Journal of Banking and Finance 170 (2025) 107339

Contents lists available at ScienceDirect

Journal of Banking and Finance

journal homepage: www.elsevier.com/locate/jbf

Revenue alignment with the EU taxonomy regulation in developed markets

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ARTICLE INFO

JEL classification codes:
G12
L25
Q55

Keywords:
Corporate Social Responsibility
EU Taxonomy Regulation
Green Assets
Stock Returns

ABSTRACT

This article provides first evidence on the capital market effects of the EU Taxonomy Regulation (TR). The TR introduced a new classification scheme to identify companies with environmentally sustainable economic activities. The results offer support for a significant estimated TR alignment premium, compatible with the interpretation that investors already apply the TR and allocate capital to TR-aligned companies. This effect strengthens with an increase in investor attention. We also find significant cross-sectional variation in abnormal stock returns surrounding the publication date of the TR conditional on the degree of estimated TR alignment. Traditional ESG ratings cannot explain the TR premium.

1. Introduction

Environmental concerns have played a leading role in the dramatic growth in sustainable investing over the past decade (BlackRock, 2020). Today, large institutional investors with combined assets under management in excess of $100 trillion have committed to integrating sustainability information into their investment decisions (PRI, 2021). Against this background, the EU Taxonomy Regulation (TR) establishes a novel classification scheme for environmentally sustainable economic activities with the stated objective of establishing a framework to facilitate sustainable investments.[1] In contrast to prior regulations on corporate social responsibility (CSR) in Europe (e.g., the EU CSR Directive),[2] which merely mandate the disclosure of qualitative information, the TR introduces an evaluation of firms' economic activities (i.e., products and services) in terms of their level of environmental sustainability and requires the disclosure of quantitative sustainability metrics. Hence, the TR not only mandates additional CSR disclosures, but also and more importantly defines the activities and companies that the European regulator considers TR-aligned (or "green"). For the first time, the TR provides regulatory guidance for investors concerning the identification of sustainable investments.

This development has the potential to affect equity markets around the world. By also amending the European Sustainable Finance Disclosure Regulation (SFDR),[3] the TR potentially exerts a "ripple effect" on sustainable investments outside the EU (Farmer et al., 2020). This is because EU funds are required to assess all their investee companies in light of the TR and to disclose their assessments to clients, even if a company is not subject to mandatory TR disclosures (e.g., U.S. firms).[4] Moreover, asset owners and portfolio managers may voluntarily opt to use the TR to integrate environmental considerations into the investment process. Thus, investors may reconsider their sustainable investments in light of the TR and reallocate their capital accordingly. In fact, a key objective of the TR is "to reorient capital flows towards sustainable investment in order to achieve sustainable and inclusive growth" (Regulation 2020/852, recital 6). If the TR did lead to such a reorientation of capital, the expectation is that the stock prices of TR-aligned companies would have been bid up as a result.

In this context, theoretical models explain how investors'

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[1] Regulation (EU) 2020/852.
[2] Directive 2014/95/EU.
[3] Regulation (EU) 2019/2088.
[4] For more information, see the final report on draft regulatory technical standards with regard to the content and presentation of disclosures pursuant to Articles 8 (4), 9(6), and 11(5) of Regulation (EU) 2019/2088: https://www.esma.europa.eu/sites/default/files/library/jc_2021_50_-_final_report_on_taxonomy-related_product_disclosure_rts.pdf.

https://doi.org/10.1016/j.jbankfin.2024.107339
Received 18 November 2022; Accepted 10 November 2024
Available online 20 November 2024

nonpecuniary preferences (e.g., for environmentally sustainable companies) impact expected returns in equilibrium (Baker et al., 2018; Fama & French, 2007; Pástor et al., 2022; Pedersen et al., 2021). These models generally predict that sustainability-motivated investors[5] are expected to bid up the price of sustainable assets. While this should result in lower expected returns over a long period of time, realized returns can be higher for green assets when investor preferences shift unexpectedly (Pástor et al., 2022). In our setting, the TR introduces a new framework for assessing sustainable companies. We posit that, similar to a change in preferences, a change in investors' assessment of sustainable companies (due to the TR) can increase (decrease) the returns of companies with a higher (lower) sustainability assessment.

Thus, in this study, we examine how capital markets evaluate firms' alignment with the TR. We focus on three key research questions in the context of the TR implementation period. First, does the alignment of a firm's revenue with the TR predict stock returns? Second, does investor attention to the TR strengthen the association between TR alignment and realized stock returns? Third, does TR alignment have greater explanatory power to predict stock returns than traditional ESG ratings?

To address the first question, we analyze the cross-section of monthly stock returns from January 2017, which is when the High-Level Expert Group (HLEG) on sustainable finance was established, to December 2020. The HLEG was tasked by the European Commission with identifying ways in which pan-European financial policy reforms could steer the flow of capital towards sustainable investments.[6] Their work ultimately led to the adoption of the TR in June 2020. The sample period starts with the establishment of the HLEG, because information about the new classification scheme for sustainable investments may have been gradually revealed to market participants even prior the eventual publication of the TR. Utilizing a new dataset on firms' estimated revenue alignment with the TR that was developed by FTSE Russell, we find evidence for an economically significant premium for TR-aligned companies. A one standard deviation in firms' TR-aligned revenues is associated with, on average, approximately 30 basis points higher monthly Fama-French-adjusted returns after controlling for other risk factors and firm characteristics that are known to predict stock returns. Using the event study methodology, we find corroborating evidence that the TR is highly relevant for investors. In line with prior studies on the adoption of stricter regulation on nonfinancial information (Chen et al., 2018; Grewal et al., 2019), using cumulative five-day abnormal stock returns we document an average negative stock return of -0.43 percent. In support of the evidence from our monthly return regressions, we also find cross-sectional variation in abnormal stock returns depending on the firms' degree of ex ante TR alignment. The abnormal returns of low-TR-alignment firms (bottom 20 percent) are -0.67 percent, whereas firms with high TR alignment (top 20 percent) exhibit abnormal returns of +0.66 percent.

Our expectation as to our second research question is that investors reallocate capital to TR-aligned companies as they learn about the TR and pay attention to the new classification scheme. While this is unobservable for individual investors, we apply two proxies for investor attention to test our hypothesis. First, we use the monthly Google Search Volume (GSV) for the search term "EU Taxonomy." Prior studies similarly use GSV data for terms signaling financial or economic content to proxy investors' attention (Andrei & Hasler, 2015; Da et al., 2011; Ramelli, Ossola, & Rancan, 2021; Vozlyublennaia, 2014). Secondly, we count all monthly news articles in the Factiva global news database that reference the TR. These proxies assume that investors learn about the TR via online research or news articles.[7] The results indicate that the monthly alignment premium is higher when investors pay attention to the TR. We show that the interaction term between investor attention and TR alignment is positive and statistically significant in explaining monthly stock returns during the TR implementation period.

Regarding our third research question, if firms' TR alignment is truly a new measure utilized by investors to assess corporate sustainability, we would expect to find a higher predictive value for future returns of firms' TR alignment over traditional ESG ratings. The rationale is that investors use the TR to reassess companies' sustainability and reallocate capital to firms with high TR alignment and lower ESG ratings. Our empirical analysis supports this perspective. First, we find that a firm's traditional ESG rating does not predict stock returns over our sample period. This alleviates the concern that our results could be driven by a *general* shift of investor preferences towards sustainable companies. Second, we show a positive relationship between TR alignment and stock returns when a firm's TR alignment is higher than its ESG rating. In our study, and as per the text of the TR, TR alignment is measured in percentage of revenues from 0 (least sustainable) to 100 (most sustainable). Likewise, the ESG rating is scaled from 0 (least sustainable) to 100 (most sustainable). Both measures provide investors with a comparative quantitative assessment of a firm's sustainability. One major difference is that ESG ratings generally measure a firm's sustainability policies (e.g., the disclosure of a carbon emissions reduction target increases the ESG rating). By contrast, the TR takes into account the status quo of a firm's actual economic activities. For each activity, the TR defines very specific metrics and thresholds in order to determine alignment. As we describe in more detail in the following section, ESG ratings and TR alignment are methodologically different proxies for quantifying the same latent variable (CSR).

This study mainly contributes to the literature on the relationship between sustainability and financial performance (for a meta-analysis, see Friede et al., 2015). While this topic has been extensively researched, the results are strongly dependent on the metric applied to measure firms' sustainability. Recent studies examine the relevance of corporate green revenues in the context of an economy-wide green taxonomy (Atta-Darkua et al., 2022; Bassen et al., 2023; Hoepner & Schneider, 2024; Huang et al., 2024; Klausmann et al., 2024; Kruse et al., 2020; Kruse et al., 2024; Lambillon & Chesney, 2023; Lel, 2024; Schütze & Stede, 2024). This is one of the first studies to apply TR alignment as a new and regulatorily endorsed metric. In contrast to the contemporary study on corporate green revenues by Klausmann et al. (2024), we specifically focus on estimated TR-aligned revenues in the context of the context of the European Commission's regulatory efforts since January 2017.[8]

Second, we contribute to the literature on the economic consequences of mandatory nonfinancial disclosure. Grewal et al. (2019) predict and empirically show that the introduction of the EU CSR Directive caused a negative average market reaction due to the cost of the disclosure mandate for affected firms. However, in a cross-sectional analysis, they also show that market reactions are positively associated

[5] Pedersen et al. (2021) consider the utility function of "ESG-motivated" investors. Over our sample period, the TR does not define technical screening criteria for the social or governance dimensions of ESG. We therefore use the term "sustainability-motivated investors" when referring to investors with nonpecuniary preferences for green assets.

[6] See also the press release on the Commission decision on the creation of the HLEG: https://ec.europa.eu/commission/presscorner/detail/en/IP_16_4502.

[7] Lioui and Tarelli (2022) use the Factiva global news database to proxy media for ESG issues based on more general sustainability-related keywords. Consistent with Pástor et al. (2022), they find a positive relation between the ESG-alpha and contemporaneous shifts in attention towards ESG.

[8] Based on the broader definition of green revenues according to the proprietary FTSE Russell's Green Revenues Classification System, Klausmann et al. (2024) provide some evidence for higher factor-adjusted returns of stock portfolios with high green revenues since 2016. The estimated TR-aligned revenues applied in this study are based on a more stringed definition for green revenues in alignment with the regulatory mandates on the European Commission. We also primarily focus on the TR implementation period from January 2017 to December 2020, consider the impact of investor attention on the TR, and contrast our findings against traditional ESG Ratings.

Table 1
Determining TR alignment – Principle and TSC threshold for the economic activity "Freight Rail Transport" as per the technical annex to final report of the TEG (page 330).

Sector classification and activity	
Macro-Sector	H - Transport and storage
NACE Level	4
Code	H49.2.0
Description	Freight Rail Transport
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction by: - Increasing the number of low- and zero emission fleets, and improving fleet efficiency - Improving efficiency of the overall transport/mobility system
Threshold	• Zero direct emissions trains (e.g., electric, hydrogen) are eligible. • Other trains are eligible if direct emissions per tonne-km (gCO_2e/tkm) are 50% lower than average reference CO_2 emissions of HDVs as defined for the Heavy Duty CO_2 Regulation, to be reviewed in 2025. • • Rail that is dedicated to the transport of fossil fuels or fossil fuels blended with alternative fuels is not eligible even if meeting the criteria above. **Brief rationale:**Zero direct emissions rail (e.g., electric, hydrogen) is eligible because: • With the present energy mix, the overall emissions associated with zero direct emissions rail transport (i.e., electric or hydrogen) are among the lowest compared with other transport modes. • The generation of the energy carriers used by zero direct emissions transport is assumed to become low or zero carbon in the near future. The threshold of 50% lower than average reference CO_2 emissions of HDVs ensures that the carbon intensity remains similar to criteria for eligible road freight vehicles, with a review in 2025 to assess technology developments in the freight transport sector. The Heavy Duty CO_2 Regulation uses a g CO_2/km metric. To convert this to a g CO_2/tonne-km metric, the average payload for the road freight vehicles should be applied. Once reference value data is available, it is expected that the taxonomy will specify CO_2e/tkm threshold values.

Table 2
Sample selection for the baseline panel regression.

		Reduction	# of firms
(1)	Unique ISINs from FTSE coverage of TR alignment		3180
(2)	Match to the unique Refinitiv Identification Code (RIC) for the primary listing of the company for the retrieval of returns and characteristics from Refinitiv Datastream and Refinitiv Eikon	616	2564
(3)	Companie's primary exchange listing within one of 23 developed countries following (Fama & French, 2012)	783	1781
(4)	Exclude micro-cap firms with free float market capitalization below $250 million following (Lins et al., 2017)	187	1594
(5)	Without stock returns over the baseline sample period from January 2017 to December 2020	80	1514
(6)	Without control variables required for baseline panel regression	99	1415

with ESG ratings. Similarly, Manchiraju and Rajgopal (2017) document a drop in stock prices following the adoption of the Indian Companies Act, which requires Indian firms to spend 2 percent of their average net profits in the prior three years on CSR activities. Moreover, Chen et al. (2018) find that a CSR disclosure mandate in China led to a decrease in firm profitability, which could be due to a change in firm behavior, generating positive externalities at the expense of shareholders. Our results show that the average market reactions are also negative on average around the publication of the TR, which is the first disclosure mandate to explicitly define which economic activities are to be regarded as sustainable in the eyes of the European regulator. We further show significant cross-sectional heterogeneity based on TR alignment.

Third, our study is related to the literature on investor attention and

Table 3
Country representation by number of firms in our baseline sample.

Countries	Avg. EU Taxonomy Alignment (%)	# of Firms
Australia	11.57	35
Austria	19.394	12
Belgium	17.791	10
Canada	25.739	40
Denmark	24.179	9
Finland	16.067	17
France	17.561	46
Germany	23.801	62
Greece	32.88	7
Hong Kong	32.722	86
Ireland; Republic of	32.707	3
Italy	11.967	6
Japan	11.064	402
Netherlands	19.603	9
New Zealand	26.844	8
Norway	17.469	20
Portugal	28.373	7
Singapore	25.656	12
Spain	22.299	13
Sweden	20.046	18
Switzerland	22.448	28
United Kingdom	20.51	88
United States of America	22.199	477
Total		1415

Table 4
Descriptive statistics. This table presents summary statistics for the main variables.

Variables	Obs.	Mean	Std. Dev.	Min	Max
Dependent variables					
Raw Return	58,413	0.818	11.724	-96.683	58.392
CAPM-adj. Return	58,413	-0.161	9.048	-30.785	54.088
Fama-French-adj. Return	58,407	0.307	8.773	-29.595	55.718
CARs (TR)	1648	-0.43	4.821	-17.287	30.387
Main variables					
EU Taxonomy Alignment (FTSE)	58,413	19.017	26.564	0	100
EU Taxonomy Alignment (FTSE)*Attention (GSV)	58,413	148.802	381.136	0	3300
EU Taxonomy Alignment (FTSE)*Attention (Factiva)	58,413	275.694	753.158	0	8100
EU Taxonomy Alignment (FTSE) Minus ESG Rating (Refinitiv)	48,201	-0.136	1.413	-2.71	5.381
EU Taxonomy Alignment (FTSE) Minus ESG Rating (MSCI)	48,202	-0.092	1.302	-2.713	4.604
EU Taxonomy Alignment (FTSE) Minus E Rating (Refinitiv)	46,878	-0.043	1.42	-2.457	4.815
EU Taxonomy Alignment (FTSE) Minus E Rating (MSCI)	48,202	-0.025	1.273	-3.329	5.288
Control variables					
ESG Controversies	58,413	0.154	0.361	0	1
Age	58,413	3.509	0.932	0	5.323
Market Cap	58,413	21.721	1.496	19.342	26.137
Book-to-Market	58,413	0.437	0.57	-4.092	2.68
Debt	58,413	20.433	3.157	0	25.377
Cash	58,413	19.504	1.918	0	23.834
Current Ratio	58,413	1.829	1.301	0.05	11.759
Profitability	58,413	6.05	6.903	-98.339	33.451
Volatility	58,413	11.418	28.248	2.259	386.737
Momentum	58,413	1.919	13.06	-27.446	172.873
ESG Rating (Refinitiv)	48,201	55.661	19.029	2.159	95.824
ESG Rating (MSCI)	48,202	5.566	2.146	0	10

Table 5
EU Taxonomy alignment and monthly stock returns. The sample period is January 2017 to December 2020. The sample includes firms in 23 developed countries. The dependent variables are monthly raw returns, CAPM-adj. returns, and Fama-French-adj. returns. The independent variable of interest is *EU Taxonomy Alignment (FTSE)*, which is the percentage of EU Taxonomy-aligned revenues as estimated by FTSE. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. All models include estimation type (Estimation FE) and tiering (Tiering FE) fixed effects, controlling for the green revenues' estimation technique applied by FTSE and the shades of green revenues, respectively. Year-month FE, Year-month*Industry FE, and Year-month*Country are year-month, year-month times four-digit NACE industry, and year-month times country fixed effects, respectively. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

		Raw Return		CAPM-adj. Return			Fama-French-adj. Return		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EU Taxonomy Alignment (FTSE)	**0.0135*** **	**0.0136*** **	**0.0127*** **	**0.0108*** **	**0.0096*** **	**0.0101*** **	**0.0117*** **	**0.0126*** **	**0.0113*** **
	(0.0033)	**(0.0039)**	**(0.0041)**	**(0.0030)**	**(0.0035)**	**(0.0036)**	**(0.0030)**	**(0.0033)**	**(0.0035)**
ESG Controversies	-0.6770***	-0.7490***	-0.8256***	-0.8240***	-0.8285***	-0.8408***	-0.5709***	-0.6426***	-0.6099***
	(0.2066)	(0.2476)	(0.2515)	(0.1742)	(0.2089)	(0.2081)	(0.1741)	(0.2171)	(0.2193)
Age	-0.1111*	-0.0475	-0.0782	0.0466	0.0666	-0.0320	-0.1067*	-0.0557	-0.0255
	(0.0651)	(0.0840)	(0.0860)	(0.0593)	(0.0715)	(0.0727)	(0.0609)	(0.0758)	(0.0767)
Market Cap	0.0620	0.0509	0.0286	0.1932***	0.1458*	0.1450	0.0783	0.0425	-0.0177
	(0.0748)	(0.0979)	(0.1117)	(0.0636)	(0.0801)	(0.0923)	(0.0661)	(0.0902)	(0.1049)
Book-to-Market	-0.1268	-0.0795	0.0676	0.0780	0.1805	0.1989	0.1239	0.0319	0.1939
	(0.1436)	(0.1986)	(0.2261)	(0.1426)	(0.1916)	(0.2208)	(0.1464)	(0.2034)	(0.2239)
Debt	-0.0217	-0.0147	-0.0162	-0.0515*	-0.0642	-0.0683	-0.0284	-0.0341	-0.0413
	(0.0414)	(0.0563)	(0.0591)	(0.0311)	(0.0416)	(0.0436)	(0.0330)	(0.0461)	(0.0487)
Cash	0.0499	0.0652	0.1167*	-0.0063	0.0426	0.0753	0.0024	0.0524	0.1138*
	(0.0461)	(0.0566)	(0.0692)	(0.0434)	(0.0516)	(0.0624)	(0.0434)	(0.0556)	(0.0679)
Current Ratio	-0.0160	-0.0168	-0.0312	-0.1071**	-0.0823*	-0.0922*	-0.0814*	-0.0703	-0.0917*
	(0.0520)	(0.0519)	(0.0542)	(0.0463)	(0.0471)	(0.0484)	(0.0442)	(0.0449)	(0.0472)
Profitability	0.0150	0.0152	0.0153	0.0246*	0.0256	0.0238	0.0092	0.0065	0.0063
	(0.0146)	(0.0192)	(0.0196)	(0.0127)	(0.0173)	(0.0176)	(0.0113)	(0.0146)	(0.0152)
Volatility	0.0371*	0.0688**	0.0680**	0.0631***	0.0968***	0.0958***	0.0718***	0.0955***	0.0916***
	(0.0218)	(0.0285)	(0.0296)	(0.0190)	(0.0238)	(0.0244)	(0.0210)	(0.0285)	(0.0284)
Momentum	-0.2358***	-0.2658***	-0.2615***	-0.1435***	-0.1903***	-0.1847***	-0.1143***	-0.1210**	-0.1107**
	(0.0419)	(0.0519)	(0.0542)	(0.0362)	(0.0411)	(0.0425)	(0.0391)	(0.0488)	(0.0487)
Constant	-0.7991	-1.5163	-1.9069	-3.8548***	-3.9478***	-4.1265***	-1.1803	-1.6434	-1.4774
	(1.4620)	(1.8308)	(1.9458)	(1.1874)	(1.4469)	(1.5308)	(1.3082)	(1.6659)	(1.7905)
Observations	58,413	52,170	52,170	58,413	52,170	52,170	58,407	52,164	52,164
R-squared	0.2541	0.4038	0.4510	0.0217	0.2116	0.2676	0.0172	0.1962	0.2499
Estimation FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tiering FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-month*Industry FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year-month*Country FE	No	No	Yes	No	No	Yes	No	No	Yes

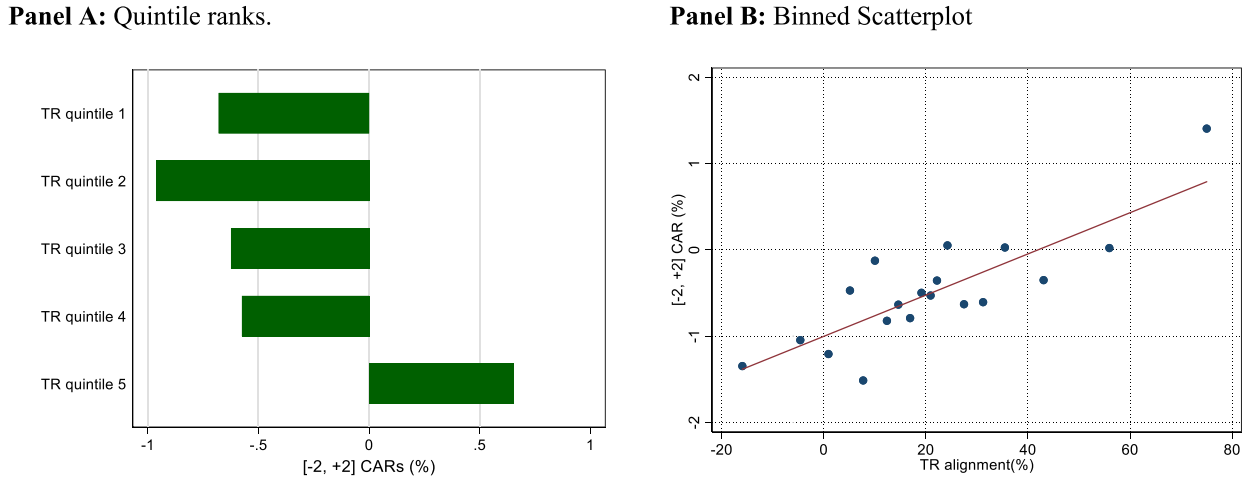

Fig. 1. Stock price reaction to the publication of the EU Taxonomy Regulation. Panel A shows the average five-day Fama-French-adjusted cumulative abnormal returns (CARs) by quintile ranks of estimated EU Taxonomy-aligned revenues. Panel B shows a binned scatterplot of EU Taxonomy aligned revenues against CARs. The scatterplot controls for firm characteristics and NACE industry-, country-, estimation-, and tiering fixed effects. The sample includes firms in 23 developed countries.

Table 6
Stock market reaction to the publication of the EU Taxonomy Regulation. The sample includes firms in 23 developed countries. The dependent variable is the Fama-French-adj. cumulative abnormal return, denoted as *CARs (TR)*. The independent variable of interest is *EU Taxonomy Alignment*, which is the percentage of EU Taxonomy-aligned revenues as estimated by FTSE. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. We include estimation type (Estimation FE) and tiering (Tiering FE) fixed effects, controlling for the estimation technique applied by FTSE and the shades of green revenues, respectively. Industry FE and Country FE are NACE industry fixed effects and country fixed effects, respectively. Standard errors are robust. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

VARIABLES	CARs (TR)	
	(1)	(2)
EU Taxonomy Alignment (FTSE)	**0.0209*** **	**0.0238*** **
	(0.0053)	**(0.0071)**
Observations	1648	1247
R-squared	0.0157	0.2629
Constant	Yes	Yes
Controls	No	Yes
Estimation FE	No	Yes
Tiering FE	No	Yes
Industry FE	No	Yes
Country FE	No	Yes

stock returns. Prior studies use GSV for terms signaling financial or economic content to proxy investors' attention (Andrei & Hasler, 2015; Da et al., 2011; Ramelli, Ossola, & Rancan, 2021; Vozlyublennaia, 2014). We show that investors' attention to the TR is an important channel for increasing the returns of green assets, which is compatible with the redirection of capital as intended by the European Commission's action plan on financing sustainable growth.[9]

Finally, we contribute to the literature on the measurement of firms' nonfinancial performance. Our study is one of the first to apply a sustainability taxonomy that was developed by a major regulatory institution instead of relying on proprietary methodologies of ESG rating providers or using single metrics (e.g., corporate carbon emissions).[10] This is important, because recent studies raise concerns over the validity of ESG ratings, showing that there is significant disagreement between them (Berg et al., 2022; Chatterji et al., 2016). We show that firms' ESG ratings do not predict returns over our sample period and that there is a negative correlation between TR alignment and ESG ratings. This finding is indicative of systematic differences in the way that the providers of TR and ESG ratings assess companies' sustainability, as also discussed in Dumrose et al. (2022).

2. Institutional background and hypothesis development

2.1. Identification of sustainable investments, ESG ratings, and TR alignment

What are sustainable investments? Despite the rapid growth of sustainable investing in the investment industry due to institutional and retail demand for sustainable assets, there is no clear answer. In academia, researchers commonly utilize ESG ratings to identify sustainable companies (El Ghoul et al., 2011; Ferrell et al., 2016; Lins et al., 2017; Pástor et al., 2022; Pedersen et al., 2021). Likewise, the incorporation of ESG ratings in the investment process by investment managers and asset owners has also grown rapidly over the past decade. The identification of sustainable companies thus hinges on the validity of the proprietary methodologies of ESG rating agencies such as ASSET4 (Refinitiv), Sustainalytics, KLD (MSCI Stats), Vigeo Eiris (Moody's), and RobecoSAM (S&P Global). However, concerns over these ratings have been sparked by recent studies showing that different ratings evaluate the same firm very differently, which raises questions about their validity and usefulness (Berg et al., 2022; Chatterji et al., 2016; Eccles & Stroehle, 2018; Gibson et al., 2021; Semenova & Hassel, 2015). Berg et al. (2022) demonstrate that significant rating differences are largely due to the use of different methodologies to quantify firms' sustainability.

The general approach taken by rating providers is to define a set of rating indicators and categories. Rating indicators are single metrics (e.g., total carbon dioxide (CO2) and CO2-equivalent emissions in tons) to quantify a sustainability category (e.g., emissions). Depending on the rating agency, the "emissions" category may include many additional quantitative and qualitative indicators. In the case of ASSET4 (Refinitiv), for example, one qualitative indicator with a positive polarity is the disclosure of a CO2 reduction policy. The number of indicators and categories and their respective weightings vary between rating providers, thus causing significant ratings disagreement between them (Berg et al., 2022). An obvious concern is that to a certain extent, ESG ratings may reflect firms' strategic greenwashing strategies (i.e., the disclosure of boilerplate information that does not reflect the actual sustainability of the firms' real economic activities). The mere disclosure of a policy (e.g., as regards business ethics or human rights, etc.) can improve a firm's ESG rating regardless of the actual implementation of said policy. Moreover, in a recent study, Christensen et al. (2021) show that greater ESG disclosure leads to greater ESG ratings disagreement, which indicates that these disclosures are interpreted differently and evaluated subjectively. In this context, it is also important to point towards contemporary working papers that raise significant concerns about fundamental conflicts of interest faced by commercial rating providers (Berg et al., 2020; Li et al., 2022; Tang et al., 2021).

What, then, is a company's "true sustainability performance"? The TR attempts to answer this question in a fundamentally different manner than commercial ESG rating providers. First, the TR examines sustainability metrics on the level of economic activities rather than on the firm level. For each activity, the TR introduces specific technical screening criteria (TSCs) including quantitative thresholds to determine the activity's substantial contribution to six environmental objectives.[11] The TSCs are derived from principles pertaining to each economic activity. The European Commission's Technical Expert Group (TEG) on sustainable finance has published a detailed description of TSCs for relevant economic activities.[12] Exemplarily, Table 1 shows the TSCs for the economic activity "Freight Rail Transport,"[13] for which the TR defines a detailed threshold of CO2 emissions. By contrast, ESG ratings commonly consider firms' total CO2 emissions irrespective of the underlying economic activities.

[9] For more information, see: https://ec.europa.eu/info/publications/sustainable-finance-renewed-strategy_en#action-plan.

[10] There are other relevant contemporary studies dealing with the TR. Alessi and Battiston (2022) develop a top-down approach to classify the TR alignment of portfolios using sector-level information. Sautner et al. (2022) report evidence that the syndicate loan market already prices in some of the intended effects of the TR. Dumrose et al. (2022) argue that the TR can help to reduce the divergence between ESG ratings.

[11] As per Article 9 of the TR, the six environmental objectives are climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, and protection and restoration of biodiversity and ecosystems.

[12] https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy-annexes_en.pdf

[13] The TEG's TSC recommendations are currently being written into law via delegated acts that pertain to each of the six environmental objectives of the TR. The first delegated act on sustainable activities for climate change adaptation and mitigation objectives was published in the Official Journal on 9 December 2021 and has been applicable since January 2022.

Table 7
EU Taxonomy alignment, attention, and stock returns. The sample period is January 2017 to December 2020. The sample includes firms in 23 developed countries. The dependent variable is the monthly Fama-French-adj. return. The independent variables of interest are *EU Taxonomy Alignment (FTSE)*Attention (GSV)* and *EU Taxonomy Alignment (FTSE)*Attention (Factiva)*, which are interaction terms of EU Taxonomy-aligned revenues as estimated by FTSE and a proxy variable for investor attention. *Attention (GSV)* is the monthly Google Trends search index for the term "EU Taxonomy." *Attention (Factiva)* is the monthly count of news articles that reference the EU Taxonomy Regulation. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. All models include estimation type (Estimation FE) and tiering (Tiering FE) fixed effects, controlling for the green revenues' estimation technique applied by FTSE and the shades of green revenues, respectively. Year-month FE, Industry FE, and Country FE are year-month, NACE industry, country fixed effects, respectively. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

	Fama-French-adj. Return							
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EU Taxonomy Alignment (FTSE)	0.0007	0.0018	0.0002	-0.0199	0.0016	0.0028	0.0012	-0.0182
	(0.0031)	(0.0034)	(0.0036)	(0.0197)	(0.0032)	(0.0034)	(0.0036)	(0.0197)
EU Taxonomy Alignment (FTSE)*Attention (GSV)	**0.0014*** **	**0.0014*** **	**0.0014*** **	**0.0011*** **				
	(0.0002)	**(0.0002)**	**(0.0002)**	**(0.0003)**				
EU Taxonomy Alignment (FTSE)*Attention (Factiva)					**0.0007*** **	**0.0007*** **	**0.0007*** **	**0.0006*** **
					(0.0001)	**(0.0001)**	**(0.0001)**	**(0.0001)**
ESG Controversies	-0.5631***	-0.6058***	-0.6197***	-0.1125	-0.5648***	-0.6079***	-0.6220***	-0.1125
	(0.1735)	(0.1933)	(0.1903)	(0.1783)	(0.1736)	(0.1935)	(0.1904)	(0.1787)
Age	-0.1049*	-0.0645	-0.0124	-0.1082	-0.1051*	-0.0648	-0.0127	-0.1040
	(0.0608)	(0.0724)	(0.0725)	(0.6334)	(0.0608)	(0.0724)	(0.0726)	(0.6334)
Market Cap	0.0767	0.0166	-0.0507	-2.2669***	0.0769	0.0169	-0.0507	-2.2621***
	(0.0658)	(0.0841)	(0.0975)	(0.3055)	(0.0658)	(0.0842)	(0.0975)	(0.3069)
Book-to-Market	0.1171	0.0413	0.2054	0.9071*	0.1181	0.0426	0.2072	0.9103*
	(0.1459)	(0.1872)	(0.2033)	(0.5428)	(0.1460)	(0.1872)	(0.2033)	(0.5440)
Debt	-0.0300	-0.0365	-0.0396	-0.0023	-0.0298	-0.0363	-0.0395	0.0006
	(0.0328)	(0.0420)	(0.0438)	(0.0437)	(0.0328)	(0.0420)	(0.0439)	(0.0434)
Cash	0.0020	0.0565	0.1268*	0.0294	0.0021	0.0568	0.1273*	0.0311
	(0.0433)	(0.0551)	(0.0657)	(0.0723)	(0.0433)	(0.0551)	(0.0657)	(0.0722)
Current Ratio	-0.0814*	-0.0794*	-0.1008**	-0.1187	-0.0819*	-0.0800*	-0.1017**	-0.1217
	(0.0443)	(0.0441)	(0.0469)	(0.1092)	(0.0443)	(0.0441)	(0.0469)	(0.1087)
Profitability	0.0097	0.0046	0.0048	-0.0413**	0.0098	0.0047	0.0050	-0.0406**
	(0.0108)	(0.0124)	(0.0130)	(0.0191)	(0.0109)	(0.0125)	(0.0131)	(0.0192)
Volatility	0.0740***	0.0986***	0.0989***	0.1216*	0.0740***	0.0985***	0.0989***	0.1212*
	(0.0211)	(0.0250)	(0.0247)	(0.0716)	(0.0211)	(0.0250)	(0.0247)	(0.0716)
Momentum	-0.1193***	-0.1267***	-0.1273***	-0.1464***	-0.1192***	-0.1266***	-0.1272***	-0.1464***
	(0.0394)	(0.0416)	(0.0414)	(0.0566)	(0.0394)	(0.0416)	(0.0413)	(0.0566)
Constant	-1.1270	-1.0973	-1.1282	48.6826***	-1.1373	-1.1104	-1.1390	48.4576***
	(1.3078)	(1.5255)	(1.6198)	(7.3583)	(1.3083)	(1.5262)	(1.6205)	(7.4131)
Observations	58,407	56,932	56,932	52,164	58,407	56,932	56,932	52,164
R-squared	0.0189	0.0343	0.0354	0.3611	0.0189	0.0343	0.0354	0.3611
Estimation FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tiering FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-month*Industry FE	No	No	Yes	Yes	No	No	Yes	Yes
Year-month*Country FE	No	No	Yes	Yes	No	No	Yes	Yes
Firm FE	No	No	No	Yes	No	No	No	Yes

Secondly, the TR stipulates that economic activities must also meet requirements for "minimum safeguards" and "do no significant harm" (DNSH). The safeguard requirements specify that issuers must conduct due diligence to prevent any negative impacts and comply with the human and labor rights standards presented in the OECD Guidelines for Multinational Enterprises, the UN Guiding Principles on Business and Human Rights, and labor rights conventions. On the economic activity level, the DNSH requirements assess any significant harm to any of the other five environmental objectives.

Third, the TR is dynamic in the sense that as per Article 26 of the TR, the TSCs are subject to review every three years. This dynamic design is intended as a mechanism for responding to changes in technology, science, new economic activities, and data. In contrast, ESG ratings are generally static and are not dynamically adjusted to reflect these changes.

Fourth, unlike ESG ratings, the TR's assessment of sustainability is fundamentally tied to the objective of achieving a climate-neutral economy by 2050. In this regard, the TR defines transitional and enabling activities that contribute to the creation of a zero net emissions economy. Transitional activities can be TR-aligned if there are no technologically or economically feasible low-carbon alternatives, CO2 emissions are below the average for the sector or industry, and the activity does not cause carbon lock-in or hinder the development of low-carbon alternatives. Enabling activities are activities that directly enable other activities to make a substantial contribution to the environmental objectives of the TR.

Overall, these conceptual differences between the sustainability assessment of the TR versus ESG ratings agencies may lead to different conclusions being drawn for the same company. At the very least, the TR provides investors with an alternative framework for their identification of sustainable companies. In the future, ESG rating providers may also incorporate TR-related company disclosures in their proprietary methodologies, which could prospectively reduce rating disagreements.

Table 8
EU Taxonomy Alignment, ESG Rating, and stock returns. The sample period is January 2017 to December 2020. The sample includes firms in 23 developed countries. The dependent variable is *Fama-French-adj. Return*. The independent variables of interest are *EU Taxonomy Alignment (FTSE), ESG Rating (Refinitiv), EU Taxonomy Alignment (FTSE) Minus ESG Rating (Refinitiv)*, and *EU Taxonomy Alignment (FTSE) Minus E Rating (Refinitiv)*. *EU Taxonomy Alignment (FTSE)* is the percentage of EU Taxonomy-aligned revenues as estimated by FTSE. *ESG Rating (Refinitiv)* is the ASSET4 ESG Rating. *EU Taxonomy Alignment (FTSE) Minus ESG Rating (Refinitiv)* is the difference between the estimated EU Taxonomy Alignment and the ASSET4 ESG Rating. *EU Taxonomy Alignment (FTSE) Minus E Rating (REFINITIV)* is the difference between EU Taxonomy Alignment and the ASSET4 Environmental Pillar Score. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. All models include estimation type (Estimation FE) and tiering (Tiering FE) fixed effects, controlling for the green revenues' estimation technique applied by FTSE and the shades of green revenues, respectively. Year-month FE, Year-month*Industry FE, and Year-month*Country are year-month, year-month times NACE industry, and year-month times country fixed effects, respectively. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

	Fama-French-adj. Return					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
EU Taxonomy Alignment (FTSE)	**0.0142*** **			**0.0128*** **		
	(0.0030)			**(0.0041)**		
ESG Rating (Refinitiv)	**-0.0020**					
	(0.0050)					
EU Taxonomy Alignment (FTSE) Minus ESG Rating (Refinitiv)		**0.2497*** **				
		(0.0725)				
EU Taxonomy Alignment (FTSE) Minus E Rating (Refinitiv)			**0.3074*** **			
			(0.1021)			
ESG Rating (MSCI)				**-0.0728**		
				(0.0497)		
EU Taxonomy Alignment (FTSE) Minus ESG Rating (MSCI)					**0.2573*** **	
					(0.0830)	
EU Taxonomy Alignment (FTSE) Minus E Rating (MSCI)						**0.2066** **
						(0.0869)
ESG Controversies	-0.3474**	-0.3201**	-0.5707**	-0.5806**	-0.5960***	-0.5667**
	(0.1567)	(0.1574)	(0.2353)	(0.2274)	(0.2271)	(0.2260)
Age	-0.0773	-0.0771	-0.0072	0.0312	0.0298	0.0158
	(0.0687)	(0.0691)	(0.0851)	(0.0799)	(0.0801)	(0.0810)
Market Cap	-0.1069	-0.0436	0.0067	-0.0208	-0.0057	-0.0189
	(0.0909)	(0.0847)	(0.1400)	(0.1172)	(0.1176)	(0.1197)
Book-to-Market	0.2079	0.2167	0.2718	-0.1032	-0.0982	-0.1022
	(0.2136)	(0.2151)	(0.3000)	(0.2776)	(0.2778)	(0.2792)
Debt	-0.0249	-0.0234	-0.0139	-0.0501	-0.0520	-0.0472
	(0.0235)	(0.0233)	(0.0603)	(0.0624)	(0.0624)	(0.0630)
Cash	0.0985**	0.1076**	0.1266	0.1330*	0.1299*	0.1383**
	(0.0468)	(0.0476)	(0.0775)	(0.0687)	(0.0685)	(0.0692)
Current Ratio	-0.1081**	-0.1182**	-0.1705**	-0.1021	-0.1029	-0.0853
	(0.0469)	(0.0474)	(0.0711)	(0.0623)	(0.0626)	(0.0609)
Profitability	-0.0085	-0.0114	-0.0001	0.0008	-0.0002	-0.0032
	(0.0129)	(0.0128)	(0.0176)	(0.0172)	(0.0172)	(0.0174)
Volatility	0.0325	0.0319	0.0964***	0.0977***	0.0971***	0.0971***
	(0.0234)	(0.0234)	(0.0313)	(0.0329)	(0.0329)	(0.0329)
Momentum	0.0121	0.0130	-0.1211**	-0.1301**	-0.1293**	-0.1286**
	(0.0390)	(0.0390)	(0.0558)	(0.0576)	(0.0576)	(0.0575)
Constant	1.2456	-0.1242	-2.4287	-1.2260	-1.5828	-1.5381
	(1.6861)	(1.6526)	(2.5128)	(2.0584)	(2.0642)	(2.1601)
Observations	42,673	42,673	41,457	42,608	42,608	42,608
R-squared	0.2774	0.2770	0.2688	0.2730	0.2729	0.2725
Estimation FE	Yes	Yes	Yes	Yes	Yes	Yes
Tiering FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-month*Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-month*Country FE	Yes	Yes	Yes	Yes	Yes	Yes

2.2. Stock returns of TR-Aligned companies

Does the intended reorientation of capital towards TR-aligned companies impact stock returns? Ultimately, this is an empirical question. The answer hinges on the attention that investors pay to the TR and the degree to which firms' TR alignment influences their investment decisions. To the extent that sustainability-motivated investors already apply the TR to identify green assets, we expect them to bid up the price for these assets, leading to higher realized returns after controlling for risk factors and relevant company characteristics.

H1. There is a positive relationship between TR alignment and stock returns over the TR implementation period.

To address this first hypothesis, we conduct cross-sectional monthly return regressions, which we explain in detail in the following section. This approach measures the coefficient loading of TR alignment over the four years from the start of the European Commission's Sustainable Finance Initiative until the end of 2020. Although we can control for risk

Table 9
EU Taxonomy Alignment and 12-month buy and hold returns. The sample period is January 2017 to December 2020. The sample includes firms in 23 developed countries. The dependent variable is the Fama-French-adjusted 12-month buy-and-hold return. The independent variables of interest are *EU Taxonomy Alignment, EU Taxonomy Alignment*Attention (GSV), EU Taxonomy Alignment*Attention (Factiva), EU Taxonomy Alignment Minus ESG Rating*, and *EU Taxonomy Alignment Minus E Rating. EU Taxonomy Alignment* is the percentage of EU Taxonomy-aligned revenues as estimated by FTSE. *EU Taxonomy Alignment*Attention (GSV)* and *EU Taxonomy Alignment*Attention (Factiva)* are interaction terms of EU Taxonomy-aligned revenues as estimated by FTSE and a proxy variable for investor attention. *Attention (GSV)* is the monthly Google Trends search index for the term "EU Taxonomy." *Attention (Factiva)* is the count of monthly news articles that reference the EU Taxonomy Regulation. *EU Taxonomy Alignment Minus ESG Rating* is the difference between EU Taxonomy Alignment and the ASSET4 ESG Rating. *EU Taxonomy Alignment Minus E Rating* is the difference between EU Taxonomy Alignment and the ASSET4 Environmental Pillar Score. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. All models include estimation type (Estimation FE) and tiering (Tiering FE) fixed effects, controlling for the green revenues estimation technique applied by FTSE and the shades of green revenues, respectively. Year FE, Year*Industry FE, and Year*Country FE are year, year times four-digit NACE industry, and year times country fixed effects, respectively. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

	Fama-French-adj. Buy-and-Hold Return						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EU Taxonomy Alignment	**0.1009*** (0.0203)**	**0.1101*** (0.0264)**	**0.1052*** (0.0265)**	-0.0286 (0.0279)	-0.0363 (0.0286)		
EU Taxonomy Alignment (FTSE) *Attention (GSV)				**0.0014*** (0.0003)**			
EU Taxonomy Alignment (FTSE)*Attention (Factiva)					**0.0008*** (0.0001)**		
EU Taxonomy Alignment (FTSE) Minus ESG Rating (Refinitiv)						**2.5913*** (0.6356)**	
EU Taxonomy Alignment (FTSE) Minus E Rating (Refinitiv)							**3.4015*** (0.6632)**
ESG Controversies	-2.3290** (1.1089)	-2.5752* (1.3410)	-3.0884** (1.3526)	-2.9891** (1.3283)	-2.9915** (1.3281)	-2.6880* (1.3777)	-2.5286* (1.3899)
Age	-0.7583* (0.4463)	-0.4162 (0.5097)	-0.4452 (0.5661)	-0.4165 (0.5604)	-0.4165 (0.5605)	-0.6344 (0.5958)	-0.5089 (0.6046)
Market Cap	0.8739** (0.3901)	0.3885 (0.4804)	0.1024 (0.5200)	0.1204 (0.5096)	0.1125 (0.5098)	0.6340 (0.6622)	0.5361 (0.6662)
Book-to-Market	0.8399 (0.8595)	0.2202 (1.0844)	1.5290 (1.2489)	1.3288 (1.2352)	1.3191 (1.2348)	1.2827 (1.5239)	2.0186 (1.5439)
Debt	-0.4764*** (0.1610)	-0.5006** (0.1994)	-0.5535*** (0.2054)	-0.5810*** (0.2002)	-0.5794*** (0.2002)	-0.4056* (0.2255)	-0.3303 (0.2263)
Cash	-0.2598 (0.2820)	-0.1156 (0.3372)	0.2634 (0.3753)	0.2519 (0.3689)	0.2549 (0.3696)	0.3175 (0.4215)	0.3545 (0.4312)
Current Ratio	-0.5839* (0.3126)	-0.4971 (0.3416)	-0.6672* (0.3695)	-0.6145* (0.3711)	-0.6225* (0.3718)	-1.0680** (0.4935)	-1.2419** (0.5287)
Profitability	0.0652 (0.0900)	0.0139 (0.1108)	0.0085 (0.1084)	0.0038 (0.1017)	0.0054 (0.1015)	-0.0488 (0.1202)	-0.0411 (0.1224)
Volatility	0.0048 (0.0187)	0.0893*** (0.0138)	0.0889*** (0.0134)	0.0879*** (0.0131)	0.0878*** (0.0131)	0.0897*** (0.0129)	0.0908*** (0.0127)
Momentum	-0.0003 (0.0282)	-0.0895** (0.0428)	-0.0900** (0.0415)	-0.0885** (0.0408)	-0.0884** (0.0408)	-0.0904** (0.0397)	-0.0920** (0.0391)
Constant	-2.0694 (7.2040)	4.3396 (8.9636)	4.2870 (9.2483)	4.6552 (9.1760)	4.7454 (9.1760)	-6.6056 (12.3252)	-7.3066 (12.5160)
Observations	4824	4305	4305	4305	4305	3545	3413
R-squared	0.0356	0.2170	0.2778	0.2921	0.2922	0.2935	0.3000
Estimation FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tiering FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Industry FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Year*Country FE	No	No	Yes	Yes	Yes	Yes	Yes

factors and firm characteristics that are known to predict returns, we make no causal claims. To provide further evidence on the relationship between TR alignment and stock returns, we utilize the publication of the TR as an exogenous shock that introduced new information to investors. In contrast to prior CSR-related regulation in the EU (i.e., the EU CSR Directive), no national implementation acts are required for the TR to take effect. Moreover, the TR adapted and specified the recommendations of the HLEG and TEG, which were tasked with designing the Taxonomy. Similar to the Grewal et al. (2019) study on the stock market reaction to the EU CSR Directive, we examine the heterogeneity in abnormal returns around the publication date with respect to firms' TR alignment. We expect to find consistent results between the long-run analysis based on monthly returns (H1) and daily abnormal returns around the publication of the TR.

H2. There is a positive relationship between TR alignment and stock price reactions to the publication of the TR.

We further expect that the positive coefficient loading of TR alignment (i.e., the alignment premium) is higher when investors pay attention to the TR and thus are more likely to apply the TR in their

Table 10
Risk-adjusted portfolio returns. The sample period is January 2017 to December 2020. The sample includes firms in 23 developed countries. This table reports the performance of high-TR minus low-TR portfolios in column 1. For each month and NACE industry, we sort stocks into portfolios based on deciles of last years' EU Taxonomy Alignment as proxied by FTSE. We then compute the monthly hedge return (i.e., high-TR minus low-TR portfolio return). Stocks are equal weighted in Panel A, value weighted in Panel B, and characteristic-weighted in Panel C. We apply the log transformation to stock weights to reduce the impact of outliers. We report the portfolios' monthly Fama-French (FF) three-factor alpha, which controls for the FF factors related to market, size, and value, five-factor alpha, which also controls for the FF factors related to profitability and investment, and six-factor alpha that also controls for momentum (MOM). Column 2 reports the same values for the performance for high-ESG minus low-ESG portfolios, constructed analogously with respect to the stocks' ESG Rating. T-statistics are reported in parentheses. In order to estimate standard errors in the portfolio regressions, we use the Newey and West (1987) procedure. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

VARIABLES	High-TR minus low-TR portfolios (1)	High-ESG minus low-ESG portfolios (2)
Panel A: Equal-weighted returns.		
Three-factor (FF) alpha	**101 bps****	-22 bps
	(2.14)	(-0.84)
Five-factor (FF) alpha	**93 bps****	-25 bps
	(2.29)	(-0.92)
Six-factor (FF + MOM) alpha	**93 bps****	-25 bps
	(2.38)	(-0.90)
Panel B: Value-weighted returns.		
Three-factor (FF) alpha	**109 bps****	-24 bps
	(2.36)	(-0.93)
Five-factor (FF) alpha	**101 bps****	-26 bps
	(2.52)	(-1.00)
Six-factor (FF + MOM) alpha	**100 bps****	-26 bps
	(2.63)	(-0.98)
Panel C: Characteristic-weighted returns.		
Three-factor (FF) alpha	**144 bps****	-16 bps
	(2.36)	-0.59
Five-factor (FF) alpha	**132 bps*****	-19 bps
	(2.88)	-0.67
Six-factor (FF + MOM) alpha	**133 bps*****	-17 bps
	(2.77)	-0.65

Table 11
Sample extension and alternative proxy for TR alignment provided by MSCI. The sample period in column (1) is January 2017 to December 2022 and is column (2) and (3) is January 2020 to December 2022. The dependent variable is monthly Fama-French-adj. return. The independent variable of interest is *EU Taxonomy Alignment*, which is the percentage of EU Taxonomy-aligned revenues as estimated by FTSE or MSCI. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. Column (1) includes estimation type (Estimation FE) and tiering (Tiering FE) fixed effects, controlling for the green revenues' estimation technique applied by FTSE and the shades of green revenues, respectively. Year-month FE, Year-month*Industry FE, and Year-month*Country are year-month, year-month times four-digit NACE industry, and year-month times country fixed effects, respectively. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

	Fama-French-adj. Return		
VARIABLES	(1)	(2)	(3)
EU Taxonomy Alignment (FTSE)	**0.0083*****		
	(0.0029)		
EU Taxonomy Alignment (MSCI)		**0.0091*****	**0.0094*****
		(0.0022)	**(0.0023)**
EU Taxonomy Eligibility (MSCI)			**0.0008**
			(0.0012)
ESG Controversies	-0.5011**	0.1157	0.2147**
	(0.1946)	(0.0823)	(0.0910)
Age	-0.0225	-0.0152	-0.0492
	(0.0714)	(0.0327)	(0.0361)
Market Cap	-0.0206	-0.0170	-0.0396
	(0.0889)	(0.0270)	(0.0302)
Book-to-Market	0.1505	0.1391***	0.1440**
	(0.1726)	(0.0513)	(0.0630)
Debt	-0.0217	-0.0029	-0.0007
	(0.0326)	(0.0081)	(0.0090)
Cash	0.0765	-0.0547***	-0.0484**
	(0.0584)	(0.0181)	(0.0206)
Current Ratio	-0.0783*	-0.0168	-0.0206
	(0.0426)	(0.0142)	(0.0151)
Profitability	0.0136	0.0121***	0.0138***
	(0.0126)	(0.0031)	(0.0033)
Volatility	0.0850***	0.1008***	0.1005***
	(0.0224)	(0.0080)	(0.0090)
Momentum	-0.1031***	-0.0759***	-0.0987***
	(0.0370)	(0.0094)	(0.0103)
Constant	-1.1252	0.4458	0.8505
	(1.5795)	(0.4988)	(0.5722)
Observations	79,348	139,928	114,665
R-squared	0.2575	0.2504	0.2576
Estimation FE	Yes	No	No
Tiering FE	Yes	No	No
Year-month FE	Yes	Yes	Yes
Year-month*Industry FE	Yes	Yes	Yes
Year-month*Country FE	Yes	Yes	Yes

investment decisions. Intuitively, we conjecture that the alignment premium is associated with investor attention to TR-related information. In our regression framework, we expect to find a significant interaction effect between TR alignment and investor attention to the TR.

H3. The relationship between TR alignment and stock returns will be stronger when investors pay attention to the TR over the TR implementation period.

As outlined in the previous subsection, we identify several key conceptual differences between the sustainability assessment of the TR and traditional ESG ratings. We argue that investors reallocate capital to TR-aligned companies when the sustainability assessment as per the TR surpasses the assessment of a traditional ESG rating.

H4. There is a positive relationship between the difference between a firm's TR alignment and its ESG and stock returns over the TR implementation period.

3. Sample and methodology

3.1. Sample construction

To construct our sample, we gather information on firms' estimated TR alignment from FTSE Russell. The FTSE Russell Green Revenues (FTSE GR) dataset covers global publicly listed firms and determines the

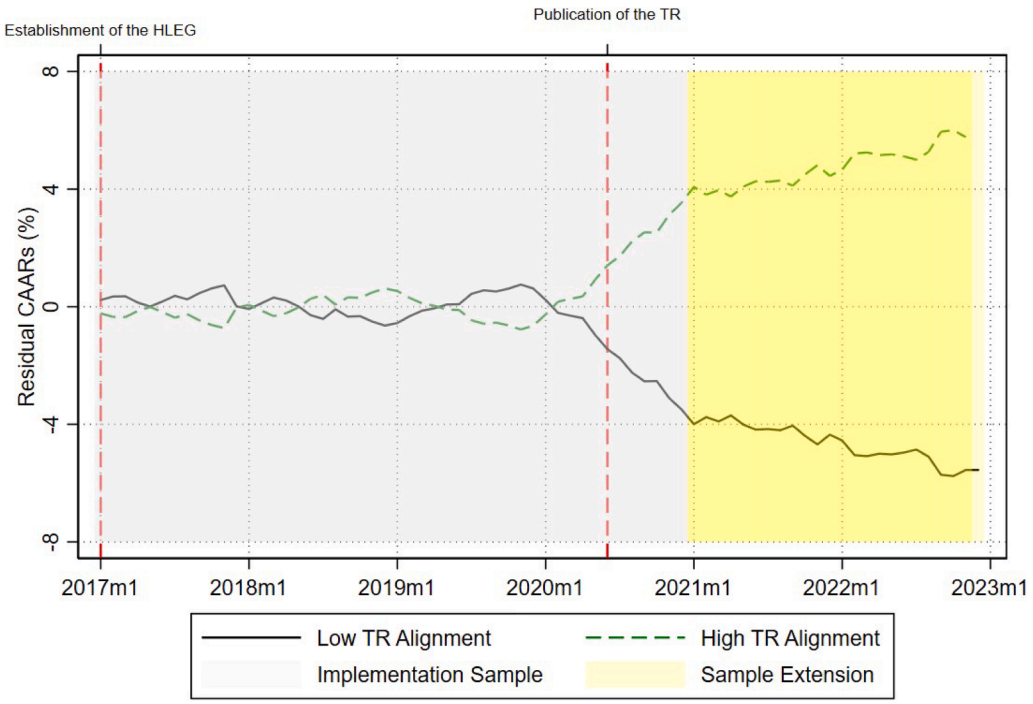

Fig. 2. High versus low EU Taxonomy alignment returns over the extended sample period. This figure shows the residual cumulative average Fama-French-adjusted returns (CAARs) for high versus low TR-aligned firms net the combined impacts on returns of other firm characteristics and past stock performance. Following the methodology in Ramelli, Wagner et al. (2021), the residual CAARs are estimated over a moving window of monthly cross-sectional return regressions including all control variables of Eq. (1). The accumulation of returns starts in January 2017, which is the first month after the establishment of the High-Level Expert Group (HLEG) on sustainable finance. The spread between the portfolios represents the return on an equally weighted long-short portfolio along EU Taxonomy alignment, net of common risk factors. The sample includes firms in 23 developed countries.

percentage of each firm's revenues that can be classified as environmentally sustainable (i.e., "green") according to the TSCs published by the TEG. This database contains yearly TR-aligned revenue percentages for over 3000 global companies and has also been used by the European Commission's Joint Research Center (JRC) for their report on the financial impact assessment of the TR disclosure requirements (Alessi et al., 2019). Note that the FTSE estimations for TR alignment are based on a previously developed "Green Revenues Classification System" (GRCS). FTSE maps this system to economic activities covered by the EU Taxonomy. As also discussed in Alessi et al. (2019), this initial system defines green revenues more broadly than the TR. Here, we use the FTSE estimations for TR-aligned green revenues.[14] Firms covered by the TR are mandated to initiate TR-aligned revenue disclosures for the 2022 fiscal year. FTSE uses publicly available information about the firms' product sales and production to generate TR alignment estimations for companies that are not covered by the TR or for which disclosures are not yet available. We match FTSE GR with stock returns from Refinitiv Datastream and corporate fundamentals from Refinitiv Eikon. As in Lins et al. (2017), we exclude micro-cap stocks with free-float market capitalization below $250 million. The final sample includes 1415 firms with a unique Refinitiv Identification Code (RIC) from 23 developed countries.[15] The sample period is from January 2017 to December 2020. The sample selection procedure is detailed in Table 2. In Appendix A, we present the distribution of firms in our sample with respect to the NACE industry division along with industry-average TR alignment. As can be seen, there is substantial variation in aligned revenues across industries. In Table 3, we provide descriptive statistics across the countries in our sample. With 477 firms, the USA is most strongly represented in the sample, followed by Japan (402 firms) and the United Kingdom (88 firms).

3.2. Cross-Sectional return regression

Following Bolton and Kacperczyk (2021), we employ monthly measures of stock returns as dependent variables. In the cross-sectional regressions, we use *Raw Return, CAPM-adj. Return*, and *Fama-French-adj. Return* to measure the return of stock i in month t.[16] To obtain factor-adjusted returns, we first estimate each stock's factor loadings from a two-year rolling OLS regression of monthly stock returns in excess of the riskless asset on the market, HML, and SMB excess returns. We then compute adjusted returns as the monthly excess return on the stock minus beta times the factor excess return. Our independent variable of interest is the firms' percentage of TR-aligned revenues over the previous year, which is denoted as *EU Taxonomy Alignment (FTSE)*. We include various control variables known to predict stock returns. *ESG Controversies* is an indicator variable equal to 1 if the firm was exposed to

[14] For more information about the GRCS and the mapping to the EU Taxonomy Regulation, please see: https://www.lseg.com/content/dam/ftse-russell/en_us/documents/research/green-revenues-eu-taxonomy.pdf.

[15] We retain firms with their primary exchange listing in the 23 developed countries used in Fama and French (2012). While the initial dataset from FTSE includes ISIN codes as identifiers, we use firms' RICs because (a) ISIN codes do not uniquely identify companies because the same company may have issued multiple securities and (b) ISIN codes can be reused after a security is delisted.

[16] CAPM-adjusted returns are adjusted for the market factor. Fama-French-adjusted returns are also adjusted for the size factor SMB ("small minus big") and the book-to-market factor HML ("high minus low"). Following Ince and Porter (2006) and Schmidt et al. (2019), we exclude extreme returns of greater than 300%. We obtained the factors from Kenneth French's website https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Table 12
Sample of only European firms. The sample period is January 2020 to December 2022. The dependent variable is the monthly Fama-French-adj. return. The independent variable of interest is *EU Taxonomy Alignment (MSCI)*, which is the percentage of EU Taxonomy-aligned revenues as estimated by MSCI. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. Year-month FE, Year-month*Industry FE, and Year-month*Country are year-month, year-month times four-digit NACE industry, and year-month times country fixed effects, respectively. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

	Fama-French-adj. Retur		
VARIABLES	European firms	Non-European firms	Interaction
EU Taxonomy Alignment (MSCI)	**0.0169*** **	**0.0081*** **	**0.0085*** **
	(0.0041)	**(0.0026)**	**(0.0025)**
European Firms			-1.0225**
			(0.4512)
EU Taxonomy Alignment (MSCI)*European Firms			**0.0029**
			(0.0040)
ESG Controversies	0.4320*	0.0851	0.1270
	(0.2233)	(0.0936)	(0.0844)
Age	-0.0754	0.0029	-0.0172
	(0.0916)	(0.0361)	(0.0332)
Market Cap	-0.0625	-0.0016	-0.0196
	(0.0783)	(0.0295)	(0.0275)
Book-to-Market	0.0835	0.1224**	0.1488***
	(0.1855)	(0.0544)	(0.0522)
Debt	-0.1894***	-0.0009	-0.0025
	(0.0494)	(0.0083)	(0.0083)
Cash	0.0195	-0.0537***	-0.0504***
	(0.0425)	(0.0203)	(0.0183)
Current Ratio	-0.1359***	-0.0170	-0.0194
	(0.0396)	(0.0152)	(0.0143)
Profitability	0.0300**	0.0101***	0.0125***
	(0.0123)	(0.0032)	(0.0031)
Volatility	0.0151	0.1064***	0.1053***
	(0.0286)	(0.0083)	(0.0081)
Momentum	0.0056	-0.0842***	-0.0956***
	(0.0305)	(0.0101)	(0.0094)
Constant	4.8002***	-0.0241	0.5163
	(1.5158)	(0.5403)	(0.5105)
Observations	15,512	120,494	139,928
R-squared	0.3922	0.2595	0.1912
Year-month FE	Yes	Yes	Yes
Year-month*Industry FE	Yes	Yes	Yes
Year-month*Country FE	Yes	Yes	Yes

global media reporting on negative ESG events over the previous year. Refinitiv collects these incidents across 23 topics.[17] The variable controls for the effect of corporate social irresponsibility on financial risk and shareholder value (Glossner, 2021; Kölbel et al., 2017). *Age* is the natural logarithm of 1 + the number of years since incorporation. *Market Cap* is the natural logarithm of the free-float adjusted market capitalization. *Book-to-Market* is book value divided by market capitalization. *Debt* is the natural logarithm of total debt. *Cash* is the natural logarithm of total cash and cash equivalents. *Current Ratio* is total current assets divided by total current liabilities. *Profitability* is the pre-tax return on assets. *Market Cap, Book-to-Market, Debt, Cash, Current Ratio,* and *Profitability* are measured at year t-1 to ensure that the information is available. *Volatility* is the standard deviation of returns based on the previous 12 months of monthly returns. *Momentum* is the average return over the past six months. To eliminate the impact of outliers, we winsorize all continuous financial variables at the 0.5 percent level. Variable definitions are presented in Appendix B.

The fixed effects OLS regression is defined as

$$Return_{i,t} = \beta_0 + \beta_1 EU\ Taxonomy\ Alignment\ (FTSE)_{i,t-1} + \sum \beta_k Controls_{i,t-1} + Estimation\ FE + Tiering\ FE + Year - month\ FE + Year - month * Industry\ FE + Year - month * Country\ FE + \varepsilon_{i,t}, \quad (1)$$

where $Return_{i,t}$ is a generic term alternatively standing for *Raw Return, CAPM-adj. Return*, or *Fama-French-adj. Return*. The vector of controls includes the firm characteristics that are already described above (*ESG Controversies, Age, Market Cap, Book-to-Market, Debt, Cash, Current Ratio, Profitability, Volatility,* and *Momentum*). Our model includes high dimensional fixed effects (FE) to control for unobserved heterogeneity. *Estimation FE* controls for different estimation strategies for the percentage of TR-aligned revenues, which are employed by the FTSE GR database. The estimation type is classified as "disclosed" (meaning that the firm discloses disaggregated revenue data per product/service along with required sustainability information), "company specific" (meaning that the revenues are estimated based on company-specific information), or "sector specific" (meaning that the revenues are estimated based on the firms' industry affiliation).[18] The FTSE GR dataset also ranks all TR-aligned economic activities within an industry in terms of their environmental sustainability by assigning them to different tiers. Primary economic activities in tier 1 (tier 3) are defined as the most (least) environmentally sustainable. Taking this differentiation within TR-aligned revenues into account, we include *Tiering FE* in our model. We control for any unobservable time, industry, and country effects by including $Year - month\ FE$, $Year - month * Industry\ FE$, and $Year - month * Country\ FE$ in the most saturated model. Finally, $\varepsilon_{i,t}$ is the residual. The coefficient of interest is β_1, which reflects the predictive value of firms' green revenues for future return leading up to and including the publication of the new disclosure requirements as per the TR.

3.3. Event study methodology

The event study methodology examines the stock price reactions around the announcement of events that convey new information to investors. We use this methodology to assess how the stock market responded to the publication of the TR on 22 June 2020. We test for any heterogeneity in the stock market reaction conditional on the firms' percentage of green revenues.

For each firm, we calculate the abnormal returns (*AR*) using the Fama-French three-factor model. First, we estimate the factor loadings over the estimation window of 250 trading days prior to the event (corresponding to the interval t = -260 to t = -10 relative to the event date t = 0) using daily returns. Formally, we estimate

$$R_{it} = \alpha_0 + \beta_i RM_t + s_i SMB_t + h_i HML_t + \varepsilon_{i,t}, \quad (2)$$

where R_{it} is the stock return in excess of the risk-free asset of firm i on day t; RM_t, SMB_t, and HML_t are the daily returns on the market, size, and value factors; and $\varepsilon_{i,t}$ is the residual. The abnormal returns are raw daily returns minus the estimated expected returns. In line with prior research on the impact of market-wide regulation (Armstrong et al., 2010; Grewal et al., 2019; Zhang, 2007), we calculate five-day cumulative abnormal

[17] The topics are anti-competitive behavior, business ethics in general, intellectual property, activities in critical countries, health and industrial accidents harming the health and safety of third parties, tax fraud, child labor, human rights, board compensation, consumer complaints, customer health and safety, product access, marketing practices, research and development, accounting issues, insider dealings, shareholder rights, workforce diversity, workforce health and safety, wages and wage disputes, and strikes.

[18] Note that fewer than 0.5% of estimates are flagged as "sector specific" in our FTSE sample. Most estimates are flagged as either "company specific" (77%) or "disclosed" (23.6%).

Table 13
Propensity score matched DiD regression. In Column (1) and (3) the sample period is 90 trading days surrounding the publication of the TR on 22 June 2020. In Column (2), (4), and (5) the sample is extended to 252 trading days. The dependent variable is *Fama-French-adj. Return. High EU Taxonomy Alignment* is an indicator variable that is 1 (0) if the firm belongs to the top (bottom) quintile in terms of TR alignment according to FTSE. *Post* is an indicator variable that identifies trading days after the publication of the TR. Control variables are defined in Eq. (1). All independent variables are measured as of December 2018. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. The models include estimation type (Estimation FE) and tiering (Tiering FE) fixed effects, controlling for the green revenues' estimation technique applied by FTSE and the shades of green revenues, respectively. Date FE, Industry FE, and Country are trading day, four-digit NACE industry, and country fixed effects, respectively. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

VARIABLES	(1)	(2)	(3)	(4)	(5)
Post	-0.0775***	-0.0549***			
	(0.0218)	(0.0174)			
High EU Taxonomy Alignment	0.0225	0.0135	0.0388	0.0144	0.0071
	(0.0328)	(0.0221)	(0.0362)	(0.0231)	(0.0267)
Post*High EU Taxonomy Alignment	**0.1168*** **	**0.0585** **	**0.1189*** **	**0.0596** **	
	(0.0347)	**(0.0256)**	**(0.0361)**	**(0.0262)**	
Q-2*High EU Taxonomy Alignment					-0.0268
					(0.0521)
Q-1*High EU Taxonomy Alignment					0.0554
					(0.0343)
Q*EU Taxonomy Alignment					**0.1172*** **
					(0.0381)
Q+1*High EU Taxonomy Alignment					**0.0755** **
					(0.0376)
Q+2*High EU Taxonomy Alignment					**0.0785***
					(0.0409)
Q+3*High EU Taxonomy Alignment					**-0.0044**
					(0.0322)
ESG Controversies	-0.1021*	-0.0367	-0.1266**	-0.0434*	-0.0416
	(0.0532)	(0.0244)	(0.0601)	(0.0257)	(0.0253)
Age	-0.0100	-0.0023	-0.0072	-0.0021	-0.0023
	(0.0201)	(0.0091)	(0.0226)	(0.0095)	(0.0095)
Market Cap	0.0311*	-0.0055	0.0418**	-0.0004	0.0003
	(0.0176)	(0.0097)	(0.0199)	(0.0105)	(0.0104)
Book-to-Market	-0.0080	-0.0240	-0.0167	-0.0228	-0.0225
	(0.0334)	(0.0206)	(0.0395)	(0.0223)	(0.0219)
Debt	-0.0062	0.0000	-0.0089	-0.0005	-0.0007
	(0.0051)	(0.0032)	(0.0059)	(0.0033)	(0.0033)
Cash	0.0207*	0.0097	0.0214	0.0078	0.0077
	(0.0119)	(0.0071)	(0.0138)	(0.0073)	(0.0073)
Current Ratio	0.0006	0.0057	-0.0006	0.0066	0.0070
	(0.0131)	(0.0073)	(0.0149)	(0.0076)	(0.0075)
Profitability	-0.0004	-0.0006	0.0005	-0.0006	-0.0007
	(0.0022)	(0.0014)	(0.0026)	(0.0014)	(0.0014)
Volatility	0.0249***	0.0103***	0.0326***	0.0131***	0.0132***
	(0.0070)	(0.0035)	(0.0078)	(0.0040)	(0.0040)
Momentum	-0.0297***	-0.0084***	-0.0411***	-0.0116***	-0.0116***
	(0.0052)	(0.0020)	(0.0058)	(0.0025)	(0.0025)
Constant	-1.1514***	-0.1362	-1.4805***	-0.2544	-0.2620
	(0.3400)	(0.1716)	(0.3872)	(0.1932)	(0.1932)
Observations	43,100	118,884	43,100	118,884	118,884
R-squared	0.0037	0.0011	0.0182	0.0163	0.0163
Estimation FE	Yes	Yes	Yes	Yes	Yes
Tiering FE	Yes	Yes	Yes	Yes	Yes
Date FE	No	No	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Event Window	± 90 Trading Days	± 252 Trading Days	± 90 Trading Days	± 252 Trading Days	± 252 Trading Days

returns centered on the event date. To assess the cross-sectional variation in market responses, we use

$$CARs\ (TR)_i = \beta_0 + \beta_1 EU\ Taxonomy\ Alignment\ (FTSE)_i + \sum \beta_k Controls_i + Estimation\ FE + Tiering\ FE + Industry\ FE + Country\ FE + \varepsilon_i. \quad (3)$$

The dependent variable $CARs\ (TR)_i$ is the five-day cumulative abnormal return for firm *i*, as defined above. We include the same vector of control variables fixed-effects as in the cross-sectional return regression.

4. Results

4.1. Summary statistics

Table 4 presents summary statistics of the main variables. The mean monthly raw return is 0.818 percent with a standard deviation of 11.724. The average returns reflect the positive development of the global equity market over the sample period (the MSCI World Index increased by over 50 percent). The firms' mean percentage of EU Taxonomy-aligned revenues is 19.017. The high standard deviation of 26.564 shows that there are substantial differences in environmentally sustainable economic activities between firms in the sample. Appendix C presents the univariate Pearson correlations among the variables. The correlation between *EU Taxonomy Alignment (FTSE)* and stock returns is

Table 14
Alternative model specifications. The sample period is January 2017 to December 2020. The sample includes firms in 23 developed countries. The dependent variable is *Fama-French-adj. Return*. The independent variable of interest is *EU Taxonomy Alignment (FTSE)*, which is the percentage of EU Taxonomy-aligned revenues as estimated by FTSE. Control variables are defined in Appendix B. All continuous financial variables are winsorized at the 0.5 and 99.5 percent level. All models include estimation type (Estimation FE) and tiering (Tiering FE) fixed effects, controlling for the green revenues' estimation technique applied by FTSE and the shades of green revenues, respectively. Year-month FE, Year-month*Industry FE, and Year-month*Country are year-month, year-month times four-digit NACE industry, and year-month times country fixed effects, respectively. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

	Fama-French-adj. Return			
VARIABLES	(1)	(2)	(3)	(4)
EU Taxonomy Alignment (FTSE)	**0.0101*** **	**0.0113*** **	**0.0102*** **	**0.0081** **
	(0.0036)	**(0.0035)**	**(0.0030)**	**(0.0036)**
Observations	44,189	52,164	58,199	57,597
R-squared	0.2384	0.2499	0.1552	0.2260
Constant	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Estimation FE	Yes	Yes	Yes	Yes
Tiering FE	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes
Year-month*Industry FE	Yes	Yes	Yes	Yes
Year-month*Country FE	Yes	Yes	Yes	Yes
Specification	Exclude low TR alignment industries	Exclude companies with negative book value	Use the 2-digit NACE industry classification	Include micro-cap companies

positive and significant at the 1 percent level, consistent with the view that firms with higher green revenues performed better during the sample period.

4.2. Baseline regression results: testing H1

Table 5 presents the main results. Columns (1), (2), and (3) show that lagged green revenues (the variable *EU Taxonomy Alignment (FTSE)*) are positively associated with *Raw Returns*. Column (1) does not include industry or country fixed effects. Column (2) includes the interaction of time and industry fixed effects. The fully saturated model in column (3) also includes the interaction of time and country fixed effects. *EU Taxonomy Alignment (FTSE)* is positive and statistically significant at the 1 percent level across all three model specifications. We test the robustness of the results using CAPM-adj. returns in columns (4), (5), and (6) and Fama-French-adjusted returns in columns (7), (8), and (9) as the dependent variables. A one standard deviation in firms' TR-aligned revenues is associated with, on average, approximately 30 basis points higher monthly Fama-French-adjusted returns. The coefficient for *EU Taxonomy Alignment (FTSE)* is consistently positive and similar in statistical and economic relevance across all model specifications. It is noteworthy that past ESG controversies have a strong negative coefficient that is comparable to the long-run negative association between ESG incidents and stock returns found in Glossner (2021).

4.3. Event study results: testing H2

The previous results suggest that the TR alignment premium increased in 2020—the year the EU Taxonomy Regulation was published. We now assess whether there are any immediate market reactions around the publication date. Fig. 1 Panel A shows that the average CAR is positive for firms in the top quintile in terms of green revenues. Conversely, the CARs are negative for firms with lower green revenues. Panel B shows the binned scatterplots for the correlation between EU Taxonomy revenues (in percent) and the CARs after controlling for other firm characteristics. The regression results are tabulated in Table 6. Column (1) shows the coefficient loading of *EU Taxonomy Alignment (FTSE)* on five-day CARs without the inclusion of control variables. Column (2) shows the results with the full set of controls. Across all models, we find evidence that firms with higher green revenues had higher stock returns around the publication of the regulation.

4.4. Attention to the EU taxonomy regulation: testing H3

If firms' alignment with the TR does indeed have an impact on the cross-section of stock returns over the sample period, we expect this effect to be stronger when more attention is paid to the regulation. Prior studies show the significance of investor attention for stock returns (e.g., Da et al., 2011). We use our proxies for investor attention to the TR derived from GSV and Factiva described above. Table 7 shows that the interaction term between TR-aligned revenues and investor attention is positive and statistically significant at the 1 percent level across all model specifications. Columns (1) to (4) include the interaction term *Taxonomy Alignment (FTSE)*Attention (GSV)* and Columns (5) to (8) include the interaction term *Taxonomy Alignment (FTSE)*Attention (Factiva)* with different sets of fixed effects. The main effect of the green revenues is insignificant. The results thus suggest that firms with more TR-aligned revenues had higher stock returns in the months during which investors paid more attention to the TR.

4.5. TR alignment and ESG ratings: testing H4

If the positive coefficient loading of *EU Taxonomy Alignment (FTSE)* on stock returns were to be driven by a general increase in investors' sustainability preferences, we would expect to find that a traditional ESG rating also significantly explained stock returns over the sample period. Appendix C shows that *EU Taxonomy Alignment (FTSE)* has a correlation of -0.07 (p-value = 0.000) with the ASSET4 ESG Rating (*ESG Rating*), which substantiates the conceptual differences between the TR sustainability assessment versus traditional ESG ratings that we describe above.[19] While there is also disagreement between different ESG rating agencies, Berg et al. (2022) show that the average correlation between ESG ratings from six major agencies (ASSET4, Sustainalytics, Robeco-SAM, Vigeo Eiris, KDL, and MSCI) is 0.54.[20] In Table 8 column (1), we include the ASSET4 ESG Rating (*ESG Rating (Refinitiv)*) as an additional control variable. We find that the coefficient of *ESG Rating (Refinitiv)* is negative and not statistically significant. The statistical and economic significance of *EU Taxonomy Alignment (FTSE)* remains unchanged from our previous analyses. In columns (2) and (3), we include *EU Taxonomy Alignment (FTSE) Minus ESG Rating* (*EU Taxonomy Alignment (FTSE) Minus E Rating*), which is the difference between the z-score standardized sustainability assessment as per the TR and the ASSET4 ESG Rating (ASSET4 Environment Pillar Rating). In support of H4, we find that a positive delta in the sustainability assessments is associated with higher risk-adjusted returns after controlling for other company characteristics. In columns (4)–(6), we repeat these analyses with the ESG Rating from MSCI (*ESG Rating (MSCI)*) and find consistent results. Importantly, the coefficient of this traditional ESG rating is again slightly negative and

[19] The cross-sectional rating distributions are presented in Appendix D.
[20] Berg et al. (2022) also show that the ASSET4 ESG rating has the lowest correlation (0.38) with the rating from MSCI. Thus, the sustainability assessment according to the TR likely deviates significantly from existing approaches from the various agencies.

not statistically significant in explaining stock returns.

5. Additional analyses

5.1. Buy-and-Hold returns

For robustness, we repeat our main analyses using 12-month buy-and-hold returns and present the results in Table 9. Across all models, we find consistent results for our prior analyses that are statistically significant at the 1 percent level.

5.2. Portfolio returns

We construct a simple trading strategy that each month buys high-TR-alignment companies (highest decile) and short-sells low-TR-alignment companies (lowest decile) in each NACE industry division. Table 10 panels A, B, and C present the resulting performance for equal-weighted, value-weighted, and characteristic-weighted (using TR alignment) portfolios in column (1). The monthly alpha of the long-short portfolio ranges from 93 bps to 144 bps (with t-values between 2.14 and 2.88) across different asset pricing models and stock weightings. In column (2), akin to a placebo test, we repeat our analysis for high-ESG minus low-ESG portfolios, constructed analogously to the high-TR minus low-TR portfolios described above. In line with our previous analysis on the firm-year level, portfolio alphas are statistically insignificant, ranging from -26 bps to -16 bps. This result is consistent with the negative and insignificant coefficients of ESG Ratings in the panel regression framework of Table 8. These results are also comparable to Pedersen et al. (2021), who report insignificant high-ESG minus low-ESG portfolio alphas for a sample of U.S. firms, using ESG ratings from MSCI. Again, our analysis evinces the relevance of how companies' sustainability is assessed and supports the perspective that investors started applying the TR to construct sustainable portfolios. Overall, the portfolio-level analysis is consistent with our previous results and substantiates the hypothesis of higher realized returns of TR-aligned companies over the TR implementation period.

5.3. Sample extension and alternative proxy for TR alignment from MSCI

In our previous analysis, we examined the TR alignment premium over the implementation period following the establishment of the HLEG until the publication of the TR in 2020. Since more recent data became available during the process of revising this paper, we are able to extend the sample by two years towards the end of 2022. Table 11 Column (1) shows that the coefficient of *EU Taxonomy Alignment (FTSE)* remains positive and statistically significant at the 1 percent level after extending the sample period.

Following the approach in Ramelli, Wagner et al. (2021), in order to illustrate the performance of TR-aligned companies over the entire sample, we re-estimate Eq. (1) each month over a rolling window but exclude our proxy for TR alignment and then plot the average residual returns for a portfolio of high TR alignment versus low TR alignment (i.e., green revenues above the sample median versus below).[21] The spread between the portfolios then represents the return on an equally weighted long-short portfolio along TR alignment, net of common risk factors. Fig. 2 shows that the spread between the portfolios is low prior to the publication of the TR, indicating common pre-trends of the two groups. The analysis shows that highly TR-aligned companies started to outperform in 2020, the year of the TR publication. The difference in residual returns is statistically significant (p-value = 0.000).[22] It is noteworthy that the spread does not reverse over the sample extension, despite some controversy over greenwashing, also referred to as "Taxonomygate" (Andreas Hoepner, 2022), regarding the sustainability assessment of certain economic activities for electricity generation from fossil fuels according to a leaked proposal for the second delegated act of the TR at the end of 2021.

Next, we replicate our results from the monthly return regressions using a different proxy for firms' TR alignment developed by MSCI. The downside of using this dataset is that the time-series is only available from 2019 onwards. Nonetheless, this additional analysis allows us to address the concern that our prior finding might be biased due to the TR alignment estimations from a specific data provider. Moreover, the MSCI dataset covers a significantly larger cross-section of companies (N = 4359 unique RICs) than the FTSE dataset, alleviating possible concerns that the prior results might be driven by sample selection bias. It should, however, be noted that any estimation by any commercial data provider can only be interpreted as a proxy of true unobservable TR alignment in the absence of firms' self-disclosures over the TR implementation period. As shown by Hoepner and Schneider (2022), TR-related estimations from different data providers are not perfectly correlated. Correspondingly, the correlation between the two proxies for TR alignment from FTSE and MSCI is 0.6 for our sample intersection.[23] The results using the MSCI dataset are presented in Column (2) of Table 11 and are in line with the previous results with the coefficient for *EU Taxonomy Alignment (MSCI)* also being significant at the 1 percent level.[24]

The MSCI EU Taxonomy database differentiates between TR-aligned and TR-eligible revenues. TR-eligible revenues refer to revenues from economic activities covered by the Taxonomy Regulation, irrespective of whether the activity substantially contributes to one of the six environmental objectives or meets any of the technical screening criteria defined by the EU. In Column (3) of Table 11 we show that the previous results are robust to controlling for the corresponding variable *EU Taxonomy Eligibility (MSCI)*. Our interpretation is that our results are not driven by TR eligibility but, as our hypotheses suggest, by TR alignment.

5.4. Sample of European firms only

The EU Taxonomy Regulation affects all companies that are constituents of investment funds sold in the EU. This is because Article 25 amends the Sustainable Finance Disclosure Regulation (SFDR), mandating that financial market participants must disclose information about the invested firms' sustainability information in accordance with the TR. Consequently, institutional investors need to estimate investee firms' TR alignment if such disclosures are not yet available or if the firm falls outside the scope of the regulation. Nevertheless, because this is a European regulation, we test the robustness of the findings using a smaller sample comprising only EU firms. For this analysis, we use the MSCI dataset because its coverage of EU firms (N = 580) dataset is more than twice as large as the FTSE sample (N = 237). The results are presented in Table 12 Column (1) and (2) and show that the TR alignment

[21] Ramelli, Wagner et al. (2021) use this method to identify differences in stock returns with respect to climate responsibility around the 2016 U.S. presidential election.

[22] The outperformance of TR aligned companies in 2020 is also made apparent by running our baseline regression for each year individually. The corresponding regression coefficients are presented in Appendix E.

[23] The estimation procedures used by MSCI and FTSE for TR-aligned revenues are similar in nature. Both methodologies estimate revenues from business activities based on disclosed or publicly available data, such as segment revenue, product lines, and product specifications. MSCI describes its approach in its "MSCI EU Taxonomy Methodology," which is available from the authors upon request.

[24] Note that the Estimation FE and Tiering FE are not available for the MSCI dataset.

premium appears larger in the EU sample. A one standard deviation increase in TR alignment of EU firms (non-EU firms) is, on average, associated with a 44.9 bps (21.5 bps) increase in monthly stock returns. It is important to note that the TR alignment premium is also positive and statistically significant in a sample of non-EU firms only. This potentially stronger effect for EU firms would be consistent with the findings of Sautner et al. (2022) in the context of the EU Taxonomy and the syndicated loan market. However, in our case, the subsample of EU firms is rather small, and the results should be interpreted with caution, especially because the standard error for the regression coefficient of *EU Taxonomy Alignment (MSCI)* increases by approximately 58°% relative to the larger subsample of non-EU firms. Therefore, in Column (3), we assess the robustness of these findings by including an interaction term in a combined model. The inclusion of the interaction term allows us to formally test for a differential impact of TR alignment between EU and non-EU firms within the same model framework. This interaction effect is not statistically significant. This outcome suggests that while there is an apparent positive and significant TR alignment premium across both samples, the variation in the effect size between EU and non-EU firms is not robust enough to conclude a region-specific premium with statistical significance.

5.5. Propensity score matched difference in difference analysis

As an additional robustness check, we conduct our analysis on a propensity score matched sample in a Difference in Difference (DiD) regression framework. We match high-TR-aligned firms (highest quintile) to a sample of low-TR-aligned firms (lowest quintile) based on the same set of firm characteristics from Eq. (1) and NACE industry sectors using pre-event values as of December 2018. The matching method is nearest neighbor with a 0.05 caliper without replacement. Following Rosenbaum and Rubin (1983), this procedure results in a sample of 120 "treated" high-TR-aligned firms matched to 120 low-TR-aligned control firms with similar observable characteristics. To allow for sufficient observations before and after the TR publication information shock, we use 90 pre- and post-event trading days. The results from the DiD design are presented in Column (1) of Table 13. The positive and statistically significant coefficient of *Post***High EU Taxonomy Alignment* (0.1168, p-value = 0.001) supports the perspective from our previous results regarding the cross-sectional heterogeneity of the publication events on firm performance conditional on proxied pre-event TR alignment. In Column (2), we extend the sample period to 252 pre- and post-event trading days to address the concern of a potentially cyclical specification. As one would expect, the DiD coefficient of 0.0585 is lower in this specification but remains statistically significant on conventional levels (p-value = 0.023). The negative *Post* coefficient in both specifications shows that the lowest quintile of firms in terms of TR alignment experienced lower returns after the publication event.

In Columns (3) and (4), we repeat the previous analysis, but also include Date Fixed Effects, controlling for any time-specific factors or events that could impact stock returns uniformly across all firms. By adding Date Fixed Effects, we account for broader market trends, economic conditions, or external shocks that may affect the overall market during the period under study, isolating the effect of TR alignment on stock returns more precisely. The results remain robust to the previous specification.

Finally, we examine the dynamic treatment effects over the +- 252 trading day event window in Column (5). Even though our baseline analysis does not reveal a significant TR premium prior to the 2020 publication (see Fig. 2), we further examine the parallel trends assumption within this DiD framework. For this purpose, we allow the effect of *High EU Taxonomy Alignment* to vary by event-time-quarter *Q* (each comprising of 63 trading days). *Q* begins with the publication event (22jun2020). Similar to the DiD approach in Dey et al. (2024), the values for *Q-4* and *Q-3* are included in the intercept to serve as the baseline comparison. The coefficients for *Q-2***High Taxonomy Alignment* and *Q-1***High Taxonomy Alignment* are relevant because they reveal any differences in returns between high and low TR alignment firms before the publication event. Consistent with the parallel trends assumption, these pre-event coefficients are statistically insignificant. Nonetheless, we cannot formally rule out some degree of market anticipation or information leakage captured in the pre-tends coefficients.[25] Most importantly, the dynamic treatment effects are positive and statistically significant for three event-time-quarters following the publication event, thus providing strong support for differences in market reactions between high and low TR alignment firms.

5.6. Alternative model specifications

Finally, we conduct several sensitivity analyses of our baseline results using the following alternative model specifications: (1) exclude companies in industries with no or low (<5 percent) TR alignment; (2) exclude companies with negative book value; (3) use two-digit NACE industry divisions rather than four-digit NACE industry classes for the fixed effects specification; and (4) include micro-cap companies. The results are presented in Table 14 and are consistent with the results of Table 6, thus alleviating concerns that the positive and significant coefficient of our TR alignment proxy in the baseline return regression is an artifact of model misspecification.

5.7. The quality of TR alignment proxies

Companies did not disclose the real level of TR alignment over the development period of the new regulation. We therefore acknowledge the concern that our findings are derived from estimated values based only on information available at that time. To assess their quality, we explore the predictive value of 2020 TR alignment estimations for the real disclosed values pertaining to the 2022 fiscal year. For this purpose, we first hand-collect the disclosed values for EU firms from annual reports and company websites.[26] The regression results are presented in Appendix F and show that the proxies from FTSE and MSCI are strongly associated with future TR alignment disclosures. The t-values are 7.89 and 6.72, respectively. In comparison, the t-value for the book-to-market ratio is -2.14 (Appendix F Column (1)), which is the highest absolute value for any of the financial control variables. The average disclosed TR alignment for 2022 is 12.1%—lower than the estimated values for 2020 according to FTSE (20.7%) and MSCI (15.3%). Overall, the results provide support for a high-quality proxy that investors could have used to learn about the TR alignment of portfolio companies prior to the mandated TR-related disclosures.

Moreover, during the revision process of this manuscript, TR disclosures became available from commercial data providers. Given the significantly larger coverage of EU firms by MSCI, we further match all available 2022 disclosures from Refinitiv Eikon to this dataset. This allows us to match the 2020 estimates to future disclosures for 485 EU firms. The strength of the association, reported in Appendix F Column (2), further increases using this sample (t-value = 10.62), and the correlation coefficient between the estimates and future disclosures is 0.57 (p-value = 0.00). A single regression of reported 2022 TR alignment on 2020 estimates results in a R-squared of 0.32.

Next, we use this largest attainable sample of estimates matched to 2022 disclosures to disaggregate the previous estimates in a first-stage regression into two components: one that fits the subsequently reported values (i.e., fitted values) and the error term. Finally, we repeat our analysis from Table 12, Column (1), using these fitted values. While

[25] Similar to the approach in Daske et al. (2008) in the context of IFRS adoption and firm valuations, we find that the results reported in Table 13 Columns (1) to (4) also hold when we define the *Post* indicator to equal one already one quarter earlier.

[26] As of October 2023.

this approach may introduce a forward-looking bias by incorporating information that was not available at the time (i.e., future revenues), it is plausible that sophisticated investors could have developed their own proprietary (and more accurate) estimates for future TR disclosures and used these for their investment decisions. If this is the case, we would expect to find an even stronger association between TR alignment and stock returns than the one described in subSection 5.4. Indeed, the coefficient for these fitted values in the same model framework is substantially larger (0.037; p-value = 0.00).

6. Conclusion

This study examines the evolution of the stock price premium paid for green assets that are aligned with the TR. While we initially observe little difference in monthly equity returns between high- and low-TR-aligned companies at the onset of the development of the new pan-European classification scheme for environmentally sustainable economic activities, we provide robust evidence of a TR alignment premium in 2020, the year the TR was published. We conjecture that this is due to investors paying greater attention to the implications of the TR for the investment decisions of financial market participants. Using GSV data for the term "EU Taxonomy" and news articles referencing the TR as proxies for investor attention, we find supporting evidence for this perspective. Our results are compatible with the interpretation that EU legislators' intention to redirect capital flows towards green assets resulted in higher realized returns for these assets. Moreover, the alignment premium cannot be explained by traditional ESG ratings. This finding supports the perspective that investors adopted the TR to assess the sustainability of companies as an alternative to ESG ratings.

This study should be viewed in light of its limitations. Because firm-level TR alignment is unobservable over the TR implementation period, we retrieved estimated values from two different commercial data providers (FTSE and MSCI). While we find that these estimates predict disclosed values in the future, they should best be regarded as signals for the true TR alignment. Similar to the case of ESG ratings, these estimates may disagree on individual companies. Importantly, our results hold for both the FTSE and MSCI samples. Another limitation is that we cannot evaluate any real effect of the TR on the firms' economic activities. Are firms making investments and strategic changes to their modus operandi to achieve greater TR alignment? Answering this question would require a longer time-series of data, because these changes likely take time to implement. However, this could be a fruitful avenue for future studies.

Despite these limitations, this study provides early evidence on the possible impact of the TR on the stock performance of green assets. The findings are relevant for regulators when evaluating and designing sustainable finance mandates. They also inform researchers and investors about the impact of such mandates on realized stock returns.

CRediT authorship contribution statement

Alexander Bassen: Writing – review & editing, Supervision, Project administration, Conceptualization. **Othar Kordsachia:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Kerstin Lopatta:** Writing – review & editing, Project administration. **Weiqiang Tan:** Writing – review & editing, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jbankfin.2024.107339.

Data availability

The authors do not have permission to share data.

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