ISSN 1808-057X
DOI: 10.1590/1808-057x20231729.en

ORIGINAL ARTICLE

Environmental, social and governance and the firm life cycle: evidence from the Brazilian market

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Received on 05.31.2022 – Desk acceptance on 07.11.2022 – 4th version approved on 04.13.2023
Editor-in-Chief: Fábio Frezatti
Associate Editor: Eliseu Martins

ABSTRACT

The study analyzed the association between environmental, social and governance (ESG) and the life cycle stages of Brazilian publicly-traded companies listed on the B3 S.A. – *Brasil, Bolsa, Balcão* (B3) from 2010 to 2020. It explores a theoretical gap regarding the relationship between the life cycle stages of companies and ESG initiatives in Brazil, an emerging country. The findings are relevant for understanding how the life cycle stages act as signals of the level of ESG actions of companies and how the market perceives these actions and their ability to create value. The research provides evidence that the fundamentals of the firm life cycle theory function as indicators for several organizational perspectives, including ESG practices. The sample consisted of 109 companies whose data were collected from Thomson Reuters® and analyzed using multiple regression. The model proposed by Dickinson (2011) was used to analyze the life cycle stages. It should be highlighted that the data were also analyzed using the fixed effect as an estimation of the econometric model, but there was a loss of statistical significance in the relationship found, possibly due to the sample selection performed in the unbalanced panel. Based on the sample analyzed and the econometric models used, the results indicate that companies in the birth and turbulence stages have lower levels of ESG practices, particularly in the environmental and social pillars, compared to companies in the maturity stage. The findings also show that ESG initiatives in the Brazilian capital market are associated with measures of companies' profitability, liquidity, indebtedness, market value, and number of analysts. The research contributes to the analysis of the relationship between the adoption of ESG practices and the life cycle stages of companies in an emerging market, with implications for stakeholders regarding the targeting of resources to sustainable actions.

Keywords: ESG, firm life cycle, Brazilian market, governance, sustainability.

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This is a bilingual text. The article was originally written in Portuguese and published under the DOI https://doi.org/10.1590/1808-057x20231729.pt
Work presented at the 22nd USP International Conference in Accounting, São Paulo, SP, Brazil, July 2022.

1. INTRODUCTION

The firm life cycle theory posits that companies evolve through several stages during their organizational existence. These stages are classified as birth, growth, maturity, turbulence, and decline based on cash inflows and outflows, i.e., the combination of the signs obtained through operational, investment, and financing cash flows (Dickinson, 2011).

At different stages, companies have specific financial characteristics and different availability of resources (McWilliam & Siegel, 2001), thus enabling the understanding of issues related to decisions on investments in the environmental, social and governance (ESG) areas, assuming that the prior analysis of the availability of financial resources of companies is determinant for the decision to invest in sustainable practices (Atif & Ali, 2021).

The literature on the firm life cycle indicates that firms that are financially constrained, such as in the early stages (birth/growth), may be less likely to focus on ESG disclosure (Atif & Ali, 2021). This relationship makes sense because these companies experience uncertainty about future cash flows and require a greater volume of investment, requiring the use of external resources to cover negative cash flows in operating and investing activities (Dickinson, 2011).

In contrast, because companies in the maturity stage have a greater competitive advantage, sufficient resources, and greater predictability of future cash flows, they may be more inclined to disclose ESG information, due to concerns about reputation and interaction with stakeholders (Atif & Ali, 2021; Hasan & Habib, 2017).

As can be seen, there is an implicit relationship between ESG disclosure and the life cycle stages of firms, but this relationship requires further study. In light of the above, the following research problem was defined: What is the relationship between ESG and the life cycle stages of Brazilian companies?

In turn, the objective of this research is to analyze the relationship between ESG and the life cycle stages of Brazilian companies. It is opportune to investigate the proposed relationship, especially considering the prominence that has been given to the disclosure of environmental, social and governance information in recent decades, stemming from the growing interest of stakeholders in socially responsible activities (Brogi & Lagasio, 2019; Conca et al, 2021; Umar et al., 2021; Yu et al., 2018), as ESG disclosures have been associated with a positive effect on firms' market value and performance (Aouadi & Marsat, 2018; Broadstock et al., 2021; Conca et al., 2021; Friede et al., 2015; Garcia-Sanchez et al., 2014; Li et al., 2018; Yu et al., 2018).

Among the studies that make up the scope of this research, it was found that few have delved deep into the specific relationship between the adoption of Corporate Social Responsibility (CSR) practices, which includes ESG, and the life cycle stages of companies, and a research gap is observed, especially in the Brazilian context.

There are studies in the international context that have investigated the relationship between the firm life cycle and CSR (Hasan & Habib, 2017; Withisuphakorn & Jiraporn, 2016) motivated by opportunistic behavior and ethical issues (Lee & Choi, 2018), the moderating role of the organizational life cycle in the allocation of resources (Hsu, 2018), financial distress (Al-Hadi et al., 2019), dividend policy (Trihermanto & Nainggolan, 2020), firm performance (Jan et al., 2021; Park, 2021), and firm value (Hendratama & Huang, 2021; Khuong & Anh, 2022), as well as the relationship between ESG disclosure and firms' default risk (Atif & Ali, 2021) and cash holdings (Atif et al., 2022).

In the Brazilian context, we can highlight the analysis of the firm life cycle to mitigate environmental impacts in Brazilian companies (Almeida et al., 2019), in the quality of corporate governance and its relationship with financial distress (Machado et al., 2020), in the cost of debt (Ribeiro et al., 2021), and in CSR performance (Freire et al., 2022).

As main results, according to the data analyzed and the econometric models used, there is a negative association between the firm's life cycle stages, in this case birth and turbulence, and ESG practices, with emphasis on the environmental and social dimensions (the most affected). In addition, companies in the maturity stage had higher levels of ESG investments, higher levels of liquidity, and lower levels of debt, confirming the assumptions of the firm life cycle theory by showing the company's relationship with stakeholders.

This article aims to fill the theoretical gap regarding the relationship between life cycle stages and ESG initiatives in the context of Brazil, an emerging country, by exploring the associations with companies' economic and financial indicators, such as profitability, liquidity, indebtedness, market value, and number of market analysts, expanding the scope of previously investigated variables. In addition, the study analyzes the possible impacts of the coronavirus

2019 (Covid-19) pandemic on the relationship between ESG practices and the stages of companies' life cycles. Thus, the study provides theoretical and practical contributions.

In the theoretical aspect, it extends the literature by exploring a relationship that has been scarcely explored in the Brazilian institutional environment (ESG versus firms' life cycles), highlighting the variables used both for ESG and for the accounting-financial indicators used to control the main relationship, since the configurations of the institutional environment can influence and affect the performance of companies differently, whether they operate in developed or emerging countries (Garcia & Orsato, 2020).

From a practical perspective, it provides evidence to investors, analysts, managers, capital providers, and other stakeholders that the life cycle stages of firms act as signals in directing resources towards sustainable actions and improving organizational management.

2. THEORETICAL FRAMEWORK

2.1 ESG Practices and the Life Cycle Stages of Firms

The adoption of ESG practices by companies has several motivations related to the search for improvements in economic and financial performance, from the perspective of satisfying the interests of stakeholders (shareholders, institutional investors, governments, employees, and suppliers) regarding the adoption of socially responsible activities and governance practices (Brogi & Lagasio, 2019; Conca et al., 2021; Umar et al., 2021; Yu et. al., 2018).

ESG disclosure has been associated with a positive image of companies in the eyes of the market as it acts as a sign of their willingness to give back some of their profits in the form of social and environmental benefits (Martins & Cunha, 2022).

In particular, the number of companies adopting sustainability strategies and disclosing ESG information has been increasing, especially in recent decades (Conca et al., 2021; Xie et al., 2019), because transparency of this information relates to the maximization of companies' sustainability, which is associated with image, brand, and reputation (Harymawan et al., 2021) and affects investors' perceptions of future financial prospects (Brogi & Lagasio, 2019; Brooks & Oikonomou, 2018; Li et al., 2018).

Recent research has shown that ESG disclosure has a positive effect on the market value and performance of companies, considering performance proxies based on return on assets (ROA), return on equity (ROE), profit margin, and on the market (market value of shares and Tobin's Q) (Aouadi & Marsat, 2018; Broadstock et al, 2021; Conca et al., 2021; Friede et al., 2015; Garcia-Sanchez et al., 2014; Li et al., 2018; Yu et al., 2018).

Moreover, the literature indicates that investment instruments labeled as sustainable achieved considerable growth during the Covid-19 pandemic, and companies with higher ESG ratings experienced comparatively higher stock returns and lower volatility, proving more resilient in turbulent times (Adams & Abhayawansa, 2021; Albuquerque et al., 2020; Broadstock et al., 2021; Díaz et al., 2021; Umar et al., 2021).

In addition, the studies have shown that companies can benefit in terms of financial performance and market value by engaging in sustainable actions such as adopting ESG practices integrated into the management strategy, although there is not a consensus on this (Brogi & Lagasio, 2019; Friede et al., 2015). Bhandari and Javakhadze (2017) and Garcia and Orsato (2020) found an inverse relationship, with a negative association between ESG disclosure and performance, which may be influenced by the institutional environment in which companies are embedded (Garcia & Orsato, 2020).

In Brazil, whose institutional environment is considered fragile and marked by social problems (Soares et al., 2018), studies (Ching et al., 2017; Martins & Cunha, 2022) have not identified a significant relationship between accounting and market variables and the disclosure of information on sustainability and ESG. Only a marginally significant relationship was found between ESG and market value, considering the social pillar (Martins & Cunha, 2022). An exception was the study by Freire et al. (2022), who found an influential and positive relationship between the adoption of CSR practices and the performance of Brazilian companies (measured by ROA), consistent with previous studies.

Analyzing the effects of the adoption of ESG initiatives on company performance is relevant because it allows investors to evaluate the cost-benefit ratio of adopted practices, considering their value maximization objectives (Qureshi et al., 2021). However, while there is much

discussion on value creation and long-term corporate success, there is no consensus on the financial performance of companies that are considered sustainable (Ching et al., 2017). There are also insufficient studies to confirm whether in fact this "virtuous cycle is bidirectional" (Qureshi et al., 2021, p. 2).

However, from the perspective of organizational management and strategy, there are issues that precede ESG investment decisions that warrant highlighting, such as the availability of financial resources (Atif & Ali, 2021; Atif et al., 2022), and the need to raise funds, improve debt levels, and seek an increase in market value and visibility by financial analysts, among others.

In this sense, the life cycle stages of firms are a way to understand the ESG phenomenon, as they reflect different attributes related to business conditions (Almeida & Kale, 2021) and can influence organizational management (Adizes, 1979; Miller & Friesen, 1980; Quinn & Cameron, 1983; Torbert, 1975) and the definition of strategies, being a determinant of value creation and competitiveness (Huang et al., 2020).

This study focuses on the firm life cycle theory and Dickinson's model (2011), which serve as a basis for understanding that the changes that occur in organizations through interaction with the internal and external environment are reflected in the cash flows generated and consumed in operating, investing, and financing activities. Therefore, it is considered that companies in their different life cycle stages (birth, growth, maturity, turbulence, and decline) (Dickinson, 2011) have different capacities in terms of financial, physical, human, and technological resources, which can affect decisions involving ESG initiatives (Freire et al., 2022; Hasan & Habib, 2017; Hendratama & Huang, 2021).

The birth stage is characterized by uncertainties in revenue and cost flows, investment decisions and product innovation, increased debt levels (Hasan et al., 2017), and a high cost of capital due to the uncertainty of future cash flows and returns (Hansen et al., 2018). In this stage, a lower level of ESG investments is expected due to financial constraints (Atif & Ali, 2021).

The growth stage is characterized by the maximization of profits, profitability, positive operating cash generation, and investments (Dickinson, 2011), where there is a decrease in uncertainties about investment returns and a consequent reduction in the cost of capital due to lower business risk (Habib & Hasan, 2019). Nevertheless, there may be restrictions on the adoption of sustainable initiatives due to the high cost associated with improving internal and business processes (Martins & Cunha, 2022).

Studies show that mature companies are more inclined to disclose ESG information in search of legitimacy, reputation, and interaction with stakeholders (Atif & Ali, 2021; McWilliam & Siegel, 2001). In these companies, greater ESG investments can be observed as they are in a period of financial stability (Hasan & Habib, 2017), in addition to ESG disclosure being associated with lower default risk (Atif & Ali, 2021).

The maturity stage reflects the adoption of a series of actions and corporate governance practices that tend to result in greater process efficiency, with positive operating cash flow and reduced investments and financing compared to the growth phase (Faff et al., 2016).

In contrast, the turbulence and decline stages are characterized by financial distress, where organizations suffer the opposite effect of the birth and growth stages, with reduced sales and investment opportunities due to a lack of resources (Hasan & Habib, 2017). In this context, companies may not have the capacity (or sufficient financial capital) to invest in ESG actions and provide quality ESG disclosure, although this is associated with superior performance in terms of future financial market prospects (Harymawan et al., 2021).

In the turbulence period, companies experience a decline in growth, investment, innovation, and operational efficiency (Dickinson, 2011), which may be accompanied by the liquidation of assets to generate cash flow and repay debt (Faff et al., 2016).

Freire et al. (2022) highlight the negative influence of the turbulence stage on CSR investments, confirming that companies with financial constraints generally seek to reduce costs and strategically allocate available resources.

In the decline stage, companies may depend on external financing to continue operations, finance assets, and restructure the business (Hansen et al., 2018). This is a more fragile phase where firms focus on re-establishing themselves in the market, which is likely to have an impact on their investment decisions (Zhao & Xiao, 2019).

Based on the discussion presented, and considering that companies in each of the life cycle stages have different economic and financial characteristics and that there are gaps to be explored in the Brazilian institutional environment, four research hypotheses were defined, taking the maturity stage as a reference for the analysis of the results:

H_1: companies in the birth stage have a lower level of ESG than companies in the maturity stage.

H_2: companies in the growth stage have a lower level of ESG than companies in the maturity stage.

H_3: companies in the turbulence stage have a lower level of ESG than companies in the maturity stage.

H_4: companies in the decline stage have a lower level of ESG than companies in the maturity stage.

3. METHODOLOGICAL ASPECTS

This study used a sample of Brazilian non-financial companies listed on the B3 S.A. – *Brasil, Bolsa, Balcão* (B3). The data collection was carried out through the Thomson Reuters® platform. The sampling process took into account the exclusion of financial companies, which have different characteristics from other sectors, as well as those that did not have available information to calculate the variables used in the study.

Thus, from a total of 356 companies listed on Thomson Reuters®, we excluded those belonging to the financial sector (41 companies), those that did not have information on combined ESG (204 companies), and those that did not have data for the other variables (two companies). It should be noted that companies reporting losses were included in the sample to increase the robustness of the results, as the analysis by life cycle stages of companies in decline, for example, could be hampered by this type of exclusion.

The final research sample had 805 observations of 109 companies and covered the period from 2010 to 2020. It is worth highlighting that the starting year was chosen because it is considered the base year for mandatory compliance with the International Financial Reporting Standards (IFRS) by Brazilian publicly-traded companies, the object of this study. The end year was selected based on the ESG sample, due to the availability of data on the platform, as 2021 was not available at the time of data collection.

3.1 Metric for ESG

As a proxy for ESG, we used the combined ESG measure, i.e. the ESG score provided by Thomson Reuters®, which is composed of the environmental (E), social (S), and governance (G) dimensions. In this combined index, each company has an ESG value for each year. We decided to use this combined measure rather than the average of the three dimensions to avoid potential distortions in the results. The ESG variable ranges from 0 to 100%, meaning that the higher the variation, the higher the level of adoption of ESG practices by the companies. The three dimensions were used separately for descriptive analyses and additional tests, unlike the main ESG variable in the hypothesis tests.

The ESG measure provided by Thomson Reuters® is considered appropriate and reliable because it is an objective, relevant, auditable, and systematic metric (Atif & Ali, 2021; Cheng et al., 2014; Garcia & Orsato, 2020). The platform is used as an information and investment analysis tool for professional investors who build their portfolios by integrating ESG data into their traditional investment analysis (Cheng et al., 2014).

3.2 Classification of Life Cycle Stages

To achieve the proposed research objective, it was necessary to define the life cycle stages of Brazilian companies. For this purpose, we used Dickinson's (2011) model, whose combination of cash flows in operations, investment, and financing determines the stage in which each company is in the respective year. Thus, according to Dickinson's (2011) definitions, a company can fit into five phases, considering the signs of the flows: (1) birth, (2) growth, (3) maturity, (4) turbulence, and (5) decline.

Thus, a company that is in the growth stage is generating cash from its operations (positive sign) and directing resources to investments (negative sign) and uses financing as a source of funds (positive sign) during this stage.

For better visualization, Panel A of Table 1 shows the result of each combination of signs. Panel B shows the distribution of the research sample according to the firms' life cycle stages.

Table 1
Classification and distribution of the sample by life cycle stages

Panel A – Methodology for classifying the firms' life cycle stages (Dickinson, 2011)					
Cash flow	**Birth**	**Growth**	**Maturity**	**Turbulence**	**Decline**
Operational	–	+	+	+ – +	– –
Investment	–	–	–	+ – +	+ +
Financing	+	+	–	+ – –	+ –
Panel B – Sample distribution according to the firms' life cycle stages					
Life cycle stage	**Birth**	**Growth**	**Maturity**	**Turbulence**	**Decline**
Frequency	49	238	422	77	19
Total			805		
Relative Frequency	6.09%	29.57%	52.42%	9.57%	2.36%
Total			100%		

Note: *+ and – represent the signs of the operational, investment, and financing cash flows presented in the companies' Statement of Cash Flows (SFC).*
Source: *Elaborated by the authors.*

3.3 Definition of the Econometric Model

Having defined the form of measurement of both the firms' life cycle stages and the ESG proxy, Table 2 shows the variables to be used in the econometric model. In this case, the dependent, independent, and control variables are presented.

Table 2
Definition of the variables

Dependent variable	**Description**	**Metric**	**Theoretical basis**
ESG	Environmental, social, and governance	Score from 0 to 100%	Compact (2004)
Independent variables	**Description**	**Metric**	**Theoretical basis**
BIR	Birth	Dummy variable that indicates the life cycle stage, with a value of 1 if the variable is present and 0 if it is absent.	Dickinson (2011)
GROW	Growth		
TURB	Turbulence		
DECL	Decline		
Control variables	**Description**	**Metric**	**Theoretical basis**
ROA	Return on total assets	$ROA = \frac{EBIT}{\text{mean total assets}}$	Almeida & Kale (2021), Aouadi & Marsat (2018)
GLIQ	General liquidity	$GLIQ = \frac{\text{current assets} + \text{LT assets}}{\text{current liabilities} + \text{LT liabilities}}$	Atif & Ali (2021), Conca et al. (2021)
IND	Indebtedness	$IND = \frac{\text{onerous liabilities}}{\text{total assets}}$	Atif & Ali (2021)
MV	Market value	Share price *versus* total number of shares	Hendratama & Huang (2021)
NALYST	Number of analysts	ln (1 + number of analysts)	Hasan & Habib (2017)

Notes: *The MV variable was transformed into a logarithm. In NALYST, we chose to adopt the ln (1 + number of analysts) calculation to avoid selection bias. The data were collected from Thomson Reuters®.*
EBIT = earnings before interest and taxes; LT = long term.
Source: *Elaborated by the authors.*

To verify the relationship between ESG and the life cycle stages of Brazilian companies, we used the ordinary least squares (OLS) regression model, as shown in equation 1. The type of econometric model was defined based on the specification tests (Chow, Breush-Pagan, and Hausman), which in turn considering the 5% significance level indicated the use of OLS. The organization of the data was obtained through an unbalanced panel, aiming to reduce the loss of observations.

As previously reported (definition of the research hypotheses), the maturity stage was used as a reference category and omitted from the model. The same treatment was applied to the year control (2010 was chosen because that it was the year of compliance with the standards) and to the sector (cyclical consumption).

$$ESG_{it} = \beta_0 + \beta_1 BIR_{it} + \beta_2 GROW_{it} + \beta_3 TURB_{it} + \beta_4 DECL_{it} + \beta_5 ROA_{it} + \beta_6 GLIQ_{it} + \beta_7 IND_{it} + \beta_8 MV_{it} + \beta_9 NALYST_{it} + \delta_t + \gamma_s + \varepsilon_{it} \quad (1)$$

The equation is composed as follows: ESG_{it} is the proxy for the level of ESG score, representing the dependent variable; BIR_{it} is a dummy variable that indicates the birth stage of the life cycle, with a value of 1 for firms in the birth stage and 0 for the others; $GROW_{it}$ is a dummy variable that indicates the growth stage of the life cycle, with a value of 1 for firms in the growth stage and 0 for the others; $TURB_{it}$ is a dummy variable that indicates the turbulence stage of the life cycle, with a value of 1 for firms in the turbulence stage and 0 for the others; and $DECL_{it}$ is a dummy variable that indicates the decline stage of the life cycle, with a value of 1 for firms in the decline stage and 0 for the others.

Regarding the control variables included in the equation, we have the following: ROA_{it} is the company's profitability measured by the ratio of earnings before interest and taxes (EBIT) to average total assets; $GLIQ_{it}$ is the general liquidity measured by the ratio of current assets and long-term assets to current liabilities and long-term liabilities; IND_{it} is the company's indebtedness measured by the ratio of total onerous liabilities to total assets; MV_{it} is the company's market value, represented by the closing price of its stock multiplied by the total number of existing shares in logarithm; $NALYST_{it}$ corresponds to the logarithm of 1 added to the number of analysts; δ_t and γ_s are the control for sector and year, respectively; and ε_{it} is the regression error. In the econometric model, we controlled for the effects of the sector and year, which in the first case is already represented by the firm.

Using the econometric model of equation 1, we proceeded to its operationalization and the consequent analysis of the results, whose objective was to verify the rejection or not of each of the hypotheses defined for this research.

4. ANALYSIS OF THE RESULTS

4.1 Analysis of the Descriptive Statistics

Table 3 shows the descriptive statistics of the quantitative variables used in equation 1, indicating the mean, median, standard deviation, minimum, and maximum for the dependent variable (ESG) and for the control variables [ROA, general liquidity (GLIQ), indebtedness (IND), market value (MV), and number of analysts (NALYST] by life cycle. Considering the sample size, i.e. the number of companies and years, it is natural that the data show high variability.

Table 3 shows that the ESG proxy had a mean of approximately 49%, indicating that the companies generally have environmental, social and governance practices close to the intermediate level. However, there were companies with high levels of ESG (maximum 89%), while others had levels well below the average (1%). Hendratama and Huang (2021) point out that companies with high ESG scores tend to be more profitable, have good liquidity and average leverage, and are well valued in the market.

Profitability, an indicator measured by ROA, showed that, on average, the companies analyzed are managing to extract efficiency from the applications of resources made (overall sample mean of 0.07), especially those in the maturity stage (mean of 0.09, maximum of 2.21). Conca et al. (2021) state that ROA indicates sufficient returns for the proper functioning of the company, considering the life cycle stage in which it finds itself.

Table 3
Descriptive statistics considering the life cycle stages of the companies

Panel A – Descriptive statistics for market value, ESG dimensions, and life cycle stages						
Variables	**Statistics**	**Birth**	**Growth**	**Maturity**	**Turbulence**	**Decline**
		n = 49	**n = 238**	**n = 422**	**n = 77**	**n = 19**
ESG	Mean	41.6431	51.3799	51.1621	39.8630	37.1713
	Median	41.0276	55.3583	52.9883	38.6194	39.5984
	Standard deviation	16.0424	20.1138	20.4077	20.2297	21.3220
	Minimum	12.3047	1.3515	1.0922	5.2247	10.1032
	Maximum	69.5638	88.7042	89.4548	82.0049	75.5403
	ESG – Overall sample mean: 49.1617					
Environment	Mean	34.3859	47.2989	46.8581	31.9752	27.9097
	Median	39.1540	54.5687	50.2450	27.8654	21.6448
	Standard deviation	23.5749	24.7183	26.7443	25.6809	24.7901
	Minimum	10.0000	1.1300	0.8333	4.6444	16.0009
	Maximum	79.6002	92.6936	94.2971	86.6933	73.5312
Social	Mean	43.0163	55.4636	54.8246	41.9770	35.5587
	Median	40.3272	60.3611	57.2901	44.0461	34.1829
	Standard deviation	18.0756	23.3823	22.7192	23.8650	23.4710
	Minimum	0.7641	0.6390	0.5938	2.5675	0.7774
	Maximum	72.1915	96.8620	96.6410	85.0613	77.7062
Governance	Mean	48.6423	51.2019	51.1002	46.2459	45.5426
	Median	43.2260	52.2139	53.7098	45.6447	41.7293
	Standard deviation	20.8053	21.5965	20.9430	22.7895	24.1158
	Minimum	12.2222	1.4626	0.8333	8.4420	8.3883
	Maximum	83.0380	90.0534	94.2245	91.2702	89.5378
ROA	Mean	0.0352	0.0699	0.0917	0.0346	-0.1078
	Median	0.0403	0.0668	0.0869	0.0591	0.0408
	Standard deviation	0.0615	0.0531	0.1357	0.1557	0.4099
	Minimum	-0.1113	-0.1689	-0.6441	-1.0076	-1.4431
	Maximum	0.1850	0.2774	2.2119	0.4907	0.2305
	ROA – Overall sample mean: 0.0717					
GLIQ	Mean	3.8255	3.4733	6.3835	5.1703	12.1557
	Median	2.3198	2.7092	3.3201	3.2364	2.6759
	Standard deviation	7.7884	3.9257	9.4570	6.8087	19.6007
	Minimum	1.2988	1.3029	1.2988	1.2988	1.2988
	Maximum	56.3573	56.3573	56.3573	46.3966	56.3573
	GLIQ – Overall sample mean: 5.3876					
IND	Mean	0.4247	0.3724	0.3150	0.3124	0.3476
	Median	0.4311	0.3691	0.3012	0.3090	0.3737
	Standard deviation	0.1625	0.1429	0.1788	0.1519	0.2373
	Minimum	0.0177	0.0177	0.0177	0.0216	0.0177
	Maximum	0.7699	0.7675	0.7699	0.7699	0.7699
	IND – Overall sample mean: 0.3392					

Table 3
Cont.

Panel A – Descriptive statistics for market value, ESG dimensions, and life cycle stages						
Variables	**Statistics**	**Birth**	**Growth**	**Maturity**	**Turbulence**	**Decline**
		n = 49	**n = 238**	**n = 422**	**n = 77**	**n = 19**
MV	Mean	22.7523	23.0948	23.1951	22.3104	21.1276
	Median	22.7039	23.0139	23.1338	22.6658	21.3708
	Standard deviation	1.0483	1.0087	1.3500	1.6507	2.2092
	Minimum	20.0549	20.3210	17.2795	17.8209	16.7707
	Maximum	25.6330	26.6641	26.8591	25.7919	24.8081
	MV – Overall sample mean: 23.0051					
NALYST	Mean	8	8	8	6	7
	Median	9	9	8	7	7
	Standard deviation	4	4	4	3	4
	Minimum	0	0	0	0	0
	Maximum	16	18	19	14	15
Panel B – Frequency distribution of observations [n (%)]						
Description		**Birth**	**Growth**	**Maturity**	**Turbulence**	**Decline**
ESG higher than the mean		18 (37)	144 (61)	240 (57)	25 (32)	6 (32)
ESG lower than the mean		31 (63)	94 (39)	182 (43)	52 (68)	13 (68)
N. observations (805)		49 (6)	238 (30)	422 (52)	77 (10)	19 (2)

Note: *Environmental, social and governance (ESG) above and below the sample mean is based on the mean of 49.16. ROA includes the observations of companies that reported a loss. ESG is the level of ESG practices.*
IND = indebtedness; GLIQ = general liquidity; MV = Market value; NALYST = number of analysts; ROA = return on assets.
Source: *Elaborated by the authors.*

By analyzing GLIQ and indebtedness (IND), whose overall means were 5.38 and 0.33, respectively, it is possible to observe that the companies have good liquidity and resources to cover their obligations. The ability to meet their obligations, especially in the short term, suggests that these are organizations with higher ESG scores and lower risks of default and insolvency, which are aspects related to the maturity stage of companies (Atif & Ali, 2021). This perspective can be observed considering that the companies in the maturity stage had a higher liquidity indicator than the sample mean (corresponding to 6.38), associated with a lower degree of indebtedness (0.31), suggesting that they do not have a high risk of insolvency.

As for the market value (MV) variable, it was again found that the companies in the maturity stage had the highest mean market values (23.19), above the overall sample mean (23.00). The NALYST variable varies from 0 (minimum) to 19 (maximum), indicating that some companies are less followed by financial market professionals, while others have greater visibility among these professionals. Similar to what Almeida and Kale (2021) point out, it is observed that fewer analysts follow the companies in the birth and decline stages (maximum of 16 and 15, respectively), compared to the companies in the growth and maturity stages (maximum of 18 and 19, respectively). The literature indicates that companies with a greater number of analysts have more CSR initiatives (Hasan & Habib, 2017).

Table 3, Panel B, shows a total of 805 observations and different ESG levels among the companies analyzed. For the period from 2010 to 2020, it was found that 52% of the companies in the sample were in the maturity stage, and that 57% of the companies in this stage have above-average ESG performance. This descriptive result is consistent with the literature, given the concerns about reputation and interaction with stakeholders, as well as the greater capacity in terms of financial resources to invest in CSR practices (Atif & Ali, 2021; Hasan & Habib, 2017).

As shown in Panel A, in the maturity stage, the market value of companies had the highest mean (23.19), with the social dimension being the most prominent (mean of 54.82), standing out from the other ESG dimensions. Corroborating these findings, Martins and Cunha (2022) found a positive (albeit marginal) relationship between the level of disclosure of the social dimension and the market value of companies listed on the Brazilian stock exchange,

in the period from 2012 to 2020 (Martins & Cunha, 2022), and Soares et al. (2018) showed that in Brazil, in the period from 2007 to 2014, there was more corporate social disclosure, consisting of labor practices, human rights, society, and product responsibility, compared to developed countries such as Australia and Canada.

Analyzing the companies in the growth stage, they had a slightly lower market value than companies in the maturity stage (mean of 23.09). In the growth stage, the ESG classification levels presented the highest index (mean of 51.38 – Panel A), with the social dimension contributing the most to the indicator (mean of 55.46). Panel B shows that most companies in the growth stage (61%) had above-average ESG levels, even surpassing companies in the maturity stage.

In the growth phase, Hasan and Habib (2017) show that firms tend to invest more in product modification and improvements rather than focusing on differentiation. However, due to the need to raise external funds, engaging in CSR activities may have been an alternative adopted by the companies to enhance their reputation (Hasan & Habib, 2017).

It is also noteworthy that most of the companies that presented below-average ESG levels were in the birth (63%), turbulence (68%), and decline (68%) phases, as shown in Panel B (mean indicators: 41.64, 39.86, and 37.17, respectively), with the governance dimension being the most representative for these companies in their different stages. The market values were also lower than the sample mean (22.75, 22.31, and 21.13, respectively).

In the birth and turbulence stages, companies may not have the resources to invest in ESG practices. In the birth stage, they do not yet have knowledge about their potential revenue or the predictability of future cash flows. In the turbulence stage, which also applies to the decline stage, companies may be in financial difficulties and therefore do not invest in ESG (Harymawan et al., 2021), focusing on survival strategies (Hasan & Habib, 2017). In this sense, these studies corroborate the findings of the present research, even with regard to the companies in the decline phase, which had a lower ESG indicator (mean of 37.17 – Panel A).

4.2 Analysis of the Spearman Correlation Matrix and the Econometric Model

Table 4 presents the analysis of the Spearman correlation matrix for all the variables, including the firm life cycle ones, in an attempt to preliminarily verify, without establishing a cause and effect relationship, the direction of the variables.

Table 4
Spearman correlation matrix of the research variables

	ESG	BIR	GROW	TURB	DECL	ROA	GLIQ	IND	MV	NALYST
ESG	1									
BIR	-0.11***	1								
GROWTH	0.08**	-0.16***	1							
TURB	-0.15***	-0.08**	-0.21***	1						
DECL	-0.09**	-0.04	-0.10***	-0.0506	1					
ROA	0.10***	-0.16***	-0.07**	-0.12***	-0.12***	1				
GLIQ	-0.09**	-0.13***	-0.15***	0.053	-0.01	0.12***	1			
IND	0.08**	0.12***	0.14***	-0.052	0.01	-0.12***	-1	1		
MV	0.42***	-0.07**	0.01	-0.13***	-0.14***	0.30***	0.07*	-0.07*	1	
NALYST	0.19***	0.06	0.04	-0.11***	-0.03	0.25***	-0.01	0.01	0.18***	1

BIR = dummy variable indicating the birth stage of the life cycle; DECL = dummy variable indicating decline stage of the life cycle; ESG = environmental, social and governance, levels of ESG practices; GLIQ = general liquidity; GROW = dummy variable indicating the growth stage of the life cycle; IND = indebtedness; MV = market value; NALYST = number of analysts; ROA = return on assets; TURB = dummy variable indicating the turbulence stage of the life cycle.
****, **, * = statistical significance of 1, 5, and 10%, respectively.*
Source: *Elaborated by the authors.*

The results shown in Table 4 indicate that the life cycle stages of birth (BIR), turbulence (TURB), and decline (DECL) had significant and negative correlations with the ESG proxy. This indicates that when the company is in these stages, its relationship with ESG practices is negative compared to companies in the maturity stage.

According to Dickinson (2011), companies in the birth, turbulence, and decline phases may have lower

profitability rates and therefore invest at a lower level, which may limit projects aimed at ESG practices. However, it is necessary to consider other factors such as structure, strategy, control, and size, among others (Atif & Ali, 2021).

In the birth stage, companies have uncertainties in revenue and cost flows, and this affects decisions related to investments and product innovation (Hasan et al., 2017; Miller & Friesen, 1980). In this phase, the firm focuses on strategy development, aiming for greater market share and competitive advantage (Hansen et al., 2018), considering the implementation of environmental, social, and governance practices when it comes to new business models aimed at innovation.

In the turbulence and decline phase, companies seek to diversify possible risks in order to continue operating, which is justified by the reduction in growth rates and operational efficiency that emerge as restrictive elements of ESG investments (Dickinson, 2011; Diebecker et al., 2017; Hendratama & Huang, 2021).

GLIQ indicates a significant and negative relationship with the level of ESG, initially suggesting that companies with less availability of resources to pay their obligations have greater ESG practices. Atif and Ali (2021) indicate that this relationship can be understood based on the search to present a good image with the intention of raising funds for the organization. In the same vein, IND showed a significant and positive correlation with the level of ESG, demonstrating that the greater the exposure to third-party capital, the higher the level of ESG.

The preliminary findings also suggest that ROA, MV, and NALYST are positively related to the level of ESG, suggesting that more profitable, larger, and more analyst-visible companies have greater ESG practices.

In order to achieve the research objective defined for this study, which was to investigate the association between ESG and the life cycle stages of Brazilian companies, we proceeded with the regression analysis, as shown in Table 5. For the purpose of comparing the model proposed by Dickinson (2011) and the one adapted by Vorst and Yohn (2018), we used alternative definitions of life cycle stages, such as the one used in the study by Almeida and Kale (2021). In turn, based on the model proposed by Vorst and Yohn (2018), companies with negative operating cash flows and positive investment and financing cash flows were reclassified as being in the growth stage instead of in decline, as proposed by Dickinson (2011).

In Table 5, models 1 and 2 refer to the life cycle estimates of Dickinson (2011) and Vorst and Yohn (2018), respectively. In addition, to check the robustness of the findings, models 1 and 2 were tested without the pandemic year (2020), according to models 3 and 4.

Table 5
Association of ESG practices with firm life cycle stages

ESG	Model 1 Life cycle (Dickinson)	Model 2 Life cycle [adapted by Vorst & Yohn (2018)]	Model 3 Life cycle (Dickinson)	Model 4 Life cycle [adapted by Vorst & Yohn (2018)]
	Full sample (2010 to 2020) Coefficient (robust standard error clustered by firm and year)		Sample excluding 2020 Coefficient (robust standard error clustered by firm and year)	
BIR	-9.9209***	-9.8892***	-10.0573***	-10.0274***
	(3.0209)	(3.01390)	(3.3928)	(3.3858)
GROW	-0.9196	-1.073078	-0.8252	-1.0138
	(1.2280)	(1.1911)	(1.3430)	(1.3008)
TURB	-5.9224**	-5.8671**	-6.5731**	-6.5021**
	(2.8824)	(2.8835)	(3.0628)	(3.0632)
DECL	-0.2564	3.1907	-0.4759	3.5257
	(4.5981)	(5.4137)	(4.9934)	(6.2631)
ROA	-16.1064**	-15.91822**	-21.0205*	-21.0253*
	(14.7762)	(14.9328)	(16.0607)	(16.2237)
GLIQ	-0.2606**	-0.2677**	-0.2637*	-0.2684*
	(0.1486)	(0.1501)	(0.1754)	(0.1762)
IND	12.7699**	12.5625**	13.2885*	13.1227*
	(7.9286)	(8.0180)	(8.7181)	(8.8047)

Table 5
Cont.

ESG	Model 1 Life cycle (Dickinson)	Model 2 Life cycle [adapted by Vorst & Yohn (2018)]	Model 3 Life cycle (Dickinson)	Model 4 Life cycle [adapted by Vorst & Yohn (2018)]
	Full sample (2010 to 2020) Coefficient (robust standard error clustered by firm and year)		Sample excluding 2020 Coefficient (robust standard error clustered by firm and year)	
MV	6.5325***	6.5850***	6.5313***	6.6005***
	(0.9662)	(0.9630)	(1.0030)	(1.0002)
NALYST	3.2748**	3.3259**	2.46201*	2.5164*
	(2.2739)	(2.2718)	(2.3317)	(2.3315)
Constant	-108.0438***	-109.273***	-105.8214***	-107.4528***
	(21.9942)	(21.9138)	(23.1710)	(23.1092)
Dummies-year	Yes		Yes	
Dummies-sector	Yes		Yes	
N. firms	109		109	
N. observations	805		702	
Adjusted R^2	24.80%	24.86%	24.46%	24.53%

Note: *Variables were winsorized at the 1st and 99th percentiles and coefficients were estimated based on the robust standard error for heteroskedasticity clustered by firm and year.*
BIR = dummy variable indicating the birth stage of the life cycle; DECL = dummy variable indicating the decline stage of the life cycle; ESG = environmental, social and governance, levels of ESG practices; GLIQ = general liquidity; GROW = dummy variable indicating the growth stage of the life cycle; IND = indebtedness; MV = market value; NALYST = number of analysts; ROA = return on assets; TURB = dummy variable indicating the turbulence stage of the life cycle.
****, **, * = statistical significance of 1, 5, and 10%, respectively.*
Source: *Elaborated by the authors.*

Table 5 shows that the differences between the models were not substantial, with the comparative analysis serving only to provide greater robustness to the findings. All the models showed similar overall explanatory power (R^2), particularly the main model, Model 1 (Dickinson, 2011), with 24.80%, implying that the variables used have explanatory power over variations in the level of ESG. Moreover, all the models were estimated with robust standard errors for heteroskedasticity (Breusch-Pagan test at a 5% significance level), clustered by firm and year, and did not present problems with omitted variables [Ramsey regression equation specification error test (RESET) at a 5% significance level] and multicollinearity [the variance inflation factor (VIF) presented a maximum value below 2 and a mean of 1.24].

The results presented in models 1 and 2, according to the sample analyzed and the estimation models, indicate that it was possible to confirm (not reject) H_1 and H_3 defined for this research. The findings show that companies in the birth and turbulence stages have a negative association, with statistical significance, in the relationship with the level of ESG of Brazilian companies.

The confirmation of these hypotheses indicates the influence of the firm's life cycle stages, in this case, birth and turbulence, on the level of adoption of ESG practices, with a relationship being identified that indicates a lower level of investment in sustainable actions by companies in these stages compared to companies in the maturity stage, in line with the findings of Freire et al. (2022), but only in the turbulence stage.

The regression model was also estimated according to each of the ESG dimensions (results not tabulated), statistically confirming that in the birth and turbulence stages, ESG investments are lower in the environmental and social dimensions, as indicated by the descriptive statistics (Table 3). The governance dimension did not influence the result, showing a certain equilibrium compared to the maturity stage. In this sense, Martins and Cunha (2022) point out that the costs associated

with sustainability, such as the improvement of working conditions and the use of new energy sources, which are still costly, may put companies in a cost-benefit trade-off (Ching et al., 2017).

In order to verify whether these findings would be somehow impacted by the effects of the pandemic, the association of ESG practices with the firms' life cycle stages was analyzed, excluding the year 2020, i.e. keeping only the years 2010 to 2019, as can be seen in models 3 and 4 of Table 5. As a result, it was observed that in the years before the pandemic, the life cycle stages explain the ESG levels, more specifically in the birth and turbulence stages. The inclusion of the year 2020 does not change the main findings. Thus, based on the estimated models, it can be seen that the results presented are consistent and robust to explain the lower level of ESG of companies in these stages.

Hasan and Habib (2017) explain these findings by noting that companies in the early stages of the life cycle have few assets, resulting in lower operating cash flows and profits, or even negative results. The uncertainty and risks inherent to this phase may reduce ESG investments.

The turbulence phase represents a period of conflict in the organizational structure, in which the firm seeks to raise funds to pay off its debts and maintain operational continuity (Hendratama & Huang, 2021). From this perspective, by reducing ESG investments, decision makers show that they are trying to make investments with short-term returns.

Given the results presented, H_2 and H_4 could not be confirmed as they did not show statistical significance [growth (GROW) and decline (DECL)]. Thus, it was not possible to conclude that companies in the growth and decline cycles have higher or lower levels of ESG compared to companies in the maturity stage.

By rejecting H_2, the results shed light on the discussion about the need for companies in the growth phase to develop innovation strategies to outperform competitors (Hendratama & Huang, 2021), and in this case, investing in ESG actions would make a difference, as the market views such initiatives positively. In addition, investing in improvements in governance practices would be crucial to minimize the agency problem that begins to emerge in this phase.

With respect to H_4, in the decline stage, the company may depend on external financing to continue operations, finance assets, and restructure the business (Hansen et al., 2018). In this sense, serving stakeholders and gaining legitimacy through ESG practices could be a way to raise funds and reduce the cost of capital.

Regarding the control variables, ROA is negatively associated with ESG practices. For Conca et al. (2021), the disclosure of non-financial information, that is, on ESG issues, may be associated with an improvement in business profitability. However, Garcia and Orsato (2020) emphasize that the institutional environment configurations are factors that can explain this negative association observed in emerging countries, unlike the relationship found in companies from developed countries.

The GLIQ variable showed a negative relationship with ESG level. The literature suggests that ESG levels can influence investors' perceptions of companies' future financial prospects (Brogi & Lagasio, 2019; Brooks & Oikonomou, 2018; Li et al., 2018). According to this argument, the adoption of ESG practices could improve the company's image, even if it has liquidity constraints. From this perspective, ESG has become a sign of legitimacy, with effects on the reputation of companies (Harymawan et al., 2021; Hasan & Habib, 2017).

Also from a financial perspective, the IND indicator showed a positive association with the level of ESG, as did MV and NALYST. This shows that companies with high financial exposure to third-party resources have also sought strategies to improve their reputation with investors and creditors, considering the evidence that indicates the positive effect of ESG actions on the market value of organizations and analyst visibility (Hendratama & Huang, 2021).

In addition to the OLS model (recommended by the Chow, Breush-Pagan, and Hausman tests), the fixed effects model was tested, but there was not a good fit to the data. These supplementary tests were not included in the article due to space restrictions, but can be requested from the authors.

As a result obtained with the fixed panel model, no statistical significance was identified between ESG and the life cycle stages. A possible explanation for this is the variability in the number of years used for each company, since it was an unbalanced panel, with some companies having fewer and others more years of observations. In this case, we chose to present the coefficients and robust standard errors clustered by firm and by year only for the OLS model.

Regarding the results, considering the sample analyzed and the estimated models, it appears that ESG practices vary according to the life cycle stages of firms, thus presenting an association between the variables explored. In this sense, the research achieved the proposed objective, which was to analyze the relationship between ESG and the life cycle stages of Brazilian publicly-traded companies.

5. CONCLUDING REMARKS

This research analyzed the relationship between ESG and the life cycle stages of Brazilian publicly-traded companies listed on the B3. For this purpose, it explored the gap of some studies related to the topic (Atif & Ali 2021; Freire et al., 2022; Hasan & Habib, 2017; Hendratama & Huang, 2021; Machado et al., 2020), which indicated the relevance of the life cycle in organizational behavior and disclosure of environmental, social and governance practices, as well as CSR actions.

Based on the sample analyzed and the estimated models, the results indicate the relationship between the firm life cycle stages, specifically birth and turbulence, and lower disclosure of ESG practices compared to firms in the maturity stage, confirming H_1 and H_3. The findings confirm the assumptions of the firm life cycle theory, in addition to demonstrating the relationship between both stakeholders and pragmatic legitimacy and the ESG actions developed by companies in certain stages.

The life cycle stages reflect the changes that companies go through in terms of strategies, structure, processes, and other factors that can be critical to the adoption of ESG actions at specific times. The adoption of such practices is primarily aimed at reducing conflicts of interest and stakeholder management, as well as demonstrating a good reputation and an ethical commitment to society.

The research findings suggest that in the birth and turbulence phases, companies are less likely to invest in ESG initiatives, particularly in the environmental and social dimensions, even though the market value indicator shows a gain for shareholders and other stakeholders, as well as greater interest from financial analysts. This may be due to financial constraints and uncertainties about future cash flows that companies face in these stages.

It is important to highlight that while on the one hand there is an emphasis on developing management strategies to increase market share and competitive advantage, which points to value creation through sustainable actions, on the other hand there are costs associated with the adoption of sustainable measures that limit the actions of companies in certain stages of their life cycle. This trade-off between costs and benefits, and the fact that the benefits are only realized in the long run, are factors that can influence strategic decisions about the allocation of available resources, as the research shows.

The study makes theoretical contributions by highlighting the effect of firms' life cycle stages over time on ESG initiatives. From an empirical point of view, the study provides insights and implications for managers – in formulating strategies that integrate ESG initiatives with business objectives, taking into account the stages of the company's life cycle – and for regulators or policymakers, making them reflect so that they can identify the necessary requirements to regulate and develop policies to encourage the adoption of ESG practices, while maintaining the objective of maximizing firm value. In addition, shareholders and investors who allocate resources in companies need information on the applicability and possible benefits of adopting such practices, in order to assess whether there is a bidirectional relationship (ESG investments and their reflection on corporate performance).

This study has limitations inherent to the sample size, as it is restricted to companies listed on the B3. An important point to highlight is the loss of significance in the relationship found here when the fixed effect was used to estimate the econometric model, possibly due to the selections made in the unbalanced panel. Thus, the limitations of the evidence must be taken into account. Future research could expand the sample for comparison among South American countries, in addition to providing a breakdown of the ESG variable by sector and years, or using other firm life cycle models.

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