



Corporate economic performance and sustainability indices: a study based on the Dow Jones Sustainability Index

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Abstract

Sustainable investing recognizes companies' role in solving some of the major sustainability challenges globally and that companies driving impactful sustainability agendas can be best positioned to grow, and one way to do this is through inclusion into a sustainability stock-market index. Current research has investigated the financial benefits of being included into sustainable indices and has found contrasting results. To expand on existing work, we report an analysis that aims at better understanding whether there is any negative economic impact related to participation in the sustainability index DJSI. To do this, we gained data on three financial indicators (market cap, net sales, and EBITDA) on five different non-related industries (Airlines, Aluminum, Apparel, Pharmaceuticals, and Forest Products). Ten companies in each industry were selected based on market-cap, with 5 being in-index and 5 being out. Although most indices' rationale is to identify companies that are best-in-class performers in sustainability and economically, we report an unexpected conclusion of no obvious financial consequences from being part of sustainability index. Only one industry—forest products—had positive impacts of index-inclusion, and the other industries' impacts were non-consequential. This indicates that sustainability indices may promote sustainable development with no financial impact.

Keywords Sustainability · Sustainable finance · Sustainability index · Economic performance · Financial performance · Strategy

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Introduction

There are many different approaches to sustainability in the field of finance. Sustainable finance itself relates to a decision-making process in which investments are made considering environmental and social impacts and thus investors incorporate sustainable activities into their portfolios (Fatemi and Fooladi 2013). Sustainability criteria are used as an emerging tool to promote and safeguard investments and other decision-making regarding sustainable businesses and related processes in relevant industries in the world (Ellison and Sayce 2007). As a background to sustainability banking and finance, one version of sustainable investing (in the sustainable investing ecosystem) is called impact investing. Impact investing is investing into certain companies or projects intending to create environmental or social gains to the community (Höchstädter 2014; Scheck 2015). The other two versions of sustainability investing which are perhaps more popular are green loans (specifically aimed for alleviating environmental issues) and sustainability-linked loans (Turner 2019). Sustainability criteria are used in each of these methods to select and evaluate its impact in creating social, environmental, and economic value.

There are many methodologies to examine sustainable investments. For example, there are mutual funds stocks and indices that address investments in green technologies (Robinson et al. 2011). Also, socially responsible investing (SRI) or Responsible Investments (RI) are conducted through environmental and social governance (ESG) criteria to analyze potential investments (Renneboog et al. 2008; Friede et al. 2015). Unfortunately, even with these currently used processes, it can be challenging to measure the encompassing impact of these investments due to the vastness of the social and environmental factors in the effects of company operations. A more specific and targeted financial tool to drive sustainability is impact investing which brings in additional dollars beyond what public and corporate charities normally generate. This funding instrument can then, for example, be used to solve issues that negatively affect societies like poor community health or poverty. Impact investing holds great promise, but it is important to recognize its limitations (Höchstädter 2014; Scheck 2015). Generally speaking, it is considered challenging to measure the impact of philanthropical acts accurately and consistently by enterprises and the government (Leon et al. 2019; Margolis and Walsh 2003). This is because of the qualitative value of the benefits associated with impact investments such as increased economic activity of a society or improved mental health of a population (La Torre et al. 2019).

Sustainable Performance Indicators (SPI) have served as meaningful targets for banks to evaluate a company's performance on their sustainability improvement path (Orazalin 2019). SPIs may be either internal (defined by the borrower in line with their global sustainability strategy) or external (assessed by independent providers against external rating criteria) (Searcy 2012). Environmental Social and Governance (ESG) ratings reports are becoming increasingly embedded in financial markets (Avetisyan and Hockerts 2017). A growing number of investment indices now hinge on companies' rankings for environmental, social,

and governance criteria, and some banks are even offering better borrowing terms to companies with strong ESG scores (Czerwińska and Kaźmierkiewicz 2015; Baker 2018; Francis et al. 2018). Limited to the green bonds market, the financial industry has recently started developing the very first systems of green ratings (Laidlaw 2018; Yang et al. 2019). Unsurprisingly, the lead has been taken by existing certification and rating agencies that are able to leverage both their technical expertise and their market positioning in the sector. However, such a practice should still be considered to be in a very early stage of development, and because of this, uncertainties in its long-term potential and effective market appeal remain.

One issue in SPIs that is yet to be resolved includes how little guidance there is to managers on how they should measure the financial impacts of their sustainability strategies. It is challenging to use common measures of corporate performance such as share price or return on equity to evaluate this sustainability performance because these measures are influenced widely by a host of other factors (Greswatsch 2015; Kleindienst 2017; Margolis et al. 2007; Orlitzky et al. 2003). Furthermore, even if the managers did have general-level information, it is not nearly detailed as they need/require it to be to establish an optimal level of corporate sustainability investment activities for their company. While this is a major issue, further research and also education can provide more insight and further the understanding of the topic (Searcy and Elkhawas 2012).

Stock market and sustainability

There are two types of theories regarding the relationship between sustainability and firm value. The value-creating theory says that sustainability practices of a company reduce firm risk and promote long-term value creation (Porter and Kramer 2006; Yu and Zhao 2015). In contrast to that, the value-destroying theory proposes that sustainability activities may actually harm shareholders and not increase firm value (Porter and Kramer 2006; Yu and Zhao 2015). The purpose of this paper is to examine the actual financial impact of companies that actively take part in sustainable acts and pro-environmental processes. This analysis is performed by comparing companies that are included in the Dow Jones Sustainability Index and in specific industry segments to companies in the same industry segment but not in the sustainability indices (Dow Jones Sustainability Indices Components Access 2020). With this analysis, the authors are adding new insight to the current discussion of the relationship between financial economics and sustainability.

A positive relationship has been earlier shown to exist between sustainability performance and firm value which is consistent with the value-creating theory (Porter and Kramer 2006; Yu and Zhao 2015). However, to clarify this position, in Harris and Eitan's price pressure hypothesis, it is proposed that event announcement does not carry any actual information and so any shift in price change is temporary (Harris and Eitan 1986). Another research by Hawn et al. supports this hypothesis by studying financial events regarding the Dow Jones Index (DJSI) to evaluate the investor reactions to the addition, continuation, and deletion from the DJSI and in

fact found that investors do not care much about DJSI measures (Hawn et al. 2018; Durand et al. 2019; Lopez et al. 2007). However, other studies have reported evidence that being added to the DJSI results in a sustained increase in a firm's share price (Robinson et al. 2011). The findings of these and other published work do highlight the importance of careful analysis in deducing the financial effects of sustainability leadership and performance.

The hypothesis in this paper is that companies that are driving world class sustainability agendas and actively invest into sustainability are not performing financially worse than those that are not. The focus is on 'financially worse' and not 'financially better' because of the general perception that sustainability is expensive, and many executives may fear that being a more environmentally friendly is going to cost a lot. Another point of view is that those companies that are in the DJSI can be considered well established in strategy formulation and the maturity of their business processes. Many times, they have also been successful in integrating sustainability into their strategies and business models (Searcy and Elkhawas 2012). And therefore, may have gained successful product or service differentiation in the marketplace and thus be more profitable (Spitzeck and Chapman 2012; Danso et al. 2019). The question is then more specifically in the context of investment managers considering sustainability indices to invest in to diversify their portfolio's risk (Balcilar et al. 2017; Sousa et al. 2018). We intend on examining the financial impact of inclusion/exclusion into sustainability indices and concluding whether there is any financial risk in investing into companies that take part in DJSI index.

Methodology

There are several sustainability indices that were investigated as a potential platform to use for this study. After careful consideration, Dow Jones Sustainability Index (DJSI) was selected. It is one of the oldest and most established indices with participation from a variety of different industries and companies. One selection criterion was also the transparency and access to sustainability index data. The DJSI allows its data to be available for research and was also from its industrial scope, the most relevant for this study.

The Corporate Sustainability Assessment (CSA) the DJSI index uses is purposed to recognize companies better equipped to manage emerging opportunities and challenges in sustainability in global business environment. The CSA captures general and industry-specific issues on each sustainability dimensions: economic, environmental, and social. So-called general criteria relating to management practices and performance measures are used and account for almost 50% of the assessment. Each sustainability dimension is evaluated by 6–10 criteria, with each of them containing 2–10 questions. In total in the CSA, there are 80–120 questions. The total score is the assessment goes up to 100 and is calculated using the pre-defined weights are designed to roll from questions to criteria and up to the dimension weight. The criteria and weights specific to industry sector can also change in time. Finally, the Sustainability Score is used to rank the company within its peer group to identify companies for inclusion to the DJSI index. For quality and data accuracy reasons

and cross-checking and independent third-party auditing is used as well. There is also an additional Media and Shareholder Analysis (MSA) step if the assessed company is involved with environmental, economic, and social crisis situations which may be harmful to their reputation and core business. This analysis includes a broad range of issues such as economic crime or corruption, fraud, practices, human rights issues, labor disputes, safety, and environmental disasters. In the CSA methodology, there are also pre-defined weights that have been set for potential MSA cases and they will vary by criterion and industry based on the materiality and impact. Finally, Ethical Exclusion Classification (EEC) is also included and companies that generate revenue from the certain listed activities will be excluded from the index or its subsets. These include companies with revenue from or allegations or indications of involvement with adult entertainment, alcohol, armaments, cluster bombs, firearms, gambling, landmines, nuclear, and tobacco (DJSI Components 2022).

The calculation of the DJSI World index of the included companies uses input data from real-time stock prices, real-time currency rates, number of free float shares, and corporate action information and data. The index uses various data verification steps to ensure data quality. The index is calculated with the Laspeyres formula (DJSI Components 2022).

$$\text{Index}_t = \frac{\sum_{i=1}^n (p_{it} \cdot q_{it} \cdot X_{it}^{\text{USD}})}{C_t \cdot \sum_{i=1}^n (p_{i0} \cdot q_{i0} \cdot X_{i0}^{\text{USD}})} \cdot \text{base value} = \frac{M_t}{B_t} \cdot \text{base value}$$

And can be simplified as

$$\text{Index}_t = \frac{M_t}{D_t}$$

where n is the number of stocks in the index, p_{it} is the price of stock (i) at time (t), q_{it} is the number of shares of company (i) at time (t), X_{it} is cross rate: domestic currency in USD of company (i) at time (t) (for companies not traded in USD), C_t is an adjustment factor for the base date market capitalization, p_{i0} is closing price of stock (i) at the base date (December 31, 1993), and q_{i0} is the number of shares of company (i) at the base date (December 31, 1993),

M_t is market capitalization of the index at time (t) and B_t is adjusted base date market capitalization of the index at time (t), and base value is 440.11 on the base date (December 31, 1993).

To carefully examine the relationship between financial performance and sustainability index, we selected five specific industries: Airlines, Aluminum, Apparel, Pharmaceuticals, and Forest Products. These industries are deliberately unrelated and chosen to highlight independent industries where sustainability can be considered highly topical and excellence in sustainability as a potential differentiator. Furthermore, they were deliberately selected on the basis that a sustainability agenda in each industry would create lasting effects which could be seen through inclusion into the DJSI.

Reducing global emissions by 50–80% (1990 base-level) by 2050 involves significant reduction of emissions in all industry sectors (McCollum 2010). In 2020, the

EPA reported that the total amount of emission from the airline industry accounts for approximately 3% of total US GHG emissions (US EPA 2020). The Pew Center of Global Climate Change noted that the airline industry in the USA increased their total domestic and international emissions by 10% from 1990 to 2005 (McCollum 2010). In addition to that, business-as-usual (BAU) projections for CO₂ emissions (of global aviation) by the International Energy Agency (IEA) are estimated at 3.1% per year over the next 40 years, resulting in a 300% increase in emissions by 2050 (McCollum 2010). In contrast to that, multiple airline companies have announced programs to try to become greener in the coming years, with Delta Air Lines recently committing 1 billion USD to becoming carbon neutral by 2030 (Boerner 2021). JetBlue pledged to get there by 2040, and United Airlines by 2050 (Boerner 2021). As such, there currently exists heavy interest by the airline industry to being more sustainable, but the emissions projections in 2008 do not illustrate this scenario well. The implication of the above facts is that there could potentially be green washing by companies in this industry to appear more environmentally friendly but still doing BAU. The relevance of including this industry in this research stems from the importance of it for national and global transportation and the economic case associated to it in becoming more sustainable.

Some related industries to aluminum—the next industry we look at—include mechanical engineering, defense industry, ship building, construction, and energy (Dudin et al. 2017). Thus, aluminum is a strategic metal with possibilities to directly influence national energetic, economic, military, and transport safety (Dudin et al. 2017). Unfortunately, the existing processes for aluminum production and manufacturing are high in energy/materials consumption and in waste generation (Yue et al. 2015). There are differing results on the environmental and life-cycle impact of the aluminum industry (nationally and globally) because of the recyclability of the material, with the current range of the greenhouse gas emissions hovering around 12–17 metric tons of CO₂-equivalent per metric ton of aluminum, depending on the various estimates and assumptions made (Saevarsdottir et al. 2019, 2020). Sustainability in the mining-types of industries is controversial; however, there are companies in those industries that are making necessary changes to go green. One such company that is included in the DJSI and the current analysis is Rio Tinto. Rio Tinto is transitioning to net zero emissions by 2050 by decarbonizing their assets, partnering to develop the green technologies and products, and investing in commodities that enable the energy transition with actions to decarbonize operations and value chains (Rio Tinto). As such, it is possible for companies in the aluminum industry to be considered sustainable if they make necessary changes and are transparent in their reporting. The importance of this industry to economies, and its high environmental impact, made it a relevant sector to include in this research.

The apparel industry was selected for examination in this paper due to it being the second largest polluting industry in the world. The global fashion industry's contribution to the world's carbon emissions was 10% of the entire total; for comparison, the US's contribution to global emissions only accounts for 14.5% of the entire total (Denuwara and Hakovirta 2019). One of the main reasons for the industry being environmentally impactful is because it is trapped in its own success—the ability to produce apparel at extremely low cost by offshoring parts of their value chain

allowed the industry to become a trillion-dollar market (Kozlowski et al. 2015). This rapid growth came with many problems that have been increasingly apparent. Significant waste generation by consumers and producers, use of non-renewable resources and hazardous chemicals, harmful labor practices, and air and water pollution from manufacturing processes, in addition to carbon emissions, are just some issues prevalent in the apparel industry (Denuwara and Hakovirta 2019; Kozlowski et al. 2015). Due to the extensive work and cost associated with creating solutions to these sustainability issues, management of companies and brands within this industry rarely tends to challenge the status quo. The biggest problem in creating solutions by brands is due to the offshoring of production and manufacturing, and so visibility of issues inside the apparel value and supply chain is quite low for international and large brands (Caridi et al. 2013). There are a number of companies that do try to be more sustainable by voluntarily reporting environmental and social effects of their company and other acts such as use sustainable materials, distribute products in greener packaging and invest in eco-efficient stores (Jestratičević et al. 2022). This industry is a trillion-dollar industry and has the potential to have major impact on the environmental status of brands and retailers.

In a previous paper, Denuwara and Hakovirta (2020) argued for human health to be a sustainability dimension due to the collapse witnessed of the global economy and society from COVID-19. The pharmaceutical industry plays the biggest role in human health and is not without its own, but different, issues. Due to its intense, unique, and important impact on a growing dimension of sustainability, we included the industry in this research. It is responsible for researching, developing, producing, and marketing pharmaceutical drugs, vaccines, and treatments for common and rare diseases (Taylor 2015). An aging world population and improved healthcare systems are driving demand for a pharmaceutical industry that is increasingly aware of the need to pursue sustainable development while delivering a wider range of pharmaceutical products (Pereno and Eriksson 2020). Concerns about the introduction of sustainability practices into the development of new delivery systems, new products that pose a lower environmental risk, waste recycling, the reduction of water usage, greener manufacturing methods, and recyclable packaging have intensified attention on this topic (Barei and Le Pen 2014). A big barrier toward sustainability in the pharmaceutical industry is the importance and cost of R&D in this industry. It is also a highly regulated industry due to the life-and-death impacts of medication. Making this industry greener and more sustainable overall would require many processes to change and pass through rigorous governmental regulations. This is not only costly, but it is also sometimes impossible in certain cases. Because drugs and vaccines tend to have specific chemical structures, attempting to change the structure for the reason of sustainability may not get the intended results in humans. But still, there are pharmaceutical companies like Amgen that are in the index because of voluntarily reporting the company's environmental and social impacts, reducing CO₂ emissions, assessing the risk and resiliency of their research, improving the efficiency and life-cycle impact of their products, and supporting social justice and equal opportunities within and outside of the company (Amgen 2021).

The forest products industry, also known as the bioeconomy, uses biotechnology and biomass (renewable resources) in the production of goods and energy. It is one

of the top ten industries in the manufacturing sector of the US, on par with the automotive and plastics industry (USDA 2021). Companies within the industry generate over USD 200 billion a year in sales (in the US economy) and are the leading generator and user of renewable energy (USDA 2021). Some of the individual fields within forest products are buildings and construction materials, pulp and paper, nano/biotechnology, and engineered composites. Like the apparel industry, the forest products industry has a large sourcing challenge associated with sustainability (Gan 2013; Petrescu et al. 2020). Other concerns in this field are emissions to water and air, recycling, chlorine bleaching, and overall forest management and certification (Robson and Davis 2015; Kaur et al. 2019). The relevance of this industry to this research stems from its existing image as a sustainable industry, and society's increasing reliance on biomass as a replacement to fossil fuels.

For each industry group, ten companies were selected based on their market cap; five of the largest market-cap companies in each industry are the in the DJSI and five of the largest market-cap companies in each industry that are not on any sustainability index. Market capitalization was used as the basis of selection to make sure complexities and maturity of business operations was at least comparative to some extent. In general, companies that are in the DJSI can afford to invest into developing sustainability reporting and driving necessary strategies to reduce their emission and the environmental impact in their value chains. As such, they tend to be large brands with a heavy presence in the industry. To make out-of-index companies comparable, we had to select an equal number of companies that have a large market cap on par with the in-index companies.

For the results, the independent variable was the year, and the dependent variables were market cap, net sales, and EBITDA for each of the companies in the selected industries. Market cap was used as a main metric, because it is a multifaceted figure that is affected by several factors. Usually, to account for these factors, numerous control variables would have to be included in each of the presented models—past returns, financial risk, R&D intensity, and earnings retention. However, many of these control variables are not comparable between different companies and can many times be highly difficult to obtain from company annual reports. Using straightforward and highly accepted financial performance metrics on a large pool of companies from various industry segments, the other indicators are averaged and are not dominant when looking at the results from total performance perspective.

Data were collected for all ten companies in each industry group including 5 years total (2015–2019). For example, in the airlines industry, the five largest airlines in the DJSI and the five largest non-DJSI airlines were analyzed. This approach enabled a large independent data sets and to see any possible correlation of financial performance to belonging to DJSI. Six tables were created to compare both groups with each other on three areas—Market Cap, Net Sales, and EBITDA. All financial data were gathered from income statements reported by Wall Street Journal and historical data reported posted by Yahoo Finance. Currency conversion was made using IRS reported yearly average currency exchange rates. This data source was used due to the consistency of reporting through-out all the investigated companies. The financial data collected was averaged and analyzed through the linear regression equation to find yearly average growth. Each annual financial performance datum

Table 1 The yearly market cap, net sales, and EBITDA (in billion USD) for the top 5 airline companies in the DJSI and the top 5 airlines companies not in the DJSI

		In Index				Out of Index			
		Average (billion USD)	% change in 5 years	Growth/year	R ²	Average (billion USD)	% change in 5 years	Growth/year	R ²
Market Cap	2015	12.81	8%	0.23	0.15	17.96	-1%	-0.13	0.01
	2016	12.65				19.04			
	2017	14.91				21.89			
	2018	13.04				18.26			
	2019	13.84				17.70			
Net Sales	2015	19.27	16%	0.84	0.93	19.26	19%	1.04	0.86
	2016	19.11				19.00			
	2017	20.41				19.79			
	2018	21.48				22.15			
	2019	22.30				22.89			
EBITDA	2015	3.53	11%	0.10	0.79	4.30	-3%	-0.08	0.11
	2016	3.46				3.95			
	2017	3.63				3.65			
	2018	3.67				3.43			
	2019	3.93				4.18			

was accomplished by collecting monthly data and averaging it to an annual average. We used r^2 to find the reliability of the data and possible related differences between industry groups and financial indicators. The trendline was afterward imposed on the graphs to guide the eye and to show the actual linear yearly growth compared to the average assumed linear growth.

The second analysis done was the Welch's t test. In statistics, Welch's t test is a two-sample location test which is used to test the hypothesis that two populations have equal means. The test is more reliable when the two samples have unequal variances and/or unequal sample sizes.

Results

The first industry group investigated was the companies in the Airlines industry (Table 1) and included the in-index (DJSI group) companies: Delta, ANA Holdings, Alaska Air, Air France-KLM, and Latam. The companies included in the out-of-index group include Southwest, Ryanair, United, China Eastern, and China Southern. The comparison of the actual annual average of the market capitalizations of the two different company groups is not quite relevant bases for comparison. However, the growth rate of the average market capitalization between the two company groups shows that the DJSI market capitalization growth was greater (0.24 billion dollars per year) than that of the out-of-index companies. In fact, the annual average

of out-of-index market capitalizations had a negative growth rate (-0.13 billion dollars per year). For both in-index and out-of-index companies, the maximum market capitalization was reached in 2017. Both trends appear similar, but the overall growth rate is greater for in-index companies, even though out-of-index companies have higher market caps on a yearly basis. One possible reason for the overall peak in market cap across the whole industry in 2017 could be because oil prices were relatively low in 2016, and financials for all airlines companies heavily depend on oil prices.

The in-index and out-of-index annual average of net sales was nearly identical from 2015 to 2019 (see Table 1). As shown by the growth on both sets of data, the rate of net sales was also nearly identical for companies in-index and out-of-index (0.8 billion dollars per year and 1.04 billion dollars per year, respectively). One possible reason why the net sales is nearly identical is that airlines—as an industry—is highly regulated, well-structured and with only small differentiation between each company's offering. For this reason, being in the DJSI may not have an advantage when comparing the net sales of companies in the airlines industry.

The data in the EBITDA graphs for in-index and out-of-index companies show similar trends lines results compared to the net sales graphs. However, the in-index companies have a positive growth pattern and out-of-index companies the growth is negative. The growth rate of EBITDA for companies in the DJSI was 0.10 billion dollars per year, whereas the growth rate of EBITDA for companies out of the DJSI was -0.07 billion dollars per year. Due to similarity of the financial results in all

Table 2 The yearly market cap, net sales, and EBITDA (in billion USD) for aluminum companies in the DJSI and the top five aluminum companies not in the DJSI

		In Index				Out of Index			
		Average (billion USD)	% change in 5 years	Growth/year	R ²	Average (billion USD)	% change in 5 years	Growth/year	R ²
Market Cap	2015	16.50	-22%	- 0.35	0.88	5.65	23%	0.26	0.11
	2016	10.88				6.49			
	2017	13.79				9.04			
	2018	13.47				6.50			
	2019	13.47				6.96			
Net Sales	2015	18.83	-13%	0.01	0.00	7.51	48%	1.04	0.85
	2016	12.30				8.13			
	2017	14.98				10.68			
	2018	17.12				11.28			
	2019	16.46				11.15			
EBITDA	2015	1.60	81%	0.38	0.70	1.15	31%	0.17	0.50
	2016	1.85				0.84			
	2017	3.10				1.20			
	2018	3.10				1.86			
	2019	2.90				1.51			

Table 3 The yearly market cap, net sales, and EBITDA (in billion USD) for apparel companies in the DJSI and the top five apparel companies not in the DJSI

		In Index				Out of Index			
		Average (billion USD)	% change in 5 years	Growth/year	R ²	Average (billion USD)	% change in 5 years	Growth/year	R ²
Market Cap	2015	28.63	50%	3.52	0.81	54.27	22%	7.20	0.98
	2016	33.12				52.13			
	2017	39.57				55.06			
	2018	47.11				63.37			
	2019	57.62				66.25			
Net Sales	2015	12.90	33%	1.08	0.98	23.13	50%	2.87	0.99
	2016	13.68				27.04			
	2017	15.41				28.72			
	2018	15.95				32.40			
	2019	17.15				34.79			
EBITDA	2015	2.11	69%	0.38	0.89	5.34	42%	0.55	0.76
	2016	1.98				5.20			
	2017	2.47				5.41			
	2018	3.02				6.20			
	2019	3.57				7.58			

Table 4 The yearly market cap, net sales, and EBITDA (in billion USD) for pharmaceutical companies in the DJSI and the top five pharmaceutical companies not in the DJSI

		In Index				Out of Index			
		Average (billion USD)	% change in 5 years	Growth/year	R ²	Average (billion USD)	% change in 5 years	Growth/year	R ²
Market Cap	2015	155.35	13%	6.36	0.46	108.26	2%	0.26	0.001
	2016	136.76				83.87			
	2017	160.11				101.23			
	2018	154.88				82.63			
	2019	178.10				110.19			
Net Sales	2015	35.81	15%	1.60	0.90	19.75	1%	- 0.02	0.01
	2016	36.62				20.48			
	2017	38.24				19.87			
	2018	41.68				19.84			
	2019	41.30				19.97			
EBITDA	2015	12.55	24%	0.74	0.91	9.63	-22%	- 0.55	0.94
	2016	12.90				9.53			
	2017	13.25				8.95			
	2018	14.21				8.31			
	2019	15.60				7.46			

Table 5 The yearly market cap, net sales, and EBITDA (in billion USD) for forest products companies in the DJSI and the top five forest products' companies not in the DJSI

		In Index				Out of Index			
		Average (billion USD)	% change in 5 years	Growth/year	R ²	Average (billion USD)	% change in 5 years	Growth/year	R ²
Market Cap	2015	5.30	29%	0.54	0.85	19.65	-11%	-0.79	0.66
	2016	5.98				19.83			
	2017	7.22				18.38			
	2018	6.97				16.15			
	2019	7.50				17.56			
Net Sales	2015	6.51	22%	0.42	0.86	15.22	-1%	-0.14	0.10
	2016	6.73				15.86			
	2017	7.01				13.91			
	2018	8.11				14.86			
	2019	7.94				15.01			
EBITDA	2015	1.00	4%	0.05	0.26	2.47	6%	0.09	0.31
	2016	0.87				2.01			
	2017	0.97				2.35			
	2018	1.25				2.57			
	2019	1.04				2.62			

three categories, there seem to be no observable advantage to being in the DJSI for companies in the airlines industry from an economic standpoint.

The next industry segment evaluated was the Aluminum industry (Table 2). Companies included in the DJSI are Alcoa Corp., Norsk, Rio Tinto, South 32, and Sims. The companies included in the out-of-index graph were selected to include: Chalco, Honqiao, Rusal, Saudi, and Xingfa. The annual average between the five companies with the DJSI had a higher market cap than the companies out of the index in every year between 2015 and 2019. However, the growth rate was higher for the out-of-index companies at 0.26 billion dollars per year when compared to -0.35 billion dollars per year for the companies in-index. One of the main reasons for the high average growth rate within the in-index was Rio Tinto. It is the largest mining companies in the world, and mine many different materials, not just aluminum. One possibility for Rio Tinto's success in 2019 could be because one of its competitors, Vale had to shut down its iron ore production due to back-to-back massive breaches in its mine waste facility. This could have contributed to Rio Tinto rise in market cap in 2019. Due to the outlier of Rio Tinto, the authors pose no conclusions for this specific evaluation.

Looking at the annual average net sales of the five companies within the DJSI, they were clearly higher than the out-of-index companies in every year between 2015 and 2019. The growth rate was higher for the out-of-index companies, but not by as much as market cap. The average in-index growth rate was negligible at 0.01 billion dollars per year, while the average out-of-index growth rate was 1

billion dollars per year. Once again, Rio Tinto drove the gross value for net sales, but also Norsk Hydro ASA contributed significantly to the overall growth rate. For the out-of-index companies, Chalco and Hongqiao both drove the growth, but both of them had significant growth in 2015–2017, but it flattened out from 2018–2019.

Similar to market cap and net sales, Rio Tinto dominated EBITDA in all 4 years, and as a result, the annual average between the five companies within the DJSI had higher EBITDA than the out-of-index companies every year from 2015 to 2019. Since Rio Tinto contributed such a large percent to the EBITDA for the in-index companies, the shape of the average EBITDA is very similar to that of Rio Tinto: high growth from 2015 to 2018 followed by a decline in 2019. While for the in-index companies, the overall growth rate for EBITDA was 0.38 billion dollars per year, for out-of-index companies, it was only 0.173 billion dollars per year. Essentially the out-of-index had a nearly flatlined EBITDA from 2015 to 2019.

The apparel industry was investigated and included in the DJSI companies Nike Inc., Adidas AG, Burberry Group PLC, Kering SA, and Moncler SpA. In the non-index companies, Dior, Fast Retailing, TJX companies, H&M, and Inditex were chosen (Table 3). For the market cap of the apparel companies in the DJSI, there is a consistent yearly growth of 7 billion USD a year. This growth is compared with the 3.52 billion USD of out-of-index companies. For the market cap alone, the in-index companies had over twice as high growth as those out-of-index. This implies that apparel companies included in a sustainability index showed stronger growth trends than companies that are not in a sustainability index. There is also a more reliable relationship between the linear average and the actual average of the companies surveyed in the in-index graph. While the trend for the out-of-index is not as reliable as the in-index growth, several assumptions can be made.

Out-of-index companies had a higher net sales increase, and the growth of net sales was 2.9 billion USD. In case of the in-index companies the growth was only 1 billion USD. This means that the out-of-index companies had almost triple the net sales growth compared to the companies in-index.

For the EBITDA, the trendline graphs were mostly identical. There is a slightly higher growth of EBITDA for apparel companies in the DJSI at 0.4 billion USD a year, and at first glance, it appears that the companies out of the index have a similar growth pattern with 0.5 billion USD a year. However, in the graph of out-of-index companies, there is a clear outlier (Dior) that is impacting the trend line. Essentially, if the outlier was eliminated, the growth of the out-of-index companies in regard to EBITDA is lower at 0.14 billion USD a year. The graph therefore slightly indicates that sustainable apparel companies have a better EBITDA than companies that are not.

For the pharmaceutical industry sector included in the DJSI index are companies: Roche Holding AG, Novartis AG, Sanofi Inc, Amgen Inc, and AbbVie Inc. We selected for the non-index graph companies Pfizer, Gilead Sciences, Vertex Pharmaceuticals, Novo Nordisk, and Jiangsu Hengrui Pharmaceutical (Table 4). In general, the companies that are in the DJSI have a higher market cap than companies outside of the DJSI. Pfizer is a major outlier, often with market caps that are equal to or higher than companies like Roche and Novartis. There is a distinctively lower growth in market cap for out-of-index companies compared to

in-index companies. For net sales, companies in the DJSI have a higher growth at 1.6 billion USD a year. In comparison to that, out-of-index companies have a slightly negative growth. For this group, the EBITDAs were closer than the net sales and market cap. The average for in-index ranged from around 12 Billion to 15 Billion, while the out-of-index ranged from around 9 Billion to 7 Billion. The growth of the EBITDA for pharmaceutical companies was slightly negative compared to the positive growth of the in-index companies.

For the last industry segment (forest products), we looked at the DJSI companies UPM-Kymmene Oyj, Sumitomo Forestry, Empresas CMPC SA, and BillerudKorsnas AB. For the out-of-index companies, we used International Paper, Kimberley Clark, Svenska Cellulosa, Oji Paper, and Rock-Tenn (Table 5). Again, the dotted line in the graphs represents the linear average and the solid line represents the average of the market cap for each year. The companies that are in the DJSI have a lower market cap than companies outside of the DJSI. Kimberly Clark is a major outlier, with a market cap that is twofold the out-of-index average. There is distinctively low positive growth in market cap for in-index companies; however, out-of-index companies demonstrate a negative growth. The authors propose with empirical evidence that forest products companies in sustainability indices are seeing a slow but steady increase in market cap compared to companies that are not in the indices.

The companies that are in the DJSI and out-of-index have stagnated net sales. There is some variability of net sales in companies out-of-index. Though stagnated, there is a low positive growth in net sales for in-index companies; however, out-of-index companies demonstrate a low negative growth. In-index companies had a low but positive growth overall. This implies the consistency of growth for in-index companies compared to the variability of growth for out-of-index companies for the forest products industry.

The companies that are in the DJSI have an average lower EBITDA than companies outside of the DJSI. Svenska Cellulosa is a major outlier, with an EBITDA that is almost 3× smaller than the out-of-index average. There is distinct variability of net sales in out-of-index companies with a very low positive growth in net sales for them. The out-of-index companies have low growth too, but it is almost double that of the in-index companies. The results show that out-of-index companies have, on average, higher EBITDAs than in-index companies.

A summary table is provided as supplemental data. This table includes a 5×4 table of all the results and a pooled data of all the analysis for comparison purposes. With the pooled data, we conducted an F test for inferential statistical purposes to see whether there is a significant change in slope between out-of-index and in-index.

The initial model to conduct the 3 F-tests is detailed below, with the reference group being in-index

$$\widehat{y} = \widehat{\beta}_0 + \beta_1 x + [\widehat{\beta}_2 * Indicator] + [\widehat{\beta}_3(x * Indicator)],$$

where indicator is 0=In-Index/1=Out-of-Index, $\widehat{\beta}_0$ is the intercept, $\widehat{\beta}_1$ is the main effect of year, x is the year (2015=1, 2016=2...2019=5), $\widehat{\beta}_2$ is the main effect

(change in intercept) in being out-of-index, $\hat{\beta}_3$ is the interaction effect between year and being out-of-index.

For the F test, we generated a linear regression model with interaction between year and indicator for all the five industries' market cap, net sales, and EBITDA (the three responsive variables). The dependent variables were MC/NS/EBITDA values; the independent variable was the year, and the conditional variable was being in-index or out-of-index.

The following hypothesis was used for the overall F-test of the data

$$H_0 : \beta_1 = \beta_2 = \beta_3 = 0$$

$$H_a : \text{Atleast one of } \beta \text{ is not } 0.$$

The null hypothesis means that there is no impact on MC/NS/EBITDA by year, indicator (being in-index or out-of-index), and interaction between year and indicator of index.

The alternate hypothesis means that there is at least one that impacts MC/NS/EBITDA among year, indicator (being in-index or out-of-index), and that interaction between year and indicator of index.

	F-statistic	Degrees of freedom	P value
Market Cap	0.6223	240	0.6012
Net Sales	0.7073	239	0.5485
EBITDA	0.4215	238	0.7378

All three *F*-tests conducted for MC, NS, and EBITDA had a *P* value above 0.05. Under significance level of 0.05, we failed to reject null hypothesis for each model and conclude none of the variable have a significant impact on each responsive variable; hence, there is no significant change in slope between being in-index and out-of-index.

Discussion

Existing models of economic theory have been questioned for many decades on its inability to efficiently address the 'human,' or 'behavioral' aspects of finance (Hersh Shefrin and Meir Statman 2000). The emerging fields of social finance and social and sustainable banking represent attempts to rectify this by including broader considerations of fairness, social values, and social justice in financial market operations (Rosella Care 2018). Previously, investors in the stock market, who are strongly considering these issues, would put their investments into environmental funds. Currently, these funds have transformed into sustainability funds that address the societal impacts of corporations in addition to the environmental impacts. For these funds and other sustainable actions of corporations to be successful, they need to be measured in a consistent and simple way and these

data be translated into a language that investors can understand. For that reason, the DJSI was created. This index provides a bridge between companies implementing sustainability practices and investors wishing to profit from these practices as well as a invest in a low risk-return profile (Jan Jaap Bouma et al. 2001). The biggest strength of this index is how accessible the data is to the public and how widely regarded it is.

The DJSI is separated into global regions such as North Americas, Europe, and others, and further divided into industries. These industries include capital goods, consumer durables, banks, consumer services, and others. In this study, within all the industries (an average of 24), five industries were identified by their ability to be an industry that is unique and not comparable to another industry in the index. These five industries were then analyzed by separating the largest cap companies from the DJSI to the largest cap companies from the same industry, not in the DJSI. The discussion of the results is included below.

Because of the outliers in the market cap for the airlines industry, the averaging of the numbers and the growth model can be considered somewhat skewed (see r -squared), and the general trend line comparison is not conclusive. However, the net sales comparison for the industry is more reliable. The out-of-index graph is slightly lower in net sales growth; however, the differences can be considered negligible. For the EBITDA, there was a nearly identical growth for both groups; however, in-index was slightly positive, and out-of-index was slightly negative. Any major conclusions on the differences in the trend of the data for both in-index and out-of-index graphs cannot be stated, especially since the overall F test for market cap, net sales, and EBITDA showed that there was no significant effect between year and index. Instead, the data points show a very identical picture of both groups and negligible differences. One implication of the graphs being identical is that it shows how similar each airline is to another. There is not much differentiation in the operational excellence, customer service, or product strategies in the airline industry, and therefore, most companies do perform to the others in the industry. This is also because of the rigidity of the airlines and the rules and regulations all companies have to compliant on in this industry. For example, if one airline is negatively affected by high oil prices, the rest of the airline industry is negatively affected, as well. Henceforth, it can be concluded that there are no significant differences between the sustainability index group and the non-sustainability index group for the airline industry.

For the aluminum industry, the average for market cap and net sales seems to be much higher for in-index companies than out-of-index companies. For the market cap, in-index companies have a lower growth than out-of-index, but both graphs have a very low r^2 value. The average net sales of in-index companies are almost twice as high as those of out-of-index. Other than that, a much higher growth can be observed for out-of-index companies and r^2 of the data is very low for in-index and very high for out-of-index. EBITDA-wise, there exists a very large outlier skewing the data for in-index companies and the reliability of out-of-index graph is not high. If the outlier is taken out, the average of EBITDA is somewhat identical at 2 billion USD for each graph. Additionally, the EBITDA growth for both sets of aluminum companies is low with 384 million USD a year compared to the 173 million USD a year growth for out-of-index companies. Overall, in-index companies seem to have

a higher average growth than out-of-index companies. Due to the conflicting sets of data, the authors pose that there are no significant differences between the sustainability index group and the non-sustainability index group for the airline industry.

For the apparel industry, the market cap growth for in-index companies is twofold compared to that of the out-of-index companies. It should also be noted that market cap average for both groups is very similar. Net sales of out-of-index companies grew considerably more than of in-index with average net sales of out-of-index companies being 1.8×higher than in-index companies. The average in-index apparel companies EBITDA is very similar to that of the out-of-index apparel companies. This applies to the EBITDA growth as well. For the Welch t test, the apparel industry showed no significant effect between year and index for market cap, net sales, and EBITDA, and so, no conclusion is made for financial impact between being in-index and out-of-index.

For the pharmaceutical industry, the market cap has very low r^2 value for out-of-index companies. The market cap growth for in-index is considerably higher than for in-index companies and the variability of data in out-of-index group for net sales contributes to a low r^2 . Growth of net sales for out-of-index companies is slightly negative compared to the growth of in-index companies. Average net sales for in-index are almost 2×higher than out-of-index. The average EBITDA for in-index companies is slightly higher than out-of-index companies with the EBITDA for out-of-index companies being slightly negative. R^2 for both sets of EBITDAs are very high. Overall, in-index companies are doing better than out-of-index companies in the three indicators, and are, on average, growing more than the out-of-index companies. We do not establish any causation. For the Welch t test, the pharmaceutical industry showed no significant effect between year and index for market cap, net sales, and EBITDA, and so, no conclusion is made for financial impact between being in-index and out-of-index.

For the forest products industry, the average market caps for out-of-index companies are twice as high as that of in-index companies. The r^2 value for both groups shows a somewhat reliable linear average regression model. The market cap growth for out-of-index companies is negative compared to the positive growth of in-index companies. The average net sales for each company in out-of-index companies is twice as high as that of in-index companies. r^2 values between both groups differ considerably and in-index companies show a reliable slight positive growth in net sales. The net sales for out-of-index companies have a negative growth. The average EBITDA for each company in out-of-index companies are also twofold that of in-index companies. r^2 values between both groups differ considerably and in-index companies' growth is small compared to the out-of-index's EBITDA growth. The market cap and net sales show a very opposite picture where the out-of-index companies have an actual negative growth compared to the positive growths for in-index companies. For the Welch t test, the forest products industry showed no significant effect between year and index for market cap, net sales, and EBITDA, and so, no conclusion is made for financial impact between being in-index and out-of-index.

Limitations and future research

The limitation for this research includes the lack of use of other sustainability indices for comparison. This would have given more comprehensive view to the variety of methodologies used and would also include more industries that may not have had full presentation in the chosen DJSI data. However, all the other indices we investigated and approached were not as broad or did not allow full access to their data. Also, the existing sustainability indices do lack standardization, credibility, and transparency of information (Windolph 2011) and may be linked to lack of data available from corporations. As such, our selection is one of the more encompassing indices with a high transparency and access to data for this type of research. The second limitation was the fact that we did not include the composition of the board of directors or executive management in the analysis of the companies. This perspective may have added more depth to the study. Including that information was somewhat challenging as the number of companies and industry sectors we chose was a relatively large sample of data and the 5-year scope of economic performance also eliminates these factors due to the changes in leadership even at the board level.

Future research adding data on the leadership and using more financial indicators than only market cap, net sales, and EBITDA in this context would be beneficial. Furthermore, finding data on even broader industrial areas including for example retail, information and communication technology, energy, and agriculture would further improve the study. The main argument for this research was that the industries selected for examination were mostly unrelated. However, while non-related industries were useful as an entry-point into this research, additional research into inter-related industries such as agriculture and food would produce a more complex viewpoint into the field of sustainable finance.

Conclusions

In this article, we report interesting findings on how companies' financial performance is impacted by the inclusion into a sustainability index. We selected Dow Jones Sustainability Index (DJSI) as it is a well-established open index with participation from a variety of different industries and companies. One selection criterion was also the transparency and access to sustainability index data. The DJSI allows its data to be available and was from its scope the most relevant for this study.

Different industries were selected for comparison purposes as every industry has differences in their sustainability agendas and their financial impact to the corporations. With this approach, we looked at industries for which the potential for sustainability advancement can be considered most impactful. With the tables and the analysis with the various amounts of data collected, it is evident that there is no significant impact of being in the DJSI or not being in the DJSI. Specifically, the results show only minor differences between the different industries and therefore gives a reliable indicator of aligned results. Additionally, our analysis and conclusions within each industry show that the overall inclusion into the DJSI is positive

for one industry (forest products), and for others non-consequential. Although the DJSI index is only one of the many sustainability indices, being one of the most established indices, this study gives an indication of the financial implications of participating in similar sustainability indices. With the analysis and discussion, we conclude that there is no clear negative nor positive financial impact for various industries related to belonging to in-index or out-of-index company groups.

From the investors perspective, the complexity of calculations in the sustainability index reports and incomparability of similar registries between different industries can make it confusing for investors to select which index is most useful to use. This lack of framework is what keeps many investors from getting into sustainable banking and financing, because they are unsure of what to trust and how to understand it. As more assessments and designations get introduced into this space, investors and other stakeholders can find more meaning and credibility on various approaches to evaluate the sustainability impact of the companies they evaluate.

In general, the movement toward sustainability is costly due to the necessary investments in operations and human resources involving both fixed and variable costs in short and long term. The management commitment in driving sustainability agendas includes complexities and various moving parts that brand owners, retailers, and manufacturer must keep track off. Due to these factors, it can be stated that there is somewhat a disconnect between the sustainability management and finance and the understanding of value chains and the role of 2nd-tier and 3rd-tier companies from the business and manufacturing perspective. It is a long and cross-functional organizational learning process to gain a complete picture of the value chain from strategic sustainability management perspective (Hakovirta 2022). The ability to manage corporate sustainability is a balancing act and includes continuous demand by the public for lower costs for goods and services, which accounts for a combination of shorter lead times and less-expensive materials and sourcing. Unfortunately, the solution to that demand is many times connected to non-sustainable technical or business processes. At the same time, investors demand differentiation by brand owners and significant growth, and require companies to be able to drive world class sustainability strategies not just in their own operations but also in the entire business ecosystem they operate in. This demands world class management skills and leadership, and such companies are typically willing to show their excellence or willingness to develop it by participating in external sustainability assessments and ultimately by joining sustainability indices such as DJSI World index. Large industrial players in certain industries have typically most complexities and investment needs to increase their positive impact in sustainability. This is why, we chose the industries we examined and conclude that 'no financial benefit or loss' in having companies of certain industries invest and take charge of sustainability development may help financial managers, sustainability managers, and/or innovation managers promote going sustainable for environmental purposes and the overall benefit of society.

It is important that the development continues for the methodologies to analyze various components of sustainability impact data and how it is reported so that companies and financial institutions—who normally do not focus on social or environmental benefits to society—can understand the results and act in a fact-based

manner. With Social Responsible Investing (SRI), assessing impact as well as being realistic about the level of social impact that can be created is especially important (Collins Ngwakwe 2018; Cho et al. 2012). SRI requires sustainability indices to simplify details into rankings and compare those details between organizations that aim to list themselves in stock exchanges. To facilitate this, corporate sustainability leadership needs to let investors know the value and returns of sustainability improvements, and banks need to provide knowledge to investors to understand related CSR information. Unfortunately, because of the abundance of new reporting initiatives and surveys in this field, there exists the possibility of incomparability between different reports and differently sourced data from different reports. Finding an encompassing method that can combine and compare each of the sustainability indices (or the most popular ones) and a system that evaluates the transparency of each company's claims to sustainability will help give investors more credible information to relate firms' sustainability performance with its firm value.

While this research is on the financial impact of being in a sustainability index using historical data, it is important to note that if companies systematically and strategically improve in the right direction to avoid potential sustainability risks—they will be ahead of many competitors in the long term. Furthermore, a more strategic company investing in sustainability development can benefit in the long run as it is very likely that industries will encounter more strict consumer requests and legislation due to the general movement of society becoming more aware of sustainability issues (Schulte et al. 2020).

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Data availability All data generated or analyzed during this study are included in this published article. Raw data in excel format are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors declare no competing interest.

References

- Amgen (2022) Environment, social and governance strategy. <https://www.amgen.com/responsibility/environment-social-and-governance-strategy>. Accessed 20 Mar 2022
- Avetisyan E, Hockerts K (2017) The consolidation of the ESG rating industry as an enactment of institutional retrogression. *Bus Strateg Environ* 26(3):316–330
- Baker S (2018) Third-party ESG ratings evolving for investor needs. *Pensions Invest* 46(21):3
- Balcilar M, Demirer R, Gupta R (2017) Do sustainable stocks offer diversification benefits for conventional portfolios? An empirical analysis of risk spillovers and dynamic correlations. *Sustainability* 9(10):1799
- Barei F, Le Pen C (2014) Refocusing on R&D model or redefining marketing strategy? Anticipating sustainability for generic pharmaceutical industry. *J Med Mark* 14(2–3):81–90
- Boerner LK (2021) Airlines want to make flight more sustainable. How will they do it? *Chem Eng News* 99(32):2005

- Bouma JJ, Jeucken M, Klinkers L (2017) Sustainable banking: the greening of finance. Routledge, London
- Care R (2019) Sustainable banking: issues and challenges. Palgrave Pivot, New York
- Caridi M, Perego A, Tumino A (2013) Measuring supply chain visibility in the apparel industry. *Benchmark Int J* 20(1):25–44
- Cho CH, Guidry RP, Hageman AM, Patten DM (2012) Do actions speak louder than words? An empirical investigation of corporate environmental reputation. *Acc Organ Soc* 37(1):14–25
- Climate change. Rio Tinto. <https://www.riotinto.com/sustainability/climate-change>. Accessed 2 Mar 2022.
- Czerwińska T, Kazmierkiewicz P (2015) ESG rating in investment risk analysis of companies listed on the public market in Poland: ESG rating in investment risk analysis. *Econ Notes-Monte Paschi Siena* 44(2):211–248
- Danso A et al (2019) Environmental sustainability orientation, competitive strategy and financial performance. *Bus Strateg Environ* 28(5):885–895
- Denuwara N, Majjala J, Hakovirta M (2019) Sustainability benefits of RFID technology in the apparel industry. *Sustainability* 11(20):6477. <https://doi.org/10.3390/su11226477>
- Dow Jones Sustainability Indices Components Access (2020) Pure play asset management | Robeco.com, 2020. <https://www.spglobal.com/esg/csa/csa-resources/dow-jones-sustainability-indices-components-bh19>. Accessed 3 Nov 2020
- Dudin MN, Voykova NA, Frolova EE, Artemieva JA, Rusakova EP, Abashidze AH (2017) Modern trends and challenges of development of global aluminum industry. *Metalurgija* 56(1–2):255–258
- Durand R, Paugam L, Stolowy H (2019) Do investors actually value sustainability indices? Replication, development, and new evidence on CSR visibility. *Strateg Manag J* 40(9):1471–1490
- Ellison L, Sarah S (2007) Assessing sustainability in the existing commercial property stock: establishing sustainability criteria relevant for the commercial property investment sector. *Prop Manag* 25(3):287–304
- Fatemi AM, Fooladi IJ (2013) Sustainable finance: a new paradigm. *Glob Financ J* 24(2):101–113
- Francis B, Harper P, Kumar S (2018) The effects of institutional corporate social responsibility on bank loans. *Bus Soc* 57(7):1407–1439
- Friede G, Busch T, Bassem A (2015) ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *J Sustain Finance Invest* 5(4):210–233. <https://doi.org/10.1080/20430795.2015.1118917>
- Gan J (2013) Economic and environmental competitiveness of US-made forest products: implications for offshore outsourcing. *J Forest* 111(2):94–100
- Grewatsch S, Kleindienst I (2015) When does it pay to be good? Moderators and mediators in the corporate sustainability-corporate financial performance relationship: a critical review. *J Bus Ethics* 145(2):383–416
- Hakovirta M (2022) Strategic sustainability management, ISBN 9781792460807. Kendall Hunt Publishing Company, Dubuque
- Harris L, Eitan G (1986) Price and volume effects associated with changes in the S&P 500 list: new evidence for the existence of price pressures. *J Finance (new York)* 41(4):815–829
- Hawn O, Chatterji AK, Mitchell W (2018) Do investors actually value sustainability? New evidence from investor reactions to the Dow Jones Sustainability Index (DJSI). *Strateg Manag J* 39(4):949–976
- Höchstädter AK, Scheck B (2014) What's in a name: an analysis of impact investing understandings by academics and practitioners. *J Bus Ethics* 132(2):449–475
- Jestratijevic I, Maystorovich I, Vrabčič-Brodnjak U (2022) The 7 Rs sustainable packaging framework: systematic review of sustainable packaging solutions in the apparel and footwear industry. *Sustain Product Consum* 30:331–340
- Kaur D, Bhardwaj NK, Lohchab RK (2018) Environmental aspect of using chlorine dioxide to improve effluent and pulp quality during wheat straw bleaching. *Waste Biomass Valoriz* 10(5):1231–1239
- Kozłowski A, Searcy C, Bardecki M (2015) Corporate sustainability reporting in the apparel industry: an analysis of indicators disclosed. *Int J Product Perform Manag* 64(3):377–439
- La Torre M et al (2019) Business models for sustainable finance: the case study of social impact bonds. *Sustainability* 11(7):1887
- Laidlaw J (2018) S&P ratings: energy efficient loans, securitization to drive green bond issuance. *SNL Bank Thrift Daily* (online)
- León T, Liern V, Pérez-Gladish B (2019) A multicriteria assessment model for countries' degree of preparedness for successful impact investing. *Manag Decis* (ahead-of-print)

- López MV, García A, Rodriguez L (2007) Sustainable development and corporate performance: a study based on the Dow Jones sustainability index. *J Bus Ethics* 75(3):285–300
- Margolis JD, Walsh JP (2003) Misery loves companies: rethinking social initiatives by business. *Adm Sci Q* 48(2):268–305
- Margolis JD, Elfenbein HA, Walsh JP (2007) Does it pay to be good? A meta-analysis and redirection of research on the relationship between corporate social and financial performance. *Ann Arbor* 1001(48109–1234):1–68
- McCollum D, Gould G, Greene D (2010) Greenhouse gas emissions from aviation and marine transportation: mitigation potential and policies. UC Davis, Davis
- Ngwakwe CC (2018) Stock exchanges sustainability initiatives and corporate environmental sustainability commitment. *EuroEconomica* 37(3):244
- Orazalin N, Mahmood M, Narbaev T (2019) The impact of sustainability performance indicators on financial stability: evidence from the Russian Oil and Gas Industry. *Environ Sci Pollut Res Int* 26(8):8157–8168
- Orlitzky M, Schmidt FL, Rynes SL (2003) Corporate social and financial performance: a meta-analysis. *Organ Stud* 24(3):403–441
- Pereno A, Eriksson D (2020) A multi-stakeholder perspective on sustainable healthcare: from 2030 onwards. *Futures J Policy Plan Futures Stud* 122:102605–102605
- Petrescu DC, Bran F, Radulescu CV, Petrescu-Mag RM (2020) Green procurement through Forest Stewardship Council (FSC) certification in the private sector: perceptions and willingness to buy of private companies from Romania. *Amfiteatru Econ* 22(53):42–56
- Porter ME, Kramer MR (2006) Strategy and society: the link between competitive advantage and corporate social responsibility. *Harvard Bus Rev* (online) 84(12):78–163
- Renneboog L, Ter Horst J, Zhang C (2008) Socially responsible investments: institutional aspects, performance, and investor behavior. *J Bank Finance* 32:1723–1742
- Robinson M, Kleffner A, Bertels S (2011) Signaling sustainability leadership: empirical evidence of the value of DJSI membership. *J Bus Ethics* 101(3):493–505
- Robson M, Davis T (2015) Evaluating the transition to sustainable forest management in Ontario's Crown Forest Sustainability Act and forest management planning manuals from 1994 to 2009. *Can J Res* 45(4):436–443
- Saevarsdottir G, Kvande H, Welch BJ (2019) Aluminum production in the times of climate change: the global challenge to reduce the carbon footprint and prevent carbon leakage. *JOM* 72(1):296–308
- Schulte J, Villamil C, Hallstedt S (2020) Strategic Sustainability risk management in product development companies: key aspects and conceptual approach. *Sustainability* 12(24):10531
- Searcy C (2011) Corporate sustainability performance measurement systems: a review and research agenda. *J Bus Ethics* 107(3):239–253
- Searcy C, Elkhawas D (2012) Corporate sustainability ratings: an investigation into how corporations use the Dow Jones Sustainability Index. *J Clean Prod* 35:79–92
- Shefrin H, Statman M (2000) Behavioral portfolio theory. *J Financ Quant Anal* 35(2):127–151
- Sierra R, Tirado M, Palacios W (2003) Forest-cover change from labor- and capital-intensive commercial logging in the southern Chocó rainforests. *Prof Geogr* 55(4):477–490
- Sousa Gabriel VM, Rodeiro-Pazos D (2018) Do short- and long-term environmental investments follow the same path? *Corp Soc-Respons Environ Manag* 25(1):14–28
- Spitzeck H, Chapman S (2012) Creating shared value as a differentiation strategy—the example of BASF in Brazil. *Corp Gov* 12(4):499–513
- Taylor D (2015) The pharmaceutical industry and the future of drug development. *Pharmaceut Environ* 1:1–33
- Turner M (2019) Sustainability-linked loans get their own standards. *Global Capital*
- US EPA (2020). EPA finalizes airplane greenhouse gas emission standards. Accessed 2 Mar 2022
- Windolph SE (2011) Assessing corporate sustainability through ratings: challenges and their causes. *J Environ Sustain* 1(1):61–80
- Yang C-C, Ou S-L, Hsu L-C (2019) A hybrid multi-criteria decision-making model for evaluating companies' green credit rating. *Sustainability* 11(6):1506
- Yu M, Zhao R (2015) Sustainability and Firm valuation: an international investigation. *Int J Account Inf Manag* 23(3):289–307
- Yue Q, Wang H, Gao C, Du T, Liu L, Lu Z (2015) Resources saving and emissions reduction of the aluminum industry in China. *Resour Conserv Recycl* 104:68–75