Firm Life Cycle and the Cost of Equity Capital: Does Corporate Social Responsibility Matter?

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ARTICLE INFO	ABSTRACT
Article type: Research Article **Article History:** Received 10 May 2025 Revised 20 September 2025 Accepted 15 October 2025 Published Online 20 February 2026 **Keywords:** The cost of equity capital, Firm life cycle, CSR, Tehran Stock Exchange.	The purpose of this study is to investigate the relationship between the firm life cycle and the cost of equity capital (CEC). For this purpose, we separate the sample firms based on five stages of corporate life cycles, including introduction, growth, maturity, shake-out, and decline. Using data from 136 firms listed on the Tehran Stock Exchange for the period 2019-2023 and panel data regressions, the results show that the stages of the firm life cycle affect the CEC. More specifically, we find that the CEC is lower in the growth and maturity stages than in the shake-out stage. In addition, our findings show that the CEC in the decline stage is higher than in the shake-out stage and corporate social responsibility (CSR) moderates the relationship between the firm life cycle and CEC. Our study contributes to the literature by examining the relationship between firm life cycles and corporate environmental commitment, showing how it changes across life cycle stages. The research is particularly valuable for its focus on Iran and its exploration of CSR as a moderating factor.

1. Introduction

A company's life cycle, like living organisms, posits that a company experiences a series of predictable developmental patterns, and that a company's capabilities, resources, structures, strategies, and functions vary significantly depending on the corresponding developmental stage (Ngo et al., 2024; Zhang et al., 2024). Firm life cycle provides management with several parameters, guidelines, and diagnostic tools for assessing a company's transition from one phase to the next (Gao et al., 2023). The notion that a company evolves throughout its financial life cycle is well established in the literature. Each phase of a company's life cycle determines the nature of its financial needs, the availability of financial resources, and the associated CEC. This approach supports lifecycle-specific financial behavior (Amin et al., 2023; La Rocca et al., 2011). Recent studies in accounting and financial economics (See Alqahtani et al., 2022; DeAngelo et al., 2006; DeAngelo et al., 2010; Dickinson, 2011) show that life cycle stages play important roles in understanding a company's financial performance. The company's life cycle is the basis of its growth and development in a competitive environment, and according to the life cycle theory, investment and financing decisions, and finally, the company's financial performance are influenced by the stages of the life cycle (Ngo et al., 2024). Thus, performance indicators are not the same at different stages of the life cycle (Graciosa et al., 2020; Maksimovic & Phillips, 2008) and capital structures vary across different stages (Frielinghaus et al., 2005; La Rocca et al., 2011). Additionally, the estimation of the value of an investor is a function of the company's life cycle (Anthony & Ramesh, 1992). Resource-based theory posits that companies vary in their collection of resources (such as financial, human capital, technological, physical, organizational resources, and reputational) and capabilities (Gerhart & Feng, 2021; Grant, 1991). These unique resources and capabilities specific to each firm are essential for understanding their growth, performance (Amin et al., 2023), and the capacity to allocate funds for philanthropic endeavors (Campbell, 2007). From this perspective, a mature firm's resources and capabilities are expansive, heterogeneous, and plentiful, while young and declining firms have a restricted, narrowed focus. The introduction stage firms do not have a sufficient customer base and lack knowledge about revenue streams, expenses, and other industry factors (Hasan & Habib, 2017a; Jovanovic, 1982). Growth firms spend more on changing and enhancing existing products rather than on establishing new ones (Hay & Ginter, 1979). Firms in the decline and shake-out stages possess fewer and/or lower value resources and resource combinations. Such firms concentrate more on their survival strategies (Hasan & Habib, 2017a).

In the other hand, the concept of CEC is very important in accounting and financial research. It is commonly used in equity risk premium estimates, business valuations and capital budgets, and investment management (Câmara et al., 2009; Chen et al., 2023). The CEC is determined by a company's economic fundamentals, industry dynamics, and general domestic economic conditions (Ashrafi, 2019; Gebhardt et al., 2001; Le & Moore, 2023). Investors' demand for a risk premium can change accordingly, as the competitive benefits associated with a company's resource base change throughout its life cycle. Taken together, these studies suggest that a company's life cycle has important implications for attracting investors, ultimately increasing equity liquidity and lowering equity costs (Jap & Ganesan, 2000; Woodward, 1997). However, so far, little research has been done on the connections. DeAngelo et al. (2010) show that a company's life cycle significantly impacts the likelihood that the company will offer secondary shares. Other studies (for example, Bulan et al., 2007; Coulton & Ruddock, 2011; Fama & French, 2011) recognize the role of the company's life cycle in determining its dividend distribution policy.

Furthermore, the CEC is linked to CSR in various ways. Initially, the CEC is the required return rate based on the market's perception of a company's risk level. If CSR influences how risky a firm is perceived to be, then socially responsible companies should experience reduced costs of equity financing (El Ghoul et al., 2011). Secondly, robust CSR and efficient corporate governance can influence companies' CEC by diminishing agency and information asymmetry issues (K. Chen et al., 2009; Prakash & Hawaldar, 2024). Third, the CEC is a crucial factor in companies' long-term investment choices, and socially responsible investment (SRI) represents a form of long-term investment. Analyzing the connection between CSR and the CEC can help CEOs in grasping the influence of SRI on companies' financing expenses and has significant consequences for strategic planning (Reverte, 2012; Zhang et al., 2024). Consequently, it is essential to examine the connection

between CSR and financial performance by assessing if CSR performance influences companies' CEC. We know that CSR is an important strategy through which companies create strong relationships with their shareholders and stakeholders. In particular, companies improve shareholders' trust in the company through social engagement and corporate social responsibility actions, which improves the opportunities available in the market for the company and reduces prices, ultimately reducing transaction costs. CSR also leads to customer satisfaction and increases the productivity and commitment of employees, which in turn enhance the financial performance of the company (Amatulli et al., 2018; Barnett & Salomon, 2006).

We believe our research can contribute to the literature. The study builds upon the current body of literature regarding firm life cycles and CEC by empirically assessing how various stages of the life cycle influence CEC. Therefore, by examining the relationship between a company's life cycle and the CEC, we can contribute to the literature by showing whether and how a company's CEC changes with the corresponding changes in its life cycle. Additionally, it enhances the discourse by exploring this relationship within the context of a specific emerging market, namely Iran. While there is potential for a more robust theoretical framework and the methodology could benefit from additional detail, the empirical analysis of this particular interaction, especially within the Iranian context, offers a significant and original contribution to the existing knowledge base. Furthermore, the paper enriches the conversation surrounding the role of CSR as a moderating factor in the relationship between the firm life cycle and CEC.

The remainder of the paper is organized as follows: In Section 2, we review prior related studies and develop testable hypotheses. Section 3 focuses on the research design, data sources, and sample selection. Section 4 documents result of the study, while Section 5 concludes the paper.

2. Literature Review and Hypotheses Development
2.1. Firm's Life Cycle and CEC
The CEC plays an important role in financial decisions. In order to determine the financial resources, the management must determine the cost of providing these resources and identify the factors affecting it (Mishra, 2023; Ngo et al., 2024). In other words, the rate of return expected by shareholders in their investments in a business unit is referred as to CEC. It is used for project calculations as well as the risk assessment of shareholders (A. Kamara & Koirala, 2023; A. Kamara & Young, 2018). Estimating the CEC is one of the primary duties of company managers. Since the CEC influences the selection of the company's capital projects, loan rates, and resource allocation (Ashrafi & Muhammad, 2014; Wang & Yuan, 2024), factors such as age, size, risk-taking, liquidity, financial leverage, and the quality of disclosure determine the cost of a company's stock. Other factors, such as industry type and economic conditions, significantly impact the CEC. In large companies, due to their transparency, easy access to managerial information, and potential benefits , this cost can be reduced (Amin et al., 2023; Witmer & Zorn, 2007). Based on life cycle theory, it can be said that the life of companies, from the emergence stage to decline, is linear and predictable, and their activities align with this cycle (Hasan & Habib, 2017b; Hassan et al., 2011). Companies at different stages of their life cycle possess varying abilities to raise capital in the market. Companies in the early stages of their life cycle tend to be relatively small, unknown, and less closely monitored by analysts and investors (Hasan, Hossain, Cheung, & Habib, 2015). Numerous studies have examined the impact of the life cycle on a company's financial performance. For example, Binder (2013) states that the form and financial structure of companies varies throughout the life cycle. Berger and Udell (2006) show that most small and medium-sized companies rely on proprietary earnings and fixed income, while large companies depend on public markets. Richardson (2006) suggests that companies in the emerging stage are more focused on investment and expansion, while mature companies seek investment to preserve their assets. The conditions of growing companies, including analyst concentration and voluntary information disclosure, reduce information asymmetry and ultimately lower the CEC (Fasih Ramandi & Rezazadeh, 2017). Companies in the maturity stage of the life cycle typically experience lower investment costs (Pástor et al., 2008). Generally, stocks that possess low liquidity exhibit high investment costs. In such stocks, a high CEC correlates with higher return expectations. As financial leverage increases, the risk for shareholders also rises, thereby increasing the CEC (Witmer & Zorn, 2007). The CEC varies according to a company's structure and business nature (Gebhardt et al., 2001);

in weak economic conditions, the CEC is higher, and vice versa (Fama & French, 1989). Companies in the maturity stage incur lower capital costs compared to those in decline and stagnation stages (Amin et al., 2023). The results of the Iranian studies also show that the cost of equity decreased in the maturity stage (Fasih Ramandi & Rezazadeh, 2017; karami & Akhoundi, 2016; Moshashaie & Mirzajani, 2019). Therefore, the following hypothesis is proposed.

H1. The CEC is lower in the maturity stage than in shake-out stage of the firm's life cycle.

Penrose (1959) presents a general theory for the growth and life of a company and states that the longevity and growth of a company depend on its resources and capacity. Chandler (1990) notes that companies utilize growth strategies to seize external opportunities. Subsequent research conducted on organizations determined the existence of the company's life cycle. Companies in the growth stage may be weak in terms of resources; however, due to their high potential and rapid growth, they have significant hope. Organizational theory states that companies in the growth stage, due to the asymmetry of the information they possess, benefit more from market movements (Fama & French, 1989; Hasan, Hossain, Cheung, & Habib, 2015). Previous studies indicate that growing companies increase analyst coverage due to their structure and characteristics, presenting a possibility of gaining benefits from private information (Amin et al., 2023; Barth et al., 2001; Lehavy et al., 2011). Consequently , as coverage increases, price deviations and information asymmetry are likely to decrease (Barth et al., 2001; Brennan & Subrahmanyam, 1995). Moreover, companies in the growth phase experiencing significant growth are likely to have their names mentioned in business newspapers reports (Bentley-Goode et al., 2019). Bushee et al. (2010) demonstrate that companies benefiting from media coverage tend to have less information asymmetry. Such companies possess a strong incentive to reduce information asymmetry through voluntary information disclosure and can achieve significant profits by investing in growing companies in the future. In summary, it is possible to diminish information asymmetry in growing companies through analyst coverage and voluntary disclosure, thereby resulting in lower share costs. The cost of capital is generally lower during a firm's growth phase compared to the shake-out phase, primarily due to various factors that reduce risk and enhance investor confidence (Amin et al., 2023; Berk et al., 1999). During the growth phase, companies typically demonstrate a validated business model and expanding market share, contributing to more stable cash flows and lower operational risks, thereby reducing the expected returns for investors (Hasan, Hossain, Cheung, & Habib, 2015; Pástor & Pietro, 2003). This stage is also marked by improved financial stability and increased access to capital (Frank & Goyal, 2003). Additionally, the increase in transparency and information sharing, driven by enhanced analyst coverage and investor relations, helps alleviate information asymmetry, further lowering uncertainty and the associated cost of capital (Lambert et al., 2007). In contrast, the shake-out phase is characterized by intensified competition and market saturation, leading to greater volatility, an elevated risk of financial distress, and a more difficult landscape for obtaining favorable financing conditions, ultimately resulting in a higher cost of capital (Hasan & Habib, 2017a; Opler & Titman, 1994). karami and Akhoundi (2016) also find that in Iranian companies CEC is lower in the growth stage in comparison to decline stage. Therefore, the following assumption is stated:

H2. The CEC is lower in the growth stage than in the shake-out stage of the firm's life cycle.

Companies that are in the emerging phase of the life cycle have limited resources, while companies in the declining phase cannot utilize resources effectively (Amin et al., 2023). In his study, Dickinson (2011) indicated that there is a significant relationship between the rise and fall of a company with EPS, ROA and profit margin. For this reason, less investment is made in these companies, so analysts spend less time on such firms. Finally, as long as investors are not sure of the return of their capital, they will not invest in such companies (Nickel & Rodriguez, 2002), resulting in an increase in the CEC. In the rise stage, which is marked by initial market entry and untested business models, investors encounter considerable uncertainty regarding the long-term sustainability and acceptance of the company in the market. This uncertainty necessitates a higher risk premium, resulting in an increased cost of capital (Berk et al., 1999; Hasan & Habib, 2017a). Conversely, the shake-out stage is characterized by fierce competition and consolidation; however, it also signifies a period when the enduring companies have shown a certain level of resilience and market viability, thereby reducing the

uncertainty that was prevalent during the earlier rise stage (Opler & Titman, 1994). In the decline stage, defined by decreasing revenues, shrinking market share, potential financial difficulties, the heightened risk of bankruptcy, and limited growth opportunities lead to a significant rise in the cost of capital, as investors seek greater compensation for the increased risk of loss (Hasan, Hossain, Cheung, & Habib, 2015). Consequently, both the rise and decline stages, which are fraught with high uncertainty and the possibility of failure, incur a higher cost of capital compared to the shake-out stage, where the remaining firms exhibit a degree of established viability and reduced risk (Frank & Goyal, 2003). Therefore, the following hypothesis is stated:

> **H3.** The CEC is higher in the rise and decline stage than the shake-out stage of the company's life cycle.

2.2. Moderating Effect of CSR

CSR can mitigate a company's risks in various ways, as has been extensively demonstrated (Kim et al., 2021; Ozkan et al., 2023). Economics and Durnev (2013) emphasize that corporate CSR investments can mitigate systemic risk and enhance firm value through greater product differentiation. Certain researchers believe that participating in CSR initiatives enhances trust among stakeholders and lowers the risk for the company. Firms compete more during the growth and maturity phases of the life cycle compared to other phases, and they place considerable emphasis on CSR during these stages (Gamal et al., 2022; Koohi et al., 2022). CSR plays a significant role in moderating the connection between a company's life cycle and its CEC by affecting how stakeholders perceive risk, trust, and sustainability over the long term. Engaging in CSR initiatives, such as adhering to ethical labor standards, promoting environmental sustainability, and fostering community involvement, can diminish the perceived risks linked to the company (Orlitzky et al., 2011; Tran et al., 2024; Wu et al., 2023). In the initial growth stage, companies often encounter increased uncertainty and risk, resulting in higher capital expenses; nonetheless, participating in CSR can boost reputation and stakeholder confidence, consequently diminishing investor risks and decreasing capital costs (Dhaliwal et al., 2011; Ho, 2015). Likewise, during mature or declining phases, CSR efforts aid in preserving favorable stakeholder relationships and lowering the chances of adverse shocks, potentially stabilizing or reducing capital costs (Morrone et al., 2022). Conversely, firms in decline stage may leverage CSR efforts to restore trust and counter negative perceptions, thereby potentially stabilizing their CEC (Orlitzky et al., 2011; Tran et al., 2024; Wu et al., 2023). Therefore, CSR serves as a cushion that diminishes the strong link between more perilous lifecycle phases and higher capital expenses, promoting long-term value generation via increased trust, decreased uncertainty, and enhanced social legitimacy (Galbreath, 2009). CSR significantly improves a company's reputation, which can be especially advantageous during the introduction and growth stages when businesses seek to convince investors (Aksak et al., 2016; Cui et al., 2018). A solid reputation established through CSR can reduce the costs associated with equity and debt by demonstrating reliability and sustainability over the long term (Maaloul et al., 2023; Tran et al., 2024). Companies that implement strong CSR practices are likely to gain improved access to sustainable or environmentally friendly financing alternatives, which typically offer lower interest rates. This aspect is particularly important during the growth and maturity phases, as businesses often need substantial capital to support their expansion efforts (B. Cheng et al., 2014; El Ghoul et al., 2011). CSR fosters stronger relationships with stakeholders, including investors, customers, and regulators (Kandpal et al., 2024). In the decline phase, proactive engagement with stakeholders via CSR can assist companies in overcoming obstacles and sustaining investor trust, which may alleviate the rise in capital costs. Additionally, CSR initiatives can enable firms to adhere to regulatory requirements and evade fines or penalties, thereby minimizing financial risks (Gong et al., 2021). Furthermore, innovation driven by CSR has the potential to create new market opportunities, especially during the growth and maturity phases, thereby increasing profitability and lowering capital costs (Alshukri et al., 2024; Tang et al., 2012). El Ghoul et al. (2013) show that information asymmetry tends to be worse for firms with low CSR and that improved CSR performance results in reduced equity financing costs. Pástor et al. (2008) demonstrate that the cost of equity is in perfect correlation with the expected conditional stock return. Therefore, if CSR influences the perceived risk associated with firms, socially responsible companies ought to experience a reduced cost of equity

financing (B. Chen & Zhang, 2021; Kim et al., 2021). Additionally, B. Cheng et al. (2014) indicate that strong CSR performance may result in improved access to financing. Reverte (2012) demonstrates that increased CSR can reduce estimation risks, transaction costs, and information asymmetry within capital markets in Spain. Tilehnouei and Dadashi (2021) indicate that corporate social responsibility has a significant effect on the cost of debt and financing through payment in Iran. Based on the substantial evidence indicating that CSR significantly alleviates perceived risks, bolsters stakeholder trust (Tran et al., 2024; Wu et al., 2023), diminishes information asymmetry (El Ghoul et al., 2013), and enhances access to financing (B. Cheng et al., 2014) in diverse organizational settings, we conclude that CSR does not solely affect capital costs in isolation but rather plays an active role in shaping how a firm's life cycle stage influences its CEC. Therefore, the following hypothesis is stated:

H4. CSR moderate the relationship between firm's life cycle and the CEC.

3. Data and Methodology
3.1. Data
Our sample includes 136 companies listed on the Tehran Stock Exchange (TSE) for the period of 2019-2023. It should be noted that we exclude the financial sector (banks, insurance companies, mutual funds, and investment firms), because the accounting methods, risks, and complexity traits of financial institutions differ significantly from those of other companies. We also excluded observations with absent values in the calculation of the CEC and control variables. Table 1 provides a more detailed description of the variables and data sources for all variables. Data for the control variables are extracted from the *Rahavard Novin Software*. Data for the risk-free rate (10-year Treasury note rates) are collected from the Central Bank of Iran.

3.2. Empirical Models and Variables Definitions
We test the relationship between the firm life cycle and the CEC using two measures of firm life cycle. We specify our empirical models as follows:

$$R_{it} = \alpha_0 + \sum_{i=1}^{3} \beta_i CLC\_DUM_{it} + \beta_4 SIZE_{it} + \beta_5 MB_{it} + \beta_6 BETA_{it} + \beta_7 LOSS_{it-1} + \beta_8 LEV_{it} + \beta_9 ZSCORE_{it} + \varepsilon_{it} \tag{1}$$

and

$$R_{it} = \alpha_0 + \beta_1 RE/TA_{it} + \beta_2 SIZE_{it} + \beta_3 MB_{it} + \beta_4 BETA_{it} + \beta_5 LOSS_{it-1} + \beta_6 LEV_{it} + \beta_7 ZSCORE_{it} + \varepsilon_{it} \tag{2}$$

Our main variable of interest is CLC_DUM. Based on the dynamic resource-based view and the life cycle theory, we predicted β_2 to be positive for H3, and β_1 and β_3 to be negative for H1 and H2 in model (1). Table 1 summarizes the definition of variables. Based on previous similar research, such as those conducted by Hasan, Hossain, Cheung, and Habib (2015), Fasih Ramandi and Rezazadeh (2017), and Amin et al. (2023), we have included a number of important control variables with the greatest impact on the dependent variable in our research model.

4. Results
4.1. Descriptive Statistics
Table 2 reports the descriptive statistics for the variables included in the regression analyses. Panel A shows that the mean (median CEC for the sample is 0.245 (0.188). Table 2 also indicates that the mean (median) RE/TA is 0.143 (0.14). The mean values of SIZE (6.019), ZSCORE (3.332), and LOSS$_{t-1}$ (0.164) suggest the presence of large and financially sound firms in the sample. Moreover, the mean (16.102) MB suggests that the sample firms have valuable growth opportunities. Panel B of Table 2 exhibits the life cycle-wise cost of equity. All the models show that the cost of equity is lowest at the mature stage, while it is comparatively higher at the decline stages. The lowest cost of equity at mature stage firms indicates that they are, on average, the least risky compared to firms at other stages.

Table 3 reports the Pearson correlations among the CEC, life cycle proxies, and control variables. As expected, the cost of equity is positively correlated with shake-out, and decline stages, and negatively correlated with the mature and growth stages of the life cycle. In addition, in line with our

expectations, there is a negative correlation between the CEC estimates and RE/TA. Finally, the correlations among CEC estimate and MB, BETA, and $LOSS_{t-1}$ are positive and significant, while the correlation of CEC with LEV, SIZE and ZSCORE is negative and significant. Overall, the correlations among the estimates of CEC, life cycle proxies, and the control variables are all in the expected direction.

Table 1. Definition of Variables

Variables	Symbol	Definition and Measurement
Dependent variable:		
Cost of equity capital	R	Capital Asset Pricing Model (CAPM)
Variable of interest:		
Firm life cycle proxies: CLC	CLC_DUM	A vector of dummy variables that capture firms' different stages in the life cycle following the Dickinson's (2011) model. Based on the model, cash flows capture differences in a firm's profitability, growth and risk and, hence, that one may use the cash flow from operating (CFO), investing (CFI) and financing (CFF) to group firms in life cycle stages such as: 'introduction,' 'growth,' 'mature,' 'shake-out,' and 'decline.' The methodology is: introduction: if CFO ≤ 0, CFI ≤ 0 and CFF > 0; growth: if CFO > 0, CFI ≤ 0 and CFF > 0; mature: if CFO > 0, CFI ≤ 0 and CFF ≤ 0; decline: if CFO ≤ 0, CFI > 0 and CFF ≤ or ≥ 0; and the remaining firm years will be classified under the shake-out stage.
Retained earnings	RE/TA	Retained earnings/total assets (DeAngelo et al., 2006)
Moderating variable:		
Corporate social responsibility	CSR	CSR checklist developed by Williams (1999). To compute the level of CSR for each individual firm, the score for each item on the checklist (environment, energy, human resources, products and customers, and community involvement) is summed and then divided by the maximum number of items of the checklist, namely, 101 items.
Control variable:		
Firm size	SIZE	Natural log of total assets of the firm at the end of the fiscal year
Growth	MB	Ratio of market value of equity at the end of the fiscal year to book value of equity
RISK	BETA	A measure of systematic risk, extracted from *Rahavard Novin Software*. The beta coefficient is obtained by dividing the covariance between the stock return and the market return by the market variance
LOSS	$LOSS_{t-1}$	A variable that takes the value of 1 if the net income before abnormal items is negative in previous years and 0 in other cases.
Leverage	LEV	(Short term debt + long term debt)/ Shareholders' equity
Financial stress	ZSCORE	A model, developed by Altman (1968), used to predict publicly traded manufacturing companies' likelihood of bankruptcy. Altman's Z score = 1.2(Working Capital/Total Assets) + 1.4(Retained Earnings/ Total Assets) + 3.3(Earnings Before Interest and Tax/Total Assets) + 0.6(Market Value of Equity/ Total Liabilities) + 0.999(Sales/Total Assets)

Table 2. Descriptive Statistics

Panel A: Pooled descriptive statistics

	R	MATURE	GROWTH	DECLINE	SHAKE	CSR	SIZE	ZSCOR	BETA	MB	LEV	$LOSS_{t-1}$	RE/TA
Mean	0.2450	0.4294	0.0323	0.0308	0.5073	0.2731	6.0193	3.3302	0.5665	16.102	0.6188	0.1647	0.1439
Median	0.1885	0.0000	0.0000	0.0000	1.0000	0.2820	5.9400	1.9750	0.2300	1.8550	0.6300	0.0000	0.1400
Maximum	28.037	1.0000	1.0000	1.0000	1.0000	0.5384	8.2600	182.66	35.030	102.02	1.5700	1.0000	0.9700
Minimum	14.793	0.0000	0.0000	0.0000	0.0000	0.0000	4.3600	0.5100	16.840	77.480	0.0900	0.0000	0.7700
STD	1.525	0.4953	0.1770	0.1731	0.5003	0.1240	0.6661	22.221	3.2768	76.100	0.2063	0.3711	0.1990
Observation	680	680	680	680	680	680	680	680	680	680	680	680	680

Panel B: Life cycle-wise cost of equity

	Statistics	MATURE	GROWTH	DECLINE	SHAKE
	Mean	0.1289	0.1727	0.4780	0.3337
R	Std. Dev	1.1574	0.2557	0.8089	1.8436
	Obs	292	22	21	345

Table 3. Correlation Matrix

Correlation Probability	R	MATURE	SHAKE	GROWTH	DECLINE	CSR	LEV	$LOSS_{t-1}$	SIZE	ZSCOR	BETA	MB	RETA
R	1.0000												

MATURE	-0.0662	1.0000											
	0.0856*	-----											
SHAKE	0.0592	-0.8792	1.0000										
	0.1246	0.0000***	-----										
GROWTH	-0.0087	-0.1586	-0.1869	1.0000									
	0.8215	0.0000***	0.0000***	-----									
DECLINE	0.0272	-0.1549	-0.1825	-0.0329	1.0000								
	0.4800	0.0001***	0.0000***	0.3932	-----								
CSR	0.2146	0.0032	-0.2145	0.1325	-0.1854	1.0000							
	0.0004***	0.9873	0.0413**	0.0132**	0.0153**	-----							
LEV	-0.0553	0.0050	-0.0012	-0.0490	0.0394	-0.1234	1.0000						
	0.1510	0.8965	0.9747	0.2033	0.3069	0.4126	-----						
$LOSS_{t-1}$	0.0446	-0.1217	0.0804	0.0092	0.1056	-0.0286	0.4679	1.0000					
	0.2472	0.0015***	0.0367**	0.8105	0.0060***	0.5138	0.0000***	-----					
SIZE	-0.0132	0.0560	-0.0780	0.0478	0.0160	0.2175	0.0499	-0.1351	1.0000				
	0.7312	0.1462	0.0429**	0.2147	0.6774	0.0003***	0.1956	0.0004***	-----				
ZSCOR	-0.0101	0.0140	0.0130	-0.0526	-0.0238	-0.1275	-0.0400	0.0030	-0.2983	1.0000			
	0.7929	0.7148	0.7351	0.1720	0.5366	0.0036	0.2988	0.9377	0.0000***	-----			
BETA	0.1775	0.0522	-0.0187	-0.0220	-0.0725	-0.0399	0.0042	-0.0272	0.0094	0.0096	1.0000		
	0.0000***	0.1751	0.6278	0.5680	0.0598*	0.3632	0.9125	0.4796	0.8059	0.8029	-----		
MB	0.0031	0.0847	-0.0620	-0.0321	-0.0299	-0.0843	0.0830	-0.0057	-0.1451	0.6196	-0.0043	1.0000	
	0.9344	0.0277**	0.1074	0.4050	0.4381	0.0547*	0.0311**	0.8812	0.0002***	0.0000	0.9096	-----	
RETA	-0.0377	0.0657	-0.0407	0.0618	-0.1333	0.1761	-0.7316	-0.6793	0.1312	0.0117	-0.0056	0.0571	1.0000
	0.0277**	0.0880*	0.2911	0.1088	0.0005***	0.0001***	0.0000***	0.0000***	0.0006***	0.7608	0.8839	0.1385	-----

The values in the matrix are Pearson correlation coefficients and ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively (two-tailed tests).

4.2. Empirical Results

Table 4 reports the t-statistic tests for the mean difference of CEC at different stages of the firm life cycle.

Table 4. Mean Difference Test of the CEC (Assuming Unequal Variance)

CEC		t-statistic for differences	P-value
Growth	Mature		
0.0323	0.4294	-19.682	0.0000***
Growth	Decline		
0.0323	0.0308	0.1548	0.8770
Growth	Shake-out		
0.0323	0.5073	-23.338	0.0000***
Decline	Mature		
0.0308	0.4294	-19.804	0.0000***
Mature	Shake-out		
0.4294	0.5073	-2.8867	0.0040***
Decline	Shake-out		
0.0308	0.5073	-23.468	0.0000***

***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

The result of Table 4 shows that the CEC estimate significantly increases from the growth to mature stage, from the growth to shake-out stage, from the mature to the shake-out stage, from the decline to the mature stage, from the shake-out to the decline stage, and from the decline to the shake-out stage of the firm life cycle. However, the mean cost of equity decreases (not significantly) from the growth to decline stage. Table 5 reports the estimates of the relationship between the CEC and the firm life cycle.

Table 5. Association Between Life Cycle Proxies Using *Dickinson (2011)* Model and the CEC

Variable	OLS	Random effects	Fixed effects	GMM
C	0.8063*** (0.0262)	0.8040*** (0.0919)	1.8870*** (0.1631)	---
GROWTH	-0.1544** (0.0752)	-0.1542*** (0.0345)	-0.6187** (0.3086)	-0.3580** (0.1564)
DECLINE	0.2953* (0.1753)	0.2955** (0.1427)	0.3423** (0.1847)	0.7186* (0.4317)
MATURE	-0.2420* (0.1305)	-0.2418** (0.1227)	-0.1535*** (0.0524)	-0.2924*** (0.1106)
LEV	-0.3322** (0.1760)	-0.3346*** (0.1283)	-0.6883* (0.4075)	-2.5061* (1.3989)
$LOSS_{t-1}$	-0.1403 (0.1421)	-0.1384 (0.1849)	0.2618** (0.1186)	0.1098* (0.0580)
SIZE	-0.0441** (0.0216)	-0.0435 (0.0940)	-0.4171** (0.2123)	-0.1122** (0.0495)
ZSCOR	-0.0024 (0.0015)	-0.0024 (0.0035)	-0.0014* (0.0008)	-0.0086** (0.0043)
BETA	0.0855* (0.0509)	0.0855*** (0.0178)	0.0939*** (0.0193)	0.1138*** (0.0355)
MB	0.0005** (0.0002)	0.0005* (0.0003)	0.0012*** (0.0004)	0.0035** (0.0015)
Adjusted R-squared	0.3039	0.4785	0.5706	---
Sargan test for validity of instrument	---	---	---	13.029 (0.1108)
AR(1)	---	---	---	0.0467
AR(2)	---	---	---	0.2353
Year dummy	Yes	Yes	Yes	Yes

Robust standard errors in brackets. *** $p < 0.01$. ** $p < 0.05$. * $p < 0.10$.

The result of Hausman test (unreported) shows that the fixed effect model is more appropriate for our data. Due to listing criteria in Tehran Stock Exchange, we do not have any firms in introduction stage, therefore the life cycles of firms are categorized into four stages of growth, mature, shake-out, and decline. Four dummy variables are established to represent each of the four stages of the life cycle. To prevent the issue of multicollinearity associated with dummy variables in the regression analysis, one stage must be excluded. Given the theoretical ambiguity surrounding the shake-out stage (Dickinson, 2011), we omit this stage from the regression model. The findings from the regression analysis indicate that, in contrast to the shake-out stage, the decline phases of the firm life cycle show a significant positive correlation with the CEC, whereas the growth and mature stages exhibit a negative correlation with the CEC. Decline is marked by elements such as falling revenues, reduced market share, possible insolvency, and inefficiencies in operations. As a result, investors view these companies as more hazardous investments, leading them to demand a greater rate of return, which ultimately results in an increased CEC. In contrast, the inverse relationship between the growth and mature stages and the CEC suggests that companies in these stages enjoy a notably reduced CEC compared to those in the shake-out stage. Firms in the growth stage typically demonstrate robust revenue increases, enhanced profitability, and favorable future outlooks, rendering them appealing investment opportunities with a lower perceived risk. Similarly, mature firms, characterized by consistent cash flows, solid market standings, and established performance histories, are regarded as less risky, which further aids in lowering their CEC.

Our findings align with the resource-based theory and the life cycle framework regarding the CEC of firms. After accounting for known factors influencing CEC and the unique characteristics of individual firms, we observe that CEC exhibits a negative and significant relationship during the growth and maturity stages. In contrast, during the decline stage, CEC shows a positive and significant relationship when compared to the shake-out stage.

However, the sign, magnitude, or statistical significance of these estimates may be biased due to endogeneity; that is, when the life cycle proxy and the error term in equations (1 and 2) are correlated. To address this concern, we adopt GMM estimator to re-examine the panel regression findings. The generalized method of moments (GMM) estimator is the econometric technique that accounts for the problem of endogeneity of variables and error correlation (Arellano & Bond, 1991; Bajo-Rubio et al.,

2010; Baltagi, 2006; Michaely & Vincent, 2012). Since there are time-invariant variables in this study (dummy variables for the firm's life cycle and loss) and the difference GMM, wipes out time-invariant variables, we use the two-step system GMM estimator.

In line with other estimators (OLS, Fixed and Random Effects), the results of two-step system GMM estimator suggest that declining firms are positively, while growth and mature firms are negatively related to the CEC. Table 6 shows the results for the CEC and RE/TA, a lifecycle proxy proposed by DeAngelo et al. (2006).

Table 6. Association Between the CEC and RE/TA (Lifecycle Proxy)

Variable	OLS	Random	Fixed	GMM
C	-2.2190** (1.0551)	0.8232*** (0.3365)	0.8231*** (0.2149)	----
RE/TA	-0.5775** (0.2890)	-0.2695** (0.1360)	-0.2097** (0.0933)	-2.1386* (1.1146)
LEV	-0.4630* (0.2596)	-0.4738* (0.2939)	-0.4738** (0.2408)	-3.2736** (1.4249)
LOSS $_{t-1}$	0.3120 (0.3281)	-0.1275* (0.0780)	0.1274** (0.0663)	0.0532** (0.0256)
SIZE	-0.3900** (0.1819)	-0.0438** (0.0209)	-0.0438*** (0.0148)	-0.2959** (0.1464)
ZSCOR	-0.0003 (0.0059)	-0.0033* (0.0018)	-0.0023** (0.0011)	-0.0097* (0.0057)
BETA	0.0915*** (0.0195)	0.0826*** (0.0165)	0.0826*** (0.0177)	0.1236*** (0.0328)
MB	0.0026* (0.0015)	0.0014* (0.0009)	0.0024** (0.0010)	0.0029** (0.0013)
Adjusted R-squared	0.243	0.347	0.357	---
Sargan test for the validity of instrument	---	---	---	13.987 (0.0821)
AR(1)	---	---	---	0.0014
AR(2)	---	---	---	0.3998
Year dummy	Yes	Yes	Yes	Yes

Robust standard errors in brackets. *** $p < 0.01$. ** $p < 0.05$. * $p < 0.10$.

The coefficients on RE/TA are negative and significant, suggesting that investors' demand for the CEC decreases as RE/TA increases. Overall, our findings align with the resource-based theory and the life cycle explanation regarding the firm's cost of equity. In the early stages, companies generally possess minimal retained earnings alongside significant growth prospects, which compels them to seek external equity financing. This necessity raises the cost of equity as investors demand higher risk premiums (Amin et al., 2023; Fama & French, 1993). As companies progress and gather considerable retained earnings, their reliance on external financing diminishes, and they demonstrate more consistent cash flows, which in turn lowers perceived risk (Grullon & Michaely, 2002). This transition results in a reduction of the required rate of return that investors expect, thereby leading to a decreased cost of equity capital (DeAngelo et al., 2006; Modigliani & Miller, 1958). Consequently, higher retained earnings, which are characteristics of a more mature stage, indicate a lower financial risk and a diminished reliance on external equity, ultimately contributing to a reduced cost of equity capital. The RE/TA ratio thus serves as a critical indicator of a firm's financing strategy, with implications for its cost of capital—lower RE/TA firms face higher costs due to reliance on external funding, while higher RE/TA firms benefit from lower costs owing to internal financing (Hasan, Hossain, Cheung, & Habib, 2015).

Table 7. Moderating Effect of CSR

Variable	OLS	Random effects	Fixed effects	GMM
C	0.7054*** (0.0342)	0.7032*** (0.0813)	1.8775*** (0.1721)	---
GROWTH	-0.1454** (0.0741)	-0.1463*** (0.0354)	-0.6275** (0.3175)	-0.3651** (0.1584)
DECLINE	0.2875* (0.1885)	0.2854** (0.1325)	0.3633** (0.1944)	0.7288* (0.4418)
MATURE	-0.2623* (0.1414)	-0.2819** (0.1425)	-0.1485*** (0.0426)	-0.3125*** (0.1205)
CSR	-0.0191** (0.0181)	-0.0161 (0.8812)	-0.0282*** (0.0013)	-0.0390*** (0.000)
GROWTH*CSR	-0.0715* (0.0381)	-0.0278* (0.0154)	-0.0301* (0.0159)	-0.0386 (0.0244)
DECLINE*CSR	0.0284* (0.0162)	0.0285** (0.0132)	0.0422** (0.0274)	0.0608* (0.0321)
MATURE*CSR	-0.0352* (0.0240)	-0.0351** (0.0332)	-0.2634*** (0.0634)	-0.3834*** (0.0115)
LEV	-0.3432** (0.1697)	-0.3464*** (0.1323)	-0.5982* (0.3095)	-2.4123* (1.4436)
$LOSS_{t-1}$	-0.1514 (0.1553)	-0.1292 (0.1763)	0.2535** (0.1264)	0.1178* (0.0673)
SIZE	-0.0552** (0.0357)	-0.0546 (0.0852)	-0.4562** (0.2514)	-0.1213** (0.0585)
ZSCOR	-0.0035 (0.0026)	-0.0014 (0.0025)	-0.0024** (0.0012)	-0.0098** (0.0048)
BETA	0.0753 (0.0517)	0.0756*** (0.0252)	0.1036*** (0.0452)	0.1246*** (0.0453)
MB	0.0008** (0.0004)	0.0006* (0.0004)	0.0009** (0.0004)	0.0046** (0.0022)
Adjusted R-squared	0.3248	0.4793	0.5958	---
Sargan test	---	---	---	13.227 (0.1328)
AR(1)	---	---	---	0.0378
AR(2)	---	---	---	0.2435
Year dummy	Yes	Yes	Yes	Yes

Robust standard errors in brackets. *** $p < 0.01$. ** $p < 0.05$. * $p < 0.10$.

The results of Table 7 indicate that there is a negative relationship between CSR and CEC. Participating in CSR initiatives can mitigate information asymmetry, enhance transparency, and cultivate trust among investors, consequently diminishing the perceived risk linked to the organization (El Ghoul et al., 2011). Additionally, robust CSR performance can bolster a company's reputation and legitimacy, drawing in long-term, socially responsible investors who might be willing to accept lower expected rates of return (Lins et al., 2017). This combination of reduced risk and an expanded investor base can ultimately result in a decreased cost of equity capital (Fatemi et al., 2018). In addition, the results indicate that CSR moderates the relationship between company life cycle and CEC. The coefficients of the tests indicate a negative and significant relationship between the CEC and the stages of growth and maturity of companies. In fact, the better the CSR performance, the lower the CEC for the company. Increased CSR contributes to a significant decrease in the CEC, particularly in mature companies. This indicates that investors view organizations with robust CSR initiatives as less risky and more sustainable. Consequently, this perception results in heightened demand for their securities, improved financing terms, and ultimately a lower CEC. This dynamic encourages companies to engage in CSR activities, yielding both reputational and financial advantages.

Table 8. Moderating Effect of CSR (RE/TA as Lifecycle Proxy)

Variable	OLS	Random	Fixed	GMM
C	-2.3189** (1.1541)	0.8152*** (0.3285)	0.8121*** (0.2038)	----
RE/TA	-0.5583** (0.2792)	-0.2795** (0.1413)	-0.2086** (0.0942)	-2.0364** (1.0124)
CSR	-0.0172** (0.0162)	-0.0282 (0.7613)	-0.0292*** (0.0023)	-0.0386*** (0.001)
RE/TA*CSR	-0.3553** (0.1670)	-0.1675 (0.1340)	-0.1097* (0.0633)	-1.5385* (0.8246)
LEV	-0.4812* (0.2778)	-0.4556* (0.2757)	-0.4946** (0.2616)	-3.3724** (1.5237)
LOSS $_{t-1}$	0.3365 (0.3487)	-0.1176* (0.1385)	0.1345** (0.0734)	0.0645** (0.0325)
SIZE	-0.3768** (0.1786)	-0.0536*** (0.0214)	-0.0427*** (0.0146)	-0.2547** (0.1123)
ZSCOR	-0.0015 (0.0047)	-0.0038** (0.0017)	-0.0026** (0.0011)	-0.0099* (0.0054)
BETA	0.0833*** (0.0236)	0.0785*** (0.0257)	0.0856*** (0.0217)	0.1324*** (0.0338)
MB	0.0025* (0.0013)	0.0015* (0.0008)	0.0026** (0.0012)	0.0027** (0.0012)
Adjusted R-squared	0.325	0.362	0.387	---
Sargan test	---	---	---	14.745 (0.0732)
AR(1)	---	---	---	0.0013
AR(2)	---	---	---	0.4126
Year dummy	Yes	Yes	Yes	Yes

Robust standard errors in brackets. *** p < 0.01. ** p < 0.05. * p< 0.10.

The result of Table 8 highlights that CSR as a moderating variable has an effect on the relationship between company life cycle (retained earnings) and the CEC.

4.2.1. Robustness Test
Alternative Measure of Firm Life Cycle
To address apprehensions about the potential sensitivity of the primary findings to the life cycle proxy, we employ firm age as a substitute metric. Firm age serves as a logical and intuitive option, given that the stages of a firm's life cycle are intrinsically linked to its age. We define AGE as the interval between the current year and the year the firm was established. The analysis indicates a negative and statistically significant relationship between the CEC and AGE. The overall conclusions remain qualitatively unchanged. In conclusion, these results align with those previously presented in our main analysis.

Table 9. Alternative Estimation of Firm Life Cycle

Variable	Pooled OLS	Random effects	Fixed effects	GMM
C	0.4103*** (0.0121)	0.4278*** (0.1144)	-1.8332*** (0.2908)	---
AGE	-0.0087** (0.0044)	0.0187*** (0.0042)	-0.1408* (0.0771)	-0.2879** (0.1235)
BETA	0.0841*** (0.0177)	0.1843*** (0.0347)	0.0909*** (0.0231)	0.1966*** (0.0278)
MB	0.0003** (0.0001)	0.0012* (0.0007)	0.0028** (0.0012)	0.0036** (0.0016)
LEV	-0.2925 (0.3279)	-0.2623 (0.3191)	-0.7621** (0.3289)	-1.4152* (0.8105)
LOSS $_{t-1}$	-0.3470* (0.1821)	-0.0970 (0.1827)	0.2689* (0.1566)	-0.0527** (0.0265)
SIZE	-0.0528** (0.0231)	-0.0658** (0.0315)	0.4708** (0.2170)	-0.5995** (0.2515)
ZSCOR	-0.0019 (0.0034)	-0.0028* (0.0016)	0.0004** (0.0002)	-0.0068** (0.0030)
Adjusted R-squared	0.2980	0.2983	0.4785	---
Year dummy	Yes	Yes	Yes	Yes
Sargan test	---	---	---	11.063 (0.1981)
AR(1)	---	---	---	0.0233
AR(2)	---	---	---	0.1821

Robust standard errors in brackets. *** p < 0.01. ** p < 0.05. * p< 0.10

The results in Table 9 indicate that there is a negative and significant relationship between the age of the company and the cost of equity across different tests. In other words, the older the company, the lower the cost of equity. The findings indicate that as the company approaches the maturity stage, the equity costs decrease. The results of the test coefficients reveal that the model is highly reliable.

Table 10. Alternative Estimation of Firm Life Cycle with Moderator Variable

Variable	Pooled OLS	Random effects	Fixed effects	GMM
C	0.4323*** (0.0134)	0.4002*** (0.1056)	-1.7312*** (0.2896)	---
AGE	-0.0084** (0.0042)	0.0072*** (0.0039)	-0.0112* (0.0066)	-0.2843** (0.1265)
CSR	-0.0184** (0.0174)	-0.0362 (0.7453)	-0.0289*** (0.0021)	-0.0413*** (0.0030)
AGE*CSR	-0.0145** (0.0134)	-0.0267 (0.7563)	-0.0279*** (0.0022)	-0.0361*** (0.003)
BETA	0.0798*** (0.0181)	0.0756*** (0.0176)	0.0923*** (0.0227)	0.1967*** (0.0254)
MB	0.0005** (0.0002)	0.0004** (0.0002)	0.0031** (0.0014)	0.0046*** (0.0012)
LEV	-0.2879 (0.3345)	-0.2965 (0.3324)	-0.7546** (0.3231)	-1.4231* (0.8126)
LOSS $_{t-1}$	-0.3464* (0.1832)	-0.0897 (0.1724)	0.2763* (0.1541)	-0.0523** (0.0245)
SIZE	-0.0525** (0.0223)	-0.0532** (0.0231)	0.4714** (0.7973)	-0.5886** (0.2423)
ZSCOR	-0.0018 (0.0031)	-0.0019 (0.0013)	0.0005** (0.0002)	-0.0064** (0.0031)
Adjusted R-squared	0.2986	0.2997	0.4976	---
Year dummy	Yes	Yes	Yes	Yes
Sargan test	---	---	---	11.163 (0.1781)
AR(1)	---	---	---	0.0256
AR(2)	---	---	---	0.1956

Robust standard errors in brackets. *** p < 0.01. ** p < 0.05. * p< 0.10

According to Table 10, in the robustness test, the results indicate that CSR moderates the relationship between CEC and the age of the company. In the three methods of OLS, fixed effects, and GMM, it demonstrates a negative and significant relationship at the 99% level. In fact, as the size of the company increases, the social responsibility of the company rises, while the cost of owners' capital rights decreases. Other tests conducted in this model confirm its reliability.

5. Conclusion
In this study, we test the relationship between a firm's life cycle and the CEC. Additionally, we include CSR as a moderating variable in our analysis. We posit that firms in different life cycle stages have varying levels of resource bases, competitive advantages, information asymmetry, and riskiness; therefore, the firm's CEC should systematically differ across its life cycle. Using a sample of Iranian listed firms from 2019 to 2023, we find that the firm 's CEC significantly differs across the stages of life cycle. Our analysis reveals that the CEC tends to be elevated during the decline stage of a firm's lifecycle, while it is comparatively reduced during the growth and maturity stages. Additionally, we observe that an increase in retained earnings relative to total assets (RE/TA) corresponds with a decrease in the cost of equity capital. Notably, these findings are consistent across various methods of estimating the cost of equity capital and throughout different stages of the firm's lifecycle. This result is in line with Hasan, Hossain, and Habib (2015), Amin et al. (2023), and La Rocca et al. (2011). Additionally, we reveal that CSR moderates the relationship between capital cost and company life cycle stages. This finding is consistent with El Ghoul et al. (2011), Feng et al. (2017), and Khan et al. (2023). The results indicate a negative and significant relationship between the CEC and the stages of growth and maturity of companies. In fact, better CSR performance leads to a lower CEC in the company. Overall, our empirical evidence contributes to the growing body of literature focusing on

the financial implications of the firm life cycle. Particularly, this study adds to the literature by providing evidence of the role of the firm life cycle in determining CEC. Our results carry substantial practical implications for managers, investors, and policymakers alike, guiding more informed capital allocation decisions and encouraging strategic CSR integration to enhance firm value and financial stability. Our findings strongly support the resource-based view of competitive advantage and firm life cycle theory. The resource-based view posits that large and mature firms possess a wealth of financial capital, diverse physical assets, and robust human resources, along with intangible knowledge and capabilities. In contrast, small and young firms typically have a more limited and concentrated resource base. These extensive resources and expertise enable mature firms to secure a competitive edge, mitigate risks and issues related to information asymmetry, and facilitate easier access to financing, ultimately leading to a decrease in equity capital costs. This aligns with the life cycle theory of firms, which suggests that different phases of a firm's development are characterized by distinct levels of transparency, analyst and investor engagement, stock liquidity, credibility, and market standing. Consequently, as firms progress through these stages, their equity capital costs fluctuate accordingly. From a practical standpoint, our findings underscore significant implications for financial management and strategic planning within firms. One key implication is that companies should strive to attain and sustain maturity, as the optimal phase in the firm life cycle, to capitalize on the advantages of reduced CEC.

Future investigations may focus on particular sectors to comprehend the subtleties of the interplay between the firm life cycle, CSR, and the CEC. The effects of CSR initiatives can differ markedly based on the characteristics of the industry, its environmental impact, and its social contributions. In addition, the impact of corporate governance, regulatory structures, and societal norms on the interplay between the firm life cycle, CSR, and the CEC differs significantly from one country to another. International comparative research can yield important insights into the ways these contextual elements influence the relationships among these variables, thereby enhancing our overall comprehension of the global ramifications of CSR.

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