ESG Insights in Real Estate Performance

Evidence from the European Non-listed Real Estate Fund Market

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Abstract

In this paper, we use the Global Real Estate Sustainability Benchmark (GRESB) as a means to enhance our understanding of the performance of European non-listed funds. By combining the data of GRESB and INREV, we learn three valuable lessons in a market in which information is still scarce. First, that the participation process of ESG benchmarking is non-random. The early participants of GRESB were large funds with low leverage, two factors that correlate with excess returns. Second, that although GRESB participating funds outperform non-participants, most of this difference in performance can be explained by other factors, like market risk, firm size and corporate leverage. Third, that we document relevant E-, S-, G-, management- and performance subscore effects on fund returns, driven by closed-end funds.

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1. Introduction

Large institutional investors around the globe have invested over 8 percent of their assets in real estate and are expected to increase this allocation in the coming years, see Carlo et al. (2021). A growing real estate allocation which includes the classic trade-off between publicly listed real estate's liquidity convenience and private real estate's pricing stability. But more and more investors have discovered a third real estate investment alternative – the non-listed real estate funds. Brounen et al. (2007) described the surge and structure of this private equity real estate market within Europe. Since then, a lot has happened and changed. The European non-listed real estate fund market matured into an investment industry consisting of 364 funds with a total gross asset value of around 332 billion euro by the end of 2022. But besides a change in numbers and size, this market also matured due to enhanced informational transparency that was triggered by the incorporation of ESG benchmarking.

In this paper, we examine and discuss the evolution of European non-listed real estate funds, by analyzing the participation effects of GRESB, the Global Real Estate Sustainability Benchmark. Established in 2009, GRESB has become the leading ESG benchmark for real estate and infrastructure investments across the world. By now, 163 of the European non-listed real estate fund participate in these GRESB ratings, using it to inform their stakeholders regarding the ESG integration within their fund management. The first European funds joined GRESB in 2011, offering us ten years of data on GRESB participation and ESG scores. By merging this information with INREV's fund performance database, we are able to assess whether this participation and the resulting scores have had any effect on fund performance. Results that can offer us new and rare insights in the early participant profiles of non-listed firms that were keen to expose their corporate ESG efforts. What can we learn from early and late

GRESB participation, and what do the available ESG scores and sub scores tell us about the performance of non-listed real estate funds?

Our analysis of the INREV return index shows that European non-listed real estate funds have steadily doubled in value since 2010. On a fund level, we find that this total return has been higher for the low-levered larger funds that focused their portfolio on one region and one real estate sector. We also find that the non-listed funds that participated in GRESB outperformed their non-participating peers in the market. We can learn from this GRESB participation process, as innovations like these set funds apart. The early GRESB participants turned out to be larger in size, which we know enhances fund performance. It appears that (early) GRESB participation required scale, and therefore we controlled for these effects to better grasp the payoff of GRESB participation and ESG performance. Overall, we find little evidence that better ESG scores lead to better returns on a fund level among GRESB participants. At least, not at the aggregate. But when digging a little deeper, we find that this aggregate score result is masked by the altering effects of sub scores and the difference in performance between open-end and closed-end funds. Participating closed-end funds need to improve their GRESB Scores in the limited time the fund is operating. As a result, the return impact seems to be more pronounced for these funds. Besides improvements on the GRESB Total Score level, also improvements of the E in ESG has a significant positive impact on the return.

This paper continues with a brief discussion of the literature on private equity real estate. After discussing our data and the GRESB scores in particular, we analyze the participation process of GRESB within the European non-listed real estate fund market, and link GRESB scores to INREV returns. We then extend the analysis with panel data regressions and use different model specifications to help us identifying the key factors that drive non-listed real estate returns. We conclude the paper with a summary of the most important findings and implications.

2. Private Equity Real Estate Performance

Even though the non-listed real estate fund market has been growing strongly over the past decades, scientific documentation of this industry is scarce. After Brounen et al. (2007), Tomperi (2010) was one of the first to analyze non-listed real estate fund returns using a U.S. database of opportunistic funds. His results showed that fund size is positively correlated to realized performance. A size effect, which was later confirmed by Andonov et al (2013), when analyzing the non-listed real estate portfolios of pension funds. Part of the reason for this size effect was the fact that smaller (pension) funds faced higher costs.

Fisher and Hartzell (2013) analyzed the performance differences between public REITs and private real estate funds using a similar database as Tomperi (2010). They found that non-listed real estate funds underperformed alternative real estate indices, like the listed market. Again, the data was centred around U.S. value-add and opportunistic funds, and moreover, most funds were launched during the pre-crisis era. Results, therefore, are somewhat skewed to negative returns. Case (2015) used 25 years of NCREIF data on core, value-add, and opportunistic strategies in private equity real estate assets to summarize some salient observations regarding capital appreciation, income, fees and expenses, the income share of total return, the effects of cash reserves and leverage, net total returns, systematic risk, and risk-adjusted performance. The available data challenge several points of conventional wisdom regarding private equity real estate returns. He finds that the use leverage has provided very little benefit to investors in private equity real estate funds, and due to their relatively large cash holdings open-end core funds underperformed. Two years later, Pagliari (2017) used the same NCREIF-Townsend fund returns to critically evaluate and decompose the realized performances of non-listed real estate funds across the three major strategies; core, value-added and opportunistic. His results showed that the observed variation across the risk adjusted net returns of value-add and opportunistic funds fell short of the low risk core funds in the U.S. market. Aarts and Baum (2016) examined a large global sample of value-added and opportunistic non-listed real estate funds and found strong evidence for performance persistence across directly consecutive funds. Performance persistence, which turned out to be a short-term phenomenon, once controlling for the prior and fund structures.

Fuerst and Matysiak (2012) were the first to empirically analyze the European non-listed fund returns using INREV data. In their analysis of the first seven years of INREV fund returns they found that lagged GDP growth, stock market returns and government bond rates were significant and positive predictors of annual fund performance. Delfim and Hoesli (2016) studied the risk factors of non-listed European real estate funds, and identified that fund size, -style and –structure are most important. Van der Spek (2020) used a proprietary funds database on European non-listed real estate funds to study the size and composition of the total fee load within private equity real estate performance. On average, he found a total fee load of 2.7 percent, which is substantially lower than for private equity funds. This fee load differs greatly across investments styles and fund size.

By combining two unique European data initiatives, INREV and GRESB, our paper contributes by analyzing the European performance of non-listed real estate funds in the period after the financial crisis, and by assessing the performance effects of their corresponding ESG engagement and -scores.

3. Our ESG Data

From 2009 onwards, GRESB, an investor-driven organization, started to transform the way investors assess the environmental, social and governance (ESG) performance of real assets globally. Today, more than 250 members, of which about 60 are pension funds and their fiduciaries, use the GRESB data in their investment management and engagement process, with clear goals to improve ESG reporting and participation and to optimize the risk/return profile of their investments. Since 2009, GRESB has assessed nearly 1,500 property companies and funds, jointly representing more than USD 2.8 trillion in property under management, as well as almost 200 infrastructure assets and funds, on behalf of close to 60 institutional investors. GRESB's objective is to provide real assets investors and managers with the tools they need to accurately monitor and manage sustainability performance of participating funds and companies, and to prepare for increasingly rigorous ESG obligations. Institutional investors that use GRESB data are increasingly scrutinizing the quality of ESG disclosure. They want

credible, quantitative data, based on relevant metrics that they can use in their investment decision-making process.

Over the past twelve years, real estate investors have come to see GRESB participation as a sign of a fundamental commitment to ESG performance. They know that they can access information about GRESB participants and recognize that participants have taken a significant step toward leadership on ESG issues. GRESB results help investors understand the sustainability related strengths and weaknesses of their investments. Similarly, participating companies and funds can use the information to identify specific opportunities for improvement. In both cases, GRESB's information provides both absolute and relative measures of performance, including key performance metrics such as greenhouse gas emissions and rankings within peer groups. This information supports engagement with critical stakeholders, communicating strengths to external audiences and highlighting relative weaknesses to operational teams.

GRESB conducts annual assessments of real estate portfolios, capturing critical information regarding ESG performance and sustainability best practices. The assessments are guided by what investors consider to be key issues in ESG integration in real asset investments. They are aligned with international reporting frameworks, such as GRI and PRI. After a data quality control process, the data is scored with each company, fund and asset receiving a GRESB Score, which is compared against peers in the region and same property type for real estate. In addition, the GRESB Rating provides an overall, high-level metric for investors to evaluate the ESG performance of real asset investments. These are aggregated in two sub-scores; (1) management, which is focused on the measurement of corporate intend and ambitions, (2) performance, which quantifies the realization of sustainability at corporate level. Both aspects are then blended in the total GRESB score.

- Insert exhibit 1: distributions of GRESB total ESG, GRESB management- and GRESB performance scores –

In the exhibit 1, we plot the distributions of the GRESB scores, and sub scores for the early period 2011-2013, and the later periods 2014-2017 and 2018-2021. In the early years the average GRESB total score was just over 40 on

a scale of 100. But as time progressed, GRESB scores improved to 81, on average in recent years. More and more non-listed funds joined the GRESB initiative, and GRESB participation increased their ESG efforts step by step. At first these improvements were made on paper by setting up policies and hiring specialized personnel, which explain the high and increasing GRESB Management sub scores in exhibit 1. Besides these good intentions, GRESB also monitored the GRESB Performance sub score, which is more focused on implementation and measuring and steadily strengthened over time.

In addition to the Management and Performance sub scores, GRESB also provides fund level sub scores for environmental (E), social (S), and governance (G) from 2014 onwards. In exhibit 2, we plot these three for the periods 2014-2017, and the more recent years since 2018.

- Insert exhibit 2: distributions of E, S, and G scores –

The largest variations are found for the environmental fund scores. These improved over time, but still offer a large dispersion across funds and potential to improve. Regarding social and governance, the GRESB sub scores show a very similar trend of high scores from the start and even higher scores in recent years. Due to these high scores, S and G offer small variations, and little potential improvements, which is something to keep in mind when analyzing the performance effects. .

4. Learning from the GRESB participation process

Today, a total of 163 European non-listed fund covered by INREV are rated by GRESB. However, not all of them started reporting to GRESB at the same time. In fact, the participation process of GRESB among non-listed funds still has some way to go, as 201 INREV funds have still not participated in GRESB. So, before we study the relationship between GRESB scores and fund performance, we will first compare the funds that have participated in GRESB at different moments in time. Just like any innovation, GRESB has gone through a diffusion process.

Starting with the early participants and ending up with the laggards. In this study, we have both the INREV fund performance data and GRESB scores on a firm level from 2010 onwards. Hence, we categorize our full fund sample into four groups; the *early participants*, which are the funds that participated in GRESB before 2013, the *later participants* which joined in the period from 2013 to 2015, the *late participants*, which participated in GRESB from 2016 onwards, and the *non-participants*. It is important to compare these funds, before we analyze any relations between the GRESB scores and INREV returns. We need to verify whether any differences between these four groups can help us explain the participation process and identify key firm characteristics that need to be controlled for in the next step of empirical performance analysis.

- Insert exhibit 3: Non-listed firm characteristics of early-, later-, late- and non GREB-participants -

In exhibit 3, we report a relevant list of sub sample characteristics across these four group of funds. As discussed, the group of non-participants is the largest with 201 funds still in total. In total, 163 European non-listed funds, with INREV coverage, reported to GRESB by 2022. A group that grew rapidly before 2013, with 65 early participants. When comparing the 2021 year-end characteristics of these early participants with those of the current non-participants, we observe a distinct size difference. Early participants are over three times larger than the non-participants. A difference, which may be due to economies of scale, which allowed them to free up resources to join GRESB at an early stage. When it comes to their leverage, investment styles, and geographic portfolio focus, the early participants tend to be lower levered but very similar on all other accounts. When comparing the early participants with those that participated later, we find the before mentioned differences in size and leverage tuned out over time. Funds that participated in GRESB before 2016 were still larger and used less debt, but the late participants look very similar to the non-participants. It is also remarkable that the ratio of closed-end funds among non-participants is similar or lower than the other groups. As closed-end funds have a more limited lifetime, it would be understandable that relatively more closed-end funds would not participate to

GRESB given the additional effort required. This is clearly not the case. Nevertheless, closed-end funds tend to participate later relatively.

Exhibit 4 grants us a first peak at fund performance. Here we pooled all participants (early and late) and constructed value weighted total return indices for GRESB participants and compared it to the 201 funds that never participated in GRESB.

- Insert exhibit 4: total return indices for GRESB participating versus non-participating funds -

These graphs show a performance gap that favors the GRESB participants, which started in 2011, and widened robustly over time. Over the full eleven years GRESB participants delivered a buy-and-hold return which was 40 percentage points higher, equivalent to around 1.8 percent a year. However, at this stage of the analysis we cannot claim that this performance gap is caused by GRESB participation, as exhibit 3 showed us that both groups differ in more than GRESB participation alone. Moreover, exhibit 5 shows us that this performance gap does not increase with participation speed. In fact, of all participating funds the returns of the early participants was the weakest.

- Insert exhibit 5: total return indices for early-, later-, late- and non-participants -

This indicates that in order to fully grasp any links between GRESB participation and fund performance, we require a closer look. Therefore, we continue our analysis by analyzing ESG scores instead of merely GRESB participation, while eventually controlling for the differences in fund characteristics that are at play.

5. Learning from ESG scores and sub scores

Now that we know that GRESB participation has gradually increased to almost half of Europe's private equity real estate fund market, it is time to zoom in on the scores that have been handed out as a result. In other words, we now focus our attention to the 163 non-listed funds that decided to be part of INREV and GRESB and have received financial returns and ESG scores and sub scores. We start our analysis by simply plotting the average GRESB Total Scores against the corresponding periodic total returns on a fund level. In exhibit 6, we separate these pairs into three periods with the 2011-2013 pair in red, the 2014-2017 pairs in green, and the pairs since 2018 in blue.

-   Insert exhibit 6: scatter plotting periodic total returns and ESG total returns -

Since total ESG scores trended upwards over time, we find the latest data, the blue dots, clustered at the right of exhibit 6, while most red dots are found at the left. In order to illustrate any relationship between these ESG score and fund returns, we added trend lines for each sub period. Trend lines which slope upwards before 2018, indicating a positive link between ESG fund performance and fund returns. For the blue dots that occurred since 2018 the trend line reversed. Part of this can be explained by the fact that during this late period, 69 late GRESB participants entered the overview. While their initial ESG scores were still low during the early years, their fund returns were high due to the strong economic circumstances before 2020. Their subsequent ESG efforts lead to increased scores, but at a time when the global pandemic slowed down the economy and softened non-listed real estate fund returns.

Although it is interesting to test whether the absolute level of the GRESB Score is an indication for stronger performing funds, it is more important to test whether the changes and improvement in GRESB Score have had any impact on subsequent fund return. In other words, are improvements in ESG leading up to higher returns? In exhibit 7, we have plotted the change in GRESB Score relative to the return achieved and we separated the open-end and closed-end funds. It is important to differentiate between these type of fund types, as these behave different. The closed-end structure is focused on achieving the targeted return over the life of the fund, typically

5-10 years. Open-end funds, on the other hand, are more focused on the longer term, and try to provide a certain risk return profile. If funds are trying to make an ESG improvement, closed-end funds have to achieve the required improvement in a shorter amount of time, given their limited life. As a result, the relation between change in GRESB Score and fund return is likely to be stronger. This stronger link seems to be confirmed by the simple trend lines in exhibit 7.

<center>- Exhibit 7: Change in GRESB Score vs total return by fund structure -</center>

In the final part of our analysis, we examine fund specific returns using panel data regressions, which allows us to control for the observed differences in fund characteristics. These regressions are run on the total fund return of fund i in year t (TR_{it}). We try to explain the cross-sectional variation in TR_{it} using different combinations of factors:

$$TR_{it} = \alpha + \beta_1 \cdot MR_t + \beta_2 \cdot TR_{it-1} + \beta_3 \cdot Size_{it} + \beta_4 \cdot Leverage_{it} + \beta_5 \cdot nonCore_{it} + \beta_6 \cdot OpenEnd_{it} + \beta_7 \cdot SingleCountry_{it} + \beta_8 \cdot SingleSector_{it} + \beta_9 \cdot GRESB_{it} + \varepsilon_{it} \quad (1)$$

, where MR_{it} is the market return of fund i in year t for the relevant sector(s) and country or region, $Size_{it}$ is the log of the Gross Asset Value (GAV) of fund i in year t, $Leverage_{it}$ is the leverage ratio (debt as percentage of GAV), $nonCore_{it}$ is a dummy indicating whether fund i has a non-core style, $OpenEnd_{it}$ is a dummy indicating whether fund i is open-end, $SingleCountry_{it}$ is a dummy indicating whether fund i only invests in one country, $SingleSector_{it}$ is a dummy indicating whether fund i specializes in one sector, $GRESB_{it}$ is a variable reflecting GRESB related data for fund i in year t. This last variable is specified in different ways. First, we use a binary dummy differentiating between GRESB participants and non-participants. Next, we combine this dummy with a second binary dummy that identifies the early and late participants. We then replace the participation dummies with the change in the GRESB score for each individual fund. This change in GRESB Total Score, is then replaced by the reported change in the two sub scores (the management- and the performance score), to assess their individual impact on excess fund returns. Finally, we also replace these variables with the change in scores for the individual

ESG components, so Environment score (E), Social score (S) and Governance score (G) to assess the effects of these three themes, separately.

For all models we include fixed time effects, but not individual fund effects, as we are keen to include and understand fund characteristics. In all models, we have tested for multicollinearity using Variance Inflation Factors (VIFs), but none of the VIFs we calculated produced worrisome levels.

- Exhibit 8: Non-listed fund performance regressions, the baseline model. -

The results of our regressions are presented in exhibit 8. Results are grouped across three expanding model specifications. In the first two models, we estimate the baseline model in which we explain the cross-sectional variation in the total returns of all INREV funds by a set of traditional fund characteristics. The resulting (and statistically significant) coefficients are according to expectations and in line with literature, as returns are highly dependent on market return, increase with size and portfolio focus. The size effect is the likely result of economies of scale, which tend to be stronger in this market, as the average fund size is still modest. Loan to Value (LTV) is highly significant, but has a negative effect on returns. The problem, however, is that leverage does not have a linear effect on return, as shown by Hoorenman and Spek (2011). Therefore, we also included a number of dummies to cope with this non-linearity. As shown in model (2), it improves the fit of the model materially, but also highlights that the best returns are typically achieved at leverage ratios below 50%. Applying more than 60% leverage has a highly negative effect on the total return. Understanding returns requires a sharp eye for risk, which is proxied in this private equity market with investment styles. Non-core funds appear to underperform, although they are associated with higher risk loadings. However, once adjusted for the non-linearity of leverage this effect is not significant. The models, therefore, clearly indicate that the average non-core return is dragged down by a number of funds underperforming due to high levels of leverage. Open-end structured funds typically underperform and in our model this seems to be around 1% compared to the closed-end funds. This open-end discount can be interpreted as the cost of liquidity. The portfolio focus premium aligns with the economy of scale

argument. It is harder and more expensive to spread and manage investments across multiple sectors and countries, when funds and organizations lack the scale to do this efficiently. The premium for focusing on a single country is 1.4% and the premium is 1.3% for single sector focus funds. We also decided to add a dummy to see whether we could capture the effects of e-commercialization in our model. We found that funds focused on the sector retail, underperformed with around 1.4%, reflecting the impact of e-commercialization over the recent past. The second baseline model (2) explains 21% of the observed variance, a proper model fit that is further enhanced by the subsequent model extensions.

In the third model we included a GRESB participation dummy, trying to test whether GRESB participating funds achieve significant higher returns as was indicated by the constructed indices. The model results demonstrate that the average annual outperformance of GRESB participating funds is 0.6%, but statistically insignificant. It tells us that over the last 11 years, GRESB participating funds have outperformed non-GRESB participating funds by 60 bps. Unfortunately, we cannot conclude that this difference is structural. This result corroborates with the performance gap that we observed before exhibit 4, however the outperformance is now reduced due to the appropriate controls that are in place. This return difference is obviously not generated by GRESB participation itself. However, more successful funds are more likely to share data and to participate with transparency improving initiatives. Moreover, to become a participant, the fund and manager need to be well in control of their organization and portfolio to comply to the reporting requirements of the GRESB participation. This level of control and organizational strength is, therefore, an indication of funds and managers that are likely to generate higher returns.

- Exhibit 9: Non-listed fund performance regressions including GRESB Scores. -

Next, we shift our attention from GRESB participation to ESG score performance. These scores are ideal to include in our regression and to test whether they correlate to financial performance. Exhibit 9 presents the results of the panel data regression analysis. Model (4) and onwards are all estimated for GRESB participants only, explaining

the lower number of observations. These models explain us whether changes in GRESB scores affect subsequent

fund performance. Model 4 is our baseline model where we include the change in GRESB Total Score. The results

of our control variables are quite similar to the full INREV sample, with a few exceptions. Most remarkable is the

positive coefficient for non-Core funds, indicating that among GRESB participating funds, non-Core funds are

actually outperforming Core funds, which is the opposite of the results for all funds, but more in line with the

associated risks and expectations. In addition, among GRESB participants, open-end funds are not

underperforming and the single sector and country funds are not outperforming significantly.

Model (4) shows that the change in GRESB Total Score has a positive effect on fund return, but this effect is not

significant. In exhibit 7, we have seen that open-end and closed-end funds behave differently to the change in

GRESB score and consequently, we have added an interaction effect to control for this variation. The results are

shown by model 4-I. It is clear that a change in GRESB Total Score has a different impact on open-end funds

compared with closed-end funds. The impact is positive and significant for closed-end funds, while it is insignificant

for open-end funds. When we split the change in GRESB Score in Performance and Management Score (model 5),

we get a similar outcome. Without the adjustment for fund structure, both scores show an insignificant effect on

return. Only after adding an interaction effect to both sub scores, the relationship between the change in

Performance score and fund return becomes significant. For closed-end funds, a 10 point increase in Performance

Score translates to a 1% outperformance on average. For open-end funds this effect is insignificant.

In model (6) we have included the individual E-S-G scores to see whether performance is driven by an

improvement of the E of Environment, the S of Social and/or the G of Governance. As these scores were only

introduced in 2014, the number of observations is lower. The E score variable shows a positive coefficient,

meaning that higher scores will lead to higher returns. The coefficient is however not significant. The same applies

to the Governance Score; positive but insignificant. The Social score coefficient, on the other hand, is negative,

but insignificant. Identical to the other two models, an interaction effect has been added and results are shown in

model (6-I). The result is that the Environment or E Score is positively correlated with returns for closed end funds,

while it is insignificant for open-end funds. We already observed in exhibit 2, that there is more variety and upside

potential with the E score. For instance, an improvement in E Score from the median to the maximum is a 28 point potential shift, which could translate in a potential additional 280 basis points of return, when using the regression results. The S and G Scores are not significant for both types of funds, although there is a somewhat positive impact of a change in G Score on closed-end funds and a somewhat negative impact of a change in S Score. For open-end funds these effects are aggregated to zero.

The similarities between models (5) and (6) are not surprising, since there is quiet some overlap between the measurement of the GRESB Performance score and the Environmental score and also between the GRESB Management score and the S- and G scores. Both Performance and Environmental are really about measuring and improving energy efficiency, and our results indicate that these factors are positively correlated with return for closed-end funds. Management, S- and G are factors more focused on intend, and are typically leading to more burden by additional administration and hiring the appropriate specialists. These are all elements that come with higher costs. Strong improvement in governance could lead to higher returns by managing risks as shown by the positive coefficient for all funds. Improvements in Social seem to reduce return a bit for closed-end funds. This could be explained by the shorter life of these funds, in which it is more difficult to offset these costs with higher returns. For open-end funds all these effects are much smaller or even fully mitigated.

6. Conclusions and implications.

In this paper, we analyzed the performance of European non-listed real estate funds, by combining the data of INREV and GRESB, the Global Real Estate Sustainability Benchmark. GRESB participation and subsequent scores offer new insights in the private equity real estate investment fund market, a market which has matured into well over 300 billion euros of asset value, spread across more than 364 funds. A market, which has attracted a lot of institutional investments, but at the same time is still in need of performance evaluation innovations. Hence, we analyze the GRESB initiative as an instrument that can help provide novel signals and relevant information to

investors. We studied the GRESB participation process among INREV members, and we used the GRESB scores and sub scores as means to study non-listed fund performance.

We have learned at least three lessons from our analyses. First, that the diffusion of a new initiative like GRESB separates the industry into early, later, late and non-participants, which differ in firm characteristics and performance. In case of GRESB, we observed that large funds opted in first. We also discovered that the total returns of GRESB participants well exceeds that of the non-participants. But once we correct for the variations in fund characteristics, this return difference is reduced to 60bps per annum, although not statistically significant. In other words, investors could learn from observing the participation process of new rating processes, as large funds with somewhat stronger performance tend to participant sooner than later.

A second lesson, is that the GRESB score itself can help us to better understand the observed cross-sectional variation of non-listed fund returns. Even after correcting for fund size, leverage, style and structure, we report a positive additional return for GRESB participants. At the aggregate, a positive change in GRESB Total Score does appear to leap up to excess fund returns, a result which is important in a market in which information is harder to find. Unfortunately, this effect is not significant. When analyzing the interaction between ESG engagement and private equity real estate fund returns, it is important to control for the atypical patterns produced by different fund structures. Closed-end funds have less time to make a difference on ESG and therefore need to make a stronger effort to make a difference. The third lesson is observed when we adjust our regression results for the effects of fund structures and we find a significant positive impact of a change in GRESB Total Scores on return for closed-end funds. When taking a closer look at the sub scores that underlie ESG, we also find some traces of engagement awards. We find the strongest return impact by the Performance and Environment Scores. Again, the coefficients are statistically insignificant for all funds, but significant for closed-end funds, showing an indication of a potential ESG impact. It is likely that due to the need to make a difference within a shorter life span and the stronger buy and sell requirements for closed-end funds, these funds show a more significant return sensitivity to improvements to environment metrics. Interestingly, the Social Score has a negative impact on returns, especially

for closed-end funds. The impact the additional costs have to achieve higher S Scores are apparently not offset by

additional returns.

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Exhibit 1:   GRESB total-, management-, and performance score distributions, across periods

In this figure, we plot the total GRESB score, management score, and performance score for the periods 2011-13, 2014-17, and 2018-2021.

GRESB score distribution per period
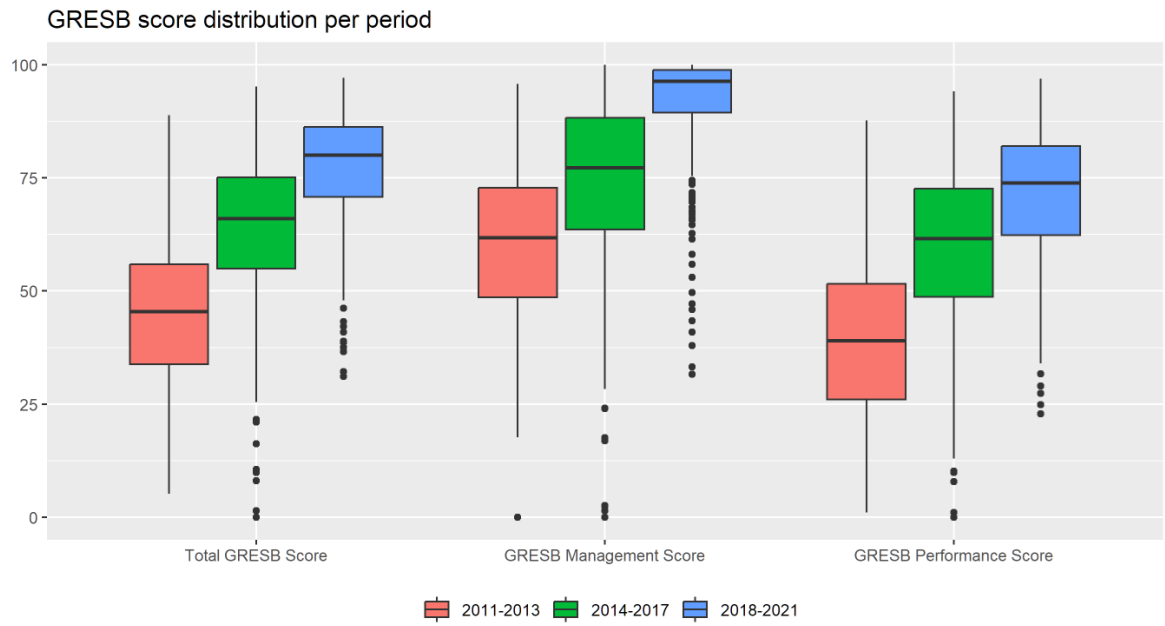
Exhibit 2: GRESB E, S, and G sub scores, across periods

In this figure, we plot the GRESB environmental (E), social (S), and Governance (G) sub scores for the periods 2014-17 and 2018-2021.

GRESB score per period for ESG (Environment, Social and Government)
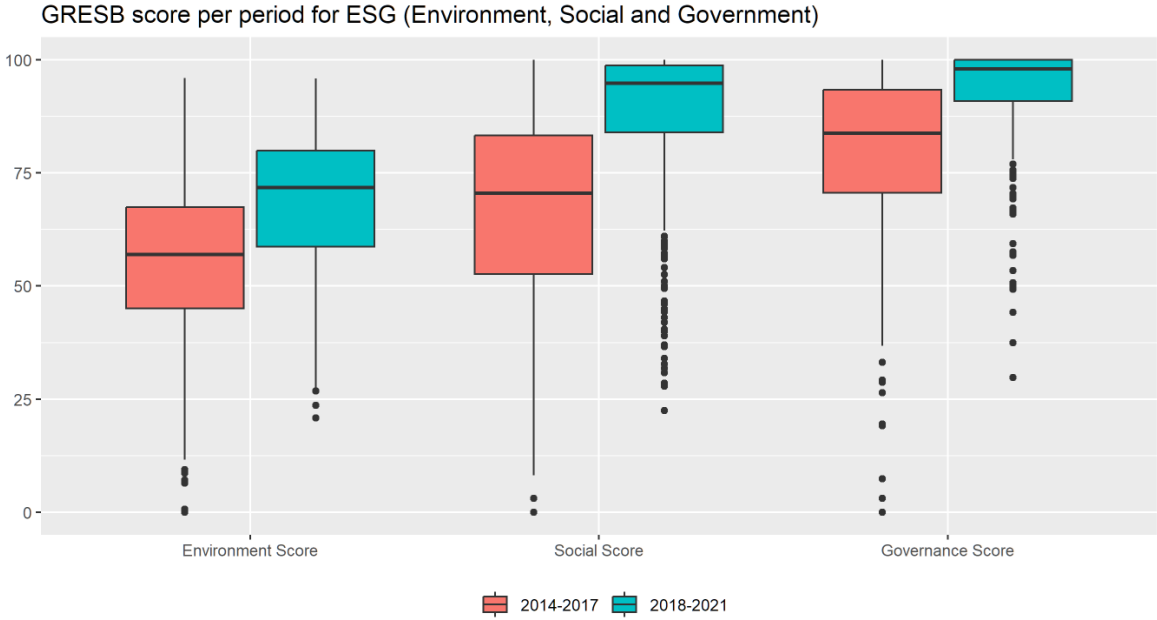
Exhibit 3:   **Non-listed firm characteristics of early-, late- and non GRESB-participants.**

In this table, we list the 2021 year-end number of funds, the minimum and maximum over the last 11 years, fund size, gearing, the fraction of core funds, the fraction of single country, single sector and open-end funds, and average amount of cash across four groups of non-listed real estate funds (those that participated in GRESB before 2013, those that participated in 2013, 2014 and 2015, those that participated after 2015 and those that did not participate GRESB at all).

	Early participants	Later participants	Late participants	Non participants
Number of funds	65	29	69	201
Min and max number of funds in the period 2011-2021	65-102	19-37	10-70	201-252
Average Size (GAV in million €)	1,674	2,092	889	504
Leverage (%)	15	18	31	28
Core (%)	83	83	77	87
Single Country (%)	57	62	33	54
Single Sector (%)	54	34	42	53
Open end (%)	65	55	57	65
Cash (%)	2.8	1.4	1.8	1.0

Exhibit 4: **Total return indices GRESB participants versus non-participants**

In this figure, we plot the INREV value weighted total return indices for GRESB participating funds versus GRESB non-participants, 2010 = 100.

Total return indices for GRESB participants and others
(2010 = 100)
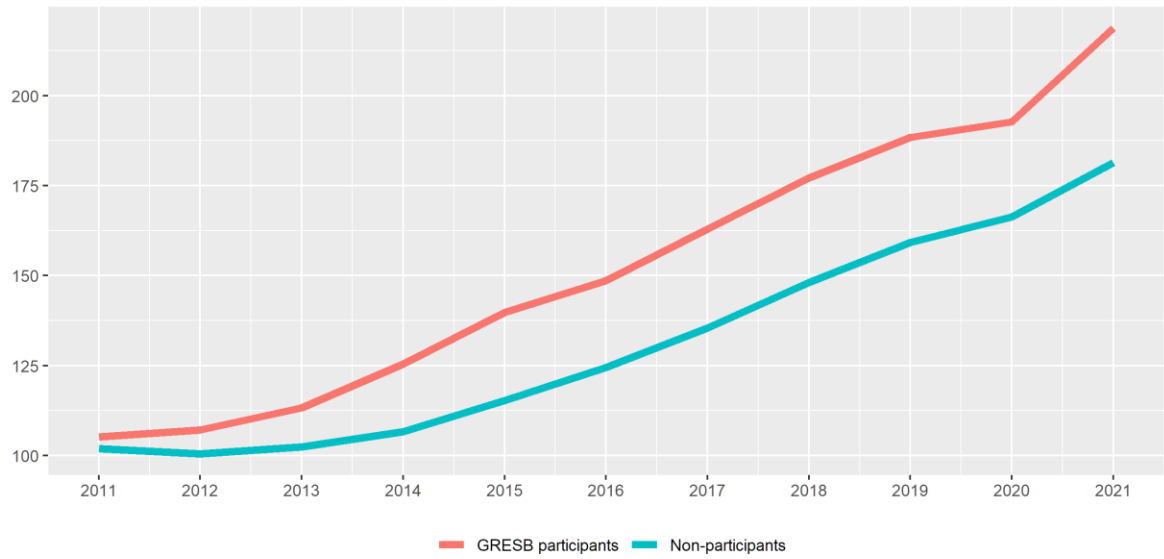
Exhibit 5:   **Total return indices GRESB early-, later-, late-, and non-participants**

In this figure, we plot the value weighted INREV total return indices for the early-, later-, late- and the GRESB non-participating funds, 2010 = 100.

Total return indices per GRESB group
(2010 = 100)

Early participants   Later participants   Late participants   GRESB participants   Non-participants
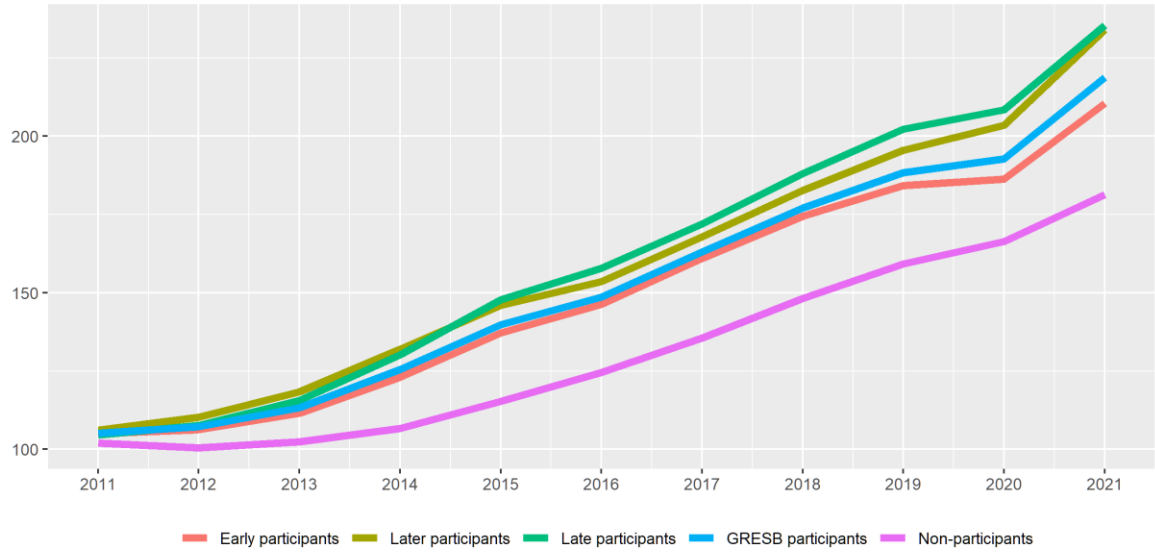
Exhibit 6:   Scatter plotting the GRESB ESG score versus periodic total returns

The dots represent the firm pairs of the GRESB ESG total score and the corresponding INREV total returns, the lines are fitted trend lines for each period (2011-13, 2014-17, 2018-21).

GRESB Score vs average total return per period, incl simple regression
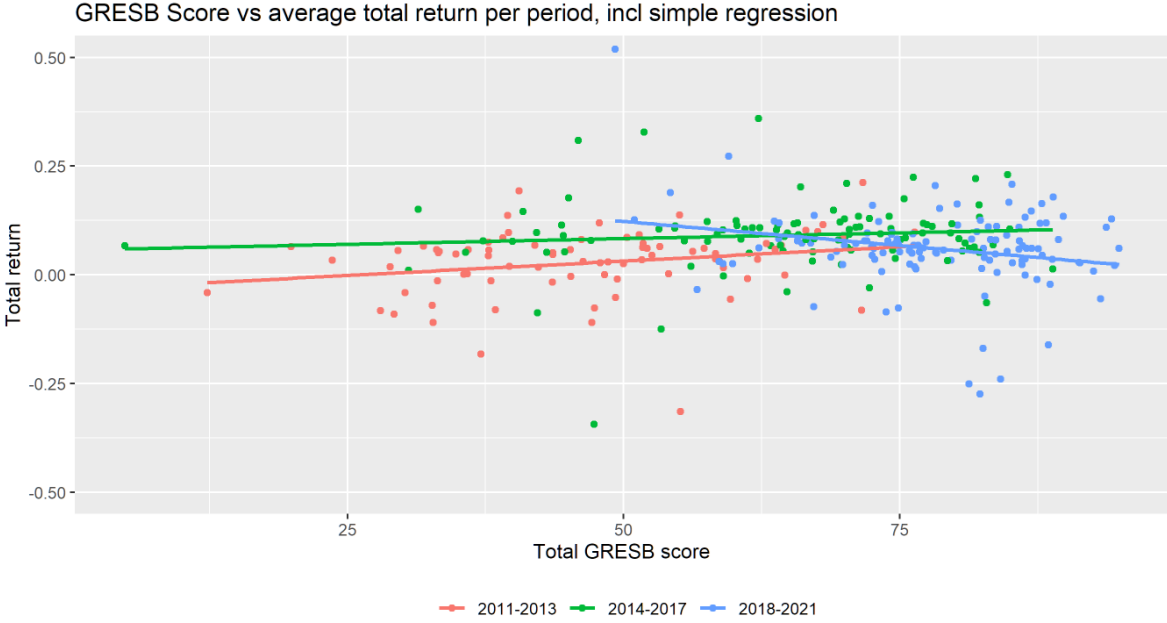
Exhibit 7: **Scatter plotting the change in GRESB Score versus periodic total returns by fund structure**

The dots represent the firm pairs of the change in GRESB total score and the corresponding INREV total returns, the lines are fitted trend lines for fund type (open-end and closed-end).

Change in GRESB Score vs total return per fund type

Exhibit 8: **Non-listed fund return panel regressions, baseline model**

In this table, we state the coefficients (and t-statistics in brackets) of our panel data return regressions. In each regression we explain the cross-sectional variation in fund returns with a set of expanding variables, including size, leverage, style, structure and GRESB participation.

	All funds		
	(1)	(2)	(3)
Lagged Total Return	0.028***	0.025***	0.025***
	(10.0)	(9.2)	(9.2)
Market Total Return	0.69***	0.67***	0.67***
	(17.3)	(17.0)	(17.0)
Size (Log of GAV)	0.019***	0.017***	0.017***
	(12.5)	(12.1)	(10.8)
Leverage (LTV %)	-0.053***		
	(-5.1)		
Dummy 40% < LTV ≤ 50%		0.010*	0.011**
		(2.0)	(2.2)
Dummy 50% < LTV ≤ 60%		-0.001	-0.000
		(-0.2)	(-0.0)
Dummy LTV > 60%		-0.138***	-0.138***
		(-13.3)	(-13.2)
Dummy non-Core	-0.015**	-0.007	-0.007
	(-2.4)	(-1.3)	(-1.2)
Dummy Open end	-0.009*	-0.012**	-0.012**
	(-1.6)	(-2.3)	(-2.2)
Dummy Single Country	0.013***	0.014***	0.015***
	(3.0)	(3.4)	(3.4)
Dummy Single Sector	0.013***	0.013***	0.013***
	(2.6)	(2.7)	(2.8)
Dummy Retail	-0.014**	-0.016**	-0.017***
	(-2.1)	(-2.6)	(-2.6)
Dummy GRESB Participant			0.006
			(1.3)
Individual fixed effects	Yes	No	No
Time fixed effects	Yes	Yes	Yes
N	3524	3524	3524
R-squared adj.	0.171	0.208	0.209

Exhibit 9: **Non-listed fund return panel regressions, including GRESB scores**

In this table, we list the coefficients (and t-statistics) of return panel data regression models 4, 5 and 6 Models named 'I' have been extended with an interaction effect for open-end funds for various GRESB Scores.

	All active GRESB Participants				With ESG score	
	(4)	(4-I)	(5)	(5-I)	(6)	(6-I)
Lagged Total Return	0.31***	0.30***	0.31***	0.30***	0.26***	0.25***
	(10.4)	(10.2)	(10.4)	(10.2)	(7.4)	(7.1)
Market Total Return	0.63***	0.63***	0.63***	0.63***	0.67***	0.67***
	(15.9)	(15.9)	(15.8)	(15.9)	(13.9)	(14.0)
Size (Log of GAV)	0.007**	0.007**	0.007**	0.007**	0.008**	0.008**
	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)
Dummy 40% < LTV ≤ 50%	0.002	0.002	0.002	0.002	0.004	0.004
	(0.3)	(0.3)	(0.3)	(0.3)	(0.5)	(0.5)
Dummy 50% < LTV ≤ 60%	-0.003	-0.002	-0.003	-0.002	0.037*	0.038*
	(-0.2)	(-0.2)	(-0.2)	(-0.2)	(1.7)	(1.8)
Dummy LTV > 60%	-0.13***	-0.13***	-0.13***	-0.13***	-0.10***	-0.10***
	(-8.4	(8.4)	(-8.4)	(-8.5)	(-4.5)	(-4.5)
Dummy non-Core	0.014*	0.015*	0.014*	0.015*	0.017*	0.017*
	(1.9)	(2.0)	(1.9)	(1.9)	(1.8)	(1.8)
Dummy Open end	-0.005	0.001	-0.005	-0.003	-0.002	0.002
	(-0.7)	(0.1)	(-0.7)	(-0.0)	(-0.0)	(0.2)
Dummy Single Country	0.007	0.007	0.007	0.007	0.003	0.003
	(1.3)	(1.4)	(1.3)	(1.3)	(0.5)	(0.5)
Dummy Single Sector	0.005	0.005	0.005	0.005	0.009	0.009
	(0.9)	(0.9)	(0.9)	(0.9)	(1.3)	(1.4)
Dummy Retail	-0.022***	-0.022***	-0.022***	-0.022***	-0.024**	-0.025**
	(-2.8)	(-2.8)	(-2.8)	(-2.8)	(-2.4)	(-2.4)
Dummy Early Participant	0.001	0.001	0.001	0.001	-0.005	-0.004
	(0.1)	(0.1)	(0.1)	(0.2)	(-0.6)	(-0.5)
Dummy Late Participant	0.001	0.002	0.001	0.002	-0.003	-0.002
	(0.1)	(0.2)	(0.1)	(0.2)	(-0.3)	(-0.2)
Δ GRESB Total Score	0.0005	0.001**				
	(1.5)	(2.4)				
Δ GRESB Total Score for Open-end Funds		-0.001*				
		(-1.9)				
Δ GRESB Performance (=Perf.) score			0.0003	0.001**		
			(1.1)	(2.5)		
Δ GRESB Management (=Mgt.) score			0.0002	-0.0001		
			(0.6)	(-0.2)		
Δ GRESB Perf. Score for Open-end Funds				-0.001**		
				(-2.5)		
Δ GRESB Mgt. Score for Open-end Funds				0.0004		
				(0.8)		
Δ GRESB Environment (=Env.) Score					0.0002	0.001**
					(0.6)	(2.1)
Δ GRESB Social (=Soc.) Score					-0.0001	-0.001
					(-0.3)	(-1.5)
Δ GRESB Governance (=Gov.) Score					0.0002	0.001
					(0.5)	(0.9)
Δ GRESB Env. Score for Open-end Funds						-0.001**
						(-2.3)
Δ GRESB Soc. Score for Open-end Funds						0.001*
						(1.7)
Δ GRESB Gov. Score for Open-end Funds						-0.001
						(-0.8)
Individual fixed effects	No	No	No	No	No	no
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1006	1006	1006	1006	749	749
R-squared adj.	0.480	0.481	0.480	0.482	0.454	0.457