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Impact of the Covid Pandemic on Cash Flow and External Financing Amid Financial Constraints

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Abstract

The paper examines how cash flow affects the demand for additional funding among listed companies in Vietnam, particularly in the context of the COVID-19 pandemic and financial constraints. Hypotheses are developed using the self-ranking match theory framework and prior research insights. The study uses data from 5,894 observations from 2010 to 2020 and employs the general regression model (GLS) to evaluate the proposed hypotheses. The findings suggest that cash flow plays an important role in shaping firms' external financing needs, with its impact becoming more pronounced under financial constraints and pandemic-related challenges. Notably, businesses facing financial limitations sought increased funding when experiencing cash flow shortages during the COVID crisis. In addition, a high financial leverage ratio from the preceding year emerged as a potential obstacle for firms attempting to access diverse external financing options. This research provides valuable insights into the financial difficulties faced by listed companies, and future studies could expand the scope by examining businesses in the financial sector and assessing macroeconomic factors affecting corporate funding sources.

Keywords: Covid pandemic, Cash flow, External financing, Financial constraints.

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Introduction

Securing external capital to support business expansion is a critical financial strategy. Modigliani and Miller [1] proposed that in an ideal capital market without transaction costs, a firm's financial position does not influence its investment choices, as external funding serves as a complete substitute for internal capital at an equivalent cost. However, in reality, businesses encounter various restrictions when accessing external financial resources. As a result, raising capital from these sources is significantly affected by factors such as cash flow availability and financial constraints [2].

The COVID-19 pandemic has further intensified the challenges companies face in obtaining external financing [3]. A surge in business failures accompanied by declining financial performance has led to a shortfall in internal capital, making it insufficient to sustain operational and investment activities. This situation has heightened the urgency for enterprises to explore alternative funding sources.

This study examines how cash flow influences firms' demand for external capital, particularly when financial constraints and the COVID-19 crisis place additional pressure on businesses. All models in this research are estimated based on segmented

samples categorized by firm size to reflect financial constraints. The dataset includes 5,894 observations from companies listed on the Vietnamese stock exchange between 2010 and 2020.

Findings indicate that the Covid-19 crisis has had a significant effect on corporate financing strategies. When cash flow generated from operational activities is insufficient to cover investment needs, Vietnamese firms tend to seek additional external funding. This substitution effect between cash flow and external financing is more pronounced among financially constrained enterprises. Moreover, when analyzing the interaction between cash flow and Covid-related factors, firms with financial limitations demonstrated a stronger inclination to raise capital during the pandemic period.

This research enhances the understanding of external financing theory in two key ways. First, it is the first study to investigate how the COVID-19 pandemic has influenced listed firms in Vietnam regarding their search for external funding. The developed models provide businesses with analytical tools to assess their financial conditions and identify suitable strategies during crisis periods. Second, financial constraints are evaluated in conjunction with pandemic-related disruptions, offering valuable insights for firms seeking to manage cash flow effectively, mitigate financial risks, and secure capital for sustained operations and growth.

Literature Review and Hypotheses

The role of internal funding in shaping a firm's access to and reliance on external capital is well-established in corporate finance research [4, 5]. The tradeoff capital structure theory suggests that companies with strong cash flow tend to adopt higher leverage strategies to maximize tax benefits associated with debt financing.

In contrast, the pecking order theory, as discussed by Almeida and Campello [6] and Kanathila *et al.* [7], highlights a negative association between internal and external financing, driven by market inefficiencies such as information asymmetry and moral hazard. Information asymmetry, in particular, influences financial constraints and explains the disparity between internal and external capital costs. Earlier research supports the notion that corporate managers possess deeper insights into their company's financial outlook and investment potential compared to external investors and lenders [8]. Given these asymmetries, the pecking order theory suggests firms prioritize internal funding first, followed by debt, and turn to equity financing as a last resort [9].

Numerous studies emphasize the role of financial constraints in shaping firms' ability to secure external capital [2]. Scholars widely acknowledge that financial limitations contribute to cost differences between internal and external funding, subsequently impacting corporate financing decisions [4, 6, 10, 11]. As a result, firms facing financial constraints encounter fewer financing opportunities and bear higher external capital costs compared to their unconstrained counterparts [6, 12].

Drawing upon the self-ranking match theory and prior research, the study proposes the following hypotheses:

Hypothesis 1: Cash flow plays a crucial role in determining a firm's reliance on external financing.

Hypothesis 2: The effect of cash flow on external financing is more pronounced in financially constrained firms.

The COVID-19 pandemic has significantly disrupted business profitability, creating cash flow volatility that has posed severe financial challenges, particularly for firms with limited access to funding. Companies facing financial constraints are more susceptible to liquidity shortages, necessitating the pursuit of alternative funding sources to sustain operations and support investment plans. Since 2020, firms in Vietnam and worldwide have experienced severe business interruptions, limiting their ability to generate sufficient internal funds. As a result, many companies have had to secure external financing to bridge funding gaps, a trend particularly evident among firms already struggling with financial constraints.

The pandemic is recognized as a significant economic shock. Baker *et al.* [3] argue that no prior outbreak, including the Spanish flu, has exerted as profound an impact on global stock markets as COVID-19. Research by Yan *et al.* [13] explores the pandemic's influence on financial markets and suggests potential investment strategies in response to the crisis. The effect of COVID-19 on corporate cash flows and financing difficulties is further examined by Dang Ngoc *et al.* [14], who highlight the subsequent decline in capital availability for businesses. Given these factors, the study advances two additional hypotheses:

Hypothesis 3: Cash flow constraints during the Covid-19 pandemic increase firms' reliance on external financing.

Hypothesis 4: The influence of cash flow on external financing is heightened when financial constraints intersect with pandemic-related disruptions.

Materials and Methods

Drawing on the analytical framework of Almeida and Campello [6] and López-Gracia and Sogorb-Mira [4], this research applies two research models to evaluate the formulated hypotheses. These models examine the determinants of firms' external financing needs, incorporating key variables such as cash flow, liquidity reserves, firm size, and asset convertibility.

Model 1: This model investigates the relationship between cash flow and external financing, capturing its influence on firms' capital-raising decisions as outlined below:

$$EXTFIN_{it} = \beta_0 + \beta_1 CF_{it} + \lambda_1 CASH_{i(t-1)} + \lambda_2 LEV_{i(t-1)} + \lambda_3 SIZE_{it} + \lambda_4 COLLAT_{i(t-1)} + \varepsilon_{it} \quad (1)$$

In Model 1, the dependent variable EXTFINit represents the additional external financing needs of company i in year t. The key independent variable, CFit, reflects the cash flow of company i for the same period. Control variables include SIZEit, indicating the size of the firm, CASH i(t-1), which represents the company's cash and cash equivalents from the previous year, LEVi(t-1), showing the financial leverage of the company from the prior year, and COLLAT i(t-1), which refers to assets that could be converted into cash in the preceding year. The complete set of variables used in this model is listed in **Table 1**.

Model 2: This model examines how the COVID-19 pandemic interacts with cash flow to influence the external financing needs of companies, as described in the following section:

$$EXTFIN_{it} = \beta_0 + \beta_1 CF_{it} + \beta_2 COVID_{it} + \beta_3 COVID\_CF_{it} + \lambda_1 CASH_{i(t-1)} + \lambda_2 LEV_{i(t-1)} + \lambda_3 SIZE_{it} + \lambda_4 COLLAT_{i(t-1)} + \varepsilon_{it} \quad (2)$$

In this study, COVID-19 is a binary variable representing data from 2020, the year when the COVID-19 pandemic significantly impacted businesses. COVID_CFit is an interaction term capturing the combined effect of the pandemic and cash flow (CF).

Both models account for the financial limitations of firms and explore how cash flow influences the need for external financing. To test the effect of financial constraints on the relationship between external financing and cash flow for Vietnamese listed companies, the analysis is conducted on samples segmented by firm size. Drawing from Park [11], companies are classified into five groups based on size, from smallest to largest. Firms in the lowest percentile are considered to be experiencing the most severe financial constraints, while those in the highest percentile are viewed as largely unconstrained. Company size is measured using the book value of total assets, a widely used indicator for identifying financial constraints [15].

Table 1. Summary of variables in the research model

Variables	Symbols and measurements	Pre-research	Expectations
	Dependent variable		
External financing	$EXTFIN_{it} = EXTFIN\_D_{it} + EXTFIN\_E_{it}$	[4, 6, 8, 11]	
External financing with debt	$EXTFIN\_D_{it}$ = (Liabilities – $Liabilities_{i(t-1)}$) /$Total\ assets_{it}$		
External financing with equity	$EXTFIN\_E_{it}$ =(Equity – $Equity_{i(t-1)}$) /$Total\ Assets_{it}$		
	Independent variables		
Cash flow	CF_{it} = (Net $Profit_{it}$ + $Depreciation_{it}$)/$Total\ Assets_{it}$	[6, 8]	_
	Control variables		
Cash and cash equivalents	$CASH_{it}$ = (Cash and cash $equivalents_{i(t-1)}$)/$Total\ assets_{i(t-1)}$	[4, 6]	+
Debt ratio	LEV_{it} = $Total\ liabilities_{t-1}$/$Total\ assets_{t-1}$	[6, 8]	-
Company size	Ln ($Total\ assets_{it}$)	[4, 6, 16]	+
Assets convertible into money	$COLLAT_{it}$ = ($Inventory_{t-1}$+ Accounts $Receivable_{t-1}$+ $Fixed\ assets_{i(t-1)}$)/$Total\ assets_{i(t-1)}$	[4, 6]	+

Previous research has often relied on methods such as fixed effects regression models (FEM), random effects regression models (REM) (López-Gracia & Sogorb-Mira, 2014; Park, 2019), or the Generalized Method of Moments (GMM) (Almeida & Campello, 2010; Chen & Hsiao, 2014) to explore the connection between cash flow and external financing. However, recognizing the specific nature and goals of our dataset, we chose to apply the generalized least squares (GLS) method. This approach is beneficial in mitigating issues like autocorrelation and heteroscedasticity in the data.

Our analysis is based on 5,894 observations from companies listed on the Vietnamese stock exchange between 2010 and 2020. The data was compiled from audited financial documents, including balance sheets, income statements, and cash flow statements, and presented in tabular format for analysis.

Results and Discussion

Figure 1 illustrates the trends in business funding sources from 2010 to 2019. In 2010, the overall funding growth rate was 22%, with external financing making up 13.6%, and equity financing accounting for 8.4%. However, by 2019, the growth rate had slowed to just 2.6%. The onset of the COVID-19 pandemic drastically impacted funding, leading to a significant 243.8% drop. Specifically, external debt financing plummeted by 192% in 2020, while equity-based funding decreased by 51.8%. These results demonstrate the profound effect of the pandemic on the financial resources of businesses.

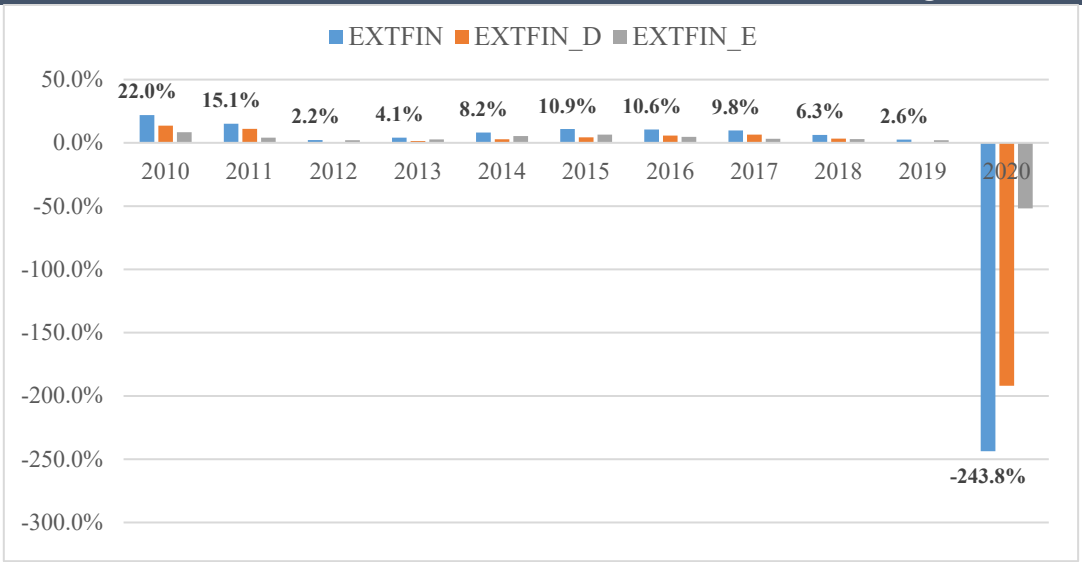

Figure 1. External financing variation

To examine the data's characteristics, the author employed descriptive statistical analysis. Outliers can substantially impact the model's precision, so we cleaned the data by eliminating outliers at the 1 percent level from both tails of the distribution. The statistical outcomes provide details on both independent and dependent variables. **Table 2** offers a summary of the control variables, outlining the number of observations, median, mean, standard deviation, and minimum and maximum values.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev	Min	Max
EXTFIN	5,984	-0.014	3.307	-198.766	1.904
EXTFIN_D	5,984	-0.033	2.555	-153.424	1.898
EXTFIN_E	5,984	0.019	0.768	-45.341	0.969
CF	5,984	0.088	0.130	-1.748	5.085
CASH	5,984	0.099	0.112	0.000	0.961
LEV	5,984	0.495	0.222	0.001	0.993
SIZE	5,984	27.181	1.545	23.330	33.677
COLLAT	5,984	0.652	0.219	0.001	1.000

The results of the descriptive statistical analysis presented in Table 2 reveal that the sample of businesses without financial constraints, covering the period from 2010 to 2020, consists of 5,984 observations. The average values for the research variables indicate that the mean debt value stands at -0.033, while the average funding from equity issuance is 0.019. For firms that utilize both debt and equity financing, the mean value is -0.014. These findings suggest that, in Vietnam, businesses tend to rely more on equity issuance than on debt financing, a trend also observed in the Spanish market, as noted by López-Gracia and Sogorb-Mira [4]. Furthermore, the cash flow (CF) variable in unlisted firms has an average value of 0.088.

The analysis shows a negative correlation between cash flow (CF) and external financing needs (EXTFIN) at a significant level. When cash flow decreases, companies are more likely to increase external funding to compensate for the shortfall, and conversely, they reduce the need for external financing when cash flow improves. Regarding the previous year's cash holdings (CASH), a positive correlation with EXTFIN was observed, though it was not statistically significant. This suggests that companies holding more cash are less inclined to seek external debt financing for capital expenditures. The financial leverage ratio (LEV) exhibits a negative relationship with EXTFIN, indicating that firms with higher leverage are less likely to pursue external funding. In contrast, firm size (SIZE) shows a positive and statistically significant correlation with all three EXTFIN-related variables, implying that larger companies are more likely to secure external funding compared to smaller ones. Finally, no significant correlation was found between collateral (COLLAT) and EXTFIN.

Table 3. Correlation matrix

	EXTFIN	CF	CASH	LEV	SIZE	COLLAT
EXTFIN	1					
CF	-0.4137*	1				
CASH	0.0154	0.1860*	1			
LEV	-0.0314*	-0.1878*	-0.2566*	1		
SIZE	0.0630*	-0.0544*	-0.1089*	0.3025*	1	

COLLAT	-0.0125	-0.0299*	-0.3773*	0.3794*	-0.0644*	1

t statistics in brackets * p<0.05

The results presented in **Table 3** reveal a negative correlation across all three columns, with statistical significance at the 1% level, indicating that most Vietnamese firms are inclined to seek additional external financing. The relationship observed between the cash flow variable (CF) and the external financing variable (EXTFIN) mirrors the findings of earlier research by Almeida and Campello [6], Chen and Hsiao [10], López-Gracia and Sogorb-Mira [4], and Park [11].

To summarize, the regression results from both Model 1 and Model 2 validate the strength of the baseline model, even after introducing control variables. These outcomes consistently highlight the influence of cash flow on the external financing choices of listed companies in Vietnam.

Table 4. Regression results of model 1 and model 2

	Model 1			**Model 2**		
	EXTFIN	**EXTFIN_D**	**EXTFIN_E**	**EXTFIN**	**EXTFIN_D**	**EXTFIN_E**
CF	-11.49***	-9.139***	-2.354***			
	[-37.83]	[-39.24]	[-32.49]			
COVID				0.647***	0.458***	0.189***
				[3.54]	[3.25]	[4.35]
COVID_CF				-21.66***	-16.41***	-5.255***
				[-40.05]	[-39.44]	[-40.87]
CASH	2.958***	2.324***	0.634***	0.49	0.451*	0.0391
	[7.81]	[8.00]	[7.01]	[1.45]	[1.73]	[0.49]
LEV	-2.224***	-1.794***	-0.430***	-0.746***	-0.676***	-0.0699
	[-10.94]	[-11.51]	[-8.86]	[-4.07]	[-4.80]	[-1.60]
SIZE	0.212***	0.170***	0.0429***	0.125***	0.104***	0.0213***
	[7.96]	[8.28]	[6.73]	[5.27]	[5.68]	[3.77]
COLLAT	1.132***	0.915***	0.217***	0.242	0.240*	0.00212
	[5.51]	[5.81]	[4.43]	[1.33]	[1.71]	[0.05]
_cons	-4.704***	-3.773***	-0.931***	-3.144***	-2.601***	-0.543***
	[-6.34]	[-6.63]	[-5.26]	[-4.78]	[-5.14]	[-3.48]
N	5984	5984	5984	5984	5984	5984

t statistics in brackets *P < 0.1, **P < 0.05, ***P < 0.01

The data in Table 4 reveals that all control variables significantly affect external financing, with a statistical significance of 1%. Debt financing shows a stronger impact on external funding needs compared to equity financing. Specifically, the previous year's cash (CASH) and convertible assets (COLLAT) exhibit positive relationships with increased financing demands. This suggests that Vietnamese companies continue to seek external financing even when they possess significant cash and convertible assets. These findings for CASH align with the conclusions of Chen and Hsiao [10], though they differ from López-Gracia and Sogorb-Mira [4], likely due to Vietnamese firms' ability to offset the capital costs of debt financing via interest tax shields.

Similarly, the impact of COLLAT in the prior year matches the findings of Chen and Hsiao [10] but contrasts with those of López-Gracia and Sogorb-Mira [4]. This discrepancy can be attributed to Vietnamese companies' preference for using convertible assets as collateral for loans rather than liquidating them for investment purposes. The financial leverage ratio (LEV) from the previous year shows a negative relationship with the need for funding, particularly in companies with higher leverage. This suggests that companies with higher debt levels face challenges in obtaining external financing, as investors are concerned about their debt repayment capabilities, consistent with the observations of Almeida and Campello [6] and López-Gracia and Sogorb-Mira [4].

Examining companies categorized by financial constraints based on size, the coefficients for cash flow (CF) are predominantly negative and statistically significant at the 1%, 5%, and 10% levels. This indicates that external financing rises as internal cash flow falls short of financing investment projects. The CF coefficient for firms with high financial constraints (group 1) is much higher than for unconstrained firms, suggesting that financially constrained firms are more reliant on external financing compared to their unconstrained counterparts.

Table 4 also presents the findings for model 2, which explores the effect of cash flow on external financing during the COVID-19 pandemic. While the correlation between cash flow (CF) and external financing is negative, it is not statistically significant. However, cash flow (CF) becomes more positively correlated with external financing when retained earnings from operations are insufficient for investments. The impact of the COVID pandemic on financing is significant at the 1% level for both debt

financing and retained earnings financing. The interaction term between COVID and CF shows a large and significant effect on financing needs, particularly for debt financing over retained earnings. These results demonstrate that cash flow is negatively correlated with the increased demand for both external and internal financing and that the surge in external financing is largely due to the pandemic's effects. Thus, the third hypothesis is validated.

Table 5. Regression results of model 1 under financial constraints

	By scale				
	Financial constraints			No. financial constraints	
	Quantile 1	**Quantile 2**	**Quantile 3**	**Quantile 4**	**Quantile 5**
CF	-19.43***	-0.332*	0.439***	0.01	-0.271**
	[-24.28]	[-1.69]	[3.00]	[0.06]	[-2.11]
CASH	4.872***	0.18	0.08	0.13	-0.03
	[3.33]	[0.98]	[0.45]	[1.11]	[-0.30]
LEV	-3.807***	-0.678***	-0.254***	-0.122**	-0.171***
	[-4.07]	[-6.14]	[-2.98]	[-2.41]	[-3.31]
SIZE	0.808***	0.1	0.11	-0.01	0.01
	[3.03]	[1.00]	[1.60]	[-0.29]	[0.71]
COLLAT	2.015**	0.229**	0.03	-0.07	-0.04
	[2.20]	[2.01]	[0.39]	[-1.35]	[-0.94]
_cons	-19.17***	-2.44	-2.86	0.52	0.1
	[-2.88]	[-0.94]	[-1.52]	[0.51]	[0.35]
N	1197	1197	1197	1197	1196

The data in Table 5 align with the observations made by Almeida and Campello [6], López-Gracia and Sogorb-Mira [4], and Park [11]. When internal resources fall short to cover investment needs, Vietnamese companies are more likely to seek external financing. The tendency for companies facing financial constraints to substitute cash flow with external financing becomes even more pronounced.

As shown in Table 6, the COVID-19 variable negatively correlates with the funding needs of financially constrained companies, whereas it does not show any notable correlation with unconstrained companies, indicating that only those facing financial challenges are driven to increase their financing activities during the pandemic. Smaller firms, in particular, experienced a significant decline in performance during the pandemic, prompting them to secure additional external financing to bridge their cash flow gaps. For the financially constrained companies in the 1st and 2nd percentiles, the regression coefficient of the COVID_CF interaction variable is significantly negative, but no statistical significance is found in the other percentiles. This suggests that, during the pandemic, firms with financial constraints are more likely to seek external financing when their internal cash flows are insufficient.

The findings from Model 2 regarding companies utilizing both debt and equity financing further confirm this trend. In conclusion, the results from Model 2 validate the fourth hypothesis of the study, showing that the COVID-19 pandemic caused a noticeable increase in external financing among companies.

Table 6. Regression results of model 2 covid effects according to financial constraints

	By scale				
	Financial constraints			No. financial constraints	
	Quantile 1	**Quantile 2**	**Quantile 3**	**Quantile 4**	**Quantile 5**
CF	-0.29	0.536***	0.434***	0.07	-0.274**
	[-0.17]	[2.61]	[3.01]	[0.53]	[-2.08]
COVID	-10.19***	-1.554***	-0.511***	0.114**	-0.06
	[-7.91]	[-12.00]	[-4.35]	[1.96]	[-1.08]
COVID_CF	-20.42***	-1.939***	-0.71	-0.846*	0.15
	[-10.59]	[-4.76]	[-0.63]	[-1.78]	[0.31]
CASH	1.03	-0.06	0.03	0.13	-0.04
	[0.76]	[-0.37]	[0.16]	[1.09]	[-0.40]
LEV	-1.18	-0.543***	-0.306***	-0.114**	-0.176***
	[-1.36]	[-5.40]	[-3.64]	[-2.23]	[-3.40]
SIZE	0.27	0.07	0.112*	-0.01	0.01
	[1.09]	[0.79]	[1.65]	[-0.26]	[0.87]
COLLAT	0.09	0.14	0.01	-0.08	-0.04
	[0.11]	[1.34]	[0.16]	[-1.44]	[-0.92]
_cons	-6.46	-1.69	-2.81	0.48	0.06

	[-1.04]	[-0.72]	[-1.53]	[0.48]	[0.21]
N	1197	1197	1197	1197	1196

Conclusion

This study investigates how cash flow influences external financing in publicly listed companies in Vietnam over ten years (2010-2020). The analysis employed the GLS regression model to test the proposed hypotheses. The findings indicate that debt financing plays a more significant role than equity financing. The previous year's cash holdings (CASH) and convertible assets (COLLAT) were positively associated with the increased demand for external financing. This suggests that Vietnamese firms tend to seek external financing even when they have substantial cash reserves and convertible assets. Furthermore, the study highlights that the prior year's financial leverage (LEV) negatively correlates with the need for external financing, as companies with higher leverage face barriers to accessing new funding. The research also reveals that firms with financial constraints are more likely to increase external funding when facing cash flow shortages, particularly during the COVID-19 pandemic.

Future research could expand by examining businesses in the financial sector and exploring additional macroeconomic factors that could influence corporate capital structures. Moreover, policy measures aimed at supporting businesses to recover post-Covid-19 could be an important area for future investigation.

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