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ESG activities and firm cash flow

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ABSTRACT

I measure the influence of ESG activities on Free Cash flow to the Firm and Free Cash Flow to Equity. I find that ESG activities primarily benefit the cash flows to creditors of firms in developed markets. The ESG effect predominantly comes from the excess spending of the firm on communicating how it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes. For developed market firms, the additional factor of excess spending on conditions for the workforce plays a role in boosting Free Cash Flow to the Firm.

1. Introduction

The effect of environmental, social, and governance (ESG) activities of firms have a long provenance in financial economics and management. [Friede, Busch, and Bassen \(2015\)](#) document more than 2200 empirical studies that have examined the relationship between ESG activities and corporate financial performance, finding a weak positive relationship overall. As noted by [Giese, Lee, Melas, Nagy, and Nishikawa \(2019\)](#) within the standard cash-flow model of the firm, there are three ways by which ESG activities can increase the value of the firm: through increasing cash flows (through either increasing revenues or decreasing costs), through lowering the risk (higher profitability and lower exposures to tail risk), and through lowering the cost of capital. The latter two channels have received some research in the empirical literature. The general findings are that ESG activities lower the cost of capital for firms and that ESG activities lower tail risk.

However, the literature on the effect of ESG activities on cash flows is sparse. This work seeks to correct that. Using a sample of 3950 firms from 70 countries from 2012 to 2020, I examine the effects of ESG activities on the Free Cash Flow to the Firm and the Free Cash Flow to Equity. This allows me to see if the benefits of ESG activities accrue mostly to shareholders or creditors. The overall results indicate that the benefits of ESG activities mostly accrue to creditors of firms. These benefits come predominantly from excess spending of firms on activities that communicate that the firms are integrating economic (financial), social and environmental dimensions into their day-to-day decision-making processes. In developed markets, the same holds, but the effect of ESG on Free Cash Flow to the Firm is boosted by excess spending on workforce conditions. In emerging markets, excess spending on reducing environmental costs and creating new environmental marketing opportunities reduces the positive effects on Free Cash Flow to the Firm.

The rest of the paper is organized as follows: [Section 2](#) reviews the relevant literature; [Section 3](#) reviews the data and the methodology; [Section 4](#) provides the estimation results; and, [Section 5](#) offers conclusions.

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Table 1
Distribution of firms in sample by country.

Country	Firms
Argentina	33
Australia	172
Austria	22
Bahamas	1
Bahrain	2
Bangladesh	2
Belgium	27
Brazil	47
Canada	178
China	247
Colombia	16
Cyprus	2
Czech Republic	2
Denmark	33
Dominican Republic	1
Estonia	1
Finland	23
France	80
Germany	113
Greece	20
Hungary	4
Iceland	1
India	70
Indonesia	4
Ireland	30
Israel	20
Italy	44
Jamaica	1
Japan	308
Jordan	2
Kazakhstan	1
Kenya	1
Kuwait	8
Latvia	1
Lithuania	1
Luxembourg	14
Malaysia	54
Malta	2
Mexico	34
Mongolia	1
Morocco	2
Netherlands	34
New Zealand	28
Nigeria	2
Norway	29
Oman	8
Pakistan	7
Peru	15
Philippines	15
Poland	21
Portugal	8
Qatar	13
Romania	2
Saudi Arabia	18
Senegal	2
Singapore	39
Slovenia	2
South Africa	61
Spain	31
Sri Lanka	5
Sweden	94
Switzerland	97
Thailand	33
Tunisia	1
Turkey	47
Uganda	1
UAE	11
UK	226

(continued on next page)

Table 1 (continued)

Country	Firms
USA	1474
Uruguay	1
Total	3950

The table consists of the number of firms in the sample by country of listing.

2. Relevant literature

The effect of ESG activities on the costs of capital has received a great deal of attention. In a meta-analysis, [Cantino, Devalle, and Fiandrino \(2017\)](#) include 25 out of 78 papers in their final analysis of the effects of ESG activities on costs of capital. The general findings are that ESG activities significantly lower the cost of equity, the cost of debt, and the overall cost of capital. [El Ghoul, Guedhami, Kwok, and Mishra \(2011\)](#) find that corporate responsibility ratings are associated with lower costs of capital for a sample of 12,915 US firms. Therefore, we can conclude that ESG activities lower financial cash flows for the firm.

In terms of tail risk, a similar story prevails, as investors seem to perceive firms with higher ESG ratings as less prone to tail risk. [Kim, Li, and Li \(2014\)](#) document a negative relation between CSR performance and future realizations of large idiosyncratic stock price decreases. [Minor \(2011\)](#) finds that firms with better CSR performance experience adverse events less often than firms with poor CSR performance do and that they lose less value when adverse events occur. [Nofsinger and Varma \(2014\)](#), [Diemont, Moore, and Soppe \(2016\)](#) [Hoepner, Oikonomou, Sautner, Starks, and Zhou \(2018\)](#) all document that ESG practices are significantly associated with lower left-tail risk. [Shafer and Szado \(2019\)](#) find that better environmental, social and governance practices significantly reduce ex-ante expectations of a left-tail event. [Boubaker, Cellier, Manita, and Saeed \(2020\)](#) find that better corporate social responsibility helps in reducing financial default risk. The implication is that ESG activities lower the cash flows associated with financial distress.

The relationship between the ESG activities of the firm and free cash flow has received little investigation in the literature. [Gul and Ng \(2017\)](#) and [Chams, Garcia-Blandon, and Hassan \(2021\)](#) find a significant positive association between free cash flow and corporate social responsibility activities. [Samet and Jarboui \(2016\)](#) for a sample of 398 firms from 2009 to 2014 find a weak negative relationship between corporate social responsibility activities and free cash flow. Thus the evidence is mixed.

Based on the previous results in the literature, given that I am working with Free Cash Flow to the Firm (defined as $EBIT(1-t) - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital}$, where t is the effective tax rate) and Free Cash flow to Equity (defined as $\text{Net Income} - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital} - (\text{Principal repaid} - \text{New Debt Issued})$), the working hypotheses for this paper are the following:

Hypotheses 1. There will be a positive significant relationship between ESG activities and Free Cash Flow to the Firm.

This will be due to ESG activities lowering the costs of financial distress due to lower financial risk per [Orlitzky and Benjamin \(2001\)](#) and [Salama, Anderson, and Toms \(2011\)](#) and the definition of Free Cash Flow to the Firm. As ESG activities lower financial risk, they will presumably lower the costs of debt and thus raise Free Cash Flow to the Firm.

Hypothesis 2. There will be no significant relationship between ESG activities and Free Cash Flow to Equity.

This will be due to due to the costs of financial distress being taken out in the derivation of Free Cash Flow to Equity.

3. Data and methodology

The data set consists of financial and ESG data for 3950 firms from 70 countries from 2012 through 2020. There is a total of 36,569 firm-years of data. A detailed breakdown of the firms by country is given in [Table 1](#).

The financial data comprises, $FCFF = EBIT(1-t) - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital}$, where t is the effective tax rate. Figures are in millions of USD. $FCFE = \text{Net Income} - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital} - (\text{Principal repaid} - \text{New Debt Issued})$ Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Debt to Capital is Market Debt to capital ratio. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. Net Capital Expenditures is critically important for panel data estimation, as, by the construction of FCFF and FCFE, NCE should be significant and negative in the regression. All financial data is from Bloomberg.

The ESG data is from Thompson Reuters and that is also known as the ASSET 4 data. It consists of the firm's overall ESG score (ESG). Community (a score measures the company's commitment towards being a good citizen, protecting public health, and respecting business ethics), Controversies (a score that measures a company's exposure to environmental, social, and governance controversies and negative events reflected in global media), CSRStrategy (a score that reflects a company's practices to communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes). Emissions (a score which measures a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes), EnvInnovation (a score which reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed products), HumanRights (a score that measures a company's effectiveness towards respecting the fundamental human rights

Table 2
Distribution of firms in sample by years of data availability.

Year	Firms
2012	3113
2013	3196
2014	3448
2015	3565
2016	3692
2017	3818
2018	3887
2019	3950
2020	3950
2021	3950

Table 3
Descriptive statistics.

	FCFF	FCFE	MarketCap	NCE	Liquidity
Mean	7.668286	94.62491	6788.190	308.8165	1.035253
Std. Dev.	4489.478	3921.374	24,199.91	4317.555	1.941316
Skewness	63.75514	-20.76972	13.26242	-72.39927	14.88783
Kurtosis	7600.163	1389.088	277.9276	8748.929	573.9374
	Institution	DC	ESG	Community	Controversies
Mean	0.433761	0.256947	50.39212	50.22234	50.25105
Std. Dev.	0.315405	0.240952	17.87502	28.74253	19.25466
Skewness	0.475733	0.906673	0.127355	-0.021348	-1.550388
Kurtosis	2.075883	3.020618	2.194734	1.820704	3.818852
	CSRStrategy	Emissions	EnvInnovation	HumanRights	Management
Mean	50.13020	50.14092	50.14531	50.49958	49.57996
Std. Dev.	26.71729	29.30416	24.96653	26.02953	28.56856
Skewness	0.270997	0.000135	0.393828	0.428794	0.018721
Kurtosis	1.847797	1.774399	2.052933	1.762350	1.820031
	ProductResp	ResourceUse	Shareholders	Workforce	
Mean	50.43890	50.04654	49.68895	50.36992	
Std. Dev.	27.24109	28.17801	28.77397	28.77646	
Skewness	0.060036	0.126093	0.018583	-0.014955	
Kurtosis	1.966670	1.705326	1.804699	1.798497	

The table consists of descriptive statistics of variables used in the paper. $FCFF = EBIT(1-t) - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital}$, where t is the effective tax rate. Figures are in millions of USD. $FCFE = \text{Net Income} - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital} - (\text{Principal repaid} - \text{New Debt Issued})$ Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Debt to Capital is Market Debt to capital ratio. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. ESG is the Thompson Reuters ASSET 4 ESG score Community, Controversies, CSRStrategy, Emission, EnvInnovation, Human Rights, Management, Product Resp., Resource Use, Shareholder, and Workforce are the category scores that go into determining the overall ESG score.

conventions), Management (a score that measures a company's commitment and effectiveness towards following best practice corporate governance principles), ProductResp (a score which reflects a company's capacity to produce quality goods and services integrating the customer's health and safety, integrity and data privacy), ResourceUse (a score that reflects a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management), Shareholders (a score which measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices) and Workforce (a score which measures a company's effectiveness towards job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce) (Thompson Reuters Eikon, 2017).

Descriptive statistics for the variables used are provided in Table 2.

In terms of methodology, the Arellano-Bond model would seem a natural place to start as it deals with the potential endogeneity of the ESG variables in the firm.

However, there are additional problems in using the ESG variables. First, as pointed out by Dremptic, Klein, and Zwergel (2019) and Harjoto et al. (2017), ESG scores can be significantly influenced by market capitalization and institutional ownership. To factor this, I regress the ESG variables on market capitalization and institutional ownership in a series of OLS panel regressions. The results are reported in Table 3.

Table 4
Regression estimates of ESG measures on market capitalization.

Variable	Market capitalization	Institutions	Adj-R ²
ESG	0.000164*** (4.53E-06)	0.146095 (0.414582)	0.069032
Community	3.55E-05*** (8.86E-06)	6.654262*** (0.724078)	0.006419
Controversies	-6.32E-05*** (5.92E-06)	-0.817329* (0.484294)	0.007249
CSRStrategy	0.000206*** (6.84E-06)	-1.774414** (0.626982)	0.048258
Emissions	4.35E-05*** (9.03E-06)	-1.829551** (0.738053)	0.001596
EnvInnovation	2.31E-05*** (7.70E-06)	-0.213087 (0.629609)	0.000434
HumanRights	2.51E-05*** (7.83E-06)	-0.384461 (0.655318)	0.000515
Management	0.000144*** (7.36E-06)	8.632322*** (0.674476)	0.031984
ProductResp	6.61E-06 (8.42E-06)	1.072509 (0.688437)	0.000077
ResourceUse	6.16E-05*** (8.69E-06)	-0.360136 (0.710022)	0.002976
Shareholders	-4.84E-06 (7.55E-06)	3.134477*** (0.691551)	0.001045
Workforce	4.50E-05*** (8.86E-06)	-1.758192** (0.724089)	0.001738

The table consists of the results of regressing singly the ESG variables on market capitalization. The results for the constant are suppressed. Market Cap is the market capitalization in millions of USD. ESG is the Thompson Reuters ASSET 4 ESG score Community, Controversies, CSRStrategy, Emission, EnvInnovation, Human Rights, Management, Product Resp., Resource Use, Shareholder, and Workforce are the category scores that go into determining the overall ESG score. Significance is signified by *, ** and *** at the 10%, 5% and 1% levels respectively. Standard Errors are in Parentheses. The regression constants are not reported but are available upon request.

Table 5
Weak instrument test results.

	Cragg-Donald F-Stat	Relevant moment selection criteria
ESG	29,124.25	28.41354
Community	30,158.42	25.56796
Controversies	1141.673	28.77687
CSRStrategy	21,321.89	26.10594
Emissions	30,378.41	25.17403
EnvInnovation	25,631.71	25.85899
HumanRights	23,429.37	26.60585
Management	24,386.42	26.34098
ProductResp	24,355.84	25.55339
ResourceUse	35,615.36	25.44003
Shareholders	31,247.65	26.84965
Workforce	19,130.09	25.29908

The table displays the Cragg-Donald F-Stat results and the Relevant Moment Selection Criteria from GMM estimation using the [Arellano and Bond \(1991\)](#) model with FCFF as a dependent variable and the left-hand column variable as predictor variables. Stock-Yogo critical values (size):10% 7.03.

Table 6
Variance inflation factors of ESG components.

	VIF
Community	1.239579
Controversies	8.770562
CSRStrategy	1.109094
Emissions	2.305844
EnvInnovation	1.326680
HumanRights	1.131742
Management	1.107526
ProductResp	6.553895
ResourceUse	2.879922
Shareholders	3.978157
Workforce	1.851833

The table reports the variance inflation factors (VIF) of the coefficients from the OLS regression of FCFF of 3950 firms from 2012 to 2020 on the ESG components, Community, Controversies, CSRStrategy, Emission, EnvInnovation, Human Rights, Management, Product Resp., Resource Use, Shareholder, and Workforce are the category scores that go into determining the overall ESG score.

Table 7
Durbin-Wu-Hausman tests for exogeneity.

	FCFF	FCFE
ESG	0.028757 (0.8653)	4.658145 (0.0309)
ESG components	15.68888 (0.1531)	10.98336 (0.4447)

This table reports the Durbin-Wu-Hausman Test statistics for the ESG variable and the ESG component variables as a group in GMM estimation with lagged differenced variables as instruments and industrial sector, year, and country control variables. Associated probabilities are reported in parentheses. Associated degrees of freedom are 1 for the ESG variable and 11 for the ESG components.,

Table 8
Regressions on free cash flow to the firm with ESG.

	OLS	GMM-AB
Constant	-27.01995 (203.2763)	-547.2065 (810.9398)
FCFF _{t-1}	0.127555*** (0.004773)	0.06684*** (0.004379)
Market Cap.	0.040127*** (0.000506)	0.0417488*** (0.002008)
NCE	-0.911469*** (0.005014)	-0.921437*** (0.004603)
DC	30.51925 (54.73106)	729.3541*** (123.3507)
Liquidity	-20.95324** (8.709087)	-44.86467*** (14.96189)
Institutions	-5.973896 (49.06561)	-2.882065 (100.2983)
ESG	3.458887*** (0.739805)	7.222816*** (2.735059)
Adj-R ²	0.7084	

The table presents the results of panel regressions on FCFF for a sample of 3950 firms as discussed in the text from 2012 to 2020. OLS is Ordinary Least Squares estimation. GMM-AB is the GMM estimation of the GMM panel [Arellano and Bond \(1991\)](#) model. $FCFF = EBIT(1-t) - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital}$, where t is the effective tax rate. Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. ESG is the Thompson Reuters ASSET 4 ESG score. Industry dummy variables, Year dummy variables, and Country dummy variables as controls are used but not reported. Standard errors are in parentheses. Significance is signified by *, ** and *** at the 10%, 5% and 1% levels respectively.

As can be seen, for the overall ESG variable, Community, CSRStrategy, Emissions, EnvInnovation, HumanRights, Management, ResourceUse, and Workforce, there is a significant positive relationship between the variables and firm market capitalization. Therefore, each of these variables is replaced by the residuals of the regression. They are referred to in the remainder of the paper by the original name. Shareholders are significantly negatively related to institutional ownership, so it too is replaced by the regression residuals. In the following panel regression, the variables are thus in excess of their average amounts.

A second problem is that in using the Arellano-Bond method, I use differenced lagged variables of the ESG variables as instruments. Due to construction, as noted by [Kotsantonis and Serafeim \(2019\)](#), these may be weak instruments. To test for this possibility, I run a GMM regression on Free Cash Flow to the Firm using the ESG component variables as predictor variables with the lagged differenced instruments and then calculate Cragg-Donald F-Stat tests for weak instruments, where the null hypothesis is that the instrument is weak. The results are presented in [Table 4](#). As can be seen, in the results that can be calculated, the null hypothesis of weak instruments is rejected based on the critical values calculated by [Stock and Yogo \(2005\)](#) of 18.37 for 5% maximal IV relative bias and 24.58 for 10% maximal IV size bias. Therefore I conclude that the proposed instruments are satisfactory.

A third potential problem is multicollinearity. An unreported correlation table (but available upon request) shows a few high positive correlations between some of the ESG component variables. To test what effect this might have, I regress Free Cash Flow to the Firm in an OLS panel regression on the ESG components variables and calculate variance inflation factors. The results are presented in [Table 5](#).

As can be seen, the variance inflation factors for Controversies and ProductResp are substantially over 5, meaning that care needs to be taken in interpreting results when viewing panel regression results. It is commonly thought that multicollinearity is not a problem in panel regression, but [Hsiao \(2003\)](#) argues otherwise.

The fourth problem is endogeneity. To test this, I test for endogeneity versus Free Cash Flow to the Firm and Free Cash Flow to Equity using the ESG variable and the ESG components as a group in GMM estimation controlling for the industrial sector, year, and country with lagged differences as instrumental variables as will be used in estimation. Then endogeneity is tested using the Durbin-Wu-Hausman Test. The results are shown in [Table 7](#) below.

The null hypothesis of the test is that the tested regressor is exogenous. For the ESG variable, the null hypothesis cannot be rejected for the ESG variable with the Free Cash Flow to the Firm but can be at the 3.09% level for the Free Cash Flow to Equity. For the ESG components, the null hypothesis cannot be rejected at conventional levels.

The GMM estimator, which is used here with panel data is a consistent estimator in the presence of the different kinds' endogeneity, namely unobserved dynamic endogeneity, heterogeneity, and simultaneity as per [Wintoki, Linck, & Netter, 2012](#).

Table 9
Regressions on free cash flow to equity with ESG.

	OLS	GMM-AB
Constant	-382.3855 (355.7237)	-1038.472 (1819.549)
FCFE _{t-1}	0.281116*** (0.006333)	0.054643*** (0.009134)
Market Cap.	0.04499*** (0.0009)	0.073624*** (0.004296)
NCE	-0.668605*** (0.008366)	-0.752737*** (0.010459)
DC	354.1673*** 95.76024	1904.195*** (266.7594)
Liquidity	-36.67205** (15.23976)	-79.07445** (32.32023)
Institutions	42.95014 (85.85996)	12.65366 (216.5326)
ESG	-0.0581 (1.294611)	5.089683 (5.931075)
Adj-R ²	0.4001	

The table presents the results of panel regressions on FCFE for a sample of 3950 firms as discussed in the text from 2012 to 2020. OLS is Ordinary Least Squares estimation. GMM-AB is GMM estimation of the [Arellano and Bond \(1991\)](#) model. FCFE = Net Income - (Capital Expenditures - Depreciation) - Change in non-cash Working Capital - (Principal repaid - New Debt Issued). Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. ESG is the Thompson Reuters ASSET 4 ESG score. Standard errors are in parentheses. Industry dummy variables, Year dummy, and Country dummy variables as controls are used but not reported. Significance is signified by *, ** and *** at the 10%, 5% and 1% levels respectively.

Table 10
Regressions on free cash flow to the firm with ESG components.

	OLS	GMM-AB
Constant	-142.383 (315.131)	-223.3521(829.1404)
FCFF _{t-1}	0.213945*** (0.008933)	0.162741*** (0.011492)
Market Cap.	0.035363*** (0.000781)	0.048439*** (0.003937)
NCE	-0.862455*** (0.011061)	-1.036248*** (0.019706)
DC	64.82956 (84.88663)	1579.021*** (253.7019)
Liquidity	-21.65814* (13.07211)	-82.73901*** (30.06038)
Institutions	12.47404 (77.48707)	46.90073 (205.7372)
Community	0.795855 (0.732226)	-13.54142 (8.492039)
Controversies	0.460952 (1.018572)	16.92486*** (5.505946)
CSRStrategy	0.995892 (0.766673)	38.94612*** (6.713365)
Emissions	0.253999 (0.965693)	-9.221023 (7.432065)
EnvInnovation	-0.169193 (0.848838)	-21.07034*** (8.101659)
HumanRights	0.691784 (0.752976)	-11.17862 (8.754709)
Management	0.484225 (0.689938)	-12.94747** (5.678152)
ProductResp	-0.315295 (0.810587)	1.916202 (6.438605)
ResourceUse	0.452994 (1.11536)	-4.438327 (8.056834)
Shareholders	0.876893 (0.642272)	1.28951 (6.328499)
Workforce	-0.490606 (0.867885)	6.396317 (6.147104)
Adj-R ²	0.4632	

The table presents the results of panel regressions on FCFF for a sample of 3950 firms as discussed in the text from 2012 to 2020. OLS is Ordinary Least Squares estimation. GMM-AB is GMM estimation of the [Arellano and Bond \(1991\)](#) model. FCFF = EBIT(1-t) - (Capital Expenditures - Depreciation) - Change in non-cash Working Capital, where t is the effective tax rate. Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. Community, Controversies, CSRStrategy, Emission, EnvInnovation, Human Rights, Management, Product Resp., Resource Use, Shareholder, and Workforce are the category scores that go into determining the overall ESG score. Industry dummy variables, Year dummy, and Country dummy variables as controls are used but not reported. Standard errors are in parentheses. Significance is signified by *, ** and *** at the 10%, 5% and 1% levels respectively.

4. Panel estimation results

First, I examine the effects of ESG activities in whole on free cash flow to the firm and free cash flow to equity for all firms and then by components of the ESG variable, and lastly by developed and emerging markets. [Table 8](#) exhibits the estimation results for all firms on free cash flow to the firm.

[Table 6](#) gives the estimation results for the free cash flow to the firm. The OLS results are given for comparison. The results of the GMM-AB estimation show that the RSG variable is positive and significant, in line with the results of [Gul and Ng \(2017\)](#) and [Chams](#)

Table 11
Regressions on free cash flow to equity with ESG components.

	OLS	GMM-AB
Constant	−925.9622* (510.9274)	−89.34921 (751.9835)
FCFE _{t-1}	0.396567*** (0.009309)	0.209092*** (0.024442)
Market Cap.	0.033074*** (0.001265)	0.104548*** (0.006792)
NCE	−0.405444*** (0.017422)	−0.63122*** (0.035584)
DC	447.4671*** (137.5394)	3008.08*** (451.4129)
Liquidity	−42.33208** (21.18834)	−94.08366** (53.13773)
Institutions	53.49872 (125.6076)	−375.4034 (367.2715)
Community	2.161885* (1.186937)	−3.726186 (13.66125)
Controversies	0.186494 (1.651176)	−6.040559 (8.821189)
CSRStrategy	1.099835 (1.242447)	−1.434524 (10.71481)
Emissions	−1.930573 (1.565441)	−27.28986** (11.76312)
EnvInnovation	0.905963 (1.37579)	−21.50275* (13.01501)
HumanRights	0.148463 (1.220494)	42.25765*** (13.87175)
Management	−1.694747 (1.118532)	−10.64649 (8.990356)
ProductResp	−0.965226 (1.313989)	−4.907703 (10.15261)
ResourceUse	2.699502 (1.808531)	30.60257*** (12.77422)
Shareholders	2.021016* (1.041461)	−6.536264 (9.990844)
Workforce	−1.460137 (1.406784)	2.371727 (9.79106)
Adj-R ²	0.2869	

The table presents the results of panel regressions on FCFE for a sample of 3950 firms as discussed in the text from 2012 to 2020. OLS is Ordinary Least Squares estimation. GMM-AB is GMM estimation of the [Arellano and Bond \(1991\)](#) model. FCFE = Net Income - (Capital Expenditures - Depreciation) - Change in non-cash Working Capital - (Principal repaid - New Debt Issued). Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. Community, Controversies, CSRStrategy, Emission, EnvInnovation, Human Rights, Management, Product Resp., Resource Use, Shareholder, and Workforce are the category scores that go into determining the overall ESG score. Industry dummy variables, Year dummy, and Country dummy variables as controls are used but not reported. Standard errors are in parentheses. Significance is signified by *, ** and *** at the 10%, 5% and 1% levels respectively.

et al. (2021).

Hypothesis 2 is tested by estimating panel regressions on the free cash flow to Equity for all firms. These results are reported in [Table 9](#).

The second hypothesis is supported here, though, as stated before, with the ESG variable alone, there is an endogeneity problem. Given this is the correct result, there is a positive significant coefficient on ESG activities for free cash flow to the firm, which is a cash flow to shareholders and creditors, and no significant coefficient on free cash flow to equity would indicate that the benefits of ESG activities flow generally to creditors, not to shareholders. However, the endogeneity problems call this into question.

Next examined are the individual effects of the components of the ESG score on the cash flow variables. [Table 10](#) reviews the effects of the ESG components on free cash flow to the firm.

The panel regressions with the entire sample and all the ESG components reveal that with the GMM estimator that the Positive effects of ESG on FCFE is driven by positive effects from excess activities in controlling ESG Controversies and communicating that the firm integrates the economic (financial), social and environmental dimensions into its decision making. However, given the high Variance Inflation Factor on Controversies, the result on it should be interpreted with care. This is partially offset by excess activities in environmental innovation and excess activities in corporate governance (Management).

I perform the same estimation on free cash flow to equity in [Table 11](#) with more interesting results.

The GMM-AB estimation finds that excess spending on the capacity to reduce the use of materials, energy, or water, and to find more eco-efficient solutions by improving supply chain management improves the Free Cash Flow to Equity as does excess activities on Human Rights. However, this is offset by excess activities on Emissions and innovations in the firms' capacity to reduce environmental costs and create new market opportunities as shown by the negative and significant coefficient on EnvInnovation.

US firms make up over 37% of the sample, so it makes sense to check how much of the results are being driven by US firms as suggested by an anonymous reviewer. To test this, the ESG components are run dropping the US firms. These results are presented in [Table 12](#).

With the US firms dropped from the sample, the only difference for the Free Cash Flow to the Firm variable is that Management is no longer negative and significant, indicating that corporate governance is a significant cash outflow for FCFE for US firms. For FCFE, there are some significant differences. The Workforce variable is negative and significant, indicating that excess spending on workforce conditions is a tradeoff for shareholders' cash flow. For Non-US firms, the Management variable is negative and significant, indicating that activities that increase the company's commitment and effectiveness towards following best practice corporate governance principles lead to a lower FCFE. The ProductResp has a positive and significant coefficient, measuring that an increase in a company's capacity to produce quality goods and services integrating the customer's health and safety, integrity and data privacy leads to a higher FCFE for non-US firms, however, the high Variance Inflation Factor on the variable means this needs to be interpreted carefully.

Table 12

Regressions on free cash flow to the firm and free cash flow to equity with ESG components without US firms.

	FCFF GMM-AB	FCFE GMM-AB
Constant	-1267.863** (504.0884)	-2017.131** (791.7279)
Dependent _{t-1}	0.2024*** (0.015677)	0.177592*** (0.025377)
Market Cap.	0.093436*** (0.007408)	0.222885*** (0.011663)
NCE	-1.061128*** (0.02654)	-0.783836*** (0.043241)
DC	2250.572*** (343.0395)	3465.792*** (539.2721)
Liquidity	-68.95778* (41.34107)	-59.99634 (64.99264)
Institutions	111.7082 (311.616)	105.535 (489.7385)
Community	-1.395914 (11.27499)	-6.184528 (6.365808)
Controversies	17.65981** (7.095722)	1.968569 (3.858552)
CSRStrategy	32.0221*** (8.439522)	8.761756 (5.871429)
Emissions	-14.49757 (9.686795)	1.147179 (6.941152)
EnvInnovation	-23.12057** (10.18891)	-10.7334 (6.730484)
HumanRights	-5.589711 (10.93399)	-4.690378 (6.382691)
Management	-10.32789 (8.478796)	-8.265677* (5.014793)
ProductResp	6.9844 (8.237345)	14.91775** (5.825888)
ResourceUse	12.7897 (10.94918)	-0.444621 (7.900026)
Shareholders	-7.419612 (7.314362)	3.361172 (4.028632)
Workforce	-5.573575 (7.804163)	-12.17708** (5.501147)

The table presents the results of panel regressions on FCFF and FCFE for a sample of 2476 non-US firms as discussed in the text from 2012 to 2020. GMM-AB is GMM estimation of the Arellano and Bond (1991) model. FCFF = EBIT(1-t) - (Capital Expenditures - Depreciation) - Change in non-cash Working Capital, where t is the effective tax rate. FCFE = Net Income - (Capital Expenditures - Depreciation) - Change in non-cash Working Capital - (Principal repaid - New Debt Issued). Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. Community, Controversies, CSRStrategy, Emission, EnvInnovation, Human Rights, Management, Product Resp., Resource Use, Shareholder, and Workforce are the category scores that go into determining the overall ESG score. Industry dummy variables, Year dummy, and Country dummy variables as controls are used but not reported. Standard errors are in parentheses. Significance is signified by *, ** and *** at the 10%, 5% and 1% levels respectively.

Table 13

Regressions on FCFF and FCFE by developed and emerging markets GMM-AB.

	FCFF-DM	FCFF-EM	FCFE-DM	FCFE-EM
Constant	-139.912 (688.0258)	-495.7004 (654.1322)	-431.1128 (1833.589)	-2839.248** (1270.188)
Lagged dependent variable	0.03256*** (0.00265)	0.229525*** (0.021244)	0.033788*** (0.008271)	0.173737*** (0.029554)
Market Cap.	0.035576*** (0.001139)	0.092421*** (0.011341)	0.045686*** (0.003784)	0.287958*** (0.017222)
NCE	-0.923942*** (0.002561)	-0.731236*** (0.038551)	-0.783094 (0.008854)	-0.532307*** (0.059093)
DC	8.436308 (74.74639)	3046.502*** (573.6194)	678.6134*** (245.5709)	5451.873*** (881.8247)
Liquidity	-0.309803 (8.899456)	-105.334 (77.62706)	-29.39473 (29.23198)	133.1368 (119.2565)
Institutions	82.15443 (57.80165)	-858.4079 (598.1938)	97.28441 (189.8534)	628.512 (918.6769)
ESG	3.831097** (1.809055)	3.836258 (11.31328)	0.318687 (5.940971)	-7.123866 (17.38791)

The table presents the results of panel regressions on FCFF and FCFE for a sample of 3950 firms as discussed in the text from 2012 to 2020 divided by developed market (DM) and emerging market (EM) using GMM-AB estimator. FCFF = EBIT(1-t) - (Capital Expenditures - Depreciation) - Change in non-cash Working Capital, where t is the effective tax rate. FCFE = Net Income - (Capital Expenditures - Depreciation) - Change in non-cash Working Capital - (Principal repaid - New Debt Issued) Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Debt to Capital is Market Debt to capital ratio. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. ESG is the Thompson Reuters ASSET 4 ESG score. Industry dummy variables, Year dummy, and Country dummy variables as controls are used but not reported. Standard errors are in parentheses. Significance is signified by *, ** and *** at the 10%, 5% and 1% levels respectively.

Next, I examine the differences between developed and emerging markets. These results for both free cash flow to the firm and free cash flow to equity for the ESG score are shown in Table 13.

As shown, the ESG score is only positive and significant for free cash flow to the firm in developed markets, thus supporting Hypothesis 1. It is not significant for free cash flow to equity, thus there is support for Hypothesis 2. Again, given the definitions of free cash flow to the firm and free cash flow to equity, I interpret these results as indicating that the benefits of ESG activities flow mostly to the creditors of developed market firms. The results for emerging markets are discouraging; none of the ESG components is significant, indicating that ESG activities do not affect cash flow in these markets. Further, the coefficient for ESG on FCFE in emerging markets is negative, though not significant.

I perform the same estimation using the ESG components. These results are presented in Table 14.

Table 14
Regressions on FCFF and FCFE by developed and emerging markets with ESG components.

	FCFF-DM	FCFF-EM	FCFE-DM	FCFE-EM
Constant	843.7974 (681.0735)	-4850.595** 2253.444	-63.704 (781.6167)	-7949.838** (3185.005)
Lagged Dependent	0.019399*** (0.009793)	0.329469*** (0.03211)	0.285633*** (0.024764)	0.25068*** (0.04565)
Market Cap.	0.005393*** (0.0017)	0.257459*** (0.023168)	0.055271*** (0.005048)	0.535731*** (0.032641)
NCE	-0.889565*** (0.018283)	-0.944102*** (0.072378)	-0.705834*** (0.029246)	-0.752076*** (0.102558)
DC	143.094 (228.3459)	6472.243*** (1079.9)	702.1835** (353.4357)	9383.329*** (1528.423)
Liquidity	-26.64444 (25.30619)	-144.2051 (127.8435)	-44.17362 (41.62185)	113.0834 (181.2518)
Institutions	567.3378*** (168.8814)	-1212.83 (1121.829)	62.49592 (272.5119)	605.6047 (1587.662)
Community	-8.659389*** (3.129997)	-4.021312 (20.70824)	5.755348 (9.672351)	10.89822 (28.33057)
Controversies	6.557054*** (1.903184)	18.64599 (13.73935)	1.50353 (5.865374)	-9.178688 (18.44269)
CSRStrategy	3.025932** (1.599043)	37.16563*** (15.87316)	0.895147 (7.847944)	57.46831*** (21.68994)
Emissions	1.010919 (2.884548)	5.26195 (18.91423)	-23.04892*** (8.774451)	0.499167 (25.82289)
EnvInnovation	-7.62733*** (2.930664)	-39.18179* (22.38139)	-19.35058** (9.021326)	-94.87699*** (29.90416)
HumanRights	-0.570008 (3.388926)	-5.596136 (18.37893)	70.97098*** (10.34628)	22.38701 (25.14698)
Management	-4.095241** (2.062685)	-15.73627 (15.89723)	2.007266 (6.343452)	-10.28747 (21.32916)
ProductResp	-1.302217 (2.34742)	19.4299 (17.47723)	-6.180056 (7.178217)	15.37363 (23.38726)
ResourceUse	-1.377805 (3.065458)	-7.912515 (21.01906)	57.52869*** (9.279994)	-10.06314 (28.37861)
Shareholders	3.261176 (2.380997)	12.29298 (13.78061)	8.831177 (7.166971)	6.460222 (18.57923)
Workforce	4.958935** (2.253514)	-15.96913 (16.8338)	10.62963 (6.90732)	-64.04523*** (23.0248)

The table presents the results of panel regressions on FCFF and FCFE for a sample of 3950 firms as discussed in the text from 2012 to 2020 divided by developed market (DM) and emerging market (EM) using the GMM-AB estimator. $FCFF = EBIT(1-t) - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital}$, where t is the effective tax rate. $FCFE = \text{Net Income} - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital} - (\text{Principal repaid} - \text{New Debt Issued})$ Figures are in millions of USD. Market Cap is the market capitalization in millions of USD. NCE is Net Capital Expenditures estimated as the difference between capital expenditures and depreciation in millions of USD. Liquidity is the annual trading volume divided by shares outstanding. Institution is the percentage of stock held by institutions. DC is Market Debt to capital ratio. Community, Controversies, CSRStrategy, Emission, EnvInnovation, Human Rights, Management, Product Resp., Resource Use, Shareholder, and Workforce are the category scores that go into determining the overall ESG score. Industry dummy variables, Year dummy variables, and Country dummy variables as controls are used but not reported. Standard errors are in parentheses. Significance is signified by *, ** and *** at the 10%, 5% and 1% levels respectively.

The detailed results reveal that the positive effect of ESG in developed markets on Free Cash Flow to the Firm is driven primarily by excess spending on activities involving the Workforce and CSR Strategy, which has a positive and significant coefficient. This means that spending more towards job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for a firm's workforce in developing markets payoffs in improving cash flow to creditors. There is also a positive and significant coefficient on the Controversies factor, but with its large Variance Inflation Factor, it is difficult to interpret how much it is influencing Free Cash Flow to the Firm.

By contrast, in emerging market firms, Free Cash Flow to the Firm is positively influenced by excess spending on CSRStrategy, communicating a firm's ability to integrate the economic (financial), social and environmental dimensions into its day-to-day decision-making processes. This is offset by excess spending in EnvInnovation, reducing environmental costs and burdens for customers, and creating new market opportunities through new environmental technologies and processes or eco-designed products, which has a negative and significant coefficient. This explains why ESG has no effect in the previous set of regressions for emerging markets on FCFF.

For Free Cash Flow to Equity in developed markets, HumanRights and ResourceUse both have positive and significant coefficients, but they are countered by the negative and significant coefficients on EnvInnovation and Emissions. Thus, excess spending on activities that promote fundamental human rights conventions and improve a firm's capacity to reduce the use of materials, energy, or water, and to find more eco-efficient solutions by improving supply chain management improve cash flow to the firm's shareholders. However, this is offset by excess spending to reduce environmental costs and burdens for customers, creating new environmental market opportunities and reducing environmental emissions in the production and operational processes. It would seem that in developed markets that shareholders have the opinion that firms have reached the optimum level of emissions reduction and environmental costs, but paradoxically could improve on some aspects of resource use.

For emerging markets, the ability to communicate to shareholders the company's practices that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes is key in generating cash flow to shareholders as shown by the positive and significant coefficient on CSRStrategy. However, this is offset by the negative and significant coefficients on EnvInnovation and Workforce. Excess spending by emerging market firms on the capacity to reduce the environmental costs, creating new environmental market opportunities, and workforce conditions offset the benefits generated to shareholders from communicating its practices. This may be a signal of overspending on environmental innovation.

5. Conclusions

In terms of the standard cash-flow model of the firm, it has been well established in the literature previously that ESG lowers the cost of capital and reduces the incidence of tail risk, and thus improves the value of the firm. What has not been established is what

cash-flow effects ESG activities have on the firm. This paper seeks to remedy this by investigating the effects of ESG activities on the free cash flow to the firm and the free cash flow to equity of the firm. I find that while ESG activities benefit the firm, the majority of those cash flow benefits flow to the creditors of developed market firms. These benefits come predominantly from the excess spending of firms on activities that communicate that the firms are integrating economic (financial), social and environmental dimensions into their day-to-day decision-making processes. In developed markets, the same holds, but the effect of ESG on Free Cash Flow to the Firm is boosted by excess spending on workforce conditions. In emerging markets, excess spending on reducing environmental costs and creating new environmental marketing opportunities reduces the positive effects on Free Cash Flow to the Firm.

For Free Cash Flow to Equity, excess spending on firms' capacity to reduce the use of materials, energy, or water and on respecting human rights conventions leads to more cash flow to shareholders, but this is countered by excess spending on emissions reduction and firms increasing capacity to reduce the environmental costs and expanding opportunities to create new environmental markets.

More detailed research on the specific ESG activities of firms and their effects on firm cash flow is called for. The research here opens up a lot of questions that a more detailed breakdown of activities can only answer. While knowing that communicating that the firms are integrating economic (financial), social and environmental dimensions into its day-to-day decision-making processes adds to Firm Free Cash Flow to the Firm, it would be more helpful to know exactly what communication processes and what information adds to cash flow. Further, for developed markets, improvement in workforce conditions adds to FCFF, so it would be helpful to know exactly what improvements add to FCFF.

Lastly, a study is needed on why there is no improvement on FCFE. A possible explanation may be that creditors are able through covenants to channel cash flows to themselves from ESG-centered projects that are not available to shareholders. This is left to future research.

Declaration of Competing Interest

None.

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