SCISPACE
formerly Typeset

Open access • Journal Article • DOI:10.1007/S10640-011-9529-Z

Is it Beneficial to be Included in a Sustainability Stock Index? A Panel Data Study for European Firms — Source link

Andreas Ziegler, Andreas Ziegler

Institutions: University of Kassel, University of Zurich

Published on: 01 Jul 2012 - Environmental and Resource Economics (Springer Netherlands)

Topics: Index (economics), Stock market index, Corporate sustainability, Panel data and Return on assets

Related papers:

- Do stock investors value corporate sustainability? Evidence from an event study
- Does the stock market value the inclusion in a sustainability stock index? An event study analysis for German firms
- The corporate social performance-financial performance link
- How Does the Market Value Corporate Sustainability Performance
- Sustainable Development and Corporate Performance: A Study Based on the Dow Jones Sustainability Index

Share this paper:

View more about this paper here: https://typeset.io/papers/is-it-beneficial-to-be-included-in-a-sustainability-stock-3fwpb1s494

Zurich Open Repository and Archive
University of Zurich
University Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2012

Is it beneficial to be included in a sustainability stock index? A panel data study for European firms

Ziegler, Andreas

Abstract: This paper empirically examines the effect of inclusion in the Dow Jones Sustainability World Index (DJSI World) on corporate financial performance. On the basis of panel data for European firms that were included in the Dow Jones Stoxx 600 Index over time, our micro-econometric analysis with fixed and random effects models implies positive impacts on return on assets for continental European countries, but insignificant effects for Anglo-Saxon European countries (i.e., the United Kingdom and Ireland). Furthermore, the impacts on alternative indicators of corporate financial performance such as Tobin's Q are generally insignificant. The weak or neutral effect of inclusion in the DJSI World on corporate financial performance can be explained by several mutually confounding factors. Furthermore, the composition of this sustainability stock index is influenced by factors that need not necessarily be directly connected to corporate environmental or social activities, so that potential positive and negative effects of corporate sustainability performance on financial performance can be weakened. Methodologically, this study again supports the strong relevance of unobserved firm heterogeneity since the application of misspecified pooled regression models leads to obviously biased estimation results

DOI: https://doi.org/10.1007/s10640-011-9529-z

Posted at the Zurich Open Repository and Archive, University of Zurich
ZORA URL: https://doi.org/10.5167/uzh-156026
Journal Article
Published Version

Originally published at:
Ziegler, Andreas (2012). Is it beneficial to be included in a sustainability stock index? A panel data study for European firms. Environmental and Resource Economics, 52(3):301-325.
DOI: https://doi.org/10.1007/s10640-011-9529-z

Environ Resource Econ (2012) 52:301–325
DOI 10.1007/s10640-011-9529-z

Is it Beneficial to be Included in a Sustainability Stock Index? A Panel Data Study for European Firms

Andreas Ziegler

Accepted: 17 November 2011 / Published online: 3 December 2011
© Springer Science+Business Media B.V. 2011

Abstract This paper empirically examines the effect of inclusion in the Dow Jones Sustainability World Index (DJSI World) on corporate financial performance. On the basis of panel data for European firms that were included in the Dow Jones Stoxx 600 Index over time, our micro-econometric analysis with fixed and random effects models implies positive impacts on return on assets for continental European countries, but insignificant effects for Anglo-Saxon European countries (i.e., the United Kingdom and Ireland). Furthermore, the impacts on alternative indicators of corporate financial performance such as Tobin's Q are generally insignificant. The weak or neutral effect of inclusion in the DJSI World on corporate financial performance can be explained by several mutually confounding factors. Furthermore, the composition of this sustainability stock index is influenced by factors that need not necessarily be directly connected to corporate environmental or social activities, so that potential positive and negative effects of corporate sustainability performance on financial performance can be weakened. Methodologically, this study again supports the strong relevance of unobserved firm heterogeneity since the application of misspecified pooled regression models leads to obviously biased estimation results.

Keywords Sustainability stock index · Corporate environmental and social activities · Corporate financial performance · Panel data · Unobserved firm heterogeneity

JEL Classification M14 · Q01 · Q56 · C23

A. Ziegler (✉)
Department of Economics, University of Kassel, Nora-Platiel-Str. 5, 34109 Kassel, Germany
e-mail: andreas.ziegler@uni-kassel.de

A. Ziegler
Center for Corporate Responsibility and Sustainability, University of Zurich,
Künstlergasse 15a, 8001 Zurich, Switzerland

1 Introduction

Knowledge about the relationship between corporate environmental or social performance and financial success contributes to the debate about whether managers systematically miss profit opportunities if they decide against protection of the natural environment (e.g., King and Lenox 2001) or compliance with social and ethical norms. Studies of this relationship are also interesting for investors. The question is whether socially responsible investing (SRI), also called ethical or sustainable investing (e.g., Renneboog et al. 2008), which refers to the practice of choosing stocks on the basis of environmental, social, and ethical screens, is rewarded or penalized by the stock markets. Against this background, some portfolio analyses compare the risk-adjusted stock returns of socially responsible and conventional mutual funds (e.g., Bauer et al. 2005). Other portfolio analyses focus on specific corporate sustainability assessments, for example, by Innovest (e.g., Derwall et al. 2005) or by KLD Research & Analytics (e.g., Kempf and Osthoff 2007). Another direction of SRI studies examines the financial performance of sustainability stock indexes (e.g., Bauer et al. 2005; Schröder 2007), which are the basis for several socially responsible funds. By examining one of the most prominent sustainability stock indexes, namely the Dow Jones Sustainability World Index (DJSI World), we contribute to this empirical literature in this paper.

However, we do not focus on the investor perspective, i.e., we do not analyze the stock returns of portfolios that are constructed on the basis of the inclusion in this specific sustainability stock index. Instead, this paper captures a firm-specific perspective. Following McWilliams and Siegel (2000) and Becchetti et al. (2008), we econometrically analyze the effect of inclusion in a sustainability stock index on corporate financial performance on the basis of firm-level data. According to conventional perception, it is expected that firms are only incorporated in sustainability stock indexes if they act in an environmentally or socially more sensitive manner than their competitors. Against this background, our analysis contributes to micro-econometric studies, which examine whether it pays to be "green" or otherwise "responsible" (e.g., Hart and Ahuja 1996; King and Lenox 2001; Ziegler et al. 2007).

In contrast to many other cross-sectional micro-econometric studies about the effect of corporate environmental or social activities on financial performance, but in line with, for example, the studies of King and Lenox (2001, 2002) and Telle (2006), we use flexible panel data models in order to control for unobserved firm heterogeneity. Therefore, we can avoid omitted variable biases due to potential model misspecifications. Furthermore, this study refers to the entire European stock market and thus considers firms of a region that has not been extensively analyzed so far since most former micro-econometric studies examine US firms (e.g., Guenster et al. 2011). Moreover, the few studies with a European focus only consider single countries, such as the United Kingdom (UK) (e.g., Elsayed and Paton 2005) or Norway (e.g., Telle 2006). Finally, we consider a specific sustainability stock index, namely the DJSI World, which has (to our knowledge) not been micro-econometrically examined in this respect. In contrast, McWilliams and Siegel (2000) and Becchetti et al. (2008) refer to the inclusion of US firms in the Domini 400 Social Index.

The structure of the paper is as follows: Sect. 2 provides a theoretical basis for the micro-econometric analysis and reviews the empirical literature. Section 3 explains our methodological approach. The data and variables in the micro-econometric analysis are described in Sect. 4. Section 5 discusses the empirical results and Sect. 6 concludes.

2 Background

2.1 Theoretical Basis

This paper empirically analyzes the impact of inclusion in the DJSI World on corporate financial performance. This sustainability stock index is commonly considered an appropriate indicator of corporate environmental and social activities, corporate sustainability performance, or corporate social responsibility (CSR) (e.g., McWilliams and Siegel 2001; Heal 2005). However, current theory of the effect of corporate environmental and social activities on financial success is quite ambiguous (e.g., Waddock and Graves 1997; Guenster et al. 2011). Arguments for a negative impact can be based on neoclassical micro-economics, which emphasizes that the operating costs of corporate environmental (e.g., Telle 2006) or social activities outweigh their financial benefits. As a consequence, a high corporate sustainability performance can lead to reduced profits, decreased firm values, or competitive disadvantages. Against this background, already Friedman (1970) argues that there is no role for CSR. This neoclassical argumentation is supported by corporate governance theory (e.g., Shleifer and Vishny 1997; Tirole 2006) by emphasizing that only if corporate governance structures (e.g., optimal control structures) are properly installed, management will find and choose the profit-maximizing path. Therefore, it can be argued that the consideration of goals of other groups (e.g., the general public) as motivation for corporate environmental and social activities enlarges the latitude of management. This can then be misused for maximizing the utility of managers, so that the risk of counterproductive activities with respect to competitiveness and thus financial performance increases.

However, arguments for a positive impact of corporate sustainability performance on financial performance can also be based on neoclassical micro-economics by emphasizing the role of activities in reducing the extent of externalized costs. While Friedman (1970) assumes in his criticism of CSR that the government defines property rights, so that no external effects exist, Heal (2005) argues that the government does not fully resolve all problems with external effects and that the competitive markets are not efficient. Therefore, corporate environmental and social activities can substitute for missing markets (and thus missing regulations) if external costs arise from them and can reduce conflicts between firms and stakeholder groups, such as the government, the general public, non-governmental organizations, competitors, employees, or clients. As a consequence, it can be argued that the reduction of these conflicts increases corporate profits and thus financial performance, at least in the long term.

This stakeholder argument is strengthened in the strategic management literature (e.g., Barnett and Salomon 2006). Stakeholder theory suggests that management has to satisfy several groups that have some interest or "stake" in a firm and thus can influence its outcome (e.g., McWilliams et al. 2006). It can therefore be beneficial to engage in environmental and social activities because otherwise these stakeholders could withdraw the support for the firm. For example, the avoidance of child labor in the full value-added chain of the products can reduce incalculable risk due to aggressive campaigns of non-governmental organizations. Another example refers to good employee relationships that are often rather inexpensive, but can improve morale and satisfaction of the employees. This can lead to gains in productivity and thus to competitive advantages compared with less responsible firms (e.g., Waddock and Graves 1997). These arguments can be embedded in the resource-based view of the firm (e.g., Barney 1991), which suggests that competitive advantages evolve from internal capabilities that are valuable, rare, and difficult to imitate or substitute (e.g., Russo and Fouts 1997; King

and Lenox 2001; McWilliams et al. 2006). In this respect, stakeholder management can be considered an important organizational capability or resource.

The previous arguments exclusively refer to real corporate environmental and social activities. While negative news, for example, with respect to child labor or environmental pollution can relatively easily be observed and evaluated, it is much more difficult to identify proactive environmental or social activities. One example for a signal to stakeholders that a firm is environmentally active is the certification of environmental management systems according to ISO 14001 (e.g., Cañón-de-Francia and Garcés-Ayerbe 2009). Another signal for corporate sustainability performance is the inclusion in a sustainability stock index. Reputation gains through this positive signal, for example, can attract customers who are sensitive to such issues, which could lead to higher sales. Furthermore, firms with a good reputation can increase their employee retention rate and additionally attract highly skilled and thus more productive employees. Against this background, it can be hypothesized that this reputation gain mechanism implies that the effect of inclusion in the DJSI World on corporate financial performance is more positive than the effect of a high corporate sustainability performance that is only insufficiently communicated to corresponding stakeholders.

However, the prerequisite for this argumentation is that the inclusion in a sustainability stock index, such as the DJSI World, is a reliable signal for a higher intensity of environmental and social activities. In this respect, Koellner et al. (2007) show that the differences between socially responsible and conventional funds are relatively small in terms of environmental impacts. With respect to the proactivity of specific corporate environmental activities, Cañón-de-Francia and Garcés-Ayerbe (2009) also argue that the ISO 14001 certification could be interpreted as a purely symbolic action. According to this view, corporate activities for this certification need not necessarily be voluntarily conducted under flexible conditions, but could also represent a compulsory response to market pressure. This argumentation can be transferred to the inclusion in sustainability stock indexes. In this case, corresponding environmental and social activities can lead to additional unexpected costs, which are not directly productive, so that weaker positive or even negative impacts on financial success are possible. Due to this overall theoretical ambiguity, we conclude that the impact of inclusion in the DJSI World on corporate financial performance is ultimately an empirical question.

2.2 Empirical Literature Review

The financial performance of sustainability stock indexes is analyzed by estimating their risk-adjusted returns (e.g., Bauer et al. 2005; Schröder 2007). Methodologically, this is in line with several portfolio analyses, which consider socially responsible and conventional mutual funds or portfolios that focus on specific corporate sustainability assessments (e.g., Derwall et al. 2005; Bauer et al. 2005; Kempf and Osthoff 2007), as discussed above. In contrast, micro-econometric analyses that examine the effects of inclusion in a sustainability stock index are rare. One exception is the study of Curran and Moran (2007) who examine British firms and their inclusion in the specific FTSE4Good UK 50 Index. By using the event study methodology, i.e., by considering the mean stock returns for corporations experiencing an unexpected event, they report insignificant impacts. Methodologically, this event study approach is in line with the study of Cañón-de-Francia and Garcés-Ayerbe (2009), who examine the certification according to ISO 14001, and with a growing number of CSR related event studies (e.g., Konar and Cohen 1997; Posnikoff 1997; Khanna et al. 1998, Dasgupta et al. 2001; Gupta and Goldar 2005) referring to positive or negative news about specific components of CSR, such as toxic emissions or the disinvestment from South Africa during the apartheid regime. However, two shortcomings of common event

studies are that they only analyze short-run effects and are limited to the analysis of stock performance.

Indeed, it is also possible that the inclusion in sustainability stock indexes has a long-term effect on corporate financial performance. To our knowledge, the only micro-econometric analyses in this respect can be found in McWilliams and Siegel (2000) and Becchetti et al. (2008). Both studies examine the effect of inclusion of US firms in the Domini 400 Social Index, which is an ethical stock index with a focus on corporate assessments of gambling, tobacco, and alcohol. While McWilliams and Siegel (2000) do not find a significant impact, Becchetti et al. (2008) report positive effects on total sales per employee, but negative effects on return on equity. It should be noted that Becchetti et al. (2008) use fixed effects models in order to control for unobserved firm heterogeneity in their panel data analysis. This is in contrast to McWilliams and Siegel (2000), who emphasize the importance of a correct model specification to circumvent omitted variable biases, but do not apply flexible panel data approaches, although they use panel data (they consider average annual values for corporate financial performance and the inclusion in the Domini 400 Social Index). The application of flexible panel data models including unobserved firm heterogeneity in Becchetti et al. (2008) is in line with the studies of King and Lenox (2001, 2002), Elsayed and Paton (2005), and Telle (2006).

In contrast to some micro-econometric studies (e.g., Filbeck and Gorman 2004; Ziegler et al. 2007) that use stock returns as an indicator of corporate financial performance, McWilliams and Siegel (2000) and Becchetti et al. (2008) apply accounting data based indicators. This is in line with most other studies examining the impact of corporate environmental or social activities on, for example, Tobin's Q, return on assets, return on sales, or return on equity (e.g., Hart and Ahuja 1996; Waddock and Graves 1997; Russo and Fouts 1997; Konar and Cohen 2001; King and Lenox 2001, 2002; Elsayed and Paton 2005; Telle 2006; Guenster et al. 2011). Many of these studies, however, only use one-dimensional and rather narrow CSR indicators, such as emissions of pollutants, or more general indicators which only refer to the environmental dimension. Studies that incorporate both corporate environmental and social activities (e.g., Waddock and Graves 1997; Ziegler et al. 2007), besides the studies on the Domini 400 Social Index as discussed above, are exceptions in this respect.

3 Methodological Approach

Following King and Lenox (2001, 2002), Elsayed and Paton (2005), Telle (2006), and Becchetti et al. (2008), we consider panel data models for our micro-econometric analysis. Our starting point is the following approach for firm i in year t (i = 1,…,N; t = 1,…,T):

$$CFP_{it} = \alpha + \beta DJSI_{it} + \gamma' X_{it} + \delta' Z_{it} + \varepsilon_{it} \quad (1)$$

While CFP_{it} denotes corporate financial performance, $DJSI_{it}$ is a dummy variable that takes the value one if firm i is included in the DJSI World in year t. Furthermore, the vector X_{it} comprises several economic variables as discussed below, which are potentially related to corporate financial performance. The vector Z_{it} comprises some time, country, and sector dummies. Finally, ε_{it} is the error term and α, β, and the components in the vectors γ and δ are the unknown parameters to be estimated.

Model approach (1) implies that corporate financial performance in year t is related to the inclusion in the DJSI World and to other economic variables in the same year t. However, such approaches do not allow reliable conclusions about the causality of the relationship between

the dependent and explanatory variables and in particular between corporate financial performance and the inclusion in the DJSI World. It can also be hypothesized that financial success positively affects environmental (e.g., Telle 2006) and social activities and thus the inclusion in sustainability stock indexes. In order to reduce possible simultaneity biases (and in line with the aforementioned studies), we regress in the second step corporate financial performance on variables that are lagged by one year (i = 1,…,N; t = 2,…,T):

$$CFP_{it} = \alpha + \beta\ DJSI_{i,t-1} + \gamma'\ X_{i,t-1} + \delta'\ Z_{it} + \varepsilon_{it} \tag{2}$$

If it is assumed that the ε_{it} are independent and identically distributed for all i and t with expectation zero and variance $var(\varepsilon_{it}) = \sigma_{\varepsilon}^2$, this leads to pooled regression models that can be straightforwardly estimated by ordinary least squares (OLS). Such approaches are similar to cross-sectional models and thus could lead to omitted variable biases due to unobserved firm characteristics. Therefore, we also apply more flexible panel data models including unobserved firm heterogeneity besides lagged explanatory variables as in the model approach (2). Unobserved heterogeneity ν_i for firm i can be incorporated in (1) and (2) when the error term ε_{it} is divided into two parts u_{it} and ν_i:

$$CFP_{it} = \alpha + \beta\ DJSI_{it} + \gamma' X_{it} + \delta'\ Z_{it} + \nu_i + u_{it} \tag{3}$$

$$CFP_{it} = \alpha + \beta\ DJSI_{i,t-1} + \gamma' X_{i,t-1} + \delta' Z_{it} + \nu_i + u_{it} \tag{4}$$

In these model approaches, the expectation of u_{it} is zero, $var(u_{it}) = \sigma_u^2$, and the covariances $cov(u_{it}, u_{js}) = 0$ for $i \neq j$ or $t \neq s$ (i, j = 1,…,N; t, s = 1,…,T). If ν_i is a group specific random variable with expectation zero, $var(\nu_i) = \sigma_\nu^2$, $cov(\nu_i, \nu_j) = 0$ for $i \neq j$, $cov(\nu_i, u_{it}) = 0$, and ν_i uncorrelated with all explanatory variables, this leads to random effects models, which we will term as (3′) and (4′) in the following. These models can be estimated by feasible generalized least squares (FGLS). If in contrast ν_i is a group specific constant term that does not vary over time and can be correlated with the explanatory variables, this leads to fixed effects models, which we will term as (3″) and (4″) in the following. The corresponding within-transformed models can also be estimated by OLS, similar to the case of pooled regression models.[1]

4 Data and Variables

4.1 Inclusion in the DJSI World

The main explanatory variable in our micro-econometric analysis is the dummy ("DJSI World") for the inclusion in the DJSI World. Together with Dow Jones Indexes, the SAM (Sustainable Asset Management) Group has launched a family of sustainability stock indexes to track the financial performance of corporations that are leaders in terms of sustainability performance (including environmental, social, and also economic criteria, see http://www.sustainability-indexes.com in the following). The DJSI World intends to comprise the world-

[1] It should be mentioned that dynamic effects could also matter. Dynamic panel data models (e.g., Bond 2002) including lagged dependent variables (i.e., in our case $CFP_{i,t-1}$) as explanatory variables can, for example, be estimated by Generalized Method of Moments (GMM) according to Arellano and Bond (1991). While we have also experimented with this approach, the estimation results are rather inconsistent, which is most likely a consequence of our relatively short observation period due to the restricted availability of corresponding data. Dynamic panel data models only work reliably for a larger time dimension, so that we do not report the corresponding estimation results. Furthermore, it should be mentioned that the estimation results of Elsayed and Paton (2005) suggest that allowing for unobserved firm heterogeneity is much more important than allowing for dynamic effects.

wide leaders, i.e., the 10% most sustainable firms of the biggest 2,500 corporations in the Dow Jones Global Total Stock Market Index. While our micro-econometric analysis refers to European firms, we do not examine the Dow Jones Sustainability Europe Index (DJSI Europe) or the former Dow Jones Stoxx Sustainability Index (DJSI Stoxx). These sustainability stock indexes intend to include the 20% most sustainable European firms of the largest 600 European firms in the Dow Jones Global Total Stock Market Index or in the Dow Jones Stoxx 600 Index (DJ Stoxx 600 Index) (e.g., Ziegler and Schröder 2010). The reason for our analysis of the DJSI World is that the DJSI Stoxx was first published in 2001, i.e., 2 years after the DJSI World so that its analysis would strongly restrict the time dimension in our panel data (the DJSI Europe as successor of the DJSI Stoxx was first launched in 2010).

It should be noted that the DJSI World (in line with other Dow Jones sustainability stock indexes) follows the best-in-class approach and thus comprises the sustainability performance leaders from each sector. For this purpose firms are annually assessed with general and industry specific criteria and are compared against their peers in the same sector. The assessments are conducted by SAM and are mainly based on responses to annual written surveys with detailed questionnaires on corporate environmental and social activities. Furthermore, SAM internally conducts additional sustainability assessments for some firms that do not participate in the survey. In this respect, it can be questioned whether the assessments on the basis of the annual standardized written surveys are fully comparable with these additional internal assessments. Another problem refers to the fact that the number of additionally analyzed firms is rather low, so that a high number of firms is not assessed at all (e.g., Ziegler and Schröder 2010). In addition, it should be noted that firm size plays an important role in the composition of the DJSI World. While this sustainability stock index intends to comprise the 10% corporations of each sector with the highest assessments in each year among the world-wide biggest 2,500 corporations, the market capitalization coverage for each Dow Jones supersector (i.e., an aggregation of one or more sectors) should amount to 20% of the Dow Jones Global Total Stock Market Index market capitalization for that supersector (in the meantime the market capitalization coverage has been decreased to 15%). As a consequence, more than 300 firms are (since 2002) included in the DJSI World, so that the previously intended numbers of corporations in these sustainability stock indexes are exceeded.

The population for our micro-econometric analysis refers to the European corporations that were included in the DJ Stoxx 600 Index between 1999 and 2003. While we also consider unbalanced panels as discussed below, we focus on balanced panels, i.e., on firms continuously included in this stock index over the entire observation period. This focus is due to two reasons. First, data from unbalanced panels comprise firms that are only temporarily included in the underlying DJ Stoxx 600 Index due to their market value, which could lead to biased estimation results. Second, the additional inclusion of firms for only one or two years could also distort the identification of unobserved firm heterogeneity over time. In the case of the balanced panel data models with unlagged explanatory variables, we can examine $N = 266$ corporations and thus 1,330 observations, for which we have all relevant financial data (that stem from Bloomberg) as discussed below over the entire observation period between 1999 and 2003. In the case of the corresponding models with lagged explanatory variables, the number of observations for the $N = 266$ corporations decreases to 1,064 for the time period between 2000 and 2003.

On the basis of the balanced panel with $N = 266$ corporations and 1,330 observations, Table 1 reports some descriptive statistics for the inclusion in the DJSI World over the time period between 1999 and 2003. The upper part of the table shows that the shares of the inclusion in the DJSI World strongly increase over time, particularly from 27.8% in 2001

Table 1 Descriptive statistics for inclusion in DJSI World, balanced panel, N = 266 corporations, 1,330 observations, time period: 1999–2003

	Number of corporations 1999	Number of corporations 2000	Number of corporations 2001	Number of corporations 2002	Number of corporations 2003	Number of observations 1999–2003
Inclusion in DJSI World	63	63	74	112	111	423
(i.e., DJSI World = 1)	(23.7%)	(23.7%)	(27.8%)	(42.1%)	(41.7%)	(31.8%)
Number of yearly inclusions in DJSI World (i.e., DJSI World = 1) between 1999 and 2003	Number of corporations	Number of yearly changes between inclusion and no inclusion in DJSI World (i.e., DJSI World = 1 and DJSI World = 0) between 1999 and 2003	Number of corporations			
0	133	0	174			
	(50.0%)		(65.4%)			
1	11	1	82			
	(4.1%)		(30.8%)			
2	45	2	10			
	(16.9%)		(3.8%)			
3	27	3	0			
	(10.2%)		(0.0%)			
4	9	4	0			
	(3.4%)		(0.0%)			
5	41					
	(15.4%)					

to 42.1% in 2002. This development between 2001 and 2002 has mainly internal selection reasons since previous to 2002 the DJSI World intended to comprise the most sustainable firms on the basis of only the biggest 2000 instead of now 2,500 world-wide corporations in the Dow Jones Global Total Stock Market Index. As a consequence, also the number of European corporations included in the DJSI World (that never comprised a fixed number of corporations over time) rises in 2002. The lower part of the table shows that many firms are either included in the DJSI World (15.4%) or not included (50.0%) throughout the entire time period between 1999 and 2003. With respect to the power of z tests in within-transformed fixed effects models as discussed below, however, it seems that there are significant variations in this main explanatory variable within firms over time. Overall, 34.6% of the firms have at least one change in the values of this dummy variable between 1999 and 2003.

4.2 Dependent and Control Variables

The dependent variables of our micro-econometric analysis refer to corporate financial performance. Following, for example, Waddock and Graves (1997), we first consider return on assets, measured in % ("ROA"). Return on assets as an accounting-based measure is defined as the ratio of operating income to total assets, where operating income is equal to the after-tax profit plus net financial expenses. Thus, return on assets reflects the profitability of a corporation after tax and interest. Furthermore, we additionally examine Tobin's Q ("Tobin's Q") as indicator of corporate financial performance. While Lindenberg and Ross (1981) define Tobin's Q as the ratio of the market value of a firm to the replacement costs of its assets, this measure is commonly not used in similar micro-econometric studies (e.g., King and Lenox 2001, 2002; Elsayed and Paton 2005; Guenster et al. 2011). The main reason for this is that the calculation of this measure is sophisticated and restricted by data availability. Furthermore, it has been shown that simplified measures of Tobin's Q are qualitatively very similar to the rather complicated measure (e.g., Chung and Pruitt 1994). Therefore, we consider Tobin's Q as the sum of market value and total debt divided by the book value of total assets (measured at the end of the year, respectively). While return on assets and Tobin's Q are similar in several aspects, they also have some differences. For example, return on assets is based on contemporaneous incomes, whereas Tobin's Q is a forward-looking measure.

Besides our main explanatory variable "DJSI World" we include several economic control variables. The most common variable is firm size (e.g., Orlitzky 2001) and is also used in the studies of McWilliams and Siegel (2000) and Becchetti et al. (2008). As an indicator of firm size we consider total assets (in millions Euro), which is in line with Waddock and Graves (1997). In this respect, the natural logarithm of total assets ("log total assets") is used to analyze possible non-linear effects (e.g., King and Lenox 2001, 2002; Elsayed and Paton 2005). In line with former studies (e.g., King and Lenox 2001, 2002) we additionally include leverage as control variable, measured by the ratio of total debt to total assets. While the interpretation of this variable ("debt/assets") is ambiguous, it is often used as an indicator of financial structure and particularly as an indicator of firm risk, i.e., the risk tolerance of management (e.g., Waddock and Graves (1997), Elsayed and Paton (2005), Guenster et al. 2011). Following Konar and Cohen (2001) and King and Lenox (2001, 2002) we also include the growth of sales as explanatory variable. We consider the growth rate (in decimals) of net sales (i.e., gross sales minus returns, discounts, and allowances) in one year compared with the net sales in the previous year ("net sales growth"). This variable can be interpreted as a measure of growth dynamics of a corporation. A final economic control variable is capital intensity ("capital intensity"). In line with King and Lenox (2001, 2002), we consider the ratio of capital expenditures to net sales. This variable is an important indicator of

Table 2 Descriptive statistics for dependent and economic control variables, balanced panel, N = 266 corporations, 1,330 observations, time dimension refers to period between 1999 and 2003

Variable	Mean	SD	Minimum	Median	Maximum
ROA	6.79	6.70	−23.14	5.82	60.16
Tobin's Q	1.29	1.55	0.04	0.90	17.96
Log total assets	23.53	1.64	18.80	23.21	27.57
Debt/assets	0.29	0.16	0	0.29	1.42
Net sales growth	0.10	0.41	−0.86	0.05	10.86
Capital intensity	0.09	0.23	0	0.05	4.56

technological intensity of the production process and the long-term growth of the firm. On the basis of the balanced panel with N = 266 corporations and 1,330 observations, Table 2 reports the means and standard deviations as well as the minimums, medians, and maximums for the dependent and economic control variables in the micro-econometric analysis.

Finally, time, country, and sector dummies are additionally included as control variables. With respect to time effects, it should be noted that data are available for the years between 1999 and 2003. Against this background, we incorporate the corresponding dummy variables "2003", "2002", "2001", and "2000" into the model approaches (1), (3′), and (3″) and thus consider the dummy for the year 1999 as omitted category. In the case of lagged explanatory variables in (2), (4′), and (4″) we include "2003", "2002", and "2001" and thus leave "2000" as omitted category. With respect to possible regional or political differences in several countries, we include corresponding dummy variables for Belgium, France, Germany, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden, Switzerland, and the UK and thus treat the dummy variables for Austria, Denmark, Finland, Greece, and Norway, from which the number of analyzed firms is only between two and five, as joint omitted category. These dummy variables take the value one if a corporation has its headquarters in the respective country. It should be mentioned that the inclusion of all 15 country dummies (considering one omitted dummy variable) qualitatively led to similar estimation results for the main explanatory variables (these estimation results are not reported for brevity). The sectoral dummy variables refer to the different main industries according to the Industry Classification Benchmark (ICB) of Dow Jones Indexes and FTSE (http://www.icbenchmark.com), namely oil & gas, basic materials, industrials, consumer goods, health care, consumer service, telecommunications, utilities, financials, and as omitted category the technology sector. It should be noted that the sector and country dummies cannot be included in the fixed effects models since they are constant over time (the parameter estimates for these dummy variables in the pooled regression and random effects models are not reported for brevity).

5 Empirical Results

5.1 Correlation Coefficients

On the basis of the balanced panel with N = 266 corporations, Tables 3 and 4 report the mutual (Pearson) correlation coefficients between the dependent and explanatory variables, respectively. While Table 3 comprises the relationships between the dependent and unlagged explanatory variables for the time period between 1999 and 2003, Table 4 refers to the

Table 3 Mutual correlation coefficients between dependent and unlagged explanatory variables, balanced panel, N = 266 corporations, 1,330 observations, time dimension refers to period between 1999 and 2003

	ROA	Tobin's Q	DJSI World	Log total assets	Debt/assets	Net sales growth	Capital intensity
ROA	1						
Tobin's Q	0.70	1					
DJSI World	−0.05	−0.06	1				
Log total assets	−0.57	−0.42	0.26	1			
Debt/assets	−0.10	−0.09	0.01	0.14	1		
Net sales growth	0.07	0.06	−0.08	0.00	−0.02	1	
Capital intensity	−0.05	−0.03	0.00	−0.06	0.12	0.01	1

Table 4 Mutual correlation coefficients between dependent and lagged explanatory variables, balanced panel, N = 266 corporations, 1,064 observations, time dimension refers to period between 2000 and 2003

	ROA	Tobin's Q	DJSI World	Log total assets	Debt/assets	Net sales growth	Capital intensity
ROA	1						
Tobin's Q	0.69	1					
DJSI World	−0.04	−0.05	1				
Log total assets	−0.56	−0.45	0.25	1			
Debt/assets	−0.08	−0.08	0.01	0.13	1		
Net sales growth	0.03	0.08	−0.10	−0.02	0.01	1	
Capital intensity	−0.04	−0.04	−0.01	−0.06	0.12	0.02	1

correlations between the dependent and lagged explanatory variables for the time period between 2000 and 2003. The tables show the expected high positive correlation coefficient between both indicators of corporate financial performance, namely return on assets and Tobin's Q. Furthermore, the high negative correlation coefficients between firm size and corporate financial performance are worth mentioning. However, the main result in these tables is the weak and even negative relationship between the inclusion in the DJSI World and the two corporate financial performance variables. Moreover, the relationships between the explanatory variables mostly are very weak as well, so that multicollinearity problems should not distort the estimation results. The highest correlation coefficients refer to the relationship between firm size and the inclusion in the DJSI World, but are still moderate with values of 0.26 and 0.25.

5.2 Micro-Econometric Analysis

On the basis of the balanced panel with N = 266 corporations, Tables 5 and 6 report several estimation results of our micro-econometric analysis with different model approaches. While Table 5 refers to the findings for return on assets as dependent variable, Table 6 refers to Tobin's Q as alternative indicator of corporate financial performance. Both tables comprise the estimation results in the pooled regression models as well as in the random and fixed effects models, respectively. Furthermore, both tables report the findings in two different model approaches as discussed above. While (1), (3′), and (3″) refer to the inclusion of

unlagged explanatory variables, the models (2), (4′), and (4″) comprise one-year time lags for the explanatory variables. According to the corresponding F tests in the pooled regression and fixed effects models as well as the Wald tests in the random effects models, the null hypotheses that all parameters are jointly zero can be rejected without exception at all common significance levels.

If we only consider the restrictive pooled regression models, the estimation results for our main explanatory variable seem to be clear. In contrast to the small and even negative univariate correlation coefficients according to Tables 3 and 4, Tables 5 and 6 suggest that the inclusion in the DJSI World is positively related with return on assets (1% significance level) and with Tobin's Q (5% significance level), irrespective of the use of unlagged or lagged explanatory variables. Furthermore, capital intensity and (in line with the univariate correlation coefficients according to Tables 3 and 4) particularly firm size are negatively related with corporate financial performance in all pooled regression models at the 1% significance level. Finally, the lagged growth of net sales has a significantly positive impact on Tobin's Q in this restricted panel data model.

However, some of these estimation results strongly change in the flexible panel data models including unobserved firm heterogeneity. For example, the negative relationship between capital intensity and return on assets becomes insignificant in the random effects model (4′) and in both fixed effects models. Furthermore, the correlations between capital intensity and Tobin's Q become insignificant in all random and fixed effects models. Therefore, the inclusion of unobserved firm heterogeneity is obviously important for the reliability of the estimation results. This conclusion is confirmed by the results of several diagnostic tests. While Breusch–Pagan (χ^2) tests refer to the null hypothesis of no random effects (i.e., that $\sigma_\nu^2 = 0$), corresponding F tests refer to the null hypothesis of no fixed effects (i.e., that all $\nu_i = 0$). The reported test statistics imply that in each case the null hypothesis is rejected at all common significance levels. In this respect, it should be mentioned that the general superiority of the random or fixed effects models is ambiguous according to the appropriate Hausman (χ^2) tests (a high value of the respective test statistics implies the rejection of the random effects model). For our preferred models (4′) and (4″) the Hausman tests suggest the use of the fixed effects model for the explanation of return on assets (see Table 5) and the use of the random effects model in the case of Tobin's Q (see Table 6).

Against this background, the main result in Tables 5 and 6 refers to the parameter estimations for "DJSI World" in the random and fixed effects models. Table 5 suggests that in comparison with the estimation results in the pooled regression models, the positive relationship with return on assets is weaker, although it remains weakly significant in our preferred models with lagged explanatory variables. According to Table 6, the correlation between "DJSI World" and Tobin's Q becomes completely insignificant. This finding also holds true for the models (4′) and (4″) with lagged "DJSI World". In this respect, it can be argued that this lack of significance for the inclusion in the DJSI World is based on the low power of the corresponding z tests in within-transformed fixed effects models due to few variations in this dummy variable within firms over time. However, the descriptive statistics in Table 1 as discussed above show that for more than one third of the N = 266 corporations the values of this main explanatory variable change over time at least once. Furthermore, it should be noted that the estimation results qualitatively are very stable between fixed and random effects models and that these estimation results are in line with the small univariate correlation coefficients according to Tables 3 and 4. Finally, even when we do not focus on statistical significance, it should be mentioned that the parameter estimates for Tobin's Q according to Table 6 are not consistently positive or negative between the random and fixed effects models. In contrast, the corresponding estimation results according to Table 5 imply that the inclusion in the DJSI

Table 5 Parameter estimates (z statistics) in different model approaches, balanced panels, N = 266 corporations, dependent variable: ROA

	Pooled regression models		Random effects (RE) models		Fixed effects (FE) models	
Explanatory variables	(1)	(2)	(3′)	(4′)	(3″)	(4″)
DJSI World	1.07***	–	0.41	–	0.21	–
	(3.69)	(–)	(1.44)	(–)	(0.69)	(–)
DJSI World (lagged)	–	1.10***	–	0.58*	–	0.55*
	(–)	(3.23)	(–)	(1.88)	(–)	(1.69)
Log total assets	−2.17***	–	−2.51***	–	−4.11***	–
	(−12.88)	(–)	(−11.84)	(–)	(−9.63)	(–)
Log total assets (lagged)	–	−2.10***	–	−1.80***	–	−0.74
	(–)	(−10.92)	(–)	(−8.26)	(–)	(−1.63)
Debt/assets	0.71	–	1.03	–	1.21	–
	(0.43)	(–)	(0.92)	(–)	(0.89)	(–)
Debt/assets (lagged)	–	1.26	–	6.23***	–	9.83***
	(–)	(0.77)	(–)	(5.49)	(–)	(7.12)
Net sales growth	1.17	–	0.89***	–	0.92***	–
	(1.42)	(–)	(4.10)	(–)	(4.21)	(–)
Net sales growth (lagged)	–	0.52	–	−0.29	–	−0.54
	(–)	(0.87)	(–)	(−0.89)	(–)	(−1.64)
Capital intensity	−2.76***	–	−1.54**	–	–0.91	–
	(−5.04)	(–)	(−2.48)	(–)	(−1.34)	(–)
Capital intensity (lagged)	–	−2.12***	–	−0.63	–	−0.16
	(–)	(−3.78)	(–)	(−1.03)	(–)	(−0.24)
2003	−0.99**	−0.45	−0.78***	−0.63**	−0.34	−1.00***
	(−2.10)	(−1.03)	(−2.94)	(−2.57)	(−1.21)	(−3.69)
2002	−1.20**	−0.64	−1.01***	−0.81***	−0.53*	−1.19***
	(−2.46)	(−1.45)	(−3.78)	(−3.47)	(−1.87)	(−4.55)
2001	−0.61	−0.33	−0.48*	−0.39*	0.02	−0.65***
	(−1.38)	(−0.77)	(−1.82)	(−1.69)	(0.06)	(−2.68)
2000	−0.19	–	−0.07	–	0.28	–
	(−0.43)	(–)	(−0.29)	(–)	(1.04)	(–)

Table 5 continued

Explanatory variables	Pooled regression models (1)		Pooled regression models (2)		Random effects (RE) models (3′)		Random effects (RE) models (4′)		Fixed effects (FE) models (3″)		Fixed effects (FE) models (4″)	
Constant	61.01***		57.50***		68.34***		50.42***		103.31***		21.73**	
	(13.46)		(12.10)		(14.01)		(10.08)		(10.36)		(2.06)	
Country and sector dummies		Yes		Yes		Yes		Yes		No		No
F statistic (all parameters)	51.66***		40.95***		–		–		18.63***		11.11***	
Wald statistic (all parameters)		–		–	390.79***		283.84***			–		–
R^2 (overall)	0.44		0.43		0.43		0.41		0.33		0.08	
Breusch–Pagan statistic (RE)		–		–	1148.52***		812.05***			–		–
F statistic (FE)		–		–		–		–	13.55***		14.60***	
Hausman statistic (RE, FE)		–		–	14.04		20.61***		14.04		20.61***	
Time period	1999–2003		2000–2003		1999–2003		2000–2003		1999–2003		2000–2003	
Number of observations	1,330		1,064		1,330		1,064		1,330		1,064	

* (**, ***) means that the appropriate parameter is different from zero or that the underlying null hypothesis is rejected at the 10% (5%, 1%) significance level, respectively

Table 6 Parameter estimates (z statistics) in different model approaches, balanced panels, N = 266 corporations, dependent variable: Tobin's Q

	Pooled regression models		Random effects (RE) models		Fixed effects (FE) models	
Explanatory variables	(1)	(2)	(3′)	(4′)	(3″)	(4″)
DJSI World	0.17**	–	0.02	–	−0.05	–
	(2.41)	(–)	(0.29)	(–)	(−0.66)	(–)
DJSI World (lagged)	–	0.13**	–	0.04	–	−0.00
	(–)	(1.96)	(–)	(0.50)	(–)	(−0.04)
Log total assets	−0.37***	–	−0.49***	–	−1.17***	–
	(−8.37)	(–)	(−9.44)	(–)	(−10.22)	(–)
Log total assets (lagged)	–	−0.32***	–	−0.33***	–	−0.46***
	(–)	(−7.56)	(–)	(−7.35)	(–)	(−4.17)
Debt/assets	0.46	–	0.83***	–	1.12***	–
	(1.48)	(–)	(2.89)	(–)	(3.06)	(–)
Debt/assets (lagged)	–	0.42*	–	0.25	–	0.10
	(–)	(1.68)	(–)	(1.00)	(–)	(0.31)
Net sales growth	0.14	–	0.06	–	0.07	–
	(1.27)	(–)	(0.96)	(–)	(1.12)	(–)
Net sales growth (lagged)	–	0.24**	–	0.09	–	0.08
	(–)	(2.54)	(–)	(1.12)	(–)	(1.07)
Capital intensity	−0.45***	–	−0.23	–	−0.02	–
	(−4.13)	(–)	(−1.40)	(–)	(−0.10)	(–)
Capital intensity (lagged)	–	−0.35***	–	−0.15	–	−0.04
	(–)	(−3.74)	(–)	(−1.08)	(–)	(−0.26)
2003	−0.62***	−0.33***	−0.57***	−0.33***	−0.40***	−0.29***
	(−5.28)	(−3.45)	(−8.06)	(−5.75)	(−5.29)	(−4.34)
2002	−0.64***	−0.37***	−0.60***	−0.37***	−0.41***	−0.32***
	(−5.48)	(−3.84)	(−8.36)	(−6.67)	(−5.31)	(−5.11)

Table 6 continued

Explanatory variables	Pooled regression models (1)	Pooled regression models (2)	Random effects (RE) models (3′)	Random effects (RE) models (4′)	Fixed effects (FE) models (3″)	Fixed effects (FE) models (4″)
2001	−0.39***	−0.19*	−0.35***	−0.17***	−0.15**	−0.14**
	(−3.19)	(−1.80)	(−5.03)	(−3.15)	(−1.97)	(−2.40)
2000	–0.20	–	−0.17**	–	−0.02	–
	(−1.39)	(–)	(−2.38)	(–)	(−0.26)	(–)
Constant	13.07***	11.15***	15.64***	11.29***	28.76***	12.06***
	(11.06)	(9.22)	(13.25)	(11.06)	(10.74)	(4.73)
Country and sector dummies	Yes		Yes		No	
F statistic (all parameters)	18.79***	17.25***	–		30.02***	13.82***
Wald statistic (all parameters)	–		406.43***	304.81***	–	
R^2 (overall)	0.38	0.39	0.37	0.38	0.18	0.21
Breusch–Pagan statistic (RE)	–		877.88***	637.00***	–	
F statistic (FE)	–		–		11.88***	10.90***
Hausman statistic (RE, FE)	–		49.79***	9.55	49.79***	9.55
Time period	1999–2003	2000–2003	1999–2003	2000–2003	1999–2003	2000–2003
Number of observations	1,330	1,064	1,330	1,064	1,330	1,064

* (**, ***) means that the appropriate parameter is different from zero or that the underlying null hypothesis is rejected at the 10% (5%, 1%) significance level, respectively

World leads on average to an increase of return on assets up to an amount of a bit more than a half percentage point. Compared with the mean according to Table 2, this corresponds to an average increase of return on assets of over 8%, which could be meaningful for some firms. However, it can also be argued that this average increase of return on assets is rather moderate since it corresponds to less than one tenth of its standard deviation (see Table 2).

5.3 Robustness Tests, Regional and Sectoral Differences

In order to test the robustness of the main result of a weak positive effect of inclusion in the DJSI World on return on assets and a neutral effect on Tobin's Q, we consider further micro-econometric analyses. First, we examine the natural logarithm of Tobin's Q ("log Tobin's Q") (e.g., Hirsch and Seaks 1993) as dependent variable, which leads to a semilog model. The first two columns of Table 7 report the corresponding estimation results for our preferred random and fixed effects models with lagged explanatory variables on the basis of the balanced panel with N = 266 corporations. In line with the estimation results for the standard approach with Tobin's Q, the inclusion in the DJSI World has no significant impact on "log Tobin's Q", either, and the magnitude of the (positive) parameter estimate in the fixed effects model (which has to be preferred according to the corresponding Hausman test) is rather small. Furthermore, we have also examined return on capital as an additional indicator of corporate financial performance. Similar to the case of Tobin's Q, the inclusion in the DJSI World has no significant effect in this case, either (the corresponding estimation results are not reported for brevity).

While we focus on balanced panels, we additionally consider an unbalanced panel with N = 492 corporations and 1,640 observations for our preferred random and fixed effects models with lagged explanatory variables. The corresponding estimation results with return on assets, Tobin's Q, and the natural logarithm of Tobin's Q as dependent variables are reported in the last six columns of Table 7. In line with the estimation results on the basis of the balanced panel data, the inclusion in the DJSI World has no significant effect on Tobin's Q and the natural logarithm of Tobin's Q. While the inclusion in the DJSI World has a significantly positive impact on return on assets in the random effects model, it has no significant impact in the fixed effects model, which has to be preferred according to the Hausman test. As a consequence, the main result of weak effects of inclusion in the DJSI World on corporate financial performance holds true, even when the estimation results on the basis of these unbalanced panel data should be treated with caution as discussed above.

Finally, we examine possible regional and sectoral differences with respect to the effect of inclusion in the DJSI World. This analysis is based on the construction of several interaction terms of this main explanatory variable and country and sector dummies.[2] While a disaggregated analysis for a high number of different countries and sectors would certainly be interesting, this analysis is unfortunately not possible since several countries and sectors only comprise a small number of firms. Therefore, we examine interaction terms with two groups of countries with possibly different CSR cultures, namely the UK and Ireland as Anglo-Saxon European countries ("DJSI World * UK, Ireland") and the remaining countries from continental Europe ("DJSI World * other countries"). Furthermore, we consider

[2] It should be mentioned that in order to test the robustness of the main results, we have also examined the inclusion of region specific time trends, i.e., interaction terms of time and region dummies instead of only time dummies. However, the estimation results for the main explanatory variables in this case are qualitatively nearly identical with the corresponding estimation results in Tables 5 and 6 so that they are not reported for brevity.

Table 7 Parameter estimates (z statistics) in different model approaches, lagged explanatory variables, time period: 2000–2003, robustness tests

	Balanced panel		Unbalanced panel					
	Dependent variable: Log Tobin's Q		Dependent variable: ROA		Dependent variable: Tobin's Q		Dependent variable: Log Tobin's Q	
Explanatory variables	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)
DJSI World	0.03	0.02	0.76**	0.41	0.10	0.01	0.04	0.02
(lagged)	(1.26)	(0.85)	(2.29)	(1.14)	(1.37)	(0.18)	(1.57)	(0.68)
Log total assets	−0.19***	−0.13***	−1.44***	−2.88***	−0.29***	−0.56***	−0.19***	−0.18***
(lagged)	(−9.23)	(−3.63)	(−7.40)	(−6.30)	(−8.67)	(−5.24)	(−11.84)	(−5.41)
Debt/assets	0.50***	0.26**	3.42***	8.21***	0.09	0.28	0.44***	0.20*
(lagged)	(5.01)	(2.31)	(3.03)	(5.61)	(0.41)	(0.82)	(5.03)	(1.87)
Net sales growth	0.08***	0.06**	−0.05	−0.03	0.00	0.00	0.00	0.00
(lagged)	(2.90)	(2.17)	(−0.95)	(−0.53)	(0.11)	(0.34)	(0.50)	(0.44)
Capital intensity	−0.04	−0.06	−0.70*	0.06	−0.13	−0.12	−0.02	−0.03
(lagged)	(0.83)	(−1.03)	(−1.72)	(0.12)	(−1.52)	(−1.09)	(−0.71)	(−0.99)
2003	−0.18***	−0.19***	−0.94***	−0.58**	−0.41***	−0.33***	−0.20***	−0.20***
	(−8.74)	(−8.51)	(−3.71)	(−2.11)	(−7.17)	(−5.07)	(−11.08)	(−9.83)
2002	−0.23***	−0.24***	−0.97***	−0.59**	−0.46***	−0.38***	−0.26***	−0.26***
	(−11.67)	(−11.19)	(−3.92)	(−2.15)	(−8.22)	(−5.95)	(−14.53)	(−13.00)
2001	−0.08***	−0.09***	−0.64***	−0.36	−0.16***	−0.10*	−0.07***	−0.07***
	(−4.13)	(−4.33)	(−2.61)	(−1.40)	(−2.78)	(−1.69)	(−3.81)	(−3.52)
Constant	5.17***	3.09***	35.94***	70.44***	9.07***	14.29***	4.68***	4.14***
	(10.72)	(3.56)	(8.54)	(6.78)	(12.73)	(5.86)	(13.41)	(5.46)

Table 7 continued

Explanatory variables	Balanced panel		Unbalanced panel					
	Dependent variable: Log Tobin's Q		Dependent variable: ROA		Dependent variable: Tobin's Q		Dependent variable: Log Tobin's Q	
	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)
Country and sector dummies	Yes	No	Yes	No	Yes	No	Yes	No
F statistic (all parameters)	–	38.05***	–	12.03***	–	17.48***	–	50.09***
Wald statistic (all parameters)	687.58***	–	235.67***	–	359.82***	–	909.45***	–
R^2 (overall)	0.58	0.40	0.25	0.13	0.28	0.19	0.51	0.38
Breusch–Pagan statistic (RE)	992.85***	–	836.76***	–	673.45***	–	1, 294.72***	–
F statistic (FE)	–	27.35***	–	11.80***	–	6.05***	–	19.36***
Hausman statistic (RE, FE)	20.55***		41.86***		8.92		93.00***	
N	266				492			
Number of observations	1,064				1,640			

* (**, ***) means that the appropriate parameter is different from zero or that the underlying null hypothesis is rejected at the 10% (5%, 1%) significance level, respectively

possible differences between financial firms ("DJSI World * financial sector") and firms from other sectors ("DJSI World * other sectors"). These two groups of sectors strongly differ with respect to the valuation by the markets and to accounting rules.

On the basis of the balanced panel with N = 266 corporations, Table 8 reports the corresponding estimation results for our preferred random and fixed effects models with lagged explanatory variables and with return on assets and Tobin's Q as dependent variables. According to this table, the inclusion in the DJSI World has no significant impact on corporate financial performance for both groups of sectors as well as no significant effect on Tobin's Q for both groups of countries. However, the main result refers to the different effects on return on assets. While the impact of inclusion in the DJSI World is not significant for the Anglo-Saxon European countries, it is positive at the 10% significance level in the fixed effects model and at the 5% significance level in the random effects model for the continental European countries. Therefore, it seems that the overall moderate impacts of inclusion in the DJSI World according to Table 5 are a consequence of these reverse effects. It should be noted that these estimation results are widely confirmed if segregated sub-samples for both groups of countries are analyzed (the estimation results are not reported for brevity).

6 Conclusions

This paper empirically analyzes the effect of inclusion in a sustainability stock index on corporate financial performance. In this respect, we examine the prominent DJSI World, which intends to comprise the world-wide leading corporations in terms of sustainability performance. In contrast to many former studies, we consider a European perspective and therefore examine firms that were included in the DJ Stoxx 600 Index between 1999 and 2003. On the basis of corresponding firm-level panel data, we apply fixed and random effects models that are able to control for unobserved firm heterogeneity. The micro-econometric analysis implies insignificant effects of inclusion in the DJSI World on return on assets for the UK and Ireland. In contrast, the impact is positive for other European countries. The reason for this difference between Anglo-Saxon European countries and countries from continental Europe is not completely clear and should thus be analyzed in future studies. It can, for example, be speculated that the relevance of stakeholders (e.g., environmental groups) is generally weaker in Anglo-Saxon European countries.

Furthermore, the impacts of inclusion in the DJSI World on alternative indicators of corporate financial performance are generally statistically insignificant for different groups of countries and sectors. This neutral impact is very robust across several indicators such as Tobin's Q or the natural logarithm of Tobin's Q as well as across several model approaches and samples (i.e., balanced and unbalanced panels). While it could be argued that the power of z tests in within-transformed fixed effects models is low since the number of variations in the main explanatory variable is rather small, it should be noted that the corresponding parameter estimates mostly imply a weak economic significance if we would ignore the z test statistics. The overall weak or neutral effect of inclusion in the DJSI World on corporate financial performance can be explained by several mutually confounding factors. While, for example, the inclusion in a sustainability stock index as positive signal for a higher corporate sustainability performance can lead to a higher firm reputation with positive consequences for financial success, proactive activities that are necessary for the inclusion in the DJSI World could also be a compulsory response to market pressure with negative consequences for corporate financial performance. However, it should also be noted that our estimation results do not support the pessimistic view of a negative impact of corporate environmental

Table 8 Parameter estimates (z statistics) in different model approaches, balanced panels, N = 266 corporations, 1,064 observations, lagged explanatory variables, time period: 2000–2003, inclusion of regional and sectoral interaction terms

Explanatory variables	Dependent variable: ROA		Dependent variable: Tobin's Q		Dependent variable: ROA		Dependent variable: Tobin's Q	
	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)
DJSI World* UK, Ireland (lagged)	0.03	0.14	0.08	0.09	–	–	–	–
	(0.05)	(0.25)	(0.70)	(0.66)	(–)	(–)	(–)	(–)
DJSI World* other countries (lagged)	0.86**	0.76*	0.01	−0.05	–	–	–	–
	(2.31)	(1.93)	(0.12)	(−0.52)	(–)	(–)	(–)	(–)
DJSI World* financial sector (lagged)	–	–	–	–	0.54	0.42	0.15	0.08
	(–)	(–)	(–)	(–)	(0.99)	(0.74)	(1.16)	(0.57)
DJSI World* other sectors (lagged)	–	–	–	–	0.59	0.60	−0.01	−0.04
	(–)	(–)	(–)	(–)	(1.64)	(1.56)	(−0.12)	(−0.42)
Log total assets (lagged)	−1.79***	−0.73	−0.33***	−0.46***	−1.80***	−0.73	−0.33***	−0.46***
	(−8.26)	(−1.61)	(−7.35)	(−4.18)	(−8.27)	(−1.63)	(−7.40)	(−4.17)
Debt/assets (lagged)	6.23***	9.85***	0.25	0.10	6.22***	9.83***	0.25	0.11
	(5.49)	(7.12)	(0.99)	(0.30)	(5.48)	(7.11)	(0.98)	(0.32)
Net sales growth (lagged)	−0.28	−0.54	0.09	0.08	−0.29	−0.54	0.09	0.09
	(−0.88)	(−1.64)	(1.12)	(1.07)	(−0.89)	(−1.64)	(1.14)	(1.07)
Capital intensity (lagged)	−0.66	−0.19	−0.15	−0.04	−0.64	−0.17	−0.15	−0.04
	(−1.08)	(−0.28)	(−1.07)	(−0.22)	(−1.04)	(−0.25)	(−1.06)	(−0.24)

Table 8 continued

Explanatory variables	Dependent variable: ROA		Dependent variable: Tobin's Q		Dependent variable: ROA		Dependent variable: Tobin's Q	
	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)	Random effects (RE) model: (4′)	Fixed effects (FE) model: (4″)
2003	−0.62**	−1.00***	−0.33***	−0.29***	−0.63**	−1.00***	−0.33***	−0.28***
	(−2.55)	(−3.68)	(−5.75)	(−4.35)	(−2.57)	(−3.69)	(−5.70)	(−4.32)
2002	−0.83***	−1.21***	−0.37***	−0.32***	−0.81***	−1.19***	−0.37***	−0.32***
	(−3.56)	(−4.61)	(−6.61)	(−5.03)	(−3.46)	(−4.55)	(−6.65)	(−5.10)
2001	−0.39*	−0.65***	−0.17***	−0.14**	−0.39*	−0.65***	−0.17***	−0.14**
	(−1.71)	(−2.70)	(−3.15)	(−2.38)	(−1.69)	(−2.68)	(−3.15)	(−2.40)
Constant	50.26***	21.50**	11.31***	12.11***	50.42***	21.72**	11.35***	12.07***
	(10.06)	(2.04)	(11.06)	(4.74)	(10.08)	(2.06)	(11.12)	(4.73)
Country and sector dummies	Yes	No	Yes	No	Yes	No	Yes	No
F statistic (all parameters)	–	9.97***	–	12.36***	–	9.87***	–	12.33***
Wald statistic (all parameters)	286.80***	–	304.59***	–	284.31***	–	306.46***	–
R^2 (overall)	0.41	0.08	0.38	0.21	0.41	0.09	0.38	0.21
Breusch–Pagan statistic (RE)	805.34***	–	635.72***	–	806.01***	–	633.39***	–
F statistic (FE)	–	14.60***	–	10.89***	–	14.55***	–	10.88***
Hausman statistic (RE, FE)	22.22***		10.45		22.40***		10.97	

* (**, ***) means that the appropriate parameter is different from zero or that the underlying null hypothesis is rejected at the 10% (5%, 1%) significance level, respectively

and social activities, which are necessary for the inclusion in sustainability stock indexes and which can lead to additional not directly productive costs.

While these arguments implicitly assume that the inclusion in the DJSI World is an appropriate indicator of corporate sustainability performance, it should be noted that the best-in-class approach implies that less sustainable firms are included if they are the leaders in unsustainable sectors and that sustainable firms are not included if they are not leaders in overall sustainable sectors. Furthermore, factors that need not necessarily be directly connected to corporate environmental or social activities also play a role. In this respect, Ziegler and Schröder (2010) show that the selection process by SAM has a strong influence. For example, a high number of firms is never assessed and thus cannot be included in the DJSI World, even when they would be very sustainable. Furthermore, the inclusion in this sustainability stock index is not only based on corporate sustainability assessments since a minimum of market capitalization coverage (20%) for each Dow Jones supersector has to be reached. Therefore, this additional factor also plays an important role for the composition of the DJSI World, so that it is likely that the composition of this sustainability stock index is biased towards large corporations. Overall, this lowers the quality of the inclusion in the DJSI World as reliable signal for environmental and social activities. As a consequence, both potential positive and negative effects of corporate sustainability performance on financial performance can be weakened.

A methodological finding refers to the strong relevance of unobserved firm heterogeneity since the application of pooled regression models consistently leads to different estimation results, i.e., to stronger significantly positive effects of inclusion in the DJSI World on return on assets and Tobin's Q. However, in line with former studies (e.g., Telle 2006), these estimation results are obviously biased since the validity of these restricted panel data models is statistically rejected in favor of random or fixed effects models. This bias is due to omitted unobserved firm characteristics in misspecified pooled regression models. If variables such as a high technological standard, a good management, or specific business strategies are positively correlated with both corporate financial performance and the inclusion in the DJSI World, the omission of these variables can lead to upward biases in the parameter estimates for the inclusion in the DJSI World.

While this omitted variable bias can be circumvented by our random or fixed effects models, another methodological problem remains since it is possible that not only the inclusion in the DJSI World has an impact on corporate financial performance, but also that corporate financial performance has an effect on the inclusion in the DJSI World. In order to reduce possible simultaneity biases, we particularly consider panel data models that include lagged explanatory variables (e.g., Telle 2006). The simultaneity problem can generally be addressed by applying instrumental variable approaches. However, the main problem in this respect is that reliable instruments are not available. Furthermore, we have also experimented with the GMM estimation of dynamic panel data models. However, this approach seems to be unreliable for our relatively short observation period due to the restricted availability of data. The analysis of the causality of the relationship between the inclusion in a sustainability stock index and corporate financial performance is certainly an important direction for future research. In future studies, it would also be interesting to disentangle the interrelationship between corporate environmental and social activities, the inclusion in sustainability stock indexes, and corporate financial performance if appropriate firm-level data are available. Furthermore, an analysis of alternative indicators of financial performance (e.g., stock performance) or more stakeholder neutral indicators (e.g., added value), which could be more positively affected by the inclusion in the DJSI World, would also be interesting.

References

Arellano M, Bond SR (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Rev Econ Stud 58:277–297

Barnett ML, Salomon RM (2006) Beyond dichotomy: the curvilinear relationship between social responsibility and financial performance. Strateg Manag J 27:1101–1122

Barney J (1991) Firm resources and sustained competitive advantage. J Manag 17:99–120

Bauer R, Koedijk K, Otten R (2005) International evidence on ethical mutual fund performance and investment style. J Bank Finance 29:1751–1767

Becchetti L, Di Giacomo S, Pinnacchio D (2008) Corporate social responsibility and corporate performance: evidence from a panel of US listed companies. Appl Econ 40:541–567

Bond SR (2002) Dynamic panel data models: a guide to micro data methods and practice. Portugese Econ J 1:141–162

Cañón-de-Francia J, Garcés-Ayerbe C (2009) ISO 14001 environmental certification: a sign valued by the market?. Environ Resour Econ 44:245–262

Chung KH, Pruitt SW (1994) A simple approximation of Tobin's Q. Financ Manag 23:70–74

Curran MM, Moran D (2007) Impact of the FTSE4Good index on firm price: an event study. J Environ Manag 82:529–537

Dasgupta S, Laplante B, Nlandu M (2001) Pollution and capital markets in developing countries. J Environ Econ Manag 42:310–335

Derwall J, Guenster N, Bauer R, Koedijk K (2005) The eco-efficiency premium puzzle. Financ Anal J 61: 51–63

Elsayed K, Paton D (2005) The impact of environmental performance on firm performance: static and dynamic panel data evidence. Struct Change Econ Dyn 16:395–412

Filbeck G, Gorman RF (2004) The relationship between the environmental and financial performance of public utilities. Environ Resour Econ 29:137–157

Friedman M (1970) The social responsibility of business is to increase its profits. The New York Times Magazine, 13 Sept 1970

Guenster N, Bauer R, Derwall J, Koedijk K (2011) The economic value of corporate eco-efficiency. Eur Financ Manag (forthcoming)

Gupta S, Goldar B (2005) Do stock markets penalize environment-unfriendly behaviour? Evidence from India. Ecol Econ 52:81–95

Hart SL, Ahuja G (1996) Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance. Bus Strateg Environ 5:30–37

Heal G (2005) Corporate social responsibility: an economic and financial framework. Geneva Pap 30:387–409

Hirsch BT, Seaks TG (1993) Functional form in regression models of Tobin's Q. Rev Econ Stat 75:381–385

Kempf A, Osthoff P (2007) The effect of socially responsible investing on portfolio performance. Eur Financ Manag 13:908–922

Khanna M, Quimo WR, Bojilova D (1998) Toxics release information: a policy tool for environmental protection. J Environ Econ Manag 36:243–266

King A, Lenox M (2001) Does it really pay to be green?. J Ind Ecol 5:105–116

King A, Lenox M (2002) Exploring the locus of profitable pollution reduction. Manag Sci 48:289–299

Koellner T, Suh S, Weber O, Moser C, Scholz RW (2007) Environmental impacts of conventional and sustainable investment funds compared using input–output life-cycle assessment. J Ind Ecol 11:41–60

Konar S, Cohen MA (1997) Information as regulation: the effect of community right to know laws on toxic emissions. J Environ Econ Manag 32:109–124

Konar S, Cohen MA (2001) Does the market value environmental performance. Rev Econ Stat 83:281–289

Lindenberg E, Ross S (1981) Tobin's Q ratio and industrial organization. J Bus 54:1–32

McWilliams A, Siegel D (2000) Corporate social responsibility and financial performance: correlation or misspecification?. Strateg Manag J 21:603–609

McWilliams A, Siegel D (2001) Corporate social responsibility: a theory of the firm perspective. Acad Manag Rev 26:117–127

McWilliams A, Siegel D, Wright PM (2006) Corporate social responsibility: strategic implications. J Manag Stud 43:1–18

Orlitzky M (2001) Does firm size confound the relationship between corporate social performance and firm performance. J Bus Ethics 33:167–180

Posnikoff JF (1997) Disinvestment from South Africa: they did well by doing good. Contemp Econ Policy 15:76–86

Renneboog L, Horst JT, Zhang C (2008) Socially responsible investments: institutional aspects, performance, and investor behavior. J Bank Finance 32:1723–1742

Russo MV, Fouts PA (1997) A resource-based perspective on corporate environmental performance and profitability. Acad Manag J 40:534–559
Schröder M (2007) Is there a difference? The performance characteristics of SRI equity indices. J Bus Finance Acc 34:331–348
Shleifer A, Vishny RW (1997) A survey of corporate governance. J Finance 52:737–783
Telle K (2006) "It pays to be green"—a premature conclusion?. Environ Resour Econ 35:195–220
Tirole J (2006) The theory of corporate finance. Princeton University Press, Princeton
Waddock S, Graves SB (1997) The corporate social performance—financial performance link. Strateg Manag J 18:303–319
Ziegler A, Schröder M (2010) What determines the inclusion in a sustainability stock index? A panel data analysis for European companies. Ecol Econ 29:848–856
Ziegler A, Schröder M, Rennings K (2007) The effect of environmental and social performance on the stock performance of European corporations. Environ Resour Econ 37:661–680