

Corporate climate change disclosures and capital structure strategies: evidence from Türkiye

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Abstract

Purpose – There has been an increase in research examining whether and how companies disclose climate change impacts and how these disclosures influence capital structure strategies in recent years. However, prior literature has generally focused on developed countries. This paper proposes to examine the impact of voluntary climate change disclosures on corporate financing decisions in an emerging economy.

Design/methodology/approach – The dataset includes 335 firm-year observations listed in the Borsa Istanbul (BIST) 100 manufacturing industry firms that participated in the Carbon Disclosure Project (CDP) questionnaire from 2016 to 2020, characterized by high public awareness of greenhouse gas emissions in Turkey. To accomplish this aim, two models have been constructed that link capital structure strategies with voluntary corporate climate change disclosures while controlling for firm-level attributes in terms of size, profitability, market value and free float ratio (FFR).

Findings – The significant and negative relationship between the voluntary disclosure of climate-related activities and long-term borrowing is consistent with the arguments that companies with high commitments are unlikely to reduce default risk in emerging markets. This paper also provides empirical evidence that the high size and the level of low profitability magnify this relationship between CDP and financial leverage.

Originality/value – The Paris Agreement seems to be a significant point where corporate lenders have become aware of the commitment of policymakers to fight climate change. The results have significant implications for both managerial strategies and environmental regulatory policy-making issues. In addition, the findings shed light on the strategic behavior of managers in the consideration of climate change risks and related transparency.

Keywords Carbon Disclosure Project (CDP), Carbon emissions, Climate-related disclosure, Capital structure, Manufacturing industry

Paper type Research paper

1. Introduction

Financial investors have predominantly perceived climate change as the gravest risk in recent years. [World Economic Forum \(2023\)](#) reports that environmental risks such as failure to mitigate climate change, failure to adapt to climate change, natural disasters and extreme weather events, loss of biodiversity and ecosystem collapse are among the top five risks. Several initiatives have been taken at both the national and international levels to mitigate



climate change and create incentives for economies to take action for accelerating the low-carbon economic transition. The Intergovernmental Panel on Climate Change (IPCC) (2022) report demonstrates that the risks posed by climate hazards and vulnerability have increased with climate change. These reports argue that climate hazards pose a major risk to economic activities. The Financial Stability Board first recognized the significance of disclosing climate change activities in 2015 when it established the Task Force on Climate-Related Disclosures (TCFD), which since 2017 has been developing recommendations for increasing climate change reporting. The TCFD's report (2022) reveals that the number of firms engaging the recommendations is growing, the type of information disclosed is evolving and disclosures are becoming more complete, and more appropriate pricing for climate-related issues is occurring.

The lack of comparability and consistency in voluntary disclosure of climate change across companies prevents stakeholders to evaluate the impact of greenhouse gas emissions on the company's financial decision process and future outlook. To overcome this lack of comparability, the Carbon Disclosure Project (CDP) has started to use a comparable questionnaire to request the firms' disclosure of greenhouse gas emissions and climate change strategies since 2003 to overcome this lack of consistency. CDP is recognized by the Harvard Business Review as the most powerful green non-governmental organization (NGO) in the world (Harvard Business Review, 2010). The data collected and the reports produced by CDP are used in business, investment and policy-making processes.

As investors seek to invest in firms that do less harm to the environment or strive to be more sensitive in this regard, companies are now becoming more actively engaged in environmental issues. CDP also supports companies in this regard. When companies take such action, it also has a positive impact on their financial concerns. In addition, CDP enables companies to become more visible to international investors and increase investment (CDP, 2022). Capital structure decisions can also be considered as the financing strategies that enable companies to ensure continuity, secure their existence, adapt to changing environmental conditions, gain competitive advantages and make new investments. The underlying motivation of this study is the lack of empirical studies examining the association between climate-related disclosures and capital structure decisions in emerging economies.

Voluntary disclosure of climate change is an area of growing research interest. Turkey is on its way to becoming a low-carbon economy as an emerging economy. Although Turkey signed the Paris Agreement in 2016, the country held off on ratifying it for five years. Turkey did not ratify the agreement until 2021 when it committed to aligning financial flows with a low-carbon transition. In Turkey, CDP has started to send questionnaires to companies in the Borsa Istanbul (BIST) 100index since 2011. The dataset includes 335 firm-year observations listed in the BIST100 index from 2016 to 2020, characterized by high public awareness of greenhouse gas emissions. The BIST100 index listed firms represent the largest scale companies by market capitalization. Therefore, these firms indicate a key understanding of the disclosure of climate change and capital structure decisions.

The present study fills this gap in the academic literature by investigating how the capital structure strategy of a corporation is shaped by voluntary corporate climate change disclosures. Accomplishing this aim could demonstrate how the attitude of climate change disclosures affects capital structure decisions in an emerging economy with limited financial funds. This study contributes to prior research in such ways. First, it documents a clear association between corporate climate change disclosures and capital structure policies under financial constraints. In addition, it underscores the effectiveness of public policy by underlining that the Paris Agreement represents a significant point after which corporate lenders have become more sensitive to considering climate-related disclosures. Finally, this paper provides significant implications for both financing strategies and environmental regulatory policy.

The rest of the paper is organized as follows: the next section reviews the theoretical framework. Section 3 gives the literature review and develops the research hypotheses. The

dataset construction and the research methodology are discussed in [Section 4](#). Empirical results and discussion are presented in [Section 5](#) and the final section offers concluding and further remarks.

2. Theoretical framework

This paper draws on insights from both the voluntary climate change disclosure field, including the agency theory, signal theory, legitimacy theory and stakeholder theory together with capital structure literature, in terms of trade-off and pecking order theory.

The agency theory is concerned with differences in knowledge and expectations that can occur between the principal and the agent, and with the formation of mechanisms that can manage these differences ([Jensen and Meckling, 1976](#)). According to Friedman, who received the Nobel Prize in Economics in 1976, investments in corporate social responsibility issues cause an agency problem due to managers can only make these investments on behalf of shareholders to enhance their reputation. Therefore, investing in socially responsible investments and disclosing environmental information may be detrimental to shareholders' interests. From another perspective, voluntary sustainability information disclosure can increase information transparency and reduce investment risks because there is asymmetric information between the agent and the principal. In this case, investing in sustainability activities and disclosing environmental information can be beneficial to shareholders ([Ross, 1977](#)). Furthermore, organizations often send signals to each other and to stakeholders that reduce information asymmetry and allow them to demonstrate their corporate image, intentions, behavior and performance. In financial markets where information asymmetry prevails, stakeholders outside the firm perceive all actions of the firm as signals and try to reduce information asymmetry ([Mitchell et al., 1997](#)). Investors evaluate these signals and use them as the basis for their investment decisions, the essential elements of the signal theory are the signal givers, the receiver and the signal ([Spence, 1973](#)). The signal givers are individuals within the organization. The receivers are individuals outside the organization. Signals are positive or negative information that the signalers have gathered and must decide whether to share with the receivers. The signaling theory focuses primarily on the intentional transmission of positive information by signalers to create a positive perception of the qualities of the organization. In this context, investors believe that a company that has positive prospects for a project will secure its financing by borrowing, which sends a positive signal to external parties and potentially leads to an increase in the company's stock value ([Noe, 1988](#)).

[Lindblom \(1994\)](#) defined the concept of legitimacy as the state or status that occurs when an entity has a value system that is compatible with the social system's value system ([Deegan, 2002](#)). The legitimacy theory states the information and disclosure in the relationships between individuals and organizations ([Gray et al., 1996](#)) Organizations adhere to the social contract or maintain their legitimacy to ensure their existence. According to the social contract, companies are obligated to take various actions desired by society in return for confirmation of their goals and the resulting profits ([Reverte, 2009](#)). When companies break the social contract, they face difficulties in accessing capital and other economic resources. Numerous studies on climate-related disclosures agree that companies value voluntary disclosures to comply with the social contract and ensure their legitimacy ([Guo, 2014](#)). While legitimacy theory deals with the expectations of society in general, according to the stakeholder theory, a positive commitment to sustainability issues or environmental actions can be an indicator of good management ([Attig and Cleary, 2015](#)).

From a capital structure perspective, the trade-off theory emerged as a result of the analysis performed by adding the costs of financial distress to the model in the [Modigliani and Miller \(1963\)](#) study. According to the trade-off theory, each company has a target debt-to-

equity ratio that it wants to achieve and that varies from company to company. The optimal debt ratio is where the tax benefit from debt and the cost of bankruptcy are equal. From this point, the tax benefit from debt disappears as the company increases debt and the risk of financial difficulty and bankruptcy increases (Modigliani and Miller, 1958). Therefore, companies will not prefer to increase the amount of continuous borrowing. The pecking order theory stated that companies choose a source of finance for their investments; they first prefer resources inside the company, then resources outside the company and finally, equity financing (Myers and Majluf, 1984). This theory explains the reasons for incurring less debt for most profitable companies. Because these companies have high profitability ratios, they do not need external resources. Companies with lower profitability ratios prefer to borrow. This is because they do not have enough internal resources to encounter financing needs.

3. Literature review

Based on theoretical perspectives and related literature, climate change disclosure has an enormous effect on capital structure decisions in terms of financial leverage and long-term borrowing levels. Each of these factors and their associated hypotheses is discussed below.

Gao and Connors (2011) hypothesize that companies with lower emissions of pollutants in the electric utility industry have higher leverage and make more voluntary disclosures, and leverage has a negative effect on disclosures between 2001 and 2007 in the United States of America. Andrikopoulos and Krikilani (2013) examine the liquidity constraints of firms listed on the Copenhagen Stock Exchange, where high financial leverage tends to reduce the extent of environmental disclosures in Denmark. In contrast, Eun-Hee and Lyon (2011) examine the conditions under which stock prices increase due to CDP participation for the Financial Times Global 500 companies. This study shows no evidence that voluntary response to CDP directly increases stock prices. Furthermore, Luo *et al.* (2013) investigate the decision to respond to the CDP survey in the United States of America and they do not reveal a significant association between CDP reporting and leverage.

Empirical studies on emerging economies in that field are limited. Ganda (2018) investigate the South African firms' CDP disclosure between the years 2010 and 2015. The paper reveals that CDP disclosure generates a positive linkage with asset profitability but a negative relationship with the market-to-book ratio. Perlin (2022) investigate this effect on Brazilian industrial firms and find that there is a positive relationship between climate change mitigation and different dimensions of corporate financial performance. Moreover, Kumar and Firoz (2019) study on 137 Indian-listed firms between 2011 and 2015. The results indicate that the financial leverage ratio has a significant effect on their voluntary participation in CDP reporting in India. Ararat and Sayedy (2019) analyze the CDP disclosure and gender diversity for BIST 100 index firms and reveal that firms with high financial leverage may prefer to increase the voluntary disclosure levels for mitigating leverage-related agency costs.

These studies show that financial leverage is related to environmental disclosure, and for this reason, the first hypothesis is formulated as follows:

H1,0. Firms' voluntary climate disclosure has no effect on the financial leverage ratio.

H1,1. Firms' voluntary climate disclosure has an effect on the financial leverage ratio.

Freedman *et al.* (2020) state that debt duration is higher, both statistically and economically, among low-carbon risk firms listed on the Johannesburg Stock Exchange (JSE) in South Africa between 2011 and 2015. In addition, this study reveals that there is a positive relationship between high-quality carbon disclosure and debt maturity. The results suggest that companies listed on the JSE can use voluntary disclosure of emissions levels to facilitate their access to longer-term credit. The article by Palea and Drogo (2020) assumes that the risk

premium increases as the level of carbon disclosure in Europe increase between 2010 and 2018. The article states that during and after the Paris Agreement, lenders have strongly dealt with the corporate carbon risk. Recognizing the strong commitment of policymakers to addressing climate change and taking action, they have begun to price carbon risk with high or low emissions. Moreover, [Zhang and Lucey \(2022\)](#) reveal that sustainability performance increases external finance, including debt levels on a global scale.

Related empirical studies exhibit that long-term borrowing level is related to environmental disclosure. Therefore, the second hypothesis is formulated as follows:

- H2,0.* Firms' voluntary climate disclosure has no effect on the level of long-term borrowing.
- H2,1.* Firms' voluntary climate disclosure has an effect on the level of long-term borrowing.

4. Research design

4.1 Research data

In this paper, the data from the CDP Turkey annual survey reports between the years 2016 and 2020 were used. CDP Turkey sends out a climate change questionnaire to Turkish BIST 100 listed companies every year in Turkey. The questionnaire consists of five main modules: "Introduction", "Risks and Opportunities", "Management", "Accounting for Greenhouse Gas Emissions", "Energy and Fuel Consumption and Trade" and "Sign Off".

The sample comprises companies continuously listed in the BIST100 index during 2016–2020, a period characterized by high public awareness of greenhouse gas emissions. After removing financial institutions due to the difference in specific accounting practices and a set of environmental and social regulations, the final sample includes 335 firm-year observations. [Şahin \(2018\)](#) studied the 60 listed firms in the BIST 100 index during the years 2012–2017. Analysis results reveal that the CDP score has an impact on only the consumer discretionary industry. In addition, [Nasih et al. \(2019\)](#) argue that the sectors in which companies operate influence the declaration of carbon emissions and estimate that companies in the mining industry will disclose more information about their carbon emissions because the mining sector is more likely to produce carbon emissions and to a greater extent. In addition, the manufacturing sector was selected because its environmental impacts are comparatively higher, in line with [Ding et al. \(2022\)](#) study of manufacturing enterprises in China. Since the regulatory structure and commercial activities of financial sector enterprises are different from those of the manufacturing sector and have different reporting procedures, the financial sector enterprises were excluded from the study. It is worth mentioning that the BIST 100 firms were invited to voluntarily report carbon disclosure through the CDP survey in 2011. Due to the modest participation level in the CDP questionnaire before 2016 and for ensuring the consistency of the firms' responses to the survey, this study tackles the firms listed on BIST100 index starting in 2016.

[Table 1](#) presents the sample construction process. The first sample comprises the corporations that were invited to engage in the CDP Turkey survey between the years 2016

Table 1.
Sample construction

The initial sample	139
Number of financial firms	61
Number of manufacturing firms	78
Companies whose financial reports cannot be fully accessed and are intermittent as of 2016	11
Final sample	67

Source(s): Authors' own work

and 2020. Out of the remaining 78 companies operating in the manufacturing sector, a total of 67 firms, whose financial statements can be accessed completely and uninterruptedly listed from 2016, were determined as the sample of the study. Hence, the final sample comprises 67 manufacturing firms listed on BIST 100 index, providing 335 firm-year observations.

The companies' data were obtained from Finnet, Turkey Public Disclosure Platform (PDP), the BIST website and companies' websites and CDP reporting data were obtained from the global CDP website. The STATA 17.0 program was used.

Table 2 exhibits that 23.88% of our sample is from fabricated metal products machinery electrical equipment and vehicles, followed by chemicals, petroleum rubber and plastic products (22.39%) and non-metallic mineral products (14.92%).

4.2 Measurement of variables

4.2.1 Dependent variables. Margolis and Walsh (2001), pioneers in this field, argue that corporate environmental responsibility is a significant determinant of financial performance. Additionally, mitigation of climate change-related risks is proven to increase financial performance (Alvarez *et al.*, 2015; Hassan and Romilly, 2018; Ganda and Milondzo, 2018). This study utilizes two dependent variables, long-term borrowing levels and financial leverage, to assess the capital structure of Turkish manufacturing firms included in the BIST100 index. Financial leverage is measured by dividing total liabilities by equity and is denoted as "*FL*". Long-term borrowing level is measured by dividing long-term debt by total assets and is denoted as "*LTBL*" (Huynh *et al.*, 2020; Alshahrani *et al.*, 2022).

4.2.2 Independent variable. CDP survey data was used for the company's commitment to climate change. Tang and Luo (2011) argue that "a company's reputation could be affected if it refuses to participate in CDP or if it participates but discloses insufficient information on carbon emissions." In addition, Alsaifi *et al.* (2020) note that CDP data were used in 70 peer-reviewed studies published between the years 2005 and 2015. Parallel with these studies, environmental disclosure is measured by the disclosure behavior of companies concerning the CDP survey results and is referred to as "CDP". This indicator is equal to 1 if the company answered the questionnaire and allowed CDP to make the answers available to the public, and 0 if not.

Table 3 exhibits the response rates to the CDP questionnaire in Turkey. The response rate in the related period is almost 41% (41 out of 100), which is relatively low compared with previous studies that employed CDP as an independent variable however as an emerging economy the response rates are increasing. Alsaifi *et al.* (2020) state that the response rate is

Sector	Number of firms	Percentage (%)
Fabricated metal products machinery electrical equipment and transportation vehicles	16	23.88
Chemicals, petroleum rubber and plastic products	15	22.39
Non-metallic mineral products	10	14.92
Food, beverage and tobacco	9	13.43
Basic metal	8	11.94
Textile, wearing apparel and leather	4	5.97
Paper and paper products printing	3	4.48
Wood products including furniture	1	1.49
Other manufacturing industry	1	1.49
Total	67	100

Source(s): Authors' own work

Table 2.
Manufacturing
industry breakdown

Table 3.
CDP survey response
rates in Turkey

Years	Number of companies responding to the CDP survey (BIST100)	Number of companies not responding to the CDP survey (BIST100)	Total
2014	23	77	100
2015	29	71	100
2016	33	67	100
2017	38	62	100
2018	31	69	100
2019	37	63	100
2020	39	61	100
2021	41	59	100

Source(s): CDP climate change program annual report, 2021

77% for nonfinancial firms in the European STOXX600 index between the years 2009 and 2018. [Prado-Lorenzo and Garcia-Sanchez \(2010\)](#) indicate 60% as the mean value for CDP based on the CDP (2008) annual survey. [Luo and Tang \(2014\)](#) reveal that 65% is the mean value for CDP according to the CDP (2010) annual survey. Additionally, [Luo et al. \(2013\)](#) state that CDP overall response rate in emerging economies is significantly lower than that in emerged economies. [Kolk et al. \(2008\)](#) observed an increasing trend in the CDP response rate for the Financial Times 500 firms each year, although they reveal any significant impact on investors' decision-making implementations. On the other hand, [Blanco et al. \(2017\)](#) makes an interview with 38 firms in seven countries and reveal that the main motivation for more than half of these firms reporting CDP is meeting financial expectations.

[Stanny and Elly \(2008\)](#) analyze the driving factors of CDP disclosure for US S&P 500 firms and depict that asset size and foreign sales are the main determinants for reporting. In this sense, for Global 500 firms, [Luo et al. \(2012\)](#) investigate the indicators of CDP disclosure and reveal that economic pressure is strongly positively related to CDP disclosure. Additionally, for large-scale firms, social pressure is found to play a vital role in CDP reporting. [Gonzalez and Ramirez \(2016\)](#) investigate the driving factors for CDP disclosure for 84 Spanish-listed firms. A positive relationship is depicted between the CDP disclosure and the asset size of the corporations.

4.2.3 Control variables. This study controls for the effects of several variables from the existing literature as influencing the linkage between CDP response and capital structure decisions. Previous studies have shown a positive relationship between environmental disclosure and firm size ([Fifka, 2013](#); [Akbaş and Canikli, 2018](#); [Nasih et al., 2019](#)). [Akbaş and Canikli \(2018\)](#) reveal that the size of companies included in the BIST100 index had a positive effect on their voluntary participation in CDP reporting in Turkey between the years 2014 and 2016. Additionally, [Nasih et al. \(2019\)](#) hypothesize that larger companies in Indonesia are more willing to disclose more about their carbon emissions between 2011 and 2016. [Kılıç Karamahmutoglu and Kuzey \(2019\)](#) argue that there are important and positive effects of bank size on banks' climate change statements in Turkey between 2010 and 2016. Furthermore, [Kumar and Firoz \(2019\)](#) acknowledge that firm size has a key role in their voluntary participation in CDP in India between 2011 and 2015. On the other hand, [Eleftheriadis and Anagnostopoulou \(2015\)](#) find no association between climate-related disclosures and corporate debt. Based on these studies, company size (Size) is selected as one of the independent variables.

Prior studies have shown a link between asset profitability (ROA) and environmental disclosure ([Ben-Amar et al., 2017](#); [Alshahrani et al., 2022](#)). [Akbaş and Canikli \(2018\)](#) find that the return on assets ratio of firms listed in the BIST100 index had a significantly positive effect on their voluntary participation in CDP reporting in Turkey between 2014 and 2016.

Kılıç Karamahmutoglu and Kuzey (2019) acknowledge that there are important and positive effects of asset profitability on banks' climate change declarations, parallel with the theory of political costs and legitimacy in Turkey between 2010 and 2016.

This study controls for investment opportunities and uses Tobin's Q as a proxy for the market value of a firm divided by the replacement cost of assets. The study by Zhang and Lucey (2022) concludes that the environmental, social and governance (ESG) performance of globally listed firms have a positive effect on firm performance between 2016 and 2020. Second, they accept that ESG performance increases corporate performance by mitigating financial problems. Finally, they recognize that strong ESG performance sends a high-value signal to the credit market, enabling companies to improve the financial environment by helping them obtain more corporate loans. Akbaş and Canikli (2018) find that the market-to-book value ratio of companies included in the BIST100 index has a positive and significant effect on their voluntary participation in CDP reporting in Turkey between 2014 and 2016. In the article by Kumar and Firoz (2019), the market-to-book value ratio is assumed to have a significant effect on voluntary participation in CDP reporting in India between 2011 and 2015. Furthermore, Saka and Oshika (2014) argue that stock market value and carbon management disclosure are positively related and that this relationship becomes stronger as carbon emissions increase. In addition, Tobin's Q and free float ratio (FFR) are used as measures of corporate performance. Table 4 exhibits the variables used in the study with explanations and symbols.

4.3 Empirical models

There has been an increase in research examining whether and how companies disclose climate change impacts and how these disclosures influence corporate financing decisions in recent years. To analyze the effect of voluntary climate disclosures on the capital structure of manufacturing firms listed in the Turkish BIST100 index and to test the above hypotheses, two different panel data regression models are run. The first model indicates the financial leverage of the companies and the second model determines the long-term borrowing level of the companies, all of which are related to the capital structure. Panel data regression models have been an appropriate regression method because they allow the effects of units and time zones to be observed both separately and together (Park, 2011). The following two-panel regression models were used to test the determinants of the capital structure of the related sample.

Variable	Explanation	Symbol
<i>Dependent variables</i>		
Financial leverage	Total liabilities/Equity	FL
Long-term borrowing level	Long-term debt/Total assets	LTBL
<i>Independent variables</i>		
Status of participation in the carbon disclosure Project (CDP)	Level of participation in CDP (The dummy is variable and takes the value "1" if companies disclosed their climate change information through CDP, and "0" if they did not	CDP
<i>Control variables</i>		
Size	Natural logarithm of total assets	Size
Asset profitability	Net profit/Total assets	ROA
Tobin Q	The market value of a company/Assets' replacement cost	TOBINQ
Free float ratio	The total par value of the company's publicly traded shares/Total par value of all its shares	FFR

Source(s): Authors' own work

Table 4.
Variables used in
the study

4.3.1 Model (1); for financial leverage.

$$FL_{it} = \alpha_i + \beta_1 CDP_{it} + \beta_2 ROA_{it} + \beta_3 TOBINQ_{it} + \beta_4 SIZE_{it} + \beta_5 FFR_{it} + e_{it}$$

4.3.2 Model (2); for long-term borrowing.

$$LTBL_{it} = \alpha_i + \beta_1 CDP_{it} + \beta_2 ROA_{it} + \beta_3 TOBINQ_{it} + \beta_4 SIZE_{it} + \beta_5 FFR_{it} + e_{it}$$

$$i = 1,2,3, \dots 67$$

$$t = 1,2,3, \dots 5.$$

The *i* in the models represents the numbers from 1 to 67 given to the 67 firms, while the *t* represents the numbers from 1 to 5 given to the five years between 2016 and 2020. While α represents the constant term; β represents the coefficients of the independent variables. *e* represents the error term encountered by firms and years.

5. Findings and discussions

This section provides descriptive statistics, correlation analysis and panel data analysis results.

5.1 Descriptive statistics

Table 5 shows the means and distributional characteristics of the research variables for 335 observations between years for all variables. Since no missing data were observed for each variable used in the analysis for all years, it is assumed that the panel data set is suitable for the balanced panel data set (Wooldridge, 2002).

When the financial leverage ratio (*FL*) of the firms is examined, it is observed that it varies between 0.1540 and 5.2454 presenting many of the firms have high debt levels. The long-term borrowing level (*LTBL*) is 17.8% on average. Generally, it has been observed that the average long-term borrowing level is 17% in the manufacturing sector (Central Bank of Turkey, Manufacturing Industry Statistics) and this shows that the borrowing levels of the firms included in the research are close to the average. When the *ROA* variable is examined, it is accepted that the firms show a good result since the average value of 6.31% is greater than 5% (Birken and Curry, 2021) but due to the negative minimum value, it can be accepted that some enterprises use their company assets unsuccessfully to generate profits. The average Tobin's *Q* ratio is 1.4834, indicating that the firms, on average, can use their resources effectively. The fact that the Tobin's *Q* ratio is generally greater than 1 indicates that the firms can use their resources effectively on average. Additionally, the size variable shows that there is no significant difference between the sizes of the companies. Finally, the average free float rate of firms is 31.46% in this period for the related sample representing the percentage of low par value of the firms' publicly traded shares in the total par value of all its shares.

Table 5.
Descriptive statistics of
research variables

Variables	Obs	Mean	Std. Deviation	Minimum	Maximum
FL	335	1.7345	1.3429	0.1540	5.2454
LTBL	335	0.1781	0.1269	0.01127	0.5415
Size	335	21.2875	1.4285	18.5220	24.8369
ROA	335	0.0632	0.0723	−0.1066	0.2327
TOBINQ	335	1.4834	0.5225	0.4937	2.6582
FFR	335	0.3146	0.1604	0.0478	0.7300

Source(s): Authors' own work

5.2 Correlation coefficient

Table 6 gives the correlation coefficients of research variables and shows that there are significant relationships between different variables in the study. The use of long-term debt is positively related to the leverage ratio, firm size and FFR, while it is inversely correlated with return on assets and Tobin's Q. The FFR is negatively correlated with return on assets, Tobin's Q and company size. Company size is also negatively correlated with return on assets and Tobin's Q. However, there is a positive correlation between return on assets and Tobin's Q.

5.3 Panel regression results

The *F*-test is a widely used statistical method for determining the presence of a fixed effect in regression models. In this case, two models were examined, with Model 1 containing financial leverage as the dependent variable and Model 2 containing the level of long-term borrowing as the dependent variable. The first column (Model 1) contains the results of a regression analysis in which the dependent variable, financial leverage, is analyzed about CDP commitment and control variables. The second column (Model 2) contains the results of a similar regression analysis, but where the dependent variable is long-term borrowing and again the relationship with CDP commitments and control variables is analyzed. The results of the *F*-test, with a statistical value of 14.97 in Model 1 and 12.52 in Model 2, strongly suggest the existence of a fixed effect in both models (Table 7). The LM test, also known as the Lagrange multiplier test, is a commonly used statistical method for determining the presence of a random effect in regression models. In this case, two models were evaluated, with Model 1 having financial leverage as the dependent variable and Model 2 having the level of long-term borrowing as the dependent variable. The results of the LM test with a chi-squared statistic of 328.26 in model 1 and 291.95 in model 2 support the existence of a random effect in both models (Table 8).

	Size	FFR	TOBINQ	FL	ROA	LTBL
SIZE	1.0000					
FFR	−0.1825	1.0000				
TOBINQ	−0.1838	−0.2005	1.0000			
FL	0.2524	−0.1580	−0.0611	1.0000		
ROA	−0.0481	−0.0643	0.3736	−0.4975	1.0000	
LTBL	0.3559	0.0436	−0.1710	0.5721	−0.4080	1.0000

Source(s): Authors' own work

Table 6.
Correlation coefficients
of research variables

Independent variables	Model (1)	Model (2)
CDP	−0.0714 (0.1854)	−0.0369 (0.0195) *
ROA	−6.0865 (0.7858) ***	−0.3183 (0.0828) ***
TobinQ	0.0620 (0.1033)	0.0019 (0.0109)
Size	0.2620 (0.0943) ***	0.0078 (0.0099)
FFR	−0.3686 (0.7110)	0.0407 (0.0749)
Cons	−3.4139 (1.9672) *	0.0267 (0.2072)
<i>F</i> test	14.97	12.52
Goodness of fit (R ²)	0.3203	0.2256
Number of obs	335	335

Note(s): Legend, ****p* < 0.01, ***p* < 0.05 and **p* < 0.10

Source(s): Authors' own work

Table 7.
Results of the *F* test

Table 8.
Results of the LM test

Independent variables	Model (1)	Model (2)
CDP	−0.0208 (0.1571)	−0.0233 (0.0162)
ROA	−6.7689 (0.7432) ***	−0.3997 (0.0778) ***
TobinQ	0.1168 (0.0956)	−0.0020 (0.0100)
Size	0.2331 (0.0638) ***	0.0239 (0.0064) ***
FFR	−0.6529 (0.5311)	0.0520 (0.0540)
Cons	−2.7610 (1.3715) **	−0.3119 (0.1388) **
Chibar2	328.26	291.95
Goodness of fit (R2)	0.3545	0.3475
Number of obs	335	335

Note(s): Legend, *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.10$
Source(s): Authors' own work

The Hausman test is a widely used statistical procedure to determine the superiority of a random effects model or a fixed effects model (Hausman, 1978). In this case, two models were subjected to the Hausman test, Model 1 and Model 2. The results showed that the probability values, Prob > Chibar2 = 0.0386 in model 1 and Prob > Chibar2 = 0.0110 in model 2, were both less than 0.05, indicating that the fixed-effects models should be preferred in the analysis of these models. Table 9 gives the Hausman Test results.

This study explores how voluntary CDP reporting shapes debt financing policy. Fixed effect model results depict that there is no significant effect on the financial leverage ratio when the researched companies voluntarily respond to the CDP. This result supports the conclusion obtained from the logistic regression analysis study on the data of 84 enterprises included in the BIST100 index between 2014 and 2016 conducted by Akbaş and Canıklı (2018). A decrease in the long-term borrowing level of the manufacturing sector companies that are included in the BIST100 index and respond voluntarily to the CDP. This result is parallel with the Zhang and Lucey (2022) study which explores ESG performance improves external finance, obtained from the research conducted on the data of worldwide public companies between 2016 and 2020. However, the result obtained from a least squares method study conducted by Freedman *et al.*, (2020) on data from South African businesses listed on the Johannesburg Stock Exchange (JSE) from 2011 to 2015 that is there is a positive relationship between high-quality carbon disclosure and debt maturity is not supported. Chithambo and Tauringana (2014) investigate the firm-specific determinants of greenhouse gas disclosures for the 210 manufacturing firms listed on the London Stock Exchange. They reveal a positive association between debt level and greenhouse gas notifications. This paper also provides empirical evidence that the high size and the level of low profitability magnify this relationship between CDP and financial leverage.

Eleftheriadis and Anagnostopoulou (2015) investigate the nexus between climate change disclosure practices of Athens Stock Exchange-listed firms and several financial variables in terms of leverage, profitability and size. This paper reveals a positive relationship between climate disclosures and firm size but no linkage between firm leverage and climate

Table 9.
Results of the
Hausman test

	Model (1)	Model (2)
Chibar2	11.73	14.85
Prob > Chibar2	0.0386	0.0110

Source(s): Authors' own work

disclosures. Furthermore, [Alshahrani et al. \(2022\)](#) study the Australian Securities Exchange (ASX) listed nonfinancial firms between the years 2008 and 2019. Ordinary least squares regression analysis with fixed effects results that higher levels of climate change disclosures being related to lower levels of leverage.

[Table 7](#) shows a negatively significant relationship (at the 10% level) between CDP and long-term debt; companies that are more committed to CDP reporting have a lower percentage of long-term debt. The observed negative relationship between the two variables also fits well with the notion that companies with a higher commitment to climate action reduce the asymmetric information between lenders and borrowers, and reduce the need to issue long-term debt to signal corporate quality. Moreover, the negative relationship between CDP and long-term borrowing is strengthened for firms with a lower return on capital.

On the other hand, [Lemma et al. \(2021\)](#) use data from S&P 500 companies from 2015 to 2019, and the paper reveals a positive linkage between the level of long-term debt and CDP reporting. These results are consistent with the arguments that high-commitment companies enjoy good reputations, better credit ratings and lower agency costs and information asymmetry, allowing them easier access to the long-term debt market. [Yuan and Pan \(2022\)](#) investigate the linkage between corporate carbon disclosure and financing structure for Chinese heavy polluting enterprises between the years 2015 and 2018. This study reveals that the external financing have closely associated with the carbon disclosure. Moreover, [Lemma et al. \(2021\)](#) show for S&P 500 companies from 2015 to 2019 that the share of long-term credit used by companies is positively associated with their commitment to climate change. Another study is by [Alshahrani et al. \(2022\)](#), who look at the nonfinancial companies of the 300 largest companies listed on the ASX from 2008 to 2019. The OLS fixed effects regression analysis shows that CDP is positively related to financial distress. That is, higher CDP levels are related to lower financial distress because companies that have high environmental performance have strong stakeholder relationships that foster stakeholder trust and cooperation, act as a “buffer” against adverse financial events and reduce financial distress. Moreover, this positive nexus between CDP and financial distress is only significant for companies with little litigation, companies with a risk committee, companies that employ Big4 auditors and companies with higher levels of audit fees. Lastly, the observed negative relationship between CDP and long-term borrowing suggests that companies are less likely to experience financial distress if they take seriously and disclose the financial impacts of climate change on their business and the impacts on their stakeholders.

6. Conclusions

Voluntary climate change disclosures represent a growing area of research interest. This study aims to investigate how the capital structure strategy of a corporation is shaped by voluntary corporate climate change disclosures. Two models are constructed, and a set of hypotheses are tested for each capital structure indicator, namely financial leverage and long-term borrowing level. These models are tested utilizing a sample of 335 firm-year observations listed on BIST 100 manufacturing industry firms that participated in the CDP questionnaire for the five years of reporting period from 2016 to 2020. Fixed-effect panel data analysis highlights evidence from an emerging economy that voluntary climate change disclosure has a reducing effect on long-term borrowing levels. The results demonstrate that CDP reporting has been applied to a limited extent by manufacturing firms, even though this sector has the largest impact on climate change.

The significant and negative relationship between voluntary disclosure of climate-related activities and long-term debt is consistent with arguments that companies with high exposure are unlikely to reduce default risk in emerging markets. In addition, corporate return on assets was found to have a significant and negative impact on the level of long-term

debt. This result is related to the fact that there is a negative relationship between the profitability of assets and the amount of long-term loans, which supports the pecking order theory that these companies do not need external resources if their profitability ratios are high. Companies with lower profitability ratios prefer to take on debt. This is because they do not have sufficient internal resources to meet their financing needs. For these companies, borrowing comes first in the financing hierarchy. In addition, this paper finds a significant and negative relationship between leverage and return on assets, which is also based on the pecking order theory. The asset size variable is statistically significant in the analysis and a positive relationship is found between asset size and the level of long-term debt. This result supports the trade-off theory, which emphasizes that as the size of affiliated firms increases, bankruptcy risk and agency costs can decrease and the debt capacity of firms increases.

Consequently, it would be of great importance to explore the links between voluntary climate change impacts and capital structure strategies in Turkey at a time when the public is intensely debating greenhouse gas emissions regulations. Investigating the new proxies for climate change disclosure in conjunction with considering investor perceptions, laws and regulations in a methodological model and finally presenting the results broadly deserves a great deal of scholarly work.

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