

Environmental regulatory risks, firm pollution, and
mutual funds' portfolio choices

Summary

Environmental regulatory risks have been identified by both academics and practitioners to be of paramount importance over the next five years (Stroebel & Wurgler, 2021), and are widely believed to have already started to materialize (Krueger, Sautner, & Starks, 2020). Although research has examined the pricing implications of environmental regulatory risks (Delis, de Greiff, Iosifidi, & Ongena, 2021; Jha, Karolyi, & Muller, 2020; Kleimeier & Viehs, 2018; Seltzer, Starks, & Zhu, 2021), there is less work that explores how the interplay between environmental regulations and firm pollution impact on investors' rational investment decisions. We fill this gap by examining how mutual funds' portfolio holdings of polluting firms respond to environmental regulations.

This paper employs a key regulatory component of the Clean Air Act, whereby counties are designated as attainment or nonattainment with respect to the National Ambient Air Quality Standards (NAAQS) for ozone. Through the NAAQS, the federal United States Environmental Protection Agency sets maximum allowable ambient concentrations of ozone pollution. Counties with ozone pollution levels above the NAAQS threshold are deemed to be in nonattainment, while those with pollution levels below the threshold are considered in attainment. Firms that operate polluting plants located in nonattainment counties face stringent regulations and mandatory pollution abatement requirements compared to those in attainment counties. Thus, our empirical strategy exploits county-level ozone nonattainment designations as an exogenous source of variation in local regulatory stringency to study how mutual funds adjust their holdings of polluting firms affected by nonattainment designations.

We hypothesize that mutual funds adjust their portfolio holdings in a rational manner ("rational hypothesis") to hedge against nonattainment regulatory risk (Pástor, Stambaugh, & Taylor, 2021). The idea is that ozone-polluting firms with a greater exposure to nonattainment designations experience greater regulatory costs (Ryan, 2012), which negatively impact on their firm fundamentals (e.g., riskier operating cash flows). Funds then optimally adjust their portfolio holdings depending on how the returns of the stock covary with the regulatory shock. Stocks that perform better (worse) when there is a nonattainment regulatory shock serve as a regulatory-risk hedge and are consequently overweighted (underweighted).

We contrast our findings with the predictions of the "salience hypothesis", which is the prevailing explanation put forth in the existing literature. Specifically, fund managers' local exposure to environmental risks amplifies the salience of these risks and results in managers overestimating the impact of these risks on firms, which leads to the underweighting of stocks exposed to these risks (Alok, Kumar, & Wermers, 2020; Foroughi, Marcus, & Nguyen, 2021; Huynh, Li, & Xia, 2021). While the rational hypothesis also predicts underweighting of ozone-polluting firms exposed to nonattainment designations, the underlying economic mechanism of the rational hypothesis is inherently different from that of the salience hypothesis, namely the underweighting of such firms is not limited to a certain geographic vicinity of the fund's headquarters and these firms, but rather, depends on the degree to which the firm is negatively impacted by the nonattainment regulations.

To empirically test the rational hypothesis, we examine changes in portfolio weights of ozone-polluting firms exposed to nonattainment designations in a triple difference-in-differences

specification. Since a firm can operate many plants across multiple counties, we capture a firm's exposure to nonattainment designations using the proportion of its plants located in nonattainment counties. Additionally, since nonattainment regulations only apply to ozone emitting plants under ozone NAAQS, we use the Toxics Release Inventory database to classify facility emissions into ozone and non-ozone pollutants. Our main finding is that funds reduce portfolio weights of heavy ozone-polluting stocks that are also heavily regulated under nonattainment designations. In economic terms, this underweighting effect translates into roughly a 1.40% drop in the dollar value of holdings for such stocks.

We also study portfolio responses to two related types of regulatory shocks, including bump-up classifications and redesignations to attainment. Bump-ups occur when a nonattainment county fails to demonstrate attainment and represent an increase in the intensity of regulation, while redesignations to attainment occur when a county has attained the NAAQS and represent an easing of regulation. Consistent with the predictions of the rational hypothesis, we find that funds underweight (overweight) heavy ozone-polluting firms exposed to bump-ups (attainment redesignations).

The salience and rational hypotheses also have different predictions for the future performance of the underweighted stocks and associated fund portfolio performance. Consistent with the fact that the rational hypothesis is based on expected changes in firm fundamentals due to the costs of nonattainment regulation, we find that heavy ozone-polluting firms that are exposed to nonattainment designations experience a decrease in profitability in the post-nonattainment period. Furthermore, examining the abnormal returns of top ozone-polluting firms that are heavily regulated under nonattainment regulations, we find that the most underweighted stocks subsequently underperform those stocks that are most overweighted, with no signs of return reversals.

In terms of portfolio performance, we find that the funds that engage in the most underweighting experience superior portfolio performance in the post-nonattainment period. Our results are consistent with funds making optimal hedging adjustments in response to regulatory risks and not due to managers' overreaction to the costs of nonattainment designations. In our final set of analysis, we find that the regulatory enforcement activities and pollution abatement investments of the most underweighted top ozone-polluting firms increase as a function of their exposure to nonattainment designations in the post-nonattainment period.

Our paper most directly contributes to the literature that examines mutual funds' portfolio choice in response to environmental risks (Alok et al., 2020; Foroughi et al., 2021; Huynh et al., 2021). We also contribute to the literature that examines the environmental determinants of institutional investors' stock holdings (Ceccarelli, Ramelli, & Wagner, 2021; Gantchev, Giannetti, & Li, 2021; Starks, Venkat, & Zhu, 2020). Lastly, this study makes an important contribution to the real impact of environmental regulations on the capital allocation in financial markets (Bishop, Ketcham, & Kuminoff, 2020; Greenstone, List, & Syverson, 2012; Isen, Rossin-Slater, & Walker, 2017; Walker, 2013). To our knowledge, we provide the first empirical analysis that uses nonattainment designations to show that environmental regulations have a material impact on the allocation of capital of polluting firms in the financial markets.

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