Online-Appendix

„How Does ESG Rating Disagreement Influence Analyst Forecast Dispersion?“

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Annex 1

Table 1: Financial analysts' information sources
Source: Based on Barker, R. G. (1998), p. 11.

Ranking of analysts' prioritized sources of information	
General	Direct from the firm
Direct contact with the firm	Personal contact – by phone, writing, or individual contact
Analyst meetings	Results announcements and analyst meetings
Results announcements	Reports and accounts
Annual report and accounts	Organized site visits and other presentations for groups of analysts
Industry contacts	
Interim reports and accounts	
In-house economics	
Industry information services	
Clients	
Sales desk	
AGM	
Market news	
In-house technical analysis	
Firms house	
Newspapers	
Reports of other brokers	

Table 2: Ranking of analysts' information sources
Source: Leins, S. (2018), p. 79.

	Timeliness	Applicabil-ity	Credibility	Originality
Academic journals	Slow	Very low	Very high	High
Academic literature	Very slow	Very low	Very high	High
Bloomberg financial data	Very fast	Neutral	Neutral	Low
Bloomberg news data	Very fast	Neutral	High	Low
Broker reports	Fast	Very high	High	High
Firm websites	Very fast	Neutral	High	Very low
Firm statements	Neutral	Neutral	Very high	Very low
Newspapers	Fast	Low	Low	Low
Online news services and blogs	Very fast	Low	Very low	High
Other analysts	Fast	Very high	Neutral	Neutral
Special-interest magazines (e.g., the Economist)	Neutral	Neutral	High	Neutral
Special-interest newspapers (e.g., the Financial Times	Fast	High	High	Neutral

Figure 1: Relationship between Growth, ROIC and Cash Flow
Source: Koller et al., 2020, p. 94.

Growth	7%	9%	13%	25%
9%	400	1100	1900	2700
6%	600	1100	1600	2100
3%	900	1100	1400	1600

ROIC

Note: Present value of future cash flows, assuming year 1 earnings of $ 100 and a 9% cost of capital. After 15 years, all scenarios grow at 4.5%.

Figure 2: Google Searches for ESG
Source: Google Trends, 2022, URL.

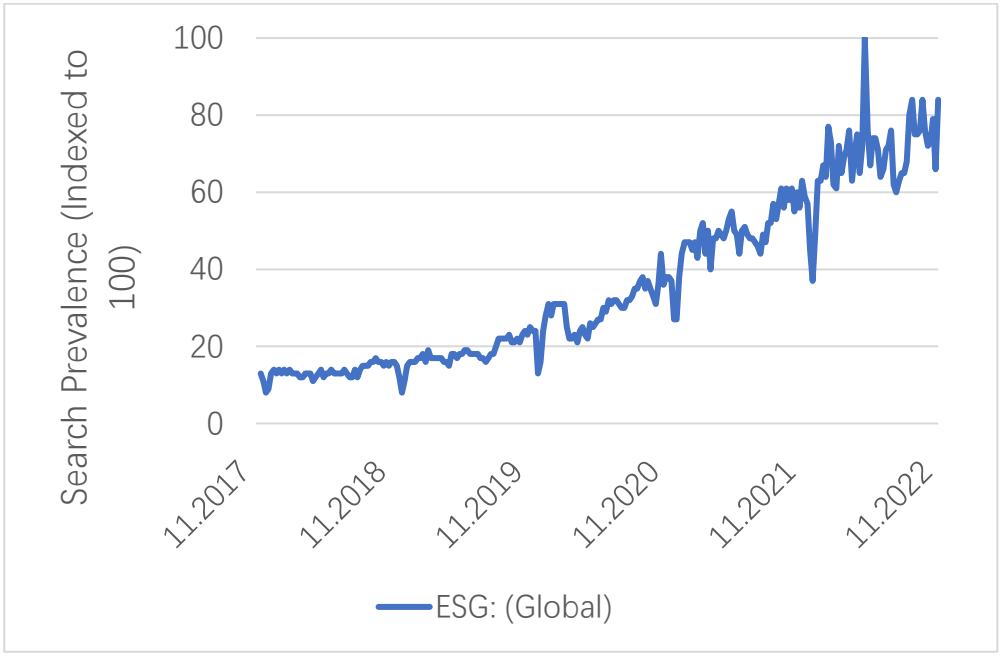


Figure 3: Example of MSCI's selection of key issues
Source: MSCI, 2022b. URL.

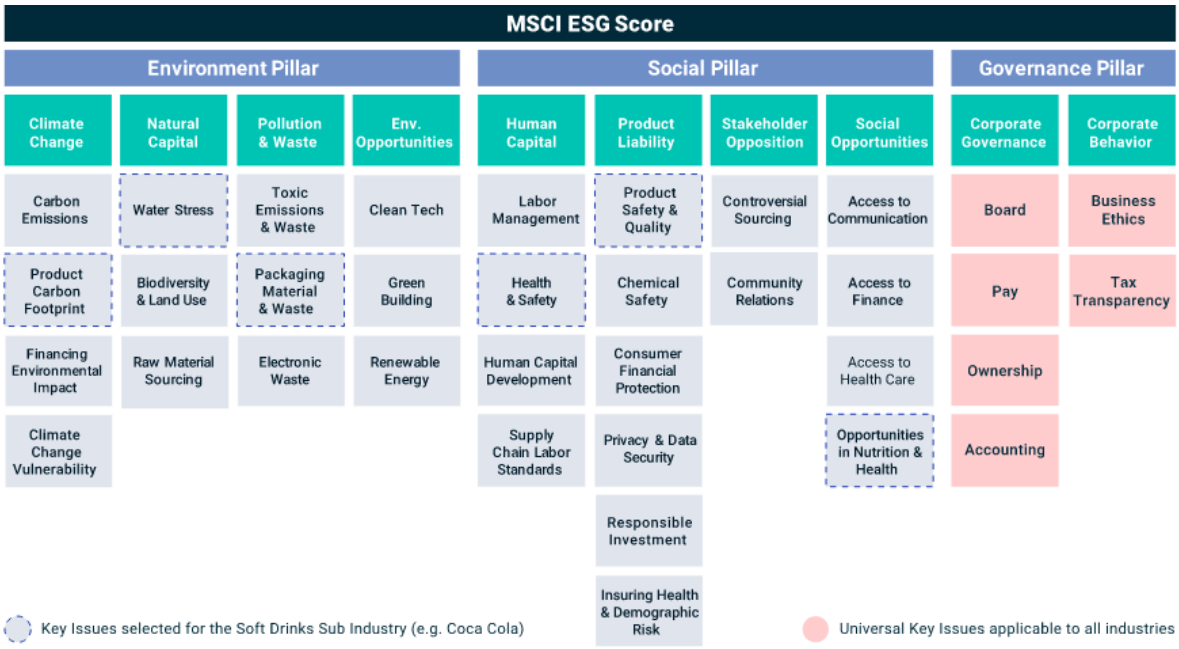


Table 3: Sustainalytics products and services
Source: Based on Morningstar (2021), p. 19-21.

Sustainalytics products and services	
ESG Risk Rating	Measurement a firm's exposure to industry-specific material ESG risks and how well a firm is managing those risks.
Carbon Risk Rating	Assessment a firm's carbon risk, driven by the transition to a low-carbon economy. The data allows investors to make informed investment decisions regarding climate change.
Product involvement data	This offering allows investors to understand, monitor, and minimize their exposure to controversial areas. Among others, these include animal testing, weapons, tobacco and adult entertainment.
Controversy Research	Identification of firms that are involved in ESG-related incidents that could damage their financial stability and/or reputation.
Global Standards Screening data	Assessment of the extent to which a firm causes, contributes, or is linked to violations of international norms and standards. Enabling investors and managers to monitor market opportunities, compliance requirements, and reputational risks.
Impact Metrics	This service allows investors to assess the positive impact of portfolios and report on alignment to the U.N. SDGs and the Sustainalytics ESG Impact Framework to demonstrate the outcomes of their impact strategy. The Sustainalytics ESG Impact Framework includes six themes aligned with the United Nations Sustainable Development Goals. The themes are: Climate Action, Healthy Ecosystems, Resource Security, Basic Needs, Human Development, and Leadership and Collaboration.

Table 4: MSCI ESG Research products and services
Source: MSCI ESG Research, 2022, p. 3 f.).

MSCI ESG Research products and services	
MSCI ESG Rating	Measurement of exposure to and management of key ESG risks and opportunities. The offering includes firm level ratings, scores, and data, as well as firm, industry and thematic reports.
MSCI ESG Controversies	Identifies firms involved in significant environmental, social or governance controversies and violations of global ESG-related norms and conventions, such as the United Nations Global Compact.
MSCI Climate Value-at-Risk	Provides a forward-looking and return-based valuation assessment to measure climate related risks and opportunities in an investment portfolio.
MSCI ESG Business Involvement Screening Research	Identifies firms involved in specific business activities, such as alcohol, gambling, tobacco or weapons.
MSCI ESG Portfolio Analysis	Provides portfolio-level aggregation of ESG scores.

Table 5: MSCI ESG Key Categories and Subcategories
Source: MSCI (2022), 4.

MSCI ESG Research			
Pillars	Categories	Subcategories	
Environmental	Climate Change	Carbon Emissions	Financing Environmental Impact
		Product Carbon Footprint	Climate Change Vulnerability
	Natural Capital	Water Stress	Raw Material Sourcing
		Biodiversity & Land Use	
	Pollution & Waste	Toxic Emissions & Waste	Electronic Waste
		Packaging Material & Waste	
	Environmental Opportunities	Opportunities in Clean Tech	Opportunities in Renewable Energy
		Opportunities in Green Building	
Social	Human Capital	Labor Management	Human Capital Development
		Health & Safety	Supply Chain Labor Standards
	Product Liability	Product Safety & Quality	Privacy & Data Security
		Chemical Safety	Responsible Investment
		Consumer Financial Protection	Health & Demographic Risk
	Stakeholder Opposition	Controversial Sourcing	Community Relations
	Social Opportunies	Access to Communications	Access to Health Care
		Access to Finance	Opportunities in Nutrition & Health
Governance	Corporate Governance	Ownership & Control	Pay
		Board	Accounting
	Corporate Behavior	Business Ethics	Tax Transparency
∑	10	35	

Table 6: Refinitiv Key Categories and Subcategories
Source: Refinitiv (2022c), p. 10.

Refinitiv			
Pillars	Categories	Subcategories	
Environmental	Emmission	Emissions	Waste
		Biodiversity	Environmental Management Systems
	Innovation	Product Innovation	Green Revenues, Research and Development and Capital Expenditures
	Resource Use	Water	Energy
		Sustainable Packaging	Environmental Supply Chain
Social	Community	Community	
	Human Rights	Human Rights	
	Product Responsibility	Responsible Marketing	Product Quality
		Data Privacy	
	Workforce	Diversity and Inclusion	Career Development and Training
		Working Conditions	Health and Safety
Governance	CSR Strategy	CSR Strategy	ESG Reporting and Transparency
	Management	Structure (Independence, Diversity, Committees)	Compensation
	Shareholders	Shareholder Rights	Takeover Defenses
∑	10	25	

Table 7: Correlations between ESG rating agencies
Source: Prall, K., 2021, URL.

	MSCI	S&P	Sustainalytics	CDP	ISS	Bloomberg
MSCI	1					
S&P	0.36	1				
Sustainalytics	0.35	0.65	1			
CDP	0.16	0.35	0.29	1		
ISS	0.33	0.14	0.22	0.07	1	
Bloomberg	0.37	0.74	0.58	0.44	0.21	1

Table 8: Correlation between ESG rating agencies
Source: State Street Global Advisors, 2019, p. 2.

	Sustainalytics	MSCI	RobecoSAM	Bloomberg ESG
Sustainalytics	1			
MSCI	0.53	1		
RobecoSAM	0.76	0.48	1	
Bloomberg ESG	0.66	0.47	0.68	1

Annex 2

Table 9: Sample selection
Source: Own illustration.

Initial sample	Firm years	Unique firms
Total number of global private firms as of January 16th, 2023.	71,860	7,186
Exclude:		
Firm observation with missing fiscal year or identifier	(0)	
Firm observations with duplicates	(0)	
Non-relevant firm-year observations (2012-2017)	(35,930)	
Incomplete or missing data	(31,952)	
Firm observations from the U. S.	(10)	
Final sample	3,968	

Note: This table delineates the sample selection for estimating the influence of ESG disagreement on analyst forecast dispersion

Table 10: Sample country composition
Source: Own illustration.

Nation	Firm years	in %	Nation	Firm years	in %
Australia	196	4.94	Luxembourg	11	0.28
Austria	14	0,35	Malaysia	92	2.32
Belgium	20	0.50	Mexico	48	1.21
Bermuda	18	0.45	Netherlands	81	2.04
Brazil	76	1.92	New Zealand	39	0.98
Canada	234	**5.90**	Norway	30	0.76
Cayman Islands	173	4.36	Oman	3	0.08
Chile	23	0.58	Pakistan	1	0.03
China	127	3.20	Panama	3	0.08
Colombia	2	0.05	Philippines	34	0.86
Curacao	3	0.08	Poland	20	0.50
Czech Republic	3	0.08	Portugal	11	0.28
Denmark	47	1.18	Qatar	9	0.23
Finland	28	0.71	Saudi Arabia	39	0.98
France	166	4.18	Singapore	34	0.86
Germany	137	3.45	South Africa	101	2.55
Greece	2	0.05	South Korea	146	3.68
Hong Kong	80	2.02	Spain	39	0.98
Hungary	7	0.18	Sweden	80	2.02
India	322	**8.11**	Switzerland	86	2.17
Indonesia	31	0.78	Taiwan	114	2.87
Ireland	68	1.71	Thailand	84	2.12
Isle of Man	3	0.08	Turkey	29	0.73
Israel	13	0.33	United Arab Emirates	7	0.18
Italy	35	0.88	**United Kingdom**	208	**5.24**
Japan	772	**19.46**	United States	0	0.00
Jersey	17	0.43		3,968	100.00
Kuwait	2	0.05			

Note: This table presents the geographic distribution of sample firm-year observations. Country refers to the place of a firm‘s incorporation. Countries represented with more than 5% in the sample are marked bold.

Figure 4: Histogram of analyst forecast dispersion before transformation
Source: Own Illustration.

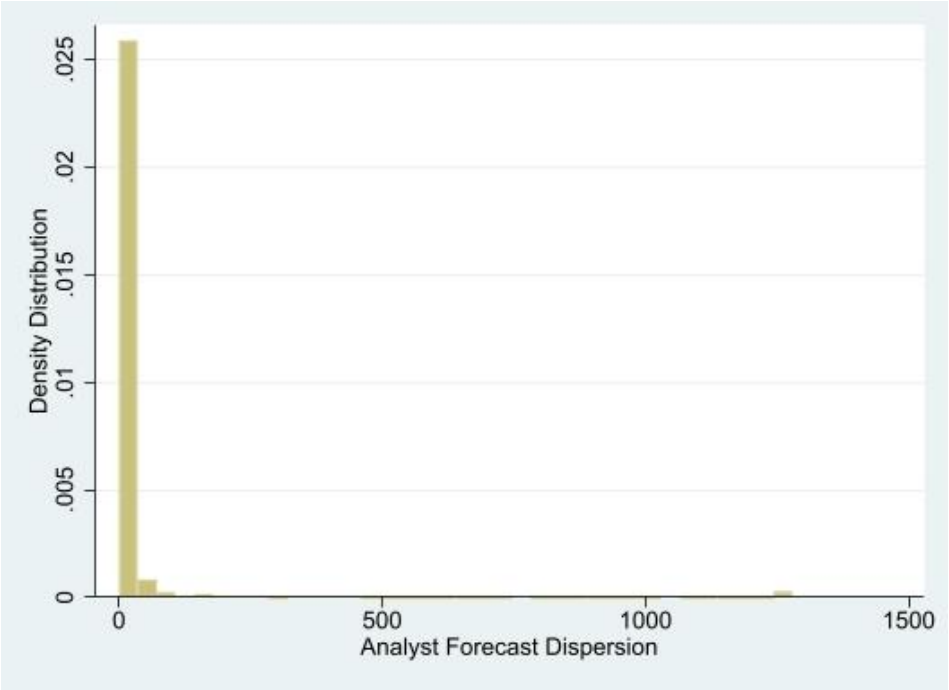
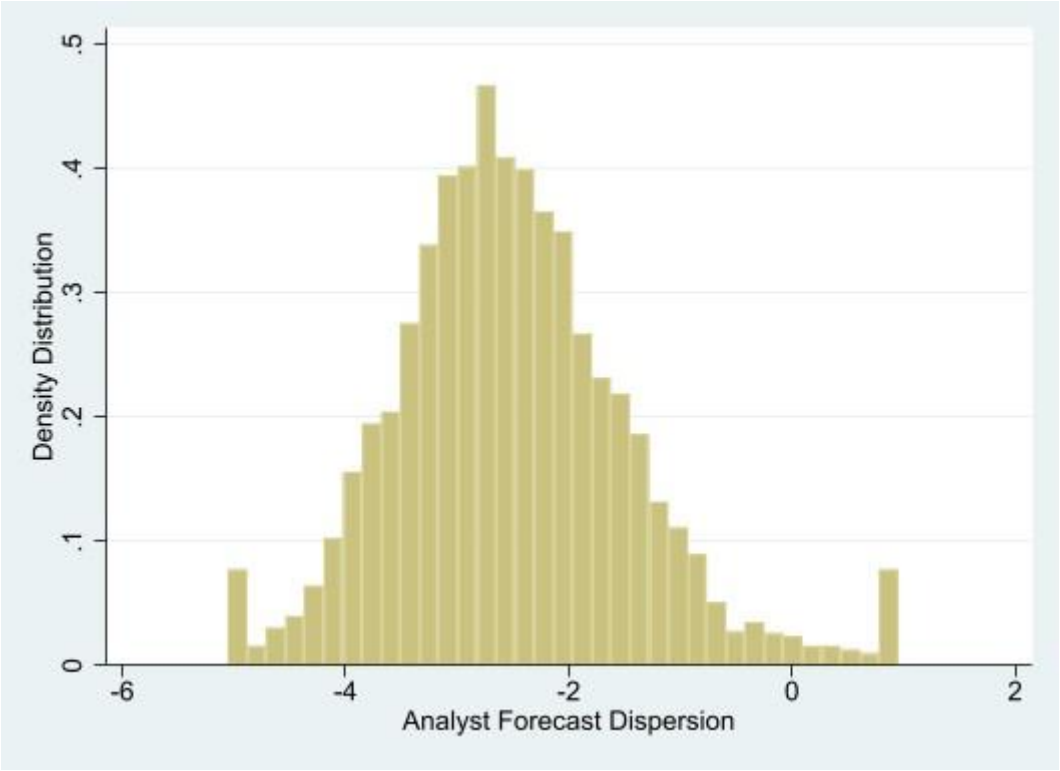


Figure 5: Histogram of analyst forecast dispersion after transformation
Source: Own Illustration.



Note: In this figure the natural logarithm has been used to transform analyst forecast dispersion.

Table 11: Definition of variables
Source: Own illustration.

Variable	Definition
Dependent variable	
AF_DISP_0	Relative analysts' forecast dispersion, defined as the standard deviation of analysts' forecast dispersion of annual earnings or firm i in year t.
AF_DISP	The natural logarithm of relative analysts' forecast dispersion, defined as the standard deviation of analysts' forecast dispersion of annual EPS scaled by the absolute value of the mean analysts' forecast for firm i in year t.
Experimental variable	
ESG_Disagreement_0	Relative disagreement between ESG rating agencies, defined as the standard deviation of the 10-point rating scale ranks of ESG ratings of a firm received from the five rating agencies (i.e. Refinitiv Eikon, MSCI, S&P, Sustainalytics, ISS) or firm i in year t.
ESG_Disagreement	The natural logarithm of relative disagreement between ESG rating agencies, defined as the standard deviation of the 10-point rating scale ranks of ESG ratings of a firm received from the five rating agencies (i.e. Refinitiv Eikon, MSCI, S&P, Sustainalytics, ISS) scaled by the absolute value of the mean ESG forecast for firm i in year t. The standard deviation is calculated even if one or more ratings are missing. At least three ratings are required.
ESG_Disagreement_3	The natural logarithm of relative disagreement between ESG rating agencies, defined as the standard deviation of the 10-point rating scale ranks of ESG ratings of a firm received from three rating agencies (i.e. Refinitiv Eikon, MSCI, S&P) scaled by the absolute value of the mean ESG forecast for firm i in year t. The standard deviation is not calculated if one or more ratings are missing.
ESG_Disagreement_4	The natural logarithm of relative disagreement between ESG rating agencies, defined as the standard deviation of the 10-point rating scale ranks of ESG ratings of a firm received from four rating agencies (i.e. Refinitiv Eikon, MSCI, S&P, Sustainalytics) scaled by the absolute value of the mean ESG forecast for firm i in year t. The standard deviation is not calculated if one or more ratings are missing.
ESG_Disagreement_5	The natural logarithm of relative disagreement between ESG rating agencies, defined as the standard deviation of the 10-point rating scale ranks of ESG ratings of a firm received from the five rating agencies (i.e. Refinitiv Eikon, MSCI, S&P, Sustainalytics, ISS) scaled by the absolute value of the mean ESG forecast for firm i in year t. The standard deviation is not calculated if one or more ratings are missing.
E_Disagreement	The natural logarithm of relative disagreement between ESG rating agencies about environmental issues, defined as the standard deviation of environmental ratings of a firm received from the five rating agencies (i.e. Refinitiv Eikon, MSCI, S&P, Sustainalytics, ISS) scaled by the absolute value of the mean environmental forecast for firm i in year t. The standard deviation is calculated even if one or more ratings are missing. At least three ratings are required.
S_Disagreement	The natural logarithm of relative disagreement between ESG rating agencies about social issues, defined as the standard deviation of social ratings of a firm received from the five rating agencies (i.e. Refinitiv Eikon, MSCI, S&P, Sustainalytics, ISS) scaled by the absolute value of the mean social forecast for firm i in year t. The standard deviation is calculated even if one or more ratings are missing. At least three ratings are required.
G_Disagreement	The natural logarithm of relative disagreement between ESG rating agencies about governance issues, defined as the standard deviation of governance ratings of a firm received from the five rating agencies (i.e. Refinitiv Eikon, MSCI, S&P, Sustainalytics, ISS) scaled by the absolute value of the mean governance forecast for firm i in year t. The standard deviation is calculated even if one or more ratings are missing. At least three ratings are required.

Control variables

Size	Natural logarithm of the market value of equity for firm i in year t.
NANA	Analyst Following calculated as the natural logarithm of the number of analysts following firm i in year t.
BTM	Ratio of book value of equity to market value of equity for firm i in year t.
Earnings_VOL	Standard deviation of earnings over the previous 5 years for firm i in year t.
Earnings_Surprise	Firm i's earnings in year t minus firm i's earnings in year t-1 deflated by stock price.
Forecast_Horizon	Natural logarithm of the number of calendar days between the mean forecast horizon and subsequent actual earnings announcement date.
Leverage	Ratio of total debt to total assets for firm i in year t.
ZMIJ	Zmijewski's financial distress score for firm i in year t.
LOSS	Indicator variable that equals 1 if firm i in year t records negative earnings and 0 if firm i in year t records positive earnings.

Note: This table defines all variables used in this empirical study, including their calculation.

Figure 6: Residual Plot for Model 1 in Table 18
Source: Own Illustration.

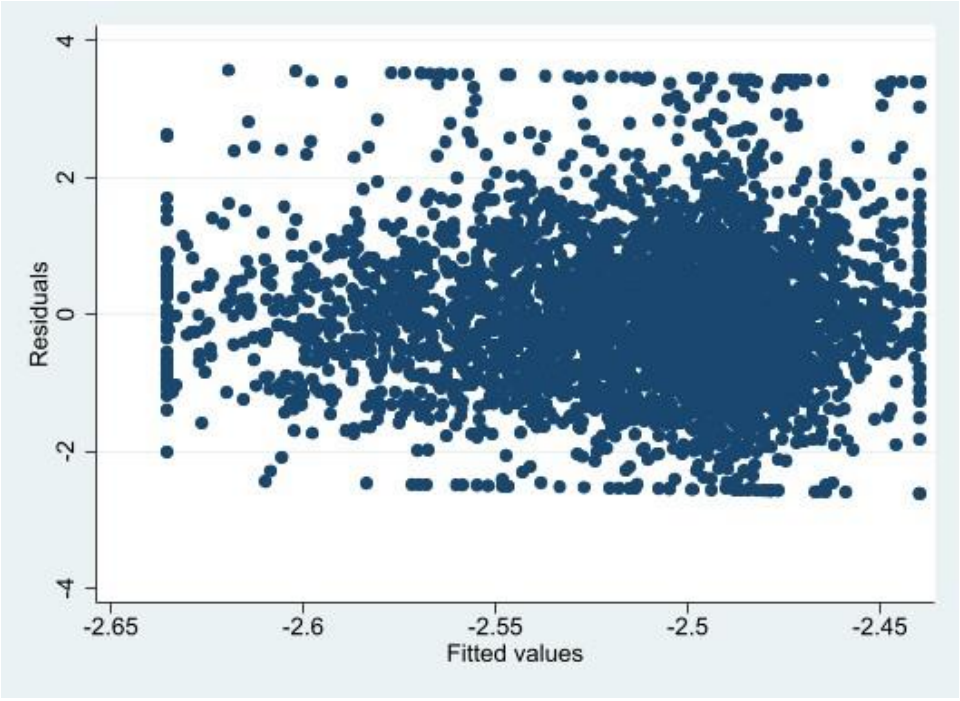


Figure 7: Residual Plot for Model 2 in Table 18
Source: Own Illustration.

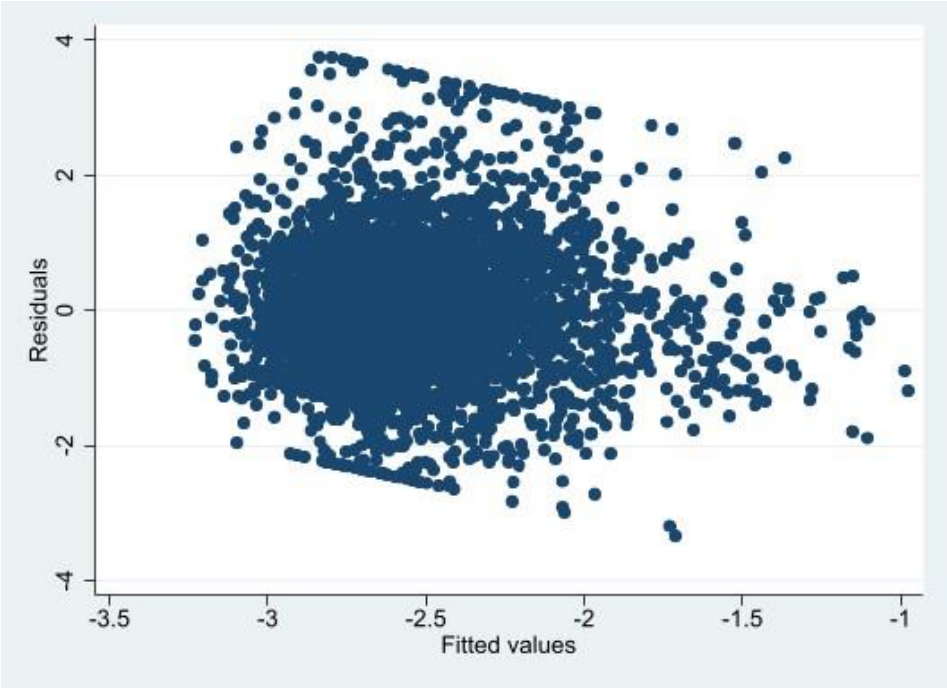
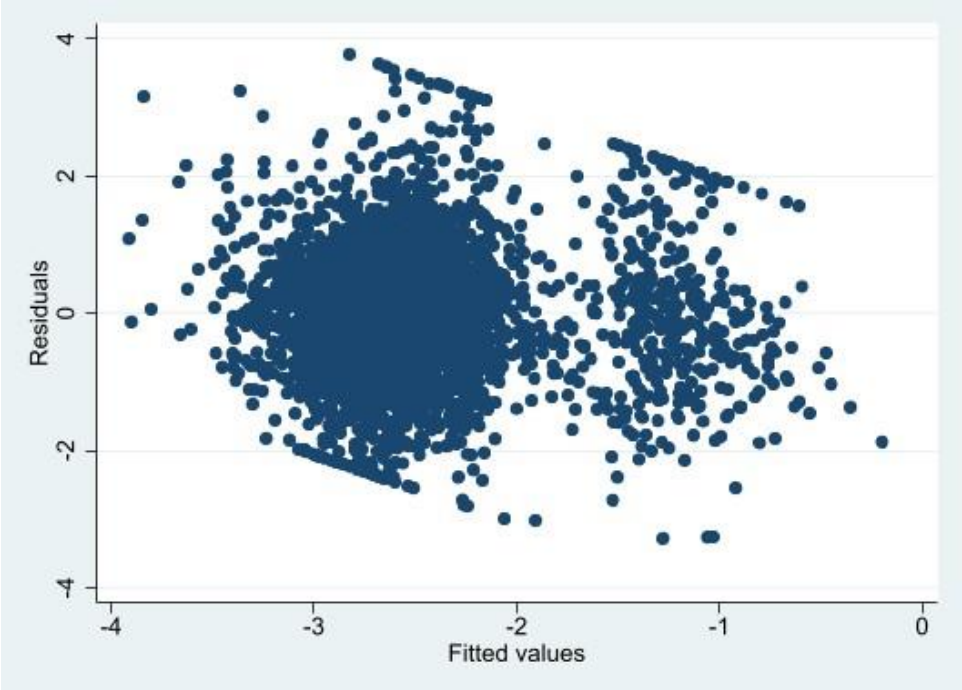


Figure 8: Residual Plot for Model 3 in Table 18
Source: Own Illustration.



Annex 3

Table 12: Regression with transformation of control variables
Source: Own illustration.

	(1) AF_DISP	(2) AF_DISP	(3) AF_DISP
ESG_Disagreement	0.0847***	0.042	0.019
	(0.000)	(0.110)	(0.464)
Size	0.0347***	-0.111***	-0.311***
	(0.000)	(0.000)	(0.000)
NANA		-0.108***	0.084**
		(0.005)	(0.034)
ln(BTM)	0.2208***	-0.075**	-0.076***
	(0.000)	(0.027)	(0.004)
ln(Earnings_VOL)		0.131***	0.139***
		(0.000)	(0.000)
ln(Earnings_Surprise)		0.101***	0.098***
		(0.000)	(0.000)
Leverage		-3.600***	-3.707***
		(0.000)	(0.000)
ZMIJ	0.191***	0.569***	0.594***
	(0.000)	(0.000)	(0.000)
LOSS		1.087***	0.893***
		(0.000)	(0.000)
Year-fixed Effects	No	No	Yes
Country-Fixed Effects	No	No	Yes
N	3,948	2,328	2,321
R-Square	0.092	0.203	0.394
Adjusted R-Square	0.091	0.199	0.379

Note: P-values are below the coefficients in brackets. The significance levels are market with stars: * p<0.10, ** p<0.05, *** p<0.01.

Table 13: Regression without financials
Source: Own illustration.

	(1) AF_DISP	(2) AF_DISP	(3) AF_DISP	(4) AF_DISP
ESG_Disagreement	0.0606**	0.0578**	0.0455**	0.0198
	(0.010)	(0.011)	(0.034)	(0.353)
Size		0.0394***	0.0448***	-0.0988***
		(0.000)	(0.000)	(0.000)
NANA			-0.0787**	0.0983***
			(0.013)	(0.003)
BTM		300.6***	222.5***	234.6***
		(0.000)	(0.000)	(0.000)
Earnings_VOL			5.39e-11	3.27e-10**
			(0.581)	(0.046)
Earnings_Surprise			0.000135*	0.000121*
			(0.077)	(0.051)
Leverage			-3.808***	-4.266***
			(0.000)	(0.000)
ZMIJ		0.194***	0.696***	0.759***
		(0.000)	(0.000)	(0.000)
LOSS			1.078***	0.913***
			(0.000)	(0.000)
Year-fixed Effects	No	No	No	Yes
Country-Fixed Effects	No	No	No	Yes
w/ Financials	No	No	No	No
w/ Real Estate and Utilities	Yes	Yes	Yes	Yes
N	3,909	3,909	3,909	3,909
R-Square	0.002	0.091	0.225	0.386
Adjusted R-Square	0.001	0.090	0.224	0.376

Note: P-values are below the coefficients in brackets. The significance levels are market with stars: * p<0.10, ** p<0.05, *** p<0.01.

Table 14: Regression without financials, utilties and real estate firms
Source: Own illustration.

	(1) AF_DISP	(2) AF_DISP	(3) AF_DISP	(4) AF_DISP
ESG_Disagreement	0.0623**	0.0675***	0.0507**	0.0179
	(0.012)	(0.004)	(0.024)	(0.422)
Size		0.0452***	0.0502***	-0.0948***
		(0.000)	(0.000)	(0.000)
NANA			-0.0523	0.0979***
			(0.121)	(0.006)
BTM		314.1***	231.9***	257.1***
		(0.000)	(0.000)	(0.000)
Earnings_VOL			3.35e-12	2.97e-10*
			(0.973)	(0.078)
Earnings_Surprise			0.000169**	0.000158**
			(0.030)	(0.017)
Leverage			-3.748***	-4.126***
			(0.000)	(0.000)
ZMIJ		0.229***	0.709***	0.752***
		(0.000)	(0.000)	(0.000)
LOSS			1.082***	0.916***
			(0.000)	(0.000)
Year-fixed Effects	No	No	No	Yes
Country-Fixed Effects	No	No	No	Yes
w/ Financials	No	No	No	No
w/ Real Estate and Utilities	No	No	No	No
N	3,578	3,578	3,578	3,578
R-Square	0.002	0.104	0.237	0.394
Adjusted R-Square	0.001	0.103	0.235	0.383

Note: P-values are below the coefficients in brackets. The significance levels are market with stars: * p<0.10, ** p<0.05, *** p<0.01.

Table 15: ESG Disagreement over time (with fixed effects)
Source: Own illustration.

	(1) AF_DISP -2018-	(2) AF_DISP -2019-	(3) AF_DISP -2020-	(4) AF_DISP -2021-	(5) AF_DISP -2022-
ESG_Disagreement	0.0337	-0.0106	0.0452	-0.0075	-0.143
	(0.436)	(0.789)	(0.294)	(0.871)	(0.247)
Size	-0.157***	-0.183***	-0.032	-0.078**	-0.106*
	(0.000)	(0.000)	(0.407)	(0.040)	(0.084)
NANA	0.0319	0.302***	-0.0126	-0.0699	0.146
	(0.638)	(0.000)	(0.859)	(0.359)	(0.192)
BTM	219.1***	156.3***	222.3***	175.4***	287.3***
	(0.000)	(0.004)	(0.000)	(0.004)	(0.002)
Earnings_VOL	2.42e-10	5.87e-10*	-1.64e-12	5.70e-10	-2.01e-10
	(0.446)	(0.051)	(0.996)	(0.118)	(0.855)
Earnings_Surprise	7.83e-6	2.35e-4*	3.16e-5	4.34e-4***	3.75e-4
	(0.954)	(0.097)	(0.804)	(0.000)	(0.164)
Leverage	-6.547***	-7.447***	-5.128***	-1.832**	-0.344
	(0.000)	(0.000)	(0.000)	(0.013)	(0.752)
ZMIJ	1.110***	1.264***	0.960***	0.329***	0.130
	(0.000)	(0.000)	(0.000)	(0.005)	(0.444)
LOSS	0.503***	0.742***	0.842***	1.201***	1.444***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Year-Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	779	1,042	1,045	747	323
R-Square	0.410	0.414	0.396	0.371	0.408
Adjusted R-Square	0.368	0.384	0.365	0.329	0.354

Note: P-values are below the coefficients in brackets. The significance levels are market with stars: * p<0.10, ** p<0.05, *** p<0.01.