

# Sustainable investing: ESG versus SDG

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## Introduction

Over the last ten years, financial markets, investors and economies have witnessed some of the most extreme, non war-related events of the XXI century. The sub-prime crisis of 2008 which led to the Great Financial Crisis (GFC), the Euro sovereign crisis, the Brexit, Trump's election and COVID-19, the recent years have been rich of highly significant events whose consequences will be felt over the coming decades. The period 2010-2020 has also witnessed a dramatic increase in awareness of sustainability issues in general and, specifically, the impact of human activities on climate, which culminated with the Paris Agreement in 2015 (UN Treaties XXVII, 2015). The same year, the United Nation 2030 Agenda was adopted, including the well-known 17 Sustainable Development Goals (SDG).

From the point of view of the financial industry, these developments have been met by investors worldwide in their long-term objectives and policies. Alongside corporate-wide policy statements and ambitions to contribute positively to both the Paris Agreement and the 2030 Agenda, investors have worked out different frameworks and corresponding metrics to address sustainability issues in their portfolios, which have grown in sophistication, scope and size over time (Townsend, 2020). As a matter of fact, a recent report by the Global Sustainable Investment Alliance estimated at 17.5tr USD the total assets that are professionally managed and that integrate, to some extent, sustainability and ESG considerations in their processes (GSIR, 2018; Boffo and Patalano, 2020).



Exhibit 1: Sustainable Development Goals. Source United Nations.

Integrating sustainability issues into investment decisions (*policy actionability*) requires robust methodologies, data availability and metrics that allow investors to monitor their risks and, eventually, improve their impact. Older and more established approaches, such as ESG integration and carbon footprints reduction are well documented in the literature, although there is still debate on ESG approaches and their impact on performances (see, e.g., Van Beurden and Gössling (2008); Kurtz and Di Bartolomeo (2011); Friede et al. (2015a); Giese et al. (2016); Zoltan and Kassam (2016); De Franco (2020); De Franco et al. (2020) and references therein).

Today investors have a large choice in terms of ESG metrics and ratings from well established data providers. These metrics reflect the methodologies that underpin them, which in turns are based on commonly accepted reporting and analysis frameworks, such as the Global Reporting Initiative (GRI) or the Sustainability Accounting Standards Board (SASB). Lack of conformity in ESG definition therefore produces a variety of ratings that may not be comparable. For instance, ESG provider MSCI typically focuses on materiality while ISS has an ethical approach and Sustainalytics has recently transitioned toward a notion of ESG risk. Typically, ESG metrics depend on policies and procedures that a company puts in place to mitigate (negative) impacts on financial outcomes related to environmental, social and governance material issues. These ratings are often adjusted to account for the specificities of each economic sector. As a consequence, companies that are serious about ESG materiality and working on improving processes and procedures that address them, can obtain high ESG ratings, even if they belong to sectors that usually come with negative connotations, whether this is justified or not. Even in particularly challenging sectors such as Energy or Agriculture and Food, there are examples of companies that have high ESG ratings while carrying large carbon footprints. Indeed, there are many examples of companies that have changed their business model by embracing sustainability issues, even in sectors such as Energy or Utilities. To some extent, high ESG scores can signal the ability and the potential that companies have to change their business model and become sustainable leaders in their sectors. This is, in the end, the spirit of ESG and sustainable investing: promoting change by diverting capital resources towards companies that are more likely to acknowledge sustainability issues and address the materiality of it (ESG as a mean of change rather than an end per se).

For SDG-oriented investments instead, the existence of a workable framework dates back to 2017 only, which means that global data and metrics exist only for the last couple of years. This makes systematic analysis particularly challenging.

Nonetheless, as investors embrace the SDG framework in their processes and investments, it is important to understand how this will be reflected in classical financial outcomes. This is important even if we have to discount for both the short period of time our analysis can consider (2017-2020), and the challenges financial markets experience in the last three years. SDG frameworks so far have been focused on revenues that companies make from products and services and their impact on individual SDG. Companies whose products contribute to one of the SDG receive higher scores, usually without particular considerations of their sector and their role in the economies.

This can be particularly relevant for SDG integration in investment strategies, as these ratings, reflecting a revenue-based methodology, carry with them significant sector distortions. This is what we find when we compare ESG-sorted portfolios and SDG-sorted portfolios in both the US and Europe. While stocks with high ESG ratings do not necessarily carry a significant financial premium over low ESG-rated stocks, for SDG-sorted portfolios we see a substantial premium between high- and low-rated stocks. Most of the premium comes from the structural sector (based on GICS classifications) are differences between high- and low-rated stocks. For the US case, a substantial overweight of Technology in the portfolio with high SDG-rated stocks explains most of the premium. The same conclusion applies to the European case with the Healthcare sector.

We can neutralize this effect by building sector-adjusted ESG-and SDG-sorted portfolios. While the approach does not necessarily guarantee the same sector allocation between sorted portfolios, it significantly reduces the structural sector differences in SDG ratings. The results are in line with the initial expectations: after adjusting for sector idiosyncrasies, the premium between high-and low-rated SDG stocks is drastically reduced. Specifically for Europe, our research identifies a smaller but still substantial premium for stocks with high SDG ratings over stocks with low ratings, even when we account for the large sector biases that come with SDG ratings.

The period considered in this paper is relatively short compared to the standard of the financial literature, mainly due to data availability on the SDG side. Nevertheless, the analysis sheds some light on a topic that is and will be increasingly important for investors and their sustainability approaches. Although we expect that the methodologies and corresponding results could change in the future, with maturing approaches from both data providers and investors, we can at least be comfortable with the fact that the results in this paper have been compiled over a period characterized by extreme market conditions, including the drawdowns at the end of 2018, the strong bull market of 2019, the exceptional market conditions of the first few months of 2020 related to COVID-19 and the subsequent exceptional recovery.

## Data

For each investment universe we consider in this paper (US and European equities, represented by their corresponding cap-weighted index, resp. Solactive GBS US Large Cap Index and Solactive Europe 600 Index), we collect daily stock prices and dividends from Datastream, ESG data from Sustainalytics and SDG scores from ISS. The data go from September, 2017 to October 2020. ESG ratings are built over hundreds of granular indicators measuring a large and diverse panel of environment, social and governance topics and represent the quality of each company across these issues, on aggregate. Typically these ratings range from 0 (worst case) to 100 (best case), although the effective distribution is concentrated between 40 and 90.

SDG scores give an indication of a company's contribution to the Sustainable Development Goals (United Nations, 2015). Since most companies focus on a specific line of business, they usually have a SDG score that reflects only few individual SDG, usually those that are relevant for their activities. These scores range between -10 and 10. At -10, the company's products and services represent a significant obstacle to the SDG while, at 10, the company is strongly promoting the SDG. Midway, at zero, the company is deemed having no particular impact on the SDG.

Within each investment universe, on a quarterly basis, we build three cap-weighted portfolios of stocks that have both an ESG and a SDG rating, sorted respectively by ESG or SDG data. As such, the highest ESG tercile portfolio, namely *ESG High* includes stocks in the investment universe whose ESG ratings rank in the top third of the distribution. The same methodology is implemented for SDG-sorted portfolios. All portfolios are rebalanced at the end of March, June, September and December. We use a lag of 4 days between the calculation and the implementation of all portfolios to manage their replicability from a trading perspective. Net dividends are reinvested in each portfolio. All portfolios and their benchmarks are calculated in USD. We finally collect data from Kenneth French's website on US and European factor portfolios.

## US equities

To understand the effect of ESG versus SDG integration, we consider three simple cap-weighted portfolios built on rankings of both ESG and SDG scores. As such, the portfolio *ESG High* (resp. *SDG High*) represents a portfolio of stocks with the highest ESG (res. SDG) scores. Exhibit 2 shows both the average ESG rating and the SDG score for the six portfolios. When splitting the investment universe according to ESG ratings, we find a significant gap in ESG ratings between the



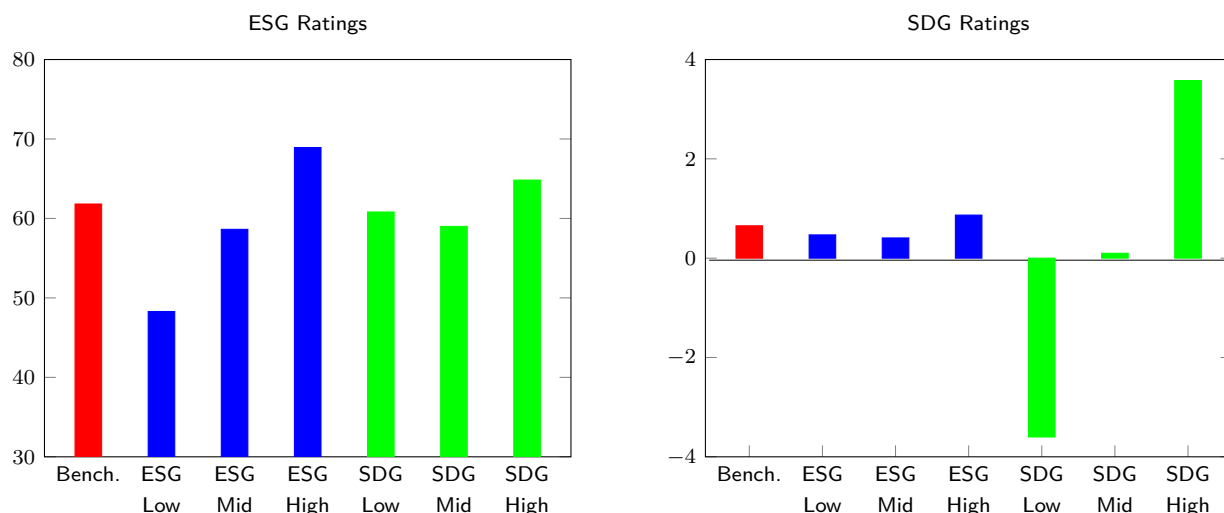


Exhibit 2: Left: Average ESG Scores for the benchmark (Solactive GBS US Index), the three ESG-sorted portfolios (blue) and the three SDG-sorted portfolios (green). Right: Average SDG Scores for the benchmark (Solactive GBS US Index), the three ESG-sorted portfolios (blue) and the three SDG-sorted portfolios (green).

low, mid and high portfolios, while there is no substantial difference in ESG ratings between the lowest and the highest SDG-sorted portfolio. A symmetric picture appears when we look at SDG scores: if there is a clear difference in SDG scores between the low, mid and high SDG-sorted portfolios (Exhibit 2 - right), the three ESG-sorted portfolios have relatively similar SDG scores, all small but slightly positive. At least from the average rating point of view, it seems that ESG and SDG sorted portfolios do not overlap much. Highly ESG rated companies are not necessarily the best in terms of SDG contribution, and the opposite is also true. We can see this by looking the average joint overlap between the two sets of portfolios, as illustrated in Exhibit 3. Each entry in the matrix shown in Exhibit 3 contains two values: the average exposure

	SDG Low	SDG Mid	SDG High
ESG Low	21.69% / 16.74%	55.39% / 31.46%	22.92% / 10.50%
ESG Mid	33.59% / 41.22%	29.55% / 26.37%	36.86% / 26.75%
ESG High	20.27% / 42.04%	28.09% / 42.17%	51.64% / 62.75%

Exhibit 3: Pairwise average overlap of the three ESG-sorted portfolios with the three SDG-sorted portfolios.

(measured by the weight of stocks in the first portfolio that are also part of the second portfolio) of each pair of ESG- and SDG-sorted portfolios. For example, on average, we see that 21.69% of *ESG Low* is also in *SDG Low*, while stocks in *SDG Low* represent 16.74% of *ESG Low*. If ESG ratings and SDG scores were perfectly (positively) rank-correlated, we would have found a matrix as in Exhibit 4 - left: lower buckets on ESG and SDG would be the same, and the same would be true for the mid and higher buckets. Conversely, if ESG ratings and SDG scores were perfectly uncorrelated, we would expect the overlap matrix to be somehow close to Exhibit 4 - right: Each ESG-sorted portfolio would overlap any SDG-sorted ones up to  $1/3^1$ .

	SDG Low	SDG Mid	SDG High		SDG Low	SDG Mid	SDG High
ESG Low	1 / 1	0 / 0	0 / 0	ESG Low	1/3 / 1/3	1/3 / 1/3	1/3 / 1/3
ESG Mid	0 / 0	1 / 1	0 / 0	ESG Mid	1/3 / 1/3	1/3 / 1/3	1/3 / 1/3
ESG High	0 / 0	0 / 0	1 / 1	ESG High	1/3 / 1/3	1/3 / 1/3	1/3 / 1/3

Perfect alignment ESG vs. SDG                      Random distribution ESG vs. SDG

Exhibit 4: Left: Theoretical overlap matrix in the case of perfectly rank-correlated ESG and SDG scores. Right: Theoretical matrix in the case of perfectly uncorrelated ESG and SDG ratings.

It turns out that overlap matrix in Exhibit 3 is far from the matrix in Exhibit 4-left, but it is no closer to Exhibit 4-right neither. Indeed, both *ESG High* and *SDG High* show high overlap: 51.64% of stocks in *ESG High* are also part of *SDG High* while 62.75% of the latter are part of the former. To some extent then, high SDG scores are likely to be associated to high ESG ratings. But for mid and low buckets, the overlap numbers are more dispersed, and surprisingly, low ESG and SDG buckets have a small overlap. Part of this can be explained by the differences in scale between ESG and SDG ratings, where we usually see a continuum in the distribution of ESG ratings from the worst to the best. On the contrary, SDG scores tend to have a three-points-like distribution: A cluster of stock with significantly negative SDG score, another with close-to-zero scores and a third one with positive SDG scores.

Exhibit 5 shows the historical behaviour of these portfolios and their benchmark while Exhibits 6–7 collect key performance indicators. We can see graphically that the three ESG portfolios tend to perform in line with the benchmark,

although *ESG Mid* has underperformed both *ESG Low* and *ESG High* as well as the benchmark.

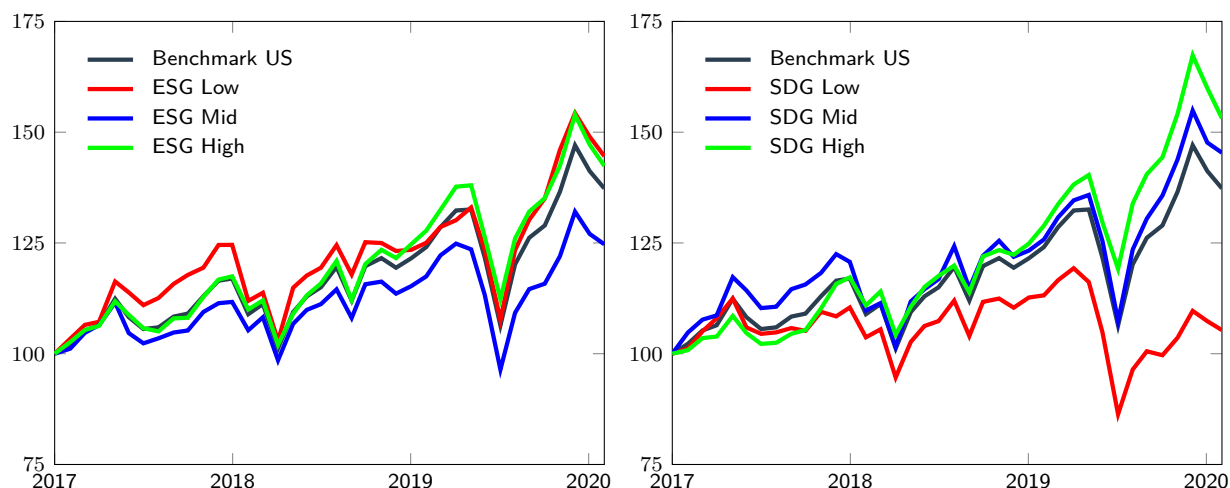


Exhibit 5: Left: Historical values of the benchmark (Solactive GBS US Index) and the three ESG-sorted portfolio. Base value = 100. Right: Historical values of the benchmark and the three SDG-sorted portfolio. Base value = 100.

On the other side, we notice that *SDG Low* significantly underperforms both the benchmark, *SDG High* and *SDG Mid*. This is highlighted in Exhibit 6, where we plot annualized performance, volatilities and the performance/volatility ratios for the six portfolios. While we do not see a particular pattern in the performance/volatility ratio when we move from *ESG Low* to *ESG High* (Exhibit 6 - left), we can clearly see that the ratio increases with the SDG scores (Exhibit 6 - right). The six portfolios have very similar levels of volatility, close to that of the benchmark.

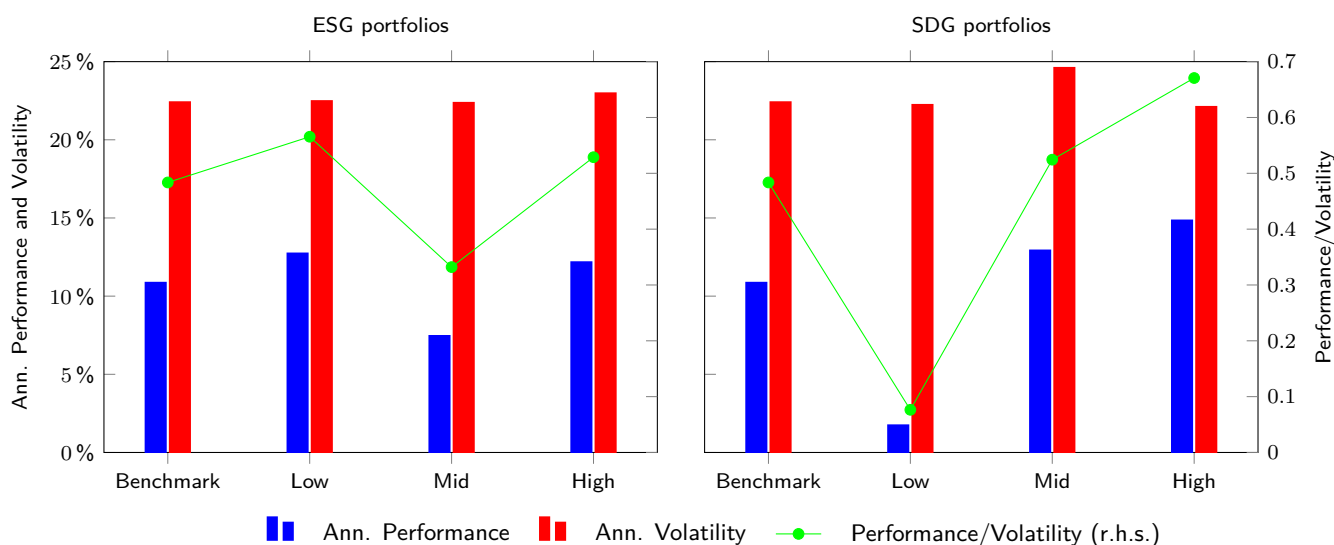


Exhibit 6: Annualized performances, volatilities and their ratios for the benchmark (Solactive GBS US Index) and the three ESG-sorted (left) and SDG-sorted portfolios (right).

They also have CAPM betas close to 1. Maximum drawdowns are not linear with ESG ratings, but they do decrease with SDG scores, where *SDG High* has a significantly lower maximum drawdown than *SDG Low*. From a performance perspective, we do not see a robust relationship between ESG-sorted portfolios and performance metrics; for SDG-sorted portfolios instead, we see how absolute performances as well as risk-adjusted ones (Performance/Volatility ratios and CAPM alphas) increase with SDG ratings.

A simple run over a classic Fama-French-Carhart four-factor model (Fama and French, 1993; Carhart, 1997) highlights the different exposures of these portfolios, as shown in Exhibit 8. *ESG Low* has a negative loading on HML, suggesting that US growth stocks, especially small ones, tend to have low ESG ratings. On the contrary, we see how large cap US stocks typically have higher ESG ratings. This is in line with the findings in Drempetic et al. (2019).

With respect to the SDG-sorted portfolios, we find a clear differentiation between *SDG Low* and *SDG High*: while the former is clearly a Value portfolio with no clear size exposure, *SDG High* appears to be relatively Growth and large cap. Given the gap in performance between growth and value stocks over the last few years, we can attribute a significant portion of the outperformance of *SDG High* to its exposure to the growth factor (14.8% annualized performance, when the benchmark is at 10.81% and *SDG Low* at 1.7%, Exhibit 7). A classic Brinson-like performance attribution (Brinson et al., 1986) of the six portfolios' excess returns over the benchmark on sector and size classifications sheds light on the underlying sources of this premium. Exhibit 9 collects the main findings. From a sector perspective, total excess returns of

	Ann. Performance	Ann. Volatility	Max Drawdown	Perf/Vol	Tracking Error	Beta	Alpha
Benchmark	10.81%	22.36%	-33.97%	0.48	0.00%	1.00	0.00%
ESG Low	12.69%	22.43%	-32.19%	0.57	5.40%	0.97	2.15%
ESG Mid	7.41%	22.32%	-36.91%	0.33	3.45%	0.99	-3.26%
ESG High	12.13%	22.93%	-32.78%	0.53	2.32%	1.02	1.09%
SDG Low	1.70%	22.19%	-39.24%	0.08	6.61%	0.95	-8.57%
SDG Mid	12.88%	24.56%	-35.06%	0.52	4.65%	1.08	1.18%
SDG High	14.80%	22.06%	-30.35%	0.67	4.02%	0.97	4.30%

Exhibit 7: Key performance indicators for the benchmark (Solactive GBS US Index) and the three ESG- and SDG-sorted portfolios.

	Alpha	MKT	SMB	HML	MOM	R <sup>2</sup>
ESG Low	-0.029	1.060***	0.059	-0.120*	0.107*	94.64%
ESG Mid	-0.027*	0.975***	-0.116**	0.071	-0.082*	97.73%
ESG High	-0.010	0.978***	-0.187***	0.014	0.002	97.33%
SDG Low	-0.041*	0.948***	-0.090	0.250***	-0.087	95.19%
SDG Mid	-0.007	1.098***	-0.019	0.007	0.049	97.04%
SDG High	-0.012	0.928***	-0.219**	-0.138**	-0.008	94.17%

Exhibit 8: Regressions of ESG- and SDG-sorted portfolios' monthly returns over the four-factor Fama-French-Carhart model. Alphas are annualized. Stars refer to statistical significance at 1% (\*\*\*), 5% (\*\*) and 10% (\*).

	Excess Return	Sector		Size	
		Allocation	Picking	Allocation	Picking
ESG Low	7.29%	0.53%	6.76%	-5.06%	12.35%
ESG Mid	-12.61%	-13.64%	1.03%	-2.83%	-9.77%
ESG High	5.08%	8.96%	-3.88%	3.83%	1.25%
SDG Low	-31.98%	-25.15%	-6.83%	-1.05%	-30.93%
SDG Mid	8.05%	6.81%	1.24%	-1.89%	9.94%
SDG High	15.82%	13.52%	2.30%	2.45%	13.37%

Exhibit 9: Brinson's performance attribution for the excess returns of the three ESG- and SDG-sorted portfolios over the benchmark (Solactive GBS US Index), across sectors and size classifications.

*ESG Mid* and *ESG High* are mainly driven by the sector allocation effect, and only for *ESG Low* the total excess return is driven by the stock picking effect. Interestingly, most of the total excess return for both *SDG Low* and *SDG High* is driven by the sector allocation effect, i.e. the effect of underweighting and overweighting sectors in the benchmark. From a size perspective instead, we do not find any particular biases: Excess returns are essentially driven by the picking component. Exhibit 10 provides more insights about the structural sector differences between *SDG Low* and *SDG High*: while *SDG Low* has significantly overweighted Consumer Staples, Energy and Industrials, *SDG High* has heavily overweighted Information Technology and Healthcare. Given the performances of these sectors over the period, namely the large underperformance of Consumer Staples, Energy and Industrials and the strong outperformance of the Information Technology, it is not surprising that *SDG High* has performed much better than *SDG Low*.

Sector	Avg. Over/Underweight		Sector Excess Return
	<i>SDG Low</i>	<i>SDG High</i>	
Communication Services	-5.91%	-2.44%	4.86%
Consumer Discretionary	4.87%	-6.8%	45.58%
Consumer Staples	12.94%	-3.3%	-14.38%
Energy	14.24%	-4.62%	-89.35%
Financials	-3.35%	-7.8%	-41.34%
Healthcare	-13.8%	19.25%	-7.94%
Industrials	12.83%	-4.59%	-28.06%
Information Technology	-21.94%	10.62%	70.55%
Materials	0.6%	-1.07%	-20.31%
Real Estate	-2.84%	0.74%	-22.73%
Utilities	2.37%	0.01%	-11.59%

Exhibit 10: Average sector over/underweight of both *SDG Low* and *SDG High* compared to the benchmark and sectors' excess returns.

## European equities

We make the same analysis for European stocks by building three ESG- and SDG-sorted portfolios. Exhibit 11 mirrors Exhibit 2 and shows the average ESG rating and SDG score for the six portfolios and the benchmark. Remarkably, as in the US case, we see that ESG ratings of SDG-sorted portfolios are relatively similar to each other, and the same holds true for the SDG scores of the three ESG-sorted portfolios. The rating gap between *ESG High* and *ESG Low* is comparable to the one in the US case (40% circa between the two extremes), although in the European case we notice overall higher ESG ratings. Similarly, the gap in SDG scores for the European portfolios is comparable to the US case but, in absolute terms, the European version of *SDG Low* has a lower SDG score than the US *SDG Low*. On the other hand, the European *SDG High* achieves a better SDG score compared to the US version.

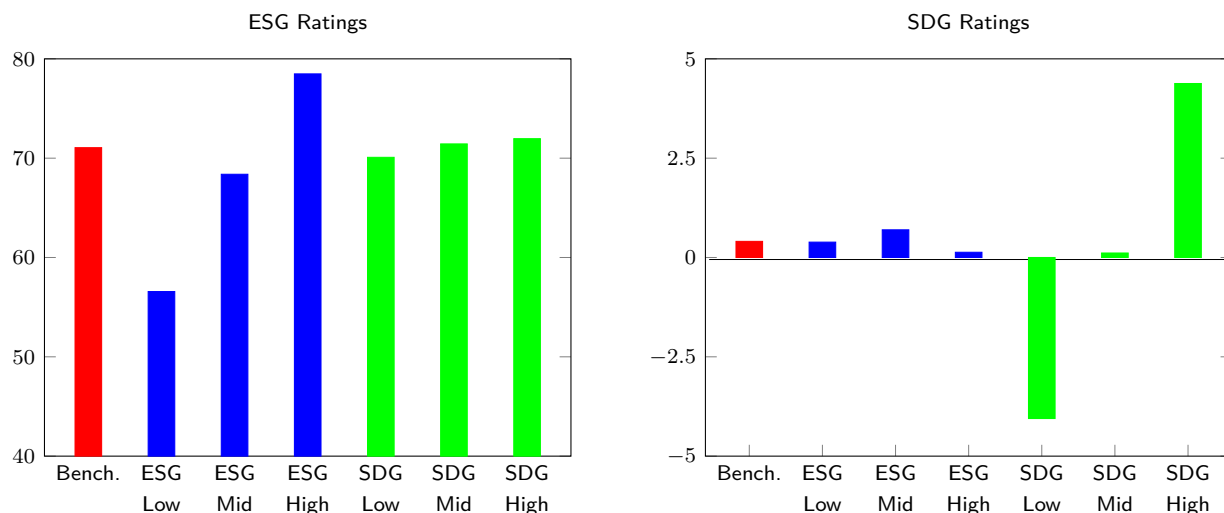


Exhibit 11: Left: Average ESG Scores for the benchmark (Solactive Europe 600 Index), the three ESG-sorted portfolios (blue) and the three SDG-sorted portfolios (green). Right: Average SDG Scores for the benchmark (Solactive Europe 600 Index), the three ESG-sorted portfolios (blue) and the three SDG-sorted portfolios (green).

Exhibit 12 shows the historical performance of the six portfolios. Interestingly, the three ESG-sorted portfolios behave globally as the benchmark, a result in line with Johannessen and Tveiters (2019). Within the SDG-sorted portfolios, instead, we see more dispersion, with *SDG High* clearly ahead of the other two SDG-sorted portfolios and the benchmark, although most of the gains seem to materialize during the deep drawdown in early 2020 and the recovery that followed.

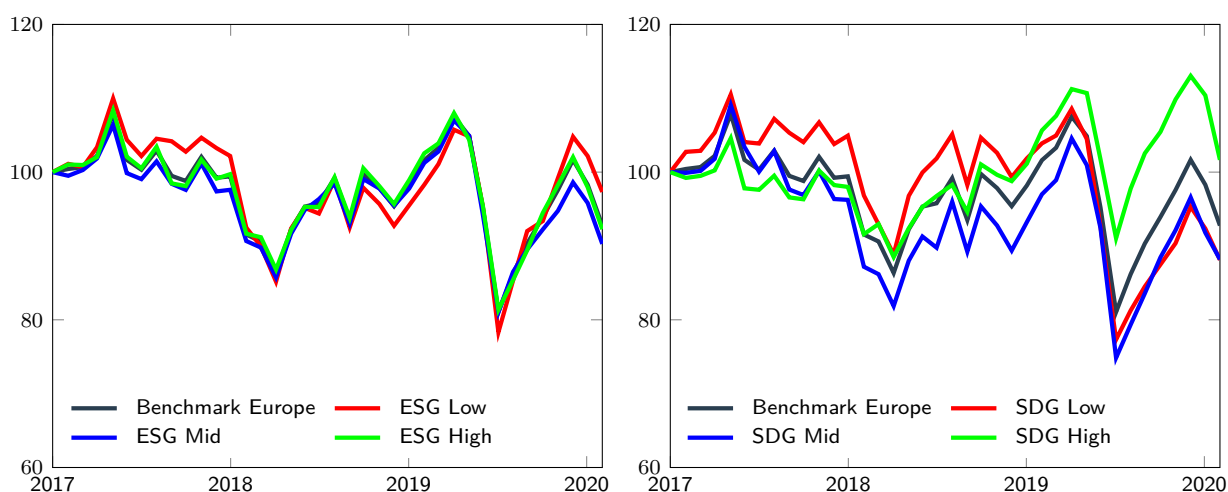


Exhibit 12: Left: Historical values of the benchmark (Solactive Europe 600 Index) and the three ESG-sorted portfolio. Base value = 100. Right: Historical values of the benchmark and the three SDG-sorted portfolio. Base value = 100.

Exhibit 13 gives an aggregated view of key performance indicators for the ESG- and SDG-sorted portfolios. As for the US case, in Europe as well we do not find any particular pattern between the performance of the ESG-sorted portfolios and their ratings. *ESG High* is roughly in line with the benchmark, while *ESG Low* does slightly better. These results do not confirm what market participants usually expect: the widespread belief that, at least in Europe, high ESG ratings usually lead to better performance, which is confirmed in many academic papers (Friede et al., 2015a; Kotsantonis et al., 2016; La Torre et al., 2020). Some of the divergences can be attributed to differences in the methodologies, as well as the differences in ESG ratings that is found in the empirical literature (Berg et al., 2020). But the biggest source of divergence is the specific period we are considering, which is perhaps too short in our case compared to equivalent work in

the literature. However, most research has not been updated to include 2020 and the effects of COVID-19 on the market. For example, Demers et al. (2020) already point out the vanishing explanatory power of ESG when one controls for firm characteristic during the initial months of 2020.

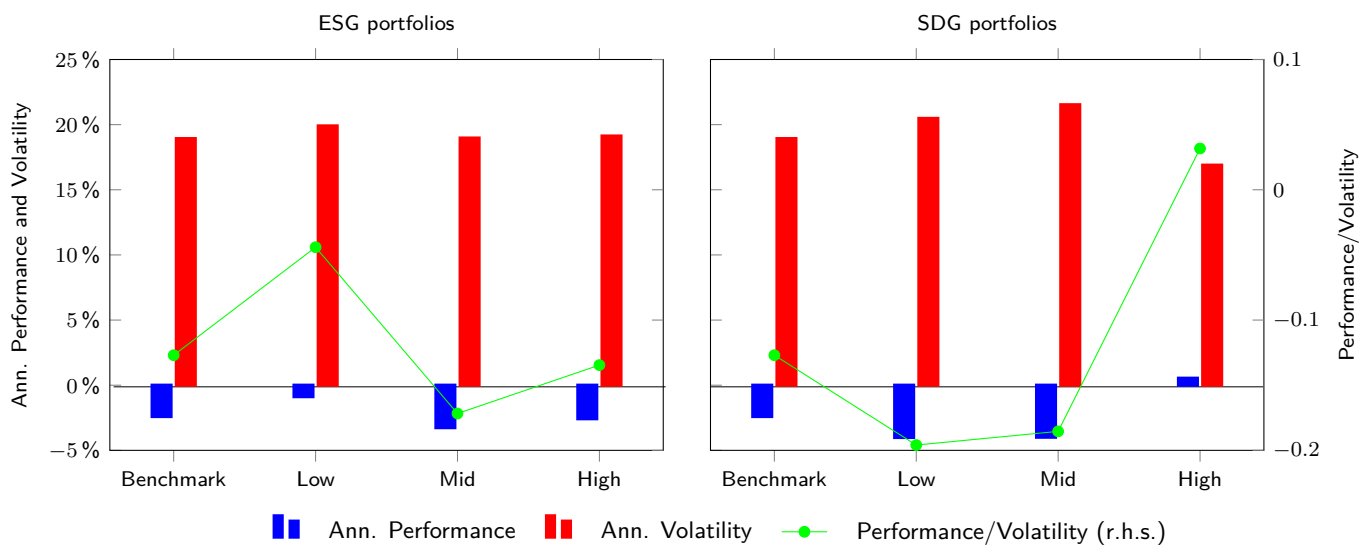


Exhibit 13: Annualized performances, volatilities and their ratios for the benchmark (Solactive Europe 600 Index) and the three ESG-sorted (left) and SDG-sorted portfolios (right).

For the SDG-sorted portfolios, we find a similar pattern as in the US case: *SDG High* clearly outperforms the benchmark and both *SDG Mid* and *SDG Low* (Exhibit 13 -right). Details of risk and performance indicators for the six portfolios are shown in Exhibit 14. If ESG rankings do not transpose in performance rankings, we note that high ESG ratings have been associated with relatively lower drawdowns. Both performance and risk figures, on a relative basis, mirror the results in the US case. From a risk perspective, the portfolios are globally similar, except for *SDG High* which exhibits a lower drawdown and volatility. It is also the only portfolio that achieves small but positive performance, with an annualized 0.54% against -2.40% for the benchmark and -4.01% for *SDG Low* over the same period. Interestingly, the maximum drawdown for *SDG High* was 10% circa smaller than both *SDG Mid* and *SDG Low*, which proves the resilience of this portfolio during the worst months at the beginning of 2020.

	Ann. Performance	Ann. Volatility	Max Drawdown	Perf/Vol	Tracking Error	Beta	Alpha
Benchmark	-2.40%	18.93%	-36.24%	-0.13	0.00%	1.00	0.00%
ESG Low	-0.88%	19.90%	-40.59%	-0.04	4.44%	1.03	1.59%
ESG Mid	-3.26%	18.97%	-36.56%	-0.17	2.42%	0.99	-0.87%
ESG High	-2.57%	19.13%	-36.04%	-0.13	2.09%	1.00	-0.16%
SDG Low	-4.01%	20.48%	-41.96%	-0.20	4.05%	1.06	-1.46%
SDG Mid	-3.99%	21.53%	-41.42%	-0.19	4.49%	1.12	-1.30%
SDG High	0.54%	16.89%	-31.06%	0.03	4.78%	0.87	2.62%

Exhibit 14: Key performance indicators for the benchmark (Solactive Europe 600 Index) and the three ESG- and SDG-sorted portfolios.

For the European universe, the overlap matrix shown in Exhibit 15, is close to Exhibit 4-right. Contrary to the US case (Exhibit 3), it seems that for European stocks, ESG and SDG metrics tend to produce different portfolios, and their overlap is not as strong as one would expect.

	SDG Low	SDG Mid	SDG High
ESG Low	32.68% / 16.33%	36.06% / 17.23%	31.26% / 13.20%
ESG Mid	35.23% / 43.45%	28.77% / 33.96%	36.00% / 37.86%
ESG High	27.16% / 40.22%	34.12% / 48.81%	38.72% / 48.94%

Exhibit 15: Pairwise average overlap of the three ESG-sorted portfolios with the three SDG-sorted portfolios.

Exhibit 16 collects the results of the factor analysis for both ESG- and SDG-sorted portfolios. Once we account for the classical four-factor model, there is no significant alpha related to these portfolios. In line with the US case (Exhibit 8), we note that both *ESG Low* and *SDG High* have significant growth style, while *ESG High* and *SDG Low* tend to correlate better with the value factor.

The main findings of the Brinson's performance attributions for the six portfolios' excess returns over the benchmark (regarding countries, sector and size classifications) are collected in Exhibit 17. For European companies too, we see that the *SDG High*'s large excess return is the result of a particularly successful sector allocation. Indeed, from both a country



	Alpha	MKT	SMB	HML	MOM	R <sup>2</sup>
ESG Low	-0.009	1.070***	0.433***	-0.197***	-0.087	97.62%
ESG Mid	-0.021	0.989***	-0.210***	-0.002	-0.014	97.67%
ESG High	-0.002	1.045***	-0.324***	0.107**	0.013	98.88%
SDG Low	-0.016	1.059***	-0.172*	0.086	0.001	95.99%
SDG Mid	0.023	1.102***	0.048	0.174**	-0.153**	97.58%
SDG High	-0.021	0.935***	-0.325***	-0.175**	0.068	93.47%

Exhibit 16: Regressions of ESG- and SDG-sorted portfolios' monthly returns over the four-factor Fama-French-Carhart model. Alphas are annualized. Stars refer to statistical significance at 1% (\*\*\*), 5% (\*\*) and 10% (\*).

and size point of view, the portfolios' excess returns are essentially driven by stock picking, which is another way to say that countries and size effects are not as predominant as one would imagine, in both ESG and SDG ratings, at least from a performance perspective. Specifically for *SDG High* we note how the total excess return over the benchmark (8.90%) is essentially driven by the stock picking component when we look at country and size classifications, but it is mainly due to the allocation effect when we look at sector (7.24% allocation effect and 1.66% stock picking effect).

	Excess Return	Country		Sector		Size	
		Allocation	Picking	Allocation	Picking	Allocation	Picking
ESG Low	4.55%	-1.40%	5.95%	1.02%	3.53%	0.84%	3.71%
ESG Mid	-2.48%	-0.64%	-1.84%	3.09%	-5.57%	0.72%	-3.21%
ESG High	-0.50%	0.84%	-1.34%	-2.66%	2.16%	-0.85%	0.35%
SDG Low	-4.64%	-0.70%	-3.94%	-0.67%	-3.98%	0.78%	-5.42%
SDG Mid	-4.58%	-0.44%	-4.14%	-6.03%	1.45%	-1.12%	-3.47%
SDG High	8.90%	1.00%	7.90%	7.24%	1.66%	0.16%	8.73%

Exhibit 17: Brinson's performance attribution for the excess returns of the three ESG- and SDG-sorted portfolios over the benchmark (Solactive Europe 600 Index), across countries, sectors and size classifications.

Exhibit 18 illustrates the average sector allocations for both *SDG Low* and *SDG High* and sectors' excess returns over the benchmark. While *SDG Low* overweights Energy and underweights Healthcare and Information Technology, *SDG High* has a particularly successful sector allocation by overweighting Healthcare and underweighting Energy.

Sector	Avg. Over/Underweight		Sector Excess Return
	SDG Low	SDG High	
Communication Services	-4.69%	5.08%	-16.9%
Consumer Discretionary	9.06%	-6.49%	5.79%
Consumer Staples	18.52%	-7.85%	9.18%
Energy	13%	-5.57%	-36.2%
Financials	-15.21%	-6.71%	-27.52%
Healthcare	-13.44%	23.38%	22.37%
Industrials	2.28%	-2.57%	6.52%
Information Technology	-5.31%	-0.8%	34.29%
Materials	0.02%	-3.56%	7.76%
Real Estate	-2.11%	2.53%	-2.95%
Utilities	-2.12%	2.56%	30.12%

Exhibit 18: Average sector over/underweight of both *SDG Low* and *SDG High* compared to the benchmark and sectors' excess returns.

## The sector-adjusted approach

The analysis in the two previous sections has proven, for the period considered, how American and European stocks with high SDG scores outperformed both their benchmarks and the portfolios with lower scores. The outperformance was the results of their particularly efficient sector allocation. By considering stocks with high SDG scores, the portfolios were tilted towards Healthcare and Information Technology and, from a factor perspective, towards Growth. And these sectors and factor style have performed particularly well over the last few years.

To disentangle these effects, we modify the portfolio construction by sorting stocks based on their ESG (resp. SDG) scores within sectors. For example, *SDG High* will now be the portfolio made of the top tier of stocks by SDG scores within each sector. In the same spirit, *ESG Low* will be the portfolio of stocks that are in the bottom third by ESG ratings within each sector. The six portfolios are weighted by market capitalization. They will not necessarily be sector-neutral with respect to their respective benchmarks, but we are now able to neutralize any distortion coming from the data (both ESG and SDG) that structurally penalizes some sectors in the universe (for instance, the Energy sector).

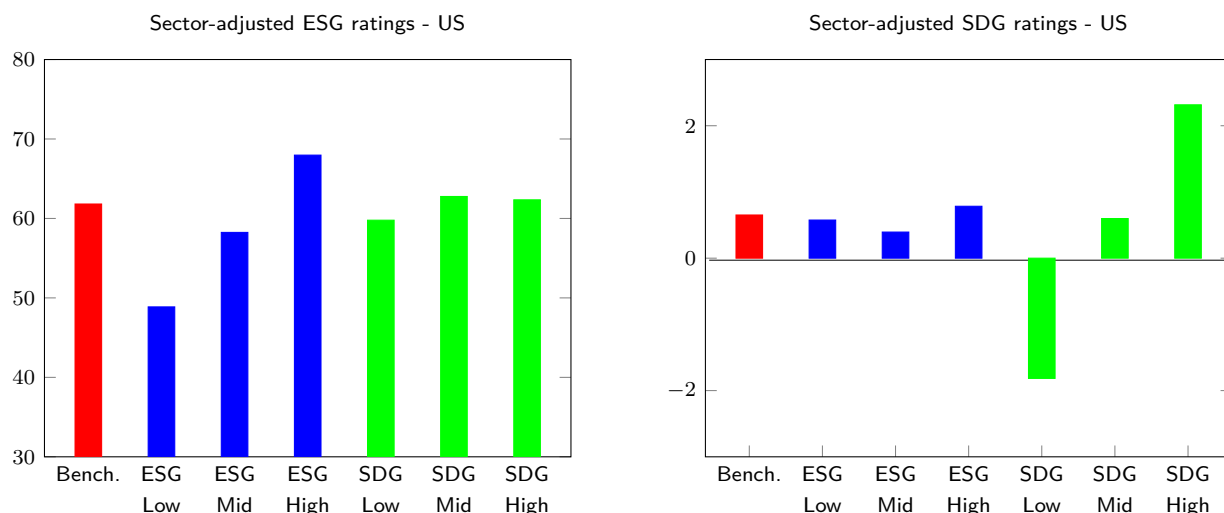


Exhibit 19: Left: Average ESG Scores for the benchmark (Solactive GBS US Index), the three sector-adjusted ESG-sorted portfolios (blue) and the three sector-adjusted SDG-sorted portfolios (green). Right: Average SDG Scores for the benchmark (Solactive GBS US Index), the three sector-adjusted ESG-sorted portfolios (blue) and the three sector-adjusted SDG-sorted portfolios (green).

Exhibits 19-20 show the average ESG and SDG rating of the six portfolios in the American and European case. Unsurprisingly, even by taking into account sector idiosyncrasies, we are still able to distinguish high and low ESG (resp. SDG) portfolios. The ESG and SDG profiles are globally preserved (when we compare them to Exhibits 2 and 11), although the average scores are now different in magnitude. The most noticeable difference appears in the SDG ratings for ESG-sorted European stocks, where we now see a negative SDG rating for *ESG Low* while it was small but positive in Exhibit 11.

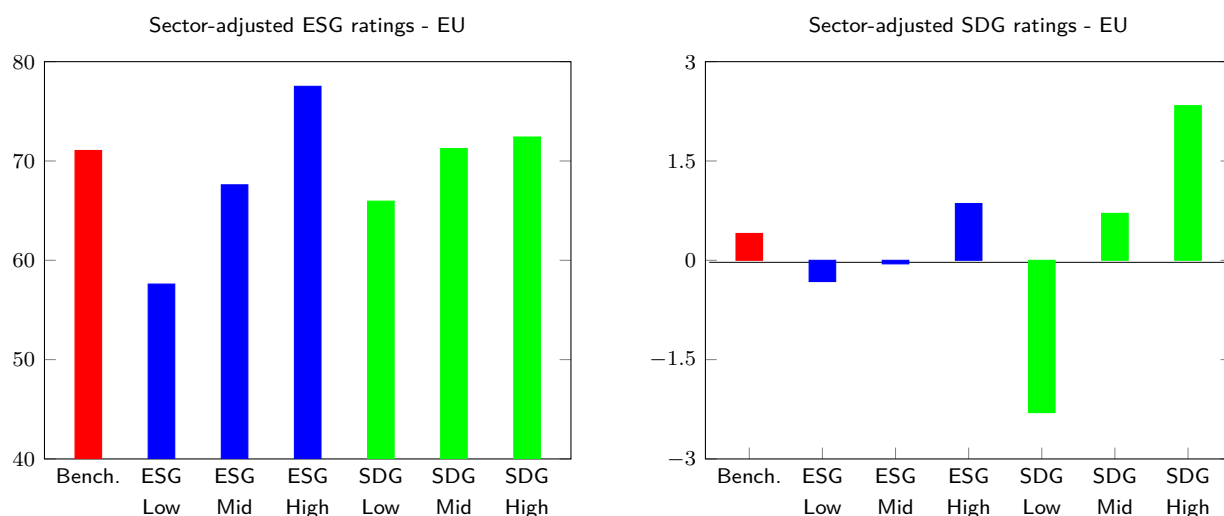


Exhibit 20: Left: Average ESG Scores for the benchmark (Solactive Europe 600 Index), the three ESG-sorted portfolios (blue) and the three SDG-sorted portfolios (green). Right: Average SDG Scores for the benchmark (Solactive Europe 600 Index), the three sector-adjusted ESG-sorted portfolios (blue) and the three sector-adjusted SDG-sorted portfolios (green).

Exhibits 21-22 collect and show standard performance indicators for the six US portfolios. We notice very little changes in the three ESG-sorted portfolios: *ESG Low* and *ESG Mid* in the sector-adjusted case are very close, from both a risk and a performance perspective to their equivalent versions in the non-adjusted case (Exhibit 7). For *ESG High* instead, the sector-adjustment produces lower performance but similar risk compared to the non-adjusted version (12.13% against 9.95% in the sector-adjusted case).

The major changes appear in the SDG-sorted portfolios, where *SDG Low* goes from 1.70% annualized performance (as reported in Exhibit 7) to 8.89% in the sector-adjusted case. At the same time, *SDG High* moves from 14.80% to 9.44% annualized performance. Clearly the adjustment in SDG ratings removes the structural sector biases that are responsible for the gap in performance between high and low SDG-rated stocks.

Graphically, the differences between the left panels of Exhibits 6 and Exhibit 21 are small and, more importantly, the sector adjustment does not change the overall behaviour of ESG-sorted portfolios from a risk-return perspective.

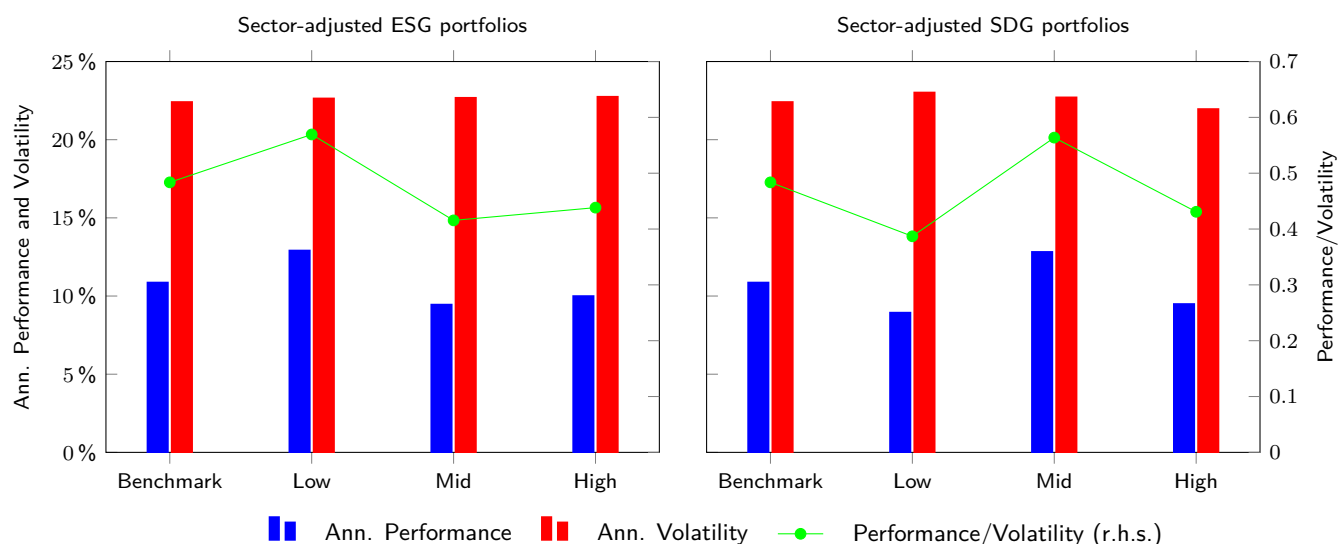


Exhibit 21: Annualized performances, volatilities and their ratios for the benchmark (Solactive GBS US Index) and the three sector-adjusted ESG-sorted (left) and SDG-sorted portfolios (right).

On the other hand, when we compare the right panels of Exhibits 6 and Exhibit 21, we see a dramatic change in the behaviour of SDG-sorted portfolios: in the non-adjusted case (Exhibit 6) the performance/volatility ratio increases when we move from low to high SDG-rated stocks. This is no longer the case once we take into account sector biases (Exhibit 21).

	Ann. Performance	Ann. Volatility	Max Drawdown	Perf/Vol	Tracking Error	Beta	Alpha
Benchmark	10.81%	22.36%	-33.97%	0.48	0.00%	1.00	0.00%
ESG Low	12.86%	22.59%	-33.89%	0.57	4.36%	0.99	2.14%
ESG Mid	9.40%	22.63%	-36.51%	0.42	3.09%	1.00	-1.44%
ESG High	9.95%	22.70%	-34.28%	0.44	1.85%	1.01	-0.99%
SDG Low	8.89%	22.97%	-36.58%	0.39	4.63%	1.01	-1.99%
SDG Mid	12.77%	22.66%	-34.98%	0.56	2.57%	1.01	1.89%
SDG High	9.44%	21.91%	-32.27%	0.43	2.46%	0.97	-1.09%

Exhibit 22: Key performance indicators for the benchmark (Solactive GBS US Index) and the three sector-adjusted ESG- and SDG-sorted portfolios.

We can see how the sector adjustment changes the nature of the SDG-sorted portfolios by looking at the performance attribution of their excess returns shown in Exhibit 23. The sector allocation effect has disappeared, especially if we compare it with the results in Exhibit 9. In particular, the total excess return of *SDG High* is now driven by the stock picking effect. The same holds true for *SDG Low*. Although there is still some negative contribution from the allocation effect, it is four times smaller than in the non-adjusted case (-25.15% in Exhibit 9 versus -5.94% in Exhibit 23).

	Excess Return	Sector		Size	
		Allocation	Picking	Allocation	Picking
ESG Low	7.99%	0.14%	7.85%	-6.99%	14.97%
ESG Mid	-5.33%	-0.10%	-5.22%	-4.69%	-0.64%
ESG High	-3.28%	0.04%	-3.33%	1.90%	-5.18%
SDG Low	-7.23%	-5.94%	-1.30%	-0.40%	-6.83%
SDG Mid	7.63%	2.95%	4.69%	-1.07%	8.70%
SDG High	-5.19%	-0.17%	-5.02%	-0.14%	-5.05%

Exhibit 23: Brinson's performance attribution for the excess returns of the three sector-adjusted ESG- and sector-adjusted SDG-sorted portfolios over the benchmark (Solactive GBS US Index), across sector and size classifications.

For the European case, the impact of the sector adjustment is not as important as in the US case. Exhibit 24 highlights the change in the risk-return profile when we move from the absolute to the sector-adjusted methodology. The left panel reflects the profile we found in the left panel of Exhibit 13. There is a level change but, overall, the ranking is preserved. The change is more substantial for SDG-sorted portfolios in the right panel: Both the shape and the level of the performance/volatility ratio is modified, even though we still see a positive premium on *SDG High*.

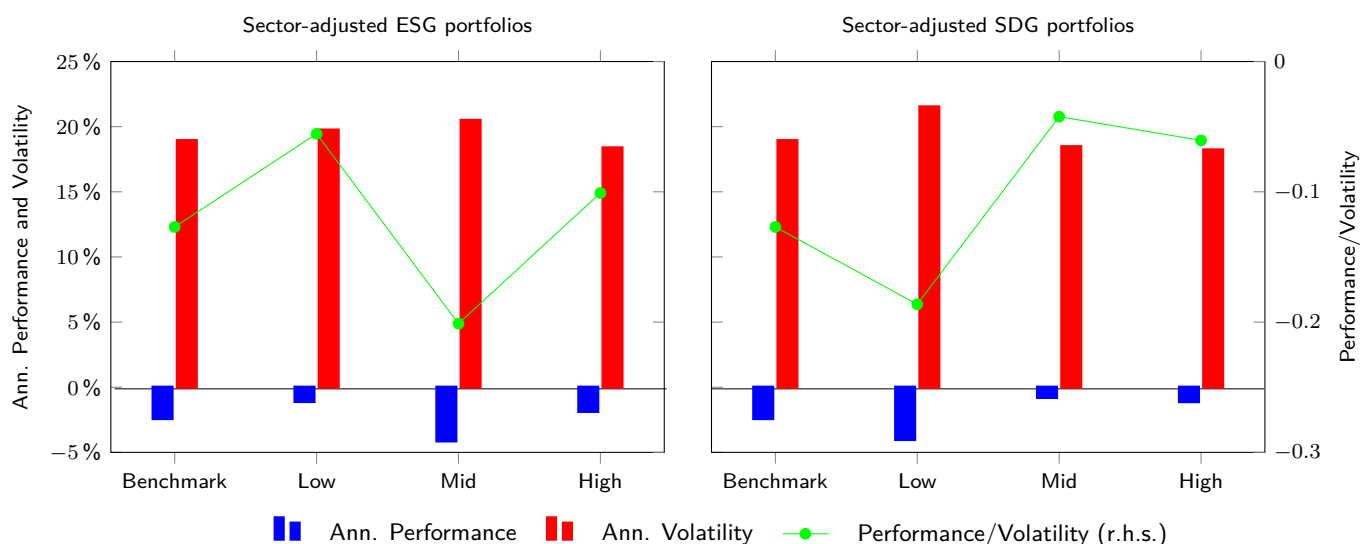


Exhibit 24: Annualized performances, volatilities and their ratios for the benchmark (Solactive Europe 600 Index) and the three sector-adjusted ESG-sorted (left) and SDG-sorted portfolios (right).

Indeed, as detailed in Exhibit 25, we see that after the sector adjustment, *SDG High* is still delivering better returns than both the benchmark and *SDG Low*, while reducing the risk. In numbers, *SDG High* outperforms *SDG Low* by 4.55% annualized (-4.01% for *SDG Low* versus 0.54% for *SDG High* in Exhibit 14). After the adjustment, we find *SDG High* outperforming *SDG Low* by 2.91% annualized (-4.01% for *SDG Low* versus -1.10% for *SDG High* in Exhibit 25).

	Ann. Performance	Ann. Volatility	Max Drawdown	Perf/Vol	Tracking Error	Beta	Alpha
Benchmark	-2.40%	18.93%	-36.24%	-0.13	0.00%	1.00	0.00%
ESG Low	-1.10%	19.74%	-39.06%	-0.06	3.72%	1.02	1.37%
ESG Mid	-4.12%	20.48%	-41.52%	-0.20	2.94%	1.07	-1.54%
ESG High	-1.85%	18.37%	-33.57%	-0.10	1.71%	0.97	0.47%
SDG Low	-4.01%	21.52%	-44.00%	-0.19	4.21%	1.12	-1.31%
SDG Mid	-0.78%	18.46%	-34.64%	-0.04	2.73%	0.97	1.54%
SDG High	-1.10%	18.22%	-33.74%	-0.06	2.25%	0.96	1.19%

Exhibit 25: Key performance indicators for the benchmark (Solactive Europe 600 Index) and the three sector-adjusted ESG- and SDG-sorted portfolios.

Unsurprisingly, we do not find any significant sector allocation effect in the six portfolios' excess returns (Exhibit 26), with the exception of *SDG Mid*. The excess return of both *SDG Low* and *SDG High* is now driven, from a sector perspective, by the pure stock picking effect. In other words, at least in the European case, there is a measurable gap from a risk and performance point of view, between stocks with high SDG scores and stocks with low scores, even if we take into account the fact that, structurally, some sectors have a clear advantage from a SDG point of view (such as Healthcare).

	Excess Return	Country		Sector		Size	
		Allocation	Picking	Allocation	Picking	Allocation	Picking
ESG Low	3.89%	-2.60%	6.50%	0.05%	3.84%	-1.50%	5.39%
ESG Mid	-4.94%	-3.17%	-1.78%	-0.50%	-4.45%	0.22%	-5.16%
ESG High	1.62%	2.03%	-0.41%	0.16%	1.46%	0.13%	1.50%
SDG Low	-4.63%	-3.78%	-0.86%	-0.18%	-4.45%	-1.51%	-3.12%
SDG Mid	4.84%	1.10%	3.74%	3.55%	1.29%	1.58%	3.26%
SDG High	3.87%	0.24%	3.63%	-0.13%	4.00%	-1.31%	5.18%

Exhibit 26: Brinson's performance attribution for the excess returns of the three sector-adjusted ESG- and sector-adjusted SDG-sorted portfolios over the benchmark (Solactive Europe 600 Index), across country, sector and size classifications.

## Conclusion

As ESG investing becomes the default setting for investors, and their sustainability policies are drawn within the framework outlined by the SDG, it is important to understand how these choices can shape and impact investment decisions. The data that captures the SDG impact of companies is still at an early stage, and the methodologies that underpin it are expected to evolve over time, as better disclosure and data availability will meet new innovative measurement techniques. Furthermore, as these themes are relatively new for both investors and the financial industry, it is difficult to assess the impact of SDG-driven investment strategies over long period of time.

Nevertheless, as the topic will certainly become central for investors in the years to come, we believe that an early stage assessment of its impact in investment decisions is useful and valuable, even if the results may be affected by the short period of time considered in the analysis.

The first result of this paper is related to the structural sector biases that SDG data carries. As they are usually built around the concept of revenues from products and services companies provide to the economy, it is perfectly understandable that some sectors will automatically have an advantage when it comes to promote one or more SDG (for example Information Technology or Healthcare). Given the relative performance of these sectors over the last few years, it is therefore natural to see stocks with high SDG scores outperforming stocks with lower scores. This is indeed what we measure in both the US and European case. Over the period 2017-2020, we measure a SDG annualized premium of circa 13% for US stocks and 4.5% for European stocks.

As most of this premium is driven by the sector allocation effect, we have tested what would happen when we adjust SDG scores to account for sector idiosyncrasies. The second finding of this paper is that after taking into account the sector effect, the US and the European cases are no longer similar. While the SDG premium for US stocks almost disappears (a difference in annualized performances of circa 0.5% between *SDG High* and *SDG Low*), we still measure a positive premium of around 3% in the European case.

More data is certainly needed to measure this premium and assess its robustness, but it seems already clear that investors will need to pay attention to unwanted biases that SDG-oriented sustainability policies could bring in their portfolios.

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