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Analysis of Environment, Social and Governance (ESG) Ratings and Financial Performance in Indian Firms: A Panel Data Study

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ABSTRACT: This research examines the link between Indian companies' income and Environmental, Social, and Governance (ESG) ratings between 2014 and 2024. The study assesses how differences in ESG ratings affect financial performance using panel data regression analysis, which includes fixed effects and random effects models, as well as the Hausman test. The research provides a ten-year perspective on this dynamic by using sales data and ESG rankings that are collected from MoneyControl and Yahoo Finance, respectively. The results show a statistically significant negative relationship between revenue and ESG ratings, with a higher ESG score being correlated with lower income. This implies that even while businesses engage in sustainable practices, there's a chance that these initiatives won't always result in quick financial rewards. The research provides insights into the possible trade-offs between sustainability and profitability in the Indian environment and emphasizes the need of taking firm-specific aspects into account when assessing the effect of ESG activities.

KEYWORDS: Indian companies, Income, Environmental, Social, and Governance (ESG) ratings Hausman test, Sales data, ESG rankings

INTRODUCTION

In order to slow down the global economic downturn, economic growth and investment must be encouraged. This calls for a change in the traditional goals of investments from profit maximization and risk minimization to striking a balance between financial and non-financial goals by using responsible investment strategies. These approaches stem from the notion of sustainable development and help to accomplish goals related to sustainable development, which in turn lessens the role of government regulation[1]. Sustainable consumption calls for a more thoughtful and responsible approach to consumption that aims to minimize environmental impact, promote social justice, and enhance overall well-being. It deviates from traditional consumption patterns that are popular in the Global North and prioritize economic growth and individualistic materialism[2].

ESG, or environmental, social, and governance, is a useful portfolio selection strategy that operates within the more general framework of sustainable and responsible investing (SRI). ESG elements are being used more widely these days, to the point that major markets' capitalization of ESG-geared portfolios is estimated to have topped US $30 trillion in 2019[3]. This is the result of using ethical investing techniques, which also improve businesses' financial success by lowering portfolio risks and increasing returns.

The global economic landscape necessitates a shift towards sustainable investment strategies, balancing financial and non-financial goals. In India, ESG (Environmental, Social, and Governance) reporting has gained momentum, especially after the Ministry of Corporate Affairs (MCA) issued the National Voluntary Guidelines on Social, Environmental, and Economic Responsibilities of Business (NVGs) in 2011. The evolution of ESG reporting, culminating in SEBI's Business Responsibility and Sustainability Report (BRSR) for the top thousand listed firms, highlights the growing importance of sustainability in corporate governance. India has been rapidly evolving its ESG reporting methods, driven by the goal of matching investments with ESG themes. But the idea that the ESG reporting standard should go beyond its traditional "reactive" perspective of stock taking and performance measuring programs is starting to gain traction. Rather, a "proactive" strategy for long-term value creation must be adopted by the policy, using a variety of performance measures and calculating the financial and non-financial potential of ESG[4].

Consequently, under the new format of the Business Responsibility and Sustainability Report (BRSR), the Securities and Exchange Board of India (SEBI) unveils its directive towards sustainability-related reporting obligations for the top thousand listed firms (by

market capitalization) in May 2021[5]. This is a significant change from the Business Responsibility Report (BRR) policy framework that existed before. The disclosure requirement, which is in place for the current fiscal year, 2022–2023 (SEBI 2021), is seen as a step toward bringing sustainability reporting up to speed with current financial reporting requirements. In light of this, it is academically fascinating to investigate the frequency of any potential proof that ESG disclosure influences the listed Indian businesses' long-term financial performance, supporting SEBI's prudential mission regarding India's ESG regulatory environment. Over the last several decades, there has been a global increase in the desire and ability to address environmental concerns that have a negative impact on nations' economic growth [6]. Utilizing modern technology and expertise for environmental remediation—whose cost may be a major deterrent—is essential to helping nations address their environmental challenges [7]. Environmental taxes are one possible tool for achieving environmental goals and promoting technological innovation and the development of cleaner technologies [8]. New techniques and technologies for reducing environmental pollution have the potential to significantly reduce the cost of upcoming environmental interventions[9]. By making ecologically hazardous commodities more expensive than those with relatively little environmental effect, these tariffs encourage consumers to change their purchasing habits in a more sustainable way[10].

Furthermore, environmental levies drive up the cost of manufacturing inputs, pushing manufacturers to switch to greener technology and procedures[11]. Environmental taxes are primarily intended to enforce responsibility for environmental externalities, not to increase income or profits[12]. Environmental taxes have the potential to significantly stimulate innovation as businesses and people seek out new, cleaner approaches to the pricing of hazardous waste, as well as to promote the adoption of current abatement strategies [13]. Due to these incentives, funding research and development (R&D) projects to progress technologies—whether directly by the polluter or via outside innovators—becomes economically appealing [14].

Assuring the financial system's long-term sustainability and profitability has been at the forefront of modern sustainable development[15]. Because markets have become more competitive and dynamic, businesses are under tremendous pressure to achieve and maintain their success. Sustainability is thus critical to businesses and to the growth of the economy as a whole. Due to increased awareness of its importance among investors, customers, and enterprises, corporate sustainability has attracted a lot of attention lately [16] Businesses have a history of making choices that increase their short-term profits at the expense of society, the environment, and government. However, in addition to their constrained, short-term profit maximization aims, they are required to take into account environmental and social sustainability in the current period[17]. Being the market leader in the future is becoming more and more necessary rather than optional. According to[18], sustainable practises concentrate on turning businesses into accountable entities that take social and environmental issues seriously. As of March 2020, about 3800 institutions globally take into account Environment, Social, and Governance (ESG) concerns when making decisions, up from only 734 in 2010 [19]. The United Nations (UN) member states approved the "Agenda for Sustainable Development" in 2015 as a comprehensive framework. It has 17 Sustainable Development Goals (SDGs) that are expected to be accomplished by 2030 (United Nations, 2020). Investors, regulators, asset owners, and individual customers are all interested in a company's environmental, social, and governance (ESG) performance. ESG concerns are now seen by stakeholders and shareholders as both a huge opportunity for wealth development and potential sources of risk. Because of this, businesses that use ESG considerations when making decisions are more likely to draw in long-term investors as creative businesses and gain credibility from stakeholders[20].Environmental, social, and governance ratings, or ESGRs, are used by managers and investors when making decisions. Furthermore, an increasing amount of scholarly research[21] uses ESGRs for their empirical analysis. As a result, ESGR suppliers are now significant organizations.

The Indian Revenue Service, also known as Bhartiya Rājasva Seva in IAST, is a public service organization whose main duty is the administration and collection of direct and indirect taxes. It operates under the Department of Revenue[22] of the Ministry of Finance as a central civil service under Group A of the executive arm of the Government of India. The Minister of Finance is in charge ministerially and the Revenue Secretary is in charge administratively. Reported revenues may provide investors valuable information about a company's profitability and value-creating sources, allowing them to evaluate the company's historical performance and project its future performance[23]. According to empirical research, enterprises' future financial performance may be inferred from their stated financial data. However, the accuracy with which the company reports its performance determines how predictive reported financials are of future success. There is likely to be more accounting manipulation in corporate situations with agency issues and knowledge asymmetry, which will result in a weaker correlation between reported and future financial performance. Stronger indications that are less vulnerable to accounting manipulation are thus required in such situations. Numerous studies have looked at non-financial indicators as leading predictors of future financial performance of

businesses, including order backlogs [24]strategic information systems and customer satisfaction. This is because financial data is susceptible to manipulation.

Contribution of the study

The major contribution of this research is the ten-year (2014–2024) examination of the correlation between Indian companies' ESG (Environmental, Social, and Governance) ratings and their income. The research delves into the intricate relationship between sustainable practices and financial success by using strong statistical approaches including panel data regression and the Hausman test. Since this dynamic reveals the monetary ramifications of ESG efforts, it is critical that stakeholders, such as legislators, investors, and business management, comprehend it. The results add to the ongoing discussion on sustainable business practices in developing economies, especially the fact that ESG ratings are negatively correlated with revenue. This highlights the need of coordinating sustainability initiatives with financial goals.

Objectives

- Examine the revenue data of Indian companies from 2014 to 2024 to understand the impact of key economic events, market demand, competitive dynamics, regulatory changes, and macroeconomic characteristics on business profitability.
- Collect and analyse ESG (Environmental, Social, and Governance) score information for Indian businesses using data from Yahoo Finance, ensuring the data is accurately formatted, filtered, and compiled into a comprehensive Data Frame.
- Offer valuable insights to stakeholders, such as investors, policymakers, and corporate managers, regarding the financial implications of ESG initiatives and the importance of aligning sustainability practices with profitability.
- Enhance the understanding of sustainable business practices in emerging markets by analysing the interplay between financial success and ESG efforts, highlighting the necessity for strategic alignment between sustainability initiatives and financial objectives.

LITERATURE REVIEW

In this study [25] the relationship between corporate social responsibility (CSR) and firm performance in Kazakhstan. It found a positive correlation between CSR practices and profitability, particularly in net profit margins. However, there was a weak quantitative relationship between stock market activity indicators and net income. The study suggests that reputation capital, a key factor influencing companies' positions in stock market indices, also influences these indicators. The mixed impact of CSR on financial performance was found, with positive, negative, and insignificant relationships. The study recommends investing more in CSR to boost competitiveness and profitability. The study suggests that social responsibility should be considered as a necessary cost item and strategic reputational investments contributing to a sustainable global world.

According to this study [4]conversation begins with SEBI's new requirement on ESG reporting by listed companies, and the research aims to empirically analyse the influence of ESG score on the financial factors that may affect the performance of enterprises in the Indian setting. The research uses a representative sample of 48 Indian companies with ESG ratings that fall within the BSE-100 index. The years 2011–2019 make up the study period. There are studies of panel regression that are both static and dynamic. This article includes the following financial performance variables: share price, market capitalization, company size, ROA, ROE, PBDIT, and Tobin's Q. It is shown that, although slowly, the ESG score affects these factors. The present project's unique contribution is to demonstrate a favourable long-term correlation between ESG disclosure and the average yearly share price of listed companies in emerging nations like India. The findings suggest that the ESG score is a developing metric for developing strategies for risk mitigation and future financial success, making it significant from a policy standpoint.

The studies [12]have examined how environmental fees impact economic development and carbon emissions. Few studies have quantified the link between environmental taxes and technical breakthroughs. This research examines the causal relationship between environmental taxes and technological innovation using a comprehensive, statistically powerful model. This panel cointegration analysis model, incorporating cross-sectional dependency, quantifies the impact of environmental levies on technological innovation in 42 high and middle-income countries from 1995 to 2018. Using CCEMG and AMG techniques, a 1% increase in environmental taxes was found to increase environment-related technological innovation by 0.57 and 0.78% on average for high and middle-income countries, respectively. This study suggests that environmental taxes can accelerate the development of technologies for carbon emission reduction and sustainable development in high and middle-income nations, potentially benefiting developing nations as an evidence base for reducing energy transition timelines.

This study[20] examines the relationship between environmental, social, and governance ratings (ESGR) of Polish listed companies in the WIG-ESG index and their value. The study, covering 36 companies from 2019-2023, found a negative but non-statistically

significant influence of ESGR on a company's value. The findings suggest that the Polish market does not recognize the potential of ESG factors in building long-term value, and investors often underestimate ESG criteria when valuing companies. The article contributes to the existing literature by expanding the field of analysing the relationship between ESGRs and corporate value, and identifying the channels of transmission and areas affecting ratings.

According to this study [26] the ESG concept has been developed further in China in recent years, there has been a progressive increase in the amount of attention paid to the effect that listed firms' ESG performance has on businesses. This study indicates that, for the quarterly data of 3,275 A-share listed businesses from 2018 to 2021, boosting the ESG performance of listed companies has a considerable beneficial influence on financial performance. This finding is based on the theories of sustainable development and stakeholder management. Corporate reputation was tested using the stepwise regression method to see if it had a fully mediating effect in the transmission mechanism. Additional research revealed that the impact of ESG performance on private enterprise performance is greater than that of state-owned enterprise performance, and that the impact on medium-sized enterprise performance is greater than that of large-scale and small-sized enterprise performance.

The study [27]investigates the relationship between ESG disclosure and earnings management in listed companies in Saudi Arabia, focusing on financial distress. Results show that ESG disclosure positively impacts earnings management, and financially distressed companies disclose more ESG practices. Environmental and social factors have positive impacts on earnings management, while governance scores are negative. The study contributes to the ESG and earnings management literature and minimizes the literature gap by focusing on financial distress's influence on the relationship. It warns policymakers that ESG enhancements may help prevent questionable practices.

This study [28]examines the impact of ESG scores on shareholders' wealth and future investment selection criteria. It analyses 225 Indian companies and finds that governance has a positive impact on equity returns, while environmental factors have a negative impact. The social factor has an insignificant impact. The study suggests that financial motivations may trigger E- and S-factor practices, emphasizing the importance of companies being conscious of their governance practices to improve shareholders' wealth.

According to this study[29] Indian corporate governance concerns and determine how corporate governance and financial performance are related. The sample consists of 141 firms that are listed on the Mumbai Stock Exchange of India and belong to the "A" category of equities. A composite measure of corporate governance is established that includes three indicators: legal, board, and proactive indicators. This measure takes into account the institutional distinctiveness in India. Secondary sources provided information on financial performance as well as the three measures. After adjusting for the confounding effects of company size, the impact of these three indicators and the composite measure of corporate governance on firm performance was investigated using step-wise multiple regression analysis. While the legal compliance indicator has no effect on the firm's performance, the board and proactive indicators do. A reliable indicator of a company's success is the composite corporate governance metric.

According to this study[30] Integration between internal and external business is increasing due to the relationship between ESG scores and company financial performance (CFP). The effect of the ESG-CFP connection varies by economy, industry, and institutional framework owing to legal, societal, and stakeholder expectations. This research examines the relationship between ESG disclosures and the financial worth of Indian energy businesses using a four-wave cross-lagged panel structural equation model. Results show that ESG to frm value is not bidirectional. We find persistent AR effects with negative associations in the first two delays and favourable associations in the last. Research findings benefit investors, fund managers, politicians, and energy industry management. We advise leaders on ESG investments and procedures, including the time lag for maximizing firm value.

This study [31]examines how ESG scores affect Southeast Asian listed firms' financial success. The paper adds actual data for regional analysis in poor nations, notably Southeast Asia, and extends previous models by including macroeconomic and COVID-19 factors. ESG score's impact on financial performance is estimated using the Fixed Effect Model from panel data of 225 listed companies in six Southeast Asian countries (Singapore, Malaysia, Thailand, Indonesia, Vietnam, and the Philippines) from 2020 to 2022. Statistics suggest Southeast Asian ESG policies are still lacking and vary widely across companies. A one-year lagged ESG variable boosts financial performance considerably. COVID-19 infection rates negatively affect return on asset (ROA), but GDP growth somewhat increases ROA. The findings also improve our knowledge of ESG investments and highlight their relevance in investment decisions, particularly in quickly emerging Southeast Asian nations where ESG considerations are essential for sustainable growth.

Then study[32] uses stakeholder theory to examine the relationship between CSRHub's environmental, social, and governance (ESG) ratings and publicly traded U.S. corporations' ROE, ROA, and net profit margin. The research aims to explore the benefits of

using ESG ratings for profit production in organizations. To fill the gap in research on how ESG ratings explain financial performance, the study asks how CSRHub's ESG ratings explain publicly traded U.S. corporations' ROE, ROA, and NPM. Research employs nonexperimental quantitative methods. All U.S. publicly listed companies with CSRHub ESG ratings are targeted. The population was 3,569. Sample size is 100 from population. Data analysis indicates low variability in ESG ratings, large variances in ROE, moderate variances in ROA, and high variances in NPM. It seems liabilities affect profitability and shareholders' equity. ESG ratings' impact on corporate profitability cannot be measured by ROA, ROE, or NPM. Due to the moral aspect of ESG ratings, changes in ROA, ROE, and NPM are not comparable to those in ESG ratings. Future studies should examine the link between accounting-based metrics and nonfinancial information and social returns.

According to this study [33] In addition to shareholder value, long-term value development should include stakeholders and the environment. With the increased demand for business sustainability, ESG problems are becoming more important. ESG ratings help compare firms' sustainable practices. This research examines how ESG ratings affect European food sector financial performance. ESG ratings and financial performance are examined from 2017 to 2020 using ordinary least squares regression. Financial performance measurements include ROA and ROE, and ESG ratings come from CSRHub. Financial performance improves with greater ESG ratings. The slight impact in this research supports prior findings that ESG ratings improve financial success. They also note that ESG ratings strongly converge to the mean, suggesting that ESG ratings may not accurately capture ESG behaviour.

This study[34] examines the relationship between the financial success of family companies during COVID-19 and their environmental, social, and governance (ESG) performance. The study uses an international display of the 500 biggest family firms from 2015 to 2021 to examine the impact of ESG on corporate valuation. The results show a positive correlation between corporate valuation and ESG performance, but the performance of companies negatively impacted during the pandemic. However, firms with superior ESG performance did not experience this negative impact, suggesting investors view better ESG performance as a predictor of future good stock performance. The study provides recommendations for investors and businesses to understand ESG's influence on family businesses' profitability and emphasizes the importance of strong ESG performance in mitigating external crises.

According to this study [35]Environmental, social, and governance (ESG) considerations may improve firms' investment and sustainability performance. This article examines how economic performance, environmental sustainability, pollution and waste, corporate social responsibility, gender, and governance structure affect company ESG policy. We also examine ESG transparency, the global pandemic, religion, governing board and size, national interest, and technology advances. Literature suggests that ESG disclosures of environmental, economic, and social sustainability performance improve corporate sustainability and performance. Religion-based enterprises improved socio-environmental performance but not governance. Independent governing boards improve ESG transparency, while dual-gender boards hurt it. The COVID-19 pandemic showed ESG investments' diversification potential. ESG policies boost corporate innovation, value creation, and financial performance. Overall, social and environmental performance positively correlated with company sustainability, demonstrating that corporate economy and social value creation are interdependent. This review's literature summary will aid ESG research on business investments and sustainability.

In this study[36] Given stakeholders' growing interest in the business's ESG policies, this research examines how ESG disclosure affects corporate performance. The Directive 2014/95/EU and its modification pushed European major firms to disclose their social responsibility activities. This paper uses Agency and Signalling theory to examine the Italian situation, where Legislative Decree 254/2016 implemented the European Directive and required large firms (those with more than 500 employees) to disclose comprehensive social and environmental information starting in 2017. This study finds that environmental, social, and governance disclosure improves firm performance, measured by EBIT, over a 10-year period (2011–2020) using a panel regression analysis of the largest Italian listed companies. Our results will assist stakeholders, decision-makers, policymakers, and researchers understand how ESG disclosure affects business performance as a whole and by pillar. The favourable correlation between ESG disclosure and corporate success should encourage managers to invest in CSR.

This study [37] analyses how stakeholder and legitimacy theory explain the impacts on explanatory factors on a firm's environmental, social, and governance (ESG) performance and financial performance. By examining ESG's explanatory impact on business performance across 10 years, the research adds to ESG and performance-based studies. The research also examines the ESG-performance relationship of SMEs, enhancing ESG understanding of SME performance. The research examines the association between ESG performance and profitability using panel regression analysis on a large Australian sample from Bloomberg's 2007–2017 database. Several robustness assessments address methodological, endogeneity, and causation concerns connected to a firm's ESG performance disclosure to assess the findings' robustness. This research found that enhancing a firm's ESG performance benefits big enterprises' stakeholders over time but not SMEs. The theoretical model argues that listed SMEs do not report ESG

initiatives due to budget constraints. In particular, the work advances academic knowledge of theory and analyses the implications for future research.

This study[38] examines the relationship between corporate profitability as determined by return on assets (ROA) and environmental, social, and governance (ESG) disclosure. Using data from MSCI ESG KLD STATS, we first evaluate an approach for indexing the ESG score of a large sample of publicly traded U.S. corporations from 2000 to 2016. The statistical model examines the relationship between ROA and the three distinct ESG score variables using 17,358 data. There are notable distinctions between financial intermediaries and industrial enterprises. Our findings have important ramifications for decision-makers in government as they show a high positive correlation between environmental consciousness in banks and profitability.

According to this study [39]environmental, social, and corporate governance (ESG) and corporate social responsibility (CSR) have garnered significant attention in the last twenty years, mostly due to the increased awareness of investors and businesses about environmental, social, and governance issues.

An overview of the scholarly literature on ESG/CSR from the perspectives of institutions, businesses, and investors is provided by this survey. First, we go over the meanings of ESG and CSR as well as how they relate to one another. Next, we go over how ESG is assessed and point out issues with the accuracy and measurement of ESG data as well as disparities across various ESG metrics. After that, we focus on investors, looking at the different kinds of investors and the institutional investors' involvement in ESG. We address the reasons for the firm's own ESG practices. We also provide a summary of the research on how ESG influences a company's performance, funding, transparency, and reporting practices. Lastly, we go into further effects of ESG and CSR on businesses and investors.

In this study [40], we investigate the ways in which a firm's financial features influence the impact of environmental, social, and corporate governance (ESG) initiatives on its value. The current research is motivated by the market's valuation of the qualitative side of ESG operations, which is not represented in ESG ratings and is dependent on a firm's financial features. Using numerous ESG score sets for the last four years from two distinct ESG rating agencies, we performed empirical studies. Our findings support earlier research in that ESG performance increases company value, but there are some differences between the different kinds of ESG elements. The favourable effect is more noticeable in companies with higher profitability or foreign ownership, suggesting that companies with strong financial standing to support these initiatives or those with obedient foreign investors who keep an eye on transparency may benefit more from ESG initiatives. The two-stage least squares approach used to capture the reverse causal relationship between financial factors and ESG performance yielded findings that were robust. According to our results, in order to fully benefit from ESG initiatives, businesses must increase market trust by making financial expenditures in areas like profitability and luring in foreign capital.

Table 1 Summary of literature review

Authors	**Year**	**Region**	**Dependent variable**	**Academic research on ESG Score**
Sholpan Shalbayeva,Taner Ismailov,Milen Mitkov,Olga Zamlynska,Valentyna Khachatrian, Viktoriia Stratiichuk	2023	Ukraine	Firm Performance Indicators	positive
Rupamanjari Sinha Ray	2023	India	financial performance	positive
Shamal Chandra Karmaker, Shahadat Hosan, AndrewJ. Chapman and Bidyut Baran Saha	2021	Bangladesh	Environment-related technological innovation	positive
Magdalena Mikołajek-Gocejna	2024	Poland	company's value	positive
Wadhaah Ibrahim Almubarak, Kaouther Chebbi and Mohammed Abdullah Ammer	2023	Saudi Arabia	Earnings Management Levels	positive

Abhishek Parikh a,, Divya Kumari a, Maria Johann b, Duˇsan Mladenovi´c	2023	Poland	Equity returns	positive
Abhishek Behl· P. S. Raghu Kumar· Harnesh Makhija· Dipasha Sharma	2022	India	Firm value of Indian energy sector companies	positive
Loan T. Le	2024	Italy	Financial performance	positive
Genese Harris	2022		ROA,ROE,NPM	positive
Helene Sandberg,Alhamzah Alnoor,Victor Tiberius	2022	Iraq	Financial performance measures,ROA,ROE	positive
Christian Espinosa-Méndez,Carlos Maquieira,José Tomás Arias	2024	Poland	corporate valuation	positive
Hadiqa Ahmad,Muhammad Yaqub,Seung Hwan Lee	2024	Gyeongbuk(Republic of Korea)	Business Sustainability	positive
Silvia Carnini Pulino,Mirella Ciaburri,Barbara Sveva Magnanelli and Luigi Nasta	2022	Italy;	Firm performance	positive
Amir Gholami,Peter A. Murray,John Sands	2022	China	firm's financial performance or profitability	positive
Marina Brogi	2018	Italy	Return on Assets (ROA)	positive
PR RAU T YU	2024	China	Firm performance Impact on firms' financing, disclosure, and reporting activities Other consequences for firms and investors	positive
Won Kang, Mookwon Jung		Korea	Firm value	positive

RESEARCH GAPS

Even though a lot of study has been done on the connection between ESG (Environmental, Social, and Governance) ratings and financial success in a variety of nations and industries, there are still a lot of unanswered questions, especially when it comes to how ESG affects revenue for Indian companies over the long run. The findings of the studies that have already been conducted are inconsistent; although some report favourable connections between ESG practices and profitability, others show negative or negligible links, and many of them concentrate on measures other than direct revenue effects, such as stock prices, ROA, and ROE. Furthermore, there is a dearth of thorough research that takes into account current economic occurrences like the COVID-19 epidemic and how they affect ESG-revenue dynamics in the Indian setting. By conducting a ten-year (2014–2024) analysis of the relationship between ESG ratings and revenue for Indian enterprises, this study seeks to close these gaps and provide detailed insights into how sustainable practices affect financial results in a developing market.

This study aims to investigate the relationship between ESG ratings and revenue for Indian firms over a decade, addressing key research questions: How do ESG ratings impact financial performance?

METHODOLOGY

This study adopts a quantitative approach to examine the relationship between ESG (Environmental, Social, and Governance) ratings and the financial performance of Indian firms over a decade, from 2014 to 2024. The research methodology encompasses the following key steps:

Data Collection:

- Revenue Data: Financial data on company revenues was sourced from Money Control. This dataset includes information from 2014 to 2024, reflecting the impact of various economic events on business profitability.
- ESG Data: ESG ratings were collected using the Yahoo Finance API. For each company symbol, the API retrieved data, which

was then parsed into JSON format. This data was processed into a DataFrame, with timestamps converted into readable dates and filtered to cover the most recent ten years.

Data Processing: The collected ESG data was formatted into a DataFrame and the timestamps were converted to a standard date format. Each company's symbol was appended to ensure clarity. The revenue data was similarly processed to maintain consistency across the dataset.

Data Analysis: The study employs panel data regression techniques to analyze the relationship between ESG ratings and financial performance. Both fixed effects and random effects models were used to account for variations over time and across different companies. The Hausman test was conducted to determine the appropriate model (fixed effects or random effects) for the data. The results indicated a significant difference between the models, favoring the fixed effects model.

Statistical Methods: The fixed effects regression model was applied to understand how ESG ratings influence company revenue. This model helps control for unobserved heterogeneity by considering the unique attributes of each company. The panel regression model includes revenue as an independent variable and ESG ratings as the dependent variable, adjusting for unobserved variables and capturing the dynamic relationship over the study period.

TOOLS USED IN DATA COLLECTION

The revenue data for businesses from 2014 to 2024, sourced from Money Control, provides a comprehensive financial overview, reflecting the impact of key economic events on business profitability. Over this decade, revenue growth has been influenced by market demand, competitive dynamics, regulatory changes, and macroeconomic factors. Notably, periods of economic prosperity saw significant revenue increases, while downturns like the 2020 pandemic led to declines. Post-2021, a recovery phase is anticipated due to digital transformation and strategic realignments. The ESG data, sourced from Yahoo Finance, is gathered for Indian businesses through an API that retrieves and parses JSON data. This information is then formatted into a DataFrame, with timestamps converted to readable dates and filtered to include only the most recent 10 years. The code calculates the average ESG score for each organization annually. This approach offers a decade-long analysis of key environmental, social, and governance indicators, providing valuable insights into the sustainability performance of these businesses.

Algorithm Used for Extract and Analyze ESG Data for Indian Companies

1. **Initialize:**
   - List of Indian company symbols.
   - Empty list for dataframes.
2. **Set Base URL:**
   - Define API endpoint: base_url = "https://query2.finance.yahoo.com/v1/finance/esgChart?symbol=".
3. **Fetch and Process Data:**
   - For each symbol:
     - Construct URL: url = base_url + symbol.
     - Fetch data: response = requests.get(url).
     - Parse JSON: data_json = response.json().
     - If ESG data is available:
       - Convert to DataFrame, format "timestamp", add "symbol".
       - Append DataFrame to dataframes.
     - Handle exceptions and missing data with appropriate messages.
4. **Combine and Filter Data:**
   - If dataframes is not empty:
     - Concatenate DataFrames into esg_data.
     - Filter for 2014-2024: esg_data = esg_data[esg_data["timestamp"].dt.year.between(2014, 2024)].
     - Extract year: esg_data["year"] = esg_data["timestamp"].dt.year.
     - Group by symbol and year, calculate mean ESG score: esg_yearly = esg_data.groupby(["symbol", "year"]).mean().reset_index().
     - Print the resulting DataFrame.
   - Else:
     - Print "No ESG data available for the specified companies."

Data Analysis:

Panel Regression:

Panel data regression is a statistical approach that evaluates variables observed for several entities across time. The results of this analysis are shown below. It is a particular kind of data analysis that is longitudinal in nature. Using pooled ordinary least squares, panel data may be examined; however, it is possible that this method will not yield the best possible findings. Models of panel data regression, such as the fixed effects model and the random effects model, are developed in order to take into account the variation in both time and cross-sections. These models are formed by introducing a constant or random variable into their analysis. In addition, panel data is more effective in drawing conclusions since it has a greater number of variables, which in turn leads to an increase in the number of observations and various degrees of freedom. Panel data analysis has the benefit of minimizing the difficulties of autocorrelation as well as multicollinearity, which ultimately results in an increase in the accuracy of econometric calculations. This is in contrast to time series analysis, which does not have this advantage.

Used a panel regression model to evaluate the influence that income has on environmental, social, and governance (ESG) ratings among Indian companies that are included in the BSE- 100 index. This statistical method is well-suited for data that spans many time periods and cross-sectional units. It enables us to take into account differences that are distinctive to individual firms as well as those that are temporally related. Through the incorporation of revenue as an independent variable and ESG ratings as the dependent variable, the model is able to adjust for unobserved heterogeneity and capture the dynamic connection that exists between both variables throughout the course of the period of 2014-2024. A better understanding of the financial and non-financial aspects that contribute to sustainable business practices may be gained by stakeholders as a consequence of the findings of the panel regression, which give useful insights into the ways in which changes in revenue impact the environmental, social, and governance performance of companies.

$$ESG_{it} = \alpha + \beta . Revenue_{it} + \gamma . X_{it} + \vartheta_{it} + \epsilon_{it}$$

Hausman Test:

Table 1: Hausman Test

Dependent variable	p-value	Chi-square test	Test of summary
revenue	0.001	0	Fixed effect Test

The Hausman test was carried out in order to study the differences and similarities between the fixed effects and random effects models for the link between ESG ratings and revenue. When doing the analysis, the revenue serves as the dependent variable, and the p-value of the test is the primary statistic that is used for the comparison. Following the Hausman test, the p-value comes out to be 0.001. Since the p-value is rather low, it may be deduced that there is a substantial difference between the models with fixed effects and those with random effects. To be more specific, a p-value that is lower than 0.05 (or 0.001 in this instance) indicates that the fixed effects model is better suitable for this data than the random effects model. The fact that the Chi-square statistic that is related with the Hausman test is zero provides more evidence in favour of the conclusion that the fixed effects model ought to be recommended. In the context of the Hausman test, the Chi-square test is used to investigate whether or not the unique errors (u_i) are associated with the regressors. A significant result, which is shown by the p-value in this case, indicates that the assumption of random effects has been broken.

As a conclusion, the findings of the Hausman test, which had a p-value of 0.001, clearly suggest that the fixed effects model is better appropriate for analysing the link between ESG ratings and revenue. This shows that the distinctive qualities of each organisation have a substantial influence on the outcomes, and it is recommended that they be taken into consideration by using a fixed effects method rather than basing the analysis on the assumption of random effects.

Fixed Effect:

Table 2: Fixed Effect

revenue	Coef.	Std. Err.	t	P>t	[95% Conf.interval]	
esgscore	-561.9	92.32001	-6.09	0	-743.4	-380.4

_cons	99489.91	4859.613	20.47	0	89936	109044
sigma_u	97191.791					
sigma_e	34127.422					
rho	0.89023757					

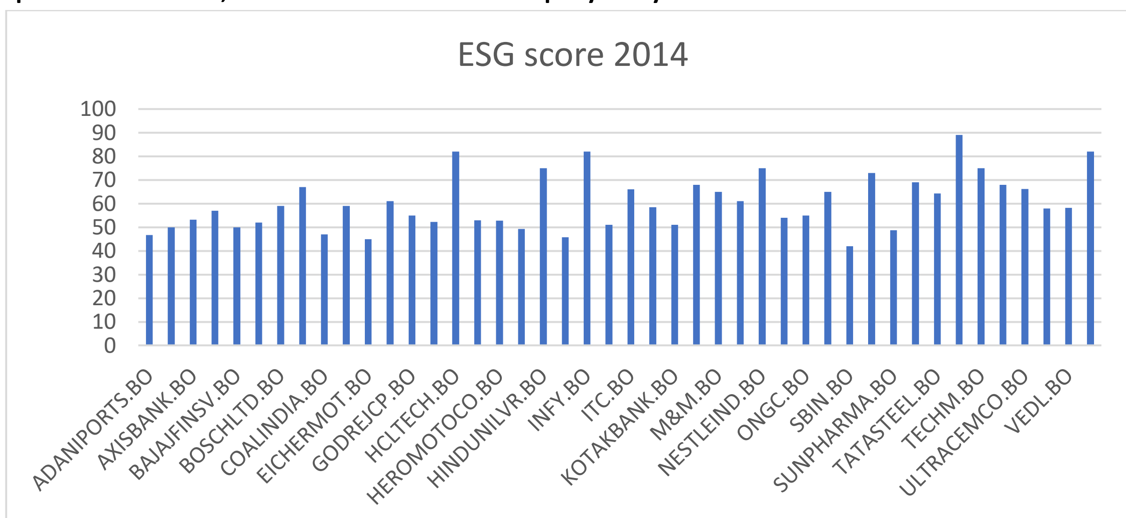
It has been shown via the use of the fixed-effects (within) regression analysis that there exists a statistically significant connection between environmental, social, and governance (ESG) ratings and revenue for the companies that were examined. It is important to note that the coefficient for the ESG score is -561.9, and the standard error is 92.32. Due to the fact that this coefficient is negative, it can be deduced that the income drops by about 561.9 units for every unit that is added to the ESG score. It can be concluded that this association is very significant based on the t-value of -6.09 and the p-value that is linked with it, which is 0.000.

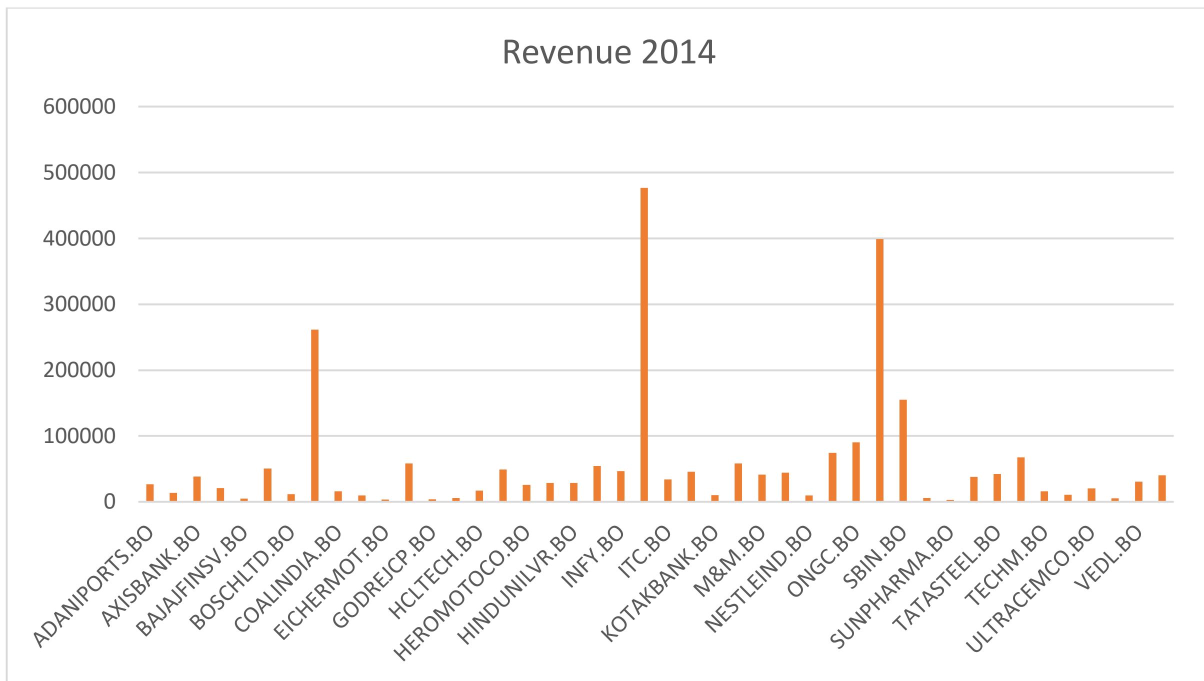
The value of the inside R-squared is 0.0857, which indicates that differences in the ESG ratings of firms account for about 8.57% of the variance in revenue that exists within organisations. The result of the between R-squared statistic is 0.0327, which indicates that only 3.27% of the variation in revenue that exists between various firms can be attributed to ESG ratings for each company. A total of 0.0015 is the value of the R-squared statistic, which indicates the percentage of the entire variability in income that can be attributed to the model.99489.91 is the value of the constant term (_cons), which represents the anticipated income in the event that the ESG score is zero. There is a high level of significance associated with the constant, as shown by its t-value of 20.47 and its p-value of 0.000. The standard error of the constant is 4859.613.

With a value of 0.8902, the rho value, which is a representation of the proportion of variance that is due to the error component that is distinctive to the firm, is fairly high. The fact that this is the case suggests that a significant percentage of the variation in revenue is not attributable to variances within firms but rather to differences across companies.

Overall, the findings of the study indicate that higher ESG ratings are related with lower sales, with a significant percentage of the fluctuation in revenue being ascribed to variables that are unique to the firm and its operations. When conducting an analysis of the influence that ESG scores have on revenue, it is essential to take into account the features that are unique to the company, as shown by the substantial assocation and the high rho value.

Comparison plots for ESG score, Revenue between each company in a year wise

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COALINDIA.BO
EICHERMOT.BO
GODREJCP.BO
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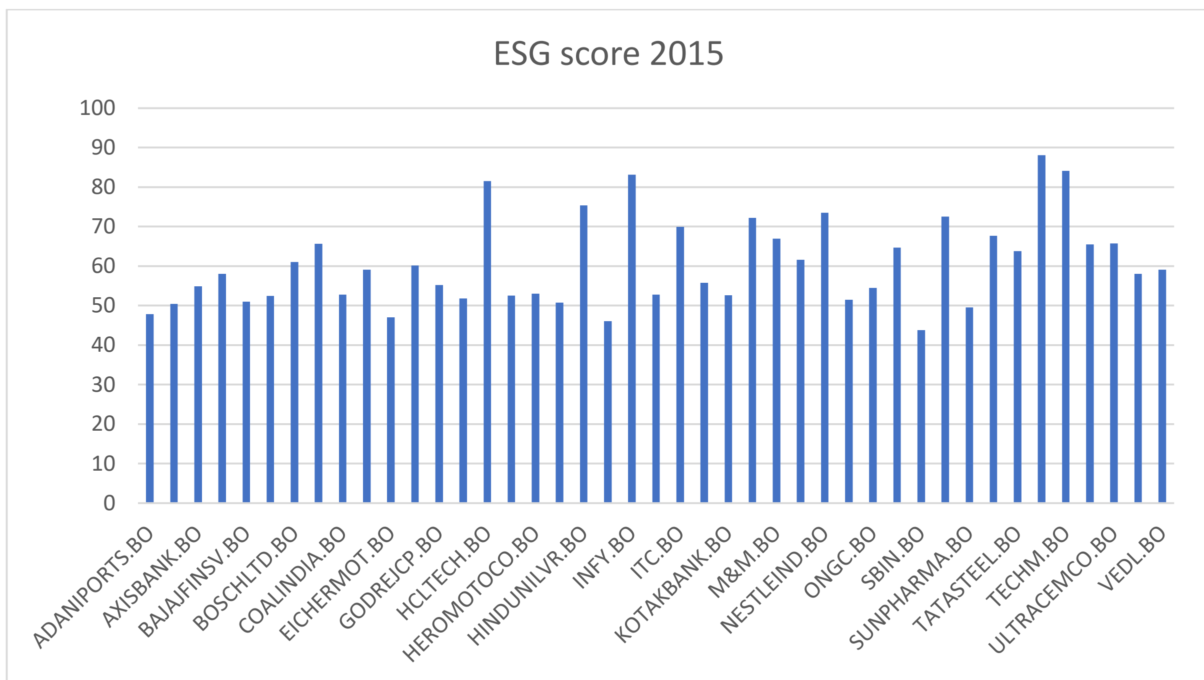
ESG score 2015
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90
80
70
60
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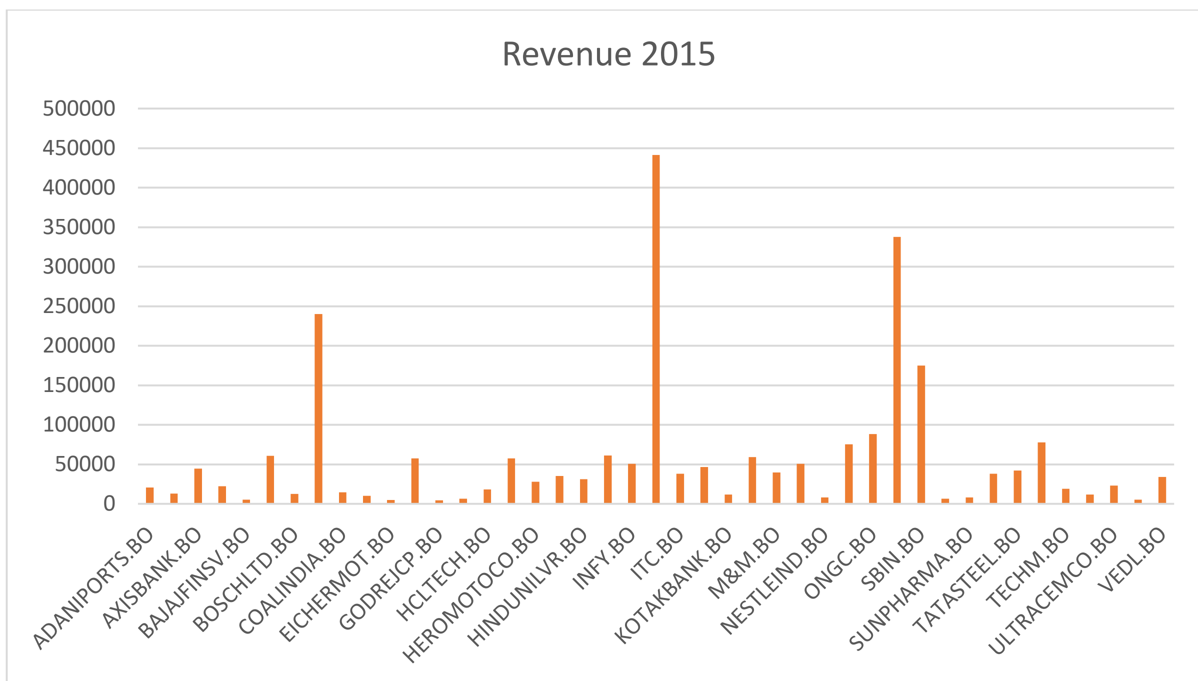
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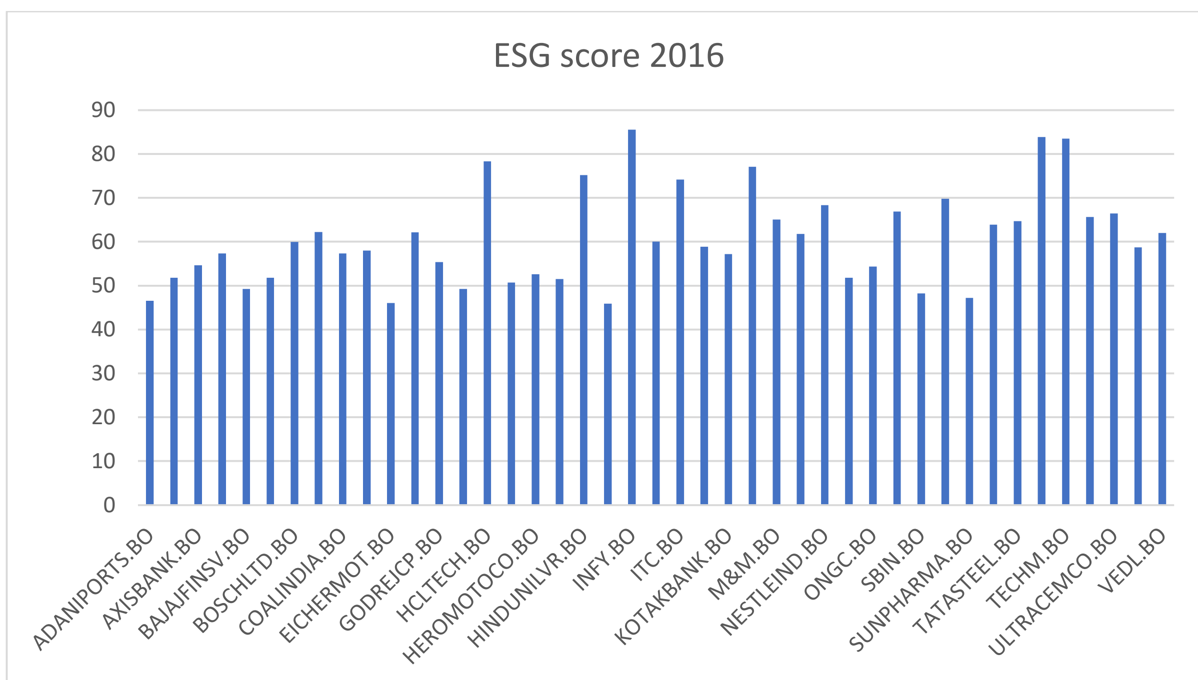
ESG score 2016
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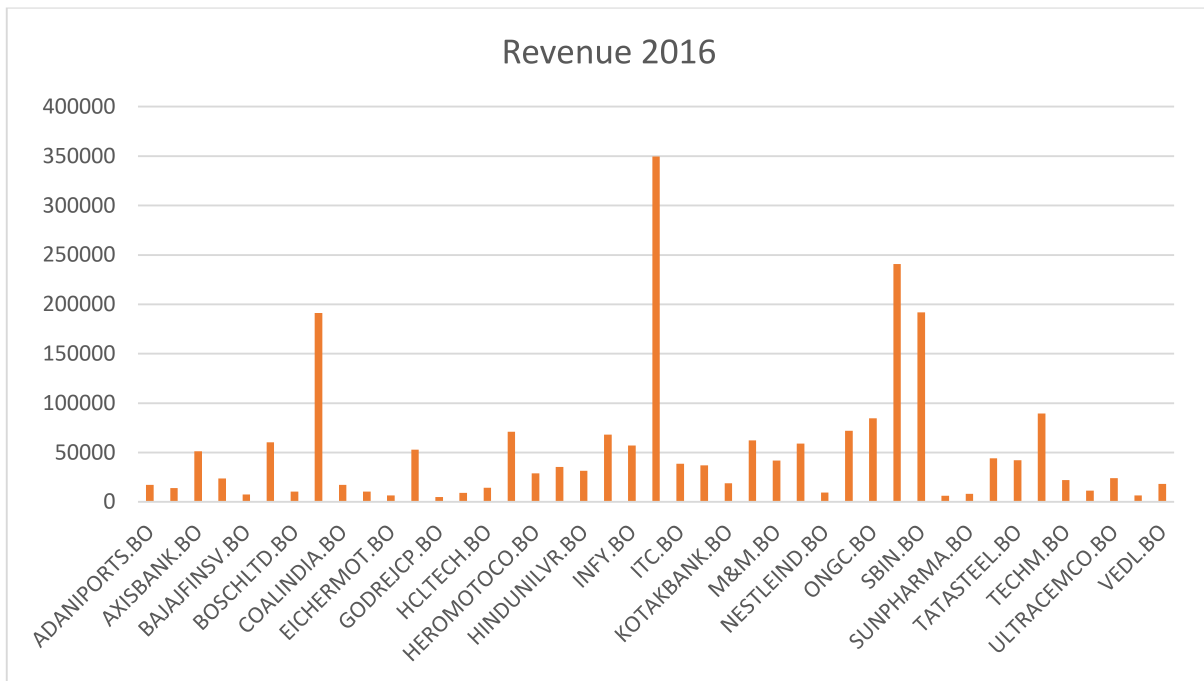
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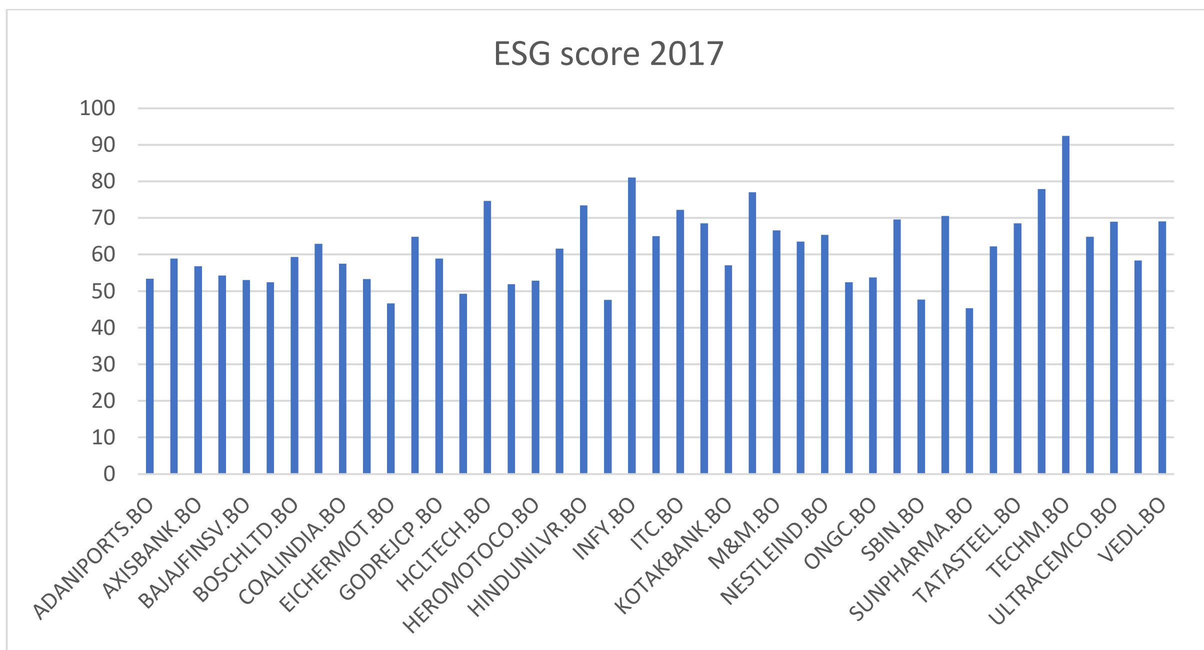
ESG score 2017
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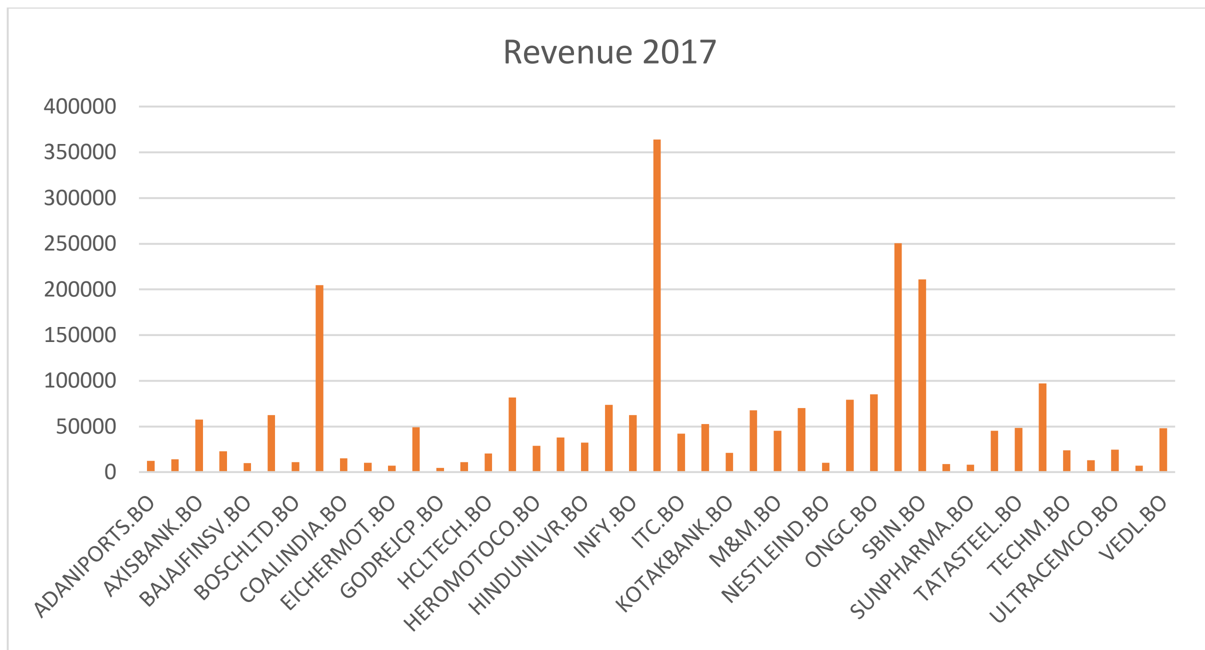
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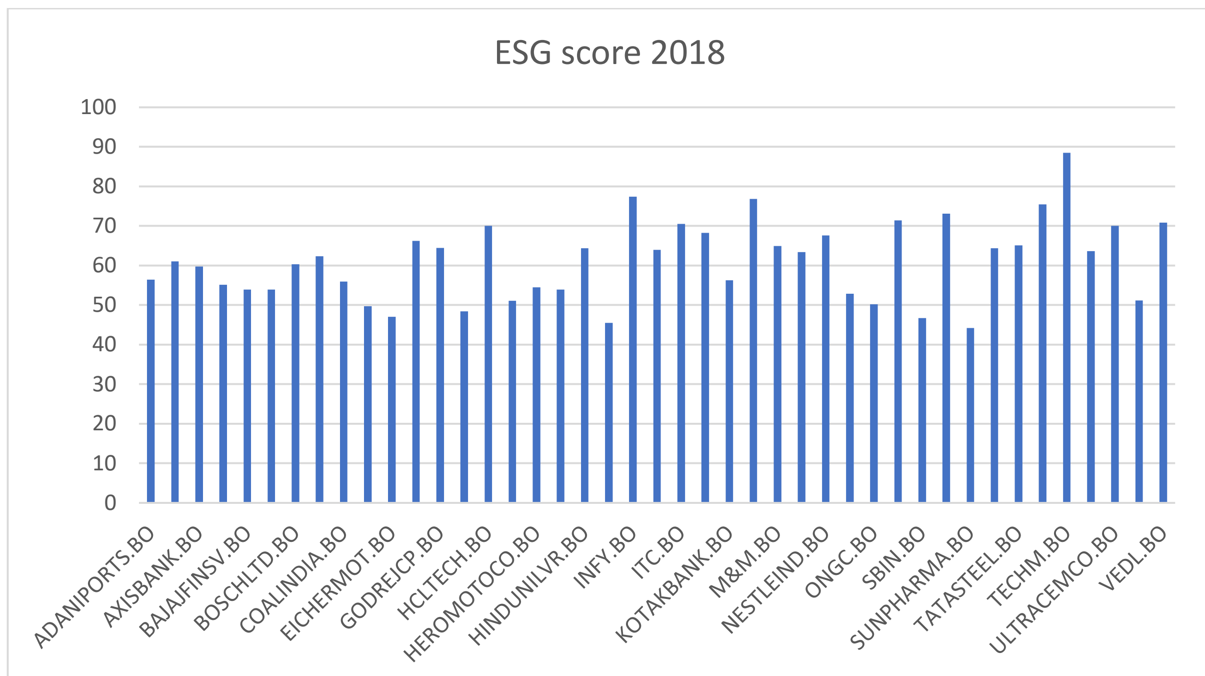
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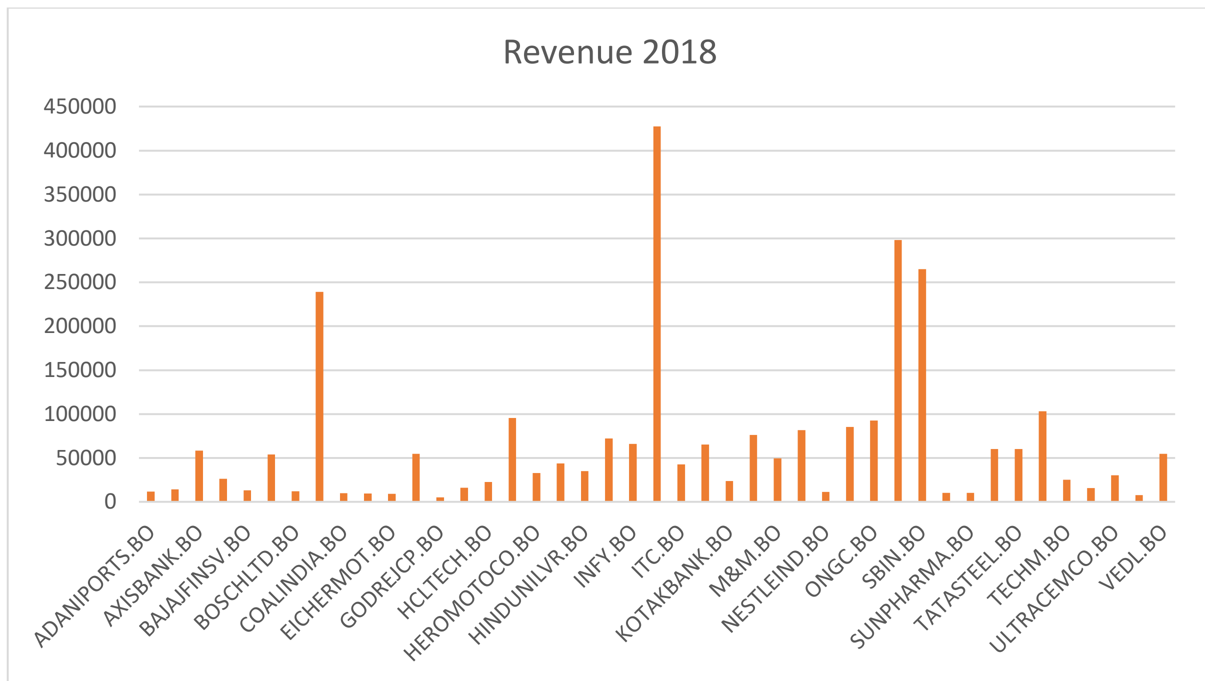
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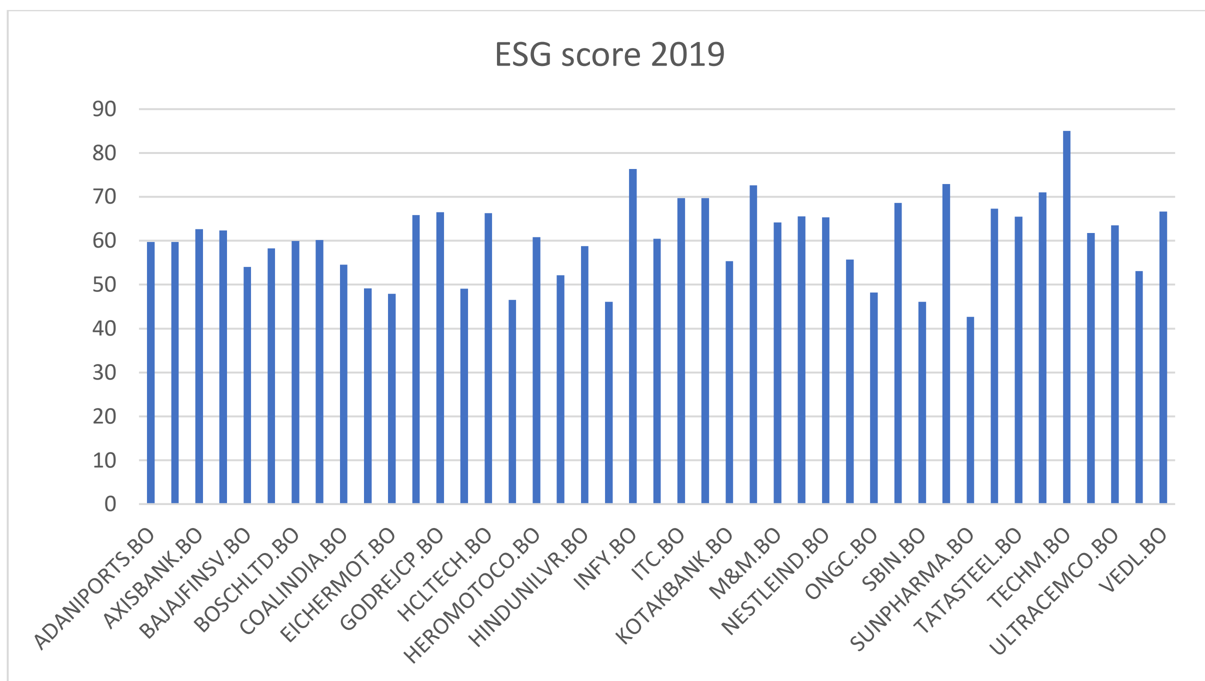
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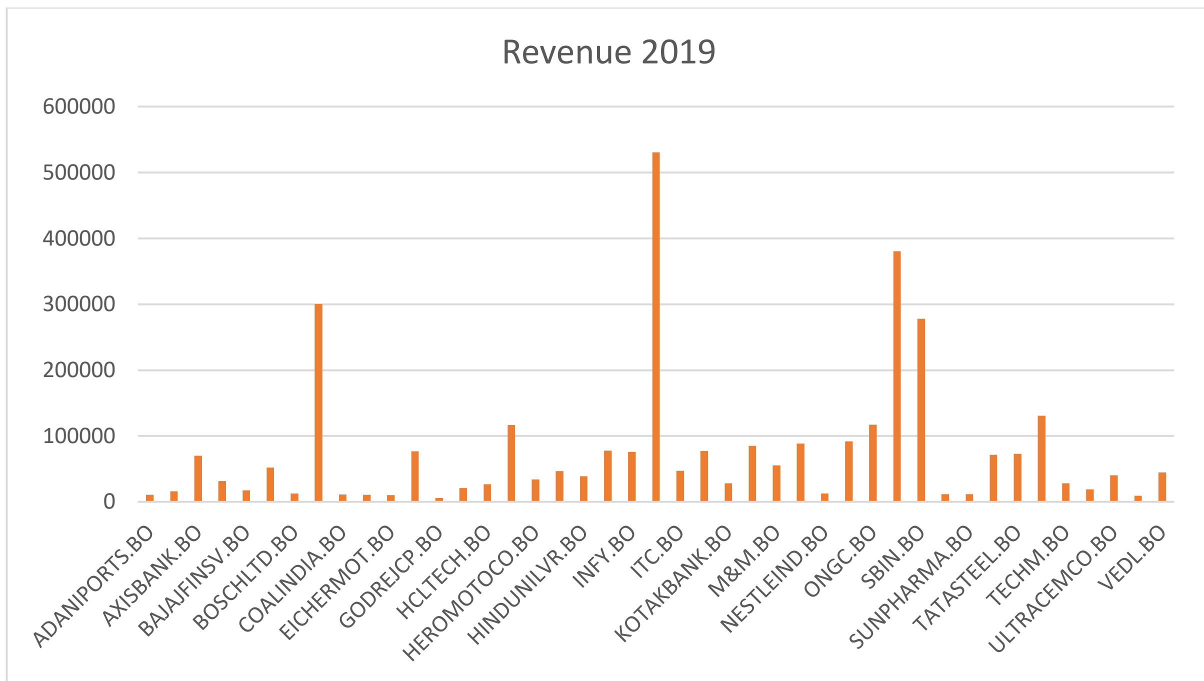
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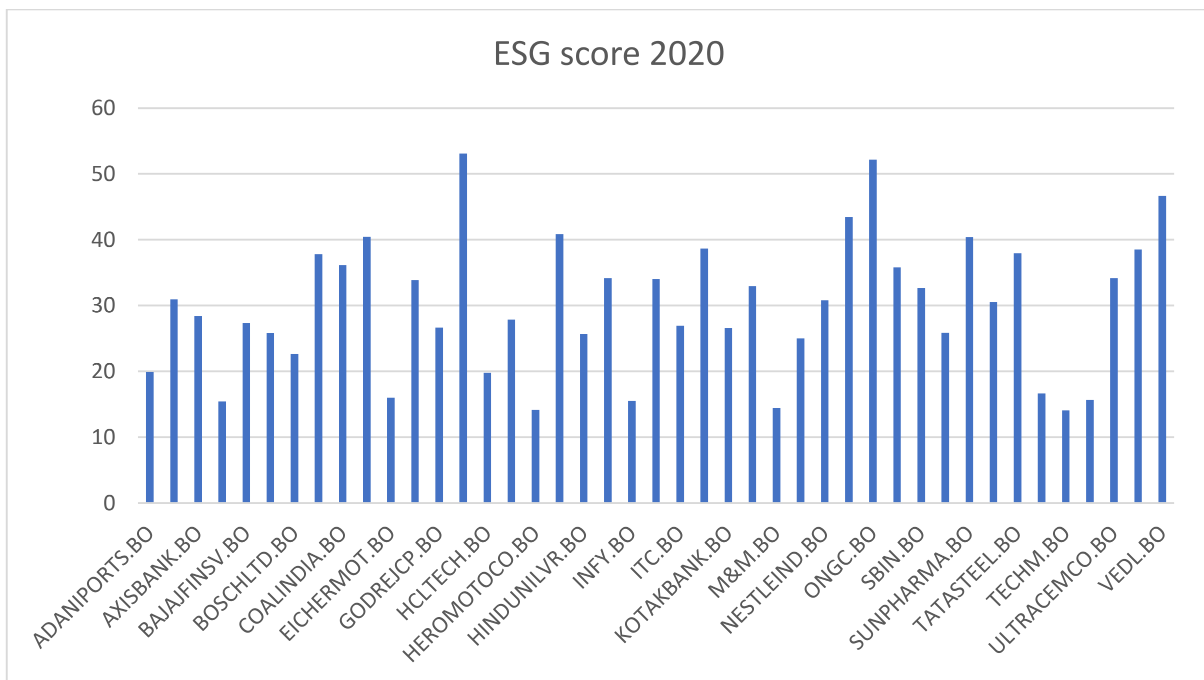
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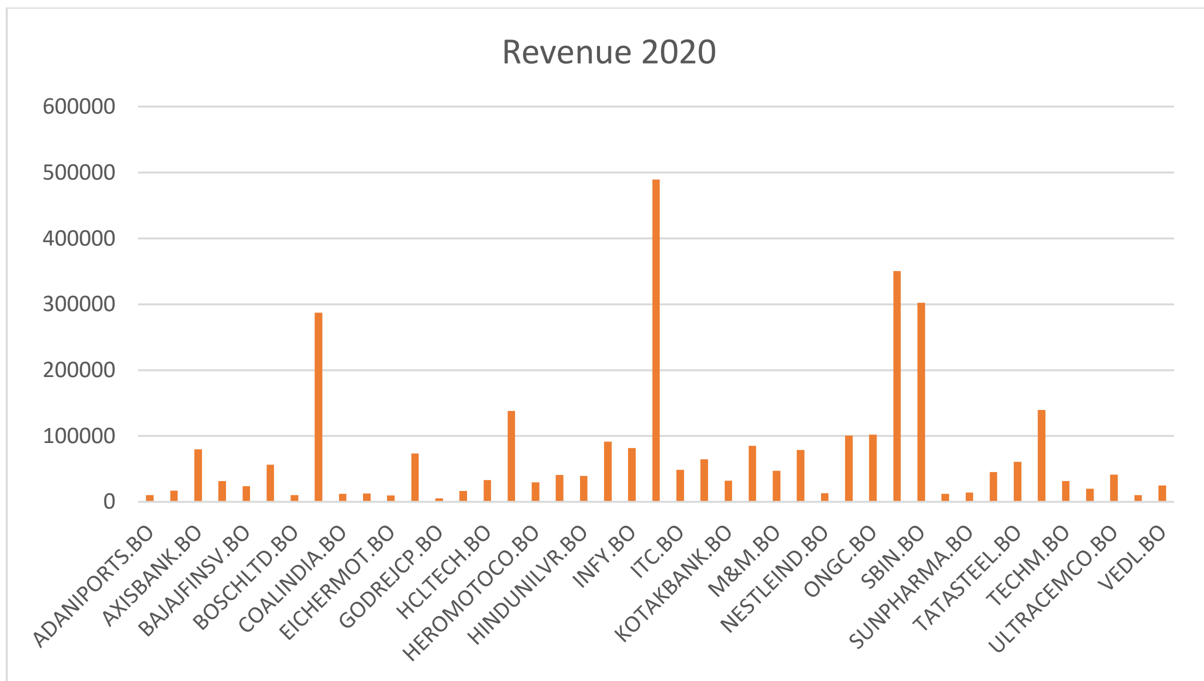
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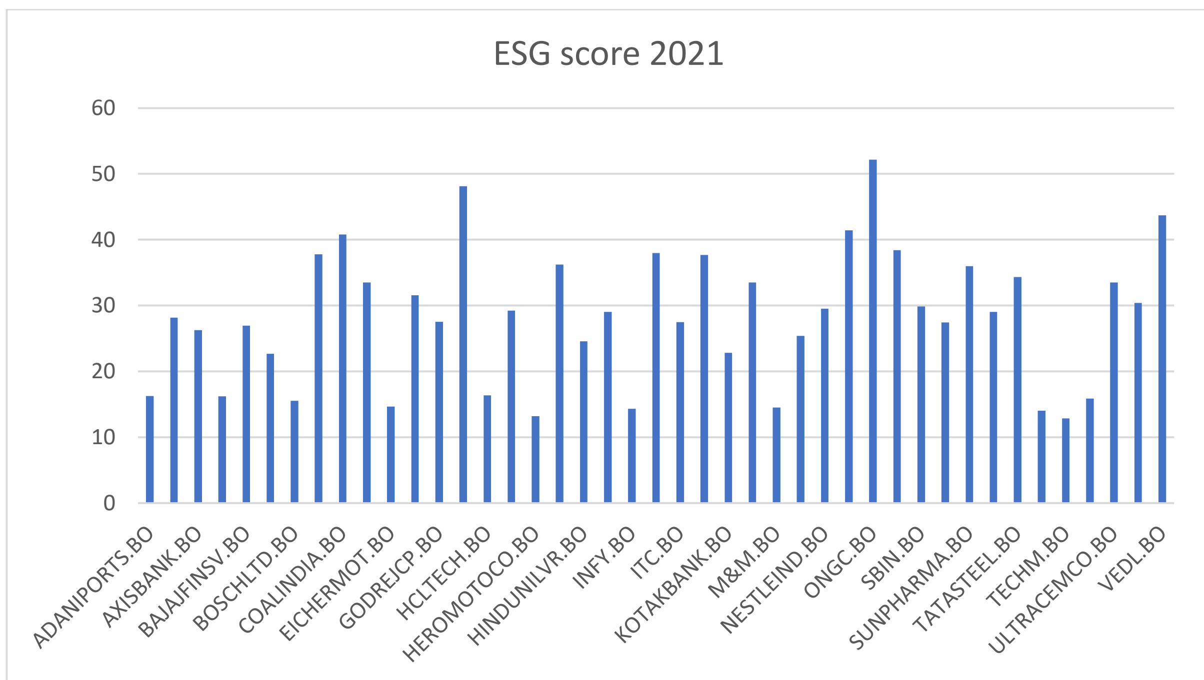
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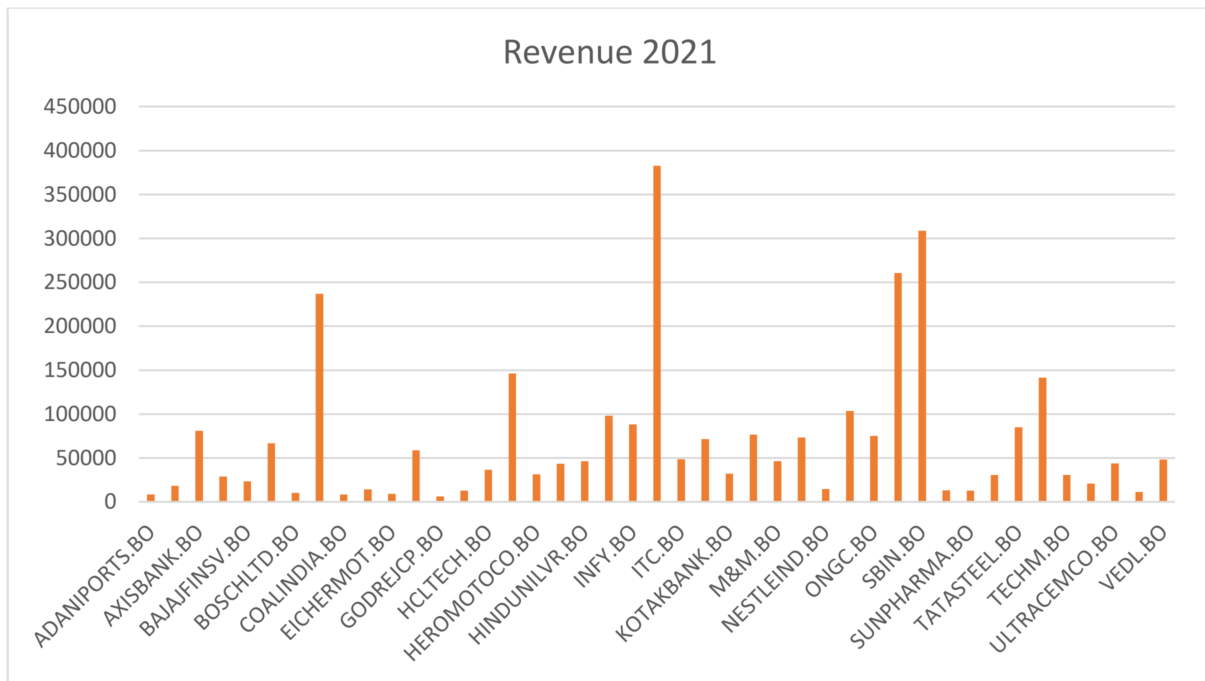
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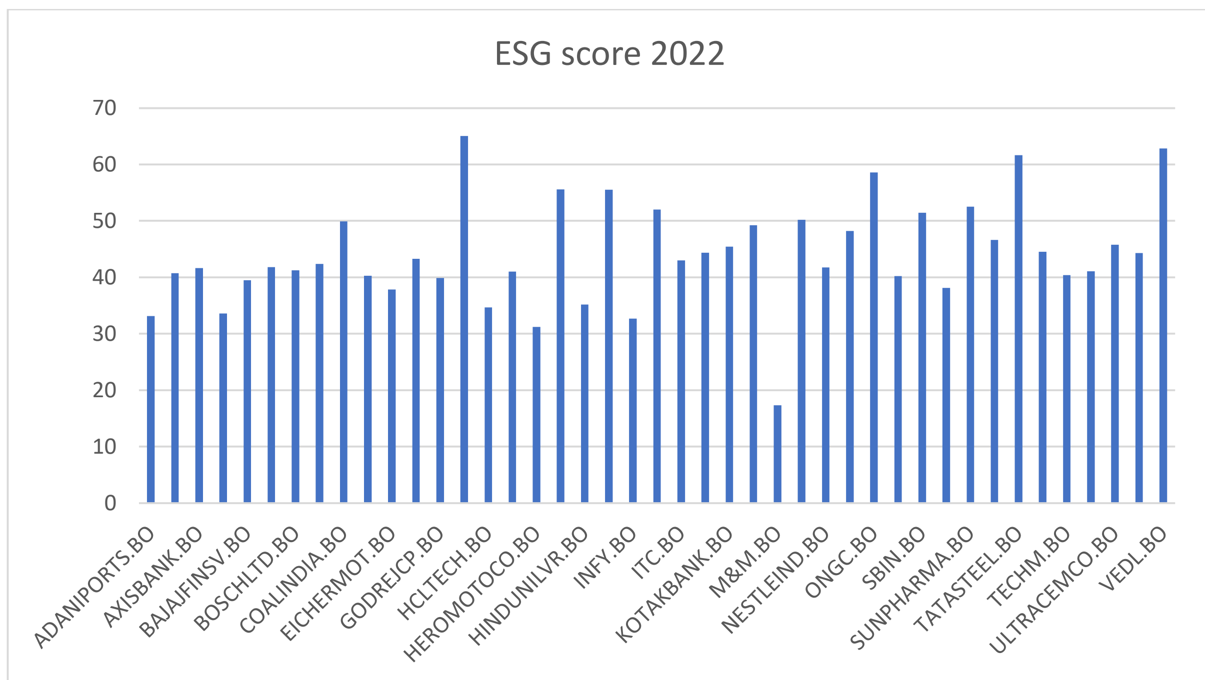
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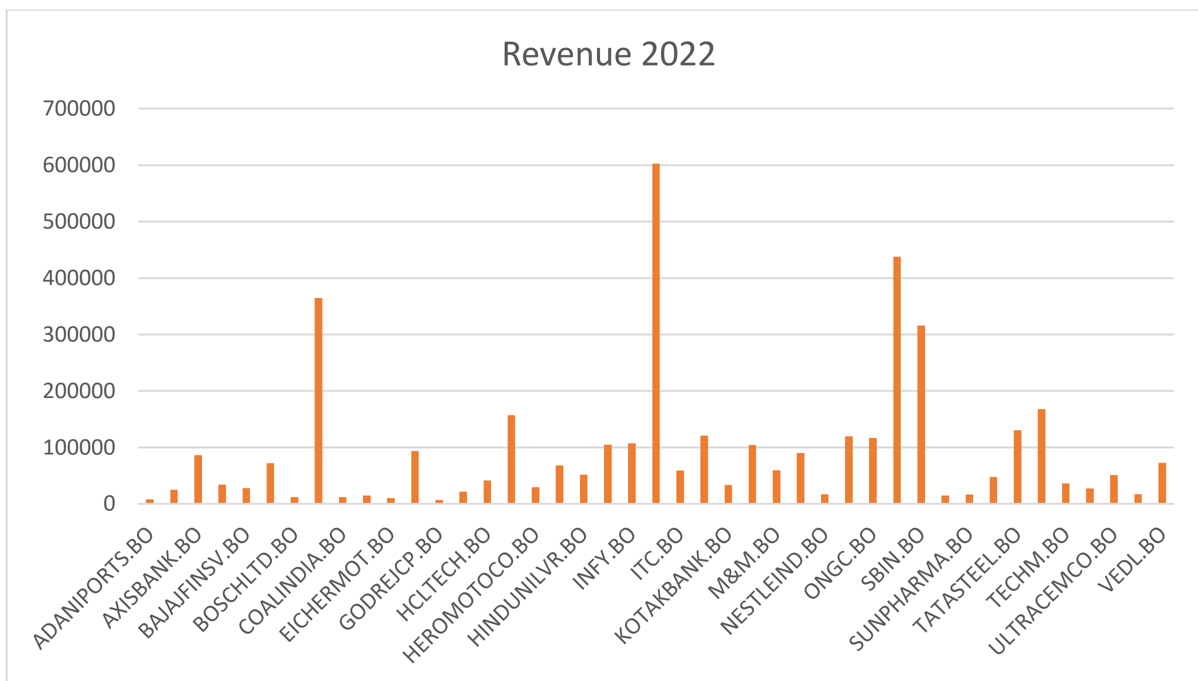
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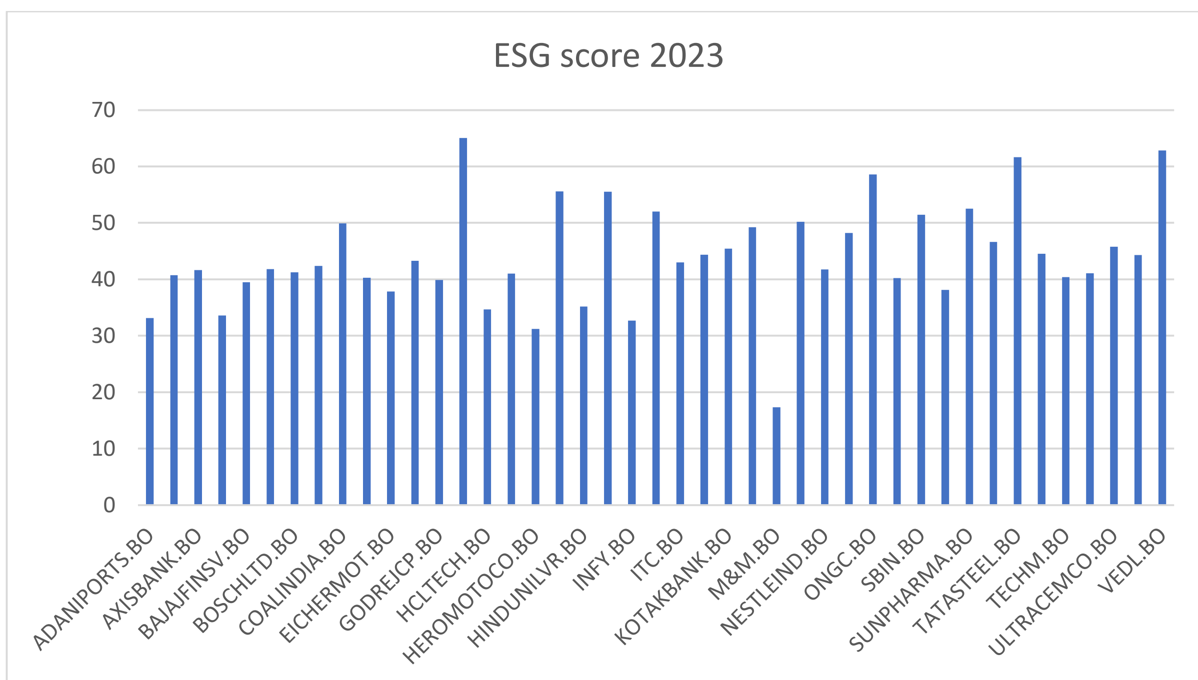
ESG score 2023
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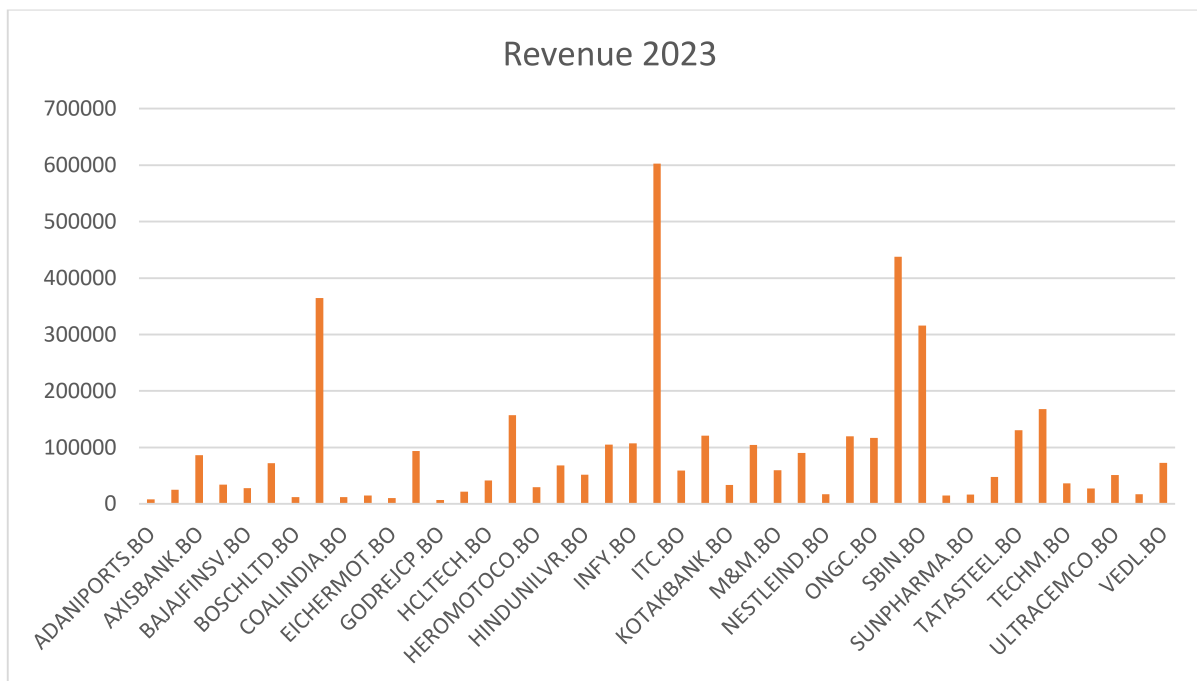

These bar graphs show the difference between the businesses' ESG scores and their annual revenues. The x-axis lists the names of the companies, and the y-axis lists their ESG score, Revenue Values. We can see one year for each bar plot.

CONCLUSION

The study's findings indicate a significant inverse relationship between ESG ratings and revenue among Indian companies, implying that higher ESG scores correlate with lower short-term financial performance. This underscores the need for companies to align their sustainability efforts with long-term financial strategies. Future research could explore the sector-specific impacts of ESG ratings and incorporate more recent data to validate these findings. Policymakers should consider these insights when formulating regulations to promote sustainable practices without compromising financial viability. While this study provides a robust analysis over ten years, it is limited by the data's availability and the dynamic nature of market conditions.

ACKNOWLEDGEMENTS

With utmost humbleness and gratitude, I express this acknowledgement to honour those who have contributed in my research paper. My sincere appreciation to my teachers at Indus International School, Pune for being a constant source of inspiration, and imbibing in me true research orientation of highest standards with values rooted in ethics and sincerity.

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