TURNING THE TITANS

INSTITUTIONAL OWNERSHIP AND ESG PERFORMANCE IN NORDIC FIRMS

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Bachelor Thesis

Stockholm School of Economics

2022

Turning the Titans: Institutional Ownership and ESG Performance in Nordic Firms

Abstract:

This paper examines whether institutional investors drive ESG performance of public firms in the Nordic countries and whether the effect differs depending on the type of investor. We find evidence that institutional investor ownership in aggregate has a positive correlation effect on firm ESG-performance as measured by the Refinitiv Eikon index. Furthermore, we find substantial differences between different types of institutional investors, with VC and PE having a negative correlation effect. Meanwhile, we find a substantial positive effect for hedge funds. Supposing the investor groups with the highest effects were to increase or decrease their ownership of firms in the Nordic countries in substantial magnitudes, we predict sizeable changes in the ESG performance of the firms.

Keywords:

Sustainability, Nordics, ESG, Institutional investors, Corporate Finance,

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Bachelor Thesis
Bachelor Program in Business & Economics
Stockholm School of Economics

1. Introduction

The topic of sustainability is rapidly becoming the defining issue of our time, with increasingly ambitious goals and plans to counter our world's challenges. Measures related to sustainability are being implemented frequently within a wide range of areas, and their importance has been increasing for investors as well. According to Bloomberg, Green Finance was a 31 trillion dollar business already in 2019, and the share of investments labelled as green is growing fast.

Evidently, societal developments mean that companies today are evaluated in several different dimensions rather than purely on the bottom line. Popular dimensions for activists and media to focus on include climate footprint, gender and racial diversity and corporate governance that balances the tug between economic and social goals in corporations. These increasing demands cause institutional investors making investment decisions today to face significant pressure to both assess and measure their ESG impact (Altinget, 2022; Nielsen, 2014). ESG stands for Environmental, Social & Governance. The "Environmental" refers to factors such as climate and resource usage, Social is about working conditions and human rights, and Governance refers to corporate governance where equality and corruption are examples of issues of interest. It is unclear whether evaluating investments by ESG metrics is beneficial for investment returns, but it is evident that ESG analysis is a valuable tool to assess risk (Goldman Sachs, 2021). What is clear however is that strong societal, institutional and political pressure is narrowing the addressable investment sphere for many bigger institutional investors.

As a piece of contemporary evidence, Philip Morris International’s takeover bid on the Swedish nicotine-product company Swedish Match, considered a national gem in Swedish industrial history, was shunned by some bigger owners as far below its intrinsic value - but unlikely to meet resistance due to the lack of Swedish institutional owners. Sweden’s largest member organisation for private investors, Aktiespararna, stated in an opinion release that the valuation would most probably be higher if Swedish mutual funds, avidly regarded as very ESG-minded, had not avoided the stock because of ESG-reasons. Sweden investors have occupied themselves with “sawing off the branch they are sitting on”, as a disappointed CEO of a contrarian institutional owner of Swedish Match regarded the situation. There were calls that this bid would likely lead to a more nuanced discussion of how investors filter companies on ESG data (Dagens Industri, 2022).

Evaluating company performance in other dimensions than purely financial thus provides a relatively new and exciting area of financial research. For example, an empirically studied topic has been if institutional ownership, in contrast with retail and other non-institutional ownership, has a positive causal effect on a company's ESG performance (Dyck, Lins, Roth & Wagner, 2017). The effect is hypothesised to be done mainly through the mechanism the authors label as "Voice", public and private engagements between investors and firms, emphasising the private ones. The topic has been engaging to determine if institutional shareholders in aggregate or different types of institutional shareholders can create real social impact, in contrast to financial such.

Generally, organisations and forums that have held a more “stakeholder-based view” on corporations and capitalism, such as the Centre for Corporate Governance at LBS, have in general long held an assumption that institutional investors have the possibility to influence company priorities and behaviour towards more sustainable operations (Centre for Corporate Governance, 2022). This hypothesis has mainly centred around the idea of indirect influence, that by assessing and choosing to invest in more sustainable companies, less sustainable companies would change course to increase their attractiveness to investors. That idea differs from investors more directly influencing company behaviour through its management by using the concrete influence and mechanisms that being a shareholder gives (Dyck et al., 2017). Thus, that would show that institutional ownership more directly drives ESG performance rather than indirectly influencing it.

With this paper, we wish to revisit that topic, using newer data and focusing on listed Nordic[1] firms with a comprehensive dataset. Testing for a relationship between institutional investor share ownership and the ESG performance of listed firms, we examine whether they drive ESG performance evaluated on a set of metrics. That would mean that institutional ownership would work as a channel for the convergence of ESG practices in public firms in Nordic countries. Thus, specifically, we aim to answer the following research questions:

I. *Does institutional investor ownership of public firms in the Nordic countries significantly drive firm performance on ESG metrics?*
II. *Does the relationship differ based on the type of institutional investor?*

[1] With the exception of Iceland, which is normally regarded as a Nordic country.

To answer our two research questions, we obtain data on firms' ESG performance from the Refinitiv Eikon database. The data is divided into eleven total categories, containing overall ESG scores as well as scores for the ten subcategories for a total of 1714 equity securities publicly listed in Sweden, Norway, Denmark and Finland. In addition, we obtain data on institutional investor ownership and select firm financial and qualitative characteristics from the S&P Capital IQ database. We perform regression analysis using a one-year lagged relationship between ESG performance as the dependent variable and institutional ownership as an independent variable. We initially use the pooled OLS method but subsequently perform additional analysis through the fixed effects model to control for time-invariant fixed effects, and through the Arellano-Bond model to address problems of reverse causality. Furthermore, we look at whether the relationship differs depending on the type of investor. Beyond using the ESG data providers' proprietary measure, we construct our own with a weighted average of each firm's ten subcategories category score.

In aggregate, we find a strong, statistically significant positive relationship between lagged institutional ownership and ESG performance of public firms in the Nordic countries, as measured by overall ESG score. In addition, we find statistically significant positive and negative relationships between several subgroups of institutional investors and ESG performance. The statistical significance for overall institutional ownership, our first research question, appears solid, but whether the relationship is causal is not as clear.

Our paper contributes to the broad and general literature on CSR and ESG in corporate finance. We complement the available by showing that investors' choice of investments plays a significant role. The impact of institutional investors making investments in Nordic companies drive wide measures of firm ESG performance.

We investigate a contemporary issue that has been studied before, albeit in somewhat modified ways and with different datasets, focusing on different regions. Chen, Dong & Lin (2020) use a quasi-natural experiment to examine in specific the causal effect of institutional shareholders on corporate social responsibility (CSR), which also is a term that relates to the social responsibilities of businesses. They find that an increase in the rate of institutional ownership improves the portfolio firm's CSR performance as measured by the MSCI ESG KLD database. Moreover, this effect appears more robust in CSR categories "financially material to firm values", using the SASB Standard

industry materiality guidelines to be able to differentiate between sustainability issues that are more or less material, depending on the industry. This indicates that institutional shareholders focus more on improving material issues for genuine (including financial) reasons rather than low-hanging fruit.

The results show to be in line with their "real effort" hypothesis: that institutional investors generate improvement in the social outcomes of their portfolio firms because of genuine interest in doing so. These interests include, for example, demand from clients, fund flow benefits and overall risk reduction purposes. Deriving from this suggests that sustainable goals benefit investors in the long run. The alternative hypothesis would be their "catering" hypothesis, that institutional investors do not exert effort to change how and to what extent portfolio firms work with CSR. The increasing number of sustainable portfolios that institutional investors manage could merely be a product to capitalise on investor demand for this in that case, and not much else. Uniquely as mentioned, the authors provide evidence that the institutional investors are not merely attempting to capitalise on this but have more internal motivations to focus on improving CSR-related areas when having the power to do so. The actions taken benefit them in the long run. With consistent evidence, they show that institutional investors causally generate improvements in the areas they study. Likewise, Jo and Harjoto (2011), which they refer to, found that more institutional ownership was associated with higher CSR scores. However, their results showed an effect of less than a tenth relative to Chen et al.

On the same theme, Dyck et al. (2019) examined the relationship between international institutional ownership and ESG by focusing on how social norms influence it, using data through year-end 2013, which warranted our use of newer data up until the latest year available. In the paper, the authors managed to find that institutional ownership has a positive influence on E&S performance[2], with their tests suggesting that the relationship is causal. With further tests done, they show that “investors manage to transplant their social norms” regarding how and to what extent to invest in E&S issues in the firms they invest in, acting as a convergence mechanism for E&S practices and ambitions worldwide. A motivation they find that explains investors diverting attention to issues that may be seen as less "financially material" could be that investment managers controlling the funds live in communities that strongly value firms with a

[2] ESG and E&S are two closely connected terms. In short, E&S refers to ESG without the governance aspects.

good record on environmental and social issues. Thereby, the investment managers (and the institutions they represent) receive social rewards and avoid social sanctions by focusing on improving E&S performance in the firms they invest in. Focusing on less "financially material" issues may thus be optimal from the manager's view since it moves the firm in question towards the ideal her community has. Thus, in essence, strong enough social ideals can overpower market pressures and pure fiduciary responsibilities.

Our study extends this paper in several dimensions. First, we look at how the effects differ depending on the type of the institutional investor, dividing up the investor group into unique subcategories: banks and investment banks, charitable foundations, corporate pension sponsors, family offices and trusts, government pension sponsors, hedge funds, insurance companies, investment managers and VC and PE managers. We also focus solely on the Nordic countries, using newer data in this aspect. Furthermore, beyond only using third-party ESG metrics, we examine the relationship with a self-constructed ESG metric using the base data available.

Contrary to Dyck et al., we find that VC and PE investors appear to have a statistically significant negative correlation to ESG performance. These results are aligned with experimental evidence that Zhang (2021) presents, finding that start-up firms aiming for environmental and social impact make investors' expectations of the quality of the business idea lower. Hence, this reduces financially maximising venture capitalists' and private equity investors' interest and attention to contact and invest in these start-ups. The results in the mentioned paper also indicate that sorting may happen as the investors mentioned above may anticipate less interest shown by the firms toward their willingness to fund the start-ups. Although these results are for smaller sized and non-public firms, the effect could be the same even for public ones, as our results may indicate. Further on the topic, Starks, Venkat & Zhu (2017) found that firms with high-ESG performance as measured by the MSCI ESG STATs database tend to have investors with longer investment horizons, and VC and PE investors are generally considered more short-term investors. The long-horizon investors also tend to behave more patiently towards their portfolio firms.

However, this does not explain the strong positive effect we found for hedge funds in our ordinary pooled regression, which we did not expect. Dyck et al. (2019) found no relationship between hedge funds and E&S performance whatsoever. The investment

horizon that hedge funds work with is relatively short term (Cella, Ellul & Giannetti, 2013), which would warrant no significant relationship at all, or a relatively small one, if not a negative one. As Dyck et al. (2019) used data through year-end 2013, this suggests that hedge funds, in aggregate, may have in the period we study (2012 until 2021) started to positively affect the firms in which they invest in regarding ESG aspects. It could also mean that hedge funds in Nordic countries behave differently as owners compared to hedge funds from non-Nordic firms or when investing in non-Nordic firms. Many hedge funds are active in their ownership, so the conditions for affecting the management in a positive ESG-direction through private engagements, for example, are already there (Becht, Franks & Grant, 2010).

In contrast, the significant positive result for government pension sponsors was in line with our expectations and something that earlier research also has shown. Pension funds are generally long-horizon investors, as Cella et al. (2013) found again. In fact, Dyck et al. (2019) found that pension sponsors, regardless of their country of domicile and social norms, consistently affected firms to strengthen their E&S performance. The authors hypothesise that their long investment horizon allows them to incur the costs associated with this for benefits potentially far away. Furthermore, regarding universal pension plans in welfare states, there is both a demand and expectation that governments will regulate pension fund behaviour and assessment routines in making investments (Altinget, 2022; Nielson, 2014). Riedl & Smeets (2017) showed that "socially responsible investors" expect and are willing to accept lower returns (thus paying a premium) in order to invest in socially responsible companies, in line with their social preferences, and Hong and Kacperczyk (2009), mentioned more in detail below, show that norm-constrained institutions, such as pension funds, are less likely to hold "sin" stocks, i.e companies involved in producing alcohol, tobacco and gambling products.

The paper by Dyck et al. (2019) can be said to be an analogous extension of Aggarwal, Erel, Ferreira & Matos (2011), who looked at how mainly investors domiciled in the United States managed to transplant "better" corporate governance practices in foreign companies which they invested in. Their results show a positive relation between firm-level governance and grade of institutional ownership. Moreover, the authors find evidence for a causal relationship, i.e., that changes in institutional ownership over time drive subsequent changes in firm-level governance, but that the opposite does not hold. Thus, institutional holdings were a channel for converging governance practices across

countries. The causal relationship is crucial as an obvious reverse causality explanation is an alternative for almost all of the mentioned results. For example, Chung and Zhang (2011) found that the share of a public company's shares held by institutional investors increases with the quality of governance. Moreover, the proportion of institutional investors that hold a firm's shares increases with its governance quality as well, they find. They hypothesise that institutional investors gravitate to stocks of companies with a good governance structure to meet fiduciary responsibility and minimise monitoring and exit costs.

Meanwhile, and maybe as opposed to governance, Gillan, Hartzell, Koch & Starks (2010) find that institutional investors seemed less likely to own shares of firms with improved environmental or social responsibility. Still, they do stress that at the same time, however, institutions appear to prefer firms with fewer corporate governance concerns, in line with Chung & Zhang (2011). On the same theme, Nofsinger, Sulaeman & Varma (2019) show that institutional investors appear indifferent to positive E&S indicators but invest less in stocks with negative such indicators (negative screening). Again, this pattern appears particularly prevalent for longer-horizon institutions.

A large part of the existing literature has looked at the inverse of our first research question, i.e., if firm performance on CSR and ESG metrics can say anything about the level of institutional investor ownership. For example, as mentioned, Hong & Kacperczyk (2009) studied the effect of social norms on markets by looking at companies involved in producing alcohol, tobacco, and gambling. Even though investors lose financially by abstaining from these stocks, as companies involved in these sectors have higher expected returns than what would be expected, they find that these companies' stocks are less likely to be held by "norm-constrained institutions". This provides evidence that they are being neglected due to the effect of norms in constraining investors. Our study is interesting in this aspect since it partly analyzes what can be expected if socially conscious investors nevertheless still invest in these financially ostracised firms. Some reasons justify this, as previous studies have shown that investors have motivations to improve firms' social outcomes. As earlier mentioned, there is a public demand for sustainable and socially impactful investment opportunities (Bloomberg, 2019), and regarding some larger institutions, such as government pension funds, there is external pressure to regulate the funds' behaviour and investment criteria.

2. Sample and Summary Statistics

2.1 Data Sources

We first obtain data on firms' ESG performance from the Refinitiv Eikon database. Refinitiv sources information from company annual and sustainability reports, NGOs, and news sources for publicly traded companies across 45 countries at an annual frequency. Refinitiv constructs Overall ESG scores from 0 to 100 for publicly listed firms based on category scores for Environmental, Social, and Governance. These categories contain a total of 10 subcategories; 3 for Environmental (Resource Use, Emissions, and Environmental Innovation), 4 for Social (Workforce, Human Rights, Community, and Product Responsibility), and 3 for Governance (Management, Shareholders, and CSR Strategy). Subcategory scores are, in turn, based on a number of quantitative and qualitative line items which Eikon analysts evaluate. Detailed definitions of the Overall ESG Score, as well as subcategories, are provided in Appendix A.

The data obtained from Refinitiv Eikon consists of Overall ESG Scores as well as subcategory scores for all ten subcategories mentioned above for a total of 1714 common or preferential equity securities publicly listed in Sweden, Norway, Denmark or Finland for the years 2012 - 2021. We use Overall ESG Score as a primary measurement of firms' ESG performance. However, as the exact method used by Eikon analysts to determine this score is unknown, we also use subcategory scores to construct a weighted average of all ten subcategories (later termed as "Category Score"). We use this as an alternative measure of firms' ESG performance in order to reduce reliance on effects introduced by database-specific weighting schemes.

We obtain data on firms' institutional investor ownership and selected financial characteristics from the S&P Capital IQ database. S&P sources information from company annual and quarterly reports, company filings with the SEC or other relevant regulatory entities, NGOs, news sources, and proprietary analysis conducted by S&P Global Market Intelligence. Capital IQ provides ownership data for insiders, corporations and institutions, as well as a number of subgroups for each of these categories.

The data obtained from Capital IQ primarily consists of percentage point firm ownership for All Institutions as well as the following subgroups of institutions; Banks/Investment Banks, Charitable Foundations, Corporate Pension Sponsors, Family Offices/Trusts, Government Pension Sponsors, Hedge Fund Managers, Insurance Companies, Investment Managers, and Venture Capital/Private Equity Firms. The data also contains Primary Industry and Country of Headquarters to separate industry- and country-specific effects, as well as Total Assets, Tangible Book Value, Net Debt, Market Capitalization, and Return on Capital as financial characteristics to measure size, leverage, tangibility, and profitability. We further use this data to derive Asset Tangibility as Tangible Book Value divided by Total Assets, Net Debt to Assets, and Tobin's Q as Net Debt plus Market Capitalization divided by Total Assets. Data points are collected for a total of 1820 common or preferential equity securities publicly listed in Sweden, Norway, Denmark or Finland for the years 2011 - 2020. The time frame used for this data (2011 - 2020) differs from the time frame used for ESG data (2012 - 2021), as the analysis focuses on investigating a one-period lagged relationship between ownership and ESG performance.

We combine the data sets by matching ticker symbols and company names, excluding observations that lack either Overall ESG Score or Total Institutional Ownership. If a firm has both common and preferential equity listings, the common share is used. The complete data set contains 2437 firm-year observations for a total of 539 firms over the time period 2011 - 2021. Of the 539 firms present in the data, only 102 are present in all periods. Beyond these firms, there is a significant drop in the number of periods for which firms have been graded by Refinitiv, resulting in half the firm-year observations (ca 1218) consisting of 142 firms, with the other 397 firms making up the remainder.

2.2 Descriptive Statistics

Table 1 contains descriptive statistics for the complete data set, sorted by country. We find variation between firms' ESG performance, institutional ownership, and financial characteristics across country, industry, and time. We control for this variation through the inclusion of control variables in our pooled OLS regression analysis and through within-transformation and first differences of variables in our subsequent fixed effects- and Arellano-Bond regression analysis, respectively.

Table 1: Summary Statistics

This table shows summary statistics of ESG, ownership and firm financial characteristics. Category Score is calculated as the weighted average of all 10 ESG category scores, Total IO stands for total institutional ownership in percentages, total assets is measured in USDm, asset tangibility is calculated as tangible book value to total assets, and Tobin's Q is calculated as market capitalization plus net debt to assets. The data are from Refinitiv Eikon and S&P Capital IQ and are obtained for years 2011 - 2021.

	Overall ESG Score	Category Score	Total IO	Total Assets	Asset Tangibility	Net Debt to Assets	Return on Capital	Tobin's Q	Number of Firms
Denmark									
Mean	52.287	46.651	30.332	43 216	0.255	0.200	13.121	2.370	
Median	54.285	48.535	28.32	2 954	0.186	0.177	9.51	0.975	
STD	17.544	21.233	15.401	148 702	0.213	0.169	12.870	3.553	
Min	1.309	1.289	.008	8.71	0.001	0.001	.001	0.000	
Max	84.416	83.376	80.01	930 437	0.939	0.943	65.4	41.280	
Obs	363	363	359	362	362	362	315	359	67
Finland									
Mean	58.647	52.18	35.358	8 420	0.265	0.181	8.002	1.334	
Median	60.640	56.192	35.08	3 808	0.215	0.169	6.355	0.996	
STD	18.262	22.658	12.377	12 124	0.185	0.128	6.523	1.510	
Min	5.854	2.119	.082	8.61	0.001	0.002	.053	0.204	
Max	91.852	92.978	83.64	70 715	0.791	0.709	48.6	22.489	
Obs	343	343	333	336	336	336	330	333	82
Norway									
Mean	51.986	45.895	45.527	11 756	0.243	0.227	8.482	1.288	
Median	52.478	48.826	42.51	2 709	0.205	0.171	7.2	0.867	
STD	17.875	22.021	25.130	24 513	0.193	0.220	9.011	1.643	
Min	7.298	2.119	.13	12.9	0.001	0.001	.035	0.060	
Max	90.320	88.227	238.66	145 807	1.614	2.319	92.1	19.890	
Obs	309	309	307	309	309	309	287	307	82
Sweden									
Mean	48.834	43.780	44.654	14 977	0.286	0.262	11.560	2.440	
Median	49.450	45.117	46.02	1 583	0.204	0.222	8.21	1.276	
STD	21.714	23.581	17.591	57 422	0.257	0.223	15.063	3.730	
Min	1.875	1.222	.078	4.06	0.001	0.001	.05	0.003	
Max	93.329	91.556	134.67	386 513	2.953	2.903	241.2	47.455	
Obs	883	883	875	881	881	881	834	875	308
Total									
Mean	51.781	46.191	40.402	18 697	0.269	0.230	10.673	2.041	
Median	53.636	48.490	39.345	2 482	0.204	0.191	7.79	1.095	
STD	20.064	22.915	18.889	77 722	0.228	0.201	12.696	3.165	
Min	1.3098	1.222	.008	4.06	0.001	0.001	.001	0.000	
Max	93.329	92.978	238.66	930 437	2.953	2.903	241.2	47.455	
Obs	1898	1898	1874	1888	1888	1888	1766	1874	539

Of the four Nordic nations, Finland appears to have both the highest mean and median ESG scores at 58.65 and 60.64, while Sweden has the lowest at 48.83 and 49.45. Sweden also has the highest standard deviation at 21.71, while Denmark has the lowest at 17.54. Sweden has by far the largest number of firms at 308, while Denmark has the lowest at 67. Despite having fewer firms, Denmark still has a higher number of firm-year observations than Finland and Norway. It is interesting to note that Sweden has the highest standard deviation in ESG score, despite having the highest number of firm-year observations (and, therefore, less impacted by outliers). This indicates that ESG performance is more varied among Swedish firms compared to other Nordic nations.

Institutional ownership is fairly diverse across nations, with Denmark and Finland displaying lower median ownership percentages at 28.32 and 35.08, respectively. In contrast, Norway and Sweden display significantly higher median institutional ownership at 42.51 and 46.02 percent, respectively. Norway displays a significantly higher standard deviation of 25.13 compared to other nations, likely due in some part to the presence of two outlier observations discussed below. Finland and Denmark display the lowest standard deviations at 12.38 and 15.40, respectively, and the lowest maximum values at 83.64 and 80.01, indicating clustering of institutional ownership around 15 - 50 percent in these nations.

Three outlier observations display an institutional ownership rate far in excess of 100, which should intuitively represent a limit for this value. These observations are from Norwegian firm Prosafe SE in 2012 and 2013, with an ownership percentage of 113.54 and 238.66, and from Swedish firm Sedana Medical in 2020 with 134.67. The ownership in all instances consists overwhelmingly of investment managers. We have been unable to determine the exact reasons behind these anomalies, so we have decided not to exclude them from the data set. The estimated effect of these observations on the overall analysis is limited, but in the event that the institutional ownership values are erroneous, the observations will bias our results slightly negatively as institutional ownership declines heavily in the subsequent periods with no considerable effect on the ESG score.

As for firm financial characteristics, Denmark has the largest firms judging by both mean and maximum asset bases, while Finland has the largest median firm size. Firm size variation is by far highest in Denmark, likely due to outliers in the data set in the

form of Maersk Group and others, with Sweden displaying the second-highest standard deviation. Norway and Finland display a lower standard deviation and mean firm size despite outliers like Orkla, Norsk Hydro, Fortum, and Nokia, indicating a relatively greater concentration of medium-sized firms in these nations. Sweden displays the greatest concentration of smaller firms, with a median firm size of only $1583 USDm.

Asset tangibility and net debt to asset levels are fairly similar across nations. In both categories, Sweden displays the highest mean (0.29 for tangibility and 0.26 for net debt to assets) and standard deviation (0.26 and 0.22 percentage points, respectively). Profitability measured by return on capital is very widespread both across and within nations, with Denmark displaying the highest mean profitability at 13.12 and Sweden displaying the highest standard deviation at 15.06. In contrast, Finland displays both the lowest mean at 8.00 and the lowest standard deviation at 6.52 percentage points.

3. Does institutional ownership drive ESG performance?

3.1 Initial Analysis: Pooled OLS Regression

To determine whether there is evidence that increased institutional investor ownership drives firm ESG performance, we perform regression analysis on the previously established data set. In line with Dyck et al. (2017), we have used a pooled OLS regression model for our initial analysis. Their analysis provides us with a comparison point for our results. The pooled OLS model does not address potential biases caused by, for example, time-invariant fixed effects or reverse causality. However, it serves as a baseline to which further analysis addressing these problems can be compared to. In this model, all observations are pooled into a single long regression, and both between and within variation are used to estimate the parameters. Our regression model is as follows:

$$Score_{it} = \beta_0 + \beta_1 IO_{it-1} + \beta_2 Firm_{it-1} + d_1 Time + d_2 Country + d_3 Industry + \epsilon_{it}$$

Where the dependent variable is either the overall ESG score or the category score for firm *i* in year *t*. IO_{it-1} is the percentage of institutional ownership in firm *i* in year *t*–1. $Firm_{it-1}$ are a set of five firm-level control variables in year *t*–1; the natural logarithm of total assets, asset tangibility, net debt to assets, return on capital, and Tobin's Q. *Time, Country* and *Industry* are dummy variables to control for effects related to year, country and industry.

We include firm size partly because larger firms are naturally exposed to more significant external pressures. Furthermore, previous literature has shown that firm size is a predictor of institutional ownership grade (Dyck et al., 2019). Firm size has also been shown to be an indicator of the likelihood of engaging in CSR, where larger companies are more likely to do so, as shown by Ferrell, Liang & Renneboog (2016).

In order to produce a measure of overall financial slack in firms, as this may predict ESG adoption (Hong & Kacperczyk, 2012), we include Tobin's Q and return on capital as measures of financial performance and profitability, and net debt to assets and asset tangibility as measures of leverage. We have chosen a one-year lag in the independent variables in line with Dyck et al. (2019). The choice of the model specification is discussed more in-depth in Section 4.1. We report the main results of this regression model in Table 2. The regression estimates for the alternative ESG measurement

Category Score have been excluded from the main text due to a considerable lack of goodness-of-fit for the model, but they are included in Appendix B1.

We find a statistically significant positive relationship between lagged total institutional ownership and ESG performance measured by overall ESG score. In addition, we find statistically significant positive and negative relationships between several subgroups of institutional investors.

In Panel A, Total IO displays a positive correlation with overall ESG score at the 0.1% level, indicating it is highly statistically significant. It also appears to be economically meaningful, as each 1 percentage point increase in lagged institutional ownership results in a 0.0966 increase in the overall ESG score. This means a one standard deviation increase in institutional ownership (18.889 percentage points) results in a 18.889 x 0.0966 = 1.825 point increase in firm ESG score the following year. The adjusted R^2 of the model is 0.673, which indicates that the model accounts for 67.3% of the variance in overall ESG score. This value indicates that the model fit is more than sufficient for our analysis, but that there is still a considerable amount of unexplained variance in the dependent variable. For reference, the adjusted R^2 of the equivalent model of Dyck et al. (2019) was 0.543, either indicating that the model explains a greater deal of variance in firm ESG performance in the Nordics compared to the global average, or that the time period of our data produces a better fit compared to the period covered by Dyck et al. (2004 - 2013). With the former interpretation, it could indicate that institutional investors that are active in the Nordic countries are more concerned with ESG matters, either exiting the firm if the ESG performance cannot be improved or that such ESG-performance improving actions are more expected of institutions active in these countries. Such higher expectations would lead to a larger share of institutional investors choosing to devote energy and time to improving ESG in the firms in which they invest in. That case would be in line with evidence of higher social pressures regarding good ESG behaviour and performance in Nordic countries, compared to the United States, as an example (Dyck et al., 2019; Botero, Djankov, La Porta, Lopez-de-Silanes & Shleifer, 2004; World Values Survey).

As for subgroups of institutional investors, we find no statistically significant correlations between subgroup ownership and ESG performance in Panel A at any level. It is interesting to note that neither ownership by charities, family offices, or trusts

Table 2: Pooled OLS Regression

This table reports regression estimates of ESG scores on institutional ownership and control variables. The dependent variable is the overall ESG score. Total IO is total institutional ownership, Banks IO is institutional ownership by banks and investment banks, Charity IO is institutional ownership by charitable foundations, Corp. Pension IO is institutional ownership by corporate pension sponsors, FO & Trust IO is institutional ownership by family offices and trusts, Gov. Pension IO is institutional ownership by government pension sponsors, Hedge Fund IO is institutional ownership by hedge fund managers, Insurance co. IO is institutional ownership by insurance companies, Inv. Manager IO is institutional ownership by investment managers, VC & PE IO is institutional ownership by venture capital and private equity firms, total assets is the natural logarithm of total assets in USDm, asset tangibility is tangible book value divided by total assets, Tobin's Q is net debt plus market capitalization divided by total assets. All independent variables are lagged by one period. The data are from Refinitiv Eikon and S&P Capital IQ and are obtained for the years 2011-2021.

Panel A:	Overall ESG Score				
	(1)	(2)	(3)	(4)	(5)
Total IO	0.0966***				
	(0.0187)				
Banks IO		-0.0384			
		(0.114)			
Charity IO			0.0417		
			(0.0752)		
Corp. Pension IO				-0.00366	
				(0.269)	
FO & Trust IO					-0.108
					(0.218)
Total Assets	8.873***	8.934***	5.260***	8.737***	8.529***
	(0.259)	(0.342)	(0.873)	(0.651)	(0.552)
Asset Tangibility	4.979**	7.595**	3.130	2.981	8.942*
	(1.887)	(2.572)	(5.462)	(4.239)	(3.623)
Net Debt to Assets	-6.382***	-6.705**	-23.78***	1.651	-4.532
	(1.910)	(2.513)	(5.898)	(3.495)	(3.979)
Return on Capital	0.0907**	0.0470	-0.0423	0.133	0.0754
	(0.0292)	(0.0358)	(0.0906)	(0.0873)	(0.0585)
Tobin's Q	-0.00589	0.0184	0.318	0.745	-0.488
	(0.116)	(0.142)	(0.553)	(0.515)	(0.403)
Time Dummy	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes
Constant	-21.09***	-26.02***	1.748	-14.94	-15.04*
	(4.516)	(7.599)	(10.74)	(9.318)	(6.778)
Observations	1751	1006	339	471	670
Adjusted R^2	0.673	0.702	0.681	0.735	0.645

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Panel B:	Overall ESG Score				
	(1)	(2)	(3)	(4)	(5)
Gov. Pension IO	0.381**				
	(0.128)				
Hedge Fund IO		0.873***			
		(0.182)			
Insurance co. IO			0.353		
			(0.283)		
Inv. Manager IO				0.152***	
				(0.0222)	
VC & PE IO					-0.985*
					(0.477)
Total Assets	8.476***	7.822***	9.134***	8.778***	7.788***
	(0.299)	(0.344)	(0.498)	(0.257)	(0.447)
Asset Tangibility	4.499*	6.510**	14.23***	5.392**	5.814*
	(2.193)	(2.409)	(3.690)	(1.878)	(2.823)
Net Debt to Assets	-8.219***	-11.60***	-7.501	-6.011**	-5.855
	(2.302)	(2.463)	(4.055)	(1.899)	(3.129)
Return on Capital	0.134***	0.0989*	-0.0424	0.0877**	0.0812
	(0.0368)	(0.0400)	(0.0453)	(0.0290)	(0.0432)
Tobin's Q	-0.0345	0.00430	-0.639*	-0.0525	-0.154
	(0.150)	(0.177)	(0.283)	(0.116)	(0.170)
Time Dummy	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes
Constant	-15.89***	-7.418	-31.04**	-21.49***	-8.302
	(4.699)	(4.871)	(11.11)	(4.488)	(5.424)
Observations	1498	1260	592	1751	876
Adjusted R^2	0.647	0.636	0.766	0.677	0.685

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

appeared to indicate statistically significant relationships, contrary to expectation. Many of these institutions pursue social returns as their primary motive.

In Panel B, however, a number of investor subgroups display statistically significant and economically meaningful results. For example, government pension sponsors show a 0.381 correlation coefficient, significant at the 1% level. This indicates that government pension sponsors drive 3.94 times more ESG performance improvement than institutions overall. This is especially interesting in light of the results for corporate pension sponsors, which were neither strongly positive nor statistically significant,

indicating that perhaps government institutions face a greater pressure to drive ESG development in their holdings. In contrast, corporate actors may be more strongly incentivized to focus on purely financial returns. As mentioned in the introduction, pension funds are generally considered to be norm-constrained institutions (Hong & Kacperczyk, 2009). There are also indicators of public pressure on governments to regulate government pension fund behaviour so that they take into account environmental and social concerns when choosing investments (Altinget, 2022; Nielsen, 2014).

Ownership by hedge funds displays a fascinating result, namely an extremely strong correlation coefficient of 0.873 significant at the 0.1% level, indicating that hedge funds drive 9.04 times more improvement compared to institutions overall. This is unexpected given that hedge funds are not generally considered to be as concerned with social returns as purely financial. Furthermore, as Cella et al. (2013) showed, hedge funds usually are short-horizon investors. Short-horizon investors have less strong preferences for high-ESG firms than longer-horizon investors, as Starks et al. (2017) found.

The table also illustrates a 0.152 correlation coefficient among investment managers, significant at the 0.1% level. This is interesting to compare to the results found from government and corporate pension sponsors, as these three types of institutional investors are the most accessible to the public and likely face increased scrutiny regarding the social effects of their holdings. Ownership by venture capital and private equity appears to have a very high negative correlation to ESG performance of -0.985 significant at the 0.1% level. This potentially indicates that VC and PE firms take short positions in firms that actively improve or publicise planned investments into their ESG work, or that VC and PE firms drive negative development in their holdings' ESG work. As the negative correlation is very high compared to that of total institutional ownership (-0.985 vs. 0.0966) by a factor of 10.2, the results seem very likely to have economic significance. However, the standard error of the correlation coefficient is also significantly higher than any other group of institutional owners, meaning that the estimate is less precise than the estimates of other subgroups with comparable statistical significance. As earlier mentioned, a negative correlation is aligned with Zhang (2021), who shows that investors have lower expectations of the quality of business ideas in start-ups where the aim is environmental and social impact. Although those were for smaller sized and non-public firms, the effect could be the same even for public ones, as our results may indicate.

The table as a whole also displays some general findings that hold for almost all investor subgroups. We see a generally stable level of goodness-of-fit across subgroups, with an adjusted R2 between 0.65 - 0.75, indicating that the model explains a similar amount of variance in ESG score irrespective of which subgroup ownership is used as an independent variable. With regard to firm financial characteristics, we find that firm size, tangibility, leverage and profitability all show a highly significant impact on ESG performance. In distinction, Tobin's Q, representing 'performance' in line with the method used by Dyck et al. (2019), does not appear to show a significant relationship. Particularly firm size, tangibility and leverage show a very strong relationship. This is somewhat intuitive, as larger firms are naturally exposed to more significant stakeholder pressure and thus have more robust corporate governance, and more tangible firms have a relatively greater environmental and social impact, creating more avenues for improvement in ESG performance[3].

While these initial results derived from the pooled OLS regression are very interesting and indicate the existence of a significant relationship between lagged institutional ownership and ESG score, we cannot be certain of their validity due to a number of statistical biases that could be present in the pooled OLS method. The primary potential bias is the presence of omitted variables, which could cause a correlation between explanatory variables and time-invariant fixed effects that would bias the regression estimates. We address this potential bias in the following section by introducing a fixed-effects regression model.

3.2 Controlling for time-invariant fixed effects

To address the problem of potential omitted variable bias in our pooled OLS model, we introduce a fixed-effects regression model. This model utilises within-transformation of the data to calculate the deviations of all the variables from their individual-specific means over time, eliminating the presence of time-invariant fixed effects from the model. The resulting model uses the time-demeaned variables to produce regression estimates using the pooled OLS method. The fixed-effects model specification is as follows:

[3] As a side note, Dyck et al. (2019) showed evidence of institutional investors having a more substantial positive effect on firms with below-median initial E&S scores and subsequently a greater scope to improve their score as opposed to an above-median subsample.

$$Score_{it} - \overline{Score_i} = \beta_1 * (IO_{it-1} - \overline{IO_i}) + \beta_2 * (Firm_{it-1} - \overline{Firm_i}) + (u_{it} - \overline{u_i})$$

Where the dependent variable $Score_{it}$ is either the overall ESG score or the category score for firm *i* in year *t*. IO_{it-1} is the percentage of institutional ownership in firm *i* in year *t*–1. $Firm_{it-1}$ are a set of five firm-level control variables in year *t*–1; the natural logarithm of total assets, asset tangibility, net debt to assets, return on capital, and Tobin's Q. $\overline{Score_i}$, $\overline{IO_i}$, and $\overline{Firm_i}$ are individual-specific means for each of the previously defined variables. u_{it} is the idiosyncratic error term. We report the main results of this regression model in Table 3. The regression estimates for the alternative ESG measurement Category Score have been excluded from the main text due to a considerable lack of goodness-of-fit and/or statistical significance for the model, but they are included in Appendix B2.

Table 3 shows several interesting results. First, we see that almost all investor subgroups display very different correlation estimates and levels of statistical significance compared to the pooled OLS method. For example, in Panel A, Total IO is not significant at the 5% level, and the correlation coefficient is far lower at 0.0118. Corporate pension sponsors display a correlation coefficient of -0.738 significant at the 5% level, indicating a strong negative relationship to firm ESG score.

In Panel B, Government pension sponsors and hedge funds display a considerably smaller and less significant relationship to ESG score, with the correlation coefficient of government pension sponsors being reduced from 0.381 to -0.384, along with a reduction in significance from the 1% level to the 5% level. Ownership by hedge funds shows a reduction from 0.873 to 0.410 with a corresponding reduction in statistical significance from the 0.1% level to the 5% level. Ownership by insurance companies shows a very strong negative correlation to ESG score of -1.224, significant at the 1% level, which is especially interesting considering that insurance companies showed no statistically significant correlation in the pooled OLS model. Ownership by investment managers has been strongly reduced in correlation and statistical power, with correlation to ESG score being reduced from 0.152 to 0.0483 and statistical significance being reduced from the 0.1% level to below the 5% level. Finally, venture capital and private equity ownership no longer show a significant correlation to ESG score, contrary to the strong negative correlation derived in the pooled OLS model.

In addition to the results of individual investor groups, we also see a number of general results from the fixed-effects model. For firm financial characteristics, we see that the effect of firm size still holds at the 0.1% level. However, tangibility, leverage and profitability no longer appear to have as strong of a correlation to ESG score. Independent variables display a generally higher level of standard error relative to the correlation coefficients, indicating that the estimates derived through this model are not as precise as those derived through the pooled OLS model. This is further validated by the fact that the level of goodness-of-fit has been reduced to a practical level of zero,

Table 3: Fixed Effects Regression

This table reports regression estimates of ESG scores on institutional ownership and control variables. The dependent variable is the overall ESG score. Total IO is total institutional ownership, Banks IO is institutional ownership by banks and investment banks, Charity IO is institutional ownership by charitable foundations, Corp. Pension IO is institutional ownership by corporate pension sponsors, FO & Trust IO is institutional ownership by family offices and trusts, Gov. Pension IO is institutional ownership by government pension sponsors, Hedge Fund IO is institutional ownership by hedge fund managers, Insurance co. IO is institutional ownership by insurance companies, Inv. Manager IO is institutional ownership by investment managers, VC & PE IO is institutional ownership by venture capital and private equity firms, total assets is the natural logarithm of total assets in USDm, asset tangibility is tangible book value divided by total assets, Tobin's Q is net debt plus market capitalization divided by total assets. The data are from Refinitiv Eikon and S&P Capital IQ and are obtained for the years 2011-2021.

Panel A:	Overall ESG Score				
	(1)	(2)	(3)	(4)	(5)
Total IO	0.0118				
	(0.0241)				
Banks IO		0.0964			
		(0.123)			
Charity IO			0.0161		
			(0.130)		
Corp. Pension IO				-0.738*	
				(0.297)	
FO & Trust IO					-0.0724
					(0.536)
Total Assets	7.348***	9.129***	11.37***	8.485***	10.15***
	(0.724)	(0.975)	(2.099)	(1.896)	(1.400)
Asset Tangibility	-1.072	1.130	5.997	1.609	-1.222
	(2.407)	(2.913)	(7.848)	(4.123)	(4.295)
Net Debt to Assets	1.634	6.047*	-9.690	-1.833	-1.149
	(2.296)	(2.689)	(7.890)	(3.515)	(4.076)
Return on Capital	-0.116**	-0.126**	-0.0784	-0.102	-0.129
	(0.0402)	(0.0463)	(0.173)	(0.0819)	(0.0776)
Tobin's Q	0.413*	0.260	1.421	1.500*	1.273**
	(0.164)	(0.205)	(0.847)	(0.587)	(0.411)
Constant	-3.452	-17.47*	-38.18*	-11.44	-25.60*
	(5.502)	(7.714)	(18.08)	(16.52)	(12.30)
Observations	1751	1006	339	471	670
Adjusted R^2	-0.272	-0.279	-0.191	-0.249	-0.165

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Panel B:	Overall ESG Score				
	(1)	(2)	(3)	(4)	(5)
Gov. Pension IO	-0.384*				
	(0.167)				
Hedge Fund IO		0.410*			
		(0.161)			
Insurance co. IO			-1.224**		
			(0.382)		
Inv. Manager IO				0.0483	
				(0.0264)	
VC & PE IO					0.208
					(0.549)
Total Assets	8.398***	7.582***	7.538***	7.213***	10.02***
	(0.776)	(0.844)	(1.603)	(0.723)	(1.095)
Asset Tangibility	-4.297	-3.020	2.922	-0.899	0.987
	(2.810)	(3.134)	(6.058)	(2.405)	(3.546)
Net Debt to Assets	-3.474	-2.262	-11.19*	2.146	0.889
	(2.842)	(3.003)	(5.437)	(2.307)	(3.500)
Return on Capital	-0.0770	-0.105*	-0.136	-0.118**	-0.0291
	(0.0431)	(0.0450)	(0.0794)	(0.0401)	(0.0588)
Tobin's Q	0.406*	0.475*	0.482	0.378*	0.726*
	(0.174)	(0.214)	(0.791)	(0.165)	(0.290)
Constant	-7.394	-2.482	1.727	-3.574	-25.59**
	(6.223)	(6.912)	(13.31)	(5.492)	(9.337)
Observations	1498	1260	592	1751	876
Adjusted R^2	-0.156	-0.186	-0.361	-0.269	-0.161

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

with adjusted R^2 consistently negative for all ownership subgroups, indicating that the regression model fails to explain any variance in firm ESG score when controlling for biases caused by time-invariant fixed effects.

These results indicate the presence of omitted variable bias in our pooled OLS model, which when controlled through the fixed effects method produces an overall lower and less precise level of correlation and statistical significance between institutional ownership and ESG score. Despite this reduction, however, the results derived through this more robust method are still economically meaningful and significant in their own right.

However, while the fixed effects model is more robust than the pooled OLS model, there is another statistical concern that is not addressed by it, namely the potential for

reverse causality. As previous literature has shown the presence of selection bias among institutional investors, whereby institutions may self-select investments with higher ESG scores instead of driving ESG development in their existing holdings, it is possible that ESG score drives institutional ownership instead of ownership driving ESG score, creating a bias in our data. While this potential bias could be argued to be somewhat mitigated by our use of lagged independent variables, as future ESG scores at times *t* should not be able to impact ownership at time *t-1*, it could equally be argued that investors are able to some extent predict future ESG scores based on current information from firms on their ESG initiatives and work, which would allow for reverse causality despite the use of lagged variables. While there is no definitive way to prevent bias due to reverse causality, we attempt to control for it in the next section by introducing the Arellano-Bond regression model in line with Leszczensky & Wolbring (2022), which utilises first differences to control for time-invariant fixed effects while introducing a lagged version of the dependent variable as an instrumental variable to address reverse causality by weakening the assumption of strict exogeneity for a subset of regressors.

3.3 Addressing problems of reverse causality

As the presence of reverse causality introduces correlation between the error term and future values of independent variables, we must relax the assumption of strict exogeneity for independent variables in order not to introduce bias to our regression estimates. To achieve this we introduce an Arellano-Bond model that uses the generalised method of moments (GMM) to distinguish between strictly exogenous variables and sequentially exogenous variables. The assumption of sequential exogeneity allows for correlation between the error term and future (but not past or present) values of independent variables, resulting in unbiased regression estimates even in the presence of reverse causality. The model introduces a lagged version of the dependent variable on the right hand side of the regression equation as an instrumental variable, and takes first differences to control for time-invariant fixed effects. The model specification is as follows:

$$\Delta Score_{it} = \beta_1 * \Delta Score_{it-1} + \beta_2 * \Delta IO_{it-1} + \beta_3 * \Delta Firm_{it-1} + \Delta\epsilon_{it}$$

Where the dependent variable $\Delta Score_{it}$ is the first difference of either the overall ESG score or the category score for firm *i* in year *t*. ΔIO_{it-1} is the first difference of the

percentage of institutional ownership in firm *i* in year *t*–1. $\Delta Firm_{it-1}$ are first differences of a set of five firm-level control variables in year *t*–1; the natural logarithm of total assets, asset tangibility, net debt to assets, return on capital, and Tobin's Q. We report the main results of this regression model in Table 4. All preceding levels of the lagged dependent variable are used as instruments. The regression estimates for the alternative ESG measurement Category Score have been excluded from the main text due to a considerable lack of goodness-of-fit and/or statistical significance for the model, but they are included in Appendix B3. Significance level thresholds have been changed to 10, 5, and 1% in order to highlight a greater number of results.

We see a correlation of 0.0389 between overall institutional ownership and ESG score, significant at the 5% level. This is weaker than the correlation derived using the pooled OLS method, which indicates that the former estimate was potentially affected by bias due to omitted variables or reverse causality. We also see relationships between ESG score and ownership by banks, corporate pension sponsors, and investment managers, all significant at the lower 10% level. It is interesting to note that the effect of investment managers is weaker than that of overall institutions, contrary to previous models. Corporate pensions sponsors again display a negative relationship to ESG score, while banks display a more than 4 times stronger correlation to ESG score than institutions overall. The previously observed significant correlations between ESG score and ownership by hedge funds, government pension sponsors, venture capital and private equity, as well as insurance companies appears to no longer be present in the Arellano-Bond model, indicating that the previously observed effects may have been caused by model biases. We again observe a higher level of standard errors among independent variable estimates similar to those observed in the fixed effects regression model, indicating that the estimates are less precise than those determined using the pooled OLS model.

Among firm financial characteristics, leverage appears to display the most significant and strongest relationship to ESG score, contrary to previous regression models where firm size was most significant. Aside from leverage, other financial characteristics appear to display inconsistent relationships to ESG score depending on which subgroup of owners is used for regression estimation, with varying strength and significance levels across groups.

Table 4: Arellano-Bond Regression

This table reports regression estimates of ESG scores on institutional ownership and control variables using the Arellano-Bond estimator for dynamic panel data. The dependent variable is the overall ESG score. Lagged ESG Score is the overall ESG score, Total IO is total institutional ownership, Banks IO is institutional ownership by banks and investment banks, Charity IO is institutional ownership by charitable foundations, Corp. Pension IO is institutional ownership by corporate pension sponsors, FO & Trust IO is institutional ownership by family offices and trusts, Gov. Pension IO is institutional ownership by government pension sponsors, Hedge Fund IO is institutional ownership by hedge fund managers, Insurance co. IO is institutional ownership by insurance companies, Inv. Manager IO is institutional ownership by investment managers, VC & PE IO is institutional ownership by venture capital and private equity firms, total assets is the natural logarithm of total assets in USDm, asset tangibility is tangible book value divided by total assets, Tobin's Q is net debt plus market capitalization divided by total assets. All independent variables are lagged by one period. The data are from Refinitiv Eikon and S&P Capital IQ and are obtained for the years 2011-2021.

Panel A:	Overall ESG Score				
	(1)	(2)	(3)	(4)	(5)
Lagged ESG Score	1.043***	0.781***	1.061***	0.686***	0.898***
	(0.0520)	(0.0968)	(0.0950)	(0.0957)	(0.0862)
Total IO	0.0389**				
	(0.0196)				
Banks IO		0.161*			
		(0.0861)			
Charity IO			0.0326		
			(0.0812)		
Corp. Pension IO				-0.662*	
				(0.392)	
FO & Trust IO					0.0235
					(0.171)
Total Assets	-2.251**	0.288	-3.542	-0.0117	-0.523
	(1.121)	(1.356)	(2.274)	(2.196)	(2.224)
Asset Tangibility	-4.709	-3.050	-11.36	-8.706**	-4.569
	(3.174)	(3.637)	(9.567)	(3.785)	(4.817)
Net Debt to Assets	8.524***	7.897***	-1.263	7.485**	11.13**
	(2.789)	(2.585)	(9.049)	(3.500)	(5.185)
Return on Capital	-0.0271	-0.0357	0.0629	-0.0104	-0.0235
	(0.0474)	(0.0404)	(0.158)	(0.0853)	(0.0846)
Tobin's Q	-0.0520	0.0630	1.757**	1.078**	0.665
	(0.269)	(0.190)	(0.861)	(0.528)	(0.447)
Constant	16.68**	11.93	28.85*	21.81	10.94
	(8.363)	(9.381)	(16.40)	(20.19)	(18.29)
Observations	977	505	204	257	405

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B:	Overall ESG Score				
	(1)	(2)	(3)	(4)	(5)
Lagged ESG Score	1.079***	1.004***	1.003***	1.040***	0.988***
	(0.0560)	(0.0648)	(0.0847)	(0.0513)	(0.0802)
Gov. Pension IO	0.0581				
	(0.269)				
Hedge Fund IO		-0.0688			
		(0.137)			
Insurance co. IO			0.471		
			(0.520)		
Inv. Manager IO				0.0352*	
				(0.0186)	
VC & PE IO					0.966
					(0.736)
Total Assets	-2.317*	-1.948	-5.115***	-2.198**	-1.457
	(1.237)	(1.280)	(1.601)	(1.117)	(1.439)
Asset Tangibility	-4.065	-3.739	-4.839	-4.753	0.995
	(3.775)	(4.224)	(6.354)	(3.186)	(4.511)
Net Debt to Assets	7.088*	10.44**	5.148	8.545***	14.37***
	(3.946)	(4.196)	(5.521)	(2.789)	(4.392)
Return on Capital	-0.0101	-0.0111	-0.0445	-0.0278	-0.0429
	(0.0502)	(0.0504)	(0.0649)	(0.0478)	(0.0922)
Tobin's Q	-0.147	0.0996	1.997***	-0.0472	0.564
	(0.280)	(0.242)	(0.673)	(0.270)	(0.394)
Constant	16.97*	17.46*	42.25***	16.88**	11.41
	(9.162)	(9.411)	(13.20)	(8.408)	(11.77)
Observations	924	776	326	977	552

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4. Discussion

4.1 Data selection and analysis method

This section will discuss the potential shortcomings of our choice of data sources, variables, and analysis methods. Our method's most outstanding potential issue stems from our reliance on a singular estimate of ESG performance through the proprietary scoring of Refinitiv. While this was attempted to be mitigated through the formulation of an alternative ESG performance estimate, "Category Score", a more robust method would be to utilise one or several additional database estimates of firm ESG performance in order to ensure that regression estimates are not dependent on singular database-specific judgments of ESG performance. In addition, if our database were to convey erroneous or no information at all, we would expect to find that the dataset is not correlated to institutional ownership with the significance that we have done. Finally, our choice of a single data source for ESG data also raises the questions about how and to what extent the relationship between institutional ownership and ESG performance is dependent on the aggregation or composition of the ESG score.

Another potential shortcoming is related to the model specification, where we assume that a one-year lag drives a causal relationship between institutional ownership and ESG performance. The ‘true’ time lag may be shorter or longer than this, which would cause our model to return biased estimates. An option and a mitigation mechanism to a potentially erroneous one-year lag could be to regress changes in ESG performance on changes in institutional ownership with several time lag periods, such as IOt-2, IOt-3…IOt-n, to be able to distinguish the relationships between IO with different time lags and ESG performance. Another option could be to split our sample period into two portions, one in the earlier part of the period and one in the latter part of the sample, and to regress changes in ESG performance over the latter part of the time period on changes in institutional ownership in the earlier period. Such long-run lags could potentially address the bias if institutions invest in the expectation of future ESG improvements.

In addition, an inaccurate temporal specification of causal effect also creates problems in the Arellano-Bond model, which uses a first differencing of variables, causing it to be sensitive to the correct specification of temporal lags as shown by Vaisey & Miles (2017). As we observed the presence of omitted variable bias through the inclusion of a fixed effects model, it is worth considering whether additional explanatory variables

should be included to potentially improve the model fit and reduce omitted variable bias, and if so, which parameters should be chosen.

Finally, while our analysis of ownership subgroups yielded interesting and economically meaningful results, it was also limited in scope. Further analysis of institutional ownership categories by subgroups of firms divided by country, industry, or size could yield additional insights into the relationship between institutional ownership and ESG performance.

4.2 Economic implications

Our chosen dataset for ESG performance from Refinitiv Eikon measures firms' relative ESG performance. The score range is a percentile ranking one and thus ranges from zero to 100. Therefore, translating statistical measures into economic implications is challenging, as the ESG measure is in substance unitless.

Nevertheless, with this in mind, relative ordering can still convey information about the effect that (lagged) institutional ownership has in this ranking. Our results show that institutional ownership significantly increases firms' ESG performance, as evidenced by the significantly positive coefficients of IO in our pooled OLS regression. As shown in Panel A, Total IO displays a positive correlation with Overall ESG score at the 0.1% level, indicating it is highly statistically significant. It also appears to be economically meaningful, as each one percentage point increase in lagged institutional ownership results in a 0.0966 point increase in the overall ESG score. A one standard deviation increase in institutional ownership (18.889 percentage points) thus results in a 1.825 point increase in firm ESG score the following year[4]. This may sound like a relatively small increase, but the reader should bear in mind that this is a one-year increase.

For comparison, the standard deviation for the full time period and over all countries is 20.06 points. The interquartile range, i.e. the difference between the 75th and 25th percentiles of the Overall ESG Score data, likewise for the full period and over all countries, is 29.42 points.

[4] Calculated as (18.889 * 0.0966)

In Panel B, we found more substantial effect sizes for several investor subgroups and thus more economically meaningful results. For example, government pension sponsors showed a 0.381 correlation coefficient, significant at the 1% level. A ten percentage point increase in lagged government pension sponsor ownership would thus result in a 10 x 0.381 = 3.81 point increase in firm ESG score the following year. As the standard deviation of the Overall ESG score for the Nordics in aggregate is 20.06 units, such an increase in institutional ownership would encompass almost a fifth of a standard deviation of relative ESG performance.

In the same way, regarding the highly negative correlation coefficient for VC and PE firms from our pooled OLS regression, a ten percentage unit increase in VC and PE ownership (lagged) would result in a 9.85 point decrease in ESG performance for the Nordics in aggregate; a decrease that must be considered highly economically meaningful. A ten percentage-unit replacement of aggregate VC and PE ownership with government pension sponsor ownership (lagged) in Nordic public firms would, in this case, lead to a 13.66 ESG performance unit increase[5], which has substantial economic weight.

Comparing our results with previous literature, Jo and Harjoto (2011) found a relatively smaller correlation, with a one-percentage increase in ownership associated with a 0.004-percentage point increase in the total CSR score. On the other hand, Chen et al. (2020) found a much larger effect at over ten times as large as Jo and Harjoto. Dyck et al. (2019) found that a one-percentage-point increase in ownership had a 0.268 point positive effect on the ESG performance score. Unfortunately, comparing our effect sizes is a rather fruitless task as the ESG score databases used are not the same. The authors of the formerly mentioned two papers used the MSCI ESG KLD database, while the Thomson Reuters ASSET4 database was used by Dyck et al.

[5] Calculated as (0.381 - (-0.985) * 10)

5. Conclusion

In this study, we use a sample of publicly traded firms in Denmark, Finland, Norway and Sweden to provide fresh evidence that institutional investor ownership in aggregate has a positive correlation effect on firm ESG-performance as measured by the Refinitiv Eikon index. Using data up to the latest year available, we find substantial differences between different types of institutional investors, with some investor groups even showing a negative correlation effect. Supposing the investor groups with the highest effects were to increase or decrease their ownership of firms in the Nordic countries in substantial magnitudes, we predict sizeable changes in the ESG performance of the firms.

Our method of investigating a one-period lagged relationship between ownership and ESG performance suggests causal changes. However, our supplementary fixed-effects test indicates that potential omitted variable bias and reverse causality bias cannot be ruled out.

Our paper contributes to both the general ESG and corporate finance literature, but more specifically to the institutional ownership literature. We complement the available by showing, once again, that investors' choice of investments may play a significant role. The impact of institutional investors making investments in Nordic companies drive wide measures of firm ESG performance.

With our results, we extend the previous research. Contrary to Dyck et al. (2019), we find that VC and PE investors appear to have a statistically significant negative correlation to ESG performance. These results are aligned with experimental evidence that Zhang (2020) presents. We also find a robust positive correlation effect for hedge funds, which was not expected. This suggests that hedge funds, in aggregate, may have in the period we study (2012 until 2021) started to positively affect the firms in which they invest in regarding ESG aspects. It could also mean that Nordic hedge funds behave differently as owners compared to non-Nordic ones.

As Dyck et al. (2019) used data through year-end 2013, this suggests that hedge funds, in aggregate, may have in the period we study (2012 until 2021) started to positively affect the firms in which they invest in regarding ESG aspects. It could also mean that hedge funds in Nordic countries behave differently as owners compared to hedge funds

from non-Nordic firms or when investing in non-Nordic firms. Many hedge funds are active in their ownership, so the conditions for affecting the management in a positive ESG-direction through private engagements, for example, are already there (Becht, Franks & Grant, 2010).

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Appendix

Appendix A1: Refinitiv ESG Category Definitions

1. **ESG Score** - Refinitiv ESG Score is an overall company score based on the self-reported information in the environmental, social and governance pillars.
2. **Resource Use Score** - Resource use category score 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.
3. **Emissions Score** - Emission category score measures a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes.
4. **Environmental Innovation Score** - Environmental innovation category score 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.
5. **Workforce Score** - Workforce category score measures a company's effectiveness towards job satisfaction, healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce.
6. **Human Rights Score** - Human rights category score measures a company's effectiveness towards respecting the fundamental human rights conventions.
7. **Community Score** - Community category score measures the company's commitment towards being a good citizen, protecting public health and respecting business ethics.
8. **Product Responsibility Score** - Product responsibility score reflects a company's capacity to produce quality goods and services integrating the customer's health and safety, integrity and data privacy.
9. **Management Score** - Management category score measures a company's commitment and effectiveness towards following best practice corporate governance principles.
10. **Shareholders Score** - Shareholders category score measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices.
11. **CSR Strategy Score** - CSR category score reflects a company's practices to communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making process.

Appendix B1: Pooled OLS Regression

This table reports regression estimates of ESG scores on institutional ownership and control variables. The dependent variable is the weighted average category ESG score. Total IO is total institutional ownership, Banks IO is institutional ownership by banks and investment banks, Charity IO is institutional ownership by charitable foundations, Corp. Pension IO is institutional ownership by corporate pension sponsors, FO & Trust IO is institutional ownership by family offices and trusts, Gov. Pension IO is institutional ownership by government pension sponsors, Hedge Fund IO is institutional ownership by hedge fund managers, Insurance co. IO is institutional ownership by insurance companies, Inv. Manager IO is institutional ownership by investment managers, VC & PE IO is institutional ownership by venture capital and private equity firms, total assets is the natural logarithm of total assets in USDm, asset tangibility is tangible book value divided by total assets, Tobin's Q is net debt plus market capitalization divided by total assets. All independent variables are lagged by one period. The data are from Refinitiv Eikon and S&P Capital IQ and are obtained for the years 2011-2021.

Panel A:	Weighted Average ESG Category Score				
	(1)	(2)	(3)	(4)	(5)
Total IO	0.0534				
	(0.0283)				
Banks IO		-0.123			
		(0.178)			
Charity IO			-0.123		
			(0.147)		
Corp. Pension IO				0.106	
				(0.538)	
FO & Trust IO					-0.519
					(0.406)
Total Assets	7.755***	7.771***	4.726**	7.660***	7.164***
	(0.391)	(0.535)	(1.708)	(1.300)	(1.028)
Asset Tangibility	3.061	4.689	6.339	5.183	5.398
	(2.854)	(4.021)	(10.68)	(8.470)	(6.748)
Net Debt to Assets	-7.957**	-7.231	-30.06**	6.223	-12.43
	(2.889)	(3.928)	(11.53)	(6.983)	(7.412)
Return on Capital	0.0985*	0.0667	-0.0339	0.155	0.167
	(0.0442)	(0.0560)	(0.177)	(0.174)	(0.109)
Tobin's Q	-0.0900	-0.0404	-0.566	-0.0695	-1.295
	(0.175)	(0.222)	(1.080)	(1.028)	(0.751)
Time Dummy	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes
Constant	-28.54***	-40.82***	9.884	-46.00*	-18.06
	(6.829)	(11.88)	(21.00)	(18.62)	(12.63)
Observations	1751	1006	339	471	670
Adjusted R^2	0.418	0.433	0.277	0.327	0.296

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Panel B:	Weighted Average ESG Category Score				
	(1)	(2)	(3)	(4)	(5)
Gov. Pension IO	-0.0194				
	(0.205)				
Hedge Fund IO		0.848**			
		(0.305)			
Insurance co. IO			-0.00452		
			(0.525)		
Inv. Manager IO				0.142***	
				(0.0336)	
VC & PE IO					-1.808*
					(0.883)
Total Assets	7.298***	6.687***	7.537***	7.558***	6.927***
	(0.481)	(0.577)	(0.925)	(0.390)	(0.827)
Asset Tangibility	1.954	3.440	10.84	3.749	3.070
	(3.525)	(4.047)	(6.846)	(2.845)	(5.229)
Net Debt to Assets	-11.09**	-16.62***	-11.43	-7.621**	-14.53*
	(3.700)	(4.136)	(7.524)	(2.877)	(5.795)
Return on Capital	0.138*	0.126	0.0344	0.0968*	0.121
	(0.0592)	(0.0672)	(0.0841)	(0.0440)	(0.0799)
Tobin's Q	-0.157	-0.101	-0.375	-0.159	-0.230
	(0.241)	(0.297)	(0.525)	(0.175)	(0.314)
Time Dummy	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes
Constant	-21.47**	-14.61	-21.04	-29.52***	-18.20
	(7.554)	(8.181)	(20.61)	(6.798)	(10.04)
Observations	1498	1260	592	1751	876
Adjusted R^2	0.361	0.332	0.404	0.423	0.362

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix B2: Fixed Effects Regression

This table reports regression estimates of ESG scores on institutional ownership and control variables. The dependent variable is the weighted average category ESG score. Total IO is total institutional ownership, Banks IO is institutional ownership by banks and investment banks, Charity IO is institutional ownership by charitable foundations, Corp. Pension IO is institutional ownership by corporate pension sponsors, FO & Trust IO is institutional ownership by family offices and trusts, Gov. Pension IO is institutional ownership by government pension sponsors, Hedge Fund IO is institutional ownership by hedge fund managers, Insurance co. IO is institutional ownership by insurance companies, Inv. Manager IO is institutional ownership by investment managers, VC & PE IO is institutional ownership by venture capital and private equity firms, total assets is the natural logarithm of total assets in USDm, asset tangibility is tangible book value divided by total assets, Tobin's Q is net debt plus market capitalization divided by total assets. The data are from Refinitiv Eikon and S&P Capital IQ and are obtained for the years 2011-2021.

Panel A:	Weighted Average Category ESG Score				
	(1)	(2)	(3)	(4)	(5)
Total IO	0.0337				
	(0.0527)				
Banks IO		0.339			
		(0.300)			
Charity IO			-0.284		
			(0.309)		
Corp. Pension IO				-0.139	
				(0.805)	
FO & Trust IO					0.548
					(1.382)
Total Assets	6.196***	8.744***	4.194	11.51*	8.354*
	(1.581)	(2.383)	(4.972)	(5.134)	(3.613)
Asset Tangibility	-4.878	-4.466	0.173	-1.666	-16.25
	(5.259)	(7.119)	(18.59)	(11.16)	(11.08)
Net Debt to Assets	-1.417	1.509	-20.30	2.228	-11.50
	(5.017)	(6.571)	(18.69)	(9.518)	(10.52)
Return on Capital	-0.0510	0.0166	-0.0143	0.115	0.331
	(0.0878)	(0.113)	(0.410)	(0.222)	(0.200)
Tobin's Q	0.331	-0.0785	-2.205	0.0727	-0.540
	(0.359)	(0.500)	(2.007)	(1.589)	(1.060)
Constant	0.0301	-19.29	25.21	-45.02	-13.04
	(12.02)	(18.85)	(42.83)	(44.73)	(31.73)
Observations	1751	1006	339	471	670
Adjusted R^2	-0.385	-0.458	-0.329	-0.383	-0.288

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Panel B:	Weighted Average Category ESG Score				
	(1)	(2)	(3)	(4)	(5)
Gov. Pension IO	-0.292				
	(0.374)				
Hedge Fund IO		0.304			
		(0.381)			
Insurance co. IO			-0.796		
			(0.939)		
Inv. Manager IO				0.0613	
				(0.0577)	
VC & PE IO					-0.393
					(1.416)
Total Assets	7.793***	7.565***	4.522	6.101***	8.324**
	(1.739)	(1.999)	(3.938)	(1.581)	(2.823)
Asset Tangibility	-10.19	-11.42	7.555	-4.739	-4.397
	(6.297)	(7.424)	(14.88)	(5.259)	(9.142)
Net Debt to Assets	-10.09	-13.39	-10.44	-0.942	-9.397
	(6.369)	(7.115)	(13.36)	(5.046)	(9.023)
Return on Capital	0.0104	0.0335	0.0759	-0.0512	0.148
	(0.0966)	(0.107)	(0.195)	(0.0876)	(0.152)
Tobin's Q	0.303	0.0876	-0.802	0.302	-0.0571
	(0.391)	(0.508)	(1.944)	(0.360)	(0.748)
Constant	-6.567	-4.552	17.25	0.0675	-14.98
	(13.95)	(16.38)	(32.70)	(12.01)	(24.07)
Observations	1498	1260	592	1751	876
Adjusted R^2	-0.273	-0.291	-0.481	-0.384	-0.310

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix B3: Arellano-Bond Regression

This table reports regression estimates of ESG scores on institutional ownership and control variables using the Arellano-Bond estimator for dynamic panel data . The dependent variable is the weighted average category ESG score. Lagged ESG Score is the weighted average category ESG score, Total IO is total institutional ownership, Banks IO is institutional ownership by banks and investment banks, Charity IO is institutional ownership by charitable foundations, Corp. Pension IO is institutional ownership by corporate pension sponsors, FO & Trust IO is institutional ownership by family offices and trusts, Gov. Pension IO is institutional ownership by government pension sponsors, Hedge Fund IO is institutional ownership by hedge fund managers, Insurance co. IO is institutional ownership by insurance companies, Inv. Manager IO is institutional ownership by investment managers, VC & PE IO is institutional ownership by venture capital and private equity firms, total assets is the natural logarithm of total assets in USDm, asset tangibility is tangible book value divided by total assets, Tobin's Q is net debt plus market capitalization divided by total assets. All independent variables are lagged by one period. The data are from Refinitiv Eikon and S&P Capital IQ and are obtained for the years 2011-2021.

Panel A:	Weighted Average Category ESG Score				
	(1)	(2)	(3)	(4)	(5)
Lagged ESG Score	0.00268	-0.0805	0.126	-0.294***	-0.0378
	(0.0743)	(0.0781)	(0.146)	(0.108)	(0.0933)
Total IO	0.0637				
	(0.0455)				
Banks IO		0.117			
		(0.203)			
Charity IO			0.284		
			(0.353)		
Corp. Pension IO				0.649	
				(0.905)	
FO & Trust IO					-0.225
					(0.427)
Total Assets	7.289**	6.602	1.848	5.141	3.578
	(3.130)	(4.434)	(5.721)	(7.780)	(8.702)
Asset Tangibility	1.338	1.146	16.26	-26.11	-11.92
	(7.888)	(9.377)	(26.04)	(17.58)	(21.62)
Net Debt to Assets	3.578	4.306	23.32	28.53**	12.23
	(6.842)	(8.587)	(35.34)	(14.34)	(19.21)
Return on Capital	-0.00930	0.0303	-0.178	0.400	0.626**
	(0.106)	(0.139)	(1.041)	(0.314)	(0.289)
Tobin's Q	0.254	-0.0555	-4.587	1.600	-3.108*
	(0.540)	(0.487)	(4.006)	(1.963)	(1.618)
Constant	-11.15	1.329	27.69	20.28	27.87
	(24.12)	(35.75)	(46.64)	(66.30)	(73.80)
Observations	977	505	204	257	405

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B:	Weighted Average Category ESG Score				
	(1)	(2)	(3)	(4)	(5)
Lagged ESG Score	-0.0156	0.00817	0.0327	0.00276	0.0175
	(0.0740)	(0.0687)	(0.106)	(0.0740)	(0.0809)
Gov. Pension IO	-0.497				
	(0.685)				
Hedge Fund IO		0.170			
		(0.469)			
Insurance co. IO			-0.743		
			(1.412)		
Inv. Manager IO				0.0533	
				(0.0491)	
VC & PE IO					-0.641
					(1.651)
Total Assets	7.512**	8.314**	-3.277	7.317**	3.961
	(3.327)	(3.687)	(5.865)	(3.126)	(5.690)
Asset Tangibility	-3.080	-1.942	6.956	1.277	9.074
	(12.31)	(14.34)	(22.33)	(7.882)	(17.78)
Net Debt to Assets	-0.677	-7.289	31.51*	3.564	4.170
	(9.817)	(10.53)	(18.17)	(6.848)	(13.16)
Return on Capital	0.0388	0.0690	0.215	-0.0100	0.390**
	(0.116)	(0.126)	(0.219)	(0.106)	(0.177)
Tobin's Q	0.180	-0.279	-5.781	0.261	-1.095
	(0.556)	(0.626)	(3.704)	(0.541)	(1.110)
Constant	-5.719	-13.70	83.30*	-10.49	15.46
	(26.20)	(30.05)	(49.35)	(24.16)	(47.25)
Observations	924	776	326	977	552

Standard errors in parentheses
Source: Refinitiv Eikon ASSET4, S&P Capital IQ
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$