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ORIGINAL ARTICLE

Which investors support the transition toward a low-carbon economy? Exit and Voice in mutual funds

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Abstract
Reducing portfolio carbon footprints (Exit) and voting in favor of climate-related shareholder proposals (Voice) are among the main actions that investors can take to promote an accelerated transition toward a low-carbon economy. This paper studies three important investor groups that can be instrumental in driving the transition and evaluates their Exit and Voice behavior. I find that the five largest asset managers perform poorly on Exit and Voice over the full sample period but improved on both in more recent years. Only a small fraction of signatories to sustainable investor initiatives are supportive of the transition. Counterintuitively, investors who perform poorly on Exit, perform well on Voice. Finally, I examine the financial consequences of employing Exit and Voice and find that Exit is positively related to risk-adjusted fund returns; however, this is not necessarily attributable to superior skill of fund managers.

Keywords Exit · Voice · Mutual funds · Climate change · Transition · Fund performance

JEL Classification D22 · G11 · G23 · Q51 · Q54

Introduction

The financial system has been assigned a pivotal role in the transition toward a low-carbon economy (e.g., Battiston et al. 2021). By aligning investments with climate goals, investors can not only reduce potential negative effects of climate change on portfolio values but can also positively contribute to the transition (e.g., Mercereau et al. 2020). Most of the effort will need to come from the private sector (IMF 2021), and investors can accelerate the transition by ceasing to fund climate-damaging activities, e.g., by excluding carbon-intensive companies from their portfolios (*Exit*). This represents the most prevalent approach to ESG investing (Dimson et al. 2020b). Another cost-effective and impactful tools to influence corporate environmental behavior is voting in favor of climate-related shareholder proposals (*Voice*) (ShareAction 2020).

I study Exit and Voice because these are among the main types of reactions to discontent with the environmental performance of companies (e.g., Hirschman 1970, 1978). Other types of investor actions may play a role, but these actions are often either not externally observable or their effects on companies are negligible. In theory, the relative effectiveness of the two strategies depends strongly on the fraction of socially responsible investors in the market (e.g., Broccardo et al. 2022). In other words, the more investors employ Exit and Voice, the greater their leverage on the transition. For both, there is at least partial empirical evidence for a positive effect on the environmental behavior of companies (e.g., Flammer et al. 2021; Gantchev et al. 2022; Rohleder et al. 2022).

In addition to the positive impact on the environment, many investors adopt Exit or Voice for financial reasons. First, many investors expect that low-carbon portfolios will generate higher returns in the future. In this sense, investors believe that the transition offers positive and profitable investment opportunities (e.g., Hartzmark and Sussman 2019). Second, low-carbon portfolios are considered to be less exposed to climate-related risks. Investors are concerned

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about potential tail risks that are associated with the transition toward a low-carbon economy (e.g., Ilhan et al. 2021). Krueger et al. (2020) find in a large-scale survey that institutional investors believe climate risks have already begun to materialize. Third, employing Exit or Voice may increase flows into the funds. Kim and Yoon (2022) find that investment companies that signed to the Principles for Responsible Investment (PRI) exhibit a spike in inflows post-signing. However, they must also deliver on their promises to avoid accusations of greenwashing (e.g., Amenc et al. 2022).

In this paper, I evaluate three important investor groups in terms of their Exit and Voting behavior, as these investors can be instrumental in driving the transition toward a low-carbon economy: the five largest asset managers (Big 5), signatories to sustainable investor initiatives and investors with high exposures to carbon-intensive stocks. Finally, I explore the financial consequences of employing Exit and Voice on mutual fund performance.

I am one of the first to jointly analyze Exit and Voice on a large and comprehensive dataset of US mutual funds using portfolio compositions and voting patterns. I use mutual funds as an ideal laboratory because they oversee large amounts of capital and thus can play a major role in the transition. So far, there is a paucity of academic literature investigating mutual funds' carbon footprints (e.g., Humphrey and Li 2021), and to my best knowledge, no empirical study examined the two strategies in combination to date. Moreover, no empirical study has yet analyzed the role of ClimateAction100+ (CA) signatories in the transition.

This paper is relevant to several strands of literature. First, it contributes to the literature on the importance of large asset managers in the transition. For instance, Azar et al. (2021) find that the three largest asset managers (Big Three) focus their efforts on large firms with high carbon emissions and Big Three ownership is related to subsequent carbon emission reductions. Second, it contributes to the literature on sustainable investor initiatives. Humphrey and Li (2021) show that Principles For Responsible Investment (PRI) fund families significantly reduce emissions after signing. Bauckloh et al. (2021) find that there is great heterogeneity in how PRI signatories integrate ESG criteria into their business operations. Third, it also adds to the literature on green fund performance, which often find lower (e.g., Reboredo et al. 2017) or insignificant different performance of green funds (e.g., Ibikunle and Steffen 2017). Due to my up-to-date dataset, I can provide new insights on these literature strands for a more recent time period, in which the appetite for sustainability may have been generally higher (e.g., Biktimirov and Afego 2022). My sample also includes the recent COVID-19 period, in which sustainability played an important role (e.g., Pavlova and Boyrie 2022).

The remainder of this paper is structured as follows: Section "Data" presents the data. Section "Methodology" describes the methodology for measuring Exit and Voice in mutual funds. Section "Which investors support the transition toward a low-carbon economy?" evaluates investor groups in terms of their Exit and Voice behavior and examines their financial consequences for mutual fund performance. Section "Robustness" describes the robustness checks and Section "Conclusion" concludes.

Data

Mutual fund data

I obtain mutual fund data from Morningstar Direct. I only examine active open-end equity funds and exclude passively managed funds. This is because passive funds cannot make active in- and divestment decisions due to their index tie. The reason that I only explore US-domiciled funds is that only they are obliged to disclose their voting records. This is not the case for other jurisdictions. Further, I also delete fund of funds. My sample includes only funds with an equity global broad category group, and which are at least 80% invested in the US. I extract total net asset value (TNA), expense ratio, turnover ratio, daily fund returns, and inception date. The data are at the fund share class level, and I consider the oldest share class as representative for the whole fund.[1] I exclude micro-funds and require a minimum TNA of US$10 million similar to Hiraki et al. (2015). Importantly, I do not only consider self-labeled "SRI funds" as they represent only a small fraction of the mutual fund market (e.g., Utz and Wimmer 2014). Studying a broad sample of mutual funds allows me to make more general statements about investor groups.

I also obtain climate-related mutual fund voting data from Morningstar Direct. Since 2003 the SEC requires US-domiciled mutual funds to disclose how they voted on proxy proposals presented at shareholder meetings accounting for July 1 of the previous calendar year to June 30 of the current calendar year (proxy year) (e.g., Cremers and Romano 2011). Morningstar provides only the categorized variables and no further information on the underlying proposals. Morningstar uses its own methodology to categorize the data into topics of proposals, and I obtain the support rate for the category "climate change." *CC_%Support* is calculated by dividing the number of climate-related proposals that were supported by the total number of voting occasions.

To ensure validity of my results, I only include a fund in my sample if there were more than three voting occasions

[1] In my dataset, the oldest share class accounts for 88.1% of total fund AUM. To check for robustness of my results, I reran all major analyses using funds' total AUM and found that my results are statistically and economically unchanged.

for that fund. The reason is that the less voting occasions, the less representative *CC_%Support*. For instance, if a fund had only one voting occasion and voted in favor of the proposal, *CC_%Support* becomes one. Calculating *CC_%Support* only based on one voting occasions is not representative for the respective fund. Consequently, I require a minimum of three voting occasions per year for each fund to be included in my sample. Further, I include *Number of cast votes* in the regressions to control for the different levels of voting occasions.

Investor initiatives membership

I obtain a list of PRI signatories with signup and delisted dates directly from PRI's online signatory directory.[2] I match the mutual fund dataset from Morningstar to the PRI list using a name-matching algorithm. Since PRI signatories usually sign up on a parent company level, I use funds' investment firm name reported in Morningstar as the matching variable. I start with 206 investment firms in Morningstar and 4,000 PRI signatories. To ensure a high-quality match, I manually verify all matching outcomes, i.e., I double-check the match proposed by the algorithm and review the non-matched observations. I make sure that each distinct investment firm is only matched once to a PRI signatory. However, multiple investment firms may be matched to a PRI signatory since asset managers own multiple investment firms to operate their mutual funds. Of the 206 investment firms from Morningstar, 118 signed the PRI prior or during the sample period. Of the total sample assets, 88.3% are managed by PRI signatories.

Analogue to the PRI signatory list, I use a list of 662 CA signatories directly obtained by CA with signature dates as of November 2021. Because the CA was founded in 2017, I can only analyze a shorter period for this initiative. I use the same approach to match investment firm names from Morningstar to CA's signatories list as for PRI signatories. In 2021, 29.6% of the sample assets are managed by CA signatories.

Corporate emissions data

I obtain corporate GHG emissions data from Refinitiv Datastream. GHG emissions comprise all greenhouse gases defined in the Kyoto Protocol that cause anthropogenic climate change including carbon dioxide, water vapor, methane, nitrous oxide and ozone (United Nations 1998). Each greenhouse gas contributes to the greenhouse effect differently; thus, the data are presented in carbon emissions equivalents (later only: carbon emissions). Refinitiv Datastream provides a very high and comprehensive coverage of company carbon emissions, covering 7985 global companies with scope 1 and scope 2 emissions for the accounting years 2002 to 2021.

Studying carbon emissions allows me to observe actual environmental actions that are directly related to climate change. Many studies focus on aggregated ESG ratings from data providers rather than relying on raw indicators. However, ESG ratings significantly differ between data providers (e.g., Dimson et al. 2020a; Berg et al. 2022) and across time within the same data provider (e.g., Berg et al. 2021). In addition, ESG ratings do not adequately reflect corporate carbon emission *reductions* (Rekker et al. 2021). Although carbon emissions are widely available for firms, the self-reported data could be exposed to a self-selection bias because reporting is mostly voluntary (Kalesnik et al. 2022) and a company's probability of reporting can be related to its amount of carbon emissions (Matsumura et al. 2014). To avoid being exposed to such bias, I also include estimates of carbon emissions from Refinitiv Datastream.[3] I focus on scope 1 and 2 emissions and standardize emissions by corporate net sales as recommended by the Task Force on Climate-related Financial Disclosures (TCFD 2017). I exclude scope 3 emissions because companies rarely report these data. Even if companies report on scope 3 emissions, the data are not comparable between companies (Kalesnik et al. 2022) and there is also a lack of consistency in scope 3 emissions estimates across data provider (Busch et al. 2020). I also obtain net sales and daily stock returns by Refinitiv Datastream.

Overall, my final dataset comprises 984 active US domestic equity mutual funds for the period from 2015 to 2021 with comprehensive and complete information on their portfolio carbon footprints (PCFs) and climate-related voting behavior. My sample is restricted to the US because only there reporting of voting records is mandatory for funds. Summary statistics of the final dataset can be found in "Appendix A."

Methodology

I use mutual funds' PCFs to measure Exit. Low PCFs can be achieved by excluding individual carbon-intensive stocks or entire sectors, through divestment or boycott (e.g., Benz et al. 2020). I calculate mutual funds' PCFs using a well-known and establish metric: the *weighted average carbon intensity* (WACI). The WACI measures the exposure of mutual funds to carbon-intensive stocks, is widely used in academic research (e.g., Rohleder et al. 2022) and the financial industry, e.g., in the construction of low-carbon indices

[2] https://www.unpri.org/signatories/signatory-resources/signatory-directory

[3] Kalesnik et al. (2022) describe carbon emission data and the estimation process of data providers in detail.

(e.g., MSCI 2018) and is recommended by the Task Force on Climate-Related Financial Disclosures (TCFD 2017). I calculate the WACI for each fund *j* in each month *t* by multiplying holdings' *i* portfolio weight with the standardized scope 1 and 2 emissions (see Eq. 1 of "Appendix D"[4]). I require a minimum of 67% coverage of holdings with carbon emission information before WACI is calculated.

I observe major differences in the average WACI for different Morningstar categories. For instance, mid-cap value funds (3.4) show an average WACI more than four times as high as large-cap growth funds (0.8). Supporting the transition toward a low-carbon economy does not imply that utilities-oriented funds may no longer invest in utilities, but rather to reallocate capital from carbon-intensive toward low-carbon stocks *within* an investment universe. For instance, the European Commission requires that climate-related indices have similar sector weights as their parent indices (European Commission 2019). In this way, money should be allocated to the firms with the lowest carbon intensities within an industry.

Consequently, I use Morningstar's fund categorization and calculate percentage deviations of each fund's WACI from the average of the respective Morningstar Category and refer to it as *portfolio carbon footprint* (*PCF,* Eq. 2 of "Appendix D"). The negative definition (negative sign) of PCF allows for an interpretation in the way that higher PCFs are associated with less carbon-intensive footprints. Another benefit of using PCF is that it controls for factors that affect all funds similarly. For instance, PCF is robust to changes in corporate carbon emissions and sales. Further, changes in market valuations should have only little effect on PCF. As a consequence, changes in PCF are mainly attributable to changes in the portfolio composition, i.e., active trades.

I measure Voice based on the fraction of climate-related proposals, that a fund supported in a given proxy year. Over time, the average support rate significantly rose from 24.7% in 2015 to 47.6% in 2021. I use the same approach as for PCF and control for the average support rate of funds within a Morningstar Category (Eq. 3 of "Appendix D"). *Support for climate-related proposals (SCP)* reflects the relative climate-related voting behavior compared to peer group funds and higher values indicate higher support.

Which investors support the transition toward a low-carbon economy?

The five largest asset managers (Big 5)

First, I examine the five largest asset managers due to their large asset and voting power. The high asset values of these investors often result in large stakes in their portfolio firms, which likely makes them pivotal voters. This could give them great leverage to contribute to accelerating the transition. I analyze the five largest asset managers (Big 5), because they control over 60% of the assets and manage 18% of the funds. There has been literature on the general voting behavior of large asset managers (e.g., Groot et al. 2021), but no study yet has analyzed portfolio carbon footprints and voting jointly. Further, I apply a climate-related focus, whereas others explore voting in terms of ESG.

In the following, I use panel regressions and include dummies indicating whether a fund is managed by one of the five largest asset managers (Eqs. 4 and 5 of "Appendix D"). I identify the five largest asset managers from my surviving sample, which includes actively managed US-domiciled funds. I include several standard control variables and add year- and fund style-fixed effects. Standard errors are clustered on the dimensions of fund and year.

Table 1 reports the regression results. The five largest asset managers are related to significantly higher PCFs and lower SCP. The results are also economically significant. The coefficients indicate that the five largest asset managers show 8.5 pp (column 1) higher PCFs and 56.5 pp (column 2) less SCP, ceteris paribus. By analyzing the five largest asset managers individually, I find that especially JP Morgan (−0.172) is associated with higher PCFs. In terms of SCP, T. Rowe Price (−0.565) and JP Morgan (−0.512) are related to significantly less SCP. Within the Big 5, Vanguard is the only asset manager that shows an insignificant relationship with both PCFs and SCP. Because I only examine active mutual funds, this is not related to Vanguard's in general more passive-related investment approach. Using other definitions of "large asset managers" (e.g., Big 3 or Big 10) yields similar results.

The results of Table 1 indicate that the Big 5 investment companies had lower levels of PCF and SCP during the sample period on average. However, there could be improvements in PCF and SCP for the Big 5 over time, which are not visible by analyzing the full sample period. To observe how PCF and SCP changes over time, I plot the development of WACI, CC_%Support (Panel A), PCF and SCP (Panel B) for the Big 5 and the rest of the sample in Figure 1.

From Panel B, it can be observed that funds of the Big 5 have significantly lower PCFs (bars) than the rest of the sample for 2015 until 2018. This means that they are significantly more invested in carbon-intensive companies. In the years 2019 and 2020, the PCFs of the Big 5 go up which could be interpretated in the way they are decarbonizing their portfolios. However, PCFs go down in 2021 again. For SCP, Panel B shows that voting behavior converges over time. In 2021, SCP is almost identical for the Big 5 and the rest of the sample. This indicates that the Big 5 showed lower levels of PCF and SCP in

[4] For convenience of the reader, I collected all relevant equations in Appendix D.

Table 1 Exit and Voice of the five largest asset managers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	PCF	SCP	PCF	SCP	PCF	SCP	PCF	SCP	PCF	SCP	PCF	SCP
Big 5	−0.085*** (−3.64)	−0.565*** (−14.22)										
American Funds			−0.137*** (−2.71)	−0.199** (−1.99)								
Fidelity					−0.022 (−0.66)	−0.388*** (−8.57)						
Vanguard							0.065 (1.30)	−0.111 (−1.53)				
T. Rowe Price									−0.094*** (−2.65)	−0.565*** (−11.42)		
JP Morgan											−0.172*** (−3.61)	−0.512*** (−7.61)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund Style-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497
Adjusted R^2	0.035	0.088	0.033	0.060	0.032	0.068	0.033	0.060	0.033	0.067	0.036	0.066

This table analyzes PCF and SCP of the five largest asset managers in the sample. *PCF* reflects the portfolio carbon footprint and *SCP* reflects the support for climate-related proposals. *Big 5* is a dummy indicating if a fund belongs to one of the five largest asset managers: *American Funds, Fidelity, Vanguard, T. Rowe Price,* and *JP Morgan.* I use log(*fund size*), log(*company size*), *expense ratio, turnover ratio,* log(*fund age*), log(*tenure*), and log(*number of cast votes*) as controls. Standard errors are clustered by fund and year. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

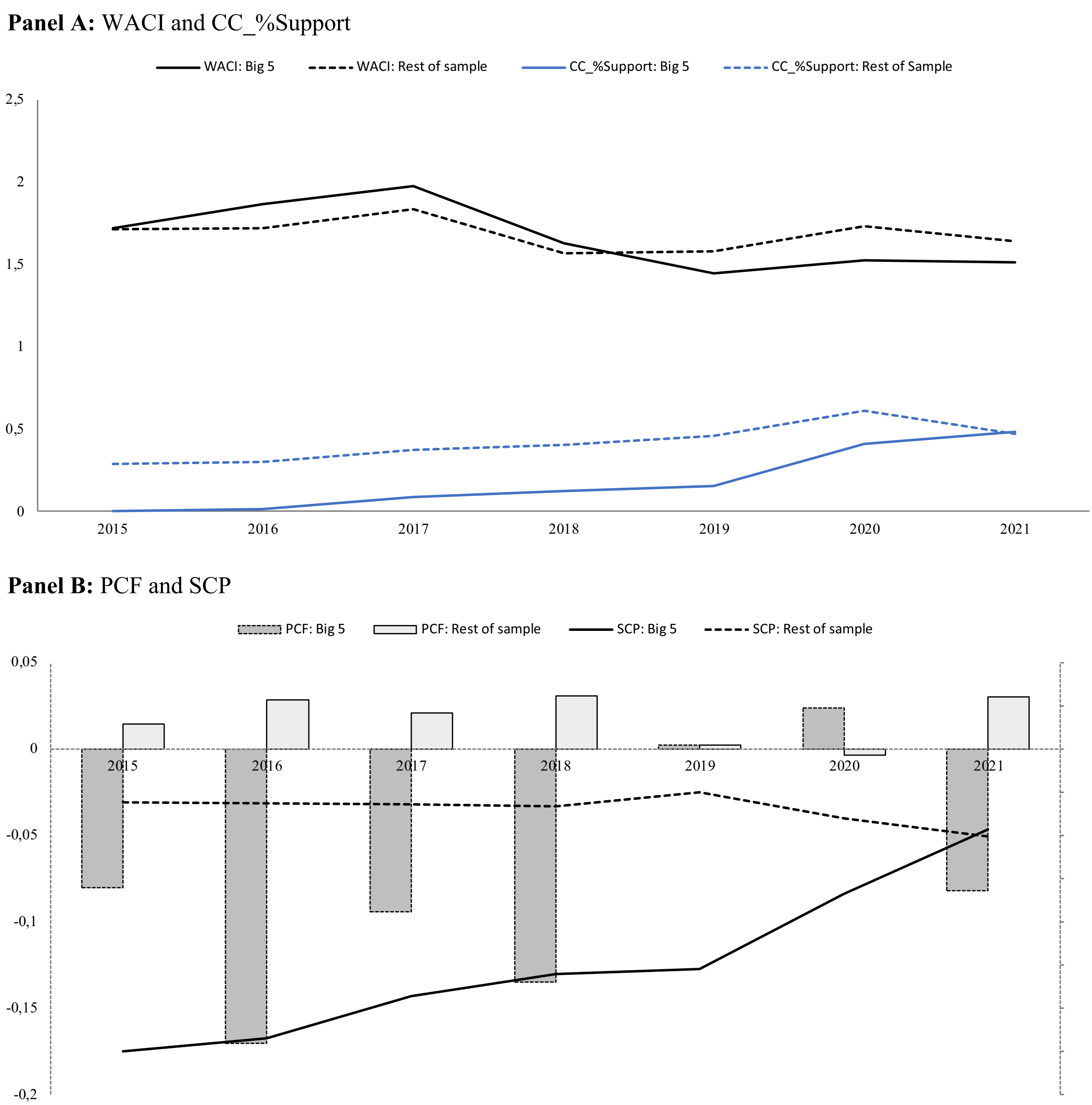

Fig. 1 Comparison of WACI and PCF for the Big 5 over time. This figure displays averages of WACI and CC_%Support (Panel **A**) and PCF and SCP (Panel **B**) of the Big 5 and the non-Big 5 investment companies (rest of the sample)

earlier years. In more recent years, however, the Big 5 investment companies appear to be improving relative to their peers. For completeness, WACI and CC_%Support are plotted in Panel A. However, these metrics are hardly comparable because the funds may operate in investment areas with different levels of carbon intensities (see Section "Methodology").

To analyze this in more detail, I rerun regressions (1) and (2) of Table 1 for each year of my sample period. If the Big 5 investment companies improved on PCF and SCP and behave similar to the rest of the sample in recent years, I expect insignificant coefficients for these years.

Table 2 shows the results of this analysis. The coefficients for PCF and SCP are consistently negative for 2015 through 2017. After that, the coefficients on PCF become statistically insignificant. In 2021, both coefficients on PCF (0.104) and SCP (-0.011) are statistically insignificant.

Table 2 Exit and Voice of the five largest asset managers by year

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
VARIABLES	PCF	SCP	PCF	SCP	PCF	SCP	PCF	SCP	PCF	SCP	PCF	SCP	PCF	SCP
Big 5	−0.162**	−0.856***	−0.095*	−0.952***	−0.124**	−0.738***	−0.025	−0.481***	0.104	−0.657***	−0.083	−0.294***	0.104	−0.011
	(−2.49)	(−6.20)	(−1.75)	(−7.70)	(−2.31)	(−8.48)	(−0.36)	(−4.86)	(1.58)	(−5.59)	(−1.23)	(−3.60)	(1.58)	(−0.15)
Year	2015	2015	2016	2016	2017	2017	2018	2018	2019	2019	2020	2020	2021	2021
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund Style-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	441	441	545	545	708	708	651	651	374	374	386	386	392	392
Adjusted R^2	0.066	0.071	0.061	0.101	0.054	0.104	0.033	0.0890	0.014	0.123	0.019	0.170	0.016	0.040

This table analyzes PCF and SCP of the five largest asset managers in the sample by year. *PCF* reflects the portfolio carbon footprint and *SCP* reflects the support for climate-related proposals. *Big 5* is a dummy indicating if a fund belongs to one of the five largest asset managers: *American Funds*, *Fidelity*, *Vanguard*, *T. Rowe Price*, and *JP Morgan*. I use log(*fund size*), log(*company size*), *expense ratio*, *turnover ratio*, log(*fund age*), log(*tenure*), and log(*number of cast votes*) as controls. Standard errors are clustered by fund and year. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Overall, the results indicate that the Big 5 had lower PCF and SCP over the sample period, on average. However, in more recent years, the Big 5 improved on PCF and SCP and showed similar PCF and SCP compared to the rest of the sample in 2021. This reveals that the largest asset managers have withdrawn capital away from carbon-intensive stocks over the sample period. Moreover, they seem to become more supportive of climate-related shareholder proposals. In view of their large managed assets and their enormous voting power, they may step up to take a supporting role in the transition to a low-carbon economy.

Signatories to sustainable investor initiatives

I then investigate investors who proactively claim to fight climate change—signatories to sustainable investor initiatives. I analyze the two largest initiatives worldwide—the PRI and the CA. The PRI considers climate change to be of the utmost importance and provides substantial assistance to signatories in addressing climate change.[5] CA signatories are fully focused on combating climate change, using shareholder engagement as their main tool (e.g., Mercereau et al. 2022). In essence, the CA represents a more extreme and more climate change-focused group of PRI signatories since 94% of CA signatories also signed the PRI.[6]

Some studies have examined the role of the PRI in academic research. Humphrey and Li (2021) show that fund families reduced their portfolio emissions after signing the initiative relative to non-signatories. Using portfolio ESG scores, Bauckloh et al. (2021) find that new members signing at a later stage of the initiative integrate ESG criteria significantly less in their business activities. The results of Groot et al. (2021) suggest that PRI signatories do not support environmental and social issues more often. However, none of the studies investigate portfolio carbon footprints and voting jointly with a clear focus on climate change. Further, no study addresses how CA signatories perform on Exit and Voice.

I start by including dummies indicating if an asset manager signed the PRI (*PRI signatory*) and/or the CA (*CA signatory*). In a second step, I distinguish signatories dependent on when they signed the respective initiatives. *Early signers* are investors who signed the initiative in its founding year (PRI: 2006; CA: 2017). *Late signers* are signatories who are not early signers. A breakdown of the categories can be found in "Appendix B ".

[5] https://www.unpri.org/climate-change

[6] In 2021, over 3,600 investors with assets under management (AUM) of more than US$110 trillion signed the PRI (PRI (2021)). The CA comprises over 615 signatories with US$65 trillion AUM (CA (2022)).

Table 3 Exit and Voice of signatories to sustainable investor initiatives

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	PCF	SCP	PCF	SCP	PCF	SCP	PCF	SCP
PRI signatory	−0.036*	0.044						
	(−1.74)	(0.86)						
No signatory			Base level	Base level				
Early signer			−0.204***	0.206**				
			(−4.77)	(2.15)				
Late signer			−0.023	0.031				
			(−1.10)	(0.61)				
CA signatory					−0.021	0.142***		
					(−0.60)	(2.69)		
No signatory							Base level	Base level
Early signer							0.006	0.363***
							(0.12)	(3.92)
Late signer							−0.041	−0.018
							(−1.04)	(−0.36)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund Style-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3497	3497	3497	3497	1803	1803	1803	1803
Adjusted R^2	0.033	0.060	0.039	0.061	0.012	0.061	0.011	0.067

This table analyzes the PCF and the SCP of signatories to sustainable investor initiatives. *PCF* reflects the portfolio carbon footprint and *SCP* reflects the support for climate-related proposals. *PRI member* is a dummy indicating if the asset manager signed the Principles for Responsible Investment. *CA member* is a dummy indicating if the asset manager signed the ClimatAction100+. *Early signer* reflect all signatories that signed in the first year of the initiative's foundation. *Late signer* are signatories that are not *Early signer. No signatory* are mutual funds that did not sign the investor initiatives. I use log(*fund size*), log(*company size*), *expense ratio, turnover ratio,* log(*fund age*), log(*tenure*), and log(*number of cast votes*) as controls. Standard errors are clustered by fund and year. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively

Table 3 provides the regression results. PRI membership is slightly negatively associated with PCFs (−0.036, column 1) and insignificantly related to SCP (0.044, column 2). However, *Early signers* are related to significantly higher PCFs (-0.204, column 3), although also to higher SCP (0.206, column 4)). The insignificant coefficients of *Late signers* (columns 3 and 4) indicate that these investors do not behave differently to *No signatories*. In case of PRI, *Late signers* account for 92.5% of the signatory observations, which suggests that a large proportion of PRI signatories lack action, at least in Exit and Voice.

For CA, I find an insignificant relationship with PCFs (-0.021, column 5) and a positive link with SCP (0.142, column 6). This suggests that CA signatories do perform well on Voice, on average. However, *Late signers* (column 7 and 8) do not behave statistically different to *No signatories*, indicating that only *Early signers* take action.[7] The lack of action for the large category *Late signers* may be related to greenwashing.

Investors with low PCFs

As a third group, I investigate investors with large exposures to carbon-intensive stocks, i.e., funds with low PCFs. Despite performing poorly on Exit, this group is of particular interest because these funds are likely to hold large stakes in carbon-intensive companies making them crucial voters. This could enable them to use their ownership and voting rights to transform them from "within" and thereby contributing to an accelerated transition. To test this, I adjust the known regression setup and include PCF as an independent variable in explaining SCP (Eq. 6 of "Appendix D ").

Table 4 indicates no relationship between PCFs and SCP due to the insignificant coefficient (−0.012, column 1). To detect a potential nonlinearity in the relationship between PCF and SCP and to examine funds with low PCFs, I

[7] To test for robustness, I re-run my panel regressions for robustness and include the *Big 5* (section "The five largest asset managers (Big 5)") dummy and the *PRI signatory* and *CA signatory* dummies jointly in the regression. My findings remain robust and are statistically and

Footnote 7 (continued)

economically similar.

Table 4 Voice of high PCF funds

	(1)	(2)
VARIABLES	SCP	SCP
PCF	−0.012 (−0.31)	
Quintile 1 of PCF (low-carbon)		0.118** (2.16)
Quintile 2 of PCF		0.071 (1.29)
Quintile 3 of PCF		Base level
Quintile 4 of PCF		0.052 (0.93)
Quintile 5 of PCF (carbon-intensive)		0.164*** (2.80)
Constant	Yes	Yes
Controls	Yes	Yes
Year-FE	Yes	Yes
Fund Style-FE	Yes	Yes
Observations	3497	3497
Adjusted R^2	0.060	0.061

This table analyzes the relationship between PCF and SCP. *PCF* reflects the portfolio carbon footprint and *SCP* reflects the support for climate-related proposals. Funds are annually sorted into quintiles (column 2) of PCF to generate dummies. I use log(*fund size*), log(*company size*), *expense ratio, turnover ratio,* log(*fund age*), log(*tenure*), and log(*number of cast votes*) as controls. Standard errors are clustered by fund and year. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

generate dummies by annually sorting funds into quintiles of PCF and include them in the regression. In column 2, funds with low PCFs (0.164) are positively associated with SCP compared to funds with medium PCFs (base level). This may suggest that funds with low PCFs use their high stakes in carbon-intensive stocks to transform them from within as active shareholders. This could be at least partly because these funds want to contribute to societal goals (e.g., Barber et al. 2021). Moreover, funds with high PCFs are also positively related to SCP (0.118). This suggests that these funds invest less in carbon-intensive companies (Exit) and more often support climate-related shareholder proposals (Voice).

Overall, my findings suggest a "U-shaped" relationship between Exit and Voice. This also points to a major weakness of ESG scores, as they are often based only on the portfolio composition of funds and do not take into account other factors such as voting behavior (e.g., Berg et al. 2022). My results show that there can be a negative relationship between Exit and Voice; thus, ESG scores that only consider Exit leave out a very important dimension of sustainability. Given the popularity of such scores, I urge rating agencies to incorporate the voting behavior in their scoring methodology. Only then investors can evaluate the "true sustainability" of mutual funds.

Performance effects of Exit and Voice

Finally, I explore the effects of Exit and Voice on mutual fund performance. According to classic finance theory, any restriction of the investment universe negatively affects standard risk-reward optimization (e.g., Markowitz 1952). Thus, exiting carbon-intensive stocks or complete sectors should be associated with lower expected returns.

So far, academic research has mostly documented lower (e.g., Chang et al. 2012; Capelle-Blancard and Monjon 2014; Reboredo et al. 2017) or insignificant different performance of green funds compared to conventional funds (e.g., Climent and Soriano 2011; Ibikunle and Steffen 2017; Boermans and Galema 2019). In et al. (2019) find positive abnormal returns but use a self-constructed model portfolio for their analysis. Some studies documented higher returns for stocks with good ESG ratings (e.g., Kang et al. 2021; Stotz 2021).

Further, no study has yet analyzed how Voice affects portfolio performance. For stocks, there is evidence that successfully engaged firms outperform on a risk-adjusted basis (Barko et al. 2021) and show higher valuations (Flammer et al. 2021). In contrary, supporting shareholder proposals at annual meetings may also be costly and resource intensive for mutual funds, which could be reflected in lower net-of-fee fund performance. I thus also examine whether supporting the transition through Exit and Voice comes at the expense of lower net-of-fee fund performance.

To ensure robustness of my analysis, I use multiple performance measures. I calculate annualized fund returns and Sharpe Ratios (Sharpe 1994). Next, I annually estimate risk-adjusted returns for each mutual fund controlling for the three factors of Fama and French (1993) and the momentum factor of Carhart (1997) using daily fund returns. Again, I use panel regression to analyze the effects of Exit and Voice on portfolio performance (Eq. 7 of "Appendix D "). I control for year- and fund style-fixed effects as in Del Guercio and Reuter (2014). Standard errors are clustered on the dimensions of fund and year.

Columns 1–6 of Table 5 present the regression results. The coefficients of PCF are positive and significant for all six model specifications. This suggests that in the observed period, Exit was associated with higher fund performance and funds with high PCFs experienced performance advantages. This is partly contrary to theory predictions and to the findings of prior academic literature, which often found an insignificant or negative relationship. One explanation could be my sample period for which investors' preference for low-carbon products was higher than for earlier periods (e.g., Ceccarelli et al. 2022). SCP shows an insignificantly relationship with both gross-of-fee and net-of-fee fund performance. Thus, higher support for climate-related proposals was not detrimental to mutual fund performance.

Table 5 Performance effects of Exit and Voice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Total Return	Sharpe Ratio	Gross_ Alpha_3ff	Net_Alpha_3ff	Gross_ Alpha_4ff	Net_Alpha_4ff	Gross_ Alpha_5ff	Net_ Alpha_5ff
PCF	0.013***	0.057***	0.005***	0.005***	0.003**	0.003**	0.000	0.000
	(5.57)	(3.67)	(3.51)	(3.39)	(2.30)	(2.18)	(0.35)	(0.22)
SCP	0.001	0.007	0.000	0.000	0.001	0.001	0.001	0.001
	(0.79)	(1.19)	(0.76)	(0.60)	(1.22)	(1.07)	(1.27)	(1.10)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund Style-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3465	3465	3472	3472	3472	3472	3472	3472
Adjusted R^2	0.824	0.870	0.303	0.306	0.130	0.130	0.210	0.205

This table analyzes the effects of PCF and SCP on the financial performance of the funds. *PCF* reflects the portfolio carbon footprint and *SCP* reflects the support for climate-related proposals. *Total return* is the annual return of fund. *Sharpe Ratio* is the ratio of a funds' total return minus the risk-free rate divided by its standard deviation. All regressions are run by fund and year. *Alpha_3ff* reflects the gross- or net-of fee risk-adjusted annualized return using the three factors of Fama and French 1993 calculated with daily fund returns. *Alpha_4ff* reflects the gross- or net-of fee risk-adjusted annualized return using the three factors of Fama and French 1993 and of Carhart 1997 calculated with daily fund returns. *Gross_Alpha_5ff* reflects the gross of fee risk-adjusted return using the three factors of Fama and French 1993 and of Carhart 1997 and an additional factor reflecting the performance of stocks with high-carbon intensity (decile 10) minus stocks with low-carbon intensity (decile 1) and daily fund returns. *Net_Alpha_5ff* reflects the gross of fee risk-adjusted return using the three factors of Fama and French 1993 and of Carhart 1997 and an additional factor reflecting the performance of stocks with high-carbon intensity (decile 10) minus stocks with low-carbon intensity (decile 1) and daily fund returns. I use log(*fund size*), log(*company size*), *expense ratio, turnover ratio,* log(*fund age*), log(*tenure*), and log(*number of cast votes*) as controls. Standard errors are clustered by fund and year. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

As a fund's risk-adjusted return (alpha) is often an indicator of a fund manager's skill, there may be a potential perception that managers of funds with high PCFs show superior skill. However, fund managers should only get credit for returns for which they are responsible. For instance, they should be rewarded for picking the best stocks from a given investment universe. On the contrary, fund managers should *not* be rewarded for a general outperformance of their investment universe. In the following, I analyze this by controlling for the general performance difference between low-carbon and carbon-intensive stocks in evaluating fund performance and fund manager skill. I construct a zero-investment-portfolio *Carbon-**i**ntensive **m**inus **l**ow-carbon (IML)*, which is long in stocks with the highest carbon intensities and short in stocks with the lowest carbon intensities. In setting up *IML*, I annually sort stocks into deciles[8] of stock-level carbon intensity[9] and construct value-weighted zero-investment-portfolios using daily stock returns. Over time, the factor is positive (see Appendix C), indicating that low-carbon stocks outperformed carbon-intensive stocks in the sample period. I use *IML* as an additional fifth factor (see Eq. 8 of "Appendix D") in the regression for estimating funds' risk-adjusted returns (e.g., Pedersen et al. 2021).

After controlling for the general return difference, Exit is insignificantly related to fund performance (Columns 7 and 8 of Table 5). This suggests that the outperformance of low-carbon funds is fully attributable to the outperformance of low-carbon stocks during the sample. Whether or not fund managers should be rewarded for this outperformance depends on their mandate to employ Exit. When a fund manager intentionally and deliberately increases its PCF to capture alpha, then this additional performance gain should be attributed to the manager. However, if a fund manager is required by mandate to invest exclusively in low-carbon stocks (e.g., low-carbon funds), the resulting performance effects should not be attributed to the fund manager. Thus, investors should be careful when evaluating the skill of mutual fund managers using standard performance measures without having information on the mandate.

To check for robustness of my results, I created the IML factor in various ways. For instance, I created a factor using terciles instead of deciles as thresholds. Further, I created factors using the approach of Fama and French (1993) by applying double sort. The created factors showed economically and statistically very similar regression results. Overall, the results are economically and statistically very similar. The results shown in the paper are robust to multiple methods for factor creation.

[8] I also construct the factor in different ways and find economically and statistically similar results.

[9] The stock-level carbon intensity is scope 1 and 2 emissions divided by net sales.

Robustness

To test for robustness, I make several adjustments to my main analyses. First, I repeat all analyses (section "The five largest asset managers (Big 5)" to "Performance effects of Exit and Voice") using different definitions of PCF and SCP. For instance, instead of using Morningstar Categories as benchmarks, I use funds' self-declared benchmark index or use *WACI* and *CC_%Support* without adjustments. The results are statistically and economically similar.

Second, I use propensity score matching for the analyses conducted in sections "Signatories to sustainable investor initiatives" and "Investors with low PCFs". For the analysis with signatories to sustainable investor initiatives (section "Signatories to sustainable investor initiatives"), I annually match PRI (CA) managed funds to non-PRI (non-CA) managed funds and subsequently compare the differences in PCF and SCP. As matching variables, I use *ln_fund* size, *ln_company size*, *ln_expense ratio*, *ln_turnover ratio* and *ln_age* and only match funds within the same Morningstar Category. The results are statistically and economically similar. However, propensity score matching is not applicable for the analysis in section "The five largest asset managers (Big 5)", because there are no suitable matching partners.

Conclusion

This paper analyzes which investors support the transition toward a low-carbon economy. My findings are relevant for academics, practitioners, and regulators. First, the improving performance of the largest asset managers on both Exit and Voice suggests that efforts by regulators and other stakeholders to mainstream sustainability in asset management may have some effect. If asset managers with the largest assets and the greatest voting power stop to support carbon-intensive businesses, they will have incentives to transform. Second, my findings question the validity of investor initiatives and reveal widespread lack of action, which could jeopardize their credibility. Thus, stronger entrance criteria and regular verification mechanisms should be introduced. Third, due to the observed U-shaped relationship between Exit and Voice, ESG rating agencies should consider including the voting behavior into their scoring methodology. So far, most environmental fund ratings are solely based on the asset allocation of funds, leaving out a major part of supporting the transition. Finally, the outperformance of low-carbon funds is not necessarily attributable to superior skills of low-carbon fund managers. Thus, investors should be careful when evaluating the skill of mutual fund managers by using standard performance measures.

Several future research questions can be derived from my study. Probably the most important question is how mutual funds' actions influence the environmental behavior of companies, i.e., whether they really influence the speed of the transition. So far, only Rohleder et al. (2022) and Gantchev et al. (2022) empirically demonstrated that investors can influence companies' carbon emissions by divesting from carbon-intensive stocks. Theoretically, Heinkel et al. (2001) and Pástor et al. (2021) suggest that boycotting polluting firms can incentivize them to transform. More research is needed to understand whether and how the undertaken efforts and actions by mutual funds have an impact.

Further research should also integrate scope 3 emission data. In my study, I exclude scope 3 emissions due to scarce data availability and because reported emissions are hardly comparable between companies. However, the scope 3 category often represents the largest source of GHG emissions, in some cases accounting for up to 90% of the total GHG impact.[10] As data availability and comparability improve, subsequent research studies should consider taking scope 3 emissions into account.

Appendix A: Summary statistics of the final dataset

See Table 6

[10] https://ghgprotocol.org/sites/default/files/standards_supporting/FAQ.pdf

Table 6 Overview final dataset

	# Funds	Fund size	Company size	Expense ratio (%)	Turnover Ratio (%)	PRI Member (%)	US Weight (%)
2015	491	3.59	56.20	0.87	57.0	57.2	95.9
2016	608	3.56	53.40	0.89	55.9	59.4	96.3
2017	780	3.39	47.90	0.88	56.5	63.7	96.3
2018	709	4.07	49.10	0.84	55.4	74.0	96.2
2019	401	5.75	72.20	0.73	53.3	85.8	96.3
2020	399	5.87	76.90	0.74	51.2	87.7	96.0
2021	410	7.03	70.50	0.75	52.1	88.8	95.8
Total	984	4.47	58.10	0.83	54.9	71.7	96.2

This table reports summary statistics of the final dataset. *# Funds* reflects the number of funds in the sample. *Fund Size* is the funds' total net assets displayed in US$-billion. *Company Size* is the combined total net assets of all funds of the same investment company and displayed in US$-billion. *PRI member* is the fraction of funds that signed the PRI. *US Weight* reflects the fraction of equity assets which are invested in the US investment area.

Appendix B: Breakdown of signatories to sustainable investor initiatives

See Table 7.

Table 7 Breakdown of signatories to sustainable investor initiatives

	Number of investment companies	Number of observations
Panel A: PRI signatories		
Early signer	9	184
Late signer	110	2.360
Non-signer	87	953
Total	206	3.497
Panel B: CA signatories		
Early signer	13	121
Late signer	15	202
Non-signer	147	1.480
Total	175	1.803

This tables provides a breakdown of signatories to sustainable investor initiatives. Early Signer are investment companies that signed in the respective founding year of the initiative. Late Signer are signatories that are not Early Signer. Non-Signer have not signed the respective initiatives.

Appendix C: IML factor over time

See Fig. 2.

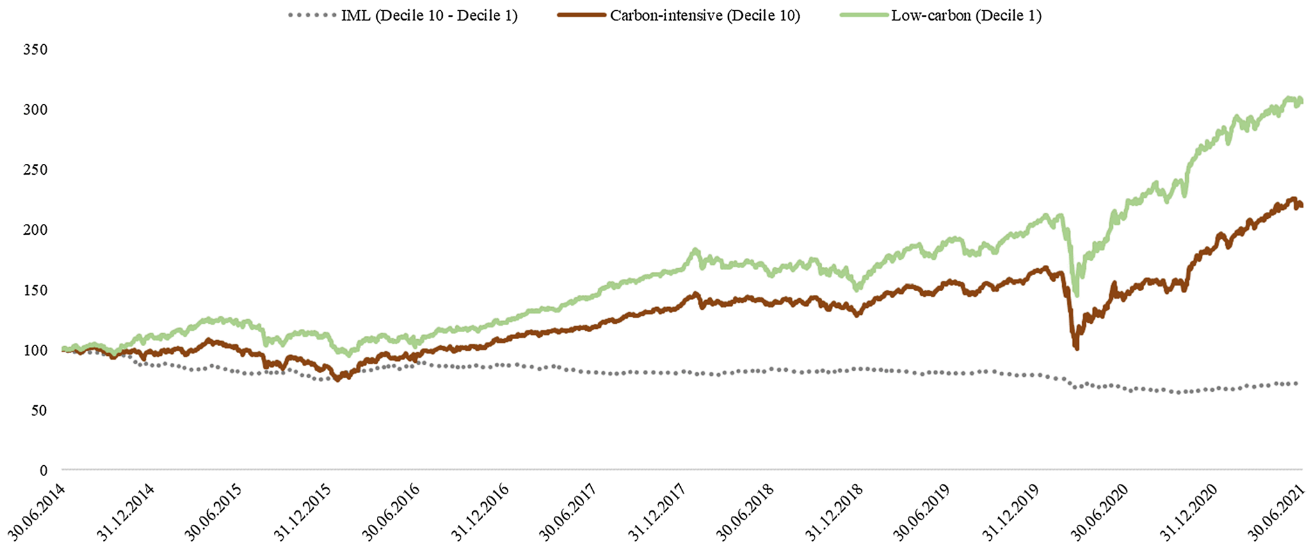

Fig. 2 IML factor over time. This figure displays cumulative returns of carbon-intensive (brown line) and low-carbon (green line) stocks. The dashed line reflects the cumulative return of a zero-investment-portfolio which is long in carbon-intensive stocks and short in low-carbon stocks. All portfolio were built value-weighted and are rebalanced annually

Appendix D: Equations

$$WACI_{j,t} = \frac{Scope\ 1\ +2\ emissions_{i,t}}{Net\ sales_{i,t}} x portfolio\_weight_{j,i,t} \tag{1}$$

$$PCF_{j,t} = -\frac{WACI_{j,t} - WACI_{j,t}^{Morningstar\ Category}}{WACI_{j,t}^{Morningstar\ Category}} \tag{2}$$

$$SCP_{j,t} = \frac{CC\_\%Support_{j,t} - CC\_\%Support_{j,t}^{Morningstar\ Category}}{CC\_\%Support_{j,t}^{Morningstar\ Category}} \tag{3}$$

$$PCF_{j,t} = \alpha + \beta_{Big5} Big\_5_{j,t} + \sum_{k}^{n} \beta_k \ln(Controls_{j,t}) + fixed\_effects + \varepsilon_{j,t} \tag{4}$$

$$SCP_{j,t} = \alpha + \beta_{Big5} Big\_5_{j,t} + \sum_{k}^{n} \beta_k \ln(Controls_{j,t}) + fixed\_effects + \varepsilon_{j,t} \tag{5}$$

$$SCP_{j,t} = \alpha + \beta_{PCF} PCF_{j,t} + \sum_{k}^{n} \beta_k \ln(Controls_{j,t}) + fixed\_effects + \varepsilon_{j,t} \tag{6}$$

$$\begin{aligned} Performance_{j,t} &= \alpha + \beta_{PCF} PCF_{j,t} + \beta_{SCP} SCP_{j,t} \\ &\quad + \sum_{k}^{n} \beta_k \ln(Controls_{j,t}) + fixed\_effects + \varepsilon_{j,t} \end{aligned} \tag{7}$$

$$\begin{aligned} r_{i,t} - rf_t &= \alpha_i + \beta_{MKT} MKTRF_t + \beta_{SMB} SMB_t \\ &\quad + \beta_{HML} HML_t + \beta_{MOM} MOM_t + \beta_{IML} IML_t + \varepsilon_{i,t} \end{aligned} \tag{8}$$

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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