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Environmental performance and firm financing during COVID-19 outbreaks: Evidence from SMEs

Nirosha Hewa Wellalage [a], Vijay Kumar [a], Ahmed Imran Hunjra [b,*], Mamdouh Abdulaziz Saleh Al-Faryan [c,d]

[a] School of Accounting, Finance and Economics, The University of Waikato, Hamilton, New Zealand
[b] Department of Business Administration, Ghazi University, Dera Ghazi Khan, Pakistan
[c] Department of Accounting and Financial Management, Faculty of Business and Law, University of Portsmouth, UK
[d] Consultant in Economics and Finance, Riyadh, Saudi Arabia

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ABSTRACT

The COVID-19 pandemic has resulted in substantial constraints for small and medium enterprises (SMEs) worldwide. The techniques in which SMEs handle recent crises and the degree to which environmental performance is advantageous when the marketplace experiences an adverse shock is fairly untouched in the literature. To assess this probability, we examine, using data from 6,597 SMEs in 13 developing countries, the effect of firm environmental efficiency on firm financing during the COVID-19 outbreak. We consider three aspects of external financing – bank, non-bank and trade credit – and suggest that it pays for firms to show devotion to environmental obligations in a global pandemic. Our research implies that the trust between a firm and its stakeholders, if it is based on environmental performance, pays off during periods of shock and adversity.

1. Introduction

COVID-19 has significantly shifted the socio-economic environment of most countries, triggering financial shocks and strains across the globe (Kuckertz et al., 2020). The adverse effect of COVID-19 on the entrepreneurial financial market is anticipated to have substantial and enduring damage on SMEs (Lerner et al., 2020). Shocks from these events typically have an adverse effect on all sorts of businesses (Demirguc-Kunt et al., 2021). For example, a recent study reports that social venture crowdfunding encountered numerous obstacles during the COVID-19 pandemic (Farhoud et al., 2021). In fact, start-ups and small businesses in China have experienced a 60% decrease in equity investments in the first quarter of 2020 (Brown et al., 2020). In the United Kingdom, entrepreneurial finance deals in the first quarter of 2020 have fallen by 30% compared to the same quarter in 2019 as a result of a decline in seed and early-stage financing (Brown and Rocha, 2020).

The performance of firms with respect to corporate social responsibility (CSR) has been a topic of interest for both researchers and policymakers (see Bruna and Nicolò, 2020; Lahouel et al., 2020). In particular, the environmental performance of firms is one of the vital factors that affect lending decisions (Wellalage and Kumar, 2021) and conditions of lending (Goss and Roberts, 2011). Firms that

* Corresponding author
E-mail addresses: nirosha@waikato.ac.nz (N.H. Wellalage), vijay.kumar@waikato.ac.nz (V. Kumar), ahmedhunjra@gmail.com (A.I. Hunjra), Al-Faryan@hotmail.com (M.A.S. Al-Faryan).

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display proactive environmental practices are seen to carry a lower level of risk (Godfrey et al., 2009), accessibility to the financial market (Jo and Na, 2012; Farza et al., 2021) and greater leverage (Sharfman and Fernando, 2008). Despite overwhelming evidence to support the positive effect of environmental performance on firm performance, how environmental performance affects firm financing when the market experiences a major shock remains relatively unknown,[1] especially in case of SMEs (see the insights of literature in Appendix-1). Given that it is important to explore whether environmental performance of SMEs helped them survive the challenges of the pandemic period.

One theoretical explanation of the impact of environmental performance on firm financing in the current global pandemic involves the orientation towards risk reduction by stakeholders. From a risk management perspective, a firm's engagement in environmental activities provides several benefits in a crisis period. It creates a higher level of trust between firm and shareholders which increases stakeholder collaboration and reciprocation and enhances the firm's reputation and innovation. The nature of the bonds between stakeholders and a firm, when these are grounded in environmentally responsible practices, is particularly valuable during crisis periods because stakeholders continue to have faith in the firm based on its history of engaging in environmentally responsible practices. In turn, this faith leads stakeholders to be willing to commit to the firm's future, despite the uncertainties of the present. Generally, the more firms commit to activities that boost their environmental performance, the more robust and long-lasting are the links constructed with stakeholders (Lins et al., 2017). Firms with high environmental performance also have an innovative capability which provides them with a competitive advantage in crisis periods, allowing them to endure and even flourish (Huang et al., 2020). The relationships a firm builds with its external stakeholder network, which are consolidated through the firm's environmental performance, enables firm to gather a wealth of information, knowledge, and ideas. These provide valuable inputs for firms and they bolster the firm's resilience during a market shock. As such, the benefits of firms "being good" in terms of engaging in environmental and socially responsible activities may go well beyond that of protection against idiosyncratic firm-specific legal risks (Hong and Liskovich, 2019). In this study, we argue that if a firm's environmental performance assists in developing stakeholder trust and cooperation and investment in eco-friendly activities can be perceived as insurance coverage for periods of crises such as pandemics.

This study makes significant contributions to the literature in two ways. First, our paper pioneers research on the effect of environmental performance on firm financing during the COVID-19 pandemic. An empirical study on the impacts of crisis events for SMEs is spare, even though SMEs tend to be the firms most disadvantaged in a crisis event (Doshi et al., 2018). The limited research on SMEs' financing in crisis periods (see Brown and Rocha, 2020; Brown et al., 2020) has not covered the environmental performance of firms as a crisis management technique that enhances the resilience of SMEs. This study fills this gap by investigating whether environmental performance helps SMEs survive the challenges of the pandemic period.

Second, this study uses a multidimensional environmental performance index (EIndex) which is constructed through Principal Component Analysis (PCA) to capture environmental performance. The validity of environmental performance data is disputed (Chatterji et al., 2009) and studies indicate the importance of a broader measure of corporate environmental performance compared to a single variable (Gupta, 2018). We address this data issue by constructing an index from 10 environmental indicators in the EIndex proxy of unlisted SMEs. The comprehensive nature of our measure offers a better environmental performance metric for unlisted SMEs.

The paper is organised as follows. Section 2 describes the data, variables and method. Section 3 discusses our empirical findings followed by robustness in Section 4, while Section 5 concludes the study.

2. Data, variables and method

2.1. Data

To investigate the association between firm-level environmental performance and firm financing during the COVID-19 pandemic, we use two sources: (i) COVID-19 follow-up surveys from the World Bank (CFES); and (ii) the Enterprise Surveys from the World Bank (WBES). Our sample includes 6597 unlisted SMEs from 13 countries in total. The number of participant firms by firm size, country, environmental index, and environmental index rankings are reported in Table 1.

2.2. Variables

Our dependant variable is access to external financing by SMEs, which are measured in three ways: bank, non-bank, and trade credit (see Wellalage and Thrikawala, 2021; Wellalage et al., 2021). Although bank financing is the most common source of finance for SMEs, they are heavily reliant on non-banking finance and trade credit as they suffer from asymmetric information (OECD, 2015).

Following Nicoletti et al. (2000), we use principal component analysis (PCA) to develop an environmental performance index. PCA is a multivariate statistical procedure that, when applied to a dataset, uncovers which factors in the set form rational subsets that are moderately independent of each other (Capelle-Blancard et al., 2019). Variables which are highly correlated are pooled into components. The components also extract maximum variability from the residual correlations and are independent of all other components (Tabachnick et al., 2007). Hence, most of the variance of the original dataset is represented by extracted components. To create the index, we consider 10 environment-specific indicators that provide information on the firm's environmental activities that contribute to reducing its impact on the environment.[2] This index provides information about the comparative value of environmental

[1] The literature provides limited evidence of the financial crisis and social performance nexus. Appendix 1 review the most recent literature.
[2] The PCA conducted in this paper consists of several steps (available on request from the corresponding author).

Table 1
Sample firms.

Country name	Sample size	Small	Medium	EIndex	Rank
Albania	273	189	84	−1.458	12
Belarus	420	210	210	.2322	5
Bulgaria	578	290	288	−1.437	11
Croatia	287	169	118	−0.5398	9
Czech Republic	391	191	200	.1290	7
Georgia	506	271	235	−1.706	13
Hungary	669	406	263	−1.227	10
Moldova	279	124	155	.9149	2
North Macedonia	261	180	81	.6045	4
Poland	1065	677	388	−0.1417	8
Romania	600	259	341	.2255	6
Russia	923	650	273	1.958	1
Slovenia	345	219	126	.6386	3
Total	6597	3835	2762		

performance between the sample countries. The higher the index, the better the environmental performance of the firm. Table 2 depicts the PCA results of the 10 environmental indicators. Two principal components were retained, and they explained 90% of the total variance of the data.

To resolve the omitted variable problem, we include several control variables in our model. In line with the literature, we have used a number of control variables. We use firm size (Small and Medium) and firm age (Firm_Age) which are related to firm characteristics. We use sole proprietorship (Sole_Prop) to control for firm legal ownership. We also include female ownership (Female_Own and family ownership (Family_Own) as ownership variables. The experience of managers (Top_mgr_exp) and current financing (Current loan) are also important factors in accessing finance. In addition, we include industry and country dummies to address possible industry and country differences.

Table 3 depicts the descriptive statistics of the study sample.

The pairwise correlation matrix (unreported) indicates that all the significant correlation coefficients amongst independent variables used in the regression are well below the 0.80 thresholds recommended by Gujarati (2004). This suggests that the issue of multicollinearity is not likely to be a problem in our evaluation.

2.3. Method

To investigate the relationship between the external financing of SMEs and environmental performance, we use a probit regression (s), where our dependant variable(s) is binary. That is, we assume:

$$Probit(Y_i = 1) = \beta_0 + \beta_1 EIndex_i + \beta_2(\mathrm{X})_i + \beta_3(\mathrm{Y})_i + \varepsilon_{ic} \quad (1)$$

where Y_i is a binary variable representing firm access to financing during COVID-19. The EIndex is a continuous variable, with the value zero being ascribed to firms that do not commit to environmental performance activities. Vector X captures firm-level and ownership characteristics. Vector Y captures country institutional factors by using country dummies. The relationship between environmental performance and financing can be endogenously determined in many ways. To address this endogeneity issue, we estimate the relationship between environmental performance and external financing using an instrumental probit regression (IVprobit). Additionally, we checked for weak exogeneity of the limited dependant variable model utilising the Smith and Blundell test (Smith and Blundell, 1986). The test rejects the hypothesis that the EIndex is exogenous at a significance level of 1%. Furthermore, a transformed F-test is used to check the validity of the instrument. The test shows that our instrument variable, *location-industry mean EIndex*, was greater than 10.[3]

3. Empirical findings

The base results of the effect of environmental performance on firm financing during the COVID-19 pandemic are presented in Table 4. The marginal effects of probit estimation for bank and non-bank financing is negative and non-significant (column II and column VI). Nonetheless, once we controlled potential endogeneity using instrumental variables, Table 4 shows a significant positive relationship between environmental performance and access to external financing variables. In particular, in Table 4, the IV probit marginal effects show that for every one-unit increase in the EIndex, the probability of bank financing, non-bank financing, and trade credit accessibility increases by 0.4065, 0.2864 and 0.4676, respectively. Our results support the argument that, during the COVID-19 crisis, stakeholders are inclined towards risk reduction. In fact, Table 4 aligns with the view that better environmental performance by firms may lower the chance of unfavourable events at the firm level (Bouslah et al., 2018) and the economic level during crises because

[3] The threshold of the F test is 10, i.e. F-test > 10, the selected instrument(s) is acceptable (Stock & Yogo, 2005).

Table 2
Principal component analysis.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	7.188	5.356	0.7188	0.7188
Comp2	1.831	1.294	**0.1831**	0.9019
Comp3	.5369	.3416	0.0537	0.9556
Comp4	.1953	.1025	0.0195	0.9752
Comp5	.0928	.0142	0.0093	0.9845
Comp6	.0786	.0471	0.0079	0.9923
Comp7	.0314	.0045	0.0031	0.9955
Comp8	.0269	.0175	0.0027	0.9982
Comp9	.0094	.0006	0.0009	0.9991
Comp10	.0087	.	0.0009	1.0000

Table 3
Descriptive statistics.

Variable	Obs	Mean	Std. Dev	Min	Max
External financing					
Bank	4121	.2880	.4529	0	1
Non_bank	4511	.2031	.4023	0	1
Trade_credit	4121	.1296	.3358	0	1
EIndex	5792	−1.02e-07	2.683	−2.032	5.453
Female_Own	6550	.3849	.4866	0	1
Family_Own	6386	.5108	.4743	0	1
[γ]Firm_Age	6594	19.82	13.02	1	197
Firm size					
Small	6597	.5852	.4928	0	1
Medium	6597	.4148	.4917	0	1
Sole_Prop	6594	.1912	.3933	0	1
Mgr_exp	5983	20.28	11.39	0	70
Current_loan	6508	.4292	.4950	0	1
Manufacturing	6576	.5289	.4992	0	1
Retail	6594	.1796	.3838	0	1
Other Industry	6597	.2915	.4142	0	1

Short abbreviation of variables: Firm level external finance accessibility (Bank, Non_bank, Trade_credit). Environmental index (EIndex), firm size (small and Medium), sole proprietorship (Sole_Prop), Number of years experience of the firm's top manager in similar field(Mgr_exp), SME currently has loan from bank or non bank fiancial institute(Current_loan), industry types(Manufacturing, Retail, Other Industry).

firms with proven credibility in being eco-liable have the ability to access vital resources (Zeidan et al., 2015). Indeed, firm engagement in environmental activities is connected with the restoration of stakeholder trust following periods of crisis (PricewaterhouseCoopers, 2013). External financing providers acknowledge eco-friendly practices as ways for a firm to decrease its degree of idiosyncratic risk. In general, our finding remains in line with Lins et al. (2017, 2019), who report that the firms with high CSR activities experienced higher profitability, growth, sales, and accessibility to external financing during the financial crisis of 2008–2009. Our findings are underpinned by the reciprocity idea which holds that stakeholders are inclined to help firms with high CSR standing during negative economic shocks, given that such firms have shown greater regard for stakeholders in the past. In terms of control variables, the marginal effects show Female_Own and Family_Own have difficulty in obtaining bank financing and non-bank financing. Similarly, we find a negative relationship between sole proprietorships and financing.

4. Robustness

We report additional tests to ensure the robustness of our main results.

4.1. Country-level macroeconomic factors

We control for distinctions in institutional quality across countries that are likely to influence environmental performance on firm financing during the pandemic. We use the following five variables: (i) The depth of credit information index (*Credit_Index*); (ii) The ease of doing business index (*Ease_Business*); (iii) The percentage of firms using banks to finance working capital (*Bank_Capital*); (iv) The regulatory quality (*Regulatory*); and (v) Worldwide governance indicators (*Governance*). As with our main results, in Table 5, the IV probit marginal effects show that for every one-unit increase in the EPI, the probability of bank financing, non-bank financing, and trade credit accessibility increases by 0.1886, 0.1935 and 0.1814, respectively. Therefore, we reinforce the view that relationship-based intangible assets (namely, trust and customer loyalty) earned from eco-friendly investments are especially important in adverse economic conditions (Godfrey, 2005).

Table 4
Probit model with continuous endogenous regressors estimation results of firm financing and environmental performance in COVID-19 outbreak.

Variable	**Bank**(A) Probit(I)	Probit (Marginal effects)(II)	IV Probitdy/dx(III)	IV Probitdy/dx(Marginal effects)(IV)	**Non-bank**(B) Probit(V)	Probit (Marginal effects)(VI)	IV Probitdy/dx(VII)	IV Probitdy/dx(Marginal effects)(VIII)	**Trade_credit(C)** Probit(V)	Probit (Marginal effects)(VI)	IV Probitdy/dx(VII)	IV Probitdy/dx(Marginal effects)(VIII)
EIndex	−0.1424***	−0.0314	.7633***	.4065***	−0.3825***	−0.0365	.6969***	.2864***	−0.8983***	.0085	1.785***	.4676***
	(0.0267)	(0.3079)	(0.0286)	(0.0297)	(0.0413)	(0.8009)	(0.0544)	(0.0492)	(0.0976)	(0.4471)	(0.0390)	(0.0377)
Female_Own	−1.294***	−0.2859	−2.277***	−1.212***	.0893	.0085	−1.732***	−0.7122***	2.124	.0202	.6774	.1775
	(0.1133)	(0.2.797)	(0.0834)	(0.0580)	(0.1295)	(0.1874)	(0.1080)	(0.1007)	(0.1.324)	(0.6043)	(6.77)	(1.775)
Family_Own	−0.02319***	−0.0051	−0.0282***	−0.0150***	−0.0448***	−0.0042	−0.0372***	−0.0153***	.0239***	.0002	.0051**	.0013***
	(0.0025)	(0.0501)	(0.0016)	(0.0009)	(0.0022)	(0.0937)	(0.0024)	(0.0008)	(0.0029)	(0.0118)	(0.0019)	(0.0004)
Firm_Age	.0284***	.0062	−0.1389***	−0.0739***	−0.3380***	−0.0323	−0.3232***	−0.1328***	−0.1347***	−0.0013	−0.5299***	−0.1388***
	(0.0070)	(0.0614)	(0.0067)	(0.0059)	(0.0160)	(0.7076)	(0.0159)	(0.0078)	(0.0294)	(0.0670)	(0.0139)	(0.0125)
Sole_Prop	−0.0129	−0.0028	−0.4127***	−0.2198***	−0.0130	−0.0012	−0.3716***	−0.1527***	−0.3945***	−0.0038	−0.2392***	−0.0627***
	(0.0782)	(0.0329)	(0.0551)	(0.0315)	(0.0747)	(0.0282)	(0.0558)	(0.0298)	(0.1053)	(0.1963)	(0.0635)	(0.0163)
Mgr_Exp	−0.0333***	−0.0073	−0.0230***	−0.0123***	−0.0201***	−0.0019	−0.0169***	−0.0069***	.1057***	.0011	−0.4540***	−0.1189***
	(0.0033)	(0.0719)	(0.0028)	(0.0013)	(0.0042)	(0.0421)	(0.0029)	(0.0012)	(0.0261)	(0.0526)	(0.0166)	(0.0128)
Current_loan	6.206	1.370	1.574	.8387	4.608	.4404	.9650	.3966	−2.1418	−0.0204	−3.317	−0.8692
	(1.007)	(8.850)	(2.636)	(1.404)	(1.567)	(0.5.333)	(4.926)	(2.025)	(0.1.227)	(1.328)	(5.292)	(1.386)
Manufacturing	3.084	.6812	1.108	.5903	3.837	.3667	1.790	.7358	7.496	.0715	2.304	.6037
	(1.007)	(1.559)	(2.637)	(1.404)	(1.567)	(6.947)	(4.926)	(2.025)	(9.644)	(3.013)	(4.233)	(1.109)
Retails	2.315***	.5115	−2.305***	−1.227***	−0.9967***	−0.0952	−4.078***	−1.676***	–	–	–	–
	(0.1510)	(0.5004)	(0.1924)	(0.1466)	(0.1589)	(2.0870)	(0.1218)	(0.1940)				
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Cons	−3.464		4.483		3.924		7.893				2.016	
	(0.1008)		(2.636)		(1.567)		(4.926)				(4.233)	
corr(e.eindex, e.bank			−0.9092				−0.8846				−0.9365	
			(0.0166)				(0.0287)				(0.0138)	
Wald test of exogeneity			250.45***				11.40***				231.39***	
Log likelihood	−1464.8		−6349.7		−1369.5		−6660.7					
Observations	3506	3506	3506	3506	3786	3786	3786	3786	2942	2942	2942	2942

Table 4. Reports probit results, probit marginal effects, IV probit results, IV probit marginal effects estimated around means points. dy/dx is for discrete change of dummy variable from 0 to 1. These models provide standard errors, which are in parentheses. The Wald test of exogeneity is reported in the last row as a chi-squared statistic with 1 degree of freedom. * Significant at 10% level, **Significant at 5% level, ***Significant at 1% level. Short abbreviation of variables: Firm level external finance accessibility (Bank, Non_bank, Trade_credit). Environmental index (EIndex), firm size (small and Medium), sole proprietorship (Sole_Prop), Number of years experience of the firm's top manager in similar field(Mgr_exp), SME currently has loan from bank or non bank fiancial institute(Current_loan), industry types(Manufacturing, Retail, Other Industry).

Table 5
Probit model with continuous regressors estimation results of firm financing, environmental performance and country level macroeconomic variables in COVID-19 outbreak.

Variable	*Panel A Bank* IV Probitdy/dx	IV Probitdy/dx (Marginal effects)	*Panel B Non_Bank* IV Probitdy/dx	IV Probitdy/dx (Marginal effects)	*Panel C Trade-Credit* IV Probitdy/dx	IV Probitdy/dx (Marginal effects)
EPI	.4798***	.1886***	.5005***	.1935***	.4651***	.1814***
	(0.0615)	(0.0222)	(0.0604)	(0.0237)	(0.0618)	(0.0265)
Female_Own	.1225	.0481	.0083	.0032	−0.1840	−0.0718
	(0.1572)	(0.0612)	(0.2084)	(0.0804)	(0.1587)	(0.0629)
Family_Own	−0.0012	−0.0004	.0014*	.0005	.0005	.0002
	(0.0017)	(0.0069)	(0.0008)	(0.0003)	(0.0012)	(0.0004)
Firm_Age	.0017	.0007	−0.0016	−0.0006	.0028	.0010
	(0.0122)	(0.0048)	(0.0137)	(0.0052)	(0.0102)	(0.0039)
∝Partnership	−0.7198***	−0.2829**	.6272*	.2426**	.6067***	.2367***
	(0.2566)	(0.1019)	(0.3655)	(0.1293)	(0.1320)	(0.0518)
∝Company	−0.0926	−0.0364	.1619	.0626	.2402	.0937
	(0.2236)	(0.0875)	(0.2415)	(0.0935)	(0.2350)	(0.0926)
Manufacturing	−0.4577*	−0.1799***	.6247***	.2416***	.4056***	.1582***
	(0.1800)	(0.0685)	(0.1211)	(0.0373)	(0.1085)	(0.0448)
Retails	.3523***	.1384***	−0.4311***	−0.1667***	−0.4020***	−0.1568***
	(0.0927)	(0.0366)	(0.1311)	(0.0550)	(0.1395)	(0.0543)
Credit_Index	.0298	.0117	.0121	.0046	.0173	.0067
	(0.2466)	(0.0970)	(0.2240)	(0.0867)	(0.2147)	(0.0838)
Ease_business	−0.0009	−0.0004	.0059	.0022	.0029	.0011
	(0.0120)	(0.0047)	(0.0119)	(0.0046)	(0.0115)	(0.0045)
Bank_Capital	−0.0390**	−0.0153**	.0395***	.0153***	.0381***	.0148**
	(0.0175)	(0.0067)	(0.0109)	(0.0048)	(0.0145)	(0.0059)
Regulatory	−0.0739	−0.2907	.1212	.0469	.14928**	.0582*
	(0.0965)	(0.0379)	(0.1010)	(0.0404)	(0.0800)	(0.0308)
Governance	−0.1223	−0.0471	−0.1189	−0.0460	.4141	.1587
	(0.3940)	(0.1543)	(0.4175)	(0.1617)	(0.4137)	(0.1570)
Cons	2.961		−4.0830*		2.062***	
	(0.2.831)		(0.2.441)		(0.3241)	
Log pseudolikelihood	−557.78		−566.28		−565.90	
corr(e.emindex,e. sales_decrease	.9832		−0.9567		.9908	
	(0.0020)		(0.0737)		(0.0075)	
Wald test of exogeneity	1569.2***		4.79**		602.69***	
Observations	4089		4089		4089	

* Significant at 10% level, **Significant at 5% level, ***Significant at 1% level. Short abbreviation of variables: Firm level external finance accessibility (Bank, Non_bank, Trade_credit). Environmental index (EIndex), firm size (small and Medium), sole proprietorship (Sole_Prop), Number of years experience of the firm's top manager in similar field(Mgr_exp), SME currently has loan from bank or non bank fiancial institute(Current_loan), industry types(Manufacturing, Retail, Other Industry).

4.2. Sub-sample analysis

In the second robustness test, we assess whether the decision to remove Poland (13% of sample) and Russia (12% of sample) from our sample affects our results. This was on the basis that Poland and Russia represent the largest percentage(s) of our sample which can potentially skew the main results. We re-estimate our baseline model for 4609 firms and observe that the results (unreported) support our main model.

5. Conclusion

This study fills a gap in the literature by investigating whether SME environmental performance helped them to survive the challenges of the COVID-19 pandemic period. The results show that a strong environmental performance by firms increased access to external finance during the pandemic.Overall, our results are consistent with our presumption that a firm's environmental performance can reduce the adverse effects when markets and institutions experience a negative shock. Firm-level environmental activities give stakeholders confidence and assurance, consolidating the existing bonds built on trust. The nature of these bonds is precious during crisis periods since stakeholders continue to trust the firm based on the past. That is, they remain committed to the firm's future, despite the ambiguities of the present.

We also highlight the importance of favourable monetary policies, such as support programs and the provision of short-term credit to the private sector, which work to generate a continuous flow of credit to businesses and to cushion the financial distress on solvent private firms. In addition to this, our results indicate that SMEs use a range of mechanisms to deal with cashflow shortages during the COVID-19 pandemic. The implication here is that because no single source of finance is sufficient to deal with the financing gaps brought about by the pandemic, a coordinated policy response across key sources of finance is imperative to prevent a collapse of the

SME sector.

Similar to all environmental performance proxies utilised in previous studies, we cannot completely eliminate the possibility that our environmental performance index suffers measurement errors. To minimise this issue, we recommend that a more comprehensive framework should be considered in future studies.

CRediT authorship contribution statement

Nirosha Hewa Wellalage: Conceptualization, Writing – original draft, Formal analysis, Methodology. **Vijay Kumar:** Conceptualization, Resources, Methodology, Writing – original draft. **Ahmed Imran Hunjra:** Data curation, Conceptualization, Project administration, Writing – review & editing. **Mamdouh Abdulaziz Saleh Al-Faryan:** Conceptualization, Investigation, Methodology, Writing – review & editing.

Appendix 1: Recent studies

Author/s, year, and paper title	Journal name	Research question	Data and Methodology	Findings/Results	Conclusion
Lins et al. (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis.	The Journal of Finance	How corporate social responsibility intensity impact stock returns in global financial crisis	Largest U.S. companies (3,00 firms) Regression models	Firms with high social capital have higher stock returns that than firms with low social capital.	Firm- Stakeholder trust, developed in investments via social capital, benefit when corporations and markets suffers a negative shock
Bouslah et al. (2018). Social performance and firm risk: impact of the financial crisis.	Journal of Business Ethics	Does social performance impact firm's risk during the financial crisis	U.S. firms covering the period 1991–2012. CAPM and the four-factor Carhart	Social performance reduces volatility during the financial crisis.	Social performance act as a risk reduction tool during an adverse economic environment.
Lins et al. (2019). Social capital, trust, and corporate performance: how CSR helped companies during the financial crisis (and why it can keep helping them).	Journal of Applied Corporate Finance	How does CSR help companies during the financial crisis	Largest U.S. companies (3,00 firms) Regression models	high-CSR companies have high stock returns during the 2008–2009 financial crisis and higher excess returns during the Enron crisis of 2001–2003	Social capital increases shareholder wealth by reducing companies' downside risk.
Marsat et al. (2020). Is there a trade-off between environmental performance and financial resilience? International evidence from the subprime crisis	Accounting & Finance	Is there a trade-off between environmental performance and financial resilience?	One thousand six hundred twenty-two firms from 20 countries	High pre-crisis environmental performance significantly increased the time of firms' market price recovery after the subprime crisis.	This result suggests that environmental performance seems like an organisational limitation that may restrict the capacity of firms to be financially resistant.
Farza et al. (2021). Does it pay to go green? The environmental innovation effect on corporate financial performance	Journal of Environmental Management	How does green innovation impact corporate financial performance	German HDAX companies from 2008 to 2019 A two-step GMM system and penalised-spline estimation	Positive relationship between green innovation and financial performance.	Green innovation drives resource efficiency and enhances corporate reputation, which, in turn, boosts financial performance.
Guérin and Suntheim (2021) Firms' environmental performance and the COVID-19 crisis	Economics Letters	How does COVID −19 impact the environmental performance of the firm	7000 listed firms from 2002 to 2019	Financial constraints and adverse economic conditions are negatively affected in firms' environmental efficiency and green investments.	This study emphasis the significance of climate policies and green recovery

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