

**Do higher ESG self-disclosures by the target company in a business combination transaction help to enhance deal outcomes?**

**By**

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## **Abstract**

This study analyzes the associations between ESG disclosure scores and outcomes of business combination deals. Bloomberg's ESG disclosure scores are regressed against three business combination outcome measures: deal premium, deal duration, and total advisory fees percentage. Empirical findings indicate that higher levels of ESG disclosure do not contribute to increasing deal premium. Higher levels of ESG disclosure are associated with longer deal duration and higher percentage fees paid to advisors. The associations are particularly observed for high environmental impact industries. Findings in this study help to answer the question: if adequacy in self-disclosed, unaudited information contributes to reduce information asymmetry? From the associations with deal outcomes in business combinations, the answer is negative. With unregulated, self-disclosed information, more disclosures are not interpreted as transparency, instead, it might call for more verification during business combination transactions.

Keywords: ESG disclosure scores; mergers and acquisitions; deal outcomes; target firms.

## **I. Introduction**

In March 2022, the US Security and Exchange Commission (SEC) issued a proposed rule that would require public companies to provide certain climate-related information in their registration statements such as the 10-K forms<sup>1</sup>; in May 2022, the SEC issued another proposed rule that would require registered investment advisers to provide additional information regarding their environmental, social, and governance (ESG) investment practices.<sup>2</sup> ESG-related disclosure issue has been a topic heavily addressed in accounting as well as sustainability literatures in recent years (Dhaliwal et al. 2011, Dorfleitner, Halbritter & Nguyen 2015, Li et al. 2018; Christensen, Serafeim and Sikochi 2022). Those academic studies address ESG disclosures from different aspects such as value implication, cost of capital, performance measures, corporate dynamic and CEO power. Overall, those studies reach inconsistent findings regarding ESG disclosures' contribution to business decision-making usefulness. While some studies assume the position that more disclosures lead to more transparency (Li et al. 2018),

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<sup>1</sup> Securities and Exchange Commission, Release No. 33-11042; 34-94478; File No. S7-10-22 *The Enhancement and Standardization of Climate-Related Disclosures for Investors*. As of late 2023, the proposed rule is not finalized.

<sup>2</sup> Securities and Exchange Commission, Release No. 33-11068; 34-94985; IA-6034; IC-34594; File No. S7-17-22: *Enhanced Disclosures by Certain Investment Advisers and Investment Companies about Environmental, Social, and Governance Investment Practices*. As of late 2023, the proposed rule is not finalized.

others document that what is voluntarily disclosed is not necessarily what is carried out (Cho et al. 2015, Basu et al. 2022). In a sense, this inconsistency is not surprising. Until the SEC proposals are finalized, currently, ESG disclosures are on a voluntary basis. Without further regulation to regulate the quantity, the quality, and the specific contents of ESG disclosures, it can be challenging for information users to ascertain the value of such disclosures.

When addressing ESG related issues, it is imperative that one can clearly differentiate between ESG rating, ESG disclosure, and ESG disclosure rating. ESG rating is a score assigned to each reporting entity by a rating agency such as Morgan Stanley Capital International (known as MSCI), Thomson Reuter, and Bloomberg. It is the rating agency's subjective assessment of the reporting entity's ESG performance based on survey questionnaires or publicly available ESG data, including but not limited to the reporting entity's self-disclosures. There are leading rating agencies competing against each other trying to establish market dominance, a yet unsolved puzzle on the market is the inconsistency among different rating agencies (Dorfleitner, Halbritter & Nguyen 2015, El-Hage 2021, Christensen, Serafeim and Sikochi 2022). ESG disclosure is the reporting entity's self-disclosures through issuing of special reports, press releasing or disclosing in shareholder documents. This is the subject the SEC proposed rules are trying to regulate. However, until the proposed rules are finalized, currently, the disclosure is at the reporting entity's discretion as to the amount, the contents and the frequency of disclosures. The ESG disclosure rating is a different score assigned to each reporting entity indicating the amount of ESG disclosures. So far, Bloomberg's ESG disclosure score is the rating most commonly employed in academic studies to measure the amount of ESG disclosure (Baldini 2018, Li et al. 2018, Christensen, Serafeim and Sikochi 2022). The definition of such ESG disclosure score given by Bloomberg makes it clear that "Environmental (E), Social (S) and Governance (G) pillars are equally weighted within the overall ESG Disclosure Score. .... This score measures the amount of ESG data a company reports publicly and does not measure the company's performance on any data point."<sup>3</sup>

Bloomberg's definition of ESG disclosure score leaves open a researchable question: given that ESG disclosure is not yet regulated and not audited (El-Hage 2021), can the amount of

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<sup>3</sup> Detailed definition given in the Background section of this study.

disclosure be interpreted as an indicator of transparency? How does the market interpret such a measure of information quantity? This study addresses this question from a unique perspective not yet addressed by previous studies: business combinations. Specifically, this study examines the association between Bloomberg's ESG disclosure score assigned to a target company in a business combination transaction and the outcomes of such a transaction. Academic evidence suggest that higher transparency and lower information asymmetry help to smooth out a business combination deal, leading to more desirable deal outcomes such as a shorter completion time, higher premium to the target company, and the lower advisory fees (Rau 2000, Song, Wei and Zhou 2013, Masulis and Simsir 2018). The question is whether the ESG disclosure score is interpreted as an indicator of higher transparency? Again, it is imperative that this study is not addressing ESG performance of the target company; this study is addressing the merger and acquisition market's interpretation of unregulated voluntary ESG disclosures.

Business combination transactions are selected as the setting to study the market's interpretation of ESG disclosure because they reflect the realized interpretation of such disclosure. Previous studies on ESG disclosure's value implications regress the disclosure scores against constructed valuation measures such as Tobin's Q and subsequent cumulative abnormal returns (CAR) (Khan, Serafeim and Yoon 2016, Li et al. 2018), however, those measures are based on unrealized market valuations. To the contrary, this study looks at completed business combination deals and analyzes ESG disclosure scores against realized deal outcomes. To this extent, this study provides insights on ESG disclosure's value implication from an angle that has not been addressed previously. In merger and acquisition literature, it has been documented that business combination deal outcomes are influenced by the target company's information asymmetry (Masulis and Simsir 2018). A researchable question is to what extent the target company's ESG disclosure contributes to narrow or to widen the information asymmetry between the counter parties in a business combination deal.

The more intuitive and conventional wisdom will easily assume that more information leads to more transparency. However, it is questionable whether the conventional wisdom is applicable to unregulated, voluntary disclosures. This study doesn't take position and leaves open the possibility that more unregulated, voluntary disclosures can lead to wider information asymmetry or more divergent interpretation, as observed in Christensen, Serafeim and Sikochi

(2022). It is hypothesized that ESG disclosure scores have influence on the deal outcomes in business combinations, but the direction of the influence can go either way, positive or negative. This study then further investigates if any influence is more pronounced in environmentally sensitive industry sectors.

To test the market's interpretation of ESG disclosures in the business combination setting, Bloomberg's ESG disclosure scores are collected and merged with data collected from the SDC merger and acquisition database. A total of 1,003 completed business combination deals, initially announced between the year 2010 and 2023, with public firms acquiring public targets are identified, with the target companies assigned an ESG disclosure score 12 months prior to the initial announcement date. Multivariate regression models are estimated with the deal outcomes as the dependent variable. The main test variables are the level of ESG disclosure scores, and the change of such scores, if available. The estimate also considers factors that might influence deal outcomes, as addressed in established merger and acquisition literature, including deal characteristics, target profitability measures and target financial structure measures. Deal outcomes are measured in three ways: deal premium, duration of the deal, and total advisory fees to advisors, also following the established methodology in merger and acquisition literature. Termination or withdrawal as a deal outcome is not included in this study because there are not enough observations with ESG disclosure scores assigned.

Findings from this study indicate that the market has an inconsistent interpretation of ESG disclosures. Overall, empirical evidence from this study does not support that more ESG disclosure is leading to better information transparency; at least, the merger and acquisition market does not interpret the disclosures that way. In terms of deal premium, there is a mildly significant, negative association between the ESG disclosure scores and the deal premium; and this association is more pronounced for tender offers than for merger deals. It has been documented in the literature that information asymmetry between the target and the acquirer is contributing to reducing the deal premium (Masulis and Simsir 2018). Following that conclusion, the negative association between ESG disclosure scores and the deal premium indicates that more disclosures actually lead to greater information asymmetry.

In terms of number of days to close the deal, there is a significant, positive association between the duration of the deal and ESG disclosure scores. This finding indicates that ESG disclosures are not helping to wrap up a business combination deal any faster; instead, the more disclosures is making the negotiation process even longer. This prolonging effect is particularly noticeable for merger deals where management of the target company has a say in closing the deal. To the contrary, for tender offers, there is a negative association, even though not statistically significant.

Total fees paid to advisors, scaled by the deal values, is another important outcome measure for business combination deals. Following SDC's definition of advisors, this study includes fees paid to due diligence advisors, fairness opinion advisors, legal advisors and financial advisors. It is argued that all these advisors count on information transparency to cut down their job loads and, therefore, the fees. The negative association between ESG disclosures and total advisory fees indicates enhanced information transparency. This finding is inconsistent with findings from the other two deal outcomes. The negative association is consistent between merger deals and tender offers; however, the association is either not statistically significant or only mildly significant.

This study then further partitions the sample to focus on those high environmental impact industries such as mining and chemistry, and low environmental impact industries such as business service and entertainment. For the low environmental impact industries, there is no statistically significant association between ESG disclosure score and business combination deal outcomes across the three outcome measures. For the high environmental impact industries, the empirical results are similar to that of the full sample. ESG disclosure scores are mildly, negatively associated with the deal premium and strongly, positively associated with the number of days to close the deal. For total advisor fees, however, the sign flipped, indicating that the more ESG disclosures the higher total advisory fees.

This study contributes to connect two areas that are of major concern for accounting researchers, practitioners, as well as capital market regulators: ESG disclosures and business combinations. Most importantly, this study analyzes realized deal outcomes to evaluate ESG

disclosure's valuation implication. Previous studies use constructed measures to infer ESG disclosure's valuation implication; however, the persistency of such implication upon realization is assumed and can be questionable. By looking at outcomes of completed business combination deals, this study is able to release the assumption of persistent ESG disclosure valuation implication and report the realized interpretation.

From the reporting entities' viewpoint, as ESG disclosure is gaining momentum, the reporting entities should know where they stand and the possible implications of their ESG disclosures. Different implications may apply to different industries with high versus low environmental impacts. Business combination deals have outcomes that can be measured from different angles. Each business combination deal is unique; the counter parties of a business combination deal need to determine what is the outcome of the most concern and what is ESG disclosures' implication on that particular outcome measure. This study directly and faithfully presents what is realized in the merger and acquisition market.

Empirical evidence from this study is either mildly significant or inconsistent. But overall, the message is loud and clear: the merger and acquisition market does not simply translate the amount of ESG disclosure to information transparency. Under the current voluntary-based ESG disclosure, more disclosure does not necessarily help to reduce information asymmetry, at least, the merger and acquisition market is not reacting so. This finding is contradictory to findings from previous study where ESG disclosure score is documented as positively associated with firm valuation (Li et al. 2018, Reber, Gold and Gold 2022). The possible explanation is realization. Voluntary ESG disclosure signals the reporting entity's compliance with social expectations and therefore helps to reduce the reporting entity's idiosyncratic risk (Reber, Gold and Gold 2022), however, when it comes to business combination transaction, it is the reality check. It is possible that acquirers and advisers in a business combination deal either question the self-disclosed information or have to perform additional due diligence to verify more pieces of information. One way or the other, empirical evidence from this study does not indicate that greater ESG disclosure by the target company in a business combination transaction necessarily helps to enhance deal outcomes. Empirical findings in this study echo the findings in Christensen, Serafeim and Sikochi (2022). Under the current system,

greater ESG disclosure only leads to greater interpretation disagreement, hence, greater rating disagreement. This message can be critical for capital market regulators. More guidance is needed before the market can begin to interpret ESG disclosures in a systematic and meaningful way. SEC's two proposed rules didn't come any minute too early; hopefully, the finalization of these rules will not come too overdue.

## **II. Background and Hypothesis Development**

Corporate social responsibility (CSR) and ESG-related studies represent a major area of interest for social scientists. In accounting and finance literature, the focus is whether corporate ESG performance is associated with firm valuation (Li et al. 2018, Reber, Gold and Gold 2022). Investors and other stakeholders assess a company's ESG performance in two ways, either through the readily available ESG ratings given by major rating agencies such as Thomson Reuters, MSCI and Bloomberg, or through the company's self-disclosures of ESG information. For ESG ratings, the rating agencies spend efforts to collect, to aggregate, and to interpret a company's ESG data, and evaluate such data against the outcomes on ESG issues. Each agency developed its own matrix to weigh and to interpret pieces of information to reach the ratings (Christensen, Serafeim and Sikochi 2022). To this extent, the rating is subjective to each rating agency.<sup>4</sup> Even though the rating agencies may not have access to each company's internal records to verify ESG data, outcomes on ESG issues have social impacts and are followed by media. In that sense, ESG performances are observable by the general public and there is a certain degree of external validity in agency ESG ratings (Reber, Gold and Gold 2022). In the literature, there is an unsolved puzzle, however, given the ESG outcomes are observable by the general public, why is there still a relatively large discrepancy among ratings provided by different agencies (Dorfleitner, Halbritter, & Nguyen 2015, Christensen, Serafeim and Sikochi 2022)?

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<sup>4</sup> For example, Bloomberg defines its ESG score as: "The Bloomberg ESG score evaluating the company's aggregated Environmental, Social and Governance (ESG) performance. The score is based on Bloomberg's view of ESG financial materiality. The score is a weighted generalized mean (power mean) of Pillar Scores, where the weights are determined by the pillar priority ranking." The definition then refers to Bloomberg's ESG financial materiality scores model and the ESG Scoring methodology documents to further address the three pillars: Environmental (E), Social (S) and Governance (G).



Companies' self-disclosed ESG information, on the other hand, does not have this external validity. Currently, ESG disclosures are on a voluntary basis and are not audited (El-Hage 2021). As a result, there is a lack of consistency and comparability across reporting entities, or even across different reporting time frames for the same reporting entity. A fundamental issue with the self-disclosed ESG information is that without external validity, to what extent the disclosures can be trusted and be applied for business decision making?

### **ESG Disclosure Score**

To help business decision makers do better evaluate a company's self-disclosures of ESG information, on top of the ESG scores, Bloomberg provides yet another score: the ESG disclosure score. The ESG disclosure score does not measure the company's performance on any ESG outcomes, rather, the disclosure score measures the consistency and the adequacy of a company's ESG disclosures.

Bloomberg defines the ESG disclosure score as:

“(the) proprietary Bloomberg score based on the extent of a company's Environmental, Social, and Governance (ESG) disclosure. The score ranges from 0 for companies that do not disclose any of the ESG data included in the score, to 100 for those that disclose every data point. Companies that are not covered by Bloomberg for ESG data will have no score and will show N/A. A consistent list of topics, data fields, and field weights apply across sectors and regions.... Environmental (E), Social (S) and Governance (G) pillars are equally weighted within the overall ESG Disclosure Score, each topic within a pillar is equally weighted, and topic weights are allocated across fields related to the issue, with quantitative fields weighted more heavily than binary fields. This score measures the amount of ESG data a company reports publicly and does not measure the company's performance on any data point.”

This definition makes it clear that this ESG disclosure score is a data adequacy measure, not a performance measure. This measure opens up a unique opportunity for accounting researchers to address an interesting and highly relevant question: to what extent data adequacy

can help to reduce information asymmetry, conditioned on that data is unaudited, voluntary disclosure?

### **ESG disclosure score related studies**

In the literature, ESG performance's value implications and ESG ratings have been studied (Cho et al. 2015, Li et al, 2018, Reber, Gold and Gold 2022, Basu et al. 2022), mostly on the association between ESG performance (ESG ratings from different agencies) and different financial measures measures. Only a limited studies focus on the ESG disclosure adequacy (Bloomberg's ESG disclosure scores).

Baldini et al. (2018) use Bloomberg's ESG disclosure scores to measure the level of ESG disclosures across countries and across firms. Their study tries to ascertain the determinants in ESG disclosures. They hypothesize that the pressure for ESG disclosure is influenced by country-level and firm-level characteristics such as political system, labor system, cultural system, firm-level analysts' coverage, cross-listing and leverage. Baldini et al. (2018) conclude that a firm's visibility in a society is positively associated with the level of ESG disclosures. The country-level determinants fit into the framework of the institutional theory; the firm-level determinants are explained by the legitimacy theory. Baldini et al. (2018) is not a valuation study, rather, they provide a theoretical foundation as to why firms engage in different ESG practices and disclosures. While trying to establish the theories for ESG disclosures, Baldini et al. (2018) made it clear in their conclusion discussion that the use of Bloomberg's ESG disclosure scores "does not consider the quality of information disclosed". This is exactly the difference between Bloomberg's ESG disclosure score and other ESG rating scores. It is not an ESG performance measure; it doesn't consider the quality of information disclosed; it simply summarizes data adequacy from different pillars, at different measuring points.

Li et al. (2018) study Bloomberg's ESG disclosure score against constructed indicators of firm value such as Tobin's Q and return on assets (ROA), and document a positive association. Li et al. (2018) also consider a moderator factor, CEO power, and conclude that higher CEO power enhances the association between ESG disclosure score and Tobin's Q. Li et al. (2018) assume the position that ESG disclosure level indicates transparency and accountability, and

therefore, leads to enhanced stakeholder trust which, in turn, plays a role to boost firm value. While their empirical results show positive associations, the basic assumption that disclosure level indicates transparency can be challenged. The Bloomberg ESG disclosure score does not measure ESG performance, or the quality of the disclosures. Whether the sheer quantity of unaudited information can indicate transparency still needs to be examined.

Christensen, Serafeim and Sikochi (2022) clearly differentiate between Bloomberg's ESG disclosure scores and other ESG performance scores; furthermore, they do not assume the position that greater disclosures is interpreted as greater transparency. As a matter of fact, Christensen, Serafeim and Sikochi (2022) use the Bloomberg ESG disclosure scores trying to answer the question why there are high degree of disagreement among rating agencies. Christensen, Serafeim and Sikochi (2022) document that greater ESG disclosure actually leads to greater ESG disagreement. They also examine the consequence of ESG rating disagreement and document that greater rating disagreement is associated with higher return volatility. Overall, their findings do not provide evidence that greater ESG disclosure helps to reduce information asymmetry.

To explain their findings that is relatively counter-intuitive to conventional wisdom, Christensen, Serafeim and Sikochi (2022) then map the metrics used by Thomson Reuters with the metrics used by Sustainalytics and categorize metrics as either input metrics or outcome metrics. With this mapping and categorization, they document that ESG disclosure amplifies disagreement more from outcome metrics than from inputs metrics. Without further regulations, self-disclosed ESG information (inputs) might fall under the shadow of "cheap talk" when a company discloses the adoption of a policy or initiative that might not generate desirable ESG outcomes. It is the interpretation of the outcome metrics that is contributing to the disagreement among different rating agencies. In a sense, their discussions on the input versus outcome metrics further question the informativeness of ESG self-disclosures.

### **Research question and hypotheses**

The research question of this study is simple and straightforward: does adequacy of unregulated, self-disclosed information help to reduce information asymmetry? Bloomberg's

ESG disclosure score provides a unique opportunity and a clear measure of such self-disclosed information. This study examines the association between the levels of self-disclosure and information asymmetry reflected in a unique setting where the effects of information asymmetry are reasonably measurable, namely, business combination.

In merger and acquisition literature, it is documented that information asymmetry is a major driver of business combination deal outcomes (Masulis and Simsir 2018). It is argued that in a business combination deal, the acquirers are exposed to an adverse position with two conditions: 1) the targets possess private information about their firm's market value, financial projections, and other operational risks; 2) the deal is a realization where the acquirer cannot fully protect themselves by subsequent contract clauses (Genesove 1993, Masulis and Simsir 2018). To protect themselves, the acquirers will offer discounted prices when they face an informational disadvantage. Masulis and Simsir (2018) document that lower premium is driven by information asymmetry, and the premium decreases as information asymmetry between the parties rises. Following merger and acquisition literature, "deal premium" is a well-established measure of deal outcome. Deal premium is measured as the offered price per share divided by the target's stock price per share, minus one, then times one hundred. In other words, it is the percentage increment of the offered price over the target's stock price.

Based on Masulis and Simsir's (2018) findings, this study tests if the adequacy of ESG self-disclosure helps to reduce information asymmetry, as reflected in deal outcomes. Without taking a position on the association between the level of ESG disclosure and the impacts on information asymmetry, this study does not predict the sign, if there is any association.

**Main hypothesis:** There is an association between target companies' levels of ESG disclosure and deal outcomes in business combination transactions.

Masulis and Simsir (2018) focus on deal premium and information asymmetry. In practice, to narrow the information asymmetry, as the standard operation, the acquirers count on the due diligent process and often engage one or more third-party advisors. Those activities involve time and fees; it is argued that those activities are also associated with information asymmetry. Traditionally in merger and acquisition literature, the length of the deal from the

announcement date to the completion date (the duration), and the total advisor's fees are also considered important measures of deal outcomes (Rau 2000, Song, Wei and Zhou 2013). This study hypothesizes on the three measures.

**Operational hypothesis (1):** There is an association between target companies' level of ESG disclosures and deal premium in business combination transactions.

**Operational hypothesis (2):** There is an association between target companies' level of ESG disclosures and the duration of business combination transactions.

**Operational hypothesis (3):** There is an association between target companies' level of ESG disclosures and total advisor fees in business combination transactions.

### III. Research Design and Sampling Procedure

#### Empirical Model

To test the hypotheses, the following model is estimated using an ordinary least squares (OLS) regression:

$$\text{DealOutcome}_i = \beta_0 + \beta_1 \text{ESGDS}_i + \beta_2 \Delta \text{ESGDS}_i + \sum \beta_n \text{Deal Characteristic Controls} + \sum \beta_m \text{Target Characteristic Controls} + \varepsilon_i \quad (1)$$

where  $\text{DealOutcome}_i$  is either deal premium, duration, or total advisory fees for each business combination deal,  $i$ , in the sample.  $\text{ESGDS}_i$  is the most recent Bloomberg ESG disclosure score assigned to the target company within 12-month before the announcement date.  $\Delta \text{ESGDS}_i$  is the percentage change of such scores from two years ago to the most recent before the announcement date.

Deal characteristic control is a vector of control variables following established merger and acquisition literature, including binary dummies to indicate whether there is stock issued for the deal (Stock), whether there are competing bids for the deal (Competition), whether the acquirers hold shares before the initial announcement (ToeHold), whether the deal is a hostile

takeover attempt (Hostile), and whether the target is in the high technology industries identified by the SDC database (HighTech). Target characteristic control is also a vector of control variables following established merger and acquisition literature. To control for the target's financial structure, debt to equity ratio (T\_DtoE), and market to book value ratio (T\_MtoB) are included. To control for the target's profitability, target's return on equity (T\_ROE), and target's gross profit margin (T\_PFTRatio) are included.

The model is estimated first with the full sample, and then with a split between the merger deals and the tender offers. Following the merger and acquisition literature, the procedures and the dynamics are quite different between the types of business combination deals (Rau 2000, Song et al. 2013). Merger deals are negotiated with the target company's management team while tender offers have lesser inputs from the target's management. The different dynamics can lead to different information asymmetry situations which is particularly of interest for the current study.

## Sampling

Business combination data is collected from the Securities Data Corporation (SDC) U.S. mergers and acquisitions database. Following Baldini et al. (2018), the social pressures and the determinants for ESG self-disclosures vary across countries and across cultural backgrounds. This study focuses on the US market to eliminate the country effects. Completed business combination deals with deal value at least ten million dollars, where a public firm is acquiring a public firm, are identified from 2010 to 2023. The minimum deal value threshold is similar to Rau (2000) and Song (2013). Business combination data is then merged with Bloomberg's ESG disclosure score through the target companies' ticker symbol. Year 2010 is when Bloomberg began to establish the ESG disclosure scores.<sup>5</sup> Business combination deals without the target company been assigned a ESG disclosure score are eliminated from the simple. The final simple consists of 1,003 deals with ESG disclosure score assigned to the target within 12-month before the initial announcement date. Table 1 describes the sampling procedure.

Table 1: Sampling procedure
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<sup>5</sup> Bloomberg's data definition indicates that ESG disclosure score is available from 2015 and on. However, earlier data are available and utilized in academic studies such as Baldini et al. (2018) and Li et al. (2018). Before 2010, the ESG disclosure score is substantially limited, leading to many missing variables.

	# of deals
Completed deals with the initial announcement date between 01/01/2010 and 12/01/2023, US merger and acquisition database	154,398
Target status: Public	6,069
Acquirer status: Public	3,500
Deal value at least \$10 Million	3,007
Target ESG disclosure score not available within 12-month before the initial announcement date	(2,004)
Final Sample*	1,003
*The unit-of-analysis in this study is completed deals. Over the sample period, three companies were acquired multiple times; each completed acquisition is included as a separate observation.	

## Descriptive Statistics

Table 2 gives the descriptive statistics of the variables. Panel A gives a breakdown of completed business combination deals in the final sample by years. Panel B gives the statistics for continuous variables; continuous variables have been winsorized at the 1% extremes. Panel C presents the distributions of the binary variables.

Deal premium is measured as the percentage increment of the offered price over the target's stock price four weeks before the initial announcement date.<sup>6</sup> The average deal premium is 43.53, with the standard deviation 53.05. Those numbers are very comparable to Masulis and Simsir (2018) who reported the average deal premium 44.2, with the standard deviation 60.1 for their sample. The average duration for this sample is 126.24 days, however, the standard deviation is almost as high as the average, to the extreme, some deals took more than two years to complete. (Continuous variables are already winsorized at 1% and 99%). The average total advisory fees is as high as 18.94% of the deal value. This number seems high, but the total fees include fees paid by both the acquirer and the target. The median is 12%, with the maximum at 86%; it seems the distribution is skewed.

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<sup>6</sup> The definition of deal premium is well-established in merger and acquisition literature; however the measurement point of the target's stock price is the researcher's discretion. Masulis and Simsir (2018) measure deal premium as relative to target's stock price 63 trading days before the announcement; Officer (2003) and Song et al. (2013) measure deal premium as relative to 43 trading days before the announcement; Boone and Mulherin (2007) measure deal premium as relative to 4 weeks before the announcement. The SDC merger and acquisition database reports the standard 4-week-leading deal premium, similar to that defined in Boone and Mulherin (2007). This study follows SDC's definition and measures deal premium as the offered prices relative to the target's price four weeks before the announcement.

The average of the ESG disclosure scores (ESGDS) is 29.29; this average is comparable with the average scores reported in previous studies. Baldini et al. (2018) report annual average of their sample from 2005 to 2012, ranging between 29.93 to 33.81, with an overall of 31.83. Li et al. (2018) report the average ESG disclosure scores for their sample between 2004 to 2013 at 30.67. The average of percentage change of ESG disclosure scores ( $\Delta$ ESGDS), however is negative 1.89% for this sample; at least half of the observations return no change of the ESG disclosure scores from two year ago (the median  $\Delta$ ESGDS is 0).

Table 3 presents the correlations between variables used in the model estimate. Notice that ESGDS is significantly correlated with all three deal outcome measures; these correlation coefficients provide initial evidence that ESGDS might have impacts on deal outcomes. However, the signs of the correlation coefficients are somewhat surprising. ESGDS is negatively correlated with the deal premium, positively correlated with deal duration, and positively correlated with the total advisory fees. It seems higher ESG disclosure scores are not influencing deal outcomes towards the desired directions. To further investigate these peculiar signs of correlation coefficients, the correlations between ESGDS and the three deal outcome measures are calculated for each year.

Chart 1 presents a trend analysis of the correlation coefficients in a line chart. It is noticeable that the correlations between ESGDS and the deal premium are mostly negative through the sample period, and there is a downward trend. The correlation with deal duration is always positive, with a slight upward trend, and so is the correlation with total advisory fees. The initial statistics from Table 3 and Chart 1 indicate that not only the level of ESG disclosures is correlated with deal outcomes, but also the correlations are becoming stronger, each pushing towards a certain positive or negative direction.



Table 2: Descriptive Statistics

Panel A: Distribution of sample deals by year													
2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	201	2022	2023
19	20	94	78	97	103	107	84	100	68	55	66	67	45

Panel B: Descriptive Statistics for continuous variables								
	count	mean	std.dev	min	25%	Media n	75%	max
Deal premium	851	43.53	53.05	-46.74	15.18	30.77	54.05	613.92
Duration	996	126.24	117.58	0.00	46.00	92.00	158.50	797.00
Total Adv. Fees	680	18.94	19.32	0.10	4.21	12.00	28.30	86.00
ESGDS	668	29.29	10.99	7.85	25.47	29.52	32.91	74.34
$\Delta$ ESGDS	862	-1.89	10.73	-65.39	0.00	0.00	0.52	37.65
T_MtoB	866	4.25	6.55	0.01	1.45	2.42	4.37	69.60
T_ROE	947	-3.78	22.75	-148.97	-6.69	2.03	6.78	101.33
T_DtoE	943	226.51	362.72	1.74	47.76	106.76	241.06	2908.28
T_PFTRatio	900	-11.66	89.90	-797.91	-6.41	3.14	9.71	732.55
N	1003							
ESGDS is the ESG disclosure score; $\Delta$ ESGDS is the percentage change of ESGDS from two years ago to the most recent before the announcement date; T_MtoB is target's market to book value ratio; T_ROE is target's return on equity; T_DtoE is target's debt to equity ratio; T_PFTRatio is target's gross profit margin.								

Panel C: Distribution of binary variables		
	# of deals	% in the full sample
Tender offers	244	24.32%
Stock	36	3.58%
Competition	25	2.49%
ToeHold	65	6.48%
Hostile	167	16.65%
HighTech	540	53.83%
Stock is a binary dummy takes the value of 1 if there is stock issuing in the deal, 0 otherwise; Competition is a binary dummy takes the value of 1 if there are competing bids, 0 otherwise; ToeHold is a binary dummy takes the value of 1 if the acquirers hold shares before the initial announcement, 0 otherwise; Hostile is a binary dummy takes the value of 1 if the deal is a hostile takeover attempt, 0 otherwise; HighTech is a binary dummy takes the value of 1 if the target is in the high technology industries identified by the SDC database, 0 otherwise.		

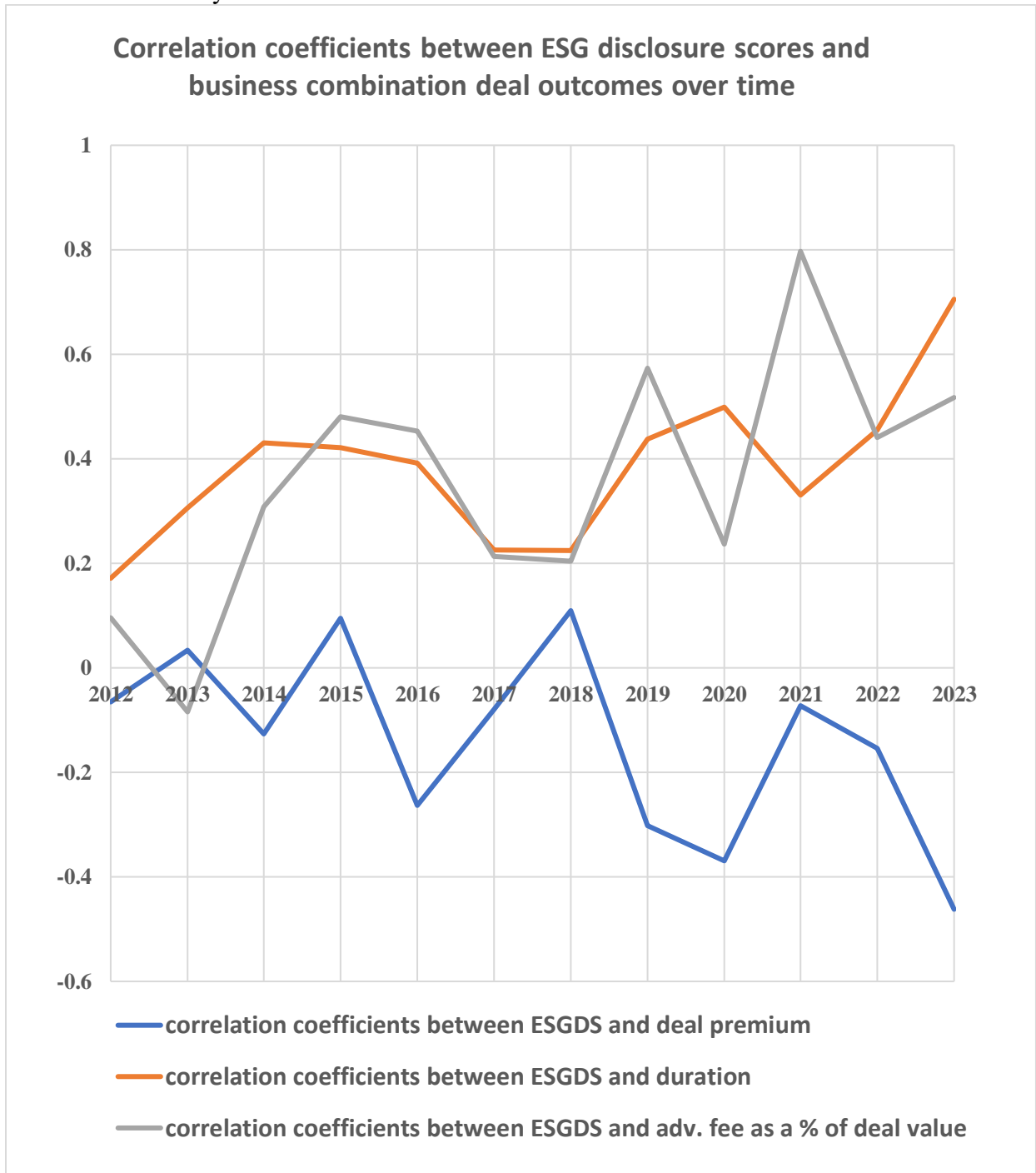
Table 3: Correlation of variables

	Deal premium	Duration	Total adv.fees	ESGDS	Stock	Completion	ToeHold	Hostile	HighTech	T_MtoB	T_ROE	T_DtoE
Duration	0.04	1.00										
Total adv.fees	0.04	0.22***	1.00									
ESGDS	-0.11**	0.18***	0.25***	1.00								
Stock	0.00	0.06*	0.13***	0.07*	1.00							
Competition	0.12***	-0.02	0.07	0.01	0.00	1.00						
ToeHold	-0.04	0.06*	-0.10**	-0.04	-0.03	-0.04	1.00					
Hostile	-0.19***	0.11***	-0.01	0.20***	-0.06	-0.05	-0.09**	1.00				
HighTech	0.20***	-0.06	0.05	0.04	0.03	0.02	-0.11***	-0.07*	1.00			
T_MtoB	-0.04	0.01	-0.02	-0.05	-0.02	0.01	0.15***	-0.03	-0.02	1.00		
T_ROE	-0.04	0.01	-0.01	-0.02	-0.00	-0.01	0.09**	0.00	-0.04	0.59***	1.00	
T_DtoE	-0.04	-0.01	0.03	-0.01	-0.01	-0.00	-0.02	-0.03	-0.02	0.12***	-0.00	1.00
T_PFTRatio	-0.03	0.01	-0.01	-0.05	0.01	0.01	0.00	0.02	-0.03	0.00	0.01	0.00
<i>N</i>	1003											

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

See Table 2 for variable definitions.

Chart 1: Trend analysis of ESG disclosure scores' correlations with deal outcomes



#### IV. Empirical Results

The results of model estimates based on Equation (1) are reported in this section. Test variables regressed against the three deal outcome measures: deal premium, duration, and total advisory fees, are reported in Table 4, 5, and 6, respectively. Equation (1) has both the levels (ESGDS) and the changes of ESGDS ( $\Delta$ ESGDS) included and is estimated as Model 1; Model 2 and Model 3 in the Tables modify Equation (1) to include either the levels alone (Model 2) or the changes alone (Model 3). All three Models are also estimated with partial sample including either merger deals alone or tender offers alone.

Table 4 reports the empirical results with deal premium as the dependent variable. ESGDS is moderately significant for the full sample and for the tender-offer subsample;  $\Delta$ ESGDS is not significantly associated with deal premium for any sample with any model specification. The most interesting result is the consistent negative associations between ESGDS and deal premium across all sample groups and all model specifications. These findings suggest that levels of ESG self-disclosures are contributing to lower deal premium. Following Masulis and Simsir (2018), if reduced deal premium is driven by information asymmetry between the counterparties, then these findings insinuate that greater ESG disclosure is not helping to reduce information asymmetry for business combination transactions.  $\Delta$ ESGDS not only is not significant but also flips signs. It seems, in negotiating deal premium, acquires either do not pay attention to, or do not know how to interpret changes of ESG disclosure scores. These findings echo the findings in Christensen, Serafeim and Sikochi (2022) that greater ESG disclosure leads to greater interpretation difficulties. Control variables indicate that competition bids (Competition), deal attitudes (Hostile), targets in the high-tech industry (HighTech), and targets' profitability (T\_ROE) are also associated with the deal premium, consistent with findings from merger and acquisition literature (Rau 2000, Song et al. 2013).

Table 5 presents the empirical results with deal duration as the dependent variable. Compared with deal premium which is also influenced by the synergy and other dynamics between the counterparties, deal duration as strictly a procedural issue can be a more direct

measure of information asymmetry, tied to the amount of due diligence that needs to be performed to verify information.

Table 5 shows that there is a positive, statistically significant association between ESGDS and deal duration for the full sample and for the merger subsample. Tender offers have a different dynamic when the target's management team has much less influence in completing the deal. When acquirers have to count more heavily on publicly available information to complete the deal, levels of ESG disclosure actually help to shorten the duration; there is a negative association, even though not statistically significant. While some deal characteristic control variables such as Stock and ToeHold show mild significancy, target's firm characteristics such as profitability show no association in completing the deal. These findings suggest that levels of ESG disclosure contribute to prolonging the number of days to complete a business combination transaction, particularly for merger deals when there is negotiation and possibly extended due diligence involved.

Another measure of deal outcome tied to information asymmetry and the level of due diligence to be performed is the number of advisors involved and total fees paid to advisors. Following SDC's data definition, advisors include financial advisors, legal advisors, fair opinion advisors, for both the acquirer and the target, similar to those included in Rau (2000). Table 6 reports the empirical results with total advisory fees as the dependent variable. The dependent variable is deflated by deal value and presented as a percentage.

Table 6 shows that ESGDS is mildly associated with total advisory fees for the full sample. For different simple groups, there is a consistent negative association, as reflected by the negative signs of the estimated coefficients. These findings suggest that higher levels of ESG disclosure help to reduce total advisory fees. If ESG disclosure is meant to enhance transparency, while the acquire might need additional verifications, there is a possibility the third-party advisors can benefit from the disclosure to reduce their workloads.

Overall, these empirical findings are consistent with the main hypothesis that there is an association between target companies' levels of ESG disclosure and deal outcomes in business

combination transactions. However, there are different levels of statistical significance for each operational hypothesis and the directions of the associations are peculiar: levels of ESG disclosure are negatively associated with deal premium, strongly and positively associated with deal duration, and mildly negatively associated with total advisory fees.

Table 4: ESG disclosure score and deal outcome (1): deal premium

	Dependent variable = Deal Premium								
	Full Sample			Mergers			Tender Offers		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	level + change	level alone	change alone						
ESGDS	-0.246 (0.046)*	-0.157 (0.112)		-0.159 (0.225)	-0.0697 (0.510)		-0.569 (0.045)*	-0.489 (0.031)*	
ΔESGDS	0.00263 (0.988)		-0.145 (0.376)	0.0688 (0.719)		-0.0229 (0.897)	-0.0894 (0.827)		-0.441 (0.240)
Stock	0.513 (0.952)	-0.172 (0.983)	-1.051 (0.901)	3.636 (0.682)	2.718 (0.746)	2.591 (0.769)	2.071 (0.924)	4.073 (0.842)	-0.201 (0.993)
Competition	25.26 (0.015)*	25.18 (0.010)*	24.62 (0.018)*						
ToeHold	-2.677 (0.704)	-2.698 (0.667)	-2.051 (0.771)	0.282 (0.967)	0.321 (0.959)	0.756 (0.913)	-3.515 (0.893)	-7.276 (0.722)	1.149 (0.965)
Hostile	-27.76 (0.000)***	-27.53 (0.000)***	-29.26 (0.000)***						
HighTech	14.66 (0.000)***	15.84 (0.000)***	14.73 (0.000)***	11.03 (0.004)**	11.93 (0.001)***	10.99 (0.005)**	19.39 (0.026)*	18.17 (0.021)*	20.55 (0.019)*
T_MtoB	-0.0920 (0.467)	-0.0998 (0.372)	-0.109 (0.390)	-0.149 (0.332)	-0.178 (0.227)	-0.166 (0.280)	-0.00474 (0.991)	0.0132 (0.968)	-0.0352 (0.932)
T_ROE	0.00571 (0.655)	0.00673 (0.554)	0.00772 (0.546)	0.0121 (0.431)	0.0152 (0.301)	0.0140 (0.361)	-0.469 (0.004)**	-0.513 (0.000)***	-0.503 (0.002)**
T_DtoE	-0.000413 (0.306)	-0.000387 (0.319)	-0.000377 (0.350)	-0.000333 (0.376)	-0.000304 (0.404)	-0.000308 (0.414)	-0.00892 (0.496)	-0.00665 (0.568)	-0.00859 (0.516)
T_PFTRatio	-0.0000220 (0.435)	-0.0000212 (0.438)	-0.0000197 (0.486)	-0.0000213 (0.416)	-0.0000209 (0.411)	-0.0000200 (0.446)	-0.00316 (0.037)*	-0.00307 (0.031)*	-0.00296 (0.052)
N	658	739	658	482	540	482	176	199	176
R <sup>2</sup>	0.093	0.093	0.088	0.027	0.028	0.024	0.241	0.243	0.223
adj. R <sup>2</sup>	0.078	0.080	0.074	0.008	0.014	0.007	0.200	0.211	0.185

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001. ESGDS is the ESG disclosure score; ΔESGDS is the percentage change of ESGDS from two years ago to the most recent before the announcement date; T\_MtoB is target's market to book value ratio; T\_ROE is target's return on equity; T\_DtoE is target's debt to equity ratio; T\_PFTRatio is target's gross profit margin. Stock is a binary dummy takes the value of 1 if there is stock issuing in the deal, 0 otherwise. Competition is a binary dummy takes the value of 1 if there are competing bids, 0 otherwise. ToeHold is a binary dummy takes the value of 1 if the acquirers hold shares before the initial announcement, 0 otherwise. Hostile is a binary dummy takes the value of 1 if the deal is a hostile takeover attempt, 0 otherwise. HighTech is a binary dummy takes the value of 1 if the target is in the high technology industries identified by the SDC database, 0 otherwise.

Table 5: ESG disclosure score and deal outcome (2): number of days to complete the deal

	Dependent variable = duration								
	Full Sample			Mergers			Tender Offers		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	level + change	level alone	change alone						
ESGDS	1.782 (0.000)***	1.702 (0.000)***		2.207 (0.000)***	2.288 (0.000)***		-0.304 (0.209)	-0.169 (0.384)	
ΔESGDS	-0.148 (0.773)		0.905 (0.060)	-0.259 (0.679)		1.009 (0.088)	0.384 (0.274)		0.194 (0.540)
Stock	54.98 (0.030)*	43.70 (0.123)	66.64 (0.010)**	58.88 (0.053)	34.84 (0.309)	72.58 (0.019)*	8.528 -0.304	9.986 -0.169	7.259
Competition	-15.27 (0.623)	-19.21 (0.588)	-10.01 (0.751)						
ToeHold	48.12 (0.017)*	37.57 (0.081)	47.99 (0.019)*	32.70 (0.145)	17.96 (0.469)	31.40 (0.172)	4.833 (0.829)	-2.820 (0.874)	7.267 (0.745)
Hostile	8.888 (0.503)	44.37 (0.002)**	20.95 (0.115)						
HighTech	-3.186 (0.750)	-6.114 (0.577)	-1.832 (0.857)	3.403 (0.780)	0.163 (0.991)	7.038 (0.573)	8.519 (0.248)	7.773 (0.250)	9.195 (0.212)
T_MtoB	-0.316 (0.146)	-0.101 (0.682)	-0.287 (0.193)	-0.269 (0.279)	-0.0170 (0.954)	-0.243 (0.340)	-0.156 (0.655)	-0.171 (0.556)	-0.173 (0.621)
T_ROE	0.0313 (0.185)	0.0112 (0.677)	0.0257 (0.284)	0.0265 (0.321)	0.00276 (0.931)	0.0202 (0.460)	0.124 (0.324)	0.112 (0.325)	0.106 (0.394)
T_DtoE	-0.000209 (0.862)	-0.000396 (0.779)	-0.000434 (0.723)	-0.000521 (0.687)	-0.000871 (0.573)	-0.000829 (0.530)	-0.00112 (0.920)	-0.000385 (0.970)	-0.000949 (0.932)
T_PFTRatio	0.0000512 (0.544)	0.0000526 (0.596)	0.0000341 (0.690)	0.0000725 (0.421)	0.0000834 (0.441)	0.0000544 (0.556)	-0.000334 (0.791)	-0.000339 (0.778)	-0.000230 (0.855)
N	740	844	740	560	640	560	180	204	180
R <sup>2</sup>	0.063	0.056	0.029	0.070	0.051	0.023	0.031	0.023	0.022
adj. R <sup>2</sup>	0.048	0.044	0.015	0.055	0.039	0.009	-0.020	-0.017	-0.024

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001. ESGDS is the ESG disclosure score; ΔESGDS is the percentage change of ESGDS from two years ago to the most recent before the announcement date; T\_MtoB is target's market to book value ratio; T\_ROE is target's return on equity; T\_DtoE is target's debt to equity ratio; T\_PFTRatio is target's gross profit margin. Stock is a binary dummy takes the value of 1 if there is stock issuing in the deal, 0 otherwise. Competition is a binary dummy takes the value of 1 if there are competing bids, 0 otherwise. ToeHold is a binary dummy takes the value of 1 if the acquirers hold shares before the initial announcement, 0 otherwise. Hostile is a binary dummy takes the value of 1 if the deal is a hostile takeover attempt, 0 otherwise. HighTech is a binary dummy takes the value of 1 if the target is in the high technology industries identified by the SDC database, 0 otherwise.



Table 6: ESG disclosure score and deal outcome (3): total advisory fees paid by the acquiror and the target as a % of deal value

	Dependent variable = total adv. fees								
	Full Sample			Mergers			Tender Offers		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	level + change	level alone	change alone						
ESGDS	-0.00875 (0.019)*	-0.00763 (0.010)*		-0.00505 (0.183)	-0.00506 (0.105)		-0.0172 (0.105)	-0.00981 (0.218)	
ΔESGDS	0.000550 (0.916)		-0.00482 (0.306)	-0.000158 (0.976)		-0.00312 (0.523)	0.0130 (0.347)		0.00176 (0.884)
Stock	-0.453 (0.066)	-0.438 (0.060)	-0.497 (0.044)*	-0.508 (0.042)*	-0.481 (0.045)*	-0.542 (0.030)*	0.115 (0.857)	0.153 (0.800)	0.0433 (0.946)
Competition	-0.318 (0.267)	-0.291 (0.285)	-0.350 (0.224)						
ToeHold	-0.428 (0.050)*	-0.346 (0.069)	-0.395 (0.071)	-0.406 (0.059)	-0.335 (0.081)	-0.382 (0.074)	-0.101 (0.901)	-0.00385 (0.995)	-0.112 (0.892)
Hostile	0.208 (0.865)	0.500 (0.548)	-0.0271 (0.982)						
HighTech	0.413 (0.000)***	0.370 (0.000)***	0.423 (0.000)***	0.393 (0.001)***	0.348 (0.001)**	0.395 (0.001)***	0.0622 (0.853)	-0.0499 (0.862)	0.123 (0.714)
T_MtoB	0.00148 (0.831)	0.00254 (0.646)	0.00170 (0.807)	-0.00256 (0.808)	-0.00110 (0.913)	-0.00292 (0.781)	-0.0263 (0.145)	-0.0170 (0.158)	-0.0308 (0.087)
T_ROE	-0.000211 (0.757)	-0.000320 (0.556)	-0.000220 (0.747)	0.000202 (0.844)	0.0000515 (0.958)	0.000245 (0.811)	-0.0190 (0.000)***	-0.0163 (0.000)***	-0.0190 (0.000)***
T_DtoE	0.0000556 (0.549)	0.0000489 (0.548)	0.0000428 (0.646)	0.0000847 (0.461)	0.0000710 (0.519)	0.0000817 (0.477)	0.000719 (0.159)	0.000577 (0.140)	0.000844 (0.097)
T_PFTRatio	-0.0000177 (0.190)	-0.0000173 (0.185)	-0.0000167 (0.219)	-0.0000215 (0.125)	-0.0000207 (0.132)	-0.0000210 (0.134)	0.0000830 (0.046)*	0.0000672 (0.080)	0.0000866 (0.038)*
N	532	596	532	418	463	418	114	133	114
R <sup>2</sup>	0.071	0.062	0.061	0.068	0.057	0.064	0.213	0.174	0.193
adj. R <sup>2</sup>	0.051	0.046	0.043	0.047	0.041	0.046	0.145	0.121	0.131

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001. ESGDS is the ESG disclosure score; ΔESGDS is the percentage change of ESGDS from two years ago to the most recent before the announcement date; T\_MtoB is target's market to book value ratio; T\_ROE is target's return on equity; T\_DtoE is target's debt to equity ratio; T\_PFTRatio is target's gross profit margin. Stock is a binary dummy takes the value of 1 if there is stock issuing in the deal, 0 otherwise. Competition is a binary dummy takes the value of 1 if there are competing bids, 0 otherwise. ToeHold is a binary dummy takes the value of 1 if the acquirers hold shares before the initial announcement, 0 otherwise. Hostile is a binary dummy takes the value of 1 if the deal is a hostile takeover attempt, 0 otherwise. HighTech is a binary dummy takes the value of 1 if the target is in the high technology industries identified by the SDC database, 0 otherwise.

## V. Additional Analyses

### Industry Effects

One control variable that shows statistic significancy consistently throughout Table 4 and Table 6 is HighTech, the dummy variable assigned by SDC to flag if the target is in the high technology industry. This finding indicates that deal outcomes are influenced by the target's industry membership. ESG performances and disclosures are related to a company's operation risks (Baldini et al. 2018, Reber, Gold and Gold 2022); with the environment pillar (E) in the ESG disclosure scores, the above statement is particularly true for companies in the environmentally sensitive industries, but not so much for others. One question of concern is whether levels of ESG disclosures are particularly relevant for some industries. To address this issue, this study further partitions the sample by industry membership.

SDC's HighTech flag indicates whether a firm is in the technology-intensive industries, however, technology-intensive industries may or may not be environmentally sensitive. This study partitions simple firms by their environmental impacts. Sample deals in this study are grouped, by target's SIC code, into those high environmental impact industries, environmental neutral industries, and low environmental impact industries. Associations between ESGDS and deal outcomes are contrasted between the high environmental impact industries and the low environmental impact industries. High environmental impact industries tend to have lower numbers as SIC codes, from SIC 0783 to SIC 3999, such as mining, chemicals, metals, oil and petroleum refining; low environmental impact industries tend to have higher numbers as SIC codes, from SIC 6000 to SIC 7812, such as business service, personal service, legal service, insurance and amusement. Table 7 presents the model estimates contrasting the two groups.  $\Delta$ ESGDS is excluded from the estimates since it does not show associations in the full sample and is causing the number of observations to drop sharply due to missing values.

Empirical findings reported in Table 7 confirm that the associations between levels of ESG disclosure and deal outcomes are more significant for high environmental impact industries. For deal premium, the coefficient estimate returns a negative sign, consistent with that from the full sample estimate, even though the coefficient is not statistically significant. For deal duration,

there is a statistically significant, positive association; this result is consistent with the estimate from the full sample. For total adversary fees, there is a statistically significant, positive association; however, the sign of the estimated coefficient is opposite to that from the full sample. The positive association insinuates that higher level of ESG disclosures is leading to higher total adversary fees for high environmental impact industries.

For low environmental impact industries, there is no statistical significance association between levels of ESG disclosure and any one of the three deal outcomes, and the signs are not consistent with those estimated from the full sample.

### **Visibility and Pressure to Self-disclose**

Baldini et al. (2018) reach the conclusion that a firm's visibility in a society is positively associated with the levels of ESG disclosures. If larger and more visible firms self-disclosed more because of social pressure, the question is whether their self-disclosures are interpreted in the same ways as those "true" voluntary disclosures. On the one hand, it is argued that higher visibility leads to higher public scrutiny and, hence, less cheap talk; on the other, however, it can also be argued that higher levels of disclosures are aiming at satisfying the social pressure (the social legitimization theory in Baldini et al. 2018), not really aiming at reducing information asymmetry. Operationally, a question needs to be addressed whether visibility can be an endogenous variable in this study.

To address this issue, this study uses a Heckman two-step model with the following selection model (Step 1) to capture visibility as a possible endogenous variable that might have impacts on both ESG disclosure levels and business combination deal outcomes.

$$\text{Inverse Mills Ratio (IMR)} = \text{ESGDS} + \text{T\_ROE} + \text{T\_MtoB} + \text{T\_DtoE} + \text{LNTA} + \text{LNDV} \quad (2)$$

where T\_ROE is the target's return on equity, T\_MtoB is the target's market to book value ratio, T\_DtoE is target's debt to equity ratio, same as those defined in Equation (1). LNTA and LNDV are the exclusion variables. LNTA is the natural logarithm of the target's total assets and LNDV is the natural logarithm of the deal value for each deal in the sample. The two exclusion variables

are meant to capture the visibility of the target firm and of the business combination deal, it is argued that visibility has impacts on both ESGDS and deal outcomes.

Results from Heckman's two-step regressions are reported in Table 8. First, in the selection model, notice that both LNTA and LNDV are statistically significant with deal premium and total advisory fees as the dependent variable. LNDV is significant in all three estimates. If those exclusion variables do catch the effects of a firm's visibility, these findings are consistent with Baldini et al. (2018). The coefficients estimate for lambda are statistically significant for two out of the three estimates; this result indicates that there are endogenous factors intermediating levels of ESG disclosures and business combination deal outcomes, possible firm size or deal size.

At the second-stage main estimates, the results are consistent with the main findings reported above: levels of ESG disclosure are negatively associated with deal premium, positively associated with deal duration, and positively associated with total advisory fees (consistent with the analysis of high environmental impact industries). The interpretation is that firm sizes or deal sizes do influence a reporting entity's levels of self-disclosure. However, even after controlling for the possible visibility effects, levels of ESG self-disclosure are still not just translated into reduced information asymmetry.

Table 7: A contrast between environmental high vs. low impact industries

	High Environmental Impact Industries			Low Environmental Impact Industries		
	DV= deal premium	DV= duration	DV= total adv. fees	DV= deal premium	DV= Duration	DV= total adv. fees
ESGDS	-0.240 (0.187)	1.344** (0.003)	0.311** (0.005)	0.0266 (0.910)	1.275 (0.109)	0.343 (0.256)
Stock	10.88 (0.541)	173.2*** (0.000)	42.20*** (0.000)	10.75 (0.510)	-35.67 (0.511)	-2.042 (0.947)
Competition	49.89** (0.006)	-38.15 (0.420)	14.97 (0.146)	2.427 (0.907)	-7.360 (0.919)	-3.700 (0.868)
ToeHold	-18.12 (0.055)	-7.020 (0.772)	-7.540 (0.169)	100.9*** (0.000)	43.21 (0.592)	-16.50 (0.575)
Hostile	-15.53 (0.155)	-18.67 (0.402)	-22.74 (0.214)	-27.24** (0.004)	57.40* (0.028)	0 (.)
HighTech	36.96*** (0.000)	-32.45 (0.073)	3.798 (0.396)	2.315 (0.758)	-3.174 (0.897)	7.228 (0.539)
T MtoB	0.0496 (0.881)	-1.180 (0.125)	0.852** (0.004)	-0.0795 (0.773)	-1.594 (0.093)	-0.490 (0.758)
T ROE	-0.00581 (0.857)	0.116 (0.123)	-0.0830** (0.004)	-0.468* (0.012)	1.107 (0.082)	0.404 (0.723)
T DtoE	-0.00592 (0.469)	0.0220 (0.190)	-0.00922 (0.061)	-0.00624 (0.424)	0.0272 (0.319)	-0.00394 (0.727)
T PFTRatio	-0.00161** (0.004)	0.000221 (0.880)	0.0000934 (0.756)	0.00000224 (0.940)	-0.00000304 (0.977)	-0.0516 (0.795)
<i>N</i>	220	254	188	187	220	134
<i>R</i> <sup>2</sup>	0.257	0.142	0.216	0.194	0.081	0.144
adj. <i>R</i> <sup>2</sup>	0.222	0.107	0.172	0.148	0.037	0.077

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . Variables are defined in Table 4.

Table 8: Results from Heckman's selection model

	DV= deal premium	DV= duration	DV= total adv. fees
main			
ESGDS	-0.363* (0.031)	2.610* (0.017)	0.469*** (0.000)
Stock	-5.863 (0.487)	39.29 (0.496)	14.27*** (0.001)
Competition	15.22 (0.203)	-13.67 (0.866)	-2.036 (0.731)
ToeHold	-6.588 (0.412)	41.50 (0.421)	-3.850 (0.389)
Hostile	-12.35 (0.122)	-11.61 (0.752)	-17.74 (0.364)
HighTech	14.96*** (0.000)	7.667 (0.746)	-2.718 (0.176)
select			
ESGDS	0.00728 (0.467)	-0.00193 (0.928)	-0.0163* (0.015)
T ROE	-0.00971 (0.152)	-0.0159 (0.320)	-0.00399 (0.320)
T MtoB	-0.0771*** (0.000)	-0.0480 (0.139)	-0.119*** (0.000)
T DtoE	0.00152** (0.002)	0.000867 (0.487)	0.00249*** (0.000)
LNDV	0.723*** (0.000)	0.294* (0.027)	0.801*** (0.000)
LNAT	-0.649*** (0.000)	-0.290 (0.081)	-0.693*** (0.000)
/mills			
lambda	-33.40** (0.003)	288.0 (0.495)	-8.833* (0.026)
N	595	595	595
* $p < 0.05$ , ** $p < 0.01$ , *** $p < 0.001$ Other variables are defined the same as in Table 4. LNDV is the natural logarithm of deal value. LNAT is the natural logarithm of target' total assets.			

## Conclusion

Business entities' environmental, social, and governance (ESG) performance is gaining public attention. In academic literature, it has been documented that ESG performance has value implications. Under the current practice, however, the disclosures of ESG information are on a voluntary basis. While the SEC is proposing rules to regulate ESG disclosures, currently, to what extent the voluntarily disclosed, unaudited information is employed for realized business decision making is a question that needs to be addressed. This study examines completed business combination deals to address this issue.

Bloomberg's ESG disclosure score provides a readily available yet unique measure of the levels of ESG voluntary disclosure. This study examines the associations between Bloomberg's ESG disclosure scores and different outcome measures in business combination deals. Empirical results from this study render unique findings: greater ESG disclosure is associated with lowered deal premium and prolonged periods to complete the deal. While levels of ESG disclosures have impacts on the total advisory fees, the directions of the impacts are not consistent. The associations between levels of ESG disclosure and deal outcomes are more observable for high environmental impact industries.

This study addresses a much profound research question: does the adequacy of unregulated, voluntarily disclosed information help to reduce information asymmetry? Empirical findings of associations with signs contradictory to conventional wisdom insinuate a negative answer to this question. While previous studies assume information transparency based on the adequacy of voluntary disclosures (Li et al. 2018), outcomes from completed, realized transactions indicate the other way. There is no telling when, or if at all, the SEC's proposed rules will be finalized. Findings in this study provide evidence that without guidance or rules to regulate the disclosures, greater disclosures are not contributing to reducing information asymmetry, instead, it might call for more verification. If ESG related issues are positioned to gain more grounds, guidance or rules on ESG disclosures are inevitable.

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