https://doi.org/10.52131/joe.2022.0402.0072

*i*RASD Journal of Economics

Volume 4, Number 2, 2022, Pages 187 – 203

Journal Home Page:
https://journals.internationalrasd.org/index.php/joe

The Effect of Covid-19 on Bank Profitability Determinants of Developed and Developing Economies

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ARTICLE INFO

Article History:
Received: April 14, 2022
Revised: May 17, 2022
Accepted: May 18, 2022
Available Online: May 18, 2022

Keywords:
Bank profitability
Covid-19
Comparative study
Europe
South Asia

JEL Classification Codes:
G01, G10, G21

Funding:
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

We have learned from the Covid 19 crisis that pandemics are inevitable, and the financial systems need to be ready to withstand such global shocks. This study aims to uncover determinants that are vital in maintaining bank profitability during such a crisis by providing evidence on how Covid-19 impacted bank profitability. Additionally, we test whether the crisis moderated the relationship between typical determinants and bank profitability across developed and developing economies. The study uses generalized least squared dummy variable model estimation. Six-year quarterly bank specific data of the top 10 countries from South Asia and Europe based on the highest GDPs is used. The study finds evidence of a significant impact of the pandemic on bank return on assets and equity. Additionally, the evidence suggests that covid-19 impacted bank profitability differently across the developed and developing countries. Covid-19 caused profitability to fall in the homogeneous European banks, whereas profitability increased for South Asian banks during the Covid crisis. We find that the pandemic moderated the relationship between bank profitability and its determinants. Credit quality and bank efficiency became less important in determining bank profitability during the Covid period. In contrast, bank size and maintaining liquidity became more important determinants. Additionally, the magnitude of capital ratio as a determinant of return on assets decreased during Covid. The moderating role of covid-19 on bank profitability determinants would be of value to both academicians and practitioners.

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Citation: Haider, J., & Mohammad, K. U. (2022). The Effect of Covid-19 on Bank Profitability Determinants of Developed and Developing Economies. IRASD Journal of Economics, 4(2), 187–203. https://doi.org/10.52131/joe.2022.0402.0072

1. Introduction

Berger and Humphrey (1997) suggest that financial institutions are imperative for economic development. Banks play a significant intermediary role by reallocating funds and mobilizing resources for productive economic activities. Arun and Turner (2009) suggest that banks are important in developing countries because of weak and immature financial markets. Additionally, banks are considered the most significant source of financing for many firms as they are the main economic savings depository. Athanasoglou, Brissimis, and Delis (2008) suggest that banks provide financial health to the shareholders and the economy. There is a

significant negative effect on economic growth due to unsatisfactory banking sector performance and can lead to failures, crises and deprivation. The banking sector is an efficient indicator to judge the strength of the economy's financial system and plays a significant role in economic development (McKinnon, 1973). The banking sector's financial performance assessment is an efficient indicator for judging financial system strength and for the bank's efficiency measurement.

Financial institutions have risky marketplace dynamics because of growing globalization pressure and deregulation. This is why banks continuously seek approaches to stay profitable. Therefore, the prime focus of many researchers and financial market analysts have been in identifying the determinants of profitability and extensively studied (Islam & Nishiyama, 2016). Typically, profitability ratios are used to measure the bank's capability to generate earnings. Typical measures include return on assets, return on equity and net interest margin (Abugamea, 2018). Short (1979) was among the first cross country studies to examine the determinants of a bank's profitability. Different past studies report that internal factors like bank size, operating efficiency, capitalization, and liquidity affect the bank's profitability (Dietrich & Wanzenried, 2011; Pasiouras & Kosmidou, 2007; Petria, Capraru, & Ihnatov, 2015). In addition, various external factors such as inflation and GDP also show a significant effect on profitability.

Calvo (2010) suggests that banks can easily diversify their risk and other financial system uncertainties. However, the failures of banks were triggered due to the economic recession of 2008, which affected the economies of different countries due to which it was concluded that the financial performance of the banking sector should be very frequently examined (Amnim, Aipma, & Obiora, 2021). Sundararajan et al. (2002) recommend that the supervision of the banks should be done with the use of management quality, asset quality, and liquidity earnings to check the soundness of banks and examine their performance. However, updating the understanding regarding determinants of banking profitability may be critical for the financial institution's management, especially in the era of recession due to Covid-19, as banks are critical contributors to the economic improvement.

Contemporary literature in concurrence suggests that it is of great significance to examine its effect on banking stability and to evaluate any probable signals for recovery (Li, Farmanesh, Kirikkaleli, & Itani, 2021). Additionally, literature suggests that this covid-19 shock is not similar to the financial crisis of 2008 (Ahmed & Mohammad, 2022; Mohammad & Khan, 2021; Ramelli & Wagner, 2020). There is a dearth of studies on how banks performed during the Covid-19 period especially in the context of financial systems of developed and developing economies.

This study aims to fill this gap. South Asian and European countries have different banking regulatory frameworks, with a more homogenous developed banking system in Europe. We test to see if the impact is similar or different across the continents, with different regulatory and structural differences. Finally, the study tests whether the Covid crisis impacted the determinants of bank profitability. Quarterly data from the top 10 countries in South Asia and Europe based on GDP are used to test these questions. By employing generalized least squared dummy variable-based estimation to capture the effect of Covid-19, the study examines the relationship and how it differed across continents where different banking structures exist. The moderating effect of the crisis on the relationship is tested using interaction terms.

2. Literature Review

Profitability and its determinants have been empirically tested in literature extensively (Abugamea, 2018). It has been mainly proxied in literature using return on assets, equity and net interest margin with higher ratios indicating better bank's performance (Kamrana, Nawaz, &

Rizwan, 2020; Mohammad, Fatima, & Imran, 2022; Samad, 2004). Short (1979) is one of the first few cross-country studies in this domain that studied the impact of concentration of banks on their profitability. The determinants of banks' profitability have been mainly categorized into two types, i.e. internal determinants and external determinants (Jeong Yeon Lee & Kim, 2013).

Different past studies report that internal factors like bank size, operating efficiency, capitalization, and liquidity affect the bank's profitability (Dietrich & Wanzenried, 2011; Mohammad & Adnan, 2022; Pasiouras & Kosmidou, 2007; Petria et al., 2015). In addition, various external factors such as inflation and GDP also show a significant effect on profitability. In addition, some studies examined different types of risk like credit risk, liquidity risk and management risk that exist and impact profitability. A significant positive relationship between the loan ratio to the total assets and efficiency was found in a study conducted by (Doku, Kpekpena, & Boateng, 2019; Yildirim & Philippatos, 2007).

Brissimis, Delis, and Papanikolaou (2008) discovered a negative relationship between credit risk and efficiency. However, Ariff and Luc (2008) conducted a study and found a negative relationship. According to financing theory, high levels of debt and low value of equity to asset ratio results in high risk, which results in high rates of return. It also explains the risk-return trade-off theory. Some scholars have also explained that higher profits can be fetched by high equity to asset ratio. These explanations are the consequence of the application of the signaling and bankruptcy costs hypothesis. According to the signaling hypothesis, the bank's market value increases with a high equity ratio (Berger, Herring, & Szegö, 1995).

Capital structure theories like the trade-off theory have also empirically tested by different researchers (Hoque & Pour, 2018; Isik & Hassan, 2002; Mohammad, 2021). A study was conducted in which the profitability and capital structure relationship was tested for the non-financial SMEs in the United Kingdom during the period 1998 - 2008 and found out that a firm's capital structure has a significant impact on its profitability. Short term debt shows a positive relationship with profitability; hence they are indicated to use more equity or short term financing in their operations (Abeywardhana, 2015).

The GDP was used in the empirical studies as a market-specific factor. There is a positive relationship between banks' efficiency and the GDP (Maudos, Pastor, Perez, & Quesada, 2002). Some other factors were considered, such as industry concentration, interest rates, GDP, and monetization in the banking market. Therefore, they tend to have higher efficiency in South Asia (Perera, Skully, & Wickramanayake, 2007). On the contrary, Husain and Abdullah (2008) examined and found that the GDP or economic development negatively impacts banks in East Asia. It was examined that there is a positive relationship between short-term interest rates and profit efficiency (Brissimis et al., 2008).

Banks are vulnerable to the disturbance in each economic and worldwide system (Abeywardhana, 2015; Ezeani, Salem, Kwabi, Boutaine, & Komal, 2022; Montgomery, Harimaya, & Takahashi, 2014; Safiullah & Shamsuddin, 2019). Studies have been extensively been done on the impact of financial shocks on the performance banks in the context of global financial crisis, the Asian crisis and other global shocks (Alqahtani & Mayes, 2018; Berger & Bouwman, 2013; Castro & Lopes, 2021; Chazi & Syed, 2010; John Y Lee, Growe, DeBruine, & Cha, 2015; Mohammad, Muhammad, & Muhammad, 2021; Said, 2012). However, the Covid-19 shock is reported to have been a unprecedented shock which sent the global economies into lock downs (Ahmed & Mohammad, 2022; Gillani, Shafiq, Ahmad, & Zaheer, 2021; Mohammad & Khan, 2021; Ramelli & Wagner, 2020).

According to Borio, Drehmann, and Xia (2020), due to covid-19, banks risk of default. Additionally, banks exposed to insolvency troubles and cash management issues due to

business closures since lockdown decreased the demand for items and offerings during the covid-19 and post-epidemic. In addition, the volume of lending by banks may be decreased, as the investment by the non-public sector and intake hold to diminish and will not enhance both during the epidemic and after it. All these factors are hypothesized to impact bank profitability. However, there is a dearth of studies on how the banks were impacted. Additionally, there is evidence of countries specific factors impacting bank profitability (Berger & Bouwman, 2013; Mohammad & Adnan, 2022; Sahyouni & Wang, 2019; Tan, Floros, & Anchor, 2017). Evidence is limited on how banks performed across the developed and developing economies.

Studies on covid-19 impact on bank performance are limited and are in the domain that has focused on country specific studies (Aiyar et al., 2021; Fajri, Muhammad, Umam, Putri, & Ramadhan, 2022; Li et al., 2021; Xu, Haris, & Irfan, 2022). Cross country studies especially comparative studies are limited.

3. Methodology

This model has been adopted from Athanasoglou et al. (2008) and has been extended further to investigate the impact of covid-19 on the profitability and determinants of the banks located in South Asia and Europe using a dummy variable approach. Following is the general linear model used to estimate the determinants of profitability of banks and the impact of covid-19 on bank profitability across the two continents:

$$\pi_{ictk} = \alpha_0 + \sum_{j=0}^{J} \beta_j X_{ict}^{j} + \sum_{l=0}^{L} \beta_l X_{ict}^{l} + \sum_{m=0}^{M} \beta_m X_{ict}^{m} + \varepsilon_{ict} \quad (1)$$

π_{ictk} is used to measure the bank profitability of banks i at time t of country c at the parameter k (k= ROA and ROE). α_0 is the constant term. The subscript j,l and m represent bank-specific, industry-specific and macroeconomic variables. ε_{ict} is the error term. Following is the extensive version of equation (1)

$$\pi_{ictk} = \alpha_0 + \beta_1 Equity\ to\ TA\ ratio_{ict} + \beta_2\ NPL\ ratio_{ict} + \beta_3\ IITOL\ ratio_{ict} + \beta_4\ Loan\ to\ deposit\ ratio_{ict} + \beta_5\ NPL\ ratio_{ict} + \beta_6\ Bank\ Size_{ict} + \beta_7\ NPL\ ratio_{ict} + \beta_8\ Growth\ of\ deposits_{ict} + \beta_9\ NPL\ ratio_{ict} + \beta_{10}\ effeciency\ ratio_{ict} + \beta_{11} GDP_{ct} + \beta_{12}\ HHI_{ct} + \varepsilon_{ict} \quad (2)$$

Return on Assets shows how efficiently a bank's management utilizes its assets to generate profit (Naceur, 2003). Following Islam and Nishiyama (2016), we defined ROA as Net income over average total assets expressed in percentage. The second measure of profitability is the return on equity (ROE), which compares its net income and its equity (Albulescu, 2015). It is calculated as net income over average total equity expressed in percentage.

The equity to total assets ratio is the proxy that we used to measure the capitalization strength, which is the capital proportion the company owns to fund its assets. A negative relationship exists between the bank's capital and its profitability because the banks with high equity to total assets ratio are safer in liquidation or loss (Prabowo et al., 2018). The Non-performing loan is used as a proxy variable for measuring the credit quality of a bank. Banks focus on keeping a low non-performing loan ratio due to the high regulations from the regulatory bodies as the loan is the largest head of a bank's balance sheet. However, a negative relationship is expected between the profitability and non-performing loan ratio (Athanasoglou et al., 2008). The total interest income over the total loan (TII/TL) ratio indicates the loan pricing behaviour. The higher will be the interest income higher will be the bank's profitability. The banks of bigger sizes will try to charge higher on their loans and advances to optimize their profit. The Loan to deposit ratio proxy is used to measure the liquidity ratio. Studies suggest that a bank's liquidity ratio is positively associated with its profitability (Albulescu, 2015). A commercial bank's vital

policy is to maintain a sound liquidity position to safeguard the bank against liquidity risk. The higher the liquidity ratio, the lower the liquidity risk, but at the same time, the bank's earning potential decreases as the loanable fund of the bank gets reduced; hence a negative relation is expected of liquidity position with the profitability. Following Smirlock (1985) and other past studies, we measured the bank size by taking the natural logarithm of its total assets as the bank size is positively associated with its profitability.

In order to expand their market share, the banks are always eager to expand their loan operation. However, the higher deposit growth is related to the credit management quality; hence the growth rate of the total deposit is an important variable to examine the bank's profitability. The proxy of Net Non-Interest Income over Total Assets is used as an efficiency ratio. The banks incur a good amount of operating and overhead expenses to generate the off-balance sheet activities (Bouzgarrou, Jouida, & Louhichi, 2018). Therefore, this variable's positive impact on a bank's profitability is expected.

Hirschman-Herfindahl Index (HHI) is used as a proxy for the variable of market concentration and its impact on banks' profitability. Petria et al. (2015) and other researchers used this variable in past studies to measure the market concentration. The Banks in a market with high concentration earn monopoly rents as they tend to collude (Abugamea, 2018). Hence, the theoretical relationship between concentration and bank performance is indeterminate and will be answered. The GDP is used to examine the total economic activity, the GDP growth ensures the economy's stability, and the bank's business risk reduces in the stable economic environment. The previous studies found a positive relationship between profitability with GDP growth (Bikker & Hu, 2002). The domestic growth rate directly affects the demand and supply of deposits and loans, thus greatly influencing the banking sector (Masood & Sergi, 2011). Yahya, Akhtar, and Tabash (2014) concluded that a bank's performance is positively related to economic growth and influences the bank's profitability.

Following Athanasoglou et al. (2008), we use random effect estimation based on the Hausman test to examine the impact of determinants of a bank's profitability and the impact Covid-19 created on profitability. Dummy variable analysis is carried out for the time before covid-19 and during covid-19 for south Asia and Europe separately to see how the bank's profitability was impacted and changed during the time of the pandemic and how determinants of profitability changed due to Covid-19 of South Asian Countries and five largest European countries based on GDP, i.e. (Germany, France, Italy, United Kingdom, and Spain). By analyzing the correlation matrix and VIF scores. Outliers were removed. We carried out random effect estimation to look for the impact created by covid-19 on the profitability of both south Asian Banks and European Banks to compare banks' profitability. The estimation is done using robust standard errors to minimize heteroskedasticity issues.

Table 1
List of Countries

EUROPE			SOUTH ASIA		
COUNTRY	**GDP**	**Unit**	**COUNTRY**	**GDP**	**Unit**
Germany	3846	USD Billion	India	2623	USD Billion
United Kingdom	2708	USD Billion	Bangladesh	324	USD Billion
France	2630	USD Billion	Pakistan	264	USD Billion
Italy	1886	USD Billion	Sri Lanka	80.71	USD Billion
Spain	1281	USD Billion			

The data has been taken from Thomson Reuters DataStream, and Table 1 reports the list of countries from which the quarterly data was taken. Quarterly data from almost 500 banks from South Asia and Europe is collected over five years from 2016 to 2021. Descriptive statistics are represented in Table 2.

Table 2
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	2578	0.005	0.012	-0.124	0.131
ROE	2578	0.035	0.094	-0.855	0.673
Capitalization Strength	2578	0.15	0.081	0.032	0.586
Credit Quality	1788	0.049	0.053	0	0.405
Interest Income	2578	0.096	0.051	0.003	0.274
Liquidity ratio	2578	0.995	0.406	0.129	2.997
Bank Size	2578	19.448	2.048	13.781	24.602
Covid-19	2578	0.179	0.383	0	1
Growth of Deposits	2578	0.023	0.109	-0.986	1.211
Efficiency Ratio	2578	0.495	0.187	0.015	0.903
GDP growth rate	2578	0.246	0.0462	-0.116	0.126
Hirschman-Herfindahl Index (HHI)	2578	0.0411	0.025	0.013	0.178

The correlation matrix is shown in Table 3. Again, none of the independent variables is highly correlated, revealing the non-existence of multicollinearity.

Table 3
Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	1											
(2)	0.8793	1										
(3)	0.0923	0.0057	1									
(4)	0.4065	0.3995	0.0232	1								
(5)	0.1579	0.1467	0.0546	0.0573	1							
(6)	0.0361	0.0151	0.3721	0.0378	0.4817	1						
(7)	0.0742	0.0332	0.0394	0.1361	0.4332	0.3763	1					
(8)	0.0332	0.0182	0.0733	0.0851	0.0197	0.0128	0.0252	1				
(9)	0.0715	0.0758	0.0256	0.0455	0.0003	0.039	0.0123	0.0074	1			
(10)	0.2576	0.2621	0.1751	0.1403	0.4601	0.1871	0.2755	-0.0089	-0.0494	1		
(11)	0.0347	0.0246	0.0921	0.0205	0.2421	0.1346	0.1906	-0.6385	-0.0096	0.2043	1	
(12)	0.0889	0.0577	0.0855	0.0139	0.6871	0.3905	0.4683	0.1291	-0.0077	-0.4369	0.2445	1

(1) ROA, (2) ROE, (3) Capitalization Strength, (4) Credit Quality, (5) Interest Income, (6) Liquidity ratio, (7) Bank Size, (8) Covid-19, (9) Growth of Deposits, (10) Efficiency Ratio, (11) GDP growth rate, (12) Hirschman-Herfindahl Index (HHI)

Table 4 reports the findings of the VIF test and reaffirms the absence of multicollinearity in the data.

Table 4
Variance Inflation Factor

Variables	VIF	1/VIF
Interest Income	2.51	0.398
Hirschman-Herfindahl Index (HHI)	2.22	0.45
GDP growth rate	1.98	0.504
Covid-19	1.91	0.522
Liquidity ratio	1.75	0.571
Bank Size	1.53	0.653
Efficiency Ratio	1.49	0.673
Capitalization Strength	1.32	0.759
Credit Quality	1.1	0.91
Growth of Deposits	1.01	0.988
Mean VIF	1.68	.

4. Findings and Discussion

Table 5 reports the study's main results and four (04) models are presented. Model 1 presents the impact created by all variables on the ROE of South Asia and Europe. In model 2, the interaction term has been to capture any difference across the developed and developing economies. Finally, in model 3, the impact of all independent variables on ROA of South Asia and Europe is shown, whereas, in model 4, the interaction term has been included.

Table 5
Main Results

	ROE Model 1	**ROE Model 2**	**ROA Model 3**	**ROA Model 4**
	Coef. /(Rob. Std. Err)	**Coef. /(Rob. Std. Err)**	**Coef. /(Rob. Std. Err)**	**Coef. /(Rob. Std. Err)**
BANK SPECIFIC:				
Capitalization Strength	0.0638	0.0521	0.0254**	0.0238**
	-0.0859	-0.0858	-0.0118	-0.0118
Credit Quality	-0.3859**	-0.4024**	-0.0556**	-0.0576**
	-0.1764	-0.1783	-0.0179	-0.018
Interest Income	0.5363***	0.4123**	0.0703***	0.0546**
	-0.1379	-0.1539	-0.016	-0.0182
Liquidity ratio	0.0239	0.0187	0.0017	0.001
	-0.0228	-0.0228	-0.0029	-0.0029
Bank Size	0.0008	-0.0018	-0.0003	-0.0007
	-0.0054	-0.0058	-0.0007	-0.0007
Growth of Deposits	0.0300**	0.0284**	0.0039**	0.0037**
	-0.0104	-0.0103	-0.0014	-0.0014
Efficiency Ratio	-0.1809**	-0.1563**	-0.0244***	-0.0212***
	-0.0578	-0.0567	-0.0066	-0.0063
INDUSTRY SPECIFIC:				
Hirschman-Herfindahl Index (HHI)	-0.0628	-0.0071	-0.0181	-0.0111
	-0.1584	-0.1617	-0.0202	-0.021
MACROECONOMIC:				
GDP growth rate	0.1364	0.2449**	0.0155	0.0287**
	-0.0948	-0.0932	-0.0106	-0.0106
Covid-19	-0.0104	-0.0330***	-0.0017*	-0.0045***
	-0.0074	-0.0092	-0.0009	-0.0011
C2xCovid		0.0417**		0.0051**
		-0.0155		-0.002
Constant	0.0328	0.0756	0.0141	0.02
	-0.1218	-0.1277	-0.0153	-0.0162
R Squared	0.313012	0.3205197	0.3292022	0.3308526
No. of Obs.	1788	1788	1788	1788
No. of Groups	127	127	127	127

By observing the empirical results as presented in Table 5, it is observed that the R square is 31%. Petria et al. (2015) found similar model fits. On the other hand, Akbaş (2012)found better fits, while Montgomery et al. (2014) found a low model fit. The data is added from five countries of the EU and four countries of SA, which could be one of the reasons for R-Squared not being so high may be due to the diversity in the kinds of banking systems and regulations.

While observing the bank-specific variables, capitalization strength has no impact on return on equity. Yahya et al. (2014) also found that capitalization strength has no impact on profitability. We find that capitalization strength significantly impacts the ROA of banks positively. Husain and Abdullah (2008) reported similar results. Higher non-performing loans are indicative of poor credit quality. Poor credit quality reduces returns on both asset and equity. They affect ROE and ROA negatively, consistent with findings in the literature (Islam & Nishiyama, 2016).On

the contrary, higher interest income is found to improve returns. It shows a significant positive impact on both ROA and ROE. The liquidity ratio has an insignificant impact on ROA and ROE.

Bank size shows an insignificant impact on ROA and ROE. This is contrary to the hypothesis that larger banks can exert market power to demand higher returns. It may suggest that smaller banks are better at relationship management and diversified / liquid investments with higher returns. However, Al-Homaidi, Almaqtari, Yahya, and Khaled (2020) reported similar findings. Deposit growth positively impacts return on equity and return on assets. The efficiency ratio reflects the ability of bank management in controlling expenses. The results suggest that a higher efficiency ratio decreases both ROA and ROE.

The industry-specific variable Hirschman-Herfindahl Index HHI index variable was found to be insignificant. However, the macroeconomic variable GDP positively impacts both ROA and ROE. Covid-19 dummy suggests that during COVID -19 period, both ROA and ROE were impacted and were significantly lower during the pandemic. The negative impact is similar in size for both ROA and ROE. However, while observing the impact of covid-19 on banks across the two continents, it was significantly different.

The impact of covid-19 on ROE in South Asia was almost zero, whereas the impact of ROE in the EU was negative, which indicates that covid-19 impacted returns in EU banks' ROE negatively. However, for South Asian banks, the impact was positive, and the banks managed to perform well and even better than in the pre-crisis period.

To summarize the developed European banking system experienced a negative impact on profitability in terms of ROA and ROE. In the case of developing economies (South Asian banking sector) returns on equity fell similar to the developed economies however returns on assets increased. So how did the pandemic impact the relationship between bank profitability and its determinants?

4.1 Moderating Effect of Covid-19

After establishing a negative impact in the main finding, Table 6 and Table 7 show the result of interaction models capturing the moderating effect of covid-19 on the profitability and determinants using interaction terms. Moderation is tested using six models, each model testing the effect of covid-19 on capitalization strength, credit quality, interest income, liquidity ratio, bank size, growth of deposits and efficiency ratio. However, Table 6 only reports three models out of the six models estimated in the analysis, whereas Table 7 reports four out of the six estimated models. The complete results are included in the appendix.

Table 6 represents the findings of moderating effect of ROA and its determinants. Model 1 results suggest that during covid-19, the magnitude of bank capitalizations impact banks' return on assets reduced but remained positive. Model 2 suggests that although liquidity was insignificant during regular times, during covid-19, it became a significant factor in determining bank profitability. During covid-19, illiquid banks are suggested to be less profitable, consistent with theory. Model 3 suggests that higher total assets during covid-19 are also associated with higher profits. In examining the phenomenon using return on equity (ROE) as a proxy of profitability, the findings are consistent, as is reported in Model 3 of Table 7.

Table 7 reports the results of the estimation of using ROE, and its results are consistent with the ROA providing evidence of result robustness. Credit Quality is a significant factor in determining the ROE of banks. Poor credit quality decreases bank return on equity. The interaction term is negative, suggesting a reduction in the over magnitude of the negative

relationship between ROE and credit quality. Interestingly enough, we find that the overall impact of the credit quality on return on equity is positive during the pandemic. Mohammad (2021) finds a similar moderating role of the economic downturn on the capital structure decision making of Pakistani banks.

Table 6
Moderating effect of Covid-19 on ROA and its determinants

	Interaction 1	**Interaction 2**	**Interaction 3**
ROA	**Coef/(Std.Err)**	**Coef/(Std.Err)**	**Coef/(Std.Err)**
Capitalization Strength	0.0264**	0.0204*	0.0229**
	-0.012	-0.012	-0.0116
Credit Quality	-0.0552**	-0.0577***	-0.0590***
	-0.0176	-0.0172	-0.0175
Interest Income	0.0663***	0.0595***	0.0591***
	-0.0174	-0.0177	-0.0161
Liquidity Ratio	0.0016	0.0021	0.0016
	-0.0029	-0.003	-0.0029
Bank Size	-0.0005	-0.0007	-0.0009
	-0.0007	-0.0007	-0.0008
Covid	0.0013	0.0025	-0.0242**
	-0.0017	-0.0021	-0.0081
Growth of Deposits	0.0036**	0.0038**	0.0030**
	-0.0013	-0.0013	-0.0013
Efficiency Ratio	-0.0237***	-0.0229***	-0.0198***
	-0.0064	-0.0061	-0.006
Interaction Terms			
Covid x Capitalization Strength	-0.0220**		
	-0.0111		
Covid x Liquidity Ratio		-0.0047**	
		-0.002	
Covid x Bank Size			0.0011**
			-0.0004
Constant	0.0145	0.0176	0.0219
	-0.0134	-0.014	-0.0152
Overall R square	0.3268899	0.3304867	0.334271
No. of Obs.	1788	1788	1788
No. of Groups	127	127	127

Table 7
Moderating effect of Covid-19 on ROE and its determinants

	Interaction 1	**Interaction 2**	**Interaction 3**	**Interaction 4**
ROE	**Coef./(Std. Err)**	**Coef./(Std. Err)**	**Coef./(Std. Err)**	**Coef./(Std. Err)**
Capitalization Strength	0.0626	0.0391	0.0482	0.0427
	-0.0844	-0.0844	-0.0849	-0.0836
Credit Quality	-0.4589**	-0.3992**	-0.4060**	-0.4100**
	-0.1875	-0.1718	-0.173	-0.1747
Interest Income	0.5329***	0.4725**	0.4524**	0.4615**
	-0.1381	-0.1532	-0.1376	-0.1481
Liquidity Ratio	0.0262	0.0267	0.0239	0.0235
	-0.0232	-0.0234	-0.0229	-0.0231
Bank Size	0.0008	-0.0013	-0.0034	-0.0015
	-0.0054	-0.0055	-0.0061	-0.0057
Covid	-0.0295**	0.0115	-0.1632**	-0.0482**
	-0.0105	-0.018	-0.0618	-0.0198
Growth of Deposits	0.0259**	0.0288**	0.0239**	0.0251**
	-0.0092	-0.0095	-0.0094	-0.0093
Efficiency Ratio	-0.1684**	-0.1744**	-0.1532**	-0.1746**
	-0.0545	-0.0551	-0.0552	-0.0542

Interaction Term				
Covid x Credit Quality	0.5016*			
	-0.2892			
Covid x Liquidity Ratio		-0.0237*		
		-0.0138		
Covid x Bank Size			0.0077**	
			-0.0032	
Covid x Efficiency Ratio				0.0795*
				-0.0453
Constant	0.0179	0.062	0.0998	0.0721
	-0.1193	-0.1191	-0.1299	-0.1257
Overall R square	0.3271196	0.3180207	0.3184884	0.3218298
No. of Obs.	1788	1788	1788	1788
No. of Groups	127	127	127	127

5. Conclusion

This paper presents how the bank's profitability was affected due to the Covid-19 crisis using an unbalanced panel data set with bank-specific, industry-specific and macroeconomic variables. We find that credit quality, interest income, deposit growth and bank efficiency are important factors that impact bank profitability. The pandemic is found to globally impact profitability of banks negatively. However, the impact across the developed and developing economies is significantly different. Using return on asset and equity as proxies for profitability we find that ROA fell for European and South Asian banks. In the case of return on equity for European banks fell. However, for South Asian banks, the impact was positive, and the banks managed to perform well and even better than in the pre-crisis period.

In analyzing the relationship of the determinants of profitability we find significant evidence of moderation. For example, credit quality and bank efficiency became less important in determining bank profitability during the Covid period. In contrast, bank size and maintaining liquidity became more important determinants. Additionally, the magnitude of capital ratio as a determinant of return on assets decreased during Covid.

The study is significant because we identify factors that become less and more important in determining profitability and eventually the stability of the banking sector. Controlling for banking sector development, we find that the crisis negatively impacts profitability. However, the crisis impacted European banks negatively while South Asian banks positively.

The study was limited to the south Asian regions and European banks based on the highest gross domestic products. In addition, the choice of banks has been based on the highest GDPs. Further studies should focus on other regions as well. Additionally, this study investigated the impact of the pandemic using a dummy variable setup capturing the before and during effect. Further research can focus on using number of covid-19 cases to study the effect and capture the impact of cross-country severity levels on banking sector performance.

Authors Contribution
Javeria Haider: writeup of the manuscript
Khalil Ullah Mohammad: study design and concept, data analysis

Conflict of Interests/Disclosures
The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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Appendix
Main Result 5
Complete result

	ROE_M Coef. / (Rob. Std. Err)	**ROE_I Coef. / (Rob. Std. Err)**	**ROA_M Coef. / (Rob. Std. Err)**	**ROA_I Coef. / (Rob. Std. Err)**
BANK SPECIFIC:				
Capitalization	0.0638	0.0521	0.0254**	0.0238**
Strength	(0.0859)	(0.0858)	(0.0118)	(0.0118)
Credit Quality	-0.3859**	-0.4024**	-0.0556**	-0.0576**
	(0.1764)	(0.1783)	(0.0179)	(0.0180)
Interest Income	0.5363***	0.4123**	0.0703***	0.0546**
	(0.1379)	(0.1539)	(0.0160)	(0.0182)
Liquidity ratio	0.0239	0.0187	0.0017	0.0010
	(0.0228)	(0.0228)	(0.0029)	(0.0029)
Bank Size	0.0008	-0.0018	-0.0003	-0.0007
	(0.0054)	(0.0058)	(0.0007)	(0.0007)
Growth of Deposits	0.0300**	0.0284**	0.0039**	0.0037**
	(0.0104)	(0.0103)	(0.0014)	(0.0014)
Efficiency Ratio	-0.1809**	-0.1563**	-0.0244***	-0.0212***
	(0.0578)	(0.0567)	(0.0066)	(0.0063)
country=Bangladesh	0.0184	0.0168	0.0017	0.0016
	(0.0271)	(0.0274)	(0.0039)	(0.0039)
country=France	0.0270	0.0209	0.0039	0.0032
	(0.0279)	(0.0283)	(0.0036)	(0.0036)
country=Germany	0.0186	-0.0022	0.0053	0.0027
	(0.0634)	(0.0650)	(0.0078)	(0.0078)
country=India	-0.0210	-0.0190	-0.0012	-0.0009
	(0.0228)	(0.0227)	(0.0029)	(0.0029)
country=Pakistan	0.0546**	0.0621**	0.0038	0.0049
	(0.0254)	(0.0263)	(0.0033)	(0.0034)
country=Spain	-0.0526	-0.0600	-0.0073	-0.0082
	(0.0518)	(0.0518)	(0.0076)	(0.0076)
country=Sri Lanka	-0.0473	-0.0460	-0.0087	-0.0084
	(0.0858)	(0.0857)	(0.0129)	(0.0129)
INDUSTRY SPECIFIC:				
Hirschman-Herfindahl	-0.0628	-0.0071	-0.0181	-0.0111
Index (HHI)	(0.1584)	(0.1617)	(0.0202)	(0.0210)
MACROECONOMIC:				
GDP	0.1364	0.2449**	0.0155	0.0287**
	(0.0948)	(0.0932)	(0.0106)	(0.0106)
Covid-19	(0.0054)	-0.0330***	-0.0017*	-0.0045***
	(0.0074)	(0.0092)	(0.0009)	(0.0011)
C2xCovid		0.0417**		0.0051**
		(0.0155)		(0.0020)
Constant	0.0328	0.0756	0.0141	0.0200
	(0.1218)	(0.1277)	(0.0153)	(0.0162)
R square	.313012	.3205197	.3292022	.3308526
No. of Obs.	1788	1788	1788	1788
No. of Groups	127	127	127	127

* p<.1, ** p<.05, *** p<.001

Table 6
Complete Results

ROA	Interaction 1 d.Err) Coef./(S	ROA_2 td.Err) Coef./(	ROA_3 Std.Err) Coef./	Interaction 2 (Std.Err) Coef.	Interaction 3 /(Std.Err) Coef	ROA_6 ./(Std.Err) Coe	ROA_7 f./(Std.Err) Coef./(Std.Err)
Capitalization Strength	0.0264**	0.0250**	0.0241**	0.0204*	0.0229**	0.0246**	0.0227**
	(0.0120)	(0.0115)	(0.0118)	(0.0120)	(0.0116)	(0.0117)	(0.0116)
Credit Quality	-0.0552**	-0.0635***	-0.0589***	-0.0577***	-0.0590***	-0.0583***	-0.0592***
	(0.0176)	(0.0191)	(0.0177)	(0.0172)	(0.0175)	(0.0176)	(0.0176)
Interest Income	0.0663***	0.0711***	0.0639**	0.0595***	0.0591***	0.0705***	0.0630***
	(0.0174)	(0.0167)	(0.0218)	(0.0177)	(0.0161)	(0.0167)	(0.0178)
Liquidity Ratio	0.0016	0.0019	0.0015	0.0021	0.0016	0.0017	0.0016
	(0.0029)	(0.0030)	(0.0029)	(0.0030)	(0.0029)	(0.0029)	(0.0030)
Bank Size	-0.0005	-0.0004	-0.0005	-0.0007	-0.0009	-0.0004	-0.0006
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0007)	(0.0007)
Covid	0.0013	-0.0036**	-0.0028**	0.0025	-0.0242**	-0.0021**	-0.0061**
	(0.0017)	(0.0015)	(0.0013)	(0.0021)	(0.0081)	(0.0009)	(0.0027)
Growth of Deposits	0.0036**	0.0034**	0.0036**	0.0038**	0.0030**	0.0033**	0.0033**
	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0016)	(0.0013)
Efficiency Ratio	-0.0237***	-0.0225***	-0.0231***	-0.0229***	-0.0198***	-0.0233***	-0.0230***
	(0.0064)	(0.0061)	(0.0062)	(0.0061)	(0.0060)	(0.0062)	(0.0061)
Covid x Capitalization Strength	-0.0220**						
	(0.0111)						
Covid x Credit Quality		0.0456					
		(0.0472)					
Covid x Interest Income			0.0086				
			(0.0130)				
Covid x Liquidity Ratio				-0.0047**			
				(0.0020)			
Covid x Bank Size					0.0011**		
					(0.0004)		
Covid x GrowthofDeposits						0.0010	
						(0.0029)	
Covid x EfficiencyRatio							0.0088
							(0.0058)
Constant	0.0145	0.0107	0.0149	0.0176	0.0219	0.0127	0.0164
	(0.0134)	(0.0138)	(0.0141)	(0.0140)	(0.0152)	(0.0136)	(0.0144)
Overall Rsquare	.3268899	.3409284	.3283373	.3304867	.334271	.3288416	.3347422
No. of Obs	1788	1788	1788	1788	1788	1788	1788
No. of Groups	127	127	127	127	127	127	127
----------							
* p<.1, ** p<.05, *** p<.001							

Table 7
Complete Results

ROE	Interaction 1 Coef./(Std.Err)	Interaction 1a Coef./(Std.Err)	Interaction 2 Coef./(Std.Err)	Interaction 3 Coef./(Std.Err)	Inteaction 3a Coef./(Std.Err)	Interaction 4 Coef./(Std.
Capitalization Strength	0.0626	0.0560	0.0391	0.0482	0.0595	0.0427
	(0.0844)	(0.0850)	(0.0844)	(0.0849)	(0.0855)	(0.0836)
Credit Quality	-0.4589**	-0.4061**	-0.3992**	-0.4060**	-0.4025**	-0.4100**
	(0.1875)	(0.1756)	(0.1718)	(0.1730)	(0.1742)	(0.1747)
Interest Income	0.5329***	0.4798**	0.4725**	0.4524**	0.5277***	0.4615**
	(0.1381)	(0.1732)	(0.1532)	(0.1376)	(0.1390)	(0.1481)
Liquidity Ratio	0.0262	0.0229	0.0267	0.0239	0.0241	0.0235
	(0.0232)	(0.0229)	(0.0234)	(0.0229)	(0.0231)	(0.0231)
Bank Size	0.0008	-0.0008	-0.0013	-0.0034	-0.0003	-0.0015
	(0.0054)	(0.0055)	(0.0055)	(0.0061)	(0.0054)	(0.0057)
Covid	-0.0295**	-0.0176*	0.0115	-0.1632**	-0.0122*	-0.0482**
	(0.0105)	(0.0097)	(0.0180)	(0.0618)	(0.0071)	(0.0198)
Growth of Deposits	0.0259**	0.0280**	0.0288**	0.0239**	0.0230*	0.0251**
	(0.0092)	(0.0097)	(0.0095)	(0.0094)	(0.0117)	(0.0093)
Efficiency Ratio	-0.1684**	-0.1747**	-0.1744**	-0.1532**	-0.1756**	-0.1746**
	(0.0545)	(0.0548)	(0.0551)	(0.0552)	(0.0551)	(0.0542)
Covid x Credit Quality	0.5016*					
	(0.2892)					
Covid x Interest Income		0.0625				
		(0.0956)				
Covid x Liquidity Ratio			-0.0237*			
			(0.0138)			
Covid x Bank Size				0.0077**		
				(0.0032)		
Covid x GrowthofDeposits					0.0209	
					(0.0190)	
Covid x EfficiencyRatio						0.0795*
						(0.0453)
Constant	0.0179	0.0550	0.0620	0.0998	0.0420	0.0721
	(0.1193)	(0.1225)	(0.1191)	(0.1299)	(0.1193)	(0.1257)
Overall Rsquare	.3271196	.3159806	.3180207	.3184884	.3152827	.3218298
No. of Obs	1788	1788	1788	1788	1788	1788
No. of Groups	127	127	127	127	127	127
* p<.1, ** p<.05, *** p<.001						