# Are Green Investors Green-inducing?

**Don Noh** Princeton University
**Sangmin S. Oh** Chicago Booth

Contact Information:

Email 1: `dnoh@princeton.edu`
Email 2: `oh@chicagobooth.edu`

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### Abstract

Despite the growing interest in green investing among academics and industry professionals alike, there is little consensus on whether it successfully incentivizes firms to adopt eco-friendly business practices. Using the equity holdings of institutional investors and the demand system approach to asset pricing, we provide evidence that institutional demand for greener stocks encourages firms to improve their environmental performances. Specifically, we devise and estimate a firm-level quantity, *institutional pressure for greenness*, that measures the price pressure a firm receives from its institutional owners. We find that this quantity has a positive and significant relationship with future improvement in a firm's environmental performance. Together with results from placebo tests, we conclude that green investors, those with high portfolio-level environment scores, are not necessarily green-inducing investors, those who encourage better environmental performance. Instead, green-inducing investors are institutions who contribute to higher institutional pressure, i.e. investors who are price-inelastic and display a positive portfolio tilt towards greener assets.

## Introduction

Efforts to promote Environmental, Social, and Governance (ESG) considerations in finance started over 30 years ago and have gained significant traction during the past decade. There are currently over 40 ESG-related associations, standards and codes in place, the most notable of which include the UN Principles for Responsible Investment launched in 2006 and the Paris COP21 Agreement signed in 2015. Accordingly, the growth of ESG-dedicated funds have also accelerated, most of which are equity funds totaling $560 billion as of 2019.

Despite the growth in academic literature accompanying this trend, there is little consensus on whether ESG investing is effective in meeting its goal: incentivizing firms to carry out investment in eco-friendly technologies and implement business practices that help reduce negative externalities. Also unanswered is the question of where the marginal dollar of investors should be invested in order to maximize impact. Such questions should be of primary interest to investors and policymakers who genuinely believe in ESG investing's potential to bring about change.

## Research Questions

Does green investing incentivize firms to reduce emissions, and where should marginal dollar be invested to maximize impact?

### Our answer to the questions:

- Yes, green institutional pressure predicts improved emissions performance.
- You should invest in a green-inducing investor, i.e. one who is price-inelastic and has a positive portfolio tilt.

## What We Do:

1. Estimate the asset demand system developed by Koijen and Yogo (2019), while extending their characteristics to include the Sustainalytics environment scores
2. Compute the institutional pressure, the derivative of a stock's equilibrium price with respect to its own environment score.
3. Verify whether institutional pressure predicts future reduction in emissions

## What We Find:

1. Asset demand system: investors' preferences for greenness display significant heterogeneity both in the cross-section and time-series
2. Institutional pressure: higher if stock's owners (1) are price-inelastic and (2) has positive portfolio tilt towards greener stocks
3. Firm response: $1\sigma$ increase in institutional pressure leads to $\approx$ 14% greater improvement in the carbon score.

## Data

Our empirical analysis combines three sources of data.

1. Firm-level environment and carbon scores from Sustainalytics
2. Institutional holdings from the Thomson Reuters Institutional Holdings database
3. Data on stock characteristics and firm variables from Compustat and CRSP

## Demand System and Stylized Facts

We estimate the demand system and obtain each investor's demand function coefficients. In particular, the coefficient on the environment score captures the portfolio tilt towards greener stocks. The data period is from 2010 to 2017.

### Original Framework

- $I$ investors optimize portfolio holdings over $N$ assets
- Log utility over terminal wealth + heterogeneous beliefs about mean returns
- Factor structure of returns + loadings depend on each stock's own characteristics
- Estimate the following using GMM:

$$\frac{w_{it}(n)}{w_{it}(0)} = \exp\left(b_{0,it} + \beta_{0,it} me_t(n) + \beta'_{1,it}\mathbf{x}^*_t(n)\right)\epsilon_{it}(n)$$

where $w_{it}(n)$ is the portfolio weight on the stock $n$
$w_{it}(0)$ is the weight on the outside asset
$\mathbf{x}^*_t(n)$ are the standardized stock characteristics

### Our Extension

- Add standardized environment score, $es^*$, for stock $n$ at time $t$
- Investor $i$'s demand for stock $n$:

$$\frac{w_{it}(n)}{w_{it}(0)} = \exp\left(b_{0,it} + \beta_{0,it} me_t(n) + \beta_{1,it}es^*_t(n) + \beta'_{2,it}\mathbf{x}^*_t(n)\right)\epsilon_{it}(n)$$
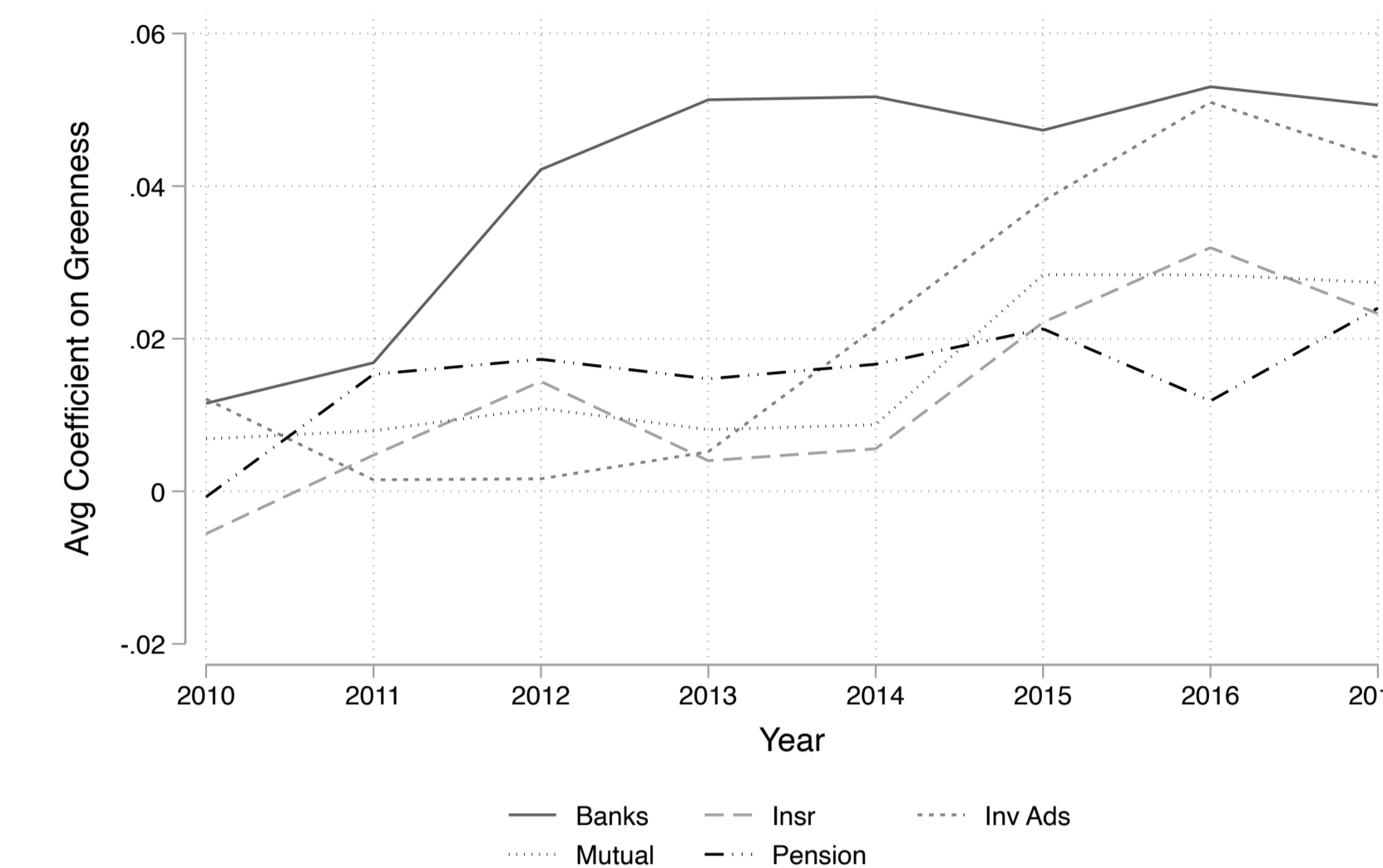


**Figure 1:** Investors demonstrate heterogeneity in their loadings.

## Estimating the Institutional Pressure

### Institutional Pressure for a given company

We implicitly differentiate the market clearing identity below w.r.t. the vector of prices $\mathbf{p}$

$$\mathbf{p} = \log\left(\sum_i A_i \mathbf{w}_i(\mathbf{p})\right) - \mathbf{s}$$

to compute the equilibrium price impact of changing the value of characteristic $k$:

$$Pressure_t(n) \equiv \frac{\partial \mathbf{p}(n)}{\partial \mathbf{x}_k(n)}$$

### Investor's Contribution to Institutional Pressure

- What about a specific investor $i$'s contribution to institutional pressure?

$$Pressure_t(n) \approx \frac{\sum_i s_i(n)\beta_{1i}(1-w_i(n))}{1-\sum_i s_i(n)\beta_{0i}(1-w_i(n))}$$

$$\text{where} \quad s_i(n) = \frac{A_i w_i(n)}{\sum_j A_j w_j(n)}$$

- Large owners with a large portfolio tilt ($\beta_{1i}\uparrow$) and lower price elasticity ($\beta_{0i}\uparrow$) contribute more to this quantity
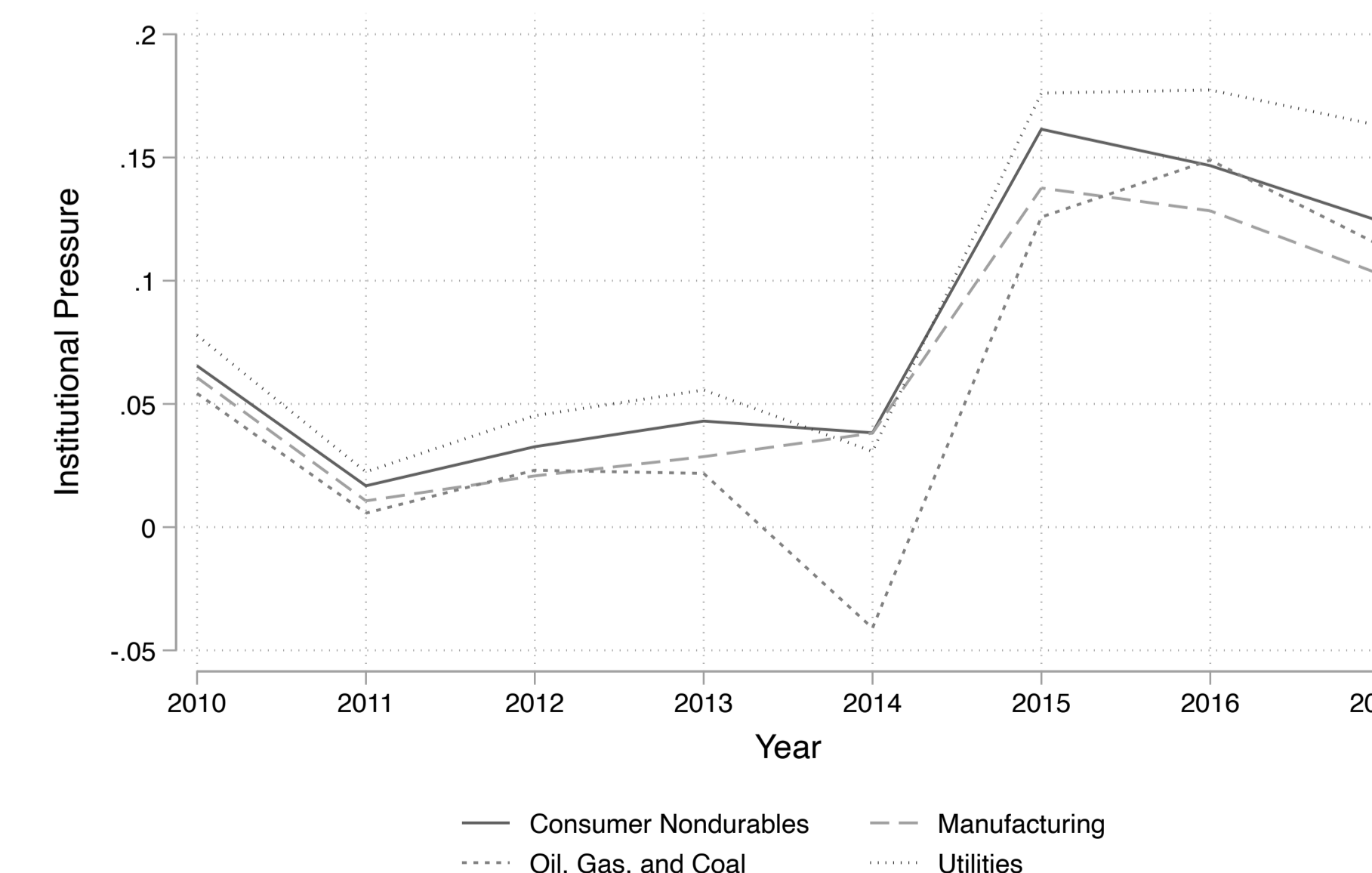


**Figure 2:** Institutional pressure has increased in recent years

## Firm Response

We now ask whether high institutional pressure translates into better environmental performance at the firm-level.

- As our main measure of firm's environmental performance, we use the carbon score from Sustainalytics.
- A higher carbon score means that a firm has lower emissions relative to its industry peers.

## Empirical Specification

We run the following cross-sectional regression:

$$y_{it} = \alpha + \beta \cdot Pressure_{i,t-1} + \gamma'X_{it} + \Lambda + \epsilon_{it}$$

- Higher carbon score $\iff$ low normalized carbon emissions
- $y_{it}$: change in the annual log carbon score
- $X_{it}$: controls (size, asset tangibility, leverage, Tobin's Q, profitability)
- $\Lambda$: year and industry fixed effects

## Results

A $1\sigma$ increase in lagged institutional pressure is associated with 13.7% higher change in carbon score for a given firm, holding other control variables fixed.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Lag Inst. Pressure | 0.129*** | 0.112*** | 0.128*** | 0.137*** | 0.157*** |
| | (0.0149) | (0.0123) | (0.0166) | (0.0329) | (0.0160) |
| Lag Carbon Score | -0.161 | | -0.0931 | -0.262*** | -0.158 |
| | (0.0988) | | (0.0831) | (0.0529) | (0.102) |
| Constant | -1.451*** | -1.308* | -1.153** | -1.778*** | -0.535*** |
| | (0.391) | (0.369) | (0.297) | (0.412) | (0.0787) |
| Lag Score | Y | N | Y | Y | Y |
| Controls | Y | Y | Y | Y | N |
| Year FE | Y | Y | Y | N | Y |
| Industry FE | Y | Y | N | Y | Y |
| Observations | 1613 | 1613 | 1616 | 1613 | 1792 |
| R-squared | 0.243 | 0.226 | 0.193 | 0.160 | 0.230 |

## Interpretation

A possible economic mechanism behind our results is that the price pressure of institutional investors increases the firm's investment in green technology and lowers future carbon emissions.

- One such channel is the equity market reaction to events associated with firm's ESG disclosures.
- Firms may also learn about the institutional pressure they face through boardroom or investor meetings.

## Conclusion

Using the asset demand system, we find that:

- Institutional pressure predicts greater improvement in future carbon scores
- Investors who are price-inelastic and have positive portfolio tilts contribute to institutional pressure