ESG Ratings and Investment Returns at the Country Level: Does Higher mean Better?

Abstract

We examine whether U.S. dollar-based investors can do better investing in highly rated ESG countries than in medium and lower rated ESG countries using both cross sectional and panel data estimations. In general, we find evidence that investment in ESG_{Low} scoring countries leads to better returns than investing in ESG_{High} scoring countries which in turn provide better returns than investing in ESG_{Medium} scoring countries. We also examine the issue of risk-adjusted excess returns using a variety of country risk-adjusted returns including the country-level Sharpe ratio, Treynor ratio and Alpha. In general, we find that ESG_{Low} countries still outperform ESG_{High} countries who in turn outperform ESG_{Medium} countries. We also find that countries that have improved their ESG scores over the period 2000-21 have tended to provide the best returns for international investors and this group is mainly made up of ESG_{Low} countries, although this is likely driven mainly by their higher economic growth rates. Finally, we examine the performance within the groups of ESG_{High}, ESG_{Medium} and $ESG_{Low.}$ In each case, we find that there is a positive relationship of returns with ESG scores within the group and that GDP per capita in levels has a negative impact on returns using both market exchange rate and purchasing power parity measures.

Keywords: ESG investing, country ESG ratings, Sharpe ratio, Treynor ratio, international CAPM

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1. Introduction

The issue of ESG investing has grown in importance from both an academic and practical perspective as increasing amounts of funds are funnelled into different types of ESG investments on both the equity and bond sides. While there has been a lot of research into whether investing in higher ESG-rated companies generates excess risk-adjusted returns, that is, if there is an ESG Alpha for companies, see for example, Asteriou *et al.* (2023), Zhang *et al*. (2022), Cornell (2021) and Belghitar *et al*. (2014) there has been little research into whether country-level ESG ratings may matter to stock market investors that invest with ESG related motives. One paper that looks at ESG ratings daily returns, and co-movements based on 19 developed countries and 19 developing economies, is Kilic *et al.* (2022) who find positive co-movements between the stock returns and ESG scores in developing countries and negative co-movements in developed countries. In this paper, we address this significant gap in the literature. To do this, we use a unique country-level dataset for the period 2000 to 2021 covering some 47 countries looking at their dollar-based returns. We look not only at the relationship between nominal dollar returns and the countries ESG ratings, but also at country level risk-adjusted returns using the country level Sharpe, Treynor and Alpha measures. In addition, we examine the overall improvement in countries ESG scores over the period 2000-21 with the aim of checking whether this can be more significant for international investors than the ESG scores themselves.

The linkage between ESG country scores and investor returns is of particular interest to institutional investors such as sovereign wealth funds, mutual funds, pension funds insurance companies and hedge funds especially those that have ESG concerns as part of their investment mandates. International investors seek to reap the benefits of international portfolio diversification, and some have explicit ESG considerations in their mandates. There is no particular reason why only companies below a certain ESG score may be excluded from consideration for investment, there is also the possibility that countries below a certain ESG score may be excluded from consideration for investment. In addition, some multinational companies may not be prepared to invest in countries below a certain ESG score as it could adversely affect their reputation with consumers of their products and services in some developed countries. However, it may also be the case that some multinational companies will avoid placing certain activities that pollute in ESG_{High} countries and instead locate them in countries with ESG_{Low} ratings.

We argue at the theoretical level that investing in ESG_{Low} countries might lead to higher or lower investment returns than investing in ESG_{High} countries. For example, investing in ESG_{Low} countries might lead to lower regulatory and compliance costs which improves investors' returns. On the other hand, investment in ESG_{Low} countries could harm companies' if it leads to consumer backlash against their products and services, lowering their revenues and profits. An interesting question we look at is; what happens to investor returns in ESG_{Medium} score countries? Do they perform better, similar or worse to investments in ESG_{Low} and ESG_{High} countries? Since these questions cannot be easily settled at the theoretical level, the main focus of this study is to look at the issue from an empirical viewpoint.

The contributions of this paper are several-fold (i) This is the first paper to look at the linkage between ESG country level scores and country level investment returns, the existing literature is focussed on the relationship between ESG company scores and investor returns. (ii) We examine the linkage between ESG country scores covering an extensive rather than short period of time and using a comprehensive dataset covering 47 countries which includes a mix of developed and developing countries. (iii) We examine both nominal dollar returns and risk-adjusted returns using a variety of risk-adjusted return measures focussing on the impact of both ESG country-level scores and changes in country ESG scores over time.

The paper is set out as follows. Section 2 provides our Analytical Framework based on the International Capital Asset Pricing Model. Section 3 provides a literature review that examines the theory concerning country ESG investing and country-level returns. Section 4 outlines our dataset sources and Section 5 presents the methodology and regressions to be employed using both cross sectional and panel data techniques. Section 6 sets out our empirical findings concerning the linkage between ESG country scores and changes in ESG scores, while Section 7 concludes.

2. Analytical Framework: the International Capital Asset Pricing Model

A useful starting point for thinking about how ESG score might influence expected returns is the international version of the Capital Asset pricing model. Indeed, Berk and van Binsbergen (2016) argue that in practice the CAPM model is the one that investors are most likely to use when making their decisions concerning their portfolio of investments. There is also recent empirical support for the international version of the CAPM by Curran and Velic (2020).[1]

The international CAPM is given by equation (1)

$$R_{ci} = R_f + \beta_{ci}[R_m - R_f] \quad (1)$$

where R_{ci} is the return on a portfolio of securities in country *i*, and β_{ci} is the beta of country *i,* which is equal to the covariance of country *i* returns with the world market return divided by the variance of returns in the world market, R_m is the rate of return on the world market and R_f is the risk-free rate of interest. A significant advantage of using the international version of the CAPM model, is that it can be used to examine risk-adjusted returns on a country-by-country basis to generate each country's Sharpe and Treynor ratios and enables the computation of a country-level Alpha, all three of these financial indices can then be used as proxies for risk-adjusted returns for the country in question. It should be noted that the CAPM model works best for portfolios of securities rather than individual securities, see Fama and French (2004). As such, it is particularly useful as a basis for measuring country risk in our study, in which we use the dollar-based equity returns of a large portfolio of securities in each country.

A commonly used metric for measuring fund managers risk-adjusted performance is the Sharpe ratio (which can be used to analyse the risk-adjusted performance of a country) as set out in equation (2):

$$SR_{ci} = \frac{R_{ci} - R_f}{\sigma_{ci}} \quad (2)$$

where SR_{ci} is the Sharpe ratio of country *i*, R_{Ci} is the return on investing in a portfolio of equities in the country, R_f is the risk-free rate of return and σ_{ci} is the standard deviation of the portfolio of equities in country *i*. The idea of the Sharpe ratio, is that the equity premium in the numerator needs to be compared to the country's portfolio risk in the denominator. A country with a high Sharpe ratio can be said to be doing relatively well on a risk-adjusted basis compared to a country with a lower Sharpe ratio.

Another widely used risk-adjusted measure is the Treynor ratio as proposed by Treynor (1965), while this has traditionally been used to analyse fund managers' performance, it can also be applied to countries. At the country level, the Treynor ratio looks at the equity risk premium from investing in a portfolio of stocks in country *i,* but rather than divide by the standard deviation of returns as in the Sharpe ratio, is divided by the country's systematic risk as given by its country beta as given in equation (3).

$$TR_{ci} = \frac{R_{ci} - R_f}{\beta_{ci}} \quad (3)$$

where $TR_{ci}i$ is the Treynor ratio of country i, R_{Ci} is the return on investing in a portfolio of equities in the country, R_f is the risk-free rate of return and β_{ci} is the beta of the portfolio of equities in country i. A country with a high Treynor ratio can be said to be doing relatively well on a risk-adjusted basis compared to a country with a lower Treynor ratio.

A final risk-adjusted country performance metric that we can use is to calculate the country's Alpha, a measure first outlined by Jensen (1968) to evaluate fund managers given by equation (4):

$$\alpha_{ci} = R_{ci} - [R_f + \beta_{ci}(R_m - R_f)] \quad (4)$$

Here the Alpha of country i, α_{ci}, is simply the realized return of investing in a portfolio of shares in country i (R_{ci}) less the expected rate of return in country i based on the CAPM model. If Jensen's Alpha for a country is positive then the portfolio return in that country are more than one might have expected from the international CAPM based on the country's beta. While if the country's Alpha is negative then the portfolios returns are lower than the CAPM risk profile of the country would have expected.

3. Literature Review

The importance of ESG investing has grown in recent years and most of the literature is based upon the investor's potential benefits. To put it simply, it examines whether investing in higher ESG-rated companies leads to better nominal and/or risk-adjusted returns than investing in lower ESG-rated company securities. The literature is quite mixed; in the case of bonds, some evidence supports the notion that companies with higher ESG ratings can borrow from international capital markets at a lower yield than those with lower ESG ratings. For instance, Crifo *et al.* (2017) look at how country ESG scores affect the sovereign borrowing costs of 23 OECD countries over the period 2007 to 2012 and find that a higher ESG score significantly lowers government borrowing costs. One possible mechanism is that a high ESG score shows that the country is responsible for its risk management strategies and, therefore, less likely to default. A second possible mechanism is that international investors are "values-oriented" and, therefore, willing to accept a lower yield on higher ESG-scoring countries. Finally, the fiscal fatigue model

suggests that countries with higher ESG scores will have more fiscal space[1] since a higher ESG score reflects greater social cohesion and inter-generational fairness, meaning that fiscal deficits are kept under greater control, helping to lower borrowing costs.

Investors can be interested in ESG investments not only for returns, but also for genuine concerns about the three pillars of environmental, social and governance but these concerns with regard to each of these three pillars will vary significantly between investors. This could mean investors exclude investments in certain companies, but also certain countries based on a mixture of company and country level ESG scores. From an investors' point of view, investment in ESG_{High} countries and avoiding investments in ESG_{Low} countries could be part of a risk management strategy designed to improve expected investment returns as suggested by Ararat and Suel (2011), such risk-management could involve the following strategy (i) non-investible countries which would involve screening out investment in some countries based on poor performance in the overall ESG ratings, (ii) non investible countries which may pass as investible based on their overall ESG score but are excluded because of an insufficient score in one or two of the three pillars, (iii) investment in countries that are above a certain overall ESG score (iv) investment in countries that fail to meet the overall ESG score requirement but have scores in one of two of the pillars that still qualify them for investment purposes, (v) there could also be overall portfolio considerations that lead investors to allocate their funds to countries with differing ESG scores to achieve their desired risk-return targets having considered the differing correlations of countries in their portfolios. In this latter case, countries with relatively low ESG scores but above a required threshold level can still play an important role in improving investors' portfolios by placing them on a superior international Capital Market Line (CML), although not on one tangential to the international portfolio efficiency frontier due to the exclusion of countries below a threshold ESG score.

At the theoretical level, international investors pursuing ESG strategies that exclude securities from certain ESG_{Low} countries from their international portfolios will have lower risk-adjusted returns than investors who include the full range of country securities when constructing their portfolios. In their study Pedersen *et al.* (2021) attempt to quantify this cost using an unconstrained efficiency frontier with an ESG constrained efficiency frontier. This means the CML of the unconstrained portfolio can be compared with the CML from an ESG-constrained portfolio made up of only investible ESG securities (in our case countries). The result is that the

[1] Fiscal space is defined as the gap between the current debt and a debt limit at which debt dynamics become uncontrollable, see Ghosh *et al.* (2013)

Sharpe ratio of the unconstrained efficiency frontier can be compared to the Sharpe ratio of an ESG-constrained frontier. From this type of approach, it is evident that the higher the ESG threshold that is applied at the country-level, the lower will be the Sharpe ratio that is obtainable to the international investor. This result is also clear from the study of Chang and Witte (2010) who emphasise that ESG investing will result in a lower Sharpe ratio and lower returns than is obtainable using an unconstrained investment approach.

More recently, Pástor *et al.* (2021) show how ESG securities can be integrated into market equilibrium models. Their model is built upon a three-fund separation model with a risk-free security, the traditional market portfolio and an ESG portfolio. We can apply their model and logic to a country context rather than a firm context, as done in the paper. If we do this, then ESG_{High} countries generate positive global externalities, while ESG_{Low} countries would generate negative global externalities. Investors who differ in their ESG preferences would gain utility from holding ESG_{High} country securities and negative utility from ESG_{Low} securities. In such circumstances, a key prediction is that investors are willing to pay more for ESG_{High} country securities and the ESG_{High} countries would have negative CAPM Alphas. On the other hand, ESG_{Low} countries securities will have positive CAPM Alphas. In other words, investors with higher ESG preferences can expect lower risk-adjusted returns than those with lower ESG preferences. Another key prediction from the Pástor *et al.* paper is that deviations of portfolios from a combination of the market portfolio and the risk-free security crucially depend upon their being differences in ESG preferences among investors. If there are identical ESG preferences, then the standard CAPM result of an investment in the risk-free security and the market portfolio being optimal still holds. Interestingly, our basic dataset reported in **Table 3**, shows that ESG_{High} countries have on average a negative Alpha and ESG_{Low} countries on average have a positive Alpha as predicted by the Pástor *et al.* model.

In an interesting study, Avramov *et al.* (2022) derive a CAPM model which allows for ESG uncertainty to affect the calculations of both Alpha and Beta. In their model, individual stock returns have a random component which is positive for ESG_{High} securities and negative for ESG_{Low} securities (in their study they are referred to as Green and Brown securities respectively). Rather than the traditional Alpha and Beta from the CAPM model, they show that ESG uncertainty (proxied, for example, by differing scores from different rating agencies) needs to be replaced by an effective Beta and an effective Alpha. The effective Beta calculation is based on the ESG-adjusted returns and may rise or fall compared to the traditional Beta. They also demonstrate the effective Alpha will fall with a rise in ESG uncertainty due to the non-pecuniary benefits that

investors have in holding what are perceived to be ESG_{High} securities. Their calibration exercise shows that increased ESG uncertainty will worsen the risk-return trade-off.

In practice, however, it is less clear whether an individual country having a higher ESG score will yield investors a better return than a country having a lower ESG score. Consider firstly, why an ESG_{High} country score could lead to better returns for investors. Countries with high ESG scores will tend to have well developed capital markets and this can mean companies are able to borrow funds more cheaply, increase their leverage and therefore expected returns for shareholders. In their study, Eichler and Maltritz (2013) argue that improved governance will lower a country's sovereign bond yield and therefore in general reduced the cost of debt and improve the returns to shareholders in that country. Countries with high ESG scores are likely to also have good ESG practices embedded into their companies that will then be less exposed to environmental, social, and governance risks improving companies' performance, and this can lead to both lower risk and higher returns for investors. Companies based in ESG_{High} countries may also be more resilient to shocks and disruptions to their businesses with a lower volatility of their real GDP's, lower inflation and higher investment, leading to greater profitability, resulting in better returns for shareholders. Also, when it comes to governance, there is good reason to believe that companies based in ESG_{High} countries will tend to have better governed companies reducing the risk of corruption and the diversion of shareholder funds into less productive investments, which will both increase the returns for shareholders and reduce the risk of bankruptcy compared to companies based in ESG_{Low} countries. Another interesting possibility is that as a country improves its ESG rating then this might lead to that country attracting greater FDI see, Fiaschi *et al*. (2017) and portfolio flows and so increase shareholder returns. ESG_{High} countries are also likely to be more transparent than ESG_{Low} countries which is also likely to lead to higher prospective and actual investment and better shareholder returns. Finally, ESG_{High} countries may be less exposed to crises than ESG_{Low} countries, which will lower the risk of company bankruptcies and therefore lead to better returns for shareholders in ESG_{High} countries.

Against this, companies incorporated in ESG_{High} countries may on average have lower required rates of return on equities than their equivalents in ESG_{Low} countries due to there being perceptions of less risk of bankruptcy due to better management, access to greater liquidity and superior monitoring by institutional investors, lowering the equity risk premium and shareholders required rate of return. Also, to the extent that ESG_{High} countries tend to be countries with higher levels of GDP, then this could mean that there will be lower expected returns for shareholders, as growth rates of developed nations are, on average, likely to be lower than those for developing countries. This means that there are better potential returns for shareholders in ESG_{Low} countries.

In addition, companies in ESG_{High} countries will face additional regulatory and environmental standards which can limit their revenues, raise their costs and therefore lower profitability and shareholder returns compared to companies in ESG_{Low} countries. Companies based in ESG_{Low} countries are likely to have lower production costs because of lower environmental compliance costs and lower wages. Also, ESG_{Low} countries are more likely to be classified as labour abundant countries, resulting in a higher marginal product of capital and therefore higher return on capital employed resulting in better returns for shareholders compared to ESG_{High} countries[2]. Another possibility is that countries with ESG_{Low} scores may have undervalued stocks due to the negative perception of these countries by international investors while those in ESG_{High} countries are overvalued. This means that investing in ESG_{Low} countries gives investors the potential for better returns than investments in ESG_{High} countries.

4. Data Sources and Descriptive Statistics

Our dataset comes from various sources, the data for our aggregate ESG score for our 47 comes from Beyond Ratings which provides the longest and most extensive record of ESG scores that is available at the country level. For each of our 47 countries we have the overall ESG score for each year for the period 2000 to 2021, the Beyond Ratings ESG country scores are used by investors, asset managers, and other stakeholders to assess the ESG performance of countries and to make investment decisions. Governments and businesses also use the ratings to track their progress on ESG initiatives[3].

For our dollar-based country returns data, we use the annual dollar-based gross return data for 47 developed and developing countries that are available from the MSCI series. The gross return data covers large, medium and small stocks in each of the countries, and the U.S. dollar-based indices for each of the countries include not only capital appreciation/depreciation but also dividends and allow for reinvestment of the dividends over time. Furthermore, since the series is expressed in dollar returns, the data allows for depreciations and appreciations of the local currencies against the US dollar. For each country, we calculated the average annualized return over the 22-year period as well as the annualized return for each individual year and the standard deviation of the annualized returns for use in the calculation of the Beta, Sharpe, Treynor and Alpha for each country. We used the MSCI gross dollar-based World Index to calculate the beta

[2] This would of course require that trade has not resulted in the factor price equalization theorem coming fully into play.

[3] Environmental factors include greenhouse gas emissions, air quality, water quality, and waste management. Social factors include human rights, labour standards, and social inclusion. Governance factors include corruption, rule of law, and transparency.

for each country, and the risk-free rate of interest was calculated by using the average three-month US Treasury bill rate which averages out at 1.536% over the entire sample period. Since the World index generated an average annual dollar return of 6.271%, the market-based risk premium was calculated as 4.735% over the 22-year period. As well as the *Beta* for each country, we calculated each country's *Sharpe* and *Treynor ratios* and the country-level *Alpha* to give us alternative measures of risk-adjusted returns. The results of our calculations are set out in **Table 1**.

To control for countries differing economic characteristics we include two control variables. The first is the economic growth rate and the expectation is that a higher growth rate will lead to higher profitability of companies and lower risks and therefore better shareholder returns on both a nominal and risk-adjusted basis. We also include the inflation rate; the expected sign is negative for shareholders in that higher inflation increases the required rate of return on equities and also add to risks. In addition, higher inflation can be associated with increased uncertainty for households and companies leading to lower aggregate demand adversely affecting companies' profitability and shareholders' returns. The data for inflation and GDP growth rates were obtained from the IMF *International Financial Statistics* database.

In **Table 1,** we can see that Switzerland has the highest ESG score average of the period 2000-2021, with an average score of 89.199, while the country with the lowest average ESG score is Pakistan, with an average score of 32.680. In terms of dollar returns, including reinvestment of dividends, the best performing market is the Czech Republic with 13.353% per annum, and by far the worst, due mainly to the implosion of value in its banking and financial sector is Greece with a negative annualized yield of 15.357%. The country with the highest alpha is the Czech Republic, which has a positive alpha of 7.947, while the country with the largest negative alpha is Greece, with –25.077. When looking at country-based *Betas*, the highest is Argentina, at 1.870, and the lowest is Jordan, at 0.410. Denmark has the highest *Sharpe ratio* at 0.416, while not surprisingly, Greece has the worst at –0.405. Using the *Treynor ratio*, the Czech Republic comes out on top with 14.459, and Greece comes out worst with –9.792. China has the highest annual growth rate of 8.665%, while the Czech Republic grew at only 0.099 % on average. Concerning inflation, Argentina is by far the worst, with an annual average of 18.418%, while Japan averages a mere 0.084%. In some of our regressions, we also use GDP per capita at market prices and GDP per capita based on purchasing power parity.

Table 1 Descriptive Statistics

Country	ESG	Return	Beta	Sharpe	Treynor	Alpha	Growth	Inflation
Argentina	64.988	3.133	1.870	0.033	0.854	-7.255	1.824	18.418
Australia	78.400	8.946	1.087	0.291	6.816	2.263	2.747	2.569
Austria	83.560	7.572	1.313	0.184	4.597	-0.181	1.388	1.936
Belgium	81.560	2.934	1.255	0.050	1.114	-4.544	1.599	1.933
Brazil	57.023	6.412	1.624	0.099	3.003	-2.813	2.232	6.302
Canada	78.498	7.554	1.121	0.240	5.370	0.712	1.942	1.940
Chile	66.017	4.199	1.092	0.079	2.440	-2.505	3.704	3.704
China	62.493	6.935	1.491	0.142	3.621	-1.662	8.665	2.183
Columbia	53.282	12.497	0.870	0.236	12.594	6.840	3.629	4.820
Czech Rep	75.486	13.353	0.817	0.368	14.459	7.947	0.099	2.352
Denmark	85.204	12.173	1.191	0.416	8.932	4.998	1.390	1.617
Egypt	46.785	6.778	1.566	0.095	3.348	-2.171	4.306	9.585
Finland	81.432	1.450	1.143	-0.003	-0.075	-5.500	1.530	1.475
France	80.152	5.039	1.099	0.159	3.186	-1.703	1.266	1.390
Germany	82.554	4.371	1.279	0.106	2.216	-3.223	1.191	1.473
Greece	70.252	-15.367	1.726	-0.405	-9.792	-25.077	0.289	1.741
Hong Kong	79.618	5.730	1.124	0.166	3.732	-1.127	0.175	1.495
Hungary	71.089	6.550	1.087	0.140	4.612	-0.134	2.545	4.298
India	33.451	9.927	1.511	0.218	5.555	1.238	5.962	6.135
Indonesia	45.765	9.274	1.322	0.177	5.853	1.478	4.856	6.158
Ireland	87.616	0.704	1.209	-0.029	-0.688	-6.557	5.376	1.779
Israel	73.234	4.410	0.869	0.110	3.307	-1.241	3.790	1.435
Italy	77.421	2.106	1.056	0.025	0.540	-4.431	0.266	1.644
Japan	77.284	2.124	0.837	0.031	0.702	-3.376	0.634	0.084
Jordan	47.965	0.823	0.410	-0.023	-1.740	-2.653	4.074	3.037
Korea	73.875	8.275	1.012	0.208	6.656	1.945	3.906	2.336
Malaysia	63.935	5.158	0.774	0.160	4.682	-0.041	4.497	2.026
Mexico	62.696	7.241	0.975	0.216	5.849	1.087	1.737	4.584
Morocco	40.286	6.065	0.643	0.189	7.042	1.484	4.543	1.484
Netherlands	83.597	7.002	1.171	0.238	4.669	-0.077	1.463	1.881
New Zealand	78.624	8.436	0.934	0.272	7.390	2.479	2.693	2.192
Norway	86.210	7.920	1.316	0.202	4.852	0.154	1.643	2.123
Pakistan	32.680	3.837	0.735	0.046	3.131	-1.179	4.133	7.926
Peru	50.626	12.798	0.923	0.279	12.195	6.889	4.446	2.757
Philippines	42.456	5.245	1.307	0.115	2.837	-2.481	4.802	3.776
Poland	68.619	3.568	1.123	0.067	1.809	-3.288	3.727	2.709
Portugal	73.148	1.035	1.121	-0.019	-0.447	-5.807	0.699	1.767
Russia	62.033	12.134	1.242	0.243	8.535	4.718	3.512	9.926
Singapore	88.526	4.447	1.211	0.104	2.404	-2.822	4.869	1.524
South Africa	54.696	7.212	0.912	0.217	6.221	1.356	2.366	5.172
Spain	76.162	3.373	1.098	0.071	1.673	-3.361	1.418	2.033
Sweden	84.364	6.689	1.479	0.171	3.483	-1.852	2.255	1.302
Switzerland	89.199	8.067	0.878	0.370	7.438	2.373	1.849	0.439
Thailand	57.255	8.275	1.274	0.158	5.289	0.706	3.404	1.854
Turkey	64.513	-2.162	1.815	-0.072	-2.037	-12.292	5.090	16.271
UK	80.026	3.207	1.017	0.081	1.643	-3.145	1.499	1.980
US	83.727	7.412	0.943	0.323	6.228	1.409	2.040	2.243

In **Table 2** we split our sample of countries into three approximately equal groups. The ESG_{High} group is made up of 16 countries the ESG_{Medium} group is made up of 15 Countries and the ESG_{Low} countries is made up of 16 countries. A cursory analysis shows that the ESG_{High} group of countries is made up predominately of developed nations. The ESG_{Medium} group of countries is a mixture of mainly developed and middle-income countries. Finally, the ESG_{Low} group of countries is made up almost entirely of developing countries.

Table 2: Classification of Countries based on average ESG Score

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ESG_{High}		**ESG_{Medium}**		**ESG_{Low}**	
Country	**ESG Score**	**Country**	**ESG Score**	**Country**	**ESG Score**
Switzerland	89.20	Canada	78.50	Malaysia	63.93
Singapore	88.53	Australia	78.40	Mexico	62.70
Ireland	87.62	Italy	77.42	China	62.49
Norway	86.21	Japan	77.28	Russia	62.03
Denmark	85.20	Spain	76.16	Thailand	57.26
Sweden	84.36	Czech Rep	75.49	Brazil	57.02
US	83.73	Korea	73.88	South Africa	54.70
Netherlands	83.60	Israel	73.23	Columbia	53.28
Austria	83.56	Portugal	73.15	Peru	50.63
Germany	82.55	Hungary	71.09	Jordan	47.97
Belgium	81.56	Greece	70.25	Egypt	46.79
Finland	81.43	Poland	68.62	Indonesia	45.77
France	80.15	Chile	66.02	Philippines	42.46
UK	80.03	Argentina	64.99	Morocco	40.29
Hong Kong	79.62	Turkey	64.51	India	33.45
New Zealand	78.62			Pakistan	32.68

Table 3 Statistics on the ESG High, Medium and Low Groupings 2000-21

	ESG	Return	Beta	Sharpe	Treynor	Alpha	Standard Deviation	Improve
ESG_{High}	83.498	5.822	1.160	0.176	3.820	-1.207	25.625	1.027
ESG_{Medium}	72.976	3.406	1.167	0.090	2.772	-3.339	31.300	1.035
ESG_{Low}	50.839	7.538	1.099	0.161	5.501	0.800	38.076	1.209

Table 3 depicts some very interesting summary statistics of the three groups of countries, the average score of the ESG_{High} group is 83.498, while for the ESG_{Medium} group it is 72.976 but for the ESG_{Low} group there is a much more significant gap, with the average ESG score being 50.839. In terms of returns, it is clear that the ESG_{Low} group have significantly higher average return of 7.538% per annum, followed by the ESG_{High} group at 5.822% and the ESG medium group at 3.406%. As such, the ESG_{Low} group of countries seem to have premium of 1.716% over ESG_{High} countries and the ESG_{Low} group has a very significant premium of 4.132% over the ESG_{Medium} group. The beta of the ESG_{Low} countries at 1.099 is also lower than that of the ESG_{High} countries at 1.16. Interestingly, however, when we look at risk-adjusted returns, the ESG_{High} countries have a slightly higher Sharpe ratio at 0.176 than the ESG_{Low} countries whose Sharpe ratio is 0.161 with the ESG_{Medium} ratio being 0.09. However, using the Treynor ratio the ESG_{Low} countries perform best with an average Treynor ratio of 5.501 while for ESG_{High} countries it is 3.82 with the ESG_{Medium} having a Treynor ratio of 2.772. The ESG_{Low} countries are the only one to have a positive Alpha of 0.8, while the ESG_{High} countries have a negative Alpha of -1.207 and once again the ESG_{Medium} countries fare worst with a negative Alpha of -3.339. When it comes to standard deviations, the ESG_{High} countries outperform by some margin the ESG_{Medium} and ESG_{Low} groups. The Improve variable is simply the ratio of the 2021 ESG score of the group of countries to the year 2000 score, this clearly shows the ESG_{Low} countries have improved their ESG scores by an average of 20.9%, while the ESG_{Medium} group have improved by an average of 3.5% and the ESG_{High} by 2.7%.

It is interesting to observe that membership of the ESG_{High}, ESG_{Medium}, and ESG_{Low} groupings is largely determined by the average per capita GDP measured at market prices over the period 2000-2021, as depicted in **Figure 1**, which uses the two-letter internet country code to identify each country. By contrast, as shown in **Figure 2**, there is no clear-cut relationship between dollar-based returns (annual averages 2000-2021) and average ESG scores.

Figure 1: Dollar GDP per capita (Vertical) and ESG scores (Horizontal) averages 2000-2021

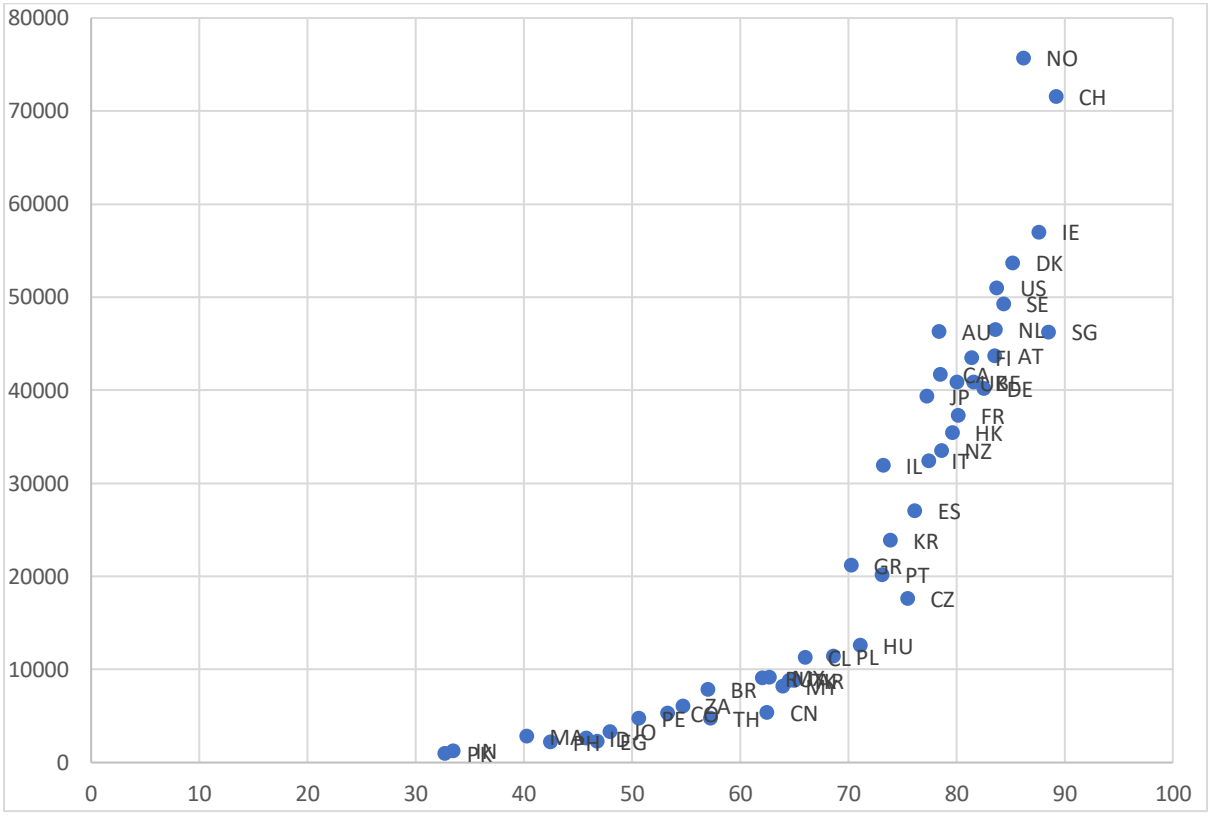
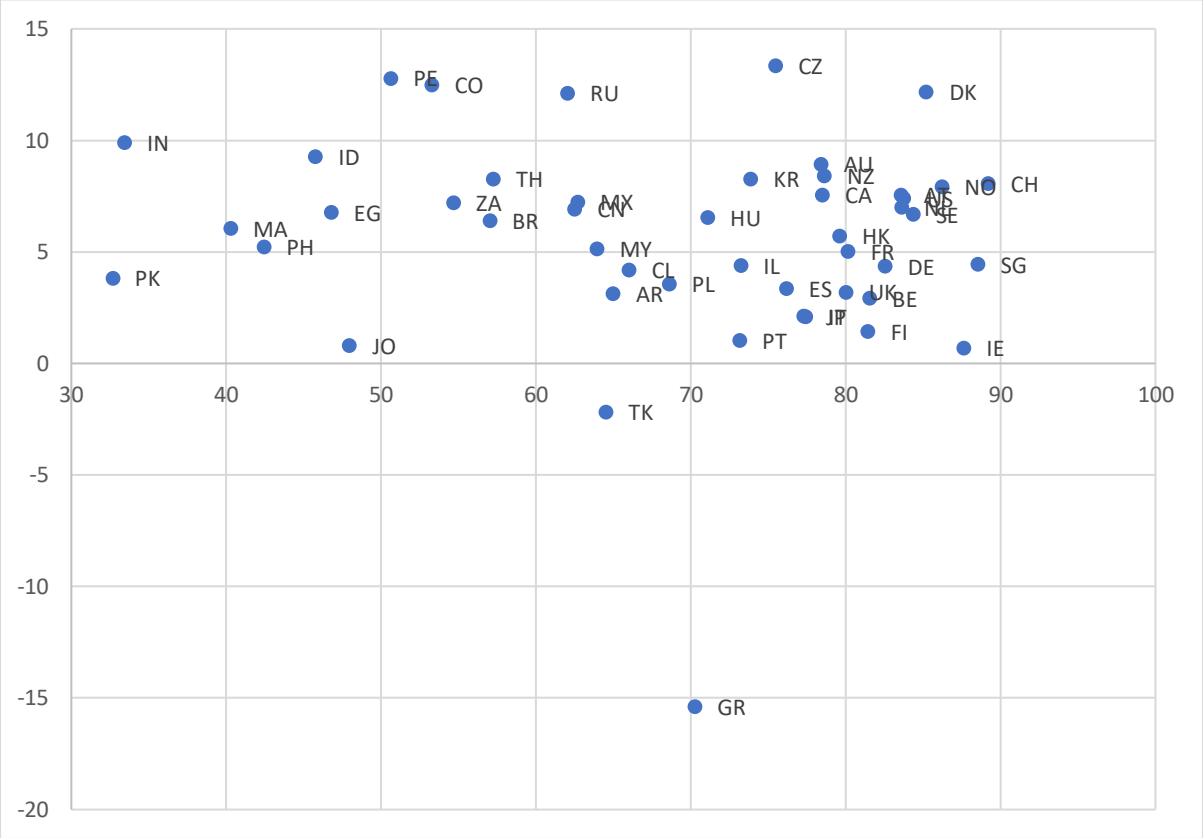


Figure 2: Dollar-based returns (Vertical) and ESG scores (Horizontal) averages 2000-2021



5. Methodology and Regressions

5.1 Cross Sectional Regression Analysis

As a first step, we use the cross-sectional data described above to estimate the effects of the ESG score (ESG_i) on the annual return (R_i) for each of the 47 countries in our sample. The first basic model we estimate is the following:

$$R_i = \alpha + \gamma ESG_i + u_i, \quad i = 1,2,\dots,47 \qquad (5)$$

Next, we add to this model some additional explanatory variables to standardise the results that include macro-fundamentals (average GDP growth, average inflation rates, the log of nominal GDP per capita, and the log of GDP per capita in PPP terms) as well as the financial indices Betas, Alphas, and the Sharpe and Treynor ratios. Thus, the estimated models can be summarised as follows:

$$R_i = \alpha + \gamma_1 ESG_i + \gamma_2 GDPGR_i + \gamma_3 INF_i + \gamma_4 FI_i + u_i \quad (6a)$$

$$R_i = \alpha + \gamma_1 ESG_i + \gamma_2 GDPGR_i + \gamma_3 INF_i + \gamma_4 LPCM_i + \gamma_5 FI_i + u_i \quad (6b)$$

$$R_i = \alpha + \gamma_1 ESG_i + \gamma_2 GDPGR_i + \gamma_3 INF_i + \gamma_4 LPCP_i + \gamma_5 FI_i + u_i \quad (6c)$$

where $GDPGR_i$ denotes the average real GDP growth rate, INF_i the average inflation rates, $LPCM_i$ the log of nominal *GDP* per capita at market prices, $LPCP_i$ the log of GDP per capita in PPP terms, and FI_i denotes the financial index where we add the Sharpe, Treynor and Alpha indices one by one.

Another important aspect of our research is to examine the improvement on ESG scores rather than the average ESG score and how these can affect the annual returns of the respective countries. For this reason, we re-estimate the above models but now instead of the average ESG score, we use the improvement in the ESG (denoted by IMP_i) for each country. The regression models are given below:

$$R_i = \alpha + \delta IMP_i + u_i \quad (7)$$

$$R_i = \alpha + \delta_1 IMP_i + \delta_2 GDPGR_i + \delta_3 INF_i + \delta_4 FI_i + u_i \quad (8a)$$

$$R_i = \alpha + \delta_1 IMP_i + \delta_2 GDPGR_i + \delta_3 INF_i + \delta_4 LPCM_i + \delta_5 FI_i + u_i \quad (8b)$$

$$R_i = \alpha + \delta_1 IMP_i + \delta_2 GDPGR_i + \delta_3 INF_i + \delta_4 LPCP_i + \delta_5 FI_i + u_i \quad (8c)$$

where all remaining variables are defined as before.

As an additional step, we proceed further by classifying the countries in our sample as ESG_{High} (contains the 16 countries with the highest ESG score), ESG_{Medium} (contains the 15 countries in the middle of the sample) and ESG_{Low} countries (contains the 16 countries with the lowest ESG score). The countries in the different groups are shown in **Table 2**.[4] So, our next regression models examine the possible effect that different levels of ESG might have to annual returns. The regression model is given below:

$$R_i = \lambda_1 H_i + \lambda_2 M_i + \lambda_3 L_i + \lambda_4 (H_i * ESG_i) + \lambda_5 (M_i * ESG_i) + \lambda_6 (L_i * ESG_i) + u_i \quad (9)$$

[4] The decision to divide the countries to the three groups was based on obtaining fairly three equal samples for each subgroup, as explained previously. However, we have tried alternative division methods (for example splitting the countries to High=ESG score>75; Medium=ESG score <75 and >60; Low=ESG score <60), and the obtained results were not significantly different from the ones presented in the paper. Tables and results are not reported here for economy of space, and they are available from authors upon request. In addition, in the robustness section 6.3 we report how the use of threshold breaks did not significantly affect our results.

where H_i is a dummy variable for ESG_{High} countries, similarly, M_i is a dummy variable for ESG_{Medium}, and L_i is a dummy variable for ESG_{Low} countries. The dummy takes the value of 1 if the country belongs to the relevant group and zero otherwise. In equation (9), we use the dummies to examine the slope of the relationship when used multiplicatively with the ESG variable.

Furthermore, alternative models of those given in equations (5) and (6a, 6b and 6c) are also estimated. However, this time changing the dependent variable from annual returns to the respective financial indices (Sharpe ratio, Treynor ratio and Alpha), as in equations (10) and (11):

$$FI_i = a + \delta ESG_i + e_i \tag{10}$$

$$FI_i = a + \delta_1 ESG_i + \delta_2 GDPGR_i + \delta_3 INF_i + e_i \tag{11a}$$
$$FI_i = a + \delta_1 ESG_i + \delta_2 GDPGR_i + \delta_3 INF_i + \delta_4 LPCM_i + e_i \tag{11b}$$
$$FI_i = a + \delta_1 ESG_i + \delta_2 GDPGR_i + \delta_3 INF_i + \delta_4 LPCP_i + e_i \tag{11c}$$

while in a similar fashion as for ESG, we proceed with regression models that check the improvement on ESG (IMP_i) and its effects on the financial indexes. The models are given below:

$$FI_i = a + \theta IMP_i + e_i \tag{12}$$

$$FI_i = \alpha + \theta_1 IMP_i + \theta_2 GDPGR_i + \theta_3 INF_i + e_i \tag{13a}$$
$$FI_i = \alpha + \theta_1 IMP_i + \theta_2 GDPGR_i + \theta_3 INF_i + \theta_4 LPCM_i + e_i \tag{13b}$$
$$FI_i = \alpha + \theta_1 IMP_i + \theta_2 GDPGR_i + \theta_3 INF_i + \theta_4 LPCP_i + e_i \tag{13c}$$

Finally, we also examine the possible effects of the different sub-groups (High, Medium, Low) to the financial indices by estimating the following regression model:

$$FI_i = \tau_1 H_i + \tau_2 M_i + \tau_3 L_i + \tau_4 (H_i * ESG_i) + \tau_5 (M_i * ESG_i) + \tau_6 (L_i * ESG_i) + e_i \tag{14}$$

5.2 Panel Data Regression Analysis

The next step of the empirical methodology employs the full panel information (22 years of annual data for 47 countries), first by estimating the effect of ESG growth on the annual returns for all countries, given in the regression model below:

$$R_{it} = a + \pi ESGGR_{it} + u_{it} \quad (15)$$

where $ESGGR_{it}$ is the percentage change in the ESG score of a country compared to the previous year. We then add the macroeconomic control variables to the same specification. The new equation model is given below:

$$R_{it} = a + \pi_1 ESGGR_{it} + \pi_2 GDPGR_{it} + \pi_3 INF_{it} + u_{it} \quad (16a)$$

$$R_{it} = a + \pi_1 ESGGR_{it} + \pi_2 GDPGR_{it} + \pi_3 INF_{it} + +\pi_4 LPCM_{it} + u_{it} \quad (16b)$$

$$R_{it} = a + \pi_1 ESGGR_{it} + \pi_2 GDPGR_{it} + \pi_3 INF_{it} + +\pi_4 LPCM_{it} + u_{it} \quad (16c)$$

Additionally, as we did with the cross-sectional analysis, we break the sample into ESG_{High}, ESG_{Medium} and ESG_{Low} groups of countries to re-estimate equation (15) for each of the high, medium and low country sub-groups. In addition we also We do this analysis by adding the macroeconomic fundamentals (equation 16) to better standardise the results. The results of all models are presented analytically in the next section.

6 Empirical Results

6.1. Cross Sectional Results

As we can see in **Table 4 (A, B, and C)** we show results of cross-sectional equations (5) and (6) with dollar-based returns as the dependent variable. First, we estimate the model with ESG only as determinant of returns. Then we add the macroeconomic control variables, and then we add the financial ratios. In Table 4A, the macro controls are *GDPGR* and *INF* only, we can see in specification (5) that the ESG country score has a negative coefficient but is not statistically significant. However, if we use the Alpha measure as an explanatory variable, then ESG is positive and significant in specification (4). Alternatively, if we use the Sharpe ratio as an

explanatory variable then the ESG appears to have a significantly negative impact on returns. However, if the Treynor ratio is used the ESG coefficient is not significant, as seen in specifications (7) and (8).

In **Table 4B**, we add also the log of nominal GDP per capita measured at market prices (*LPCM*) and although the coefficient on this variable is persistently negative it is not significant, and the results are very similar to **Table 4A**. In **Table 4C** we show the results again with the log of GDP per capita in PPP terms (*LPCP*), and the results are fairly similar to those reported in **Tables 4A and 4B**), except that ESG plays an even less significant role. In all cases, it is clear that ESG does not play a major role in determining investor dollar-based returns. The coefficients are small in magnitude, and they are rarely statistically significant. The macro controls do not seem significant either except possibly for inflation which is significant in specification (4).

Table 4A: Results of Basic ESG models with INF and GDPGR - equations (5) and (6)
Dependent Variable: RET

	1	2	3	4	5	6	7	8
ESG	-0.0333	-0.0217	-0.000911	0.0301**	-0.0582***	-0.0426**	-0.0009	0.0226
	(0.0448)	(0.0581)	(0.0120)	(0.0129)	(0.0146)	(0.0188)	(0.0154)	(0.0193)
INF		-0.122		0.208***		0.0661		0.0645
		(0.212)		(0.0481)		(0.0691)		(0.0706)
GDPGR		0.382		0.132		0.138		0.264*
		(0.462)		(0.102)		(0.149)		(0.152)
ALP			0.863***	0.891***				
			(0.0355)	(0.0307)				
SHA					31.93***	32.03***		
					(1.636)	(1.661)		
TRE							1.080***	1.084***
							(0.0582)	(0.0576)
Cons	7.931**	6.494	6.845***	3.630***	5.199***	3.489**	1.422	-1.186
	(3.163)	(5.110)	(0.843)	(1.129)	(1.039)	(1.655)	(1.133)	(1.733)
Obs	47	47	47	47	47	47	47	47
R^2	0.012	0.034	0.932	0.954	0.898	0.902	0.888	0.898

Table 4B: Results of Basic ESG models with INF, GDPGR and LPCM - equations (5) and (6)
Dependent Variable: RET

	1	2	3	4	5	6	7	8
ESG	-0.0333	0.0255	-0.000911	0.0602	-0.0582***	0.0582	-0.000927	0.0470
	(0.0448)	(0.260)	(0.0120)	(0.0570)	(0.0146)	(0.0822)	(0.0154)	(0.0855)
INF		-0.135		0.199***		0.0377		0.0575
		(0.226)		(0.0510)		(0.0722)		(0.0753)
GDPGR		0.347		0.110		0.0639		0.246
		(0.502)		(0.111)		(0.160)		(0.166)
LPCM		-0.681		-0.434		-1.454		-0.351
		(3.644)		(0.800)		(1.154)		(1.201)
ALP			0.863***	0.891***				
			(0.0355)	(0.0309)				
SHA					31.93***	32.10***		
					(1.636)	(1.651)		
TRE							1.080***	1.083***
							(0.0582)	(0.0582)
Cons	7.931**	9.954	6.845***	5.835	5.199***	10.87*	1.422	0.597
	(3.163)	(19.22)	(0.843)	(4.223)	(1.039)	(6.086)	(1.133)	(6.352)
Obs	47	47	47	47	47	47	47	47
R^2	0.012	0.035	0.932	0.955	0.898	0.906	0.888	0.898

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

Table 4C: Results of Basic ESG models with INF, GDPGR and LPCP - equations (5) and (6)
Dependent Variable: RET

	1	2	3	4	5	6	7	8
ESG	-0.0333	0.0292	-0.000911	0.114*	0.0748	-0.0378	-0.000927	0.0671
	(0.0448)	(0.279)	(0.0120)	(0.0601)	(0.0762)	(0.0902)	(0.0154)	(0.0918)
INF		-0.121		0.210***		0.0662		0.0653
		(0.215)		(0.0475)		(0.0699)		(0.0713)
GDPGR		0.361		0.0974		0.136		0.246
		(0.480)		(0.104)		(0.155)		(0.158)
LPCP		-1.104		-1.808		-0.105		-0.964
		(5.911)		(1.272)		(1.908)		(1.944)
ALP			0.863***	0.892***				
			(0.0355)	(0.0303)				
SHA					32.05***	32.02***		
					(1.599)	(1.682)		
TRE							1.080***	1.084***
							(0.0582)	(0.0581)
Cons	7.931**	14.13	6.845***	16.14*	13.22***	4.217	1.422	5.484
	(3.163)	(41.24)	(0.843)	(8.872)	(4.624)	(13.32)	(1.133)	(13.57)
Obs	47	47	47	47	47	47	47	47
R^2	0.012	0.035	0.932	0.956	0.905	0.902	0.888	0.898

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

Next, in **Table 5 (A, B and C)** we can see that improvement in ESG score is generally a significant determinant of investment returns, suggesting that countries with improved ESG score positively impact returns. Interestingly, regarding the countries' Alphas we can see a clear positive relation as expected in specifications (3) and (4). The same applies to the Sharpe ratio in specifications (5). The Treynor ratio, which adjusts the market risk premium for the country-level volatility of returns, generates a positive impact. Still, in this case, the improvement of the ESG score does not have any significance. The control variable for inflation is positive and significant in specifications (4) and (6) which is the opposite of what one might expect. However, since the relation is with nominal returns over a prolonged period of 22 years, the positive association is perhaps less surprising. The growth rate of GDP is generally mixed in the regressions with it being significantly negative in specifications (2) and (4) and positive but not significant in the specifications (6) and (8). For reasons of robustness as with **Table 4,** we re-estimate all models with the addition of *LPCM* (**Table 5B**) and LPCP (**Table 5C**), where the results are of the same sign and similar magnitude in all cases, confirming further the findings. *LPCM* is positive and significant at the 1% level in specification (4) but negative at the 5% significance in specification (6). Using *LPCP* it appears to be positive at the 1 % level in specification (4) and negative at the 10% significance in

specification (6). Overall, it seems that the improvement of ESG scores over time has positively influenced investor returns.

Table 5A: Results of Basic ESG improvement with INF and GDPGR - equations (7) and (8)
Dependent Variable: RET

	1	2	3	4	5	6	7	8
IMP	7.196*	10.20	2.586**	5.119***	4.549***	3.811	2.365	1.843
	(4.131)	(7.409)	(1.078)	(1.594)	(1.465)	(2.540)	(1.425)	(2.557)
INF		-0.0733		0.171***		0.127*		0.0355
		(0.194)		(0.0422)		(0.0667)		(0.0660)
GDPGR		-0.300		-0.362**		0.0226		0.0403
		(0.682)		(0.146)		(0.232)		(0.232)
ALP			0.850***	0.871***				
			(0.0337)	(0.0291)				
SHA					30.82***	31.45***		
					(1.730)	(1.729)		
TRE							1.063***	1.068***
							(0.0571)	(0.0587)
Cons	-2.223	-4.401	3.940***	1.609	-3.625**	-3.423	-1.157	-0.846
	(4.561)	(6.706)	(1.197)	(1.449)	(1.611)	(2.278)	(1.548)	(2.286)
Obs	47	47	47	47	47	47	47	47
R^2	0.063	0.072	0.939	0.959	0.886	0.895	0.895	0.896

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

Table 5B: Results of Basic ESG improvement with INF, GDPGR and LCM - equations (7) and (8)
Dependent Variable: RET

	1	2	3	4	5	6	7	8
IMP	7.196*	10.05	2.586**	6.300***	4.549***	2.394	2.365	2.598
	(4.131)	(7.730)	(1.078)	(1.458)	(1.465)	(2.516)	(1.425)	(2.607)
INF		-0.0812		0.239***		0.0595		0.0779
		(0.219)		(0.0423)		(0.0708)		(0.0735)
GDPGR		-0.310		-0.278**		-0.0648		0.0969
		(0.702)		(0.132)		(0.226)		(0.235)
LPCM		-0.0672		0.548***		-0.592**		0.354
		(0.834)		(0.158)		(0.269)		(0.279)
ALP			0.850***	0.882***				
			(0.0337)	(0.0261)				
SHA					30.82***	31.82***		
					(1.730)	(1.664)		
TRE							1.063***	1.074***
							(0.0571)	(0.0585)
Cons	-2.223	-3.529	3.940***	-5.432**	-3.625**	4.274	-1.157	-5.422
	(4.561)	(12.77)	(1.197)	(2.404)	(1.611)	(4.124)	(1.548)	(4.257)
Obs	47	47	47	47	47	47	47	47
R^2	0.063	0.072	0.939	0.968	0.886	0.907	0.895	0.899

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

Table 5C: Results of Basic ESG improvement with INF, GDPGR and LCP - equations (7) and (8)
Dependent Variable: RET

	1	2	3	4	5	6	7	8
IMP	7.196*	10.10	2.586**	6.374***	4.549***	2.490	2.365	2.663
	(4.131)	(7.773)	(1.078)	(1.479)	(1.465)	(2.566)	(1.425)	(2.622)
INF		-0.0775		0.226***		0.0786		0.0704
		(0.212)		(0.0413)		(0.0697)		(0.0712)
GDPGR		-0.305		-0.299**		-0.0357		0.0841
		(0.697)		(0.132)		(0.228)		(0.233)
LPCP		-0.0642		0.806***		-0.777*		0.531
		(1.265)		(0.241)		(0.414)		(0.423)
ALP			0.850***	0.881***				
			(0.0337)	(0.0263)				
SHA					30.82***	31.74***		
					(1.730)	(1.686)		
TRE							1.063***	1.073***
							(0.0571)	(0.0585)
Cons	-2.223	-3.612	3.940***	-8.221**	-3.625**	6.123	-1.157	-7.354
	(4.561)	(16.95)	(1.197)	(3.219)	(1.611)	(5.550)	(1.548)	(5.653)
Obs	47	47	47	47	47	47	47	47
R^2	0.063	0.072	0.939	0.967	0.886	0.904	0.895	0.899

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

In **Table 6** we look at the effects of dividing the countries into ESG_{High}, ESG_{Medium} and ESG_{Low} groups, by using a dummy of 1 for the ESG_{High} countries and 0 for the other two groups, we then assign a dummy of 1 for the ESG_{Medium} countries and 0 to all the other countries, then finally we assign a 1 to the ESG_{Low} countries. We also then have the interaction term between the dummy for the high, medium and low countries and their ESG scores. When we look at the specification without the interaction terms, we can see that the average return of the ESG_{High} countries is 5.822% the average return of the ESG_{Medium} countries is 3.406% and the average return of the ESG_{Low} countries is 7.538% and all are significantly different zero and confirm the results reported in **Table 1**. In specification (2), we are focussed on the interaction term, which gives the slope of the relationship between ESG score and returns within each of the three groups. Interestingly, within each group, there is a positive and significant relationship between the ESG score and returns. However, the positive relationship is much stronger in the ESG_{Low} countries with a coefficient of 0.145, while for ESG_{High} countries, the coefficient is 0.0698, and for the ESG_{Medium} group, the coefficient is 0.0487.

Table 6: Results for High, Medium and Low ESG scores – Equation Model (9)		
Dependent Variable: RET	1	2
H	5.822***	
	(1.106)	
M	3.406***	
	(1.142)	
L	7.538***	
	(1.106)	
H * ESG_H		0.0698***
		(0.0132)
M * ESG_M		0.0487***
		(0.0156)
L * ESG_L		0.145***
		(0.0212)
Obs	47	47
R^2	0.654	0.658

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

In **Table 7A** we examine the risk-adjusted measures of profitability to see if there is a relationship with the country's ESG score. In the case of the Sharpe ratio there is a positive relationship with the ESG score. Still, it is not statistically significant, suggesting that there is no link using the aggregate dataset of 47 countries. While using the Treynor ratio there is a negative but not significant relationship. Finally, when it comes to Alpha which is a key metric for fund managers, we find that there is a negative but not significant relationship suggesting that ESG_{Low} countries tend to have a greater probability of obtaining excess risk adjusted returns. The results with the addition of GDPGR and INF as control variables are broadly the same as those with no control variables, and neither inflation nor GDP growth is significant. **Table 7B** adds the LPCM variable, and **Table 7C** adds the LPCP variable, while the effect of both variables is generally negative the effect is not significant. In sum, the additional control variables do not seem to have any effects on the risk-adjusted returns.

Table 7A: Results for the effect of ESG on the Financial Indices with INF and GDP Equation Models (10) and (11)

Dependent Variable:	SHARPE		TREYNOR		ALPHA	
ESG	0.000779	0.000653	-0.0300	-0.0409	-0.0375	-0.0375
	(0.00133)	(0.00172)	(0.0391)	(0.0507)	(0.0501)	(0.0501)
INF		-0.00586		-0.172		-0.369
		(0.00628)		(0.185)		(0.232)
GDPGR		0.00761		0.109		0.280
		(0.0137)		(0.403)		(0.505)
Constant	0.0855	0.0938	6.026**	7.087	1.258	3.213
	(0.0938)	(0.151)	(2.758)	(4.458)	(3.535)	(5.595)
Obs	47	47	47	47	47	47
R^2	0.008	0.034	0.013	0.034	0.012	0.012

Table 7B: Results for the effect of ESG on the Financial Indices with INF, GDP and LPCM Equation Models (10) and (11)

ESG	0.000779	-0.00102	-0.0300	-0.0198	-0.0375	-0.0390
	(0.00133)	(0.00768)	(0.0391)	(0.227)	(0.0501)	(0.284)
INF		-0.00538		-0.178		-0.375
		(0.00670)		(0.198)		(0.248)
GDPGR		0.00883		0.0933		0.266
		(0.0149)		(0.438)		(0.550)
LPCM		0.0241		-0.305		-0.277
		(0.108)		(3.180)		(3.992)
Constant	0.0855	-0.0285	6.026**	8.636	1.258	4.622
	(0.0938)	(0.569)	(2.758)	(16.78)	(3.535)	(21.06)
Obs	47	47	47	47	47	47
R^2	0.008	0.035	0.013	0.034	0.012	0.073

Table 7C: Results for the effect of ESG on the Financial Indices with INF, GDP and LPCP Equation Models (10) and (11)

ESG	0.000779	0.00261	-0.0300	-0.0271	-0.0375	-0.0728
	(0.00133)	(0.00812)	(0.0391)	(0.239)	(0.0501)	(0.301)
INF		-0.00576		-0.170		-0.367
		(0.00629)		(0.185)		(0.233)
LPCP		-0.0514		-0.436		-0.0624
		(0.169)		(4.961)		(6.245)
Constant	0.0855	0.497	6.026**	10.82	1.258	5.625
	(0.0938)	(1.150)	(2.758)	(33.84)	(3.535)	(42.60)
Obs	47	47	47	47	47	47
R^2	0.008	0.029	0.013	0.032	0.012	0.066

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

Table 8A: Results for the effect of IMP on the Financial Indices with INF and GDP Equation Models (12) and (13)

Dependent Variable:	SHARPE		TREYNOR		ALPHA	
IMP	0.0859	0.203	4.544	7.827	5.424	5.832
	(0.126)	(0.222)	(3.660)	(6.536)	(4.701)	(8.309)
INF		-0.00637		-0.102		-0.280
		(0.00580)		(0.171)		(0.217)
GDPGR		-0.0103		-0.319		0.0713
		(0.0204)		(0.602)		(0.765)
Constant	0.0455	-0.0311	-1.003	-3.329	-7.251	-6.896
	(0.139)	(0.201)	(4.041)	(5.916)	(5.190)	(7.522)
Obs	47	47	47	47	47	47
R^2	0.010	0.049	0.033	0.051	0.029	0.066

Table 8B: Results for the effect of IMP on the Financial Indices with INF, GDP and LPCM Equation Models (12) and (13)

IMP	0.0859	0.241	4.544	6.938	5.424	4.251
	(0.126)	(0.230)	(3.660)	(6.797)	(4.701)	(8.613)
INF		-0.00442		-0.148		-0.363
		(0.00653)		(0.193)		(0.244)
GDPGR		-0.00771		-0.379		-0.0363
		(0.0209)		(0.617)		(0.782)
LPCM		0.0165		-0.392		-0.698
		(0.0249)		(0.733)		(0.929)
Constant	0.0455	-0.245	-1.003	1.763	-7.251	2.159
	(0.139)	(0.381)	(4.041)	(11.23)	(5.190)	(14.23)
Obs	47	47	47	47	47	47
R^2	0.010	0.059	0.033	0.057	0.029	0.078

Table 8C: Results for the effect of IMP on the Financial Indices with INF, GDP and LPCP Equation Models (12) and (13)

IMP	0.0859	0.240	4.544	6.925	5.424	4.226
	(0.126)	(0.232)	(3.660)	(6.837)	(4.701)	(8.668)
INF		-0.00492		-0.138		-0.344
		(0.00633)		(0.187)		(0.237)
GDP		-0.00849		-0.362		-0.00664
		(0.0208)		(0.613)		(0.777)
LPCP		0.0224		-0.555		-0.988
		(0.0377)		(1.112)		(1.410)
Constant	0.0455	-0.307	-1.003	3.486	-7.251	5.233
	(0.139)	(0.506)	(4.041)	(14.91)	(5.190)	(18.90)
Obs	47	47	47	47	47	47
R^2	0.010	0.057	0.033	0.056	0.029	0.076

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

Next, in **Table 8**, we repeat the analysis but this time using the improvement in ESG score (*IMP*) as the main explanatory variable together with GDPGR and INF as macro-fundamentals (**Table 8A**), and then adding LPCM (**Table 8B**) and LPCP (**Table 8C**) in those specifications. The results show that in all cases the improvement on ESG produces positive effects, but none of them appears to be statistically significant. Furthermore, all the macro-fundamentals variables are correctly signed but statistically insignificant. Thus, it seems that although ESG improvement has a role on average returns, it does not seem to significantly affect the financial ratios.

In **Table 9** when we take the Sharpe, Treynor, and Alpha risk-adjusted measures as the dependent variables and divide the countries into the ESG_{High}, ESG_{Medium} and ESG_{Low} groups, we get some interesting results. Using the Sharpe ratio, the intercept for the ESG_{High} countries is 0.176, which is followed by the ESG_{Low} countries with 0.161 while for the ESG_{Medium} countries it is much lower at 0.078. Interestingly when we look at the relationship with ESG scores, there is a positive and significant relationship in all three cases. Still the coefficient for the ESG_{Low} countries is the highest at 0.00312 which is followed by the ESG_{High} countries at 0.00211 and the ESG_{Medium} countries have the lowest coefficient at 0.00113. In none of the cases is the ESG coefficient particularly large in value but a positive association exists between risk-adjusted returns and ESG scores.

When we use the Treynor ratio as the dependent variable in **Table 9,** then the intercept coefficient for the ESG_{Low} countries is the highest at 5.501, which is followed by the ESG_{High} countries with 3.820. By contrast, for the ESG_{Medium} countries it is much lower at 2.464. When examining the slope coefficients, we once again detect a positive relationship with ESG scores with the coefficient for the ESG_{Low} countries is again the highest at 0.106 which is followed by the ESG_{High} countries at 0.0458 and the ESG_{Medium} countries with the lowest coefficient at 0.0355.

When we use the Alpha as the dependent variable in **Table 9** then the coefficient of the intercept for the ESG_{Low} countries is positive but not significant, while for the ESG_{High} countries it is negative but not significant. Interestingly though, for the ESG_{Medium} countries it is negative and significant. When examining the slope coefficients with Alpha being the dependent variable, only in the case of the ESG_{Low} countries we have a positive coefficient, while in the case of the ESG_{High} countries it is negative and not statistically significant but notably for the ESG_{Medium} countries there is a negative and significant relationship with ESG scores.

Table 9: Results for High, Medium and Low ESG scores on Financial Indices – Equation (14)

Dependent Variable:	SHARPE		TREYNOR		ALPHA	
H	0.176***		3.820***		-1.207	
	(0.0334)		(0.986)		(1.240)	
M	0.0778**		2.464**		-3.727***	
	(0.0345)		(1.018)		(1.281)	
L	0.161***		5.501***		0.800	
	(0.0334)		(0.986)		(1.240)	
H*ESG_H		0.00211***		0.0458***		-0.0143
		(0.000395)		(0.0117)		(0.0150)
M*ESG_M		0.00113**		0.0355**		-0.0482***
		(0.000468)		(0.0139)		(0.0178)
L*ESG_L		0.00312***		0.106***		0.0167
		(0.000637)		(0.0189)		(0.0242)
Obs	47	47	47	47	47	47
R^2	0.559	0.571	0.542	0.549	0.183	0.166

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

6.2 Panel Regression Results

In **Table 10** we look at the fixed effect and the random effects models by looking at the panel data using equations (15) and (16). As such, we are focussing on the effect of annual changes in the ESG growth score against the annual dollar nominal returns. In the absence of the control variables, we can see that there is a significant positive relation between the change in the ESG growth score and the returns at the 10% level for the fixed effect model and at the 5% level for the random effects specification with the latter being the best specification according to the Hausman test. However, once we introduce the GDP growth rate and the inflation rate control variable the significance of the change in the ESG score disappears. In the fixed effects specification, the GDP growth rate is a positive determinant of the returns, and the inflation has a negative effect. While in the random effects specification the GDP growth maintains its significance at the 5% level but the inflation rate coefficient, while negative, loses its significance. Again, as a robustness check, we re-estimate all models adding LPCM (**Table 10B**) and LPCP (**Table 10C**) as additional macro-controls, the results remain very much the

same as in **Table 10A**. However, we can see that both GDP per capita measures are significantly negative in explaining dollar-based returns.[5]

In **Table 11,** we look at how the ESG growth score affects annual returns by looking at three countries' groupings using the fixed effects and random effects model specifications. The Hausman tests suggest that random effects is the preferred estimation method in all three cases. We can see there is a positive and significant effect only for the ESG_{Medium} group using the fixed effect specification and for the random effect specification at the 5% significance level. There is also a significant effect for the ESG_{Low} countries in the case of the random effects model at the 10% significance level. However, when it comes to the ESG_{High} countries there are no significant effects, using either the fixed or random effects model specifications suggesting that improvements in their ESG scores do not improve investors' annualized returns for ESG_{High} countries.

In **Table 12** we look at how changes in the ESG score affect annual returns by looking at three groupings of ESG High, Medium and Low countries using both the fixed effects and random effects model specifications but also including our control variables. In this specification, we can see that the positive relationship between the ESG_{Medium} and ESG_{Low} countries now disappears. Instead the GDP is seen to have a positive and sometimes significant effect on investor returns while the inflation tends to have a negative and significant effect. However, in the case of the ESG_{High} countries we now detect a significant and negative effect from a higher ESG score on investor returns. Again, the robustness checks include the LPCM (**Table 12B**) and the LPCP variable (**Table 12C**) as additional macro-control variables. We can see that adding GDP per capita at market prices or using PPP measures again both enter with significantly negative values in the case of ESG_{Medium} and ESG_{Low} countries.

[5] It is important to note that including the macroeconomic control variables that lead to a non-significant effect coming from ESG is not due to multicollinearities between the variables. We have calculated the panel correlation coefficients and pairwise correlation coefficients and, in most cases, we found negligible correlations. For the case of GDP growth and ESG for example, we found that the panel correlation coefficient is -0.291. Pairwise correlations for each country case revealed very low coefficients (the highest was 0.5 for the case of Ireland), whilst we had 23 countries reporting positive correlations and 24 countries reporting negative correlations. Most of the obtained coefficients (41 out of 47 countries) were found to be statistically insignificant. Analytical tables and results are available from authors upon request.

Table 10A - ESG Growth and Returns – equation models (15) and (16)
Panel Data with GDPGR and INF

Dependent	Fixed Effects		Random Effects	
Variable: RET	Model 1	Model 2	Model 1	Model 2
ESGGR	1.463*	0.0956	1.967***	0.685
	(0.798)	(0.882)	(0.717)	(0.836)
GDPGR		1.010***		0.973***
		(0.363)		(0.331)
INF		-1.073***		-0.240
		(0.306)		(0.210)
Constant	11.50***	13.04***	11.31***	9.996***
	(1.092)	(1.759)	(1.072)	(1.462)
R^2	0.0036	0.024	0.037	0.016
Obs	987	987	987	987
Hausman Test			2.06 [0.15]	15.7 [0.001]

Table 10B - ESG Growth and Returns – equation models (15) and (16)
Panel Data with GDPGR, INF and LPCM

ESGGR	1.463*	0.535	1.967***	0.267
	(0.798)	(0.861)	(0.717)	(0.836)
GDPGR		0.717**		0.678**
		(0.356)		(0.336)
LPCM		-21.53***		-3.867***
		(2.976)		(0.951)
INF		-1.307***		-0.578***
		(0.300)		(0.224)
Constant	11.50***	221.6***	11.31***	49.33***
	(1.092)	(28.87)	(1.072)	(9.787)
R^2	0.0036	0.075	0.0037	0.052
Obs	987	987	987	987
Hausman Test			2.06 [0.15]	54.8 [0.00]

Table 10C – ESG Growth and Returns – equation models (15) and (16)
Panel Data with GDPGR, INF and LPCP

ESGGR	1.463*	0.914	1.967***	0.414
	(0.798)	(0.873)	(0.717)	(0.833)
GDPGR		0.703*		0.689**
		(0.359)		(0.337)
LPCP		-25.63***		-5.642***
		(4.015)		(1.465)
INF		-1.237***		-0.516**
		(0.301)		(0.220)
Constant	11.50***	271.5***	11.31***	68.47***
	(1.092)	(40.52)	(1.072)	(15.25)
R^2	0.036	0.064	0.0037	0.048
Obs	987	987	987	987
Hausman Test			2.06 [0.15]	43.8[0.00]

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.
Note 3: the shaded results suggest the best specification using the Hausman test.

Table 11 - ESG High, Medium and Low Countries - Sub-samples – equation model (15)
Dependent Variable: RET

	Fixed Effects			Random Effects		
	High	Medium	Low	High	Medium	Low
ESGGR	-1.004	2.618*	2.051	-1.066	3.082**	2.011*
	(1.286)	(1.550)	(1.331)	(1.239)	(1.484)	(1.178)
Constant	10.38***	9.276***	14.34***	10.39***	9.201***	14.37***
	(1.432)	(1.868)	(2.387)	(1.408)	(1.845)	(2.303)
Obs	336	315	336	336	315	336
R^2	0.002	0.009	0.007	0.002	0.009	0.007
No of ID	16	15	16	16	15	16
Hausman Test				0.03 [0.85]	1.07 [0.30]	0.01 [0.94]

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.
Note 3: the shaded results suggest the best specification using the Hausman test.

Table 12A - ESG High, Medium and Low Countries - Sub-samples with controls
Dependent Variable: RET
GDPGR and INF – equation model (16)

	Fixed Effects			Random Effects		
	High	Medium	Low	High	Medium	Low
ESGGR	-4.708***	0.458	1.142	-4.213***	1.270	1.317
	(1.411)	(1.766)	(1.463)	(1.377)	(1.718)	(1.384)
GDPGR	1.658***	1.087*	1.082	1.304***	1.099**	0.674
	(0.516)	(0.608)	(0.747)	(0.472)	(0.558)	(0.696)
INF	-7.076***	-0.790**	-0.935	-5.994***	-0.253	0.0439
	(1.147)	(0.366)	(0.739)	(1.069)	(0.251)	(0.541)
Constant	19.43***	10.59***	15.14***	18.24***	8.253***	11.94***
	(2.346)	(2.692)	(4.853)	(2.250)	(2.317)	(4.195)
Observations	336	315	336	336	315	336
Number of ID	16	15	16	16	15	16
Hausman Test				7.33 [0.06]	5.52 [0.13]	4.72 [0.19]

Table 12B - ESG High, Medium and Low Countries - Sub-samples with controls
GDPGR, INF and LPCM – equation model (16)

ESGGR	-4.696***	0.704	2.027	-4.213***	0.895	1.243
	(1.417)	(1.741)	(1.386)	(1.379)	(1.710)	(1.363)
GDPGR	1.658***	0.906	0.242	1.320***	0.919*	0.145
	(0.517)	(0.601)	(0.717)	(0.474)	(0.558)	(0.704)
INF	-7.077***	-0.907**	-1.691**	-6.040***	-0.586**	-0.373
	(1.149)	(0.362)	(0.707)	(1.076)	(0.282)	(0.547)
LPCM	-0.629	-18.85***	-29.23***	-1.795	-8.179**	-9.171***
	(5.625)	(5.900)	(4.570)	(4.130)	(3.254)	(2.739)
Constant	26.19	198.1***	261.8***	37.58	91.08***	91.60***
	(60.49)	(58.78)	(38.83)	(44.54)	(33.04)	(24.15)
Hausman Test				7.37 [0.11]	11.35 [0.02]	34.9 [0.00]

Table 12C - ESG High, Medium and Low Countries - Sub-samples with controls
GDPGR, INF and LPCP – equation model (16)

ESGGR	-4.717***	1.565	2.216	-4.150***	1.545	1.276
	(1.438)	(1.760)	(1.406)	(1.396)	(1.700)	(1.371)
GDPGR	1.659***	0.834	0.0307	1.317***	0.825	0.193
	(0.517)	(0.600)	(0.735)	(0.475)	(0.560)	(0.713)
INF	-7.075***	-0.861**	-1.551**	-6.015***	-0.563**	-0.152
	(1.149)	(0.359)	(0.712)	(1.073)	(0.271)	(0.541)
LPCP	0.213	-26.31***	-41.04***	-1.363	-15.27***	-10.63***
	(6.075)	(7.405)	(7.113)	(4.675)	(5.290)	(3.994)
Constant	17.14	280.2***	398.0***	32.87	166.2***	112.4***
	(65.24)	(75.94)	(66.52)	(50.22)	(54.76)	(37.99)
Hausman Test				7.38 [0.11]	12.28 [0.01]	30.6 [0.00]

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.
Note 3: the shaded results suggest the best specification using the Hausman test.

6.3. Further Robustness Checks

As extra robustness checks, first, we re-estimated all panel models with the macroeconomic controls (Inflation, GDP growth and GDP per capita in nominal and market terms) with the addition of another control variable, which is the share of renewable energy over total energy for each country (RENSHARE).[6] We add this variable because renewable energy share might be also important for determining investment returns but captures a different dimension than the ESG criteria. The results are reported in **Table 13**. Similarly to **Table 10**, we estimate the specifications with both the FE and RE methods. What is clear from these new results is that ESGGR, after adding macro controls, becomes insignificant, even with the addition of the renewable energy share. More importantly, all other macroeconomic determinants are with their expected signs and of similar magnitude and significance as in our regressions reported in **Table 10**, suggesting the robustness of the findings. The renewable energy variable is positive, suggesting positive effects of portfolio investment returns, but mostly insignificant, apart from two cases where it is significant at the 10% level only.

[6] Data for this variable are available for all countries in our sample and all years from the World Bank – World Development Indicators database.

Table 13: Robustness Tests with Renewable Energy Share
Dependent Variable: RET

VARIABLES	Model 1 FE	Model 1 RE	Model 2 FE	Model 2 RE	Model 3 FE	Model 3 RE
ESGGR	0.0149	0.584	0.48	0.226	0.802	0.377
	(0.885)	(0.837)	(0.864)	(0.836)	(0.874)	(0.834)
GDPGR	1.042***	0.981***	0.739**	0.697**	0.748**	0.709**
	(0.364)	(0.331)	(0.357)	(0.337)	(0.359)	(0.338)
INF	-1.067***	-0.246	-1.302***	-0.565**	-1.232***	-0.503**
	(0.306)	(0.21)	(0.3)	(0.224)	(0.301)	(0.221)
LPCM			-21.42***	-3.678***		
			(2.981)	(0.967)		
LPCP					-26.65***	-5.319***
					(4.043)	(1.508)
RENSHARE	0.299	0.127*	0.193	0.0773	0.535*	0.0658
	(0.28)	(0.0713)	(0.273)	(0.0721)	(0.276)	(0.073)
Constant	7.628	7.767***	217.0***	46.06***	272.0***	63.97***
	(5.374)	(1.924)	(29.6)	(10.25)	(40.46)	(16.05)
R^2 within	0.025	0.017	0.076	0.052	0.069	0068
No of ID	47	47	47	47	47	47
Observations	987	987	987	987	987	987

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

Additionally, we wanted to check whether countries with higher GDP growth rates are those with increasing ESG scores (ESGGR) over time, and thus, it is both that leads to increasing returns over time. To this end, we re-estimated all models by adding an interaction term of GDP growth and ESG growth scores to check if this is true. The results are reported in **Table 14**. Again, we observe that our initial estimates are quite robust. None of the ESGGR coefficients is statistically significant, while all macroeconomic variables are significant as before, and the interaction term is very small and insignificant. This suggests that the returns are affected by economic performance but not by the ESG growth interaction with each country's GDP growth rate.

Table 14: Robustness Tests with Interaction (GDPGR*ESGGR) term
Dependent Variable: RET

VARIABLES	Model 1 FE	Model 1 RE	Model 2 FE	Model 2 RE	Model 3 FE	Model 3 RE
ESGGR	-0.0832	0.688	0.509	0.442	0.802	0.594
	(0.994)	(0.961)	(0.972)	(0.956)	(0.984)	(0.955)
GDPGR	1.014***	0.973***	0.717**	0.682**	0.705**	0.692**
	(0.363)	(0.332)	(0.356)	(0.337)	(0.359)	(0.337)
INF	-1.079***	-0.24	-1.308***	-0.571**	-1.241***	-0.508**
	(0.307)	(0.212)	(0.31)	(0.225)	(0.302)	(0.221)
LPCM			-21.52***	-3.900***		
			(2.981)	(0.956)		
LPCP					-25.61***	-5.698***
					(4.018)	(1.473)
GDPGR*ESGGR	0.0513	-0.000787	0.00748	-0.0454	0.0319	-0.0465
	(0.132)	(0.121)	(0.128)	(0.12)	(0.129)	(0.12)
Constant	12.93***	9.997***	221.5***	49.72***	271.2***	69.11***
	(1.784)	(1.469)	(28.93)	(9.844)	(40.55)	(15.35)
R^2 within	0.024	0.016	0.076	0.051	0.065	0.048
No of ID	47	47	47	47	47	47
Observations	987	987	987	987	987	987

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.

A further robustness test involved estimating of the basic panel model by identifying two possible thresholds, through the panel threshold regression model developed by Hansen (1999). Here we take the ESG level as the threshold variable to examine the effect of ESG improvement (captured by the ESGGR variable) on returns. The model is as follows:

$$R_{it} = a + \beta_1(ESG\_GR_{it}) * I(ESG_{it} < \gamma_1) + \beta_2(ESG\_GR_{it}) * I(\gamma_1 < ESG_{it} < \gamma_2) + \\ + \beta_3(ESG\_GR_{it}) * I(ESG_{it} > \gamma_2) + \gamma GDPGR_{it} + INF_{it} + u_{it} \quad (17)$$

where *I(.)* is an identity function (taking the value 1 when the condition is satisfied) with the threshold variables in parentheses, and γ_1 and γ_2 are threshold parameters to be estimated. We estimate the panel threshold model using the test command provided by Wang (2015). This command automatically searches the threshold values avoiding the uncertainty of the threshold estimation caused by human subjective choices. Also, we estimate the panel threshold regression model in equation (17) three times as before. One with GDPGR and INF as macroeconomic variables, and then adding LPCP and LPCM as further macroeconomic determinants (capturing the effect of GDP per capita). The results for those three models are

given in **Table 15**. From the results obtained we observe two distinct and statistically significant threshold values one at ESG=61.706 and the second at ESG=76.537. Note that this threshold division is not the same as defined using average ESG scores provided in **Table 2** and used in the analysis before. Here, since we have panel data, we allow each country to belong to each of the three groups if their respective ESG scores started very low (let's assume lower than 61.7) and increased through time (to go to the medium group and then to the high group). Thus, the interpretation of the findings is different as well. The results suggest a statistically significant and negative relationship for the ESG_{High} scores, negative but insignificant for the ESG_{Medium} scores and positive and significant for the ESG_{Low} scores. Therefore, it is clear that when a country has a low level of ESG and improves its score, then this has a strong positive impact on returns. There is no effect for the middle group, but when a country has a high level of ESG score, further improvement of its score leads to lower returns. All macro-fundamentals have the expected effects, are statistically significant and further confirm the results of our previous analysis.

Table 15: Panel Threshold Estimates
Dependent Variable: RET

	Threshold Value	F-stat	p-value
Threshold 1 *(γ_1)*	61.706	16.71	0.006
Threshold 2 *(γ_2)*	76.537	18.13	0.003
VARIABLES	Model 1	Model 2	Model 3
GDPGR	0.957***	0.730**	0.712**
	(0.331)	(0.338)	(0.337)
INF	-0.269	-0.485**	-0.548**
	(0.209)	(0.220)	(0.224)
LPCP		-4.612***	
		(1.539)	
LPCM			-3.292***
			(0.983)
$(ESG\_GR_{it}) * I(ESG_{it} < \gamma_1)$	2.642**	2.193*	2.152**
	(1.030)	(1.011)	(1.059)
$(ESG\_GR_{it}) * I(\gamma_1 < ESG_{it} < \gamma_2)$	-1.308	-0.951	-1.171
	(1.662)	(1.659)	(1.654)
$(ESG\_GR_{it}) * I(ESG_{it} > \gamma_2)$	-2.266**	-1.582**	-1.780**
	(1.079)	(0.741)	(0.749)
Constant	9.903***	57.73***	43.41***
	(1.458)	(16.03)	(10.11)
Observations	987	987	987
R-squared	0.094	0.081	0.094
Number of ID	47	47	47

Note 1: Values of standard errors are reported in parentheses.
Note 2: ***,**,* denote statistical significance at the 1%, 5% and 10% respectively.
Note 3: The bootstrap value for both thresholds has been set to 300.

Finally, we re-estimated all our panel regression models including year-fixed effects in the estimation process. The results of these alternative specifications were very similar with the exception that inflation became statistically insignificant in all cases.[7] So, it seems that the effects of GDP growth and GDP per capita have a stronger impact on returns since they were statistically significant and robust in all alternative models.

[7] We do not report the results of those models for economy of space, but they are available from authors upon request.

7. Conclusions

Our paper is a first attempt to move the debate from looking at how the ESG of firms affects investor returns to how investment in different rated ESG countries can affect investors' returns. This is an important difference and is of direct relevance to a range of investors that have ESG objectives as part of the investment mandate, which includes sovereign wealth funds, mutual funds, pensions funds and some hedge funds. Our results suggest that ESG oriented funds could be sacrificing returns in both nominal and risk-adjusted measures by avoiding investments in ESG_{Low} countries. However, if their mandates were to include investing in countries which are improving their ESG scores then this would permit them to take advantage of investments in ESG_{Low} countries, which have significantly improved their ESG credentials by comparison to ESG_{High} and ESG_{Medium} countries over the past couple of decades. We do, however, find some fairly strong evidence that as countries graduate from ESG_{Low} to ESG_{Medium} countries, there may be a deterioration in investors nominal and risk-adjusted returns which will likely only improve once they graduate further to ESG_{High} status which can take many years to achieve. Nonetheless, we have to be careful about the sources of the excess returns in investing in ESG_{Low} countries because in quite a few of our regressions the result is mainly explained by their higher average growth rates and on occasion a positive association with their higher inflation rates.

Our results are suggestive that there could eventually be an ESG_{Medium} trap facing ESG conscious investors that invest in ESG_{Low} countries, once they move to the ESG_{Medium} status then returns are likely to deteriorate significantly. However, there is on average a long way to go for many ESG_{Low} countries to graduate to ESG_{Medium} status, which could take decades to achieve given that they have improved at slightly less than 1% per annum in the past two decades. Progress in the ESG_{High} and ESG_{Medium} countries has been considerably slower, at typically less than 0.15% per annum. Our results do suggest that improvements in ESG scores for the ESG_{Low} countries have been associated with increased returns for investors which should encourage international investors and the governments in ESG_{Low} countries to make continued efforts to improve the ESG scores.

It would be interesting in future research to investigate the linkage between ESG country scores and the performance of differently rated ESG companies in the various countries. For example, do ESG_{High} companies perform better in ESG_{High}, ESG_{Medium} or ESG_{Low} countries? Similarly, it could be asked as to whether ESG_{Low} companies perform better

in ESG_{High}, ESG_{Medium} or ESG_{Low} countries. In addition, there is ample evidence that large capitalization stocks tend to have higher ESG scores, so it would be interesting to find out to what extent the country level ESG scores interact with the size of companies.

Another important issue for future research is the precise relationship between country ESG scores and company ESG scores. Is it ESG initiatives at the country level that improve company ESG scores? Or, do companies raising their ESG scores encourage governments to improve their ESG scores? Also, to what extent are ESG country and company scores interconnected in a bidirectional causality relationship? The answer to these questions is important not only for international investors but also for the good functioning of economies and, ultimately, the global economy.

Finally, since ESG_{Low} countries tend to have the highest economic growth rates, then it will be an important policy issue for governments as to whether raising a county's ESG score will negatively or positively affect its prospective economic growth rate. Our research has very little to say on this issue, but it matters both for the citizens of the ESG_{Low} countries and international investors and should be high on the agenda for future research in this area.

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