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# Heterogeneous Effects of ESG Signaling on Private Venture Capital Funding and Subsequent Exit Outcomes

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## ABSTRACT

ESG (Environmental, Social, and Governance) is widely used as a framework for making investment decisions in public capital markets, yet its role beyond these markets remains less understood. Prior research primarily focuses on public firms and aggregate ESG measures, leaving it unclear which ESG dimensions are most influential in private venture capital settings characterised by having high information asymmetry and limited disclosure. This study examines the relationship between ESG performance and both private venture capital funding amounts and subsequent exit outcomes. ESG scores for each firm are calculated by extracting text from archived firm websites and inputting the cleaned text into an ESG scoring algorithm. These scores are merged with Pitchbook funding and exit data across 16,688 venture capital funding rounds between 1984 and 2021. They are analysed using correlation analysis, univariate t-tests, and multivariate OLS and logistic regressions with firm level controls and fixed effects. The analysis shows that ESG performance is positively associated with funding amounts and exit outcomes. Environmental and governance performance drive larger private funding rounds, governance performance is strongly associated with IPO likelihood, while social performance is the primary driver of acquisition likelihood. Overall, these findings suggest that ESG communication functions as a strategic signal in venture capital markets, although investors prioritise different ESG dimensions at funding and exit stages. Importantly, the ESG measures used in the study are derived from firm level communication rather than directly observed ESG performance.

## INTRODUCTION

Since its introduction in the mid-2000s, the concept of ESG has rapidly grown in popularity within public capital markets, used by investors and firms to assess a company's sustainability and ethical impact. According to Bloomberg Intelligence's ESG Asset Forecast Model, global ESG assets under management exceeded US$30 trillion in 2022 and are expected to hit US$40 trillion by 2030. However, its prominence in private venture capital markets is lesser known due to these markets' high information asymmetry and limited disclosure (Bernstein, Giroud, and Townsend, 2016). Under conditions of information asymmetry, ESG communication may function as an observable signal that influences investor decisions (Spence, 1973).

Prior research indicates that better ESG performance correlates with firm success due to strong risk management and corporate responsibility. Firms with more sustainable practices have been linked to higher firm valuation (Eccles, Ioannou, and Serafeim, 2014), lower cost of capital (El Ghoul et al., 2011), stronger stakeholder relationships (Freeman et al., 2010), and enhanced investor trust during periods of uncertainty (Lins, Servaes, and Tamayo, 2017). However, these studies focus on public firms operating under relatively high levels of disclosure and regulation rather than private venture backed firms. Moreover, these studies generally analyse ESG performance as a whole. It remains unclear which components of ESG, if any, are the most influential in shaping investor decisions in private venture capital markets.

This paper examines the relationship between each component of ESG and funding outcomes in private venture capital funding markets. To measure ESG performance, the study retrieves companies' archived websites one year prior to their funding rounds via the Wayback Machine and analyses the text following Momtaz and Mansouri's (2022) methodology. This allows for individual E, S, and G scores to be calculated for each company before they exit. These ESG calculations are merged with Pitchbook funding and exit data across 16,688 venture capital funding rounds between 1984 and 2021, allowing the study to analyse the individual importance of E, S, and G for investors in these markets.

It is important to clarify that the ESG scores used in this study reflect ESG signalling rather than directly observed ESG performance. The scores are calculated from textual analysis of firm websites, capturing how firms communicate their sustainable practices. In venture capital markets characterised by high information asymmetry, investors may use this form of ESG communication to infer firm quality and make investment decisions.

Regarding this method of calculating ESG scores, prior literature suggests that ESG disclosure may still indicate firm behavior. For example, Eccles, Ioannou, and Serafeim (2014) find that "High Sustainability" firms with stronger ESG disclosure also exhibited more sustainable practices. However, other research argues that "greenwashing", where firms overstate their sustainability efforts, create a divergence between ESG signaling and actual performance (Delmas and Burbano, 2011). Therefore, ESG communication may serve as an imperfect but informative signal of firm quality.

In this context, the study contributes by examining how ESG signaling influences investor behaviour in private venture capital markets.

The study tests the following hypothesis:

- $H_0$: There is no statistically significant relationship between a firm's ESG performance and its funding success in private venture capital markets.
- $H_1$: There is a statistically significant relationship between a firm's ESG performance and its funding success in private venture capital markets.
- $H_2$: The environmental, social, and governance components of ESG differ in their relationship with funding outcomes.

While univariate analyses provide preliminary evidence of heterogeneous effects across ESG components, the multivariate analyses control for firm characteristics and fixed effects, offering a more precise assessment of these relationships.

The findings are as follows.

First, ESG performance is positively and statistically significantly associated with higher funding received in private venture capital markets. These positive associations are primarily driven by environmental and governance performance. Social performance, however, seems to be discounted by private markets.

Second, ESG performance is positively and statistically significantly associated with a higher likelihood of going public by an IPO. This relationship is primarily driven by governance performance, while environmental and social performance shows muted responses.

Finally, ESG performance is positively and statistically significantly associated with the likelihood of getting acquired. Social performance is the main driver of acquisition likelihood, while there seems to be no effect for environmental and governance performance.

The remainder of this paper proceeds as follows: Section 2 outlines the data and methodology, Section 3 turns to empirical results, Section 4 discusses the findings, and Section 5 concludes.

## DATA AND METHODOLOGY

### Data Sources

This study combines data from multiple sources to explore the relationship between firms' ESG characteristics and their funding outcomes. The main data source is Pitchbook, a publicly available database.

From the PitchBook dataset, the following variables are obtained.

- **raised amount usd:** how much funding a firm has received in a given venture capital funding round
- **post_money_valuation_usd**: the firm's reported valuation immediately after the funding round
- **money_raised_usd**: a measure of the total amount of money raised in an IPO
- **valuation_price**: the firm's reported valuation immediately after an IPO
- **ipo_dummy**: a binary variable that equals 1 if the firm has completed an initial public offering (IPO) and 0 otherwise.

- **acquisition_count**: the number of acquisitions involving the firm as a target across its history.
- **acquisition_dummy**: a binary indicator equal to 1 if the firm has ever been an acquisition target and 0 otherwise.
- **investor_count**: the total number of distinct investors participating in a firm's funding round
- **country** and **state**: categorical identifiers for the firm's headquarters location
- **yeardummy**: a set of annual indicators used to capture time specific effects
- **employee_dummy:** categorical indicators for firm size brackets (1–10, 11–50, 51–100 employees etc.)
- **age**: the number of years between the firm's founding and the relevant funding round
- **homepage_url_cb**: the firm's website address, later used to collect historical website data through the Wayback Machine for ESG measurement.
- **org_uuid_short**: the firm's unique identifier within PitchBook, ensuring consistent merging across datasets.
- **price_usd**: the amount paid to acquire the firm.

## Funding Variables

The main dependent variable is raised_amount_usd, which measures how much funding a firm has received in a given venture capital funding round. The variable is highly left-skewed, so the natural logarithm, ln_raised_amount_usd, is used in the analysis instead to normalise the distribution.

Post_money_valuation_usd captures the firm's valuation immediately after each funding round and shows investor perception. Its log transformation, ln_post_money_valuation_usd, is also used instead.

Firm exit success is measured with ipo_dummy, which equals 1 if the firm has completed an IPO, and acquisition_dummy, which equals 1 if the firm has been acquired. The acquisition_count variable records the total number of acquisitions involving each firm, providing additional granularity on exit activity.

Overall, these funding and exit variables are strong indicators of success, making them ideal dependent variables. An overview of these variables is shown in *Table 1*.

| | count | mean | sd | min | p25 | p50 | p75 | max |
|---|---|---|---|---|---|---|---|---|
| Money Raised ($ Mil.) | 15,799 | 81.74 | 370.65 | 0.00 | 0.22 | 1.91 | 50.05 | 20,000.00 |
| Post Money Valuation ($ Mil.) | 14,025 | 1,020.70 | 5,954.91 | 0.00 | 2.55 | 12.86 | 500.00 | 220,000.00 |
| Investor Count | 15,965 | 3.15 | 3.52 | 1.00 | 1.00 | 2.00 | 4.00 | 51.00 |
| IPO Dummy | 16,688 | 0.09 | 0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| IPO Valuation Price ($ Mil.) | 1,104 | 65,806.66 | 695,403.40 | 5.00 | 1,700.00 | 5,000.00 | 23,526.83 | 22,200,000.00 |
| IPO Money Raised ($ Mil.) | 1,104 | 1,449.78 | 2,991.92 | 0.01 | 193.00 | 520.00 | 1,340.00 | 25,000.00 |
| Acquisition Dummy | 16,688 | 0.09 | 0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Acquisition Count | 16,688 | 0.10 | 0.32 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 |
| Acquisition Price ($ Mil.) | 596 | 2,563.23 | 5,140.35 | 0.00 | 100.00 | 539.78 | 2,240.00 | 29,000.00 |

**Table 1:** Summary statistics on funding outcome variables

This table shows summary statistics on the funding outcome variables used in the study. It shows the number of observations (count), the mean, the standard deviation (sd), the minimum value (min), the 25th percentile (p25), the median (p50), the 75th percentile (p75), and the maximum value (max). The sample consists of 16688 funding rounds over the 1984-2021 study period. Variable descriptions are provided in ***Introduction***.

## Control Variables

To control for firm characteristics that may influence funding and exit outcomes, the study includes several control variables.

investor_count measures the number of distinct investors participating in a funding round, serving as a proxy for investor network breadth and external validation. Because its distribution is skewed, the analysis uses the natural logarithm, ln_investor_count.

Age measures how old the firm was at the time of the funding round, reflecting firm maturity.

employee_dummy variables classify firms by employment size brackets (1–10, 11–50, 51–200, 201–500, and 500+ employees) to control for scale effects.

An overview of these variables are shown in *Table 2*.

| | count | mean | sd | min | p25 | p50 | p75 | max |
|---|---|---|---|---|---|---|---|---|
| Investor count | 15,965 | 3.15 | 3.52 | 1.00 | 1.00 | 2.00 | 4.00 | 51.00 |
| Age | 16,684 | 4.73 | 9.03 | 0.00 | 1.00 | 3.00 | 6.00 | 233.00 |
| Employee count 1-10 | 16,688 | 0.27 | 0.45 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| Employee count 11-50 | 16,688 | 0.29 | 0.45 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| Employee count 51-100 | 16,688 | 0.06 | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Employee count 101-250 | 16,688 | 0.09 | 0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Employee count 251-500 | 16,688 | 0.07 | 0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Employee count 501-1000 | 16,688 | 0.07 | 0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Employee count 1001-5000 | 16,688 | 0.08 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Employee count 5001-10000 | 16,688 | 0.02 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Employee count 10000+ | 16,688 | 0.03 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Employee count unknown | 16,688 | 0.01 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |

**Table 2:** Summary statistics on firm level control variables

This table shows summary statistics on the firm level control variables used in the study. It shows the number of observations (count), the mean, the standard deviation (sd), the minimum value (min), the 25th percentile (p25), the median (p50), the 75th percentile (p75), and the maximum value (max). The sample consists of 16688 funding rounds over the 1984-2021 study period. Variable descriptions are provided in ***Introduction***.

## ESG Scores

The funding success data is complemented with data on the firms' ESG performance. To capture ESG performance, the study follows the methodology of Momtaz and Mansouri (2022) to calculate ESG scores based on input text, giving a comparable measure of how sustainable every firm is.

To automate ESG data collection, a custom Python program systematically loops through firms' historical websites obtained from the Wayback Machine. For each firm, the script retrieves the webpage archived one year prior to the funding round and extracts all visible text content from the homepage using the BeautifulSoup HTML parser. The text is then cleaned by removing numbers, punctuation, URLs, and non-English content through language detection algorithms. Lastly, the cleaned text is input into Momtaz and Mansouri's ESG calculating algorithm. The resulting scores range from 0 to 1, where higher values indicate a stronger focus on sustainability.

The algorithm yields ESG scores in 10227 out of 16688 cases. In some cases, the ESG scores or their subscores are missing. This is due to a lack of machine readable text on the website, the language of the text not being english, or the website not existing. To maintain a comprehensive sample, in such cases, missing ESG values are replaced with zero.[1]

By using the one year lagged website for constructing our ESG measures, concerns about endogeneity, particularly reverse causality are mitigated. The analysis focuses on the treatment effect of ESG performance on funding performance. However, an alternative explanation in which causality is reversed is also conceivable. It might be the case that firms that have received high venture capital funding subsequently increase their ESG performance after the funding. By using the one year lagged ESG measures in explaining contemporaneous venture capital success, these concerns are mitigated.

An overview of the ESG scores is shown in *Table 3*. Overall, the combined ESG score ranges from 0 to 0.21. With the 50th percentile being 0.0019 and the 75th percentile being 0.01, this shows that most of the firms in our analysis exhibit very low ESG scores. Only a small number of firms show significant ESG scores. The mean is larger than the median, indicating that the data distribution is right skewed and there is a long tail of high values. Moreover, the standard deviation is roughly twice the size of the sample mean, indicating significant variance in the firms' ESG performance. Finally, these findings are not driven by a single subdimension but exist throughout all E, S, and G pillars.

| | count | mean | sd | min | p25 | p50 | p75 | max |
|---|---|---|---|---|---|---|---|---|
| **Environmental** | 16,688 | 0.0009 | 0.0035 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0669 |

[1] In untabulated robustness tests, the baseline model is rerun without replacing missing values. All results remain statistically highly significant and their economic effect sizes even increase.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Social** | 16,688 | 0.0033 | 0.0056 | 0.0000 | 0.0000 | 0.0000 | 0.0043 | 0.1058 |
| **Governance** | 16,688 | 0.0027 | 0.0052 | 0.0000 | 0.0000 | 0.0000 | 0.0038 | 0.0744 |
| **ESG** | 16,688 | 0.0068 | 0.0114 | 0.0000 | 0.0000 | 0.0019 | 0.0100 | 0.2121 |

**Table 3:** Summary statistics on ESG scores

This table shows summary statistics on the ESG scores used in the study. It shows the number of observations (count), the mean, the standard deviation (sd), the minimum value (min), the 25th percentile (p25), the median (p50), the 75th percentile (p75), and the maximum value (max). The sample consists of 16688 funding rounds over the 1984-2021 study period. Variable descriptions are provided in ***Introduction***.

## EMPIRICAL RESULTS

### Funding Success Variables Correlation Analysis

To begin, a correlation analysis is conducted among the funding success variables as shown in table 4. The raised_amount_usd variable has a moderate positive correlation with post_money_valuation_usd (0.51), suggesting that firms raising larger funding rounds tend to be valued more highly immediately after investment.

raised_amount_usd is also moderately correlated with money_raised_usd (0.30), reflecting consistency between alternative measures of funding. Its correlation with ipo_dummy (0.16) and price_usd (0.24) suggests that firms securing larger funding rounds are slightly more likely to go public and, when acquired, achieve higher acquisition prices.

investor_count shows small positive correlations with both raised_amount_usd (0.11) and ipo_dummy (0.04), implying that rounds involving more investors are slightly larger and more likely to lead to an IPO. However, the small magnitude of these coefficients suggests that investor participation alone doesn't strongly determine exit outcomes.

Correlations involving acquisition count and acquisition dummy are relatively low, indicating that whether a firm gets acquired or not is largely independent of initial funding or valuation metrics. Overall, no pairwise correlation exceeds 0.51, suggesting that multicollinearity is not a concern in later analysis.

| **Variable** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** |
|---|---|---|---|---|---|---|---|---|---|
| **Raised Amount (1)** | 1.0000 | | | | | | | | |
| **Post-Money Valuation (2)** | 0.5060 (0.0000) | 1.0000 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Investor Count (3)** | 0.1054 (0.0000) | 0.0769 (0.0000) | 1.0000 | | | | | | |
| **IPO Dummy (4)** | 0.1559 (0.0000) | 0.1743 (0.0000) | 0.0378 (0.0000) | 1.0000 | | | | | |
| **Valuation Price (5)** | 0.0111 (0.7284) | 0.0067 (0.8467) | −0.0509 (0.0945) | . | 1.0000 | | | | |
| **Money Raised (6)** | 0.3038 (0.0000) | 0.3304 (0.0000) | −0.0117 (0.6999) | . | 0.0386 (0.2176) | 1.0000 | | | |
| **Acquisition Dummy (7)** | 0.0278 (0.0005) | −0.0033 (0.6988) | 0.0164 (0.0378) | 0.0202 (0.0092) | −0.0280 (0.3521) | −0.1125 (0.0002) | 1.0000 | | |
| **Acquisition Count (8)** | 0.0420 (0.0000) | 0.0023 (0.7868) | 0.0111 (0.1619) | 0.0236 (0.0023) | −0.0270 (0.3702) | −0.1061 (0.0004) | 0.9584 (0.0000) | 1.0000 | |
| **Price (USD) (9)** | 0.2446 (0.0000) | 0.3223 (0.0000) | 0.0610 (0.1407) | 0.3357 (0.0000) | 0.6088 (0.0000) | 0.0530 (0.6384) | . | −0.0201 (0.6247) | 1.0000 |

**Table 4**: Pairwise correlation coefficients for funding success variables

This table shows pairwise correlation coefficients for the funding success variables used in the study. P values are in parentheses. The sample consists of 16688 funding rounds over the 1984-2021 study period. Variable descriptions are provided in ***Introduction***.

## ESG and Funding Correlation Analysis

The Pearson correlation coefficients between the main funding variable (ln_raised_amount_usd) and the ESG variables are calculated next, as shown in Table 5.

All coefficients are positive, suggesting that all of the ESG components are associated with stronger funding outcomes. Column 1 shows that ln_raised_amount_usd is positively correlated with all ESG variables, with the strongest relationships being with the Social and Governance variables (0.09 and 0.12, respectively). This correlation implies that governance and social factors such as financial transparency or relations with stakeholders carry greater informational value to investors when assessing investment risk.

The remaining columns show that the ESG variables are positively correlated with each other, especially between the Social and Governance scores (0.61). The total ESG score is also strongly correlated with each of its components (0.60 with E, 0.89 with S, and 0.83 with G), indicating that the aggregated score accurately reflects firms' overall ESG communication levels.

Overall, these results demonstrate that stronger ESG performance, especially in the social and governance subcomponents, is associated with improved funding outcomes.

| **Variable** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
|---|---|---|---|---|---|
| **Ln Raised Amount USD (1)** | 1.0000 | | | | |
| **Total ESG Score (2)** | 0.1109<br>(0.0000) | 1.0000 | | | |
| **E (3)** | 0.0301<br>(0.0002) | 0.5981<br>(0.0000) | 1.0000 | | |
| **S (4)** | 0.0935<br>(0.0000) | 0.8888<br>(0.0000) | 0.3773<br>(0.0000) | 1.0000 | |
| **G (5)** | 0.1226<br>(0.0000) | 0.8276<br>(0.0000) | 0.2268<br>(0.0000) | 0.6125<br>(0.0000) | 1.0000 |

**Table 5:** Pairwise correlation coefficients for ESG and funding performance

This table shows pairwise correlation coefficients for ESG and funding performance. P values are in parentheses. The sample consists of 16688 funding rounds over the 1984-2021 study period. Variable descriptions are provided in ***Introduction***.

## Univariate Analysis

To explore whether firms with stronger ESG performance receive more venture capital funding, the study performs a series of t-tests comparing mean raised_amount_usd across firms with above and below median ESG scores. Median values are calculated within each year to account for temporal variation, and dummy variables are generated to identify firms with above median performance in E, S, G, and total ESG score.

Table 6 presents the univariate analysis for the social component. Firms with S scores above the median raise an average of USD 85.1 million, compared with USD 79.2 million for those below. However, the difference is statistically insignificant with a p value of 0.324.

Two-sample t test with equal variances

| Group | Obs | Mean | Std. err. | Std. dev. | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| 0 | 9,074 | 79.23214 | 4.271484 | 406.8911 | 70.85907 | 87.60521 |
| 1 | 6,725 | 85.11511 | 3.843737 | 315.2099 | 77.58017 | 92.65006 |
| Combined | 15,799 | 81.73629 | 2.948819 | 370.6491 | 75.95626 | 87.51631 |
| diff | | -5.88297 | 5.96393 | | -17.57295 | 5.807015 |

diff = mean(0) - mean(1) t = -0.9864
H0: diff = 0 Degrees of freedom = 15797

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.1620 Pr(|T| > |t|) = 0.3239 Pr(T > t) = 0.8380

**Table 6:** Univariate analysis for social score

This table shows results of univariate analysis for the social score and associated funding performance. Group 0 consists of firms with below median social performance by year. Group 1 consists of firms with above median social performance by year. The sample consists of 15799 funding rounds over the 1984-2021 study period for which the raised_amount_usd variable is available. Variable descriptions are provided in *Introduction*.

Table 7 presents the univariate analysis for the environmental component. Firms with E scores above the median raise an average of USD 94.3 million, while those below raise USD 79.4 million. The mean difference of USD 14.9 million is significant, as shown in the two-tailed test ($p = 0.067$) and the one-tailed test ($p = 0.034$). This provides preliminary evidence that firms with stronger environmental communication levels receive more funding.

Two-sample t test with equal variances

| Group | Obs | Mean | Std. err. | Std. dev. | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| 0 | 13,349 | 79.42412 | 3.183712 | 367.8393 | 73.18359 | 85.66464 |
| 1 | 2,450 | 94.33432 | 7.786914 | 385.4326 | 79.0647 | 109.6039 |
| Combined | 15,799 | 81.73629 | 2.948819 | 370.6491 | 75.95626 | 87.51631 |
| diff | | -14.9102 | 8.14588 | | -30.87706 | 1.056654 |

diff = mean(0) - mean(1) t = -1.8304
H0: diff = 0 Degrees of freedom = 15797

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0336 Pr(|T| > |t|) = 0.0672 Pr(T > t) = 0.9664

**Table 7:** Univariate analysis for environmental score

This table shows results of univariate analysis for the environmental score and associated funding performance. Group 0 consists of firms with below median environmental performance by year. Group 1 consists of firms with above median environmental performance by year. The sample consists of 15799 funding rounds over the 1984-2021 study period for which the raised_amount_usd variable is available. Variable descriptions are provided in *Introduction*.

Table 8 presents the univariate analysis for the governance component. Firms with G scores above the median raise an average of USD 87.6 million, compared with USD 77.6 million for the lower performing group. The difference of USD 10 million is significant, with a p value of 0.094 in the two tailed test and a p value of 0.047 in the one tailed test, demonstrating that governance quality may play a role in funding success.

Two-sample t test with equal variances

| Group | Obs | Mean | Std. err. | Std. dev. | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| 0 | 9,283 | 77.60577 | 4.195949 | 404.2726 | 69.38079 | 85.83075 |
| 1 | 6,516 | 87.62081 | 3.921833 | 316.5772 | 79.93273 | 95.30889 |
| Combined | 15,799 | 81.73629 | 2.948819 | 370.6491 | 75.95626 | 87.51631 |
| diff | | -10.01504 | 5.989883 | | -21.75589 | 1.725817 |

diff = mean(0) - mean(1) t = -1.6720
H0: diff = 0 Degrees of freedom = 15797

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0473 Pr(|T| > |t|) = 0.0945 Pr(T > t) = 0.9527

**Table 8:** Univariate analysis for governance score

This table shows results of univariate analysis for the governance score and associated funding performance. Group 0 consists of firms with below median governance performance by year. Group 1 consists of firms with above median governance performance by year. The sample consists of 15799 funding rounds over the 1984-2021 study period for which the raised_amount_usd variable is available. Variable descriptions are provided in ***Introduction***.

Finally, when comparing firms with above and below median total ESG scores (Table 9), the mean difference is negligible (USD 81.8 million vs. USD 81.7 million) and statistically insignificant ($p = 0.982$).

Two-sample t test with equal variances

| Group | Obs | Mean | Std. err. | Std. dev. | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| 0 | 8,254 | 81.67261 | 4.669279 | 424.2111 | 72.51965 | 90.82557 |
| 1 | 7,545 | 81.80595 | 3.469519 | 301.3692 | 75.00473 | 88.60717 |
| Combined | 15,799 | 81.73629 | 2.948819 | 370.6491 | 75.95626 | 87.51631 |
| diff | | -.1333442 | 5.903772 | | -11.70541 | 11.43872 |

diff = mean(0) - mean(1) t = -0.0226
H0: diff = 0 Degrees of freedom = 15797

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.4910 Pr(|T| > |t|) = 0.9820 Pr(T > t) = 0.5090

**Table 9:** Univariate analysis for total ESG score

This table shows results of univariate analysis for the total ESG score and associated funding performance. Group 0 consists of firms with below median ESG performance by year. Group 1 consists of firms with above median ESG performance by year. The sample consists of 15799 funding rounds over the 1984-2021 study period for which the raised_amount_usd variable is available. Variable descriptions are provided in *Introduction*.

Overall, the univariate analysis suggests that higher environmental and governance performance corresponds with greater funding success, while the total ESG score and social score alone do not show statistically significant differences. These findings indicate that investors may react more to specific aspects of ESG performance than to overall sustainability scores.

## Multivariate Analysis

To examine whether the findings observed in earlier analysis persist when controlling for firm characteristics, this study incorporates a series of multivariate regression models. These models analyse the relationship between ESG performance and venture funding outcomes while accounting for firm age, investor participation, firm size, country fixed effects, and year fixed effects. This ensures that the findings are not driven by heterogeneity across firms.

### Funding Amounts

The analysis begins by examining the relationship between ESG performance and venture capital funding success by estimating the following regression model.

$\ln\_raised\_amount\_usd_t = \beta_0 + \beta_1\ totalesgscore_{t-1} + \beta_2\ X_{t-1} + \lambda + \delta + \epsilon_t$, where ln_raised_amount_usd is the capital raised in a given funding round at year t. Totalesgscore is the venture's overall ESG score as of the previous year (t-1). X is a vector of control variables measured as of the previous year (t-1). This includes firm age (age), investor count (ln_investor_count), as well as dummy variables indicating employee count (employee_dummy). $\lambda$ and $\delta$ are country and year fixed effects respectively. $\lambda$ captures unobserved heterogeneity across venture headquarter countries, $\delta$ absorbs unobserved heterogeneity across time. $\epsilon$ is the error term. Column 1 of Table 10 presents the results.

| **Variables** | **Total ESG** | **E only** | **S only** | **G only** | **E, S, G** |
|---|---|---|---|---|---|
| **Total ESG score** | 7.228*<br>(1.198) | | | | |
| **Environmental (E)** | | 20.051*<br>(3.714) | | | 18.796*<br>(3.979) |
| **Social (S)** | | | 6.769*<br>(2.434) | | −8.184<br>(3.158) |
| **Governance (G)** | | | | 16.743*<br>(2.621) | 19.137*<br>(3.249) |

| | | | | | |
|---|---|---|---|---|---|
| **Firm age** | 0.034*<br>(0.002) | 0.034*<br>(0.002) | 0.035*<br>(0.002) | 0.034*<br>(0.002) | 0.034*<br>(0.002) |
| **ln(Investor count)** | 0.812*<br>(0.018) | 0.813*<br>(0.018) | 0.810*<br>(0.018) | 0.810*<br>(0.018) | 0.811*<br>(0.018) |
| **Observations** | 15,204 | 15,204 | 15,204 | 15,204 | 15,204 |
| **R-squared** | 0.737 | 0.737 | 0.737 | 0.737 | 0.737 |
| **Country fixed effects** | Yes | Yes | Yes | Yes | Yes |
| **Year fixed effects** | Yes | Yes | Yes | Yes | Yes |
| **Firm size fixed effects** | Yes | Yes | Yes | Yes | Yes |

**Table 10:** ESG Performance and Venture Funding Amounts (OLS)

*Dependent variable: ln(raised_amount_usd)*
*Standard errors in parentheses.*
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*

This table shows results of multivariate regressions of contemporaneous funding received on one year lagged ESG performance, control variables, and fixed effects. Control variables include firm age (age), investor count (ln_investor_count), as well as dummy variables indicating employee count (employee_dummy). Country fixed effects capture unobserved heterogeneity across venture headquarter countries, year fixed effects absorb unobserved heterogeneity across time.

Column 1 of Table 10 shows that aggregate ESG performance is positively associated with funding amounts, with a positive coefficient of 7.228 that is statistically significant at the 1% level. Firms with higher total ESG scores raise larger funding rounds, even after controlling for firm characteristics, suggesting that ESG communication may function as a positive signal in venture capital investment decisions.

The control variables behave as expected, with firm age and investor participation consistently positive and statistically significant. The model has a high explanatory power, with an R squared value of 0.737.

Columns 2 to 4 subsequently re-estimate the above model for each ESG pillar individually. Funding amounts continue to show positive correlations with environmental, social, and governance performance when taken separately. A one unit increase in the environmental score is associated with an increase of 20.051 in ln(raised_amount_usd), while the corresponding coefficients for social and governance performance are 6.769 and 16.743 respectively. They are all statistically significant at the 1% level.

However, when disaggregating ESG into its three components and including them simultaneously in column 5, the results suggest that the overall effect is driven by the environmental (18.796) and

governance (19.137) pillars, while the social pillar exhibits a negative association (−8.184). The change in sign of the social pillar suggests that its positive relationship with funding in column 3 is driven by its correlation with environmental and governance performance. Overall, this implies that ventures may benefit from emphasising their environmental and governance practices on their websites when seeking funding, whereas social performance appears to be discounted by investors.

**Exit Outcomes: IPOs and Acquisitions**

Having established a relationship between ESG performance and funding received, the analysis now turns to alternative measures of funding performance, namely IPO and acquisition outcomes.

**IPO Likelihood**

Table 11 presents logistic regression estimates analysing the relationship between ESG performance and IPO likelihood. The model includes the same control variables and fixed effects as in the OLS model earlier.

| **Variables** | **Total ESG** | **E only** | **S only** | **G only** | **E, S, G** |
|---|---|---|---|---|---|
| **Total ESG score** | 14.380*<br>(2.685) | | | | |
| **Environmental (E)** | | 29.989*<br>(8.103) | | | 22.353<br>(8.792) |
| **Social (S)** | | | 20.665*<br>(5.549) | | 0.124<br>(7.481) |
| **Governance (G)** | | | | 29.810*<br>(5.770) | 26.623*<br>(7.434) |
| **Firm age** | 0.032*<br>(0.004) | 0.033*<br>(0.004) | 0.033*<br>(0.004) | 0.033*<br>(0.004) | 0.032*<br>(0.004) |
| **ln(Investor count)** | −0.207*<br>(0.042) | −0.211*<br>(0.042) | −0.208*<br>(0.042) | −0.211*<br>(0.042) | −0.209*<br>(0.042) |
| **Observations** | 14,930 | 14,930 | 14,930 | 14,930 | 14,930 |
| **Pseudo $R^2$** | 0.364 | 0.362 | 0.363 | 0.364 | 0.364 |
| **Country fixed effects** | Yes | Yes | Yes | Yes | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Year fixed effects** | Yes | Yes | Yes | Yes | Yes |
| **Firm size fixed effects** | Yes | Yes | Yes | Yes | Yes |

**Table 11:** ESG Performance and IPO Outcomes (Logit Models)

*Dependent variable: IPO dummy*
*Logit coefficients reported*
*Standard errors in parentheses.*
**** p < 0.01, ** p < 0.05, * p < 0.10.*

This table shows results of logistic regressions of the probability of an IPO on one year lagged ESG performance, control variables, and fixed effects. Control variables include firm age (age), investor count (ln_investor_count), as well as dummy variables indicating employee count (employee_dummy). Country fixed effects capture unobserved heterogeneity across venture headquarter countries, year fixed effects absorb unobserved heterogeneity across time.

Column 1 shows that aggregate ESG performance is positively and statistically significantly associated with IPO outcomes, with a coefficient of 14.38. This means that firms with higher overall ESG scores are more likely to go public even after controlling for firm age, investor participation, firm size, and country and year fixed effects.

Columns 2 to 4 estimate the effects of each ESG pillar individually. In these models, each ESG pillar is entered separately into the logistic regression while excluding the other two ESG pillars, allowing the relationship between each individual pillar and IPO outcomes to be examined independently. When considered in isolation, environmental (29.989), social (20.665), and governance (29.810) performance are all positively and statistically significantly associated with the likelihood of an IPO.

Column 5 presents the results for the logistic regression model when E, S, and G are included simultaneously. In this specification, only the governance pillar remains positive and statistically significant (26.623), while the environmental (22.353) and social (0.124) components are not statistically significant. This demonstrates that governance performance is the primary driver of IPO likelihood, while environmental and social performance do not independently predict IPO outcomes. Overall, these results suggest that firms with a higher governance performance are more likely to go public.

**Acquisition Outcomes**

Next, the analysis examines the relationship between ESG performance and the likelihood of getting acquired. Table 12 presents logistic regression results for acquisition outcomes, closely mirroring the structure applied above. Column 1 shows that total ESG performance is positively and statistically significantly associated with acquisition likelihood, with a coefficient of 9.216. This demonstrates that firms with stronger overall ESG performance are more likely to be acquired.

| Variables | Total ESG | E only | S only | G only | E, S, G |
|---|---|---|---|---|---|
| **Total ESG score** | 9.216*<br>(2.527) | | | | |
| **Environmental (E)** | | 13.476<br>(8.426) | | | 0.409<br>(9.351) |
| **Social (S)** | | | 21.500*<br>(5.073) | | 22.968*<br>(6.809) |
| **Governance (G)** | | | | 12.357<br>(5.641) | −2.843<br>(7.252) |
| **Firm age** | 0.023*<br>(0.003) | 0.024*<br>(0.003) | 0.023*<br>(0.003) | 0.024*<br>(0.003) | 0.023*<br>(0.003) |
| **ln(Investor count)** | 0.064<br>(0.040) | 0.061<br>(0.040) | 0.064<br>(0.040) | 0.061<br>(0.040) | 0.064<br>(0.040) |
| **Observations** | 15,452 | 15,452 | 15,452 | 15,452 | 15,452 |
| **Pseudo $R^2$** | 0.188 | 0.187 | 0.188 | 0.187 | 0.188 |
| **Country fixed effects** | Yes | Yes | Yes | Yes | Yes |
| **Year fixed effects** | Yes | Yes | Yes | Yes | Yes |
| **Firm size fixed effects** | Yes | Yes | Yes | Yes | Yes |

**Table 12:** ESG Performance and Acquisition Outcomes (Logit Models)

*Dependent variable: Acquisition dummy*
*Logit coefficients reported*
*Standard errors in parentheses.*
**** p < 0.01, ** p < 0.05, * p < 0.10.*

This table shows results of logistic regressions of the probability of getting acquired on one year lagged ESG performance, control variables, and fixed effects. Control variables include firm age (age), investor count (ln_investor_count), as well as dummy variables indicating employee count (employee_dummy). Country fixed effects capture unobserved heterogeneity across venture headquarter countries, year fixed effects absorb unobserved heterogeneity across time.

When the E, S and G are considered individually in Columns 2 to 4, social performance (21.500) is positively and statistically significantly associated with acquisition outcomes, while environmental (13.476) and governance (12.357) performance are weaker and statistically insignificant. A similar trend is shown when all three pillars are included in the model together in Column 5. The social pillar exhibits a positive and statistically significant relationship with acquisition outcomes (22.968), while environmental (0.409) and governance (−2.843) components are statistically insignificant. This pattern suggests that acquirers may prioritise social performance in firms over environmental and governance performance.

**Multivariate Analysis Summary**

Across all models, ESG performance is a statistically significant predictor of funding success. Ventures may benefit from emphasising their environmental and governance practices on their websites when seeking funding, whereas social performance appears to be discounted by investors. This can help them receive higher funding rounds.

Moreover, ESG performance is positively associated with both exit outcomes, but the importance of individual ESG components differs by exit type. Governance performance is the main factor influencing IPO likelihood, while social performance is the main driver of acquisition likelihood. These results demonstrate significant heterogeneity across ESG dimensions and suggest that different exit routes prioritise different aspects of ESG performance.

## DISCUSSION

The analysis of ESG performance and both private venture capital funding outcomes and subsequent exit success reveals that they are positively associated with each other. Furthermore, the three components of ESG (environmental, social, and governance) all have heterogeneous effects depending on the stage of the venture lifecycle.

First, the positive correlation between overall ESG score and private venture capital funding amounts suggests that ESG communication may influence investment decisions even in private markets. While existing literature primarily focuses on public capital markets, where ESG reporting is common, venture capital markets typically operate under greater information asymmetry with limited disclosure from firms. Early stage firms rarely publish official ESG reports, but they often communicate sustainability subtly through their websites. Therefore, ESG communication may still function as a signal for venture capital investors to assess firm potential.

The funding analysis presents the environmental and governance pillars as the main drivers of funding amounts, while the social pillar demonstrates a negative relationship with funding. A possible explanation is that environmental initiatives and governance structures demonstrate how a firm is managed and how it minimises regulatory risk. Environmental initiatives can demonstrate how a firm is willing to comply with regulations. As carbon reporting becomes increasingly standardised across industries, firms that already

maintain environmentally friendly operations will likely face lower adjustment costs in the future. Governance practices like transparent operations and board diversity may indicate that a firm has strong oversight and decision making structures. For venture capital investors, who invest large sums of money in early-stage firms, these signals can increase their confidence in how a firm will execute its strategy on a large scale in the future. By contrast, social initiatives such as income equality and employee wellbeing provide less information about a firm's ability to scale. Since venture capital investors typically emphasise rapid firm growth trajectories, they may place less weight on social signals when evaluating early stage firms.

Secondly, the analysis of exit outcomes presents governance performance as the main driver of a firm's IPO likelihood, and social performance as the main driver of acquisition likelihood. A possible explanation is that firms are required to follow strict regulatory procedures in order to be publicly listed, which involves disclosing comprehensive internal information and complying with board composition rules. These transparency requirements continue even after a firm has gone public, as they must regularly disclose audited financial statements. Therefore, strong governance performance can demonstrate a firm's readiness to operate under these regulations in public markets. Meanwhile, acquisitions are often executed to gain market power or boost brand reputation. A company with strong social performance maintains strong relationships with its customers and employees, which can strengthen their loyalty to the company. This loyalty can enhance the company's brand reputation, thereby improving its competitiveness in the market and increasing its attractiveness to potential acquirers.

Overall, these findings demonstrate that ESG performance in venture capital is not viewed by investors as a unified construct. Instead, investors value different pillars of ESG in different stages of the venture lifecycle. Environmental and governance performance is strongly associated with funding decisions, governance performance is the main driver of IPO outcomes, while social performance is the main driver of acquisition outcomes.

The findings of this study align with existing research. Prior studies demonstrate that there is a positive relationship between ESG and financial performance in capital markets (Friede, Busch, and Bassen, 2015). Mansouri and Momtaz (2022) also find that startups with higher ESG scores receive higher initial valuations and larger funding rounds in Initial Coin Offerings (ICOs). Although these markets are different from the private venture capital markets that this study focuses on, the similarity between the results suggests that firm sustainability may impact investor decisions. Furthermore, research on corporate governance suggests that firms with high quality management teams receive higher IPO valuations (Chemmanur and Paeglis, 2005), broadly aligning with this study's finding of governance performance being strongly associated with IPO likelihood. Lastly, research on ESG and M&A transactions find that social performance is the most critical dimension for M&A success (Huang et al., 2023), supporting this study's finding of social performance being strongly associated with acquisition likelihood.

Despite these contributions, it is important to acknowledge the limitations and potential biases in the analysis.

Firstly, the observed relationship between social performance and acquisition likelihood may be influenced by unobserved firm characteristics. Well-built companies with better management quality and more developed business models may both exhibit higher social signaling and be more likely to attract acquisition offers. Therefore, the positive correlation between social performance and acquisition likelihood may reflect confounding rather than a causal effect. To address this, future research could adopt other identification strategies such as instrumental variable methods or matched sample designs, and incorporate alternative measures of firm quality in order to fully isolate causal relationships.

Another concern is that the study may exhibit selection bias as the Pitchbook dataset primarily includes firms that have raised venture capital funding. The sample may not capture every startup in venture capital markets, especially those that fail at very early stages. While the dataset does include both successful and unsuccessful firms in exit stages, the exclusion of unfunded firms may limit the generalisability of the results. To address this, future research can incorporate more comprehensive datasets that include earlier-stage or unfunded firms in venture capital markets.

Lastly, the ESG scores used in the study are derived from textual analysis of archived firm homepages. This approach may not fully reflect all the ESG communication made by the firm, as they may have explained their ESG initiatives in other sections of their website, on social media, or in product launch events. Future research can include a wider variety of data sources, including full website scraping and social media content, to capture a more comprehensive measure of firms' ESG communication.

## CONCLUSION

This study examines whether ESG performance influences funding success in private venture capital markets and subsequent exit outcomes. Prior research mainly focuses on public firms and aggregate ESG measures. However, whether ESG impacts private ventures and whether investors value specific ESG components differently across stages of the venture lifecycle are still unclear. This paper provides evidence that ESG performance is positively associated with both funding amounts in private markets and exit outcomes, with heterogeneity across ESG dimensions. Environmental and governance performance drive larger private funding rounds, governance performance is strongly associated with IPO likelihood, while social performance is the primary driver of acquisition likelihood. These findings suggest that ESG communication serves as a positive signal for investors in venture capital markets, influencing both private capital funding amounts and subsequent exit evaluations, with investors prioritising different ESG attributes across different stages of the venture lifecycle. Future research could explore the reasons behind these differences, examine how ESG priorities evolve over time, or investigate whether differing patterns are seen across different industries and countries.

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