become more efficient with experience. That could also mean that in order for R.E.I.T.s to be able to take advantage of time, a different recourse of a management style and a different perspective of the board of directors are needed, but the former infrequently occurs in a 10-year period.

Table 3. Stochastic frontier estimation.

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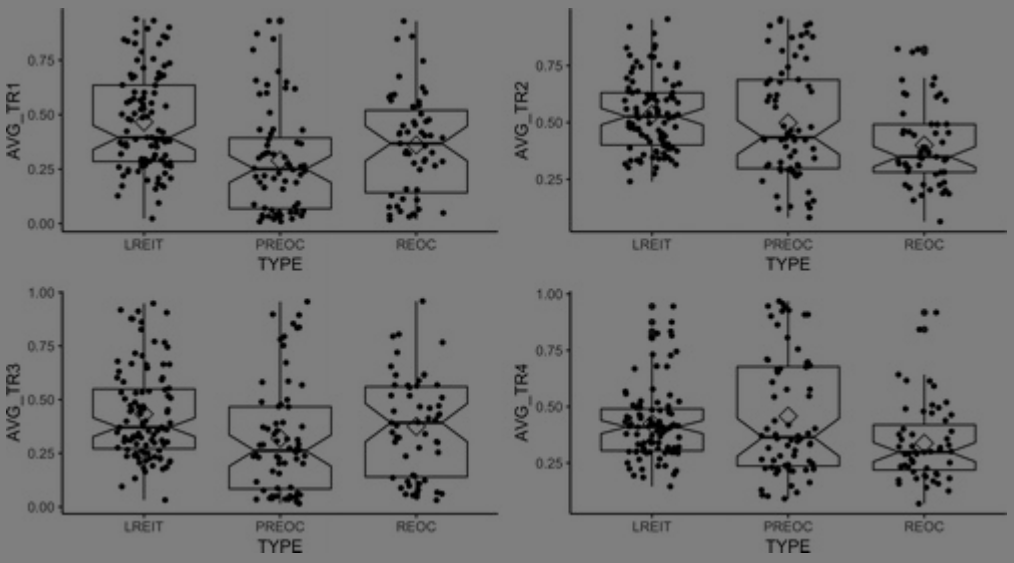
It also confirms that R.E. as a product is a very bureaucratic mechanism which requires many permits from the state and other third parties involved. A time period of three years is too short to have an accumulated experience.

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 somethi at inefficie nt. Another observat their counterp varying from 7% anaged to be 8% m roductivity of P.R.E. 0), can be expl ve to adopt. Since i son to listed firms, th d profit areas to was consiste unterparts, reaching .1, and L.R.E.O. ation are

Figure 2. On the top left, a three-year average (2014–2016) efficiency boxplot for the 1st translog model, on the top right, a three-year average efficiency boxplot for the 2nd translog model, on the lower left, a three-year average efficiency boxplot for the 3rd translog model, and on the lower right, a three-year average efficiency boxplot for the 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.



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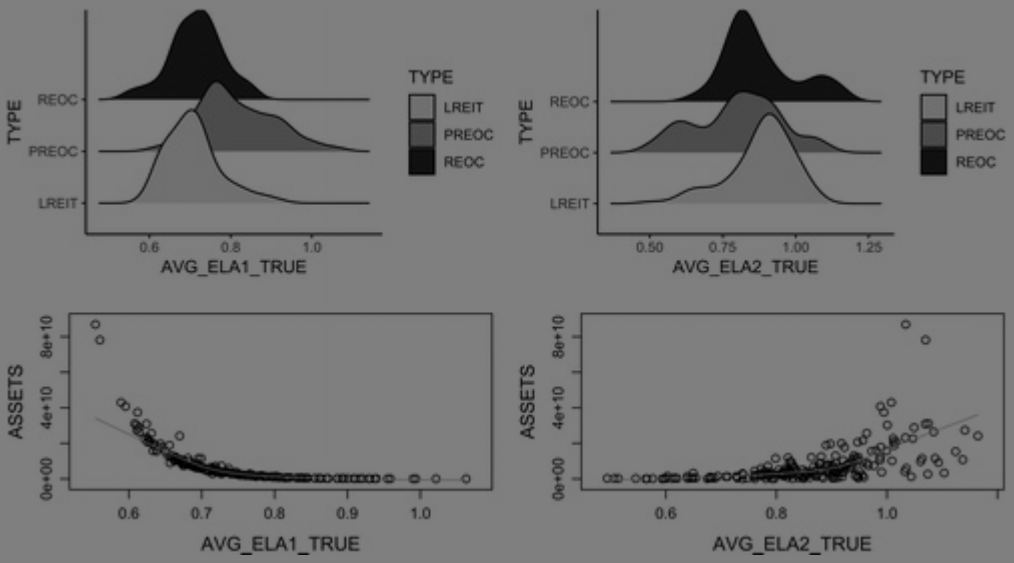
An accurate and a comprehensive comparison of the results acquired from our four translog panel data models with the results obtained by other authors was not possible since all other models only compared R.E.I.T.s among themselves or with other listed income p s, time periods, els differ by a signifi what in a similar v he efficienc ying the D.A.E. m while for time pe 32%, 35%, and n of the prior res

Economi y Ambrose et al. (2 kewise, as firms be ternalities better th mounting to

0.74 for the first model with output assets. The mean differences can be observed in Figure 3.

Figure 3. On the top left, a three-year average (2014–2016) elasticities density plot for the first translog model, on the top right, a three-year average elasticities density plot for the second translog model, on the lower left, a three-year average elasticities to 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.



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R.E.I.T.s ...rivate firms and R.E. ...inability to find long ...analysing R.E. busi ...imited, growth p ...evenue output, r ...he average econ ...nue variab ... the second model va ...tively. Only two L.L.C ...sets T.R. model, w ...ne – R.E.O.C.s ...nt modellin ...where

output revenue, while Miller et al.'s, (2006) results found economies of scales for companies to be closer to 98% with output assets and 99% with output revenue.

5. Conclusion

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

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variable seems to have had no effect on efficiency, concluding that in order for R.E.I.T.s to be more efficient, a considerable management changes have to be allowed. Also, since the R.E. market is a very bureaucratic environment because of the state regulations, this makes the process of strategic efficiency growth harder to implement in R.E.I.T.s unlike in other types of firms in a three-year period.

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.[4]

Notes

1 Non-R. estate sector but do n m cash flows and a om rental incom

2 The ef echnical efficienc an be called scale eff

3 Notice een 23

the scope of our article, we found no earlier research to address these discrepancies. It is difficult to know whether they have any distorting effects on our model when analysing firm structure-to-structure.

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