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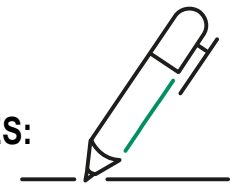
IMPACT OF SUSTAINABILITY ON THE PERFORMANCE OF EQUITY INDICES: SCREENING APPROACHES



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Executive Summary

We investigated the impact of different sustainability-based screening approaches on the performance of large cap equity market indices over the past five years. We considered four broad regional large market capitalization-weighted indices and examined the impact of six different screening approaches: our Responsible Business Conduct (RBC) policy, Environmental Social and Governance (ESG) company scores, Sustainable Investment (SI) grades, and three fund labels, Towards Sustainability (TS), *Investissement Socialement Responsible* (ISR), and the Paris Aligned Benchmark (PAB) label. In our historical simulations, we employed two methods to reweight the indices after exclusions: i) rebasing the index using market cap weights and ii) minimizing the tracking error relative to the market cap-weighted index. The impact on tracking error risk and performance is smaller for less stringent approaches such as our RBC policy than for more stringent approaches such as investing solely in SI-graded companies. In general, we also found that rebasing tends to generate higher tracking error and larger return differentials relative to the market capitalization indices than tracking error minimization. Overall, with the exception of RBC, most other rebased indices assessed would have outperformed the market capitalization indices over the five-year period. This was less the case for Europe where only the SI basket index would have outperformed. However, performance varied significantly over the period and 2022 would have been a challenging year across the board, mainly due to the large underweight of the energy sector inherent to most screening approaches considered. We advise against generalizing the results of this study to other asset classes, or to other equity regions, countries or indices with smaller capitalization stocks where exclusions can have a bigger impact. This caution also applies to actively managed portfolios where various other factors influence performance and ESG considerations are often integrated into the fundamental analysis used for investment decisions, making the attribution process very challenging.

Keywords: sustainable investment, screening, ESG, SRI, ISR Label, Towards Sustainability, Paris Aligned Benchmark.

JEL Classification: G11, G18, M14, Q01, Q56

Introduction

When investigating the impact of sustainability criteria on investment performance it is important to be clear about what type of approach to sustainability is being assessed because not all have the same objectives. Following the recently harmonized definitions[1] of the CFA Institute, the UN-Principles for Responsible Investment and the Global Sustainable Investment Alliance, approaches to sustainability can be classified into:

- **Screening** (selectivity): determining which assets are permissible in portfolios based on well-defined rules which can be based in undesirable criteria (negative screening), desirable criteria (positive screening), desirable criteria relative to peers (best-in-class screening) or widely recognised criteria (norms-based screening). Such rules may arise from a variety of purposes which include:
    - **Limiting risk**: for example, with a **Responsible Business Conduct** (RBC) policy which aims at mitigating risks by excluding sensitive industries and assets exposed to regulatory or stranded asset risk. While these investments should mitigate risk longer-term, some can have positive or negative excess returns over traditional benchmark indices for extended periods of time in the short to medium term[2].
    - **Satisfying investor preferences:** for example, with **Social-Responsible-Investing** (SRI) where assets are excluded based on specific ethical criteria that meet investor requirements, even if some of those exclusions can have a detrimental impact on excess returns.
    - **Defining the permitted investment universe**: for example, to limit the investment universe only to eligible companies in an investment product with **Environmental Social and Governance** (ESG) criteria that systematically exclude certain assets or that must be met for an asset to be considered.
    - **Complying with laws and regulations**: for example, when excluding assets in certain geographical location based on sanctions signed into law.
- **ESG integration**: the ongoing consideration of financial material ESG factors into the investment analysis and decision-making process, based on the expectation that they affect risk and returns of investments. ESG integration does not imply that there are explicit restrictions on the investment universe. In actively managed portfolios, ESG considerations are typically embedded in fundamental analysis to help make better informed investment decisions.
- **Sustainable thematic investing**: investing in a selection of assets expected to benefit from a related megatrend. Examples of thematic investing focused on sustainability include themes linked to climate change and the shift to a circular economy. We should note that, because of the focused nature of most specialised thematic strategies, thematic portfolios can be concentrated and thus have significant sector, region and/or style biases. Such biases may not always produce a positive contribution to excess returns over traditional broad market capitalization weighted indices over the shorter- to medium-term.

[1] Paul A., C. Fidler, N. Gehrig, R. Willis, J. Ambachtsheer, B. McGannon, S. O'Connor, S. Peres da Costa, M. Robinson, L. Woll, M. Bartek, T. Belsom, L. Green, K. Krauter, C. Melot, R. Van Merrienboer, E. Wagstaff. 2023. "Definitions for Responsible Investment Approaches" CFA Institute, Global Sustainable Investment Alliance, and Principles for Responsible Investment.

[2] A good example is the tobacco industry. Despite underperforming by 0.8% annually in the last 14 years (USD total returns), the MSCI World Tobacco Index did outperformed the MSCI World Index in six of the last fourteen years. Return differentials can be large on an annual basis. For example, the MSCI World Tobacco Index underperformed the MSCI World Index by 28.6% in 2023 after outperforming by 28.9% in 2022. Source: MSCI.

- **Stewardship**: using investor rights and influence to protect and enhance overall long-term value, including the common economic, social, and environmental assets on which their interests depend. The long-term nature of this approach means that it is more challenging to generate value over shorter- to medium-term horizons.

- **Impact investing**, aiming to produce a measurable social and/or environmental impact alongside a financial return. Depending on the trade-off between these two objectives, out-performance over traditional broad market capitalization indices may not always be delivered, in particular over shorter- to medium-term horizons.

Moreover, when discussing research results it is also important to precise the scope (i.e. the approach used to measure the impact, the time period, the asset class, the region) and the measure of performance considered:

- **Excess returns** of the sustainability approach relative to a market capitalization index, perhaps the most obvious but not always the most adapted in particular for approaches like Thematic Investments where sector, regional and/or style biases may contribute significantly, or to Stewardship, due to its long-term nature,

- **Alpha**, the component of the excess return of a sustainability approach relative to a market capitalization index which cannot be attributed to a correlation with the returns of the unconstrained market capitalization index. However, other definitions of alpha are available and often used. For example, in academic studies of equity investments, alpha is often measured using factor models like the Fama-French three-factor model, and more recently using the Fama-French five-factor model[3]. Other models are sometimes also considered[4],

- **Sharpe ratio**, the risk-adjusted returns of an investment measured by dividing the investment returns over money market rates by the volatility of the investment returns. A higher Sharpe ratio can show that risk has been lowered even if returns are comparable, which can still be beneficial for investors.

Indeed, results and conclusions can differ depending on these choices. Not being clear about the type of investment approach under consideration, performance measure, scope and limitations of analysis are common sources of confusion that tend to arise when discussing the impact of sustainability on performance. Typical sources of confusion include:

- **Generalising performance** results of one sustainability approach to all other sustainability approaches.

- **Not distinguishing between different sustainability objectives**, for example not distinguishing between ethically driven SRI (Socially Responsible Investing) screening approaches and ESG (Environmental, Social, and Governance) integration that aims to target potentially better risk-adjusted outcomes.

- **Not recognising that real performance is driven by many different factors** and that in practice the attribution can be near impossible, in particular for actively managed funds based on fundamental analysis with extra-financial considerations embedded in a decision-making process along with other considerations. In addition, there will also be an impact on performance from other portfolio constraints, e.g. liquidity considerations.

[3] When using Fama-French factor models, the alpha is calculated from a regression of the fund returns over money market rates against the returns to several factors. The factors used by the three-factor Fama-French model are i) the returns to the market cap weight portfolio over money market rates, ii) the return spread between small- and large-cap stocks (SMB) and iii) the return spread between high and low book-to-market stocks (HML). Two additional factors are used in the five-factor Fama-French model: iv) the return spread between high and weak operating profitability stocks (RMW) and v) the return spread between companies that invest aggressively and conservatively (CMA). Data for those models is usually sourced from https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[4] Examples of other models include i) extensions of the Fama-French models augmented with a momentum factor (UMD), ii) the q-factor model that includes profitability and investment factors in addition to market and size factors, or iii) the Stambaugh and Yuan four-factor model.

- **Overlooking the combined effect of overlaying multiple sustainable criteria** in a real portfolio: for example, labelled actively managed sustainable funds with ESG integration also need to fulfil additional requirements of those labels.
- **Placing too much emphasis on shorter-term performance impact** instead of considering the impact over the medium- to longer-term horizon.
- **Ignoring the impact on risk** i.e. not adjusting performance results for risk.
- **Confusing alpha with excess return** against a benchmark or ignoring the definition of alpha used.

Academic evidence

There is a substantial body of research investigating the relationship between ESG criteria and the corporate financial performance of investments. Friede, Busch, and Bassen (2015) reviewed **3,718 studies on the empirical relationship between ESG and performance**, of which **2,200 were unique studies**, using a **vote-count** and **meta-analysis** approach. They first counted the number of studies with significant positive, negative, and non-significant results, using only academic studies with quantitative summaries. Then, they applied a second-order meta-analysis to 60 econometric review studies based on those original unique studies. They found that **90% of the studies cited a non-negative relationship between ESG and corporate financial performance** in a mix of non-portfolio and portfolio (funds) studies. A drawback of this approach is that it **masks many important details and cannot account for the sources of confusion** mentioned earlier or biases in the literature towards specific types of analysis. However, Busch and Friede (2018) partly addressed some of these biases and reconfirmed the original study's findings.

Additionally, Whelan et al. (2021) examined a more recent set of over 1,000 studies from 2015 through 2020. This meta-analysis reinforces the generally positive relationship between company/investment financial performance and company/investment sustainability performance found in Friede, Busch, and Bassen (2015).

In an earlier paper, Capelle-Blancard and Monjon (2010) investigated the **impact of socially responsible screenings** on the performance of a sample of French SRI funds. They found evidence that **greater screening intensity slightly reduces financial performance**, but **the relationship reverses when the screening becomes more stringent**. Furthermore, they found that only sector screens, such as the exclusion of *sin* stocks[5] commonly found in the RBC policy of many asset managers, **decrease financial performance**. In contrast, **transversal screens**, like those based on the commitment to UN Global Compact Principles, **have no significant impact**.

Indeed, as shown by Filbeck, Holzhauer, and Zhao (2014) and Statman, Glushkov, and Zhao (2016), *sin* stocks have historically delivered abnormally high returns, raising concerns about the impact of ethical screenings on performance. However, Blitz and Fabozzi (2018) demonstrated that this excess return can be almost entirely explained by the fact that *sin* stocks tend to be quality stocks with strong exposures to two Fama and French (2015) factors: profitability (RMW) and investment (CMA). **Investors can compensate for the drag generated by the absence of *sin* stocks** by simply allocating more to non-*sin* stocks that are exposed to the same factors driving sin stock returns.

[5] Sin stocks are publicly traded companies involved in or associated with an activity that is considered unethical or immoral. Sin stock sectors usually include weapons manufacturers, tobacco, alcohol, gambling and sex-related industries. However, they can also be defined by regional and societal expectations that vary widely across the globe.

When it comes to ESG, several studies suggest that **ESG factors could have been used to enhance investment performance and reduce risk**. In a recent study[6], Morningstar analysed 69 of their ESG indices launched in 2020 or earlier, mostly equity-focused but also including a corporate bond index. They found strong performances, with **75% outperforming their market capitalization-weighted equivalents in 2020**. For a smaller sample of 65 ESG indices, they also found that **88% outperformed over five years** and **91% lost less during market downturns**, including the bear market of the first quarter of 2020. While sector biases, such as favouring technology over energy, partly explain this outperformance, they do not account for it entirely.

Several other studies point to similar findings. Nagy et al. (2016), Verheyden et al. (2016), Giese and Nagy (2018), Giese et al. (2019), and Giese, Nagy and Lee (2020) found that simple strategies based on **ESG upgrading** and **ESG momentum** using the ESG scores from either MSCI or Sustainalytics, two data providers, would have generated **positive excess returns** against market capitalization indices.

Khan, Serafeim, and Yoon (2016) Khan, Serafeim, and Yoon (2016) were among the first to find that **companies with higher ratings on material sustainability issues exhibited positive alpha**, while those with lower ratings showed negative alpha. They also found that this alpha disappeared when non-material factors were considered. Alpha was measured using a Fama-French three-factor model, augmented with momentum and liquidity factors. The simulations were conducted using a dataset specifically constructed by hand-mapping industry-specific materiality guidance from the Sustainability Accounting Standards Board (SASB) to MSCI KLD, which contains company-level performance ratings from 1991 to 2012. Berchicci and King (2022) confirmed the findings of Khan, Serafeim, and Yoon (2016) when using the same measures and modelling approach. However, they noted that the alpha vanished when accounting for sector biases and a larger number of style biases. They also found it **challenging to replicate the mapping of material sustainability factors**, and performance was sensitive to the accuracy of this mapping.

Later academic studies based on regression analysis also revealed that simple portfolios invested in top ranked ESG stocks had **style exposures that could explained most of their excess returns against the broader index**. These ESG portfolios were found to be **biased towards larger capitalization quality stocks with lower risk and sometimes expensive valuations**. No significant alpha beyond the contribution from these style exposures was found. Both studies used MSCI ESG company ratings. One of these studies, by Bruno, Esakia and Goltz (2022), measured **alpha** using an extended Fama-French five-factor model with a momentum factor covering the period 2008-2021 while the other, by Breedt, Ciliberti, Gualdi and Seager (2019), used a less standard factor model based on low beta, momentum, profitability, accruals, value-book and size factors, covering the period 2007-2017.

However, two different studies suggest that **portfolio construction can significantly impact performance**, and using portfolio optimization to hedge as much as possible certain systematic biases may play a crucial role in extracting alpha from ESG ratings. Dor, Guan, and Sun (2022) found that for ESG portfolios constrained to have similar sector and style exposures as the broad index, both an ESG upgrading strategy and a strategy investing in stocks with stronger ESG momentum generated positive alpha. By design, the excess returns of these strategies could no longer be attributed to sector or style exposures. The style exposures were based on the Fama-French five-factor model, and the study used MSCI ESG company ratings, covering the period from 2009 to 2020. An earlier study by Nagy, Kassam, and Lee (2016) corroborates these findings. In their case, portfolio optimization was used to construct an ESG upgrading strategy while minimizing tracking error relative to the market capitalization index, with constraints to avoid highly concentrated portfolios. This study also relied on MSCI ESG company ratings and covered the period from 2007 to 2015.

More recently, Cazau et al. (2025) found an **overall positive correlation** between controlled log returns for stocks in the S&P 500 index and the ESG metrics from Thomson Reuters. The Fama-French five model was used to control stock returns for systematic risk factor exposures. The relationship between ESG metrics and stock returns was found to be sector dependent and

[6] https://sg.morningstar.com/sg/news/209505/morningstarrsquo%3Bs-esg-indexes-have-outperformed.aspx

the explanatory power of **the ESG-returns correlation enhanced by focusing on the material ESG factors for each sector** as proposed by SASB.

It is, nevertheless, important to **approach the academic results mentioned above with some caution**. Firstly, these studies often **span periods that are too short** to be statistically significant, typically not much longer than a decade. Secondly, some ESG data providers have revised their ESG scores after **changing their methodologies**. An example is the ESG scores from Refinitiv, a data provider now renamed LSEG Data & Analytics. While a positive link between their ESG scores and stock returns was found in the re-written dataset, such relationship was not found in their original dataset (Berg, Fabisik and Sautner (2021)).

Finally, it is important to exercise caution when generalizing conclusions about the performance of ESG strategies, as **ESG scores from different data providers can vary**, sometimes significantly (Kostantonis and Serafeim, 2019; Dimson, Marsh, and Staunton, 2020; Berg, Kölbel, and Rigobon, 2022). These divergences seem mainly driven by a measurement effect, meaning there can be a disagreement in the rating of companies even for the same E, S, or G factors. **The greater the divergence in ESG ratings from two providers, the larger the expected difference in the performance of investment strategies** derived from those ESG datasets. Lastly, as with all assessments of performance, historical results cannot be viewed as a guarantee of future returns.

This review highlights how conclusions about the impact of sustainability on the performance of investment approaches can vary, sometimes significantly, depending on the specific approach considered and the performance measurement used in the assessment. The diversity in methodologies, timeframes, and data sources underscores the complexity of evaluating ESG strategies. It is essential to consider these parameters carefully when drawing meaningful insights while avoiding overgeneralizations.

- **Style exposures**

Several of the studies cited above have shown a tendency for **ESG material factors** to favour **quality stocks** with **lower risk**. Melas, Nagy and Kulkarni (2016) investigated the extent of such biases and found that MSCI ESG scores do tend to show a low but statistically significant positive correlation with quality and low volatility stock characteristics. They also found a zero or small negative correlation with value, momentum and low size. Indeed, there are several papers explaining why we should expect that a better rated company on material ESG factors could be more profitable and less risky than peers.

Reasons **why companies better rated on material ESG factors should be more profitable than peers** include i) being able to obtain better resources (Cochran and Wood (1984), Waddock and Graves (1997)), ii) attracting and retaining more competitive employees (Turban and Greening (1997), Edmans (2011)), iii) contributing towards positive marketing of products and services (Moskowitz (1972), Fombrun and Shanley (1990)), iv) contributing as advertising to increasing demand for products and services or reducing consumer price sensitivity (Dorfman and Steiner (1954); Navarro (1988), Sen and Bhattacharya (2001), Milgrom and Roberts (1986)), by reducing costs through lower levels of waste produced within productive processes (Konar and Cohen(2001), Porter and Van der Linde (1995)).

Additional **empirical evidence** of a bias of companies with higher ESG ratings to be more profitable than peers was provided by Ademi and Klungseth (2022) and Luo and Liao (2023).

In turn, reasons **why companies better rated on material ESG factors should be less risky than peers** include i) more likely to mitigate risks arising from negative regulatory, legislative or fiscal action (Berman et al. (1999), Hillman and Keim (2001)), ii) better at protecting and enhancing corporate reputation (Fombrun and Shanley (1990), Freeman, Harrison and Wicks (2007), Cornell, and Damodaran (2020)), and reduces bankruptcy risk by alleviating financing constraints (Bauer, Derwall and Hann (2009), Zihao (2023)).

Additional **empirical evidence** of a bias of companies with higher ESG ratings to be less risky than peers was provided by Karpoff, Lott and Wehrly (2005), De and Clayman (2015) and Cornell and Damodaran (2020).

Empirical analysis

We shall now discuss the results from historical simulations of the impact on the performance of four regional broad equity market capitalization-weighted indices (MSCI All Countries World, MSCI USA, MSCI Europe, and MSCI Emerging Markets) arising from the application of various screening approaches based on sustainability criteria.

We considered screening approaches commonly used by BNP Paribas Asset Management: our RBC policy, our proprietary ESG scoring approach, our definition of Sustainable Investment grade companies, and the exclusion lists required by three different European fund labels: Towards Sustainability label, *Investissment Socialement Responsable* label and the Paris Aligned Benchmark label. We simulated the historical performance and risk of the indices reweighted after applying the stock exclusion filters defined by these different sustainability screening approaches. We then compared the performance and risk of the reweighted indices with those of the original market capitalization-weighted indices.

Unfortunately, we were restricted to a five-year period due to the lack of available data to simulate most of them over the longer-term. Thus, while the study provides useful insights and is a valuable an evaluation of the simulated performance of the reweighted indices, we are not claiming that observed performances will necessarily be repeated in the future or could have been observed in the more distant past.

Below we summarise the approaches considered:

- **Our RBC policy**[7] is a **screening** approach that excludes companies in breach of the United Nations Global Compact, or the OECD Multinational Enterprises Guidelines, or with significant exposure to controversial weapons, coal, tobacco, unconventional oil & gas or asbestos, or not satisfying our minimum requirements for companies involved in palm oil and wood pulp, nuclear, mining or agriculture. This excludes 7% of market cap from MSCI USA and 2% from MSCI Europe indices. The objective is to mitigate risk by avoiding exposure the most sensitive industries and assets at regulatory or stranded asset risk.

- **Our ESG scoring methodology**[8] is a sector-relative approach used for both **screening** and **ESG integration**. It is based on an average of 37 material and insightful factors for each sector, based on a robust methodology to calculate company scores and built for and with BNP Paribas Asset Management's investment teams, sustainability centre and quant research group. Selection of factors considers not only materiality but also the quality, availability and differentiation of data. Carbon emissions and controversies are applied across the entire company universe. Prior to Aug-20, we used BNPP AM previous methodology for ESG scores with sector controls.

- **Our Sustainable Investment methodology**[9] is a binary qualification based on the **Sustainable Finance Disclosure Regulation** (SFDR) put forward by the European Union in December 2019 we use mainly for **screening** in our funds classified as Article 9 based on SFDR, but also as a minimum investment constraint in funds classified as Article 8. A **sustainable investment** is defined by the regulation as an investment i) having an environmental or social objective, ii) doing no harm, and iii) having good governance. Our approach requires that companies pass at least one of the following criteria in order to qualify: i) a minimum alignment of the company economic activities with the taxonomy of sustainable activities from the European Union, ii) a minimum alignment of revenues with the UN

[7] BNP Paribas Asset Management, "Responsible Business Conduct Policy." August 2023
[8] BNP Paribas Asset Management, "Creating Value with our Proprietary ESG scores." January 2024
[9] https://docfinder.bnpparibas-am.com/api/files/14787511-CB33-49FC-B9B5-7E934948BE63

Sustainable Development Goals, iii) be a company from a high GHG emission sectors (Materials, Energy, Industrials and Utilities in the MSCI GICS) that is transitioning its business models to align with net zero (implied temperature rise <1.5%), iv) be a company with a leading contribution to either the environmental or the social pillars or our ESG scores. Companies are also required to do no significant harm when it comes to any other environmental or social objectives, which we assess by checking that they are not involved in any significant controversies or are classified in decile 10 of our ESG scoring model or fall into our RBC Watchlist or are involved in the oil & gas sector. Finally, we also make sure that they follow good governance practices by avoiding companies with the lowest governance scores according to our ESG scoring model.

- **Towards Sustainability Label**[10] (Label TS) is a **European standard** developed by **Febelfin** in collaboration with the financial sector and independent experts. This **fund label** awarded by an independent body is based on a quality standard with strict conditions, excluding harmful activities that encourage companies to look to sustainable investment and to report on their activities. The label combines three requirements: transparency sustainability policy, **ESG integration,** and **screenings** excluding certain sectors such as weapons, tobacco, coal, unconventional oil & gas and laggard oil & gas and electricity utilities and excluding companies in violation of frameworks like the UN Global Compact, the UN Guiding Principles on Business and Human Rights, the OECD Guidelines for Multinational Enterprises, and the International Labour Organization's Conventions. Going beyond the minimal requirements of 'do no harm', funds should be invested in projects, companies or governments with a positive contribution to society by following at least one of these additional strategies: **ESG screening**, **ESG upgrading**, **sustainability thematic investing**, **impact investing**, **engagement**, solidarity or charity, or other ways to favour more sustainable issuers in the selection process.

- **Label *Investissement Socialement Responsable***[11] (Label ISR) is a **French label** created by the **French Ministry of the Economy and Finance**, whose objective is to give greater visibility to investment funds that respect the principles of socially responsible investment, authorised for marketing in France. Eligible funds must fulfil a set of criteria divided into six pillars which include i) communicating to investors about the objectives of ESG criteria used, ii) adopting the required ESG analysis tools, iii) specify how the results of ESG analysis are used for investment decisions, iv) engage with companies in a manner consistent with the commitments, v) communicate about the strategy used for those engagements and implement an approach to control the respect of the strategy, vi) communicate about the evolution of the ESG performance of each company in the portfolio, setting up measurement and monitoring systems to assess the positive impacts of the strategy implemented. The label uses **screenings** to exclude coal, unconventional oil & gas.

- **Paris Aligned Benchmarks**[12] (PAB) were introduced by the **European Commission** as **standards for the methodology of low-carbon benchmarks** in the European Union. These are based on the commitments set forth in the Paris Agreement and rely on the 1.5°C scenario, with no or limited overshoot, referred to in the Special Report on Global Warming of 1.5°C from the Intergovernmental Panel on Climate Change (IPCC). The regulation is consistent with the Commission's objective of attaining net zero GHG emissions by 2050. The regulation requires a reduction of greenhouse gases (GHG) intensity relative to investable universe of at least 50%, imposes a decarbonisation trajectory reducing average GHG intensity min 7% p.a., an allocation to high-impact sectors at least equal to their aggregate exposure in the underlying investable universe and a **screening** excluding coal, oil ang gas,

[10] https://towardssustainability.be/
[11] https://www.lelabelisr.fr/wp-content/uploads/EN_Referentiel-Label-ISR-mars24-1.pdf
[12] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R1818

brown electricity generation controversial weapons, tobacco and also excluding companies in violation of the UN Global Compact and the OECD Guidelines for Multinational Enterprises.

In exhibit 1, we provide an illustration of the different level of stringency of each of these screening approaches when it comes to stock exclusions in different sectors. RBC is the least stringent except for the agriculture sector where is second to SI. The labels are more constraining than the RBC but less than an application of a screen to constrain portfolios to invest only in SI grade companies. Of these three labels, in general, Label TS is the most stringent, in particular due to exclusions of fossil fuel companies. Label ISR and PAB tend to be more stringent on exclusions in the power generation sector.

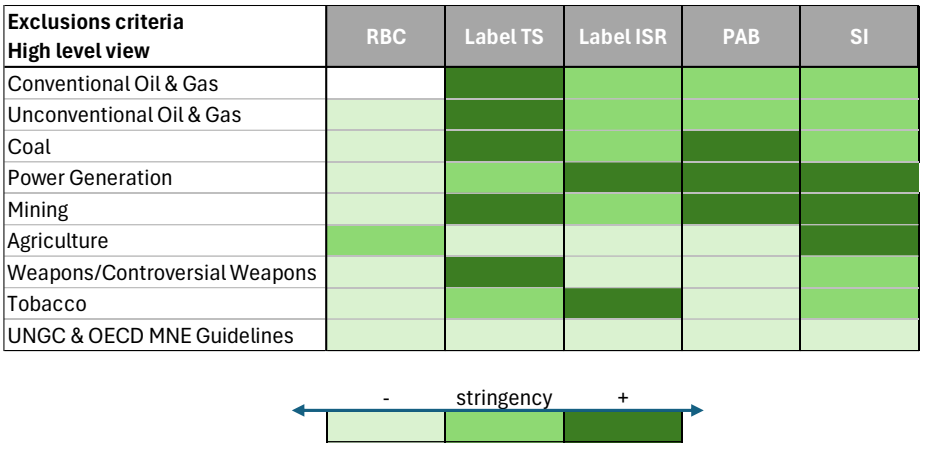

Exhibit 1: stringency of the sustainable investment screening approaches in different sectors.

In exhibit 2, we show the average number of stocks excluded, the average percentage number of stocks excluded, and the average market capitalization excluded when these sustainability screening approaches are applied to four equity indices between Jan-2022 and Dec-2024. Exclusions are applied at the start of each month.

	MSCI All Country World			MSCI USA			MSCI Europe			MSCI Emerging Markets		
MSCI market cap	number of stocks 2490			number of stocks 618			number of stocks 424			number of stocks 1378		
	number of excluded stocks	% excluded stocks	% market cap excluded	number of excluded stocks	% excluded stocks	% market cap excluded	number of excluded stocks	% excluded stocks	% market cap excluded	number of excluded stocks	% excluded stocks	% market cap excluded
RBC	168	6.8%	5.4%	42	6.7%	5.4%	6	1.3%	2.2%	125	9.0%	6.0%
Label TS + RBC	295	11.8%	10.5%	77	12.4%	10.4%	30	7.0%	10.6%	204	14.8%	12.9%
Label ISR + RBC	320	12.8%	9.9%	57	9.2%	8.3%	20	4.7%	10.0%	238	17.3%	15.8%
PAB + RBC	298	11.9%	10.5%	67	10.8%	9.6%	29	6.9%	9.5%	194	14.1%	12.0%
ESG -20%	654	26.3%	19.2%	152	24.6%	19.8%	99	23.3%	19.8%	416	30.2%	18.0%
SI + RBC	1653	66.4%	60.8%	409	66.3%	63.7%	230	54.3%	45.1%	1026	74.5%	68.1%

Exhibit 2: average number of stocks excluded, percentage of average number of stocks excluded, and average market capitalization excluded by each sustainable investment approach in each region. RBC: exclusions based on our Responsible Business Conduct policy, Label TS + RBC: exclusions based on the Towards Sustainability label and our RBC policy, Label ISR + RBC: exclusions based on the *Investissement Socialement Responsable* label and our RBC policy, PAB + RBC: exclusions based on the Paris Aligned Benchmark requirements and our RBC policy, ESG -20%: exclusions of the 20% worst companies ranked by our aggregate Environmental, Social and Governance score in terms

of market cap, SI + RBC: Sustainable Investment screening and exclusions from our RBC policy. Monthly rebalancing. Jan-22 to Dec-24. Source: BNP Paribas Asset Management and MSCI.

In general, these exclusions had a smaller impact on the European investment universe and a larger impact on Emerging Markets. The RBC policy had the smallest impact in terms of exclusions while Label TS, Label ISR and PAB augmented with our RBC come next with comparable exclusions relative to each other. Overall, Label TS is slightly more stringent than Label ISR and PAB in both Europe and the USA. However, for Emerging Markets, Label ISR is more stringent than both Label TS and PAB, whereas for the All Country World universe, results are mixed depending on what measure of exclusions is considered. In any case, the Sustainable Investments screening is the most stringent approach followed by the exclusion of 20% in market cap weight of companies with the worst ESG aggregate scores. In exhibit 2, 20% of market capitalization is not always reached because of rounding effects: if excluding the next worst ESG company exceeds the combined 20% market capitalization then that company is not excluded.

Performance simulations using rebased indices: we reweighted the index portfolios after excluding stocks as required by our RBC policy or, in addition, as required either by the Label TS, or by the Label ISR, or by the PAB approach, or also excluding stocks from companies that do not qualify as Sustainable Investment, or in the stocks of companies with the worst ESG aggregate scores[13]. In these historical simulations, the stocks were screened at the end of the month and used to construct a new fully invested index with stock weights calculated from rebasing their market capitalization. We simulated the returns of these reweighted indices in excess of the market capitalization weighted index returns over the period Jan-20 through Dec-24. The same four investment universes as before were considered, with calculations in EUR for the MSCI Europe index and in USD for the others. We use returns net of dividends and gross of transaction costs and market impact. Calculations are gross of fees.

In exhibit 3, we show the results from these simulations of the returns of rebased indices in excess of the market cap index returns:

- The **RBC exclusions** had a small negative impact on performance over the period used in the simulations which is larger for Emerging Markets. The impact on performances is more significant over shorter periods of one year and 2022 is an example when RBC exclusions result in poor performances. However, the tracking error arising from RBC exclusions is the smallest and did not exceed 0.7%.

- Augmenting our **RBC exclusions** with those required by the **Label TS**, **Label ISR** and **PAB** would have had a relatively correlated impact on excess returns in each region over the entire period and resulted in positive performances except for Europe. For the MSCI All Country World and MSCI USA, the excess returns were positive in 2020, 2023 and 2024, negative in 2022 and just slightly negative in 2021. For MSCI Emerging Markets, 2020 and 2024 were also positive but 2022 was less negative than in other regions while 2021 and 2023 were negative. Over the entire period used in the simulations, the information ratios were positive and in the range of 0.2 to 0.3 for the MSCI All Country World and MSCI USA where are for the MSCI Emerging Markets and MSCI Europe, Label TS was slightly negative and Label ISR and PAB slightly positive. The tracking error of these different sets of exclusions is comparable and falls in the range 1.2% to 1.6% except for Label ISR in Emerging Markets where it reached 2.1%.

- The **ESG exclusions** would have generated positive excess return against the MSCI All Country World, MSCI USA and MSCI Emerging Markets over the entire period with information ratios of 0.46, 0.30 and 0.32, respectively. For Europe, the overall excess return was close to zero. 2022 was the only year with negative excess returns across the

[13] In our proprietary ESG scoring approach, stocks excluded by our RBC policy are assigned the lowest possible ESG score, i.e., zero. For this reason, the exclusion of the worst ranked companies by ESG score contains the set of companies excluded by our RBC policy.

board and was particularly difficult for All Countries, US and Europe. The exclusion of the worst 20% ESG stocks in market cap weight results in 1.2% to 1.7% tracking error for these rebased indices, a tracking error comparable to that generated by the less stringent list of exclusions required by the Label TS, Label ISR and PAB.

- Investing in the **SI basket** rebased index would have generated positive excess return against the market cap indices in all four regions over the entire period with information ratios between 0.23 for Europe and 0.64 for the Emerging Markets. Returns were large and significant, in particular in 2020 and 2021 while 2022 was a difficult year with underperformance in all regions except the US. The tracking error generated by the larger number of exclusions is more comparable to that of actively managed funds ranging from 3.0% for All Countries to 5.9% for Emerging Markets.

A

MSCI All Country World (USD)	2020*	2021	2022	2023	2024	full period annualised		
	Return					Return	Volatility	
MSCI market cap	16.8%	19.0%	-17.9%	22.8%	18.0%	10.6%	17.5%	
	Excess return					Excess return	Tracking error	Information ratio
RBC	0.6%	-0.3%	-1.4%	0.9%	0.3%	-0.1%	0.6%	-0.18
Label TS + RBC	3.8%	-0.6%	-3.0%	1.7%	0.9%	0.2%	1.3%	0.18
Label ISR + RBC	3.4%	-0.4%	-2.8%	2.0%	1.1%	0.4%	1.2%	0.31
PAB + RBC	3.3%	-0.5%	-3.0%	2.2%	1.2%	0.3%	1.2%	0.27
ESG -20%	4.0%	1.2%	-1.8%	1.2%	-0.6%	0.6%	1.2%	0.46
SI + RBC	4.5%	4.9%	-1.2%	0.3%	-1.3%	1.2%	3.0%	0.40

B

MSCI USA (USD)	2020*	2021	2022	2023	2024	full period annualised		
	Return					Return	Volatility	
MSCI market cap	21.4%	27.0%	-19.4%	27.1%	25.1%	14.6%	18.5%	
	Excess return					Excess return	Tracking error	Information ratio
RBC	0.9%	-0.1%	-1.6%	1.5%	0.5%	0.0%	0.7%	0.04
Label TS + RBC	4.3%	-0.1%	-3.7%	3.2%	1.1%	0.4%	1.5%	0.29
Label ISR + RBC	3.5%	-0.3%	-3.0%	3.0%	0.9%	0.4%	1.2%	0.32
PAB + RBC	3.7%	-0.3%	-3.4%	3.5%	1.0%	0.5%	1.3%	0.35
ESG -20%	5.5%	1.3%	-2.3%	1.0%	-1.4%	0.5%	1.6%	0.30
SI + RBC	2.9%	7.8%	0.4%	-0.5%	0.6%	2.1%	4.0%	0.51

C

MSCI Europe (EUR)	2020*	2021	2022	2023	2024	full period annualised		
	Return					Return	Volatility	
MSCI market cap	-2.9%	25.8%	-8.9%	16.6%	9.2%	7.2%	15.5%	
	Excess return					Excess return	Tracking error	Information ratio
RBC	0.0%	0.0%	-0.7%	0.5%	-0.1%	-0.1%	0.3%	-0.28
Label TS + RBC	3.3%	-0.3%	-3.4%	0.4%	-0.2%	-0.1%	1.6%	-0.09
Label ISR + RBC	2.5%	-0.4%	-3.1%	0.9%	0.6%	0.0%	1.3%	0.02
PAB + RBC	2.2%	0.0%	-3.1%	0.9%	0.9%	0.1%	1.4%	0.05
ESG -20%	1.7%	0.5%	-1.9%	-0.2%	-0.2%	-0.1%	1.6%	-0.04
SI + RBC	7.5%	2.4%	-3.5%	1.0%	-1.8%	1.0%	4.3%	0.23

D

MSCI Emerging Markets (USD)	2020*	2021	2022	2023	2024	full period annualised		
	Return					Return	Volatility	
MSCI market cap	18.7%	-2.0%	-19.7%	10.3%	8.2%	2.2%	18.5%	
	Excess return					Excess return	Tracking error	Information ratio
RBC	0.5%	-1.1%	-0.9%	-0.7%	0.7%	-0.4%	0.6%	-0.66
Label TS + RBC	4.0%	-2.5%	-0.4%	-1.8%	1.5%	0.0%	1.6%	-0.02
Label ISR + RBC	5.7%	-2.7%	-0.5%	-1.0%	1.4%	0.3%	2.1%	0.16
PAB + RBC	3.6%	-2.1%	-0.3%	-1.0%	1.3%	0.1%	1.4%	0.11
ESG -20%	2.5%	-0.8%	-1.2%	1.2%	2.0%	0.6%	1.7%	0.32
SI + RBC	11.9%	10.2%	-5.0%	2.9%	2.8%	3.8%	5.9%	0.64

Exhibit 3: annualised returns and tracking error of monthly rebalanced indices reweighted after exclusions as in Exhibit 2, with stock weights determined by rebasing the index using the market capitalization of stocks. For illustration purposes only. Past returns are not indicative of future returns. Returns are in EUR for simulations based on MSCI Europe index and USD for all other simulations. Jan-20 through Dec-24. Source: BNP Paribas Asset Management and MSCI.

Rebasing index portfolios using the market capitalization of the screened stocks to calculate their weights is a straightforward approach to handling stock exclusions in indices. However, as the number of exclusions increases, the rebased index portfolios become sub-optimal, resulting in unnecessarily large tracking error relative to the original indices. These larger tracking error stems from sector, regional, and style systematic risk biases in the rebased portfolio relative to the original market cap weighted index. An alternative approach is to construct indices where the contributions of those systematic risk biases to the tracking error relative to the original indices is minimized. As we shall see in the next section, although this method is less straightforward, it can significantly reduce the impact of stock exclusions on excess returns relative to the original indices.

Performance simulations using minimum tracking error indices: we constructed minimum tracking error indices that exclude stocks as required by our RBC policy or, in addition, as required either by the Label TS, or by the Label ISR, or by the PAB approach, or also excluding stocks from companies that do not qualify as Sustainable Investment, or in the stocks

of companies with the worst ESG aggregate scores. These fully invested index portfolios are constructed with the help of portfolio optimization to find the stock weights that minimise the tracking error against the respective market capitalization weighted index in each region. We used our front office equity risk models, the *BlackRock Fundamental Risk for Equities* (BFRE[14]) models for each region. These indices with exclusions were rebalanced at the end of each month and used to calculate the simulated returns in excess of the market capitalization weighted index returns. These simulations covered a shorter period than before, Jan-22 through Dec-24, because the BFRE models were not available for 2020 and 2021. We considered the same four investment universes and used returns net of dividends and gross of transaction costs, market impact and fees as before.

A

		MSCI All Country World (USD)					
		2022	2023	2024	full period annualised		
		Return			Return	Volatility	
MSCI market cap		-17.9%	22.8%	18.0%	19.0%	16.4%	
		Excess return			Excess return	Tracking error	Information ratio
RBC	Rebased	-1.4%	0.9%	0.3%	-0.3%	0.7%	-0.38
	Min TE	-0.1%	0.3%	-0.3%	0.0%	0.2%	-0.17
Label TS + RBC	Rebased	-3.0%	1.7%	0.9%	-0.6%	1.4%	-0.42
	Min TE	-1.0%	1.0%	0.1%	-0.1%	0.7%	-0.16
Label ISR + RBC	Rebased	-2.8%	2.0%	1.1%	-0.3%	1.3%	-0.24
	Min TE	-0.6%	1.0%	0.1%	0.1%	0.5%	0.10
PAB + RBC	Rebased	-3.0%	2.2%	1.2%	-0.3%	1.4%	-0.23
	Min TE	-0.6%	1.0%	0.0%	0.0%	0.5%	0.07
SI + RBC	Rebased	-1.2%	0.3%	-1.3%	-0.8%	2.9%	-0.28
	Min TE	1.0%	-3.0%	-4.1%	-1.7%	2.2%	-0.76

B

		MSCI USA (USD)					
		2022	2023	2024	full period annualised		
		Return			Return	Volatility	
MSCI market cap		-19.4%	27.1%	25.1%	28.1%	17.6%	
		Excess return			Excess return	Tracking error	Information ratio
RBC	Rebased	-1.6%	1.5%	0.5%	-0.2%	0.8%	-0.23
	Min TE	0.2%	0.1%	-0.2%	0.0%	0.3%	0.16
Label TS + RBC	Rebased	-3.7%	3.2%	1.1%	-0.5%	1.6%	-0.31
	Min TE	-1.0%	1.7%	0.4%	0.1%	0.9%	0.14
Label ISR + RBC	Rebased	-3.0%	3.0%	0.9%	-0.3%	1.4%	-0.21
	Min TE	-0.2%	1.2%	-0.4%	0.2%	0.6%	0.31
PAB + RBC	Rebased	-3.4%	3.5%	1.0%	-0.3%	1.5%	-0.18
	Min TE	-0.1%	0.9%	-0.2%	0.1%	0.6%	0.23
SI + RBC	Rebased	0.4%	-0.5%	0.6%	0.2%	3.7%	0.06
	Min TE	0.8%	-1.9%	-4.8%	-1.6%	3.4%	-0.46

C

		MSCI Europe (EUR)					
		2022	2023	2024	full period annualised		
		Return			Return	Volatility	
MSCI market cap		-8.9%	16.6%	9.2%	16.0%	13.0%	
		Excess return			Excess return	Tracking error	Information ratio
RBC	Rebased	-0.7%	0.5%	-0.1%	-0.2%	0.3%	-0.49
	Min TE	-0.2%	0.3%	-0.3%	-0.1%	0.3%	-0.35
Label TS + RBC	Rebased	-3.4%	0.4%	-0.2%	-1.3%	1.6%	-0.82
	Min TE	-1.3%	-0.6%	-0.9%	-1.0%	1.0%	-0.95
Label ISR + RBC	Rebased	-3.1%	0.9%	0.6%	-0.7%	1.5%	-0.50
	Min TE	-1.2%	-0.2%	-0.4%	-0.6%	0.9%	-0.71
PAB + RBC	Rebased	-3.1%	0.9%	0.9%	-0.7%	1.5%	-0.44
	Min TE	-1.0%	-0.1%	0.6%	-0.2%	0.9%	-0.23
SI + RBC	Rebased	-3.5%	1.0%	-1.8%	-1.6%	3.4%	-0.48
	Min TE	-1.4%	-1.1%	0.2%	-0.8%	1.4%	-0.58

A

D

		MSCI Emerging Markets (USD)					
		2022	2023	2024	full period annualised		
		Return			Return	Volatility	
MSCI market cap		-19.7%	10.3%	8.2%	-4.2%	17.7%	
		Excess return			Excess return	Tracking error	Information ratio
RBC	Rebased	-0.9%	-0.7%	0.7%	-0.4%	0.6%	-0.60
	Min TE	-0.1%	-0.5%	0.5%	-0.1%	0.4%	-0.18
Label TS + RBC	Rebased	-0.4%	-1.8%	1.5%	-0.3%	1.5%	-0.19
	Min TE	-0.4%	-1.3%	0.7%	-0.3%	0.7%	-0.46
Label ISR + RBC	Rebased	-0.5%	-1.0%	1.4%	-0.1%	1.8%	-0.04
	Min TE	-0.3%	0.1%	0.6%	0.1%	0.9%	0.11
PAB + RBC	Rebased	-0.3%	-1.0%	1.3%	0.0%	1.2%	-0.01
	Min TE	-0.6%	-0.6%	0.6%	-0.2%	0.6%	-0.42
SI + RBC	Rebased	-5.0%	2.9%	2.8%	-0.5%	6.4%	-0.07
	Min TE	0.0%	-1.9%	0.5%	-0.4%	3.7%	-0.12

Exhibit 4: annualised returns and tracking error of monthly rebalanced indices with some of the sets of exclusions as in Exhibit 2 and two different approaches, one with stock weights rebased using market capitalization after applying each set of exclusions, the other with stock weights found by portfolio optimisation to minimise the tracking error against the respective market capitalization index after excluding stocks. For illustration purposes only. Past returns are not indicative of future returns. Returns are in EUR for all simulations based on MSCI Europe stocks and USD for all other simulations. Jan-22 through Dec-24. Source: BNP Paribas Asset Management and MSCI.

In exhibit 4 we compare the results based on the simulated returns of the rebased indices and of the minimum tracking error indices:

[14] https://www.blackrock.com/aladdin/products/aladdin-risk

- The **minimum tracking error indices** tend to have significantly smaller tracking error and return differentials relative to the respective market capitalization indices than their equivalent **rebased indices**.

- For **RBC exclusions**, the tracking errors fall to between 0.2% and 0.4% and the excess returns are close to zero in every year and over the entire period. The larger difference in returns was found in Emerging Markets with -0.5% excess return in 2023.

- Minimum tracking error indices also have smaller tracking error and smaller return differentials relative to the market cap indices than their equivalent rebased indices after augmenting our **RBC exclusions** with those required by the **Label TS**, **Label ISR** and **PAB**. In several cases, minimum tracking error indices managed to reduce tracking error to half of the tracking error of the equivalent rebased indices. The exception is Europe where the reduction in tracking error and returns differentials is smaller.

- For the **SI basket**, minimum tracking error indices exhibit smaller but still large tracking errors, indicating that systematic risk biases relative to the market cap indices are not as easily hedged away. The extension of stock exclusions from this screen makes hedging these biases more challenging. The return differentials generated by minimum tracking error indices relative to market cap indices remain large and have low correlation with those from their equivalent rebased indices. In 2022, minimum tracking error indices performed significantly better than rebased indices. However, they underperformed in 2023 and especially in 2024 for the US and All Countries, primarily due to a much smaller weight in Nvidia, which was by far the top-performing stock in 2024.

It is not easy to construct rebased indices that meet all the additional criteria beyond stock exclusions that is required for Label TS and Label ISR eligibility. In turn, it is much easier to do so in the minimum tracking error indices since these can accommodate other criteria in the form of additional constraints added to the optimiser along with the stock exclusions.

A

MSCI All Country World (USD)		2022	2023	2024	full period annualised		
		Return			Return	Volatility	
MSCI market cap		-17.9%	22.8%	5.0%	2.6%	18.5%	
		Excess return			Excess return	Tracking error	Information ratio
Label TS	+ RBC	-1.0%	1.0%	0.1%	-0.1%	0.7%	-0.16
Label TS all criteria	+ RBC	-0.9%	0.8%	0.2%	-0.1%	0.7%	-0.10
Label ISR	+ RBC	-0.6%	1.0%	0.1%	0.1%	0.5%	0.10
Label ISR all criteria	+ RBC	-0.7%	0.6%	0.4%	0.0%	0.7%	-0.02

B

MSCI USA (USD)		2022	2023	2024	full period annualised		
		Return			Return	Volatility	
MSCI market cap		-19.4%	27.1%	7.0%	4.3%	19.6%	
		Excess return			Excess return	Tracking error	Information ratio
Label TS	+ RBC	-1.0%	1.7%	0.4%	0.1%	0.9%	0.14
Label TS all criteria	+ RBC	-1.1%	1.4%	0.2%	0.0%	1.0%	-0.05
Label ISR	+ RBC	-0.2%	1.2%	-0.4%	0.2%	0.6%	0.31
Label ISR all criteria	+ RBC	-0.6%	0.3%	-0.6%	-0.3%	0.8%	-0.43

C

MSCI Europe (EUR)		2022	2023	2024	full period annualised		
		Return			Return	Volatility	
MSCI market cap		-8.9%	16.6%	3.6%	4.5%	14.7%	
		Excess return			Excess return	Tracking error	Information ratio
Label TS	+ RBC	-1.3%	-0.6%	-0.9%	-1.0%	1.0%	-0.95
Label TS all criteria	+ RBC	-1.3%	-0.7%	-0.6%	-0.9%	1.1%	-0.85
Label ISR	+ RBC	-1.2%	-0.2%	-0.4%	-0.6%	0.9%	-0.71
Label ISR all criteria	+ RBC	-1.2%	-0.6%	0.2%	-0.6%	1.0%	-0.57

D

MSCI Emerging Markets (USD)		2022	2023	2024	full period annualised		
		Return			Return	Volatility	
MSCI market cap		-19.7%	10.3%	0.0%	-5.5%	19.7%	
		Excess return			Excess return	Tracking error	Information ratio
Label TS	+ RBC	-0.4%	-1.3%	0.7%	-0.3%	0.7%	-0.46
Label TS all criteria	+ RBC	-0.2%	-1.1%	0.8%	-0.2%	0.7%	-0.22
Label ISR	+ RBC	-0.3%	0.1%	0.6%	0.1%	0.9%	0.11
Label ISR all criteria	+ RBC	-0.2%	0.7%	1.1%	0.5%	1.0%	0.47

Exhibit 5: annualised returns and tracking error of monthly rebalanced minimum tracking error indices, one applying only the set of stock exclusions and the other applying the entire set of criteria required by the Label TS and the Label ISR.

For illustration purposes only. Past returns are not indicative of future returns. Jan-22 through Dec-24. Source: BNP Paribas Asset Management and MSCI.

In exhibit 5, we compare the excess returns and tracking error of minimum tracking error indices with only the stock exclusions required by Label TS and the Label ISR against those with all the required criteria imposed as constraints:

- The tracking error of the minimum tracking error indices with **all criteria** was either equal or just slightly larger than for the indices with only **exclusions**, which suggests that the additional constraints required by these labels are not too stringent when compared to the stock exclusions, the main source of tracking error. The differences in excess returns tend to be small with few exceptions, e.g. Label ISR for the US and Emerging Markets where adding all constraints impacts excess returns and information ratio more significantly.

- In exhibit 5, we did not include historical simulations of the **PAB** indices with all criteria because one of the required additional constraints, i.e., the pathway for reduction of portfolio carbon intensity over time by at least 7% per annum, is a dynamic constraint that could become more constraining in the future if companies do not reduce their carbon emissions. Moreover, the regulation behind **PAB** requires that Scope 3 emissions must be included within 4 years of inception. For these reasons, the relevance of the results from these historical simulations is much more limited than even for the **Label TS** and **Label ISR**.

When it comes to ESG, we applied three levels of exclusions based on BNP Paribas Asset Management's aggregate ESG scores: 20%, 25%, and 30% of the index market capitalization by excluding the lowest-ranked stocks. As before, we can compare the tracking error and excess returns of rebased indices after excluding these stocks with those from minimum tracking error indices that exclude the same companies. Additionally, we can compare these results with those from an alternative approach to enhance the ESG score of the index: instead of excluding stocks, this approach allows minimum tracking error indices to invest in all stocks but requires them to maintain a weighted average aggregate ESG score equal to or higher than that of the equivalent rebased index with exclusions. These simulations enable us to compare two methods of improving the aggregate index ESG score: i) selectivity, where a higher ESG score is achieved by excluding the stocks with the worst ESG scores, and ii) upgrade, where a higher ESG score is achieved by overweighting stocks with higher ESG scores and underweighting those with lower ESG scores without excluding any stocks.

A

			MSCI All Country World (USD)					
			2022	2023	2024	full period annualised		
			Return			Return	Volatility	
MSCI market cap			-17.9%	22.8%	5.0%	2.6%	18.5%	
			Excess return			Excess return	Tracking error	Information ratio
ESG - 20%	SELECTIVITY	Rebased	-1.8%	1.2%	-0.6%	-0.6%	1.1%	-0.57
		Min TE	0.1%	-0.7%	-1.1%	-0.5%	0.6%	-0.93
ESG > ESG -20%	UPGRADE	Min TE	-0.1%	-0.2%	-0.1%	-0.1%	0.3%	-0.34
ESG - 25%	SELECTIVITY	Rebased	-1.7%	1.4%	-1.1%	-0.7%	1.3%	-0.49
		Min TE	0.3%	-1.1%	-1.5%	-0.6%	0.8%	-0.76
ESG > ESG -25%	UPGRADE	Min TE	-0.1%	-0.2%	-0.1%	-0.1%	0.4%	-0.33
ESG - 30%	SELECTIVITY	Rebased	-0.7%	1.3%	-1.1%	-0.2%	1.5%	-0.17
		Min TE	0.8%	-1.6%	-1.7%	-0.6%	1.1%	-0.58
ESG > ESG -30%	UPGRADE	Min TE	-0.1%	-0.3%	0.0%	-0.2%	0.4%	-0.36

B

			MSCI USA (USD)					
			2022	2023	2024	full period annualised		
			Return			Return	Volatility	
MSCI market cap			-19.4%	27.1%	7.0%	4.3%	19.6%	
			Excess return			Excess return	Tracking error	Information ratio
ESG - 20%	SELECTIVITY	Rebased	-2.3%	1.0%	-1.4%	-1.2%	1.5%	-0.79
		Min TE	-0.2%	-1.0%	-1.1%	-0.7%	0.9%	-0.79
ESG > ESG -20%	UPGRADE	Min TE	-0.2%	-0.5%	-0.8%	-0.5%	0.5%	-0.84
ESG - 25%	SELECTIVITY	Rebased	-1.5%	1.4%	-1.5%	-0.7%	1.5%	-0.46
		Min TE	0.5%	-1.3%	-1.1%	-0.5%	1.2%	-0.37
ESG > ESG -25%	UPGRADE	Min TE	-0.3%	-0.5%	-0.8%	-0.5%	0.6%	-0.81
ESG - 30%	SELECTIVITY	Rebased	-2.1%	1.0%	-2.3%	-1.3%	1.7%	-0.77
		Min TE	-0.4%	-2.0%	-1.9%	-1.3%	1.5%	-0.90
ESG > ESG -30%	UPGRADE	Min TE	-0.4%	-0.5%	-0.9%	-0.6%	0.7%	-0.80

C

			MSCI Europe (EUR)					
			2022	2023	2024	full period annualised		
			Return			Return	Volatility	
MSCI market cap			-8.9%	16.6%	3.6%	4.5%	14.7%	
			Excess return			Excess return	Tracking error	Information ratio
ESG - 20%	SELECTIVITY	Rebased	-1.9%	-0.2%	-0.2%	-0.9%	1.7%	-0.51
		Min TE	-0.4%	-0.8%	-0.5%	-0.6%	0.9%	-0.64
ESG > ESG -20%	UPGRADE	Min TE	-0.2%	-0.2%	0.2%	-0.1%	0.5%	-0.11
ESG - 25%	SELECTIVITY	Rebased	-1.7%	-0.6%	-0.4%	-1.0%	1.8%	-0.53
		Min TE	-0.7%	-0.9%	-0.7%	-0.7%	1.0%	-0.74
ESG > ESG -25%	UPGRADE	Min TE	-0.3%	-0.3%	0.3%	-0.1%	0.6%	-0.17
ESG - 30%	SELECTIVITY	Rebased	-1.6%	-1.0%	-0.5%	-1.0%	2.1%	-0.49
		Min TE	-0.7%	-1.3%	-0.1%	-0.7%	1.2%	-0.55
ESG > ESG -30%	UPGRADE	Min TE	-0.4%	-0.4%	0.4%	-0.1%	0.7%	-0.21

D

			MSCI Emerging Markets (USD)					
			2022	2023	2024	full period annualised		
			Return			Return	Volatility	
MSCI market cap			-19.7%	10.3%	0.0%	-5.5%	19.7%	
			Excess return			Excess return	Tracking error	Information ratio
ESG - 20%	SELECTIVITY	Rebased	-1.2%	1.2%	2.0%	0.5%	1.5%	0.32
		Min TE	0.4%	0.4%	1.6%	0.8%	0.7%	1.04
ESG > ESG -20%	UPGRADE	Min TE	0.1%	-0.2%	0.3%	0.1%	0.4%	0.22
ESG - 25%	SELECTIVITY	Rebased	-1.4%	1.8%	0.9%	0.2%	2.0%	0.11
		Min TE	0.3%	0.8%	1.0%	0.7%	1.0%	0.64
ESG > ESG -25%	UPGRADE	Min TE	0.1%	-0.2%	0.5%	0.1%	0.4%	0.31
ESG - 30%	SELECTIVITY	Rebased	-1.8%	1.7%	1.0%	0.1%	2.5%	0.03
		Min TE	-0.1%	0.1%	1.2%	0.4%	1.2%	0.31
ESG > ESG -30%	UPGRADE	Min TE	0.2%	-0.1%	0.6%	0.2%	0.5%	0.46

Exhibit 6: annualised returns and tracking error of monthly rebalanced reweighted indices with three different approaches. One, selectivity, with stock weights rebased using market capitalization after excluding the stocks with the worst ESG scores. A second, selectivity, with stock weights that minimize the tracking error against the respective market capitalization index after excluding the same stocks. A third, upgrade, where no stocks are excluded, with the index portfolios constrained to have an ESG score equal or higher than that of the equivalent rebased index portfolio which excludes the stocks with the worst ESG scores, considering stock exclusions adding up to 20%, 25% or 30% of the market capitalization available. For illustration purposes only. Past returns are not indicative of future returns. Jan-22 through Dec-24. Source: BNP Paribas Asset Management and MSCI.

In exhibit 6, we compare the excess returns and tracking error of rebased and minimum tracking error indices based on the *selectivity* approach, relying solely on stock exclusions, with those based on the *upgrade* approach, relying solely on tilts:

- For the ***selectivity*** approaches, we found that, as expected, the **minimum tracking error indices** significantly reduce the tracking error when compared with the **rebased portfolios**. With 30% exclusions in terms of market capitalization, the minimum tracking error indices have tracking errors in the range of 1.1% to 1.5% whereas with 20% exclusions, the tracking errors fall to 0.6% to 0.9%. Excess returns, which were negative in this shorter period excluding 2020 and 2021, were better for minimum tracking indices. For both All Country and US, the minimum tracking error indices under-performs the equivalent rebased indices in 2023 and 2024 because of a much smaller allocation to Nvidia, by far the best performing company, with a weight closer to that in the market capitalization index portfolio.

- When comparing the ***upgrade*** with the ***selectivity*** approaches, we find that the ***upgrade*** method generated significantly smaller tracking errors and differentials in returns against the market cap index. ***Upgrade*** indices with ESG scores equal to or higher than those achieved through selectivity based on 30% market capitalization exclusions had tracking errors ranging from 0.4% to 0.7%. The tracking error and return differentials were reduced by investing

at least partially in stocks with the worst ESG scores. The investment in some poorly rated ESG stocks is balanced by a larger overweight of stocks with the highest ESG scores, ensuring that the final ESG score of the index increases as required. For All Countries and the US, the impact from the outperformance of Nvidia was much smaller on the ***upgrade*** indices than on their equivalent ***selectivity*** indices.

- While the ***upgrade*** approach may not be suitable for all investors, it can be advantageous for some, e.g. those with significantly large pools of assets under management or investors who prioritize engaging with ESG laggards.

Sector biases: we now investigate the sector biases of the indices discussed above. In exhibit 7 we show the average sector active weight of each index relative to their respective market capitalization weighted index over the period Jan-22 through Dec-24. In the last three columns, we show the excess return of the energy sector relative to the respective market capitalization index in 2022, 2023 and 2024 as well as the contribution from the active weight of the energy sector to the excess returns of each index in those same years.

- First, we can see that most of the reweighted indices here considered tend to underweight the energy sector quite significantly. This is the case in particular for the **Label TS**, **Label ISR**, **PAB** and for the **SI basket** in all four regions considered. This bias is also present in the indices with **ESG selectivity**.

- Second, the rebased indices tend to underweight the energy sector more than the minimum tracking error indices. While the minimization of tracking error tends to reduce this bias, reducing the size of the underweight seems to be more difficult for the **Label TS**, **Label ISR**, **PAB** and for the **SI basket** than for **RBC** and for **ESG selectivity**.

- The energy sector significantly outperformed in 2022 expect in Emerging Markets. The underweight of the energy sector explains most of the poor performances for the All Country, US and Europe in 2022.

- Some other biases include a tendency to **overweight** the **information technology** and the **health care** sectors, with larger overweight in **rebased** indices than in **minimum tracking error** indices. We also found a tendency for **Label TS**, **Label ISR** and **PAB** to overweight Financials in Europe and Emerging Markets. In general, the sector biases tend to be smaller for minimization of tracking error indices than for rebased indices. Sector biases generated by the **SI baske**t tend to be the larger with a strong underweight of **financials** and a large overweight of **industrials**. For All Countries and the US, a large underweight of **communication services** was also featured.

A

			MSCI All Country World (USD)												
			Comm. Services	Cons. Disc.	Cons. Staples	Energy	Financials	Health Care	Industrials	Info. Tech.	Materials	Real Estate	Utilities	Energy 2022	Energy 2023	Energy 2024
			Weights											Excess return over market index		
MSCI market cap			7.6%	11.0%	7.1%	4.7%	16.0%	11.8%	10.3%	21.8%	4.5%	2.4%	2.8%	52.3%	-16.9%	-15.1%
			Active weights											Contribution to excess return		
RBC		**Rebased**	0.4%	0.6%	-0.3%	-1.7%	0.1%	0.7%	-0.3%	1.2%	-0.3%	0.1%	-0.6%	-0.7%	0.3%	0.6%
		Min TE	0.0%	0.1%	0.0%	-0.2%	-0.3%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	-0.1%	0.0%	0.0%
Label TS	**+ RBC**	**Rebased**	0.9%	1.1%	0.1%	-4.5%	1.0%	1.4%	-1.5%	2.2%	-0.1%	0.3%	-0.9%	-2.0%	0.8%	0.6%
		Min TE	0.2%	0.2%	0.3%	-2.2%	0.3%	0.2%	-0.3%	0.1%	0.4%	0.1%	0.4%	-1.0%	0.4%	0.3%
Label TS all criteria	**+ RBC**	**Min TE**	0.0%	0.4%	0.2%	-2.1%	0.1%	0.4%	-0.3%	0.4%	0.4%	0.2%	0.4%	-1.0%	0.4%	0.3%
Label ISR	**+ RBC**	**Rebased**	0.8%	1.0%	0.0%	-4.2%	0.7%	1.3%	-0.1%	2.4%	-0.9%	0.2%	-1.2%	-2.0%	0.7%	0.5%
		Min TE	0.0%	0.0%	0.0%	-1.3%	0.0%	0.1%	0.1%	0.3%	0.2%	0.1%	0.3%	-0.8%	0.2%	0.2%
Label ISR all criteria	**+ RBC**	**Min TE**	-0.4%	0.3%	-0.3%	-1.2%	-0.1%	0.4%	0.0%	0.8%	0.0%	0.3%	0.1%	-0.7%	0.2%	0.1%
PAB	**+ RBC**	**Rebased**	0.9%	1.2%	0.1%	-4.4%	1.1%	1.4%	-0.6%	2.5%	-0.6%	0.3%	-1.8%	-2.0%	0.8%	0.6%
		Min TE	0.1%	0.5%	0.3%	-2.1%	0.2%	0.2%	0.0%	0.3%	0.5%	0.2%	-0.2%	-1.0%	0.4%	0.3%
ESG -20%	**SELECTIVITY**	**Rebased**	-0.7%	-0.6%	-0.4%	-3.0%	-0.3%	2.5%	-0.5%	4.3%	-0.8%	0.1%	-0.6%	-1.3%	0.5%	0.4%
		Min TE	-0.9%	-0.3%	-0.2%	-0.5%	0.2%	0.2%	-0.1%	1.5%	0.1%	0.0%	-0.1%	-0.2%	0.1%	0.1%
ESG > ESG -20%	**UPGRADE**	**Min TE**	-0.3%	0.3%	-0.2%	-0.2%	-0.4%	0.3%	0.0%	0.5%	-0.1%	0.3%	-0.2%	-0.1%	0.0%	0.0%
SI	**+ RBC**	**Rebased**	-5.5%	-0.1%	-0.5%	-4.6%	-10.0%	8.0%	6.6%	5.4%	0.0%	0.1%	0.6%	-2.1%	0.8%	0.6%
		Min TE	-4.5%	-0.5%	-1.1%	-4.2%	-2.7%	1.5%	5.4%	4.5%	1.7%	-0.3%	0.2%	-2.0%	0.7%	0.5%

B

			MSCI US (USD)												
			Comm. Services	Cons. Disc.	Cons. Staples	Energy	Financials	Health Care	Industrials	Info. Tech.	Materials	Real Estate	Utilities	Energy 2022	Energy 2023	Energy 2024
			Weights											Excess return over market index		
MSCI market cap			8.7%	10.6%	6.4%	4.1%	13.1%	13.1%	8.7%	27.5%	2.5%	2.6%	2.5%	84.1%	-28.5%	-18.1%
			Active weights											Contribution to excess return		
RBC		**Rebased**	0.5%	0.6%	-0.3%	-1.8%	-0.5%	0.7%	-0.2%	1.6%	-0.1%	0.1%	-0.7%	-1.1%	0.3%	0.3%
		Min TE	0.2%	0.0%	0.2%	-0.1%	-0.5%	0.1%	-0.3%	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
Label TS	**+ RBC**	**Rebased**	1.0%	1.1%	0.1%	-4.1%	0.2%	1.5%	-1.7%	2.7%	0.0%	0.3%	-1.1%	-2.5%	0.9%	0.6%
		Min TE	0.8%	-0.1%	-0.2%	-4.1%	1.7%	0.3%	-0.8%	0.5%	1.3%	-0.5%	1.0%	-2.5%	0.9%	0.6%
Label TS all criteria	**+ RBC**	**Min TE**	0.6%	0.0%	-0.4%	-4.1%	1.7%	0.4%	-0.8%	0.9%	1.2%	-0.4%	1.0%	-2.5%	0.9%	0.6%
Label ISR	**+ RBC**	**Rebased**	0.8%	0.9%	-0.1%	-3.7%	-0.1%	1.2%	-0.3%	2.5%	-0.2%	0.2%	-1.2%	-2.3%	0.8%	0.5%
		Min TE	0.3%	0.3%	0.4%	-1.0%	-0.2%	0.1%	-0.3%	0.1%	0.2%	0.0%	0.2%	-0.9%	0.2%	0.1%
Label ISR all criteria	**+ RBC**	**Min TE**	-0.5%	0.6%	-0.2%	-1.1%	-0.2%	0.3%	-0.7%	1.6%	-0.2%	0.3%	0.2%	-0.9%	0.2%	0.1%
PAB	**+ RBC**	**Rebased**	0.9%	1.1%	0.0%	-3.8%	0.1%	1.4%	-0.7%	2.9%	-0.3%	0.3%	-2.1%	-2.3%	0.8%	0.5%
		Min TE	0.5%	0.6%	0.5%	-2.0%	0.1%	0.2%	-0.4%	0.2%	0.3%	-0.1%	0.1%	-1.2%	0.4%	0.3%
ESG -20%	**SELECTIVITY**	**Rebased**	-1.5%	-1.1%	-0.6%	-3.5%	-0.6%	2.9%	-0.9%	5.7%	0.0%	0.2%	-0.7%	-2.3%	0.7%	0.5%
		Min TE	-0.2%	-0.4%	0.4%	-1.3%	0.4%	0.0%	-1.0%	1.6%	0.2%	-0.1%	0.4%	-1.2%	0.2%	0.2%
ESG > ESG -20%	**UPGRADE**	**Min TE**	-0.4%	0.4%	-0.2%	-0.4%	-0.3%	0.2%	-0.6%	1.2%	-0.2%	0.3%	0.0%	-0.2%	0.0%	0.1%
SI	**+ RBC**	**Rebased**	-8.6%	0.2%	-1.5%	-4.1%	-9.9%	10.0%	6.9%	5.5%	1.0%	0.1%	0.5%	-2.5%	0.9%	0.6%
		Min TE	-7.7%	0.2%	-0.1%	-4.1%	-4.1%	0.9%	4.9%	7.5%	1.5%	0.0%	0.8%	-2.5%	0.9%	0.6%

C

			MSCI Europe (EUR)												
			Comm. Services	Cons. Disc.	Cons. Staples	Energy	Financials	Health Care	Industrials	Info. Tech.	Materials	Real Estate	Utilities	Energy 2022	Energy 2023	Energy 2024
			Weights											Excess return over market index		
MSCI market cap			3.4%	10.6%	12.2%	5.8%	17.7%	15.9%	15.4%	7.0%	7.0%	0.9%	4.2%	47.2%	-6.8%	-13.4%
			Active weights											Contribution to excess return		
RBC		Rebased	0.1%	0.2%	-0.8%	0.1%	0.4%	0.4%	0.3%	0.2%	-0.8%	0.0%	-0.2%	0.1%	0.0%	0.5%
		Min TE	0.0%	0.1%	-0.2%	0.1%	0.1%	0.0%	0.1%	0.0%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Label TS	+ RBC	Rebased	0.4%	1.2%	0.3%	-5.6%	2.1%	1.9%	-1.2%	0.8%	-0.2%	0.1%	0.2%	-2.3%	0.3%	0.7%
		Min TE	1.0%	0.5%	-0.3%	-4.5%	1.5%	0.6%	-0.8%	-0.4%	1.4%	-0.1%	1.2%	-2.0%	0.2%	0.6%
Label TS all criteria	+ RBC	Min TE	1.0%	0.8%	-0.7%	-4.5%	1.1%	0.8%	-0.9%	-0.2%	1.3%	0.0%	1.2%	-1.9%	0.2%	0.6%
Label ISR	+ RBC	Rebased	0.4%	0.6%	0.2%	-5.5%	2.0%	1.8%	1.7%	0.8%	-1.2%	0.1%	-0.6%	-2.3%	0.3%	0.7%
		Min TE	0.6%	-0.4%	0.4%	-4.1%	1.4%	0.4%	0.2%	0.1%	0.6%	-0.1%	1.0%	-1.7%	0.2%	0.5%
Label ISR all criteria	+ RBC	Min TE	0.6%	0.5%	-0.6%	-4.1%	0.8%	0.8%	0.2%	0.4%	0.3%	0.3%	0.8%	-1.7%	0.2%	0.5%
PAB	+ RBC	Rebased	0.3%	1.1%	0.2%	-5.7%	1.9%	1.7%	1.5%	0.7%	-0.4%	0.1%	-1.4%	-2.4%	0.3%	0.7%
		Min TE	0.6%	-0.1%	0.4%	-4.9%	1.7%	0.7%	0.0%	-0.2%	2.0%	-0.2%	-0.1%	-2.1%	0.2%	0.6%
ESG -20%	SELECTIVITY	Rebased	0.4%	0.5%	0.5%	-3.5%	-1.9%	3.0%	1.6%	1.4%	-2.3%	0.1%	0.1%	-1.0%	0.0%	0.5%
		Min TE	0.3%	0.2%	-0.4%	-0.7%	0.0%	0.3%	0.4%	0.2%	-0.4%	-0.1%	0.1%	-0.2%	0.0%	0.1%
ESG > ESG -20%	UPGRADE	Min TE	0.1%	0.7%	-0.9%	-0.1%	-0.5%	0.3%	0.4%	0.3%	-0.5%	0.4%	-0.1%	0.0%	0.0%	0.0%
SI	+ RBC	Rebased	-0.9%	-2.8%	0.7%	-5.8%	-11.3%	7.7%	5.1%	5.0%	0.0%	0.1%	2.2%	-2.4%	0.3%	0.7%
		Min TE	0.2%	-0.3%	-1.7%	-5.8%	-2.1%	1.0%	3.7%	1.1%	2.3%	0.4%	1.4%	-2.1%	0.3%	0.7%

D

			MSCI Emerging Markets (USD)												
			Comm. Services	Cons. Disc.	Cons. Staples	Energy	Financials	Health Care	Industrials	Info. Tech.	Materials	Real Estate	Utilities	Energy 2022	Energy 2023	Energy 2024
			Weights											Excess return over market index		
MSCI market cap			9.6%	13.1%	6.0%	5.1%	22.1%	3.8%	6.5%	21.4%	7.8%	1.8%	2.8%	-4.1%	17.2%	-10.5%
			Active weights											Contribution to excess return		
RBC		Rebased	0.4%	0.8%	-0.2%	-0.8%	1.2%	0.2%	-0.8%	1.3%	-1.2%	0.1%	-1.1%	0.0%	-0.1%	0.1%
		Min TE	0.1%	0.1%	-0.1%	-0.1%	0.3%	0.1%	-0.2%	0.1%	0.1%	0.0%	-0.4%	0.0%	0.0%	0.0%
Label TS	+ RBC	Rebased	1.2%	1.2%	0.1%	-5.1%	2.9%	0.5%	-1.0%	2.3%	-1.1%	0.2%	-1.4%	0.3%	-0.7%	0.5%
		Min TE	0.3%	1.1%	0.6%	-4.9%	1.7%	-0.1%	0.6%	-0.2%	1.2%	-0.1%	-0.2%	0.3%	-0.7%	0.5%
Label TS all criteria	+ RBC	Min TE	0.5%	1.1%	0.5%	-5.0%	1.3%	0.0%	0.6%	-0.1%	1.2%	0.1%	-0.2%	0.3%	-0.7%	0.5%
Label ISR	+ RBC	Rebased	1.4%	1.5%	0.0%	-4.6%	1.9%	0.6%	-0.9%	3.9%	-2.6%	0.1%	-1.4%	0.3%	-0.6%	0.5%
		Min TE	0.0%	-0.5%	0.2%	-2.7%	2.9%	-0.4%	0.3%	0.2%	0.1%	-0.2%	0.0%	0.2%	-0.3%	0.3%
Label ISR all criteria	+ RBC	Min TE	0.2%	-0.2%	0.1%	-2.7%	2.1%	-0.4%	0.2%	0.6%	0.0%	0.0%	0.0%	0.2%	-0.4%	0.3%
PAB	+ RBC	Rebased	1.1%	1.2%	0.0%	-4.9%	2.8%	0.5%	-1.0%	2.7%	-1.1%	0.2%	-1.5%	0.3%	-0.7%	0.5%
		Min TE	0.2%	1.4%	0.3%	-4.0%	1.4%	-0.1%	0.4%	0.1%	0.7%	-0.1%	-0.3%	0.3%	-0.5%	0.5%
ESG -20%	SELECTIVITY	Rebased	1.3%	2.0%	-0.6%	-3.1%	0.2%	0.4%	-0.9%	4.4%	-2.3%	-0.3%	-1.1%	0.1%	-0.4%	0.3%
		Min TE	0.2%	0.6%	-0.3%	-1.0%	0.6%	0.2%	-0.1%	0.3%	-0.2%	-0.2%	-0.3%	0.0%	-0.1%	0.1%
ESG > ESG -20%	UPGRADE	Min TE	0.4%	0.3%	-0.2%	-0.2%	-0.4%	0.2%	0.0%	0.3%	-0.2%	0.3%	-0.5%	0.0%	0.0%	0.0%
SI	+ RBC	Rebased	-0.6%	-0.4%	-1.7%	-5.1%	-13.5%	1.9%	1.9%	21.0%	-3.1%	0.0%	-0.4%	0.3%	-0.7%	0.5%
		Min TE	0.4%	-1.1%	1.1%	-5.1%	-8.0%	3.7%	6.8%	0.4%	-0.1%	1.7%	0.3%	0.3%	-0.7%	0.5%

Exhibit 7: average sector active weights calculated over the period Jan-22 through Dec-24 for the different reweighted indices considered with RBC: exclusions based on our Responsible Business Conduct policy, Label TS + RBC: exclusions based on the Towards Sustainability label and our RBC policy, Label ISR + RBC: exclusions based on the *Investissement Socialement Responsable* label and our RBC policy, PAB + RBC: exclusions based on the Paris Aligned Benchmark requirements and our RBC policy, ESG -20%: exclusions of the 20% worst companies ranked by our aggregate Environmental, Social and Governance score in terms of market cap, SI + RBC: Sustainable Investment screening and exclusions from our RBC policy. Both rebased indices and minimum tracking error indices were considered. For illustration purposes only. Past returns are not indicative of future returns. Source: BNP Paribas Asset Management and MSCI.

Style factor biases: in order to investigate style factor biases, we regressed the excess returns of each index against the returns of the five Fama-French factors. We used the data available on Kenneth French's website[15] for the HML factor (High-

[15] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

minus-Low), which measures the return spread between high and low book-to-market stocks; the SMB factor (Small-minus-Big)[16], which measures the return spread between small- and large-cap stocks; the RMW factor (Robust-minus-Weak), which measures the return spread between robust and weak operating profitability stocks; and the CMA factor (Conservative-minus-Aggressive), which measures the return spread between companies that invest aggressively and those that invest conservatively. We also used the returns of each MSCI market cap-weighted index, respectively, in excess of money market rates as an additional fifth factor in the regressions.

The regressions used factor returns in EUR for Europe and in USD for all other regions. Our analysis focused solely on the rebased portfolio strategies[17] with returns simulated over the period from Jan-2020 through Dec-2024. The results from these regressions are presented in Exhibit 8. We find:

- All indices had a statistically significant negative exposure to the HML factor. Due to the positive performance of the HML factor during this period, such exposures contributed negatively to excess returns. These exposures are most likely a result of underweighting the energy sector, which is typically associated with lower price-to-book ratios and with value investing. Consequently, most of our reweighted indices were more frequently tilted towards growth sectors, as observed in the previous section.
- In general, the **SI baskets** also had positive exposures to RMW and CMA factors which generated positive contributions to excess returns.
- Overall, the intercept of the regressions was positive and the sum of the contribution of factor exposures to excess returns was negative except for the **SI baskets** in All Countries, US and Emerging Markets. Indeed, we tend to find positive alpha everywhere once we subtract all contributions arising from the factor exposures from the excess returns of each rebased index, even if this alpha was often not statistically significant at the confidence level considered. For such short-period, alpha would need to be larger to be significant. Alternative, alpha at these levels would become statistically significant only if observed over longer periods.

[16] Because of the correlation between size and price-to-book, the HML and SMB factors are constructed so as to be less correlated with to each other. More precisely, SMB (Small Minus Big) is the average return on the three small portfolios minus the average return on the three big portfolios, one for value stocks, one for growth stocks and one for stocks without strong value or growth characteristics. In turn, the HML (High Minus Low) is the average return on two value portfolios minus the average return on two growth portfolios, one for the smaller cap stocks, one for the larger cap stocks.,

[17] In any case, minimum tracking error strategies generally reduce the portfolio's active exposures to these style factors compared to those in market cap-weighted portfolios

A

MSCI All Country World (USD)		Regression coefficients					Regression	Contribution to annualised average excess returns					Factor	Alpha	Excess	R-square
		CMA	RMW	HML	SMB	Mkt-Rf	Intercept	CMA	RMW	HML	SMB	Mkt-Rf	contrib.		returns	
RBC		**-0.04**	0.01	-0.01	0.01	0.00	0.00%	-0.1%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.1%	62%
Label TS	**+ RBC**	-0.04	-0.02	**-0.07**	-0.01	-0.01	0.04%	-0.1%	-0.1%	-0.1%	0.0%	-0.1%	-0.3%	0.5%	0.2%	74%
Label ISR	**+ RBC**	**-0.06**	-0.01	**-0.05**	0.00	-0.01	0.05%	-0.1%	0.0%	-0.1%	0.0%	0.0%	-0.2%	0.6%	0.4%	74%
PAB	**+ RBC**	**-0.06**	-0.01	**-0.04**	-0.01	0.00	0.04%	-0.1%	0.0%	-0.1%	0.0%	0.0%	-0.2%	0.5%	0.3%	70%
ESG -20%		0.01	0.01	**-0.07**	**-0.02**	0.00	0.04%	0.0%	0.0%	-0.1%	0.1%	0.0%	0.0%	0.5%	0.5%	58%
SI	**+ RBC**	0.00	0.18	-0.06	-0.01	-0.02	0.06%	0.0%	0.6%	-0.1%	0.1%	-0.2%	0.4%	0.7%	1.1%	33%

	CMA	RMW	HML	SMB	Mkt-FR
Average factor returns	1.4%	3.3%	1.2%	-5.3%	9.3%

B

MSCI US (USD)		Regression coefficients					Regression	Contribution to annualised average excess returns					Factor	Alpha	Excess	R-square
		CMA	RMW	HML	SMB	Mkt-Rf	Intercept	CMA	RMW	HML	SMB	Mkt-Rf	contrib.		returns	
RBC		**-0.02**	0.01	**-0.02**	**0.01**	**0.01**	-0.01%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	-0.1%	0.1%	61%
Label TS	**+ RBC**	-0.03	-0.01	**-0.06**	0.00	0.01	0.04%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.4%	0.4%	67%
Label ISR	**+ RBC**	**-0.03**	0.00	**-0.05**	0.01	0.01	0.03%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%	0.4%	65%
PAB	**+ RBC**	**-0.03**	0.00	**-0.05**	0.01	0.01	0.03%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.4%	0.5%	63%
ESG -20%		0.01	0.03	**-0.08**	0.01	0.00	0.02%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	0.3%	0.4%	50%
SI	**+ RBC**	0.05	0.10	-0.10	0.03	-0.02	0.11%	0.0%	0.7%	0.0%	0.0%	-0.2%	0.5%	1.4%	1.8%	12%

	CMA	RMW	HML	SMB	Mkt-FR
Average factor returns	0.8%	7.2%	0.4%	-1.1%	13.1%

C

MSCI Europe (EUR)		Regression coefficients					Regression	Contribution to annualised average excess returns					Factor	Alpha	Excess	R-square
		CMA	RMW	HML	SMB	Mkt-Rf	Intercept	CMA	RMW	HML	SMB	Mkt-Rf	contrib.		returns	
RBC		0.00	0.01	-0.01	-0.01	0.00	-0.01%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.1%	32%
Label TS	**+ RBC**	0.02	0.01	**-0.11**	0.02	0.01	0.03%	0.0%	0.0%	-0.5%	0.0%	0.1%	-0.5%	0.3%	-0.1%	70%
Label ISR	**+ RBC**	0.01	0.01	**-0.08**	0.03	**0.02**	0.03%	0.0%	0.0%	-0.4%	0.0%	0.2%	-0.2%	0.3%	0.1%	65%
PAB	**+ RBC**	0.01	0.01	**-0.08**	0.01	0.02	0.03%	0.0%	0.0%	-0.4%	0.0%	0.1%	-0.3%	0.4%	0.1%	64%
ESG -20%		0.07	0.03	**-0.11**	-0.04	0.01	0.02%	0.0%	0.0%	-0.6%	0.0%	0.1%	-0.3%	0.3%	-0.1%	68%
SI	**+ RBC**	0.13	**0.16**	**-0.27**	-0.04	-0.01	0.17%	0.1%	0.2%	-1.4%	0.0%	-0.1%	-1.2%	2.0%	0.8%	78%

	CMA	RMW	HML	SMB	Mkt-FR
Average factor returns	0.7%	1.0%	5.0%	-1.1%	7.8%

D

MSCI Emerging Markets (USD)		Regression coefficients					Regression	Contribution to annualised average excess returns					Factor	Alpha	Excess	R-square
		CMA	RMW	HML	SMB	Mkt-Rf	Intercept	CMA	RMW	HML	SMB	Mkt-Rf	contrib.		returns	
RBC		-0.02	0.02	**-0.03**	0.01	0.00	0.00%	-0.1%	0.0%	-0.3%	0.0%	0.0%	-0.3%	0.0%	-0.3%	51%
Label TS	**+ RBC**	-0.03	0.05	**-0.11**	-0.02	0.00	0.10%	-0.1%	0.1%	-1.2%	0.0%	0.0%	-1.2%	1.2%	0.0%	68%
Label ISR	**+ RBC**	-0.03	0.07	**-0.16**	-0.01	0.00	**0.17%**	-0.1%	0.1%	-1.6%	0.0%	0.0%	-1.6%	2.0%	0.4%	67%
PAB	**+ RBC**	-0.04	0.04	**-0.08**	-0.02	0.00	0.09%	-0.2%	0.1%	-0.8%	0.0%	0.0%	-0.9%	1.1%	0.2%	62%
ESG -20%		**-0.11**	**0.12**	-0.02	-0.02	0.02	0.09%	-0.4%	0.2%	-0.2%	-0.1%	0.0%	-0.5%	1.1%	0.6%	61%
SI	**+ RBC**	**0.22**	**0.58**	**-0.16**	**0.27**	**0.15**	0.27%	0.8%	1.0%	-1.7%	0.7%	0.2%	0.9%	3.2%	4.1%	29%

	CMA	RMW	HML	SMB	Mkt-FR
Average factor returns	3.6%	1.7%	10.4%	2.5%	1.6%

Exhibit 8: results from the regressions of the excess returns of the rebased indices in Exhibit 2 against the Fama-French factors, based on monthly returns in EUR for Europe and USD otherwise. The period used in the regressions is Jan-20 through Dec-24. The results include the regressions coefficients and the intercept from the regressions as well as the contribution to excess returns from the factor exposures. Regression coefficients and intercepts in bold have p–values below 0.05. The factor contributions to excess returns, the alphaa and the index excess returns are based on annualised monthly returns. The average annualised factor returns are shown at the bottom of each table. For illustration purposes only. Past returns are not indicative of future returns. Source: BNP Paribas Asset Management and MSCI.

Sustainability biases: we now investigate the biases of the reweighted indices discussed above using different metrics of sustainability. The EU taxonomy (EU Taxo), which defines economic activities that can be considered environmentally sustainable, is based on Bloomberg data. The carbon intensity (CO2I) is measured in ton CO2e / million euro EVIC (enterprise value including cash) and is based on several data sources namely Trucost, CDP and Bloomberg for company emissions, and Factset for the EVIC. ESG scores are based on the BNP Paribas Asset Management methodology and range from 0 for the worst to 99 for the top performers with 50 being neutral. ESG scores. These scores rely on Sustainalytics financial material

factor raw data and compare companies with their peers in each of the 20 sectors in the same of 4 regions. Data from ISS and Proxinvest was also used for Governance factors. Under SFDR, Sustainable Investment (SI), as described before, is an investment in an economic activity that contributes to an environmental or social objective and does not significantly harm any environmental or social objective and follow good governance practices. For SI, we used the BNP Paribas Asset Management classification of companies. Finally, we also use the Principal Adversary Impact 13 (PAI 13), which measures board gender diversity of companies with data provided by ISS.

A

			MSCI All Country World				
			Portfolio				
			EU Taxo	ESG score	CO2I*	SI	PAI 13**
MSCI market cap			3.2%	55.1	74.6	39.2%	33.7%
RBC		Rebased	3.2%	58.2	49.5	41.5%	34.0%
		Min TE	3.2%	58.0	58.9	40.5%	33.8%
Label TS	+ RBC	Rebased	3.3%	58.9	37.8	42.9%	34.0%
		Min TE	3.3%	58.9	37.8	42.9%	34.0%
Label TS all criteria	+ RBC	Min TE	3.4%	60.7	47.1	44.8%	34.1%
Label ISR	+ RBC	Rebased	3.2%	58.4	33.5	42.7%	34.0%
		Min TE	3.4%	58.3	50.1	41.2%	33.7%
Label ISR all criteria	+ RBC	Min TE	3.7%	63.2	41.9	49.3%	34.3%
PAB	+ RBC	Rebased	3.1%	58.3	30.8	42.1%	33.9%
		Min TE	3.4%	58.1	44.1	40.8%	33.6%
ESG - 20%	SELECTIVITY	Rebased	3.4%	61.6	38.3	46.9%	34.6%
		Min TE	3.3%	61.2	53.5	44.3%	33.9%
ESG > ESG -20%	UPGRADE	Min TE	3.4%	61.7	52.2	47.3%	34.2%
SI	+ RBC	Rebased	6.8%	63.8	42.0	100.0%	33.6%
		Min TE	5.4%	63.3	52.4	100.0%	33.6%

B

			MSCI USA				
			Portfolio				
			EU Taxo	ESG score	CO2I*	SI	PAI 13**
MSCI market cap			3.4%	53.9	50.0	36.3%	35.2%
RBC		Rebased	3.5%	57.0	32.0	38.4%	35.5%
		Min TE	3.5%	56.7	41.8	37.4%	35.4%
Label TS	+ RBC	Rebased	3.5%	57.8	21.0	39.4%	35.6%
		Min TE	3.8%	57.7	36.2	40.3%	35.4%
Label TS all criteria	+ RBC	Min TE	3.9%	59.9	32.8	43.3%	35.6%
Label ISR	+ RBC	Rebased	3.5%	57.6	20.2	39.1%	35.5%
		Min TE	3.6%	57.4	34.4	38.0%	35.3%
Label ISR all criteria	+ RBC	Min TE	4.1%	62.3	28.2	46.1%	35.7%
PAB	+ RBC	Rebased	3.4%	57.6	16.6	38.4%	35.5%
		Min TE	3.5%	57.6	24.3	37.5%	35.1%
ESG - 20%	SELECTIVITY	Rebased	3.7%	60.7	23.2	43.8%	35.6%
		Min TE	3.8%	60.3	34.3	40.7%	35.1%
ESG > ESG -20%	UPGRADE	Min TE	3.9%	60.8	33.6	44.0%	35.7%
SI	+ RBC	Rebased	8.1%	62.4	30.2	100.0%	34.3%
		Min TE	7.2%	62.9	37.6	100.0%	35.2%

C

			MSCI Europe				
			Portfolio				
			EU Taxo	ESG score	CO2I*	SI	PAI 13**
MSCI market cap			3.4%	59.6	83.1	54.9%	41.5%
RBC		Rebased	3.5%	61.0	66.2	56.2%	41.5%
		Min TE	3.5%	60.9	72.9	55.7%	41.5%
Label TS	+ RBC	Rebased	3.7%	61.9	54.9	60.6%	41.4%
		Min TE	3.7%	62.1	70.9	57.6%	41.4%
Label TS all criteria	+ RBC	Min TE	3.8%	63.8	63.0	60.0%	41.5%
Label ISR	+ RBC	Rebased	3.2%	61.9	48.2	59.4%	41.3%
		Min TE	3.4%	61.9	62.2	57.2%	41.3%
Label ISR all criteria	+ RBC	Min TE	3.7%	66.2	48.2	63.7%	41.5%
PAB	+ RBC	Rebased	3.3%	61.9	41.3	59.4%	41.3%
		Min TE	4.2%	61.6	59.5	58.0%	41.4%
ESG - 20%	SELECTIVITY	Rebased	4.0%	64.7	43.8	64.8%	41.8%
		Min TE	3.6%	64.3	61.6	59.6%	41.5%
ESG > ESG -20%	UPGRADE	Min TE	3.6%	64.7	56.1	61.5%	41.6%
SI	+ RBC	Rebased	5.4%	65.6	51.6	100.0%	41.3%
		Min TE	4.7%	65.5	58.7	100.0%	41.6%

D

			MSCI Emerging Markets				
			Portfolio				
			EU Taxo	ESG score	CO2I*	SI	PAI 13**
MSCI market cap			3.0%	53.1	189.8	31.9%	18.0%
RBC		Rebased	3.0%	56.5	113.0	34.0%	18.2%
		Min TE	3.2%	56.3	131.6	33.5%	18.2%
Label TS	+ RBC	Rebased	3.2%	57.0	86.8	35.9%	18.3%
		Min TE	3.5%	56.7	99.2	35.1%	18.5%
Label TS all criteria	+ RBC	Min TE	3.6%	58.5	93.5	38.7%	18.7%
Label ISR	+ RBC	Rebased	3.3%	55.7	75.6	36.2%	17.9%
		Min TE	3.6%	55.4	93.0	34.4%	18.0%
Label ISR all criteria	+ RBC	Min TE	3.7%	60.3	88.7	41.1%	18.6%
PAB	+ RBC	Rebased	2.9%	55.8	88.9	35.0%	18.4%
		Min TE	3.1%	55.6	105.5	33.9%	18.4%
ESG - 20%	SELECTIVITY	Rebased	2.9%	59.6	93.0	37.8%	19.1%
		Min TE	3.3%	58.6	120.5	35.1%	18.4%
ESG > ESG -20%	UPGRADE	Min TE	3.3%	59.6	122.8	39.3%	18.5%
SI	+ RBC	Rebased	6.4%	65.3	85.0	100.0%	17.4%
		Min TE	6.9%	62.1	121.6	100.0%	18.3%

** tons/EUR million EVIC *** Percentage of women in executive management

Exhibit 9: average sustainability metrics calculated over the period Jan-22 through Dec-24 for the same reweighted indices as in Exhibit 7. For illustration purposes only. Source: BNP Paribas Asset Management, MSCI, Bloomberg, Trucost, CDP, FactSet, Sustainalytics, ISS and Proxinvest.

In exhibit 9, we show the averages of sustainability metrics for the different reweighted indices consider calculated over the period of the simulations, Jan-22 through Dec-24. We find that:

- All reweighted indices had a higher **ESG score** and a lower **CO2I** than their respective market capitalisation weighted indices. The **CO2I** of the **rebased indices** was often lower than for the equivalent **minimum tracking error** index.

- **RBC** exclusions, despite its small tracking error and return differential relative to the market capitalization indices, already generated a significant increase the **ESG score** and reduction in the **CO2I** everywhere, even if somewhat less in Europe.

- Most reweighted indices had higher **SI** and **EU Taxo** allocation than the respective market capitalization index. While minimum tracking error indices did not always surpass their rebased equivalents in **SI** and **EU Taxo** allocations, they did exceed those of market capitalization portfolios. Additionally, we found a larger overall allocation to **SI** stocks in Europe compared to other regions. Finally, the **SI basket** had the larger **EU Taxo**.

- Regarding **PAI 13**, in general we found that the values for the reweighted indices were aligned with those for the respective market capitalization index, or just marginally higher. This indicator tends to be uncorrelated with the sustainable criteria that determine the exclusions in each approach considered. Overall, **PAI 13** is higher in Europe compared to other regions and lower in Emerging Markets.

Alignment and mis-alignment with Sustainable Development Goals (SDG): in this final section we used data from Matter[18] i) assessing how much revenue of a given company is either aligned (SDG A) with an economic activity that supports the achievement of one or more underlying targets for at least one SDG, and ii) assessing how much revenue is mis-aligned (SDG M) with an economic activity that undermines the achievement of one or more underlying targets for at least one SGD. The data is formed on a taxonomy of over 500 economic activities that have a relationship with each of the identified investable SDG targets. This serves as the definitive guide for how the model connects economic activities to the SDGs. The SDG Taxonomy was developed through collaborative research between BNP Paribas Asset Management and Matter. The research identified the key drivers of the underlying indicators for each target, pinpointing economic activities that either hinder or contribute to these outcomes. Matter's data was used to calculate the percentage of revenue in a portfolio that is either aligned or misaligned with the SDGs.

			MSCI All Country World		MSCI USA		MSCI Europe		MSCI Emerging Markets	
			Portfolio		Portfolio		Portfolio		Portfolio	
			SGD A	SGD M	SGD A	SGD M	SGD A	SGD M	SGD A	SGD M
MSCI market cap			18.3%	12.4%	18.2%	9.4%	20.2%	19.1%	19.8%	13.8%
RBC		Rebased	19.0%	9.8%	19.0%	6.7%	20.6%	18.0%	19.9%	12.2%
		Min TE	18.5%	12.0%	18.2%	9.0%	20.3%	18.7%	19.6%	13.4%
Label TS	+ RBC	Rebased	19.7%	7.0%	19.6%	4.2%	21.8%	12.1%	21.0%	8.6%
		Min TE	18.8%	11.0%	19.0%	5.9%	20.7%	15.0%	20.2%	11.3%
Label TS all criteria	+ RBC	Min TE	19.0%	10.5%	19.3%	5.5%	21.0%	14.8%	20.0%	11.0%
Label ISR	+ RBC	Rebased	19.5%	7.3%	19.2%	4.9%	21.7%	14.0%	21.6%	8.4%
		Min TE	18.6%	11.4%	18.3%	8.4%	20.4%	16.9%	20.6%	11.0%
Label ISR all criteria	+ RBC	Min TE	19.2%	10.2%	19.5%	7.4%	21.4%	15.8%	20.4%	10.3%
PAB	+ RBC	Rebased	18.9%	7.2%	18.9%	4.8%	21.3%	13.3%	20.0%	8.7%
		Min TE	18.3%	11.3%	18.3%	8.5%	19.9%	15.4%	19.5%	12.3%
ESG - 20%	SELECTIVITY	Rebased	20.9%	7.8%	21.2%	4.6%	23.5%	13.8%	21.4%	9.5%
		Min TE	19.2%	11.5%	18.9%	8.0%	20.4%	17.1%	19.6%	12.9%
ESG > ESG -20%	UPGRADE	Min TE	19.0%	11.1%	19.2%	8.1%	21.2%	17.7%	19.4%	13.0%
SI	+ RBC	Rebased	40.2%	4.9%	43.9%	2.5%	33.5%	9.0%	46.9%	5.2%
		Min TE	30.9%	5.7%	33.1%	3.0%	25.0%	9.5%	35.9%	7.5%

Exhibit 10: average of percentage revenue in the reweighted indices aligned (SDG A) and mis-aligned (SDG M) with SGDs, calculated over the period Jan-22 through Dec-24 for the strategies considered in Exhibit 7. For illustration purposes only. Source: BNP Paribas Asset Management, Matter and MSCI.

The results shown in exhibit 10 are the average percentage revenue in the reweighted indices which is either aligned (SDG A) or mis-aligned (SDG M), calculated over the period of the simulation. For the indices considered we found that:

[18] https://www.thisismatter.com/data/sdg-fundamentals

- The reweighted indices significantly reduced the exposure to **revenues mis-aligned with SGDs** relative to the respective market capitalisation weighted index.

- The magnitude of the reduction in exposures to **SGD M** was larger for the **SI basket** than for the others, and still large and significant for **Label ISR**, **Label TS, PAB** and **ESG**. **RBC** has the smallest reduction.

- The reweighted indices had a larger exposure to **revenues aligned with SGDs** than their respective market capitalisation weighted index. This increase is large and significant for **SI basket** but much smaller for all other indices considered.

- The increase in exposure to **SGD A** was larger for the **ESG rebased** indices than for **RBC** or for the **Label ISR**, **Label TS** and **PAB**, which suggests that there was also a stronger embedded bias towards **SGD A** in our **ESG** scores.

- The increase in exposure to **revenues aligned with SDGs** and the decrease in exposure to **revenues mis-aligned with SGDs** was smaller for **minimum tracking error** indices than for **rebased** indices

Limitations of the analysis: the results presented in this paper provide valuable insights into the impact of sustainability on the performance of these reweighted indices. However, it is important to acknowledge some limitations inherent in the methodology employed:

- **Recent past performances**: the analysis is based on the most recent five years. This temporal limitation may not fully capture the longer-term potential impact or the impact under future market conditions.

- **Simulated index performances**: the analysis relies on rules-based approaches to construct well diversified indices rebalanced monthly. This is not representative of actively managed portfolios which are often concentrated and embed ESG considerations directly in the fundamental analysis leading to investment decisions along with other considerations.

- **Transaction costs and market impact not included**: these costs would have had a negative impact on the net returns of investments.

- **No liquidity constraints or real portfolio constraints included**: these could further impact performances.

- **Combined effect of overlaying effects not considered:** a combination of sustainable criteria is used in many of our funds, which may include the requirement to qualify for more than one sustainable fund label.

Conclusions

In this paper, we explore the impact of applying different sustainability approaches on four broad equity indices, focusing on the financial outcomes of different screening approaches employed by BNP Paribas Asset Management. Our study examined exclusions based on our RBC policy, proprietary ESG company scoring approach, SI screens, and on three label exclusion lists: Label TS, Label ISR and the PAB framework. These approaches represent different levels of sustainability, from the less stringent RBC policy to most stringent SI screens.

Our results suggest that the performance and risk vary not only based on the sustainability criteria but also on how the indices are reweighted. We compared the impact of two different approaches used to handle the impact of stock exclusions. Rebasing

the index using market capitalization stock weights after stock exclusions, while simple, can introduce biases that tend to increase tracking error and thus generate returns less aligned with those from market capitalization indices. In contrast, minimum tracking error indices tend to have lower tracking error and smaller return differentials relative to market capitalization indices.

Among all sustainable screenings used, we found that our RBC policy-based exclusions would have had the smallest impact on the equity indices considered. Moreover, the tracking error of the reweighted indices could have been effectively reduced by using portfolio optimization instead if a simple index rebasing approach. The return differentials between the minimum tracking error indices and the market capitalization indices were small, even in 2022, the most challenging year in the simulated period. This underscores the importance of portfolio construction in managing the risk exposures introduced by sustainability constraints to reduce their impact on performance when desirable.

For the Label TS, Label ISR, and PAB exclusions and ESG selectivity, we found that minimum tracking error indices also had smaller tracking error than their rebased equivalents and exhibited smaller impact on excess returns. Moreover, minimum tracking error indices could more easily accommodate all other criteria required by these labels beyond the simple stock exclusion lists. The impact on tracking error and excess returns of other criteria required by these labels was found to be small.

For ESG, we found that minimum tracking error indices without exclusions and constrained to have an ESG score higher than the market capitalization index (upgrade) have an even smaller tracking error than minimum tracking error indices with exclusions (selectivity). The differences between the returns of ESG upgrade indices and the returns of the market capitalization index are also much smaller than the differences of returns of their respective ESG selectivity indices.

Minimisation of tracking error helps mitigate biases introduced by sustainability criteria in the indices. However, not all biases can be successfully controlled. An example is the exclusion of stocks from the energy sector, which was responsible for created a significant underweight in the sector relative to market capitalization indices. This underweighting was a major contributor to the underperformance in 2022, particularly for All Countries, US, and European.

Consistent with the underweighting of the energy sector, Fama-French regressions showed a bias towards growth stocks and away from value stocks in the rebased indices, which contributed negatively to portfolio returns in the simulated period. Interestingly, the alpha estimated from these regressions was positive in almost all cases and across nearly all reweighted indices, although it was often not statistically significant at the confidence level considered.

Our analysis based on the most recent five years of data and relying simulating the performance of reweighted equity indices can help us understand what could have been expected from applying screenings based on sustainability criteria to the broad equity indices considered. The results suggest that, in general, over the period, sustainability would have had a positive contribution to most of these indices. However, this is not a proof of a sustained future positive contribution of sustainability to long-term performance. Moreover, no transaction costs or market impact were included, no liquidity and no real portfolio constraints were considered, and we did not assess the implications of applying multiple sustainability constraints often found in commercially available indices and sustainable funds.

For these reasons, the results are limited relevance for our Article 8 actively managed funds, which are also impacted by other considerations such as the main investment philosophy used in the funds beyond sustainability. The results we found

here are also of limited relevance for the performance of our Article 9 funds which use other criteria in the selection of investments, and not only the SI screening.

Finally, we would not generalise the results obtained here to other asset classes, or even other equity regions or countries. Indices with higher levels of concentration are more at risk of being exposed to large cap stock exclusions while small cap equity indices tend to be more easily be impacted by exclusions.

In conclusion, the impact of applying sustainability constraints on investment performance varies depending on the specific approach, period, scope, and measurement method. While some approaches may have a minimal impact, others can result in positive or negative excess returns based on their purpose, scope, and timeframe. More stringent criteria tend to generate higher tracking errors relative to market cap indices. Portfolio construction techniques, such as minimisation of tracking error, can help mitigate the impact of exclusions by controlling as much as possible their impact of risk and performance. Conversely, simple rebasing techniques can exacerbate or create biases due to the rules behind stock re-weighting. Finally, as demonstrated in our simulations, some of the sustainability screenings considered here would have contributed positively to excess returns of the reweighted equity indices over the five-year period considered, in particular in All Countries, US and Emerging Markets, as illustrated by our examples. Nevertheless, we would be careful to extrapolate the results into the future or to other equity indices or other asset classes.

Disclaimer

well as up. Investors may not get back the amount they originally invested. The performance data, as applicable, reflected in this material, do not take into account the commissions, costs incurred on the issue and redemption and taxes. All information referred to in the present document is available on www.bnpparibas-am.com.

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