

How did COVID-19 affect Shariah Compliant versus Conventional Firms' Operating Performance?

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1. Abstract

Our paper addresses a gap in the current literature regarding the impact of COVID-19 on the operational performance of Shariah-compliant (SC) and non-Shariah-compliant (NSC) firms in the US. We use Refinitiv for our SC-NSC categorization criteria and use a unique dataset from S&P's Compustat North American quarterly database for all US firms for the period 2018-2022. Our paper attempts to move beyond basic stock-level analysis to include ROA decomposition of PM (profitability margins) and ATO (asset efficiency) to ascertain the reason behind SC firms being more naturally resilient during the pandemic. We show that the negative impact of the pandemic on SC firms' operating performance was comparatively much lower than their conventional NSC counterparts. Our robust empirical results continue to hold when testing our regression model on samples constructed using different methodologies, as well as accounting for potential endogeneity in the Shariah-compliance variable. Overall, our findings imply that SC firms exhibit greater resilience and stability during times of unexpected crises, making them a profitable, safe, and reliable investment to reduce market-associated risks.

KEY WORDS: Operating efficiency, Shariah compliance, Islamic, COVID-19, profitability

2. Introduction

In light of COVID-19's significant impact imposed on the global economy, many studies have been conducted to evaluate how the pandemic unprecedentedly affected businesses and consumers worldwide. Current literature has examined the influence of COVID-19 from different financial dimensions. Most studies have primarily focused on how the pandemic affected local and international stocks markets; such as on daily stock returns (Bahrini & Filfilan, 2020), market volatility (Kusumahadi & Permana, 2021) and bidirectional spill-over effects globally (He et al., 2020). Secondly, studies have also been conducted to evaluate the pandemic's impact on firms' liquidity (Nerantzidis et al., 2023; De Vito & Gomez, 2020), risk and performance (Almustafa et al., 2023; Devi et al., 2020) and differing magnitude of impact across industries (Alsamhi et al., 2022).

To the best of our knowledge, there has not been any empirical analysis in the literature to evaluate COVID-19's influence on firms operating profitability from the lens of Shariah compliance. Similar studies have gauged differences in stock market reactions to the pandemic between Shariah-compliant (SC) and non-Shariah-compliant (NSC) firms (Bhutto et al., 2022; Shear & Ashraf, 2022; Raza et al., 2022; Hassan et al., 2022). These studies overall provided evidence of how SC stocks outperformed their NSC counterparts during the pandemic. Further research has also evaluated the difference between SC firms in comparison to their conventional counterparts operating profitability, conducted by Akguc & Rahahleh (2018) using GCC sample and using US sample (Akguc & Rahahleh, 2020), and on risk and resilience (Cheong, 2021), without including COVID-19 as a factor. Therefore, to address the current gap in the literature, our research aims to examine whether SC firms are less impacted than NSC (i.e. conventional) firms during the recent truly unforeseen economic shock: the COVID-19 pandemic. We hypothesize that unforeseen events like the pandemic negatively impacted NSC firms to a greater degree than SC firms. Classification between both types of firms is done based on the criteria followed by leading financial institutions, such as the FTSE Global Islamic Index series and the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI). Additionally, we hypothesize that SC firms are exposed to less risk than their conventional counterparts due to their different operational structures. Typically, SC firms have smaller asset sizes, higher liquidity, lower cash holdings, and reduced operating cash flow than NSC firms (Akguc & Al Rahahleh, 2018). Given that an average SC firm tends to have lower leverage than its NSC counterpart, this aspect also holds significant relevance in the context of capital structure literature. In spite of this, further studies also suggest how SC firms' lower leverage prompts them to experience lower risk, hence higher resilience during financial crises than NSC firms. Cheong (2021) profounded this effect following the U.S. subprime crisis and, using firm-level stock returns, Shear and Ashraf (2022) similarly proved this during the COVID-19 market collapse. Therefore, considering these examples, it is important to acknowledge how firm performance

during economic uncertainties can be influenced by religious motivations and criteria that are often disregarded in corporate governance.

By using data extracted from Refinitiv Workspace and North American Compustat database, we conducted multivariate regression analysis and additional robustness tests to evaluate the impact of COVID-19 on SC vs. NSC firms' operating performance. We conducted our analysis within the quarterly timeline from 2018 Q1 to 2020 Q4, with the quarter containing March 2020 classified as the "COVID-hit quarter". Therefore, any quarter prior to and after this quarter is categorized as the pre and post-COVID quarter respectively. Overall, we found that SC firms are significantly more profitable than their NSC counterparts post-pandemic. In our univariate analysis, we found that the average SC firm has around 1.8% higher return on assets (ROA) in comparison to NSC firms. In our multivariate analysis, including the COVID-19 and SC interaction dummy and controlling for multiple firm characteristics and fiscal quarter fixed effects, we also found the mean difference in ROA between SC vs. NSC firms to be within the range of 1.22 to 1.29%. This, therefore, confirms our univariate results. Moreover, when we evaluate the model using OLS (quantile) regression, the mean (median) difference in ROA for SC firms after the pandemic is around 0.3% (0.4%) and is statistically significant. Since profit margins exhibit a similar trend, it means that SC firms are more profitable and less impacted by the pandemic than their NSC counterparts.

To further support our hypothesis and address the potential endogeneity of the SC dummy, we also evaluated the multivariate model using two-stage least square analysis (2SLS). In this method, we used the percentage of SC firms within the 2-digit SIC industry as the instrument addressing the potentially endogenous SC dummy. With this instrument, we assumed that as the number of SC firms in 2-digit SIC increases, the probability that firms within this industry are SC also increase due to peer pressure (Akguc & Al Rahahleh, 2020, p. 17). To satisfy the exogeneity requirement, we also assumed that this instrument is not directly correlated to profitability or any of the other independent variables in the model. In the 2SLS analysis, we found that the average SC firm is 1.01% (ROA NI) to 1.2% (ROA EBIT) more profitable than the average NSC after the pandemic, statistically significant at 1%. We also found that the 2SLS estimation is more efficient than the OLS.

Overall, we found that SC firms are more operationally effective than their NSC counterparts. Evaluating this comparison in isolation of the impact of COVID-19, we found significant and robust evidence that supports existing literature using multiple profitability definitions in all of our univariate and multivariate analyses, at both the mean and median levels. Evaluating this difference between SC and NSC firms operating profitability, in spite of COVID-19's impact, we found that SC firms are significantly more profitable than NSC firms post-pandemic. This finding is robust as the results hold when evaluated using different definitions of profitability and the median and 2SLS methodology.

3. Literature Review

Since COVID-19 was such a widespread event impacting firms and consumers globally, its effects have been widely studied. An ample amount of research has also been carried out on the effect of the pandemic on regional and international stock markets. One such study is carried out by Mazur et al. (2021) who use a dataset of US stocks of S&P 1500 to focus on industry-level classifications to research whether all industries exhibited the same level of negative impact from the pandemic. Their findings revealed that "COVID-19 may not necessarily be equally detrimental to all firms and industries" (2021). It is important to note that they treat March 2020 as the main month of the pandemic, labeling it as the "March 2020 stock market crash", exactly similar to our timeline. In addition, various studies have also been carried out regarding comparisons between the performance of SC and NSC firms. Hassan et al. (2022) conducted a t-test and Mann-Whitney test over a comparatively short timeline from January to September 2020 to analyze the pre and post-COVID returns from SC and conventional markets. The final findings of their market analysis perfectly align with our hypothesis as they prove that the Islamic markets outperform their counterparts. Further, they state that "collectively, these results reinforce the view that in the crisis period, Islamic markets are more resilient." (Hassan et al., 2022).

Unlike existing literature which utilizes stock market index level data, Shear and Ashraf (2022) used firm-level stock returns to find robust evidence that Shariah-compliant stocks outperform their conventional counterparts during the COVID-19 market collapse. They revealed that although both kinds of stocks experienced lower negative returns in reaction to the increase in COVID-19 cases and governmental restrictions, conventional stocks were adversely impacted to a greater extent than Shariah-compliant stocks. This is explained by the lower leverage and higher level of tangible assets holding that are principles of general Shariah compliance. This paper adds value to our hypothesis as the findings imply that Sharia-compliant firms performed better during the pandemic.

Previous literature has utilized examples of other financial crises to certify that SC firms are more resilient than their NSC counterparts. In a study conducted by Cheong (2021), he examined 2,160 firms to gauge the effects of Shariah compliance on non-financial firms' operating performance and how certain restrictions influence their risk and resilience. SC firms were found to experience lower firm risk when measured by total and idiosyncratic risk and exhibit stronger resilience with more minor deviations from maximum values in sales, cost of goods sold, operating expenses, and share price. As the effect of Shariah compliance is more profound in the years following the U.S. subprime crisis, this study supports our hypothesis that SC firms outperform conventional firms during or after a financial crisis, due to greater financial resilience and stability.

To keep our literature review up-to-date with recently conducted research, we also view a study carried out by Sukon and Halim (2023), who also use Stata to find out that during times of crises, the portfolio containing the conventional sample will outperform the Shariah-compliant samples in most cases. Their portfolio examinations also revealed that "there exists a consistent trend whereby the performance of the overall conventional sample will converge towards the performance of the Shariah-compliant samples" (Sukor & Abdul Halim, 2023). Therefore, their final findings suggest that Shariah-compliant samples should be included in portfolios during times of crisis because they are less affected by market-wide volatility, provide stability, and do not experience significant deteriorations in their performance during crises. It supports our belief that the stability of Shariah-compliant samples reflects the conservative of the contemporary Shariah stock screening methodologies and Shariah itself.

We also found it valuable to consider research that contradicts our beliefs. Hasan et al. (2021) explored the impact of COVID-19 on global Islamic and conventional stock markets and its co-movement using the Dow Jones and FTSE Index. Their study revealed that both stock markets are strongly correlated, resulting in similar levels of volatility during the 2020-sample pandemic period. Hence, they strongly rebut the hypothesis that Islamic markets are decoupled from their conventional counterparts. They also criticized previous literature, connotating that the conservative features of Islamic stocks do not provide market protection against financial crises. This is an interesting research that claims there is no difference between the impact of COVID on SC vs NSC firm performance despite the majority of previous literature proving the resiliency of SC firms in times of adversity. Although we do agree on the fact that both SC and NSC firms were negatively impacted by the pandemic, we aim to further test to prove that NSC firms were impacted to a greater extent due to the difference in their firm structure.

We base our main analysis and the initial idea of our hypothesis on a study by Akguc and Al Rahahleh (2018), who evaluated the difference in performance between SC and NSC firms based on firms in six Gulf Cooperation Countries (GCC). They used the key variable of operating profit margin to evaluate how SC firms' lower cost structures allow them to outperform NSC firms operationally. The study also showed how SC firms had better total asset turnover in comparison to NSC firms, supporting our belief that SC firms are more operationally efficient than NSC firms.

4. Data and Methodology

4a. Data and Full Sample Construction

Extraction of Datasets

The initial (raw sample) dataset consists of quarterly financial statements of US firms. Firstly, Refinitiv's Shariah compliance screening tool was utilized to extract the names of all 878 SC firms in the US. Where each firm is uniquely identified using gvkey and ticker name. Secondly, the North America database in Compustat was utilized to extract quarterly data for all publicly listed US firms. We merged SC firms from Refinitiv to the financial data from Compustat to obtain our full dataset. We then organized the financial data to accommodate ratio computations and include other variables relevant to analyzing firm operational profitability.

Data Cleaning

We followed the standard approach in empirical finance by excluding financial firms with SIC codes ranging from 6000-6999 and regulated utility firms with SIC codes ranging from 4900-4949. This was done because regulated utility firms may be linked with the state and high levels of debt (high leverage) in financial firms do not hold the same meaning when applied to non-financial firms. In addition, missing industry SIC code observations were dropped. Negative values for total assets, total current assets, cash and cash equivalents, total debt and liabilities, total current liabilities, and revenue were also dropped. This is because negative values for these variables are considered abnormal. Missing values for some of the key variables for our analysis such as total assets, EBIT, and EBITDA were also removed from the raw sample.

We conducted a few experiments to finalize our exploratory decisions when finalizing the data-cleaning procedure. We took a variety of different cleaning filters into account which included but were not limited to market capitalization, total quarterly revenues, and total quarterly assets owned. Revenue was recorded in a nominal account and does not have the quarterly balances carried forward to the next year. The account is temporary and is closed off with a transfer to the income statement at the end of each fiscal period. In comparison to revenue levels, asset size for a particular firm tends to stay more consistent over time as it is recorded in a permanent account. This makes it a better data-cleaning filter. Market capitalization is a market-based measure, which tends to be very volatile and changes with market conditions. Due to the risk of seasonal fluctuations in both market capitalization and revenue, they were not chosen as criteria to filter the main dataset. We considered different asset size levels to filter our full sample, including USD 1 million, 5 million, and 10 million total quarterly assets. In order to generalize our research findings, we excluded firms with total quarterly asset size below USD 5 million, to prevent them from skewing our results. Therefore, it was chosen that dropping all firms below USD 5 million asset size was the most reasonable decision for gaining the greatest accuracy of our research findings.

Computing the COVID variable

Another key variable in our dataset is the COVID dummy that takes the value of 0 to represent pre-COVID periods and takes the value of 1 to represent post-COVID periods. Our data timeline ranges from 2018-2022 and we recognized March 2020 as the peak of the COVID-19 pandemic in the United States (CDC, 2023). Thus, the time period before March 2020 was labeled as pre COVID while the time period after March 2020 was labeled as post COVID.

Computing SC variable

By utilizing the dataset extracted from Refinitiv Workspace, we generated the SC dummy variable by merging this dataset with the current main dataset. The SC variable holds the value of one if the observed firm is present in both datasets and zero otherwise. In our study, we based our Shariah

compliance classification according to the criteria followed by Refinitiv and other leading financial institutions globally e.g. Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) (2015). The following are the criteria for Shariah compliance:

- Accounts receivable/total assets < 45%
- Total Interest Income + income from non-compliant / Total < 5%
- Conventional Debt / Total Assets < 30%
- Cash + Interest-bearing deposits / Total Assets < 30%

Meeting these requirements classifies a firm as Shariah-compliant. If any one of these conditions is violated, the firm is termed as NSC. Upon matching, we found that around 878 firms matched our main sample. This totals the number of firm-year observations of SC firms to 16144 and 54970 for NSC firms.

CPI adjustment

Using quarterly data extracted from the US Bureau of Labor Statistics (BLS) (FRED., 2023), our study adjusts key variables and ratios for inflation to account for the potential effects of price changes. In this CPI dataset, we also generated a manually labeled time variable to accommodate the preceding merging process i.e. year and quarter (2000Qi). For each firm's quarterly observations from the year 2018-2022, we generated the CPI variable by merging the CPI dataset with our financial dataset. For accuracy, we manually updated any missing values for the combined fiscal year and quarter variable based on data from other firms having the same fiscal year-end. The inflation-adjusted variables are then generated as a product of the respective variable and its matched CPI, unique for each year and quarter.

Winsorization

Winsorization was carried out to set the extreme outlier data values equal to the 97.5th percentile of the data. We did this to mitigate the effects of outliers by replacing them with less extreme values. There were two options and various percentiles experimented with before finalizing the level and method of winsorization. The technique chosen was winsorizing within two groups, i.e. for SC and NSC firms separately since this would lead to greater accuracy instead of winsorizing the overall data without any groupings based on SC. Winsorization was tested at 1%, 2.5%, 3%, as well as at the 5% level. We concluded that a 5% winsorization level would be too limiting in terms of reducing the sample size by too much which would lead to a loss of valuable data. At the same time, winsorizing at 1% would not be enough to reduce the influence of potential outliers in the large dataset containing small-scale to large-scale firms. The 2.5% winsorization level made the full sample more symmetric and normal while ensuring that our final findings are not disrupted by the impact of outliers.

Therefore, our final full sample dataset contains ratios and values winsorized at 2.5% conducted for all SC and NSC firms separately to allow for better analysis, following Semenenko & Yoo (2019). This dataset also has a total of 71,114 observations, with 4921 distinct firms. Out of which, 878 are SC and the remaining 4,043 distinct NSC firms in our full sample.

4b. Industry-size matched (with replacement) dataset construction

The full sample dataset was utilized to construct a separate subset including only firms that have been matched by industry and asset size. Asset-matching by industry with replacement refers to creating a dataset with unique matched pairs of distinct SC and NSC firms that have the closest asset size range within each industry. “*With replacement*” indicates that after a certain SC firm has been matched to an NSC firm to form a pair, those particular SC and NSC firms cannot be matched to another different SC or NSC firm in the industry anymore. To start off our matching procedure, we only kept key firm identification variables (i.e., gvkey, ticker, company name, SIC) and the quarterly timeline of total assets as the initial sub-dataset. Instead of utilizing the current four-digit SIC code, we generated a new variable that only utilized the first two digits of the SIC variable to represent each industry in our

filtering process. This is to get a greater number of matched pairs and a more comprehensive dataset since the four-digit SIC code is too narrow and specific.

For each firm, we only considered the total asset value from the most recent quarter in our SC-NSC matching process. Therefore, we assume that most matched firm pairs will be constant throughout the timeframe of our analysis. For each firm, we also created separate variables to represent the upper and lower bound of the asset-matching range: 0.5 to 2 times the total asset size of the SC firm as conducted by Asker et al. (2014). We finalized this range after testing the model on both two-fold and three-fold asset matching ranges and agreeing that the three-fold range would not lead to close enough matches. The two-fold range being narrower leads to closer and more accurate matches, which would improve the quality of our research findings.

We used a Stata package called “rangejoin” created by Robert Picard (2021) to facilitate this within-range merging between temporary datasets that had SC and NSC firms separately. This produced a dataset in which each SC firm is matched with multiple NSC firms. To find and finalize the pair with the closest asset difference, we computed a new variable that measures the differences between each SC firm and all of its matched NSC firms respectively. The actual matching with replacement algorithm was carried out using Python after experimentation with Stata. After importing the current industry-size-matched dataset as a CSV file into Python and storing it as a list of dictionaries, we ran a loop through this list to only select observations that satisfy our criteria. We initialized two empty sets to separately keep track of and store unique SC and NSC firm names and an empty list called “fileteredAM” to append the selected dictionaries. In short, the algorithm basically iterates through each dictionary and checks whether both the SC and NSC firm names are already stored in their separate sets. If both firms are not present in the sets, this dictionary is appended to the “filteredAM” list, and the respective SC and NSC firm names are added to their set; therefore conducting “matching with replacement”. We then finalized our industry-size-matched dataset, by creating a unique ID for each SC-NSC pair and merging the dataset to the full sample dataset based on this ID. The final industry-size-matched (with replacement) dataset consists of 25,566 total observations; including 14,862 observations of 810 distinct SC firms and 11,704 observations of 810 distinct NSC firms. The accuracy of our matching can be verified through the equal total number of unique SC and NSC firms present in the dataset. The density graphs in Figure 1 demonstrate how the discrepancies between the observations of SC and NSC firms were standardized and removed through the construction of the asset matched sample. Panels A and B in figure 1 exhibit kernel density estimations for both the full and industry-size matched sample with replacement, based on industry and natural logarithm of total assets in constant 2022 USD million. Our main analysis is run on the asset matched sample due to the improvement in asset distribution that results from the matching methodology of sample construction.

4c. Variables specification and descriptive statistics

Firm Characteristics

In Table 1, Panel B provides summary statistics comparing key firm characteristics of SC vs. NSC firms from the industry-size matched (with replacement) dataset. Generally, SC firms are smaller than NSC firms. In the mean (median) level, SC firms have a total asset size of \$6.99bln (\$1.31bln) in comparison to the \$7.73bln (\$1.53bln) of NSC firms. On average, SC firms also have lower sales growth than NSC firms (4.42% vs. 7.06%). Moreover, SC firms have lower leverage than NSC firms in the mean and median levels (around 48% vs. 57%). Despite this, NSC firms notably have better liquidity than SC firms. On average, NSC firms hold more cash than SC firms (\$621mln vs. \$456mln). An average NSC firm also holds more cash and short-term investments than the average SC firm (\$774mln vs. \$583mln).

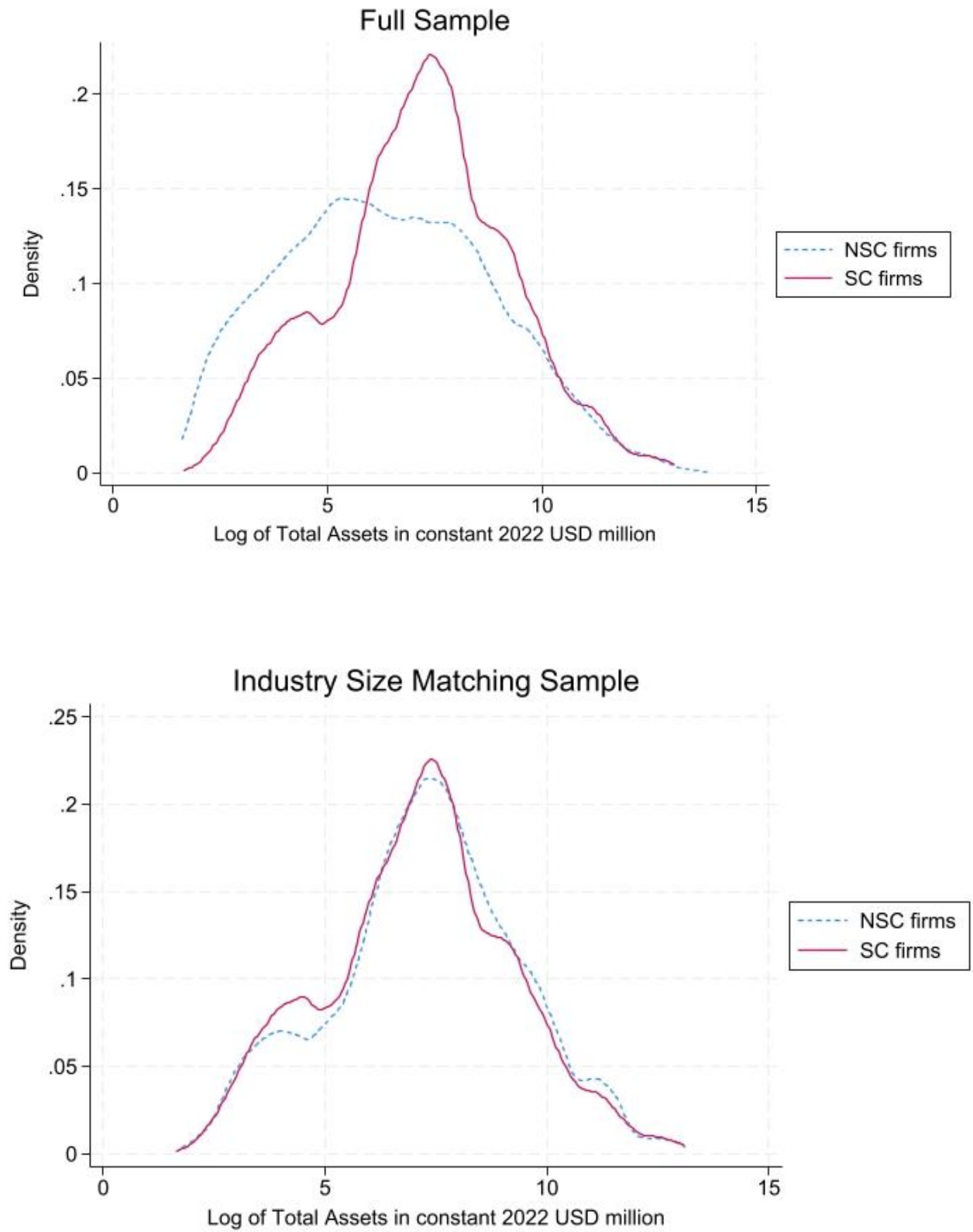


Figure 1: Matching quality: asset size distribution of SC firms vs NSC firms.

Operating Performance Measures and univariate analysis

Various performance indicators show that SC firms outperform NSC firms overall. In the summary statistics (Table 1: Panel B), return on assets (ROA) and profit margin (PM) are included in three different definitions; earnings before interest and taxes (EBIT); earnings before interest, taxes, depreciation, and amortization (EBITDA), and net income, scaled by total assets to compute ROA or revenue to compute PM. Using ROA to measure profitability, SC firms are more profitable than NSC firms in each definition. Specifically, when EBIT, EBITDA, and Net Income are used to define ROA, the differences in the mean (median) values are higher by 1.8% to 1.9% (0.5% to 0.6%) between SC and NSC firms. When measuring profitability using PM, SC firms are also more profitable than NSC firms in each definition. Using EBIT, EBITDA, and Net Income to define PM, the differences in the mean (median) values are higher by 106.6%, 111.2%, and 115.4% (1.2%, 1.4%, and 2.0%) between SC and NSC firms. All of the differences in the mean and median values between SC and NSC, for both ROA and PM, are also significant at the 1% level. These conclusions are confirmed by figure 2, which displays a quarterly time series graph for the duration of our research period (2018-2022). The dashed line divides the time frame into pre and post COVID eras to compare the negative after effects of the pandemic. It is evident that mean ROA (for all its definitions) is higher for an average SC firm as compared to an NSC firm. All 3 panels display the widening gap between SC and NSC firms' ROA in the post COVID period, which proves that the SC firms' operating performance was less negatively impacted than NSC firms'. Panels B and C explicitly show the comparatively steeper decline of ROA (higher negative slope) for NSC firms immediately after the COVID-hit quarter (2020 Q1).

The consistent pattern of SC firms exhibiting a higher ROA (%) can be attributed to the components (ratios) in ROA construction, namely total asset turnover (ATO) and profit margin (PM). We observe SC firms having a higher total asset turnover (ATO) than NSC firms, with mean (median) ATO of 24% (21.2%) vs. 20.8% (16.9%) respectively. These results are consistent with our previous findings, in which SC firms have higher ATO and PM values, therefore also having higher ROA than NSC firms (as ROA is equal to PM*ATO). Furthermore, SC firms are also more efficient than NSC firms in collecting their receivables (215 vs. 235 days). Overall, when each definition of ROA and PM is used, it can be observed that the average SC firm is more profitable than the average NSC firm in each year from 2018 to 2022. Our conclusion also holds when we use median differences that are not affected by outliers on either tale. Therefore, these univariate results support our main hypothesis that SC firms are more profitable than NSC firms

4d. Methodology

The following is the final multivariate regression model we estimated:

$$\begin{aligned} \text{profitability}_{it} = & \beta_0 + \beta_1(\text{COVID})_i + \beta_2(\text{Shariah-compliant})_i + \beta_3(\text{Shariah-compliant} \times \text{COVID})_i \\ & + \beta_4 \ln(\text{total asset})_{it} + \beta_5(\text{sales growth})_{it} + \beta_6(\text{leverage})_{it} + \beta_7(\text{fixed asset turnover})_{it} \\ & + \text{fiscal quarter dummies} + \varepsilon_{it} \end{aligned}$$

Where *profitability* is the dependent variable that estimates firm performance, measured by returns on assets (ROA) or profit margin (PM). In our analysis, we have included three different definitions of both ROA and PM in terms of EBIT, EBITDA, and net income. The ratio is scaled by total assets to compute ROA and scaled by revenue to compute PM. This step was taken to make the dependent variables more comparable across different-sized firms and industries. For the main independent variables, we have dummy variables that reflect the difference in the impact of COVID between SC and NSC firms. These include the *COVID* dummy (1 if the financial quarter is post-COVID and 0 if pre-COVID), *SC* dummy (1 for SC firm, 0 for conventional firm), and the interaction between these two variables (1 if SC and post-COVID and 0 otherwise). In our dataset, we classified the “COVID quarter” as the fiscal quarter that includes March 2020. Therefore, pre-COVID is classified as any quarters before the “COVID quarter” and post-COVID as any quarters after this quarter respectively.

Table 1. Summary statistics.

	Shariah Compliant (SC)						Non-Shariah Compliant (NSC)						Difference in means	Difference in medians
	N	Mean	SD	p25	p50	p75	N	Mean	SD	p25	p50	p75		
Panel A: full sample														
Assets (mm US\$)	16144	6903.116	15261.950	352.037	1338.072	4950.169	54970	6045.501	14746.950	91.094	537.174	3521.549	857.615***	800.898***
Revenue (mm US\$)	16142	1386.745	3126.006	71.885	296.691	1032.427	54941	1017.712	2541.797	3.654	71.501	563.736	369.033***	225.190***
Sales Growth (%)	15996	4.548	20.027	-5.053	2.550	11.001	47038	8.769	43.758	-7.109	2.663	14.279	-4.221***	-0.113
Cash	16143	452.279	976.607	16.426	81.700	334.400	54953	461.446	1099.130	14.154	71.222	295.000	-9.167	10.478***
Cash and short term inv.	16143	572.079	1322.775	18.435	96.069	377.200	54953	588.789	1372.413	17.966	98.689	395.130	-16.710	-2.620
Leverage	16144	0.486	0.195	0.344	0.492	0.615	54970	0.542	0.348	0.266	0.521	0.737	-0.055***	-0.028***
ROA EBITDA	16144	0.010	0.044	-0.002	0.015	0.031	54970	-0.037	0.102	-0.067	0.000	0.022	0.047***	0.015***
ROA EBIT	16144	-0.001	0.045	-0.014	0.006	0.022	54970	-0.046	0.102	-0.075	-0.011	0.012	0.045***	0.017***
ROA Net Income	16144	-0.007	0.043	-0.017	0.001	0.015	54970	-0.054	0.103	-0.079	-0.016	0.005	0.047***	0.018***
PM EBIT	16029	0.055	0.380	0.038	0.111	0.195	48064	-2.570	10.062	-0.254	0.079	0.220	2.625***	0.032***
PM EBITDA	16029	-0.014	0.410	-0.004	0.068	0.140	48064	-2.769	10.522	-0.341	0.031	0.142	2.755***	0.037***
PM Net Income	16029	-0.044	0.419	-0.017	0.046	0.103	48064	-2.908	10.807	-0.390	0.003	0.091	2.864***	0.042***
Total asset turnover	16142	0.245	0.146	0.134	0.219	0.329	54941	0.164	0.161	0.040	0.126	0.228	0.081***	0.093***
Fixed asset tumover	16111	2.030	2.644	0.590	1.220	2.233	53485	2.326	4.437	0.183	0.813	2.101	-0.296***	0.407***
Avg. collection period	14902	209.936	111.989	139.451	205.699	266.449	42443	239.096	189.275	119.271	208.027	298.578	-29.160***	-2.328*
Avg. credit period	15980	125.806	98.028	60.695	100.516	158.682	47546	357.378	852.523	60.858	120.065	228.154	-231.573***	-19.548***
Panel B: Industry-size matched sample														
Assets (mm US\$)	14862	6996.139	15555.960	322.579	1314.107	4832.198	11704	7726.231	16225.690	405.058	1530.830	5787.526	-730.092***	-216.723***
Revenue (mm US\$)	14860	1373.037	3120.705	65.850	283.514	982.540	11702	1371.360	2713.651	52.337	270.101	1176.526	1.677	13.413*
Sales Growth (%)	14716	4.417	19.805	-5.066	2.462	10.719	10976	7.062	34.442	-5.631	2.902	12.512	-2.646***	-0.440***
Cash	14861	455.985	992.932	15.888	79.307	329.011	11703	620.962	1261.015	29.972	132.137	485.864	-164.977***	-52.830***
Cash and short term inv.	14861	582.657	1355.169	17.921	93.000	369.000	11703	773.909	1561.362	36.325	171.053	608.054	-191.252***	-78.053***
Leverage	14862	0.480	0.193	0.337	0.488	0.609	11704	0.574	0.299	0.356	0.575	0.750	-0.094***	-0.087***
ROA EBITDA	14862	0.009	0.044	-0.002	0.015	0.031	11704	-0.010	0.076	-0.020	0.011	0.026	0.018***	0.005***
ROA EBIT	14862	-0.002	0.045	-0.015	0.005	0.022	11704	-0.019	0.076	-0.030	0.000	0.017	0.018***	0.005***
ROA Net Income	14862	-0.007	0.044	-0.018	0.001	0.014	11704	-0.027	0.076	-0.035	-0.006	0.009	0.019***	0.006***
PM EBIT	14747	0.051	0.390	0.036	0.112	0.197	11198	-1.014	6.520	-0.028	0.100	0.203	1.066***	0.012***
PM EBITDA	14747	-0.019	0.422	-0.009	0.067	0.140	11198	-1.132	6.795	-0.090	0.053	0.140	1.112***	0.014***
PM Net Income	14747	-0.050	0.431	-0.022	0.045	0.104	11198	-1.204	6.935	-0.125	0.025	0.094	1.154***	0.020***
Total asset turnover	14860	0.240	0.145	0.130	0.212	0.321	11702	0.208	0.168	0.093	0.169	0.274	0.032***	0.042***
Fixed asset tumover	14832	1.974	2.396	0.599	1.244	2.255	11614	2.335	3.868	0.487	1.085	2.225	-0.362***	0.159***
Avg. collection period	13952	215.355	112.741	144.679	209.487	270.271	10267	235.163	148.741	139.769	219.343	297.834	-19.808***	-9.856***
Avg. credit period	14698	126.967	102.360	59.502	100.146	159.403	11086	174.731	201.228	67.071	118.019	196.560	-47.765***	-17.873***

Notes: Panel A presents descriptive statistics for the full sample dataset of SC and NSC firms in the US from 2018 to 2022. Panel B presents descriptive statistics for the industry-size-matched dataset (with replacement) of SC and NSC firms in the US from 2018 to 2022. Data for both panels are sourced from Compustat North America database and Refinitiv. Monetary values are also expressed in 2022 constant price using CPI and in million USD, continuous variables are winsorized at 2.5% at each tail to reduce the impact of outliers, ***, **, and * represent statistical significance at 1, 5, and 10% respectively.

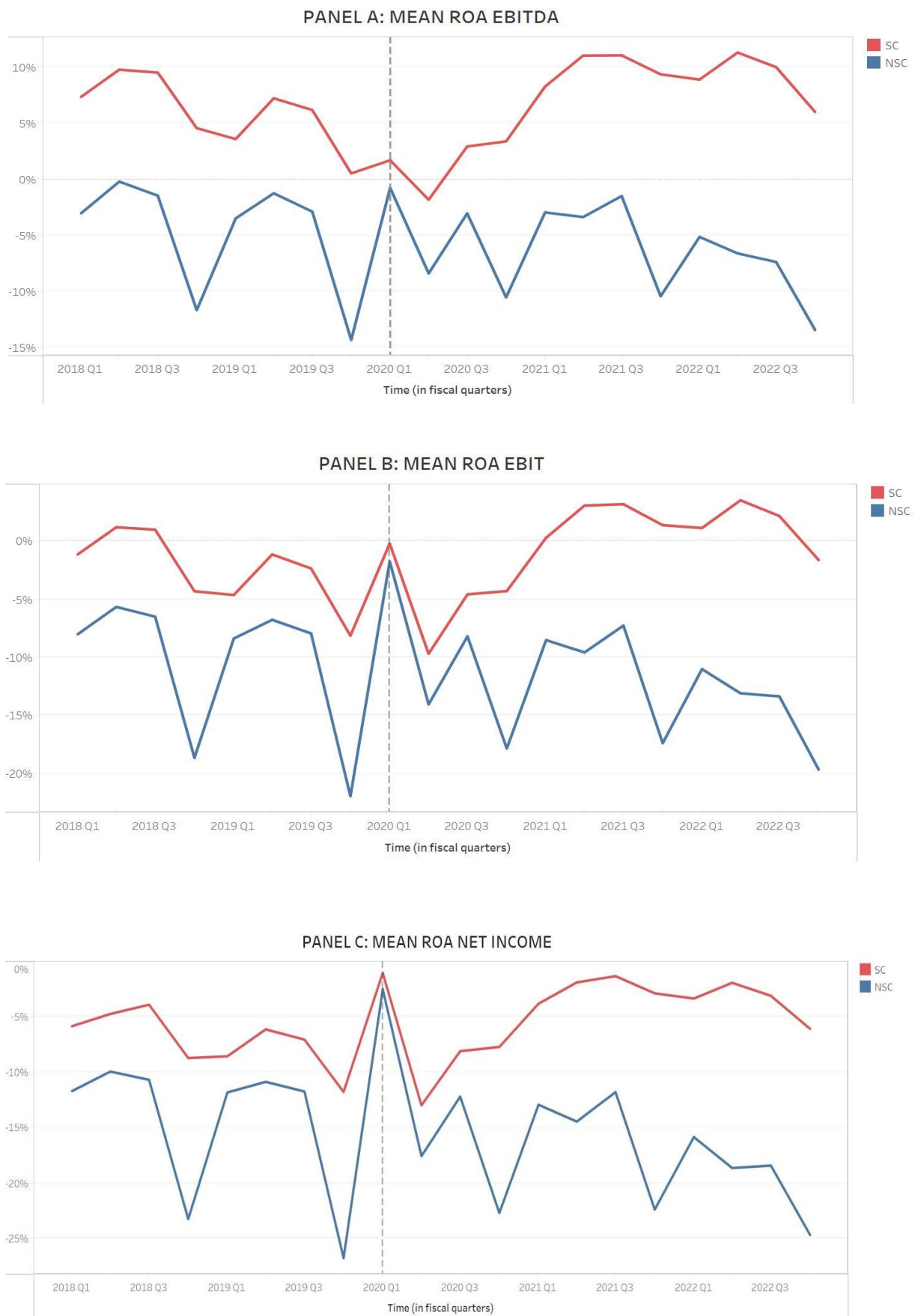


Figure 2: Operating performance by fiscal quarter.

The additional independent control variables in our finalized model were selected after comprehensive exploratory research, in which a range of different firm-specific variables were studied. Out of all the profitability, liquidity, and efficiency ratios, the following variables were finalized as they affect firm operational performance, proven by previous literature (Akguc & Al Rahahleh, 2018): *ln(total asset)* is the natural logarithm of total assets. *Sales growth* is the percentage increase in revenue computed between the current and last quarter's revenue. *Leverage* is the use of debt to finance a firm's assets and generate returns (total debt scaled by assets). *Fixed-asset turnover* shows how efficient a firm is in generating sales from its fixed assets (revenue divided by net fixed assets). The model also includes fiscal quarter dummies to control for potential time-specific variation between different quarters within a fiscal year. We also cluster standard errors at firm level (gvkey) and control for fiscal quarter fixed effects.

5. Main empirical results

5a. Multivariate regression analysis

Table 2: Panel B presents the regression results for the industry-size matched (with replacement) dataset, estimating the difference in the impact of the pandemic on SC vs. NSC firms operating performance. In this section, we used the pooled ordinary least squares regression (OLS) method and clustered for standard errors at firm level. Looking at the relationship between operating performance and the COVID variable, an average firm experienced a significant decrease in its profitability during the pandemic. The COVID variable coefficients in all models are negative and statistically significant at the 1% level. Additionally, the SC dummy exhibits a positive and highly statistically significant correlation to operating profitability in all our models. In models 1 to 3, the average SC firm is 1.22% (ROA EBIT) to 1.29% (ROA EBITDA) more profitable than NSC firms, confirming our previous univariate analysis. When comparing the impact of COVID on SC vs. NSC firms using the COVxSC interaction dummy, SC firms are generally more profitable than their NSC counterparts post-pandemic. The average SC firm can be seen to be 0.33% (ROA EBIT) to 0.34% (ROA EBITDA) more profitable than NSC firms post-pandemic. These coefficients are also statistically significant at 1%, further supporting our main hypothesis. Moreover, the results also show that operational profitability is positively correlated to firm size (total assets), sales growth (only when ROA is used as the profitability measure), and fixed asset turnover but is negatively correlated to leverage.

Now that we have seen how SC firms are statistically more profitable than NSC firms, we would like to evaluate SC firms' higher profitability through ROA's main components: PM and ATO. From the OLS regression results (Table 2), the difference in PM for the SC coefficient is positive and highly statistically significant. This confirms our univariate findings as the average SC firm has higher PM than the average NSC firm. Similarly, in the univariate results (Table 1: Panel B), the average SC firm is estimated to have a 3.2% higher ATO than its NSC counterpart; this difference in means is also statistically significant at 1%. These results show how higher PM and ATO significantly contribute to ROA maximization, consistent with the two-step Du-Pont system. Moreover, SC firms may have higher PM than their NSC counterparts due to their lower leverage. Lower leverage is directly correlated with the higher PM as when a firm holds less debt, they incur less interest expense, resulting in higher net profits. As the model suggests, leverage is negatively correlated with operational profitability and, in Table 1: Panel B, SC firms can be seen to have 9.4% lower leverage than NSC firms on average. An average SC firm also collects its receivables around 20 days earlier than its average NSC counterpart. Therefore, these results confirm previous literature on how SC firms are more operationally profitable than their NSC counterparts.

5b. Median regression analysis

We carried out quantile (median) regression on the same multivariate model for additional consolidation of our previous findings from the mean-level regression analysis using the pooled OLS method. The baseline model was estimated with controls for the same firm-relevant variables and

Table 2. Baseline operating profitability regressions.

	ROA EBITDA (1)	ROA EBIT (2)	ROA Net Income (3)	PM EBITDA (4)	PM EBIT (5)	PM Net Income (6)
Panel A: full sample						
COVID	-0.0208*** (0.00314)	-0.0216*** (0.00316)	-0.0204*** (0.00304)	-0.919*** (0.335)	-1.026*** (0.351)	-1.062*** (0.360)
Shariah Compliant	0.0196*** (0.00161)	0.0190*** (0.00162)	0.0193*** (0.00159)	1.959*** (0.160)	2.066*** (0.167)	2.112*** (0.171)
COVID x Shariah Compliant	0.00447*** (0.00131)	0.00440*** (0.00133)	0.00413*** (0.00131)	0.643*** (0.130)	0.671*** (0.137)	0.703*** (0.141)
Ln (total assets)	0.0159*** (0.000455)	0.0160*** (0.000453)	0.0165*** (0.000465)	0.822*** (0.0468)	0.852*** (0.0489)	0.887*** (0.0505)
Sales Growth	4.73e-05*** (1.22e-05)	4.57e-05*** (1.21e-05)	2.90e-05** (1.22e-05)	0.00655*** (0.00169)	0.00698*** (0.00176)	0.00689*** (0.00181)
Leverage	-0.0260*** (0.00335)	-0.0304*** (0.00334)	-0.0469*** (0.00350)	2.336*** (0.367)	2.447*** (0.383)	2.225*** (0.398)
Fixed Asset Turnover	0.00193*** (0.000219)	0.00224*** (0.000221)	0.00219*** (0.000222)	0.297*** (0.0185)	0.315*** (0.0194)	0.327*** (0.0200)
Fiscal Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.105*** (0.00423)	-0.113*** (0.00421)	-0.116*** (0.00418)	-9.406*** (0.550)	-9.845*** (0.575)	-10.09*** (0.587)
N	62,599	62,599	62,599	62,243	62,243	62,243
Adjusted R-Squared	0.2258	0.2266	0.2458	0.0911	0.0909	0.0907
Panel B: industry-size matched sample						
COVID	-0.0198*** (0.00333)	-0.0211*** (0.00335)	-0.0206*** (0.00324)	-0.811*** (0.183)	-0.901*** (0.191)	-0.924*** (0.194)
Shariah Compliant (SC)	0.0129*** (0.00225)	0.0122*** (0.00227)	0.0126*** (0.00224)	0.894*** (0.213)	0.936*** (0.222)	0.968*** (0.226)
COVID x Shariah Compliant	0.00343* (0.00176)	0.00331* (0.00179)	0.00330* (0.00176)	0.509*** (0.142)	0.535*** (0.148)	0.541*** (0.151)
Ln (total assets)	0.0110*** (0.000592)	0.0114*** (0.000592)	0.0115*** (0.000606)	0.256*** (0.0409)	0.265*** (0.0424)	0.271*** (0.0432)
Sales Growth	0.000117*** (2.17e-05)	0.000113*** (2.15e-05)	8.90e-05*** (2.05e-05)	-0.00283 (0.00206)	-0.00269 (0.00215)	-0.00271 (0.00218)
Leverage	-0.0135*** (0.00493)	-0.0174*** (0.00494)	-0.0279*** (0.00509)	1.690*** (0.495)	1.781*** (0.515)	1.743*** (0.525)
Fixed Asset Turnover	0.00170*** (0.000272)	0.00226*** (0.000276)	0.00214*** (0.000271)	0.110*** (0.0205)	0.121*** (0.0213)	0.126*** (0.0217)
Fiscal Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0698*** (0.00593)	-0.0808*** (0.00588)	-0.0829*** (0.00579)	-3.518*** (0.630)	-3.725*** (0.653)	-3.813*** (0.663)
N	25,620	25,620	25,620	25,570	25,570	25,570
Adjusted R-squared	0.1783	0.185	0.1947	0.0522	0.0529	0.0527
Notes: This table present OLS regressions results from the full sample dataset in Panel A and the industry-size-matched dataset (with replacement) in Panel B. The regression results show the impact of basic firm characteristics on operating profitability of SC vs. NSC firms in the US from 2018-2022. COVID is a dummy variable that takes a value of one for the post-covid period and zero for the pre-covid period. SC is a dummy variable that takes a value of one for SC firms and zero for NSC firms. COVID x SC is a dummy that takes a value of 1 for SC firms post-Covid and 0 otherwise. The data was sourced using Compustat North American database. All models are controlled for fiscal quarter fixed effects and the t-statistics (reported in parenthesis) are computed using standard errors clustered at firm level. All monetary values are expressed in 2022 constant price using CPI, continuous variables are winsorized at 2.5% at each tail to reduce the impact of outliers, ***, **, and * represent statistical significance at 1, 5, and 10% respectively.						

Table 3. Median operating profitability regressions.

	ROA EBITDA (1)	ROA EBIT (2)	ROA Net Income (3)	PM EBITDA (4)	PM EBIT (5)	PM Net Income (6)
<i>Panel A: full sample</i>						
COVID	-0.0148*** (0.00178)	-0.0173*** (0.00179)	-0.0160*** (0.00183)	-0.0552*** (0.0118)	-0.0817*** (0.0109)	-0.0809*** (0.00935)
Shariah Compliant	0.00887*** (0.00111)	0.00899*** (0.00116)	0.00898*** (0.00112)	0.0116* (0.00628)	0.0299*** (0.00567)	0.0379*** (0.00522)
COVID x Shariah Compliant	0.00589*** (0.000873)	0.00654*** (0.000901)	0.00631*** (0.000830)	0.0311*** (0.00449)	0.0313*** (0.00420)	0.0298*** (0.00385)
Ln (total assets)	0.00810*** (0.000359)	0.00850*** (0.000340)	0.00829*** (0.000342)	0.0497*** (0.00226)	0.0465*** (0.00212)	0.0421*** (0.00196)
Sales Growth	8.45e-05*** (1.19e-05)	7.54e-05*** (1.05e-05)	5.29e-05*** (9.35e-06)	0.000357*** (9.35e-06)	0.000389*** (7.18e-05)	0.000271*** (7.18e-05)
Leverage	-0.00669*** (0.00233)	-0.0111*** (0.00254)	-0.0219*** (0.00255)	-0.0676*** (0.0144)	-0.0508*** (0.0133)	-0.0940*** (0.0131)
Fixed Asset Turnover	0.00114*** (0.000142)	0.00170*** (0.000155)	0.00165*** (0.000149)	0.00104 (0.000755)	0.00477*** (0.000659)	0.00529*** (0.000635)
Fiscal Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0533*** (0.00323)	-0.0660*** (0.00324)	-0.0647*** (0.00314)	-0.223*** (0.0210)	-0.287*** (0.0207)	-0.267*** (0.0195)
N	62,599	62,599	62,599	62,243	62,243	62,243
R-Squared	0.218	0.219	0.239	0.050	0.061	0.057
<i>Panel B: industry-size matched sample</i>						
COVID	-0.0141*** (0.00246)	-0.0156*** (0.00238)	-0.0149*** (0.00208)	-0.0356*** (0.0117)	-0.0605*** (0.00947)	-0.0607*** (0.00840)
Shariah Compliant (SC)	0.00325** (0.00132)	0.00384*** (0.00136)	0.00407*** (0.00128)	0.00449 (0.00666)	0.00924 (0.00580)	0.0118** (0.00507)
COVID x Shariah Compliant	0.00418*** (0.00109)	0.00462*** (0.00116)	0.00451*** (0.00104)	0.0150*** (0.00494)	0.0180*** (0.00490)	0.0185*** (0.00405)
Ln (total assets)	0.00549*** (0.000392)	0.00605*** (0.000406)	0.00562*** (0.000377)	0.0372*** (0.00198)	0.0329*** (0.00188)	0.0272*** (0.00168)
Sales Growth	0.000164*** (1.80e-05)	0.000143*** (1.88e-05)	0.000113*** (1.64e-05)	0.000688*** (7.34e-05)	0.000645*** (8.28e-05)	0.000523*** (6.86e-05)
Leverage	-0.00817*** (0.00314)	-0.00992*** (0.00315)	-0.0171*** (0.00325)	-0.124*** (0.0167)	-0.0876*** (0.0150)	-0.102*** (0.0136)
Fixed Asset Turnover	0.00107*** (0.000174)	0.00178*** (0.000204)	0.00164*** (0.000169)	-0.00230*** (0.000823)	0.00202** (0.000839)	0.00209*** (0.000564)
Fiscal Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0283*** (0.00388)	-0.0446*** (0.00387)	-0.0428*** (0.00377)	-0.0941*** (0.0190)	-0.143*** (0.0186)	-0.123*** (0.0165)
N	25,620	25,620	25,620	25,570	25,570	25,570
R-squared	0.164	0.174	0.183	0.007	0.013	0.011

Notes: This table present median regressions results from the full sample dataset in Panel A and the industry-size-matched dataset (with replacement) in Panel B. The regression results show the impact of basic firm characteristics on operating profitability of SC vs. NSC firms in the US from 2018-2022. COVID is a dummy variable that takes a value of one for the post-covid period and zero for the pre-covid period. SC is a dummy variable that takes a value of one for SC firms and zero for NSC firms. COVID x SC is a dummy that takes a value of 1 for SC firms post-Covid and 0 otherwise. The data was sourced using Compustat North American database. All models are controlled for fiscal quarter fixed effects and the t-statistics (reported in parenthesis) are computed using standard errors clustered at firm level. All monetary values are expressed in 2022 constant price using CPI, continuous variables are winsorized at 2.5% at each tail to reduce the impact of outliers, ***, **, and * represent statistical significance at 1, 5, and 10% respectively.

fiscal quarter fixed effects while clustering for standard errors at firm level. We performed this as an additional check to prove that our results still hold at the median level, as displayed in Table 3. Based on the industry-size matched (with replacement) in Panel B, the regression output confirms our baseline hypothesis that a median SC firm operates more efficiently than a median NSC firm. This median difference is 0.33% to 0.41% when controlling for other firm-relevant variables and quarterly fixed effects. This can also be seen for all definitions of ROA and PM as the SC variable is strictly positive. All of these results display statistical significance at the 1% level. Additionally, the COVID variable is negative and statistically significant for all definitions which confirms our belief that the pandemic negatively impacted businesses' operational profitability. The interaction dummy between SC and COVID also provides some useful insights that display strong statistical significance. The consistently positive COVxSC variable shows that an SC firm operating in a post-pandemic era will have a higher ROA and PM (in terms of EBITDA, EBIT, and NI). This indicates that SC firms' operations were least negatively impacted by the unexpected pandemic, which makes them more resilient. Shifting from all other possible combinations at the median to being an SC firm in the post-COVID era is expected to increase ROA by 0.42% to 0.46%. Moreover, the results also indicate that operational profitability is positively related to sales growth and fixed asset turnover, while inversely related to the level of leverage for a particular firm within the two-digit SIC (industry).

We can again analyze ROA through its components PM and ATO at the median level. As expected, the univariate analysis in Table 1: Panel B shows that the median ATO for SC firms is 4.2% higher than the median ATO for NSC firms; statistically significant at 1%. Similarly, SC firms are also 1.2% more profitable (in terms PM calculated using net income) than their conventional counterparts at the median. For all regressions, we can safely conclude that PM and ATO contribute to SC firms earning a higher ROA than NSC firms, with ATO having the most contribution. Moreover, SC firms may have higher PM than their NSC counterparts due to their lower leverage. In Table 1, panel B, SC firms can be seen to have 8.7% lower leverage than NSC firms at the median. A median SC firm also has higher sales growth and collects its receivables approximately 9 days earlier than a median NSC firm, which demonstrates efficient accounts receivable management and improved liquidity. These statistics at the median confirm that SC firms are overall more operationally efficient than NSC firms.

6. Additional robustness tests

6a. Industry-size matched without replacement sample analysis

Robustness tests were carried out using various methodologies to determine whether our initial results hold using different analytical approaches. This forms an important addition to our exploratory research as we replicate our initial baseline regression model on datasets constructed using different matching procedures. Concerns may arise regarding the “with replacement” dataset because if an SC firm's closest NSC match is already matched to another SC firm in the dataset, this NSC firm is no longer considered a matching option for the current SC firm. This can cause two possible inefficiencies. Firstly, not every SC firm may be paired with its best (closest in range) alternative if that NSC firm is already paired with another SC firm. Secondly, some SC firms may be left completely unmatched if all of their potential NSC matching options are already taken by other SC firms. We alleviate this concern by constructing a “without replacement” dataset that uses a two-fold range of recent asset size for matching, with the flexibility of each NSC to be matched to multiple SC firms. SC-NSC pairs were formed by selecting the firms that had the smallest difference between their respective recent asset size. The two-fold range was used for consistency purposes since the main “with replacement” dataset was also constructed on a two-fold range. After merging the matched pairs to the full sample, our final industry-size-matched dataset (without replacement) comprised 24986 observations for 1496 distinct firms. These included 9324 observations for 644 NSC firms and 15662 observations for 852 SC firms as some NSC firms are matched to more than one SC firm.

Our estimated regression model was kept constant as the one used for the “with replacement” dataset, with ROA and PM as the dependent variables (in terms of EBITDA, EBIT, and NI). We also controlled

for other firm characteristics, quarterly fixed effects, and clustered standard errors at the firm level (gykey). The OLS regression results (Table 5: Panel A in the appendix) confirm our prior results as the SC variable is positive and statistically significant for all definitions of ROA (1.22% to 1.29%) and PM at 1% significance. This proves that SC firms, on average, have better profitability and efficiency of operations than NSC firms. This finding can be further backed up by the median regression output (Table 5: Panel B in the appendix). The SC variable stays consistently positive and also displays statistical significance for all ROA definitions (0.26% to 0.37%). Furthermore, we also notice statistically significant (at 1%) positive coefficients for the COVxSC interaction dummy variable. This confirms our hypothesis that SC firms in the post-pandemic era operate the most productively as the ROA ranges from 0.40% to 0.44%. It is also established that post-pandemic SC firms are also the most profitable at the median, as the PM (ranging from 1.42% to 1.73%) shows positive coefficients significant at 1%. Overall, our results hold even in the case of using an industry-size-matched dataset with unequal numbers of unique SC and NSC firms.

Our aim in carrying out variations in experimental procedures is to confirm our original findings persist in the case of different matching methodologies. The “without replacement” matching dataset is one such example that further validates our research results so we can confidently reject the null hypothesis.

6b. Endogeneity of firm’s Shariah-compliant status

Despite the finalized regression model, our SC dummy can potentially be endogenous. Whereby, external factors may influence a firm’s decision to be Shariah-compliant or not. If this is the case, then our estimated SC dummy would be inconsistent. To address this concern, we used the two-stage instrumental variable (2SLS) approach. In which, we used the percentage of SC firms within the 2-digit SIC industry as the instrument addressing the potentially endogenous SC dummy. We assume this instrument from the support of the “peer pressure effect”; the more SC firms there are in an industry, the more likely that a firm in this industry will be SC (Akguc & Al Rahahleh, 2020, p. 17). We also assume that this instrument is not correlated to any other independent variables or the error term in the model.

Table 6 presents the estimation results from our 2SLS regression. In the first stage, we estimated a probit model with SC as the main dependent variable and the remaining control variables as the same as in model 1. We later saved the predicted probabilities from this regression so it can be used as a proxy for the second stage. As the estimation results show, our instrument is positive and statistically significant at 1%. This supports our hypothesis that as the proportion of SC firms in an industry increases, the likelihood that firms in this industry are SC will also increase. In the second column of Table 6, we also computed the marginal effects of all of the variables in the first stage model at the mean level. The instrument’s coefficient shows that as the number of SC firms increases by 1%, the probability that a firm will be SC increases by 0.878%; statistically significant at 1%. Looking at the p-value of 0.00 for the Durbin-Wu-Hausman test, we can also reject the hypothesis that the SC dummy is exogenous. Therefore, our 2SLS estimation is more efficient than OLS. As mentioned earlier, we used the predicted probabilities from the first stage as a proxy for the SC dummy in the second stage. The results in the second column show that the coefficient for the SC dummy is positive and statistically significant for all definitions of ROA at 1%. Based on ROA, the average SC firm is around 5.78 to 6.09% more profitable than NSC firms. Looking at the COVxSC interaction dummy, the coefficient is positive and highly statistically significant for all definitions of ROA. The average SC firm is also 1.01 (ROA NI) to 1.17% (ROA EBITDA) more profitable than the average NSC after the pandemic. Overall, this further supports our main finding that SC firms are more profitable than their NSC counterparts, even after the pandemic.

6c. Propensity score matching

To resolve another possible concern over the credibility of our findings due to sample selection in the full-sample dataset, we conducted a propensity score matching. This was carried out to resolve any concerns over the endogeneity of the SC variable with firms selecting themselves as SC or NSC. We used a probit model to estimate propensity scores, which included the SC dummy as the main dependent variable (taking the value of 0 for NSC firms and a value of 1 for SC firms). This model controlled for the natural logarithm of total assets, sales growth, leverage, fixed asset turnover, and firm fiscal quarter fixed effects. Standard errors were clustered at the firm level by using the gvkey variable. We use the natural logarithm of total assets because it is a stable indicator of firm size which directly impacts firm efficiency. It is also essential to consider sales growth in the model due to its highly positive correlation with firms' operating performance. Propensity scores derived from the estimated probit model were used to conduct nearest neighbor matching of SC to NSC firms using a caliper of 0.05. This means that SC firms were matched with NSC firms based on the closest propensity scores between the two firms, with the difference not exceeding 0.05. We label it as a form of “without replacement” matching because a particular SC firm could be matched with multiple NSC firms. Subsequently, the final propensity score matched sample contained a total of 4175 distinct firms, which included 10063 observations for 878 SC firms and 10063 observations for 3297 NSC firms. The equality in observation numbers verifies the accuracy of the propensity-matching process. Panels A and B (in Figure 3) also display how the propensity score matched sample is more comparable between SC and NSC firms instead of the full sample.

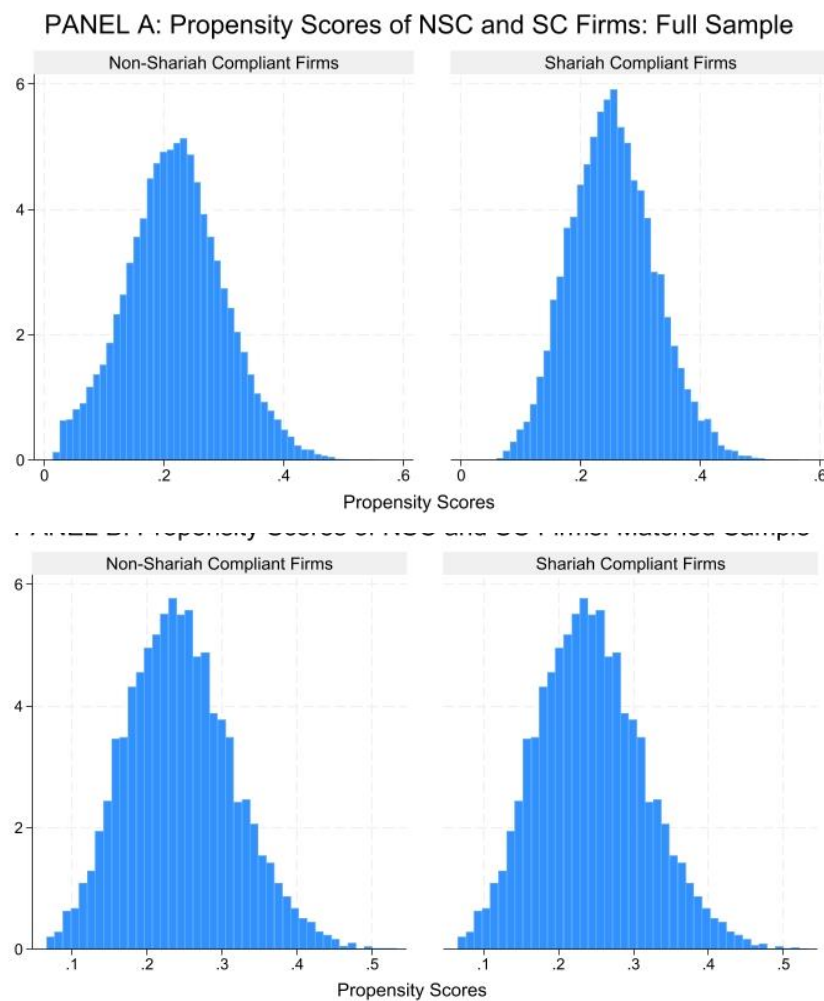


Figure 3: Propensity score distribution.

Table 4: Propensity score matching: SC-NSC firms mean and median profitability differences.

	ROA EBITDA (1)	ROA EBIT (2)	ROA Net Income (3)	PM EBITDA (4)	PM EBIT (5)	PM Net Income (6)
Mean (SC-NSC)	0.032113***	0.0306663***	0.0307127***	2.2413052***	2.3640304***	2.4391816***
Median (SC-NSC)	0.0096758***	0.0111742***	0.0118338***	-0.0010863	0.0117663***	0.021242***

Notes: This table shows the mean and median difference for measures of operational efficiency (different definitions of ROA and PM) for SC and NSC firms in US for the period 2018–2022 using a propensity score-matched sample. Propensity scores come from a probit model, where the dependent variable is the SC dummy, that takes a value of one for SC firms and zero for NSC firms. Control variables are ln(total assets), sales growth, and leverage, which includes controlling for fiscal quarter fixed effects and clustering standard errors at firm level. Matching is done using propensity scores based on the nearest neighbor matching method using a caliper of 0.05. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively. All variables are winsorized at 2.5% at each tail to reduce the potential impact of outliers.

Univariate test results on the pps-matched sample confirm our previous findings as shown in Table 4. SC firms are, on average, shown to have higher operational profitability than NSC firms (3.07% to 3.21%) for all definitions of ROA at the 0.01 level. Running the regression at the median level also gives a statistically significant range for all definitions of ROA at the 0.01 level (from 0.96% to 1.18%). OLS regression output for PM is also significant and supports our underlying claim that SC firms are on average more profitable than NSC firms due to the structure followed under Shariah compliance. PM at the median also has positive coefficients and statistical significance except for PM calculated using EBITDA. However, it does not impact our results because the output does not carry any significance. Therefore, our propensity score matching resolves any concerns about the potential endogeneity of the SC variable because the multivariate regression output (Table 7 in appendix) supports our hypothesis. It confirms our previous results by using a more comparable sample (matched based on propensity scores) while accounting for other firm-relevant factors, such as sales growth, firm size, fixed asset turnover, and quarterly fixed effects.

7. Limitations

Conducting our Shariah compliance (SC) classification using data from Refinitiv Workspace means that this classification is static since the function only represents firms' current SC status. This also means that we had to assume that firms' SC status remains constant throughout our study period. Therefore, we cannot evaluate the difference in COVID-19's impact if firms were to change their SC status on a yearly or quarterly basis. To do this, we would have to conduct our own manual screening, both quantitatively (using the financial criteria) and qualitatively (based on the permissibility of firms' core business activities), as an additional robustness test. Additionally, since we assume that firms' SC status remains constant throughout our study, we also had to assume that SC-NSC pairs remain constant as well. However, this may not be the case if firms' SC status were to fluctuate in reality. We expect very few companies to change their SC status during our short sample from 2018 to 2022, and given our very large sample size, our results are very unlikely to change.

Moreover, correlating a firm's SC status with the basis of religious motivations can also be ambiguous because there is a difference between a firm being SC vs. SB (Shariah-based). Some SC firms might not intentionally operate following Shariah principles but are still classified as SC if they are found to be compliant with the criteria. These firms might internally adapt existing conventional strategies that make them operationally profitable, which also happens to be in accordance with Shariah. Alternatively, SB firms are fully governed by Shariah in their operations. In the US sample we use in our study, no firm is expected to be SB. In fact, determining SB status of any firm would be very difficult unless we conduct a detailed survey of CEOs, particularly in countries where Islam is the main religion.

Additionally, basing our study only on US firms' with a total quarterly asset size greater than USD 5 million also posed some limitations. Due to the asset size restriction, our findings cannot be extrapolated to see the effect of Shariah compliance on smaller firms and their resilience during economic downturns. Therefore, this presents an interesting scope for future research in the literature. Moreover, while the US economy is strongly correlated with the global economy due to its status as the largest economy worldwide (Kose et al., 2017), our findings may still not be applicable to certain countries. Especially

in the context of COVID-19, different countries may have experienced the maximum impact of the pandemic at varying times and might take distinct durations to recover from this impact. Therefore, due to the unique economic patterns a country experiences, its timeline for the “COVID-hit” quarter may vary. This period may extend longer than one quarter or some countries may encounter multiple waves in which the pandemic significantly impacted their economy.

8. Implications of findings

Our findings hold practical implications for future research, which can add to our current analysis. Adding other important variables related to firm characteristics, such as inventory turnover, may improve the research model. This is because inventory is an important part of firm structure that is directly linked to operational performance. Further, steps may be taken to overcome the limitation of using static data. This can also include analyzing which firms changed their Shariah-compliant status during the research period. Lastly, additional Shariah-compliance screening may be carried out to test for non-Shariah-compliant words included in each firm’s business description. This will ensure that SC-NSC categories are based on both theoretical and mathematical (ratio criterion) models.

Overall, our results can be utilized by investors when making decisions about market portfolios. Constructing a portfolio with a greater weightage of Shariah-compliant stocks will strengthen the probability of gaining higher-than-average portfolio returns during financial crises. This is because conventional firms display greater risk and instability in such times as proven by our analysis. Hence, portfolios consisting of more Shariah-compliant stocks will be less negatively impacted by future unexpected crises similar to the COVID pandemic. In terms of social implications, we can clearly see the conservative nature of the Shariah-compliance screening criterion used for SC-NSC categorization; this makes SC firms more stable and resilient.

9. Challenges

When developing the COVID variable, we faced a challenge for companies with different fiscal year ends since their monthly distribution of quarters were different from the typical calendar year quarters. Our dataset contained companies having a fiscal year end month for all 12 months. Therefore, for each fiscal-year end month, we had to construct a separate timeline to define the “COVID-hit” quarter (quarter including March 2020) and classify the pre and post-COVID quarters respectively. If March 2020 fell on a fiscal quarter, we removed that specific quarter to have a clean test. For example, if the fiscal month end for a company was March 31, then the last quarter for that company includes 2 non-Covid months (January and February) and one Covid month (March). In this specific case, we excluded quarter 4 for this company from our analysis.

While constructing the industry-size matched with replacement dataset, we faced a few challenges in filtering unique SC-NSC matched pairs. Our preliminary dataset contained SC firms matched with multiple NSC firms, and we required that each SC firm was matched only with its closest NSC firm not previously paired in the same industry. Initially, we experimented with multiple filtering algorithms in Stata, however, none met our criteria effectively. Therefore, we turned to Python to leverage the combination of data structures including sets, loops, and dictionaries. Using a loop, we were able to simultaneously track the matched SC-NSC pairs while filtering the dataset, eventually achieving the desired results.

Another coding issue was dealing with the non uniqueness in the company identifier variable when trying to merge the “industry-size matched sample without replacement” to the main dataset. Since multiple NSC firms were matched with one or more SC firms, repeated observations existed of certain NSC firms. Therefore, Stata could not execute the merging between these datasets: dataset with SC-NSC pairs and the dataset with quarterly firm observations. Using various online resources, we explored how to approach an appropriate merging strategy in Stata. We decided to create two subsets of the SC-NSC pairs dataset, one with all unique SC firm observations and the other including only the first

observation of the matched NSC firms. We then merged these datasets separately to the main file so the issue of non uniqueness was eliminated.

Throughout conducting our analysis, we identified certain factors that we had to modify and backtrack our code to improve the accuracy of the dataset. This included dropping some fiscal year observations that were beyond the scope of our analysis (2018 to 2022) and recalculating the definitions of some variables carrying abnormal observations. Additionally, we also had to re extract our main dataset from our original sources (Refinitiv Workspace and Compustat) a few times because of overlooking key aspects of data management. Although these seemed like minor oversights, they taught us the basics of research work and data handling. We followed a strategy to recheck our sample dataset after running each section of code to ensure that it is functioning properly.

10. Conclusion

This paper is the first to analyze the difference in the impact of COVID-19 on Shariah-compliant (SC) versus non-Shariah-compliant (NSC) firms' operating performance. By using data extracted from Refinitiv Workspace and Compustat North American database, we empirically examined the effect of Shariah compliance on US firms' profitability from 2018 to 2020.

On average, we found that the pandemic caused a significant decrease in firm profitability, however, this drop in profitability is much less for SC firms. SC firms are more profitable than their conventional counterparts, even post-pandemic. This difference in profitability is also proven to be statistically significant and robust when evaluated using multiple profitability definitions and methodologies estimating the regression model i.e. OLS and median regression. Our regression model controlled for multiple firm-specific variables affecting operational profitability as well as fiscal quarter fixed effects. To account for the potentially endogenous SC dummy variable, we also conducted the 2SLS regression method using the percentage of the number of SC firms in an industry as the instrument. We found that our results are robust even when evaluated using the 2SLS regression method, further supporting our main hypothesis.

The higher profitability of SC firms compared to NSC firms during the pandemic can be attributed to their ability to maintain lower costs and operate with greater efficiency. This conclusion is supported by the observation that, on average, SC firms exhibit higher profit margins (PM) and asset turnover ratios (ATO) in comparison to NSC firms. Therefore, our findings provide valuable insights to investors and business owners seeking to understand the dynamic and influence of religious motivations and principles on firm performance in the context of global crises like COVID-19. Specifically, business owners can leverage these insights by experimenting with the effect of incorporating Shariah compliance principles into their business practices, aiming to enhance their firm's resilience during dynamic market conditions. These findings may also facilitate investors' decisions to diversify their market portfolio risk by considering SC options as SC firms have demonstrated to be more dependable than NSC firms during economic downturns.

11. References

- Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI). (2015). Shari'ah Standards, Manama, Bahrain.
- Almustafa, H., Nguyen, Q. K., Liu, J., & Dang, V. C. (2023). The impact of covid-19 on firm risk and performance in MENA countries: Does National Governance Quality matter? *PLOS ONE*, 18(2). <https://doi.org/10.1371/journal.pone.0281148>
- Al Rahahleh, N., Akguc, S., & Abalala, T. (2021). Dow Jones islamic index firms: How profitable are they? *International Journal of Islamic and Middle Eastern Finance and Management*, 14(3), 463–481. <https://doi.org/10.1108/imefm-09-2019-0379>
- Alsamhi, M. H., Al-Ofairi, F. A., Farhan, N. H. S., Al-ahdal, W. M., & Siddiqui, A. (2022). Impact of covid-19 on firms' performance: Empirical evidence from India. *Cogent Business & Management*, 9(1). <https://doi.org/10.1080/23311975.2022.2044593>
- Akguc, S., & Al Rahahleh, N. (2018). Effect of shariah compliance on operating performance: Evidence from GCC countries. *Emerging Markets Finance and Trade*, 54(12), 2874–2896. <https://doi.org/10.1080/1540496x.2018.1425991>
- Akguc, S., & Al Rahahleh, N. (2020). Shariah compliance and investment behavior: Evidence from GCC countries. *Emerging Markets Finance and Trade*, 57(13), 3766–3791. <https://doi.org/10.1080/1540496x.2019.1706164>
- Asker, J., Farre-Mensa, J., & Ljungqvist, A. (2014). Corporate Investment and Stock Market Listing: A puzzle? *Review of Financial Studies*, 28(2), 342–390. <https://doi.org/10.1093/rfs/hhu077>
- Bahrini, R., & Filfilan, A. (2020). Impact of the novel coronavirus on Stock market returns: Evidence from GCC countries. *Quantitative Finance and Economics*, 4(4), 640–652. <https://doi.org/10.3934/qfe.2020029>
- Bhutto, N. A., Khan, S., Khan, U. A., & Matlani, A. (2022). The impact of covid-19 on Conventional and Islamic stocks: Empirical evidence from Pakistan. *Journal of Economic and Administrative Sciences*. <https://doi.org/10.1108/jeas-09-2021-0180>
- Centers for Disease Control and Prevention . (2023, March 15). *CDC Museum Covid-19 Timeline*. Centers for Disease Control and Prevention. <https://www.cdc.gov/museum/timeline/covid19.html>
- Cheong, C. W. H. (2021). Risk, resilience, and Shariah-compliance. *Research in International Business and Finance*, 55, 101313. <https://doi.org/10.1016/j.ribaf.2020.101313>
- Consumer price index for all urban consumers: All items in U.S. city average. FRED. (2023, July 12). <https://fred.stlouisfed.org/series/CPIAUCSL>
- De Vito, A., & Gomez, J.-P. (2020). Estimating the COVID-19 cash crunch: Global evidence and policy. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3560612>
- Devi, S., Warasnasih, N. M., & Masdiantini, P. R. (2020). The impact of covid-19 pandemic on the financial performance of firms on the Indonesia Stock Exchange. *Journal of Economics, Business, & Accountancy Ventura*, 23(2). <https://doi.org/10.14414/jebav.v23i2.2313>
- Hasan, Md. B., Mahi, M., Hassan, M. K., & Bhuiyan, A. B. (2021). Impact of covid-19 pandemic on stock markets: Conventional vs. Islamic indices using wavelet-based multi-timescales analysis. *The*

North American Journal of Economics and Finance, 58, 101504.
<https://doi.org/10.1016/j.najef.2021.101504>

Hassan, M. K., Chowdhury, M. I., Balli, F., & Hasan, R. (2022). A note on covid-19 instigated maximum drawdown in Islamic markets versus conventional counterparts. *Finance Research Letters*, 46, 102426. <https://doi.org/10.1016/j.frl.2021.102426>

He, Q., Liu, J., Wang, S., & Yu, J. (2020). The impact of covid-19 on stock markets. *Economic and Political Studies*, 8(3), 275–288. <https://doi.org/10.1080/20954816.2020.1757570>

Kose, M. A., Lakatos, C., Ohnsorge, F., & Stocker, M. (2017). *The Global Role of the U.S. Economy: Linkages, Policies and Spillovers*. <https://doi.org/10.1596/1813-9450-7962>

Kusumahadi, T. A., & Permana, F. C. (2021). Impact of covid-19 on global stock market volatility. *Journal of Economic Integration*, 36(1), 20–45. <https://doi.org/10.11130/jei.2021.36.1.20>

Mazur, M., Dang, M., & Vega, M. (2020). Covid-19 and March 2020 stock market crash. evidence from S&P1500. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3586603>

Nerantzidis, M., Koutoupis, A., Tzeremes, P., Drogalas, G., & Mitskinis, D. (2023). The effects of covid-19 on firms' liquidity: Evidence from the Athens Stock Exchange. *Journal of Business Economics and Management*, 24(1), 155–176. <https://doi.org/10.3846/jbem.2023.18637>

Picard, R. (2021). rangejoin.ado (Version 2.3) [Software]. Available from <http://fmwww.bc.edu/repec/bocode/r/rangejoin.ado>

Raza, M. W., Said, B., & Elshahat, A. (2022). Covid-19 and informational efficiency in Asian Emerging Markets: A Comparative Study of conventional and Shariah-compliant stocks. *International Journal of Islamic and Middle Eastern Finance and Management*, 16(3), 576–592. <https://doi.org/10.1108/imefm-01-2022-0041>

Semenenko, I., & Yoo, J. (2019). Annual reporting, agency costs, and firm valuations. *Journal of Corporate Accounting & Finance*, 31(1), 72–82. <https://doi.org/10.1002/jcaf.22419>

Shear, F., & Ashraf, B. N. (2022). The performance of Islamic versus conventional stocks during the covid-19 shock: Evidence from firm-level data. *Research in International Business and Finance*, 60, 101622. <https://doi.org/10.1016/j.ribaf.2022.101622>

Sukor, M. E., & Abdul Halim, A. (2022). Portfolio optimization of shariah-compliant samples in the USA. *Journal of Islamic Accounting and Business Research*, 14(1), 34–57. <https://doi.org/10.1108/jiabr-10-2021-0278>

12. Appendix

Table 5. Operating profitability regressions on “without replacement” dataset.

	ROA EBITDA (1)	ROA EBIT (2)	ROA Net Income (3)	PM EBITDA (4)	PM EBIT (5)	PM Net Income (6)
<i>Panel A: OLS regression</i>						
COVID	-0.0191*** (0.00351)	-0.0203*** (0.00354)	-0.0198*** (0.00341)	-0.899*** (0.182)	-0.992*** (0.191)	-1.018*** (0.195)
Shariah Compliant	0.0126*** (0.00248)	0.0122*** (0.00250)	0.0129*** (0.00246)	0.819*** (0.230)	0.862*** (0.239)	0.892*** (0.243)
COVID x Shariah Compliant	0.00210 (0.00197)	0.00192 (0.00199)	0.00196 (0.00195)	0.535*** (0.157)	0.562*** (0.164)	0.573*** (0.168)
Ln (total assets)	0.0106*** (0.000602)	0.0110*** (0.000602)	0.0111*** (0.000609)	0.240*** (0.0424)	0.249*** (0.0440)	0.254*** (0.0448)
Sales Growth	0.000139*** (2.32e-05)	0.000134*** (2.30e-05)	0.000107*** (2.18e-05)	-0.00307 (0.00224)	-0.00289 (0.00233)	-0.00294 (0.00236)
Leverage	-0.0186*** (0.00518)	-0.0221*** (0.00518)	-0.0323*** (0.00525)	1.324*** (0.491)	1.403*** (0.511)	1.359*** (0.522)
Fixed Asset Turnover	0.00166*** (0.000298)	0.00225*** (0.000301)	0.00212*** (0.000297)	0.103*** (0.0214)	0.114*** (0.0222)	0.118*** (0.0226)
Fiscal Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0636*** (0.00618)	-0.0750*** (0.00612)	-0.0771*** (0.00601)	-3.106*** (0.658)	-3.304*** (0.683)	-3.378*** (0.694)
N	24,198	24,198	24,198	24,157	24,157	24,157
R-Squared	0.175	0.182	0.194	0.050	0.051	0.051
<i>Panel B: median regression</i>						
COVID	-0.0145*** (0.00239)	-0.0152*** (0.00279)	-0.0155*** (0.00214)	-0.0402*** (0.0142)	-0.0562*** (0.00916)	-0.0614*** (0.00864)
Shariah Compliant (SC)	0.00258* (0.00139)	0.00348** (0.00151)	0.00374*** (0.00136)	-0.00337 (0.00722)	0.00478 (0.00612)	0.00906 (0.00559)
COVID x Shariah Compliant	0.00402*** (0.00120)	0.00411*** (0.00132)	0.00443*** (0.00115)	0.0142*** (0.00549)	0.0163*** (0.00514)	0.0173*** (0.00461)
Ln (total assets)	0.00546*** (0.000382)	0.00594*** (0.000421)	0.00551*** (0.000378)	0.0367*** (0.00196)	0.0325*** (0.00189)	0.0270*** (0.00170)
Sales Growth	0.000189*** (1.65e-05)	0.000171*** (1.88e-05)	0.000139*** (1.60e-05)	0.000740*** (7.77e-05)	0.000745*** (7.98e-05)	0.000612*** (5.75e-05)
Leverage	-0.0126*** (0.00321)	-0.0140*** (0.00353)	-0.0207*** (0.00333)	-0.148*** (0.0158)	-0.110*** (0.0156)	-0.123*** (0.0143)
Fixed Asset Turnover	0.00102*** (0.000200)	0.00176*** (0.000217)	0.00163*** (0.000178)	-0.00265*** (0.000756)	0.00176** (0.000781)	0.00192*** (0.000604)
Fiscal Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0246*** (0.00363)	-0.0412*** (0.00387)	-0.0399*** (0.00361)	-0.0706*** (0.0178)	-0.124*** (0.0180)	-0.108*** (0.0153)
N	24,190	24,190	24,190	24,149	24,149	24,149
R-squared	0.159	0.169	0.179	0.006	0.010	0.009

Notes: This table present regression results from the industry-size-matched (without replacement) dataset. Panel A presents the OLS regression results, Panel B presents the results from the median regression. These regression results show the impact of basic firm characteristics on operating profitability of SC vs. NSC firms in the US from 2018-2022. COVID is a dummy variable that takes a value of one for the post-covid period and zero for the pre-covid period. SC is a dummy variable that takes a value of one for SC firms and zero for NSC firms. COVID x SC is a dummy that takes a value of 1 for SC companies post-Covid and 0 otherwise. The data was sourced using S&P's Compustat North American database. All models are controlled for fiscal quarter fixed effects and the t-statistics (reported in parenthesis) are computed using standard errors clustered at firm level. All monetary values are expressed in 2022 constant price using CPI, continuous variables are winsorized at 2.5% at each tail to reduce the impact of outliers, ***, **, and * represent statistical significance at 1, 5, and 10% respectively.

Table 6. Instrumental variable estimation.

	First Stage		Second Stage		
	<i>Shariah-compliant (SC)</i>	<i>Margins</i>	<i>ROA EBITDA</i>	<i>ROA EBIT</i>	<i>ROA Net Income</i>
Shariah Compliant (predicted)			0.0609*** (0.00488)	0.0597*** (0.00490)	0.0578*** (0.00484)
COVID			-0.0220*** (0.00346)	-0.0230*** (0.00349)	-0.0215*** (0.00339)
COVID x Shariah Compliant			0.0110** (0.00499)	0.0117** (0.00503)	0.0101** (0.00503)
Ln (total assets)	0.0642*** (0.0110)	0.0179*** (0.00304)	0.0151*** (0.000452)	0.0152*** (0.000450)	0.0158*** (0.000464)
Sales Growth	-0.00152*** (0.000132)	-0.000423*** (3.86e-05)	6.87e-05*** (1.24e-05)	6.69e-05*** (1.23e-05)	4.89e-05*** (1.24e-05)
Leverage	-0.951*** (0.0761)	-0.265*** (0.0207)	-0.0160*** (0.00347)	-0.0204*** (0.00346)	-0.0375*** (0.00362)
Fixed Asset Turnover	-0.0190*** (0.00522)	-0.00530*** (0.00145)	0.00206*** (0.000218)	0.00237*** (0.000220)	0.00231*** (0.000222)
Percentage of Shariah-compliant firms within each industry	3.150*** (0.168)	0.878*** (0.0409)			
Fiscal Quarter FE	Yes	Yes	Yes	Yes	Yes
Constant	-1.249*** (0.0928)		-0.116*** (0.00456)	-0.124*** (0.00452)	-0.126*** (0.00449)
Durbin-Wu-Hausman test					
p-value	0.00				
N	62,599	62,599	62,599	62,599	62,599
Pseudo-R-squared	0.1255				
R-squared			0.226	0.227	0.245

Notes: This table presents the two-stage least squares (2SLS) regression of basic firm characteristics that impacts the operating profitability of SC vs. NSC firms from 2018-2022. COVID is a dummy variable that takes a value of one for the post-covid period and zero for the pre-covid period. SC is a dummy variable that takes a value of one for SC firms and zero for NSC firms. COVID x SC is a dummy that takes a value of 1 for SC firms post-Covid and 0 otherwise. The first stage regression is a probit model with SC dummy as the main dependent variable. The instrument used for the potentially endogenous SC dummy is the percentage of SC firms within each industry. This is calculated by dividing the total number of SC firms by the total number of firms in each industry. The second column presents the marginal effects of all of the variables in the first stage model at the mean level. The second stage are pooled OLS regression results, conducted on different definitions of ROA as the dependent variable. The null hypothesis for the endogeneity test is that the SC dummy is exogenous. All models controlled for fiscal quarter fixed effects and the t-statistics (reported in parenthesis) are computed using standard errors clustered at firm level. All monetary values are expressed in 2022 constant price using CPI, continuous variables are winsorized at 2.5% at each tail to reduce the impact of outliers, ***, **, and * represent statistical significance at 1, 5, and 10% respectively.

Table 7. Baseline regressions on propensity score-matched dataset.

	ROA EBITDA (1)	ROA EBIT (2)	ROA Net Income (3)	PM EBITDA (4)	PM EBIT (5)	PM Net Income (6)
COVID	-0.0207*** (0.00449)	-0.0208*** (0.00449)	-0.0195*** (0.00446)	-0.895** (0.435)	-0.789* (0.422)	-0.914** (0.455)
Shariah Compliant (SC)	0.0291*** (0.00201)	0.0280*** (0.00201)	0.0283*** (0.00198)	2.286*** (0.211)	2.168*** (0.201)	2.343*** (0.215)
COVID x Shariah Compliant	0.00422** (0.00199)	0.00372* (0.00200)	0.00362* (0.00198)	0.687*** (0.231)	0.657*** (0.219)	0.726*** (0.237)
Ln (total assets)	0.0150*** (0.000506)	0.0150*** (0.000504)	0.0150*** (0.000503)	0.570*** (0.0417)	0.549*** (0.0399)	0.583*** (0.0426)
Sales Growth	0.000147*** (2.19e-05)	0.000140*** (2.17e-05)	0.000123*** (2.13e-05)	0.00920** (0.00404)	0.00939** (0.00385)	0.00905** (0.00414)
Leverage	-0.00485 (0.00354)	-0.0111*** (0.00357)	-0.0208*** (0.00353)	3.418*** (0.407)	3.278*** (0.389)	3.390*** (0.415)
Fixed Asset Turnover	0.00269*** (0.000269)	0.00301*** (0.000269)	0.00288*** (0.000262)	0.247*** (0.0202)	0.229*** (0.0192)	0.254*** (0.0206)
Fiscal Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.127*** (0.00490)	-0.120*** (0.00497)	-0.128*** (0.00484)	-8.417*** (0.604)	-8.024*** (0.580)	-8.603*** (0.619)
N	20,126	20,126	20,126	18,828	18,828	18,828
R-squared	0.258	0.265	0.254	0.097	0.097	0.097

Notes: This table presents OLS regression results from the full sample dataset in Panel A and the propensity-score-matched dataset in Panel B. The regression results show the impact of firm characteristics on operating profitability of SC vs NSC firms in the US from 2018-2022. COVID is a dummy variable that takes a value of one for the post-covid period and zero for the pre-covid period. SC is a dummy variable that takes a value of one for SC firms and zero for NSC firms. COVID x SC is a dummy that takes a value of 1 for SC companies post-Covid and 0 otherwise. The data was sourced using S&P's Compustat North American database. All models are controlled for fiscal quarter fixed effects and the t-statistics (reported in parenthesis) are computed using standard errors clustered at firm level. All monetary values are expressed in 2022 constant price using CPI, continuous variables are winsorized at 2.5% at each tail to reduce the impact of outliers, ***, **, and * represent statistical significance at 1, 5, and 10% levels, respectively.