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Modelling the Impact of COVID-19 on SMEs' Performance: Econometrics Evidence from Sri Lanka

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ABSTRACT

COVID-19 has created severe health issues while creating drastic impacts on global economy and thus the World Health Organization (WHO) announced a global emergency condition as well. These adverse impacts of COVID-19 are more substantial especially in business sectors in least developed and developing countries. Hence, the current study attempts to examine the impact of COVID-19 on SMEs' performance in Sri Lanka, highlighting the differences in SMEs' performance between pre-COVID-19 and during COVID-19 periods. The study based on primary data collected from 304 SMEs located in nine provinces of Sri Lanka and both descriptive and econometrics analyses were employed to accomplish the objectives of the study. The statistical investigation based on t-test analysis clearly indicates that there is a statistically significant difference in SMEs' performance between pre-COVID-19 and during COVID-19 periods. More specifically, both financial and operational performance have reduced while increasing the innovative performance during the COVID-19 period compared to Pre-COVID-19 period. Moreover, the econometrics analysis confirms that SMEs affected by COVID-19 account for lower performance compared to those are not

affected by COVID-19. More specifically, negative impact on SMEs performance gets higher when the magnitude of COVID-19 impacts increases. Hence, it is apparent that COVID-19 has drastically affected the SMEs' performance in Sri Lanka. Thus, the present study strongly recommends implementation of proactive policies to re-emerge SMEs while SMEs should themselves organize to battle with the COVID-19 outbreak.

Keywords: *COVID-19, Innovativeness, Small & Medium Enterprises, SME Performance, Sri Lanka*

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1. INTRODUCTION

The World Health Organization (WHO) has currently announced a global emergency condition due to COVID-19 outbreak. The COVID-19 emerged in Wuhan, China in the later part of 2019 and spread across the world occurring devastating impacts on human beings. COVID-19 has now affected all most every country in the world and most of the countries have imposed travel restrictions within and across the countries while some countries have been locked down for months. Consequently, COVID-19 has drastically damaged both individual economies and the global economy in addition to its devastating health impacts. In fact, Raga (2020) highlighted that Severe Acute Respiratory Syndrome (SARS) in 2003 dropped down the global output by 50 Billion. However, the economic cost of the present pandemic seems to be much higher than any of such historical pandemic and ADB (2020) estimated that the global output may dropped from USD 77 Billion to USD 347 Billion or by 0.1% to 0.4% of global GDP. Downturn in global output is also reflected from individual countries as well and especially the economies of the least developed and developing countries are adversely affected. Sri Lanka as a developing country located in South Asian region, firstly locked down the country in March, 2020 and thereafter national and international travel restrictions have been imposed time to time. Hence, the entire economy of Sri Lanka has been affected and especially the impacts on business sector including Small and Medium Enterprises (SMEs) are more substantial.

SMEs have been identified as one of the crucial engines of economic growth of most of the countries. Specifically, SMEs reduce unemployment by generating employment opportunities while increasing the household income which leads to lower poverty rate and inequality in society. Moreover, SMEs' direct value addition to the Gross Domestic Production (GDP) is vital in most of the

developing countries while SMEs linked with Global Value Chain (GVC) account for inflow of foreign exchange. Studies such as Hofer & Bygrave (1992), Hyrsky (1999), Bennet & Dann (2000) and Dzisi (2008) repeatedly stated that entrepreneurial skills are essential for the success of SMEs. Specifically, Gartner (1985), Vanderwerf & Brush (1989) and Schumpeter (1939) had also emphasized that entrepreneurial skills such as innovativeness, risk bearing ability and wealth creation abilities are the drivers of SMEs. Criteria of defining and classifying of SMEs varies across the countries based on the dimensions and bases used. Particularly, in the United State of America (USA), SMEs in sectors such as manufacturing, trade and wholesale, mining and oil extraction should have employees less than 500, 100 and 1500 respectively (Ward, 2018). In contrast, Canada has recognized four types of SMEs such as micro, small, medium and large based on number of employees such as micro (1-4), small (5-99), medium (100-499) and large (more than 500) (The Industry of Canada, 2017). According to the Ministry of Industry and Commerce, Sri Lanka. (2002), Sri Lanka has classified SMEs sector into three categories – micro, small and medium based on two dimensions such as number of employees and turnover. Table 1 clearly indicates the SME classification of Sri Lanka along with its dimensions and thresholds used.

Table 01: SME classification in Sri Lanka

Company category	Manufacturing Sector		Service Sector	
	Number of Employees	Annual Turnover (Million)	Number of Employees	Annual Turnover (Million)
Micro	1-10	≤ LKR 15	1-10	≤ LKR 15
Small	11-50	≤ LKR 16-250	11-50	≤ LKR 16-250
Medium	51-300	≤ LKR 251-750	51-200	≤ LKR 251-750

Source: Ministry of Industry and Commerce, Sri Lanka. (2002)

It is apparent from the table 1 that only the businesses with less than 300 employees and less than LKR 750.0 million annual turnover are considered as SMEs. According to Nanayakkara (2011), majority of SMEs in Sri Lanka are performing at micro level and the micro-SMEs are dominated by trade and retails businesses. However, the contribution of SMEs to the GDP is vital in the context of Sri Lanka and specifically SMEs contributed more than 55% to the country's GDP during the last decade while producing more than 45% of employment (MIC, 2016). Under this scenario, the government of Sri Lanka has recognized the importance of harnessing the SME sector with country's development process and in turn SME sector has been added into the 'Vision 2025' – the strategic plan of the government.

However, the present pandemic situation has drastically affected the entire business sector of Sri Lanka, reducing its contribution to GDP, employment and household income as well. Despite the business community expected a rapid recovery, the pandemic situation is going bad to worse with the 3rd and 4th waves of COVID-19 in Sri Lanka. However, there is no systematic study has been yet conducted to assess the impact of COVID-19 on SMEs in Sri Lanka. Hence, it is timely important to examine whether the SME sector has also been affected by the COVID-19. Therefore, this study examines how the COVID-19 has affected SME sector in Sri Lanka. More specifically, the current study attempts to accomplish two main objectives as below.

- To examine whether there is a statistically significant difference in SMEs' performance between pre-COVID-19 and during COVID-19 periods.
- To quantify the impact of COVID-19 on SMEs' performance in Sri Lanka.
- Based on the aforementioned objectives, the following hypotheses are tested to verify the accomplishment of the objectives.

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- H$_1$: There is a significant difference in SMEs' performance between Pre-COVID-19 and during COVID-19 periods

- H$_2$: COVID-19 significantlaffectsct SMEs' performance in Sri Lanka.

The main contribution of this study includes classification of SMEs according to the magnitude of COVID-19 effect and recognized four types of SMEs such as SMEs 'Not Affected', 'Moderately Affected' and 'Affected' and 'Severely Affected' by COVID-19. Moreover, this classification then used to examine how the performance of SMEs affected when the magnitude of COVID-19 effects changes. Thus, this might be one of the initial studies which assess the changes in SMEs' performance based on different level of COVID-19 effects. The rest of the paper includes literature review which critically evaluate the existing body of knowledge followed by the methodology of the study. The next section elaborates the results and discussions while the conclusions and recommendations are explained in the last section of the paper.

2. LITERATURE REVIEW

COVID-19 negatively affects SMEs around the world. However, the impact of the Covid -19 crisis varies according to the size of the SMEs, type of the SMEs, sectors and region and countries. Many researchers have analyzed the impact of COVID-19 on SMEs from different points of view.

Kumar and Ayedee (2021) have examined the problems faced by SMEs during the COVID-19 pandemic and have analyzed the possibility of use technology adaptation to overcome those problems by reviewing the literature. COVID-19 negatively has affected the performance of SMEs in five ways, such that; lack of employees, financial difficulties, health issues of employees, decrease of sales and turnover and low demand (Bartik et al. 2020; Kalemli-Ozcan, et al., 2020; OECD, 2020; Dai et al., 2020; Nurunnabi et al., 2020; ECCP, 2020; Juergensen et al, 2020). According to the literature, the authors highlighted that those

negative effects can be minimized by adopting different technologies. Technology 4.0, including artificial intelligence, and big data analytics help to continue operation with smart manufacturing, identify potential customers, increase sales productivity, improve and financial performance, overall cost and efficiency (Moeuf et al, 2017; Gualtieri, et, al, 2020; Zheng, 2019; Malhotra, 2020; Gerner, 2020; Masood and Sonntag, 2020; Kumar, et al., 2020). Social media supports to increase visibility, increase customers' confidence, improve the marketing, cost reduction in customer service, improved customer collaboration and information accessibility (Kumar and Ayedee, 2018; Kumar, 2020; Taiminen and Karjaluoto 2015; Ainin et al, 2015; Wong, 2012; Ferrer et al., 2013; Rodriguez et al., 2014). Web-based resources positively affect knowledge sharing (Soto- Acosta et al. 2004). Information Communication Technologies also helps to increase collaboration, creativity and innovation and cost-saving (Apulu and Lathma, 2011; Ongaori and Migiro, 2010). E-commerce causes to increase revenue and accessibility, improve financial performance and marketing, reduce cost, and speed up transaction process (Wahyuni et al., 2020; Vellody and Bahl, 2015; Mansur, 2019). Further, according to the literature authors have highlighted the key factors that affect technology adaptation. Characteristics of the owners (Hanum and Sinarrasri, 2017; Rahayu and Day, 2015; Olatokun and Bankole, 2011), observed usefulness (Venkatesh et al, 2003; Davis, 1989; Zarehan et al, 2011; Taylor and Todd, 1995), perceived easiness of use (Venkatesh et, al, 2003; Taylor and Todd, 1995; Nguyen and Luu, 2020; Kaur and Kumar, 2020), and facilitating conditions (Anderson and Schwager, 2004; Al Mursalin, 2012) are the main key factors that affect to adopt technological innovation. Further, the research highlighted that even though many SMEs adopt technology it is not successful because of a lack of infrastructure facilities.

SMEs in Chain one of the emerging economies are also badly affected by the COVID-19 pandemic. Sun et. al, (2021) have analyzed the impact of COVID-19

on the performance and norms of the SMEs in China using primary data collected from 330 responders using Confirmatory Factor Analysis. The results revealed that COVID -19 have significantly affected innovative operational procedure, profitability, remote work and stakeholder satisfaction and safety. Hence, the authors highlight the importance of develop policies that can effectively manage the crisis. According to Lu et al. (2020), because of COVID-19 sales volume has been declined in SMEs in China indicating massive economic losses. Similarly, Omar, et al., (2020) have highlighted that SMEs in China have faced cash flow problems because of the reduction of sales volume along with economic difficulties during the Covid -19 pandemic outbreak. According to Hao et al., (2020) SMEs in China that link to the tertiary sector such as tourism and transportation are badly affected by the COVID-19 pandemics. Accordingly, Gossling et al, (2021), also have highlighted that SMEs related to the tertiary sector in China lost their normal capacity to 56 per cent the first quarter of the preceding year.

COVID-19 severely affected MSMEs in Pakistan. Shafi et al, (2020), have analyzed the impact of COVID-19 on MSMEs in Pakistan by using 184 MSMEs in Pakistan. The results indicated that financial difficulties, disruption of the supply chain, declined of demand, decreases in sales and revenue are the most severe problems that MSMEs face in Pakistan. The results indicate that more than 83 per cent of MSMEs do not have a plan to face a crisis. The main strategies that MSMEs used to minimize risk are getting the loan, completely or partially shut down, reduce salaries and reduce employees. Santhirakumar et al., (2021) have analyzed the economic impact of COVID -19 on the MSMEs sector by using 400 MSMEs in Batticaloa district in Sri Lanka using the marketing mix concept (4Ps) method. Problem Faced Index shows that reduction of production, lack of raw material, increased price of raw material, increased price of final production, the impact of the marketplace, impact on transformation, government regulations and

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impact on online business were the major challenges faced by the MSMEs. The impact of the Problem Faced Index on Production shows that uncertainty, reduction of production, storage problem, depletion of raw material and maintenance of machinery are the main obstacle faced by the production side. Problem Faced Index on Price shows that increases in the price of raw materials, and increased in the final product are the main difficulties that faced MSMEs. Problem Faced Index on Place shows that impact on market place, impact on transformation, government regulation and reduction of middle staffs are the main problem. Problem Faced Index on Promotion shows that reduction of customer communication, impact on online business, effects on direct advertisement and impact on value-added products are the main problem. The author recommended relaxing conditionality and interest rate for loans, the introduction of an online platform for the local producer.

Gourinchas et al., (2021), have conducted a comprehensive analyzed the impact of Covid -19 on SMEs in seventeen countries using firm-level data. The analysis takes into consideration the firm-level heterogeneity, supply, demand, sectoral and aggregate shocks to the vulnerability of SMEs. The results show that the impact of COVID-19 varies according to the sector, region, and country and according to the heterogeneity of the firm. Especially, loss of employment, financial difficulties are the main negative effect that firms faced. The study shows the importance of government intervention to minimize the risk faced by SMEs. The study shows that without proper government intervention the rate of SME failures would have almost doubled. The results showed that reduction or forgiveness of interest rate, deferment of tax and rental has only a small impact on firm failure. According to the results, cash grants have a significant positive impact on SMEs but the fiscal cost is high.

Jill et al (2020) have analyzed the long term and short-term impact of COVID-19 on European SMEs in the manufacturing sector. The results indicate that

logistical problems, declined in demand are the most significant challenges faced in the short run. The long-run effect of the crisis has different impacts according to the types of SMEs. Therefore, they suggest the importance of flexible policies according to the type of SMEs and type of the problems. Further researchers highlighted the importance of imposing long-term policies based on promoting renewal, implement innovation, internationalization, and networking. Kukanja et al., (2020) have examined COVID-19 crisis management strategies of SMEs in the tourism sector, distributing an online questionnaire among 574 responders. Crisis management strategies were analyzed according to four dimensions such that workforce, cost control, organizational support and marketing management practices using Explanatory factor analysis. The results indicate that SMEs mostly focus on crisis management strategies such as workforce, cost control, organizational support, promotional and customer-related marketing practices. Different types of SMEs coop with different strategies.

COVID-19 negatively affect the SMEs in Sri Lanka also. Robinson and Kendatharan (2020) have examined the impact of COVID-19 on business and management field industries in Sri Lanka by interviewing 14 SMEs operators in hotels, apparel, foods, restaurants and communication industries using semi-structured questionnaires. Shortage of materials, decreases in domestic and international demand, loan repayment problems, financial difficulties for even basic requirements, lack of labour facilities are the most significant negative impact of COVID-19 on SMEs in Sri Lanka. Although many researchers have analyzed the impact of COVID-19 on SMEs in various countries, a few researchers have focused on the impact of COVID-19 on SMEs in Sri Lanka. This research has attempted to fill this gap by conducting a comprehensive analysis on the impact of COVID-19 on SMEs' performance in the context of Sri Lanka.

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3. METHODOLOGY

3.1. Sample and Data Collection

The study is based on primary data collected from the SMEs located in nine districts of Sri Lanka and these nine districts represents the nine provinces of Sri Lanka. Simple random sampling technique was applied to select the districts within the provinces. 45 SMEs from each district were selected for the study considering a SME holder as a unit of analysis of the study. Mainly, Snowball and Convenience Sampling techniques were used to select SMEs from the districts. Structured online questionnaire was used to collect the required information and the web link of the online questionnaire was distributed among the SMEs selected from nine districts. However, only 304 SMEs responded and table 2 indicates the district-wise details of the sample. The required data for the variables were collected for both COVID-19 and Pre-COVID-19 periods separately. The COVID-19 period is defined after 18th of March, 2020 as Sri Lanka imposed Island-wide travel restrictions and lockdown starting from 18th of March, 2020. Hence, the current study collected data for the COVID-19 period starting from 18th of March, 2021 to 31st of July, 2021. In contrast, data related to 1st of January, 2019 to 17th of March, 2020 are considered as the Pre-COVID-19 period.

Table 2: Details of the Sample and Data Collection

	District	Number of Responded SMEs
1	Colombo	36
2	Galle	32
3	Kandy	36
4	Badulla	34
5	Anuradhapura	30
6	Rathnapura	36
7	Jaffna	30
8	Batticaloa	34

| 9 | Kurunegala | 36 |
| | Sample Size | 304 |

Source: Created by authors

3.2. Data Analysis and Operationalization of the Study

3.2.1. t-Test Analysis

The present study employs a quantitative analytical approach to accomplish the objectives of the research. Mainly, a descriptive analysis and t-test analysis are applied to achieve the first objective – whether there is a statistically significant different in SMEs' performance between COVID-19 period and Pre-COVID-19 period. Particularly, the t-Test analysis is used to test the H_1 hypothesis which check whether there is a significant difference in the SMEs' performance between COVID-19 period and Pre-COVID-19 period. Specifically, Two-sample independent t-Test expressed in the equations (1) was applied to test the following hypothesis.

$$t = \frac{\overline{X}_1 - \overline{X}_2}{SE} \tag{1}$$

Where $\overline{X}_1 - \overline{X}_2$ are the means value of SMEs' performance before and during COVID-19 periods and *SE* stands for the Standard Error.

- H_0 = The mean performance of SMEs' before COVID-19 period equals the mean performance of SMEs' during the COVID-19 period.
- H_1 = The mean performance of SMEs' before COVID-19 period does not equal to the mean performance of SMEs' during the COVID-19 period.

The t-test was separately applied to test the statistical differences in Financial Performance, Innovative Performance and Operational Performance of SMEs

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before and during the COVID-19 periods. Table 3 indicates the operationalization of the variables related to t-test analysis.

Table 3: Operationalization of Variables related to t-Test Analysis

	Dimension	**Indicators**	**Source.**
Financial Performance.	Profitability.	1. Return on Assets. 2. Return on Sales.	(Carton & Hofer, 2010)
	Growth.	1. Growth rate of sales. 2. Growth rate of operating expenses. 3. Growth rate of total assets. 4. Growth rate of employees.	(Carton & Hofer, 2010)
	Liquidity.	1. Liabilities to total assets.	(Carton & Hofer, 2010)
Innovative Performance.	Product Innovation.	1. Developing totally new products 2. Developing newness for current products 3. Decreasing manufacturing cost 4. Increasing manufacturing quality	(Ng et al., 2017)
	Process Innovation.	1. Determining and eliminating non-value-adding activities in delivery related processes. 2. Decreasing variable cost and/or increasing delivery speed in delivery related logistics processes. 3. Increasing output quality in manufacturing processes, techniques, machinery and software. 4. Decreasing variable cost components in manufacturing processes, techniques, machinery and software.	(Ng et al., 2017)

		5. Determining and eliminating non-value-adding activities in production processes.	
	Organizational Innovation.	1. Renewing the organization structure 2. Renewing the human resources management system. 3. Renewing the supply chain management system. 4. Renewing the organizational structure to facilitate strategic partnerships. 5. Renewing the production and quality management systems.	(Ng et al., 2017)
	Marketing Innovation.	1. Renewing the product promotion techniques employed for the promotion of the current and/or new products. 2. Renewing the product pricing techniques employed for the pricing of the current and/or new products. 3. New products through changes such as in appearance, packaging, shape and volume without changing their basic technical and functional features. 4. Renewing general marketing management activities.	(Ng et al., 2017)
Operational Performance.	Cost.	1. Ability to offer low prices/lower than our competitors 2. Ability to compete based on the quality of services and products.	(Bon & Mustafa,2013)

		3. Utilize all of our resources effectively, producing most output.	
		4. Ability to eliminate waste and increased revenues	
	Speed.	1. Increasing the speed of productions and delivery of products 2. Reducing the lead time to fulfill customer orders.	(Bon & Mustafa,2013)
	Flexibility.	1. Product adaptability in meeting customers' demands. 2. Flexible modes of service and product delivery.	(Bon & Mustafa,2013)
	Quality.	1. Continuous improvement and innovations. 2. Gaining knowledge by training and education on quality.	(Bon & Mustafa,2013)
	Dependability.	1. Focus more on customers. 2. Deliver customer order on time.	(Bon & Mustafa,2013)

Source: Created by Authors

3.2.2. Regression Analysis

Aligning with the H_2 hypothesis, the impact of COVID-19 on the performance of SMEs has been examined by using a regression analysis. The model expressed in equation (2) empirically estimated to accomplish the second objective of the study. The empirical model and its variables align with the studies such as Vidavong et al. (2017), Dikova et al. (2015) and Biesebroeck, V. (2005). The SMEs' performance was considered as the dependent variable of the model and a composite index for SMEs' performance was formed by aggregating the mean values of three dimensions of SMEs' performance such as Financial Performance,

Innovative Performance and Operational Performance. Apart from that, a dummy variable was created to capture the impact of the COVID-19 on SMEs' performance and the dummy variable is defined as below.

If the COVID-19 has reduced the profit of a SME by 0%   - Not Affected (NA)

If the COVID-19 has reduced the profit of a SME by 0% - 25%   - Moderately Affected (MA)

If the COVID-19 has reduced the profit of a SME by 25% - 50%   - Affected (A)

If the COVID-19 has reduced the profit of a SME by more than 50%   - Severely Affected (SA)

$$Performance = \beta_0 + \beta_1 MA_i + \beta_2 A_i + \beta_3 SA_i + \beta_4 K_i + \beta_5 L_i + \beta_6 HC_i + \beta_7 Sales_i +$$
$$\beta_8 TR_i + \beta_9 R\&D_i + \beta_{10} Age_i + \beta_{11} Finance_i + \beta_{12} Urban_i +$$
$$\beta_{13} Rural_i + \beta_{14} BDS_i + U_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

The variables indicated in the empirical model are explained in the table 4 below.

Table 4: Operationalization of Variables related to Regression Analysis

Variable Name	Explanation	Expected Sign
Performance	SMEs' Performance - A composite variable created by aggregating the mean values of Financial Performance, Innovative Performance and Operational Performance	Not Applicable
MA	Moderately Affected by COVID-19 MA=1 for SMEs who's profit reduced by 0%-25% due to COVID-19 MA=0 Otherwise	Negative when MA = 1
A	Affected by COVID-19 A=1 for SMEs who's profits reduced by 25%-50% due to COVID-19 A=0 Otherwise	Negative when A = 1

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SA	Severely Affected by COVID-19 SA=1 for SMEs who's profit reduced by 0%-25% due to COVID-19 SA= 0 Otherwise	Negative when SA = 1
K	Total capital of the firm	Positive
L	Number of workers	Positive
HC	Level of education of SME holder	Positive
Sales	Annual sales revenue	Positive
TR	Number of employees who are trained annually	Positive
R & D	Research & Development expenditure as % of total revenue	Positive
AGE	Number of years in the industry	Positive
Finance	Dummy variable for access to finance Finance=1 for SMEs who have access to formal finance Finance= 0 for otherwise	Positive when Finance = 1
Urban	Dummy variable for location Urban=1 for SMEs located in urban area Urban=0 for otherwise	Positive when Urban = 1
Rural	Dummy variable for location Rural=1 for SMEs located in rural area Rural=0 for otherwise	Positive when Rural = 1
BDS	Dummy variable for access to Business Development Service BDS=1 for SMEs who have access to BDS BDS=0 for otherwise	Positive when BDS = 1

Source: Created by authors

4. RESULTS AND DISCUSSION

4.1. Profiling the SMEs in Study Area

The study has surveyed 304 SMEs in nine districts. The table 5 summarizes the district-wise key information related to the surveyed SMEs. Considering the types of SMEs, irrespective of the district variation, majority of SMEs are belonged to Micro and Small categories. Districts such as Badulla (43.4%), Jaffna (42.3%) and Batticaloa (41.2%) account for the largest percentages of micro-level SMEs. In contrast, Colombo (33.4%), Rathnapura (21.7%) and Galle (21.6%) own the largest percentages of medium-level SMEs. Specifically, ownership of medium-size SMEs by the marginalized districts such as Batticaloa (9.4%), Jaffna (10.6%) and Anuradhapura (13.3%) is considerably low compared to other districts. Education levels of the SME holders also examine considering four educational levels such as 'No Schooling', 'Primary', 'Secondary' and 'Tertiary and above'. Table 5 highlights that majority of SME holders have secondary and primary level education and also SME holders in Galle (63.4%), Kurunegala (62.4%) and Colombo (62.2%) have the highest secondary level educational attainments. Similarly, SME holders with tertiary education are also higher in districts such as Colombo (13.2%), Kandy (13.2%) and Galle (12.6%).

Table 5: Profiling statistics (Percentage) of the SMEs in study area

	Colombo	Galle	Kandy	Badulla	Anuradhapura	Rathnapura	Jaffna	Batticaloa	Kurunegala
Type of SMEs									
Micro	23.4	32.8	31.9	43.4	41.1	36.2	42.3	41.2	32.4
Small	43.2	45.6	48.6	41.3	45.6	42.1	47.1	49.4	48.9
Medium	33.4	21.6	19.5	15.3	13.3	21.7	10.6	9.4	18.7

Level of Education of SME Holders									
No Schooling	1.2	1.5	2.3	4.5	5.2	2.3	6.7	5.6	3.1
Primary	23.4	22.5	25.3	43.8	42.5	26.1	41.3	43.2	25.3
Secondary	62.2	63.4	59.2	41.3	44.2	59.4	45.2	46.7	62.4
Tertiary and above	13.2	12.6	13.2	10.4	8.1	12.2	6.8	4.5	9.2
Gender of SMEs' Ownership									
Male	63.2	59.3	72.3	52.8	65.1	72.3	59.2	78.2	67.3
Female	36.8	40.7	27.7	47.2	34.9	27.7	40.8	21.8	32.7
Monthly Income of SMEs									
LKR 25,000>	2.3	3.1	2.9	5.2	6.5	3.6	6.9	7.2	4.3
LKR 25,000 - LKR 45,000	12.5	15.2	19.4	23.2	24.2	19.4	28.2	25.5	18.5
LKR 45,000 - LKR 65,000	19.9	23.9	21.5	32.5	25.2	23.5	25.1	27.2	23.2
LKR 65,000 - LKR 85,000	35.2	28.3	28.6	18.5	26.4	32.1	23.5	25.3	32.5
LKR 85,000 - LKR 105,000	19.6	20.2	18.7	17.4	12.9	14.2	12.1	11.4	15.2
LKR 105,000 <	10.5	9.3	8.9	3.2	4.8	7.2	4.2	3.4	6.3

Source: Created by authors based on survey data

Apart from that, it is a common fact that SMEs are male-dominant across all the districts and however SMEs owned by women are considerably higher in districts such as Badulla (47.2%), Jaffna (40.8%) and Galle (40.7%). In terms of the income level of SMEs, more than half of the SMEs earn monthly income between LKR 45,000 – LKR 105,000. However, closer investigation of table 5 indicates that percentage of SMEs who have higher level of monthly income are located in districts such as Colombo, Galle, Kandy and Rathnapura.

Table 6: SMEs in study area according to the type of business

Type of Business	Colombo	Galle	Kandy	Badulla	Anuradhapura	Rathnapura	Jaffna	Batticaloa	Kurunegala
Agriculture and Dairy	6.5	12.5	13.5	17.3	16.5	15.2	14.5	13.7	14.2
Apparel	15.3	11.2	8.5	9.6	7.8	10.3	8.7	10.2	12.5

Food & Beverages	21.5	14.2	17.3	19.3	18.2	20.2	19.8	20.3	18.2
Hotels & Hospitality	21	18.5	22.5	21.8	17.3	16.8	18.4	17.3	16.2
Wood & Furniture	11.2	10.2	13.4	10.2	14.6	12.4	10.6	12.2	11.5
Metal and Cement Works	10.5	14.9	8.5	7.8	10.9	8.5	9.5	9.2	7.6
Craft and Paintings	7.8	11.3	8.8	8.2	10.2	12.4	11.3	10.2	10.9
Other	6.2	7.2	7.5	5.8	4.5	4.2	7.2	6.9	8.9
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Created by authors based on survey data

Table 6 indicates the percentage of SMEs in each district according to the type of business. According to the table 6, SMEs related to business sectors such as Food & Beverages and Hotels & Hospitality are the most common SME sectors in all 9 selected districts. Moreover, considering the district level analysis, Hotels & Hospitality sector related SMEs are highest SME sector in districts such as Galle, Kandy and Badulla while Food & Beverages related SMEs are more common in districts such as Colombo, Anuradhapura, Rathnapura, Jaffna, Batticaloa and Kurunegala. Apart from that, SMEs related to Agriculture & Dairy and Craft & Paintings are the least common SMEs in all districts.

4.2. Analysing the Differences in SMEs' Performance during and Pre - COVID-19 Periods

Differences in SMEs performances are examined under three main dimensions such as financial performance, innovative performance and operational performance. The differences related to each dimension have been illustrated using graphs followed by a statistical analysis based on t-test analysis.

4.2.1. Comparison of Financial Performance before and during COVID-19

The financial performance is measured using three dimensions (Profitability, Growth and Liquidity) and altogether seven indicators as depicted by figure 1 below.

Figure 1: Comparison of Financial Performance before and during COVID-19 Periods
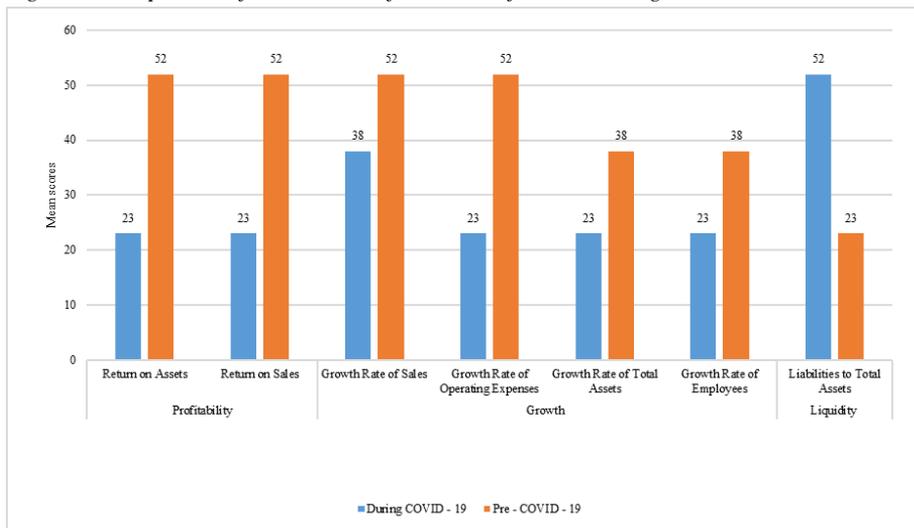
Source: Created by author based on survey data.

Profitability of SMEs which is measured by return on assets and return on sales is apparently affected by COVID-19. Both indicators of profitability have been reported a mean score of 23 during the COVID-19, despite those were 52 during pre-COVID-19. The dimension called 'growth' is measured by using four indicators (Growth rate of sales, Growth rate of operating expenses, Growth rate of total assets and Growth rate of employees). According to figure 1, it can be confirmed that growth of SMEs during the COVID-19 period is considerably lower than that of Pre-COVID -19 period. The difference in growth is more substantial related to indicators such as growth rate of sales and growth rate of operating expenses. Moreover, liquidity which is measured using liabilities to total assets also highlights the adverse impact of COVID-19 and therefore

liabilities to total assets have drastically increased (up to 52) during the COVID-19. Hence, as all of the dimensions of the financial performance of indicate that the financial performance of SMEs has been drastically affected by COVID-19.

In addition to above descriptive analysis, t-test was carried out to check whether there is a statistically significant difference in financial performance of SMEs between Pre-COVID-19 period and during COVID-19 period. The t-test was separately applied for all the indicators of financial performances and the results are indicated in table 7.

Table 7: t – test Analysis on Financial Performance

Indicators of Financial Performance	Mean (Pre-COVID)	Mean (During COVID)	t Critical Value	P(T<=t)
ROA	4.06	2.08	32.3210	0.0000
ROS	4.15	2.27	27.3109	0.0000
Growth of Sales	3.98	2.52	13.2136	0.0000
Growth of Operating Expenses	3.98	1.89	25.5117	0.0000
Growth of Total Assets	3.98	1.89	28.7061	0.0000
Growth of Employees	3.34	1.75	24.7640	0.0000
Liabilities to Total Assets	1.97	3.70	-20.7686	0.0000

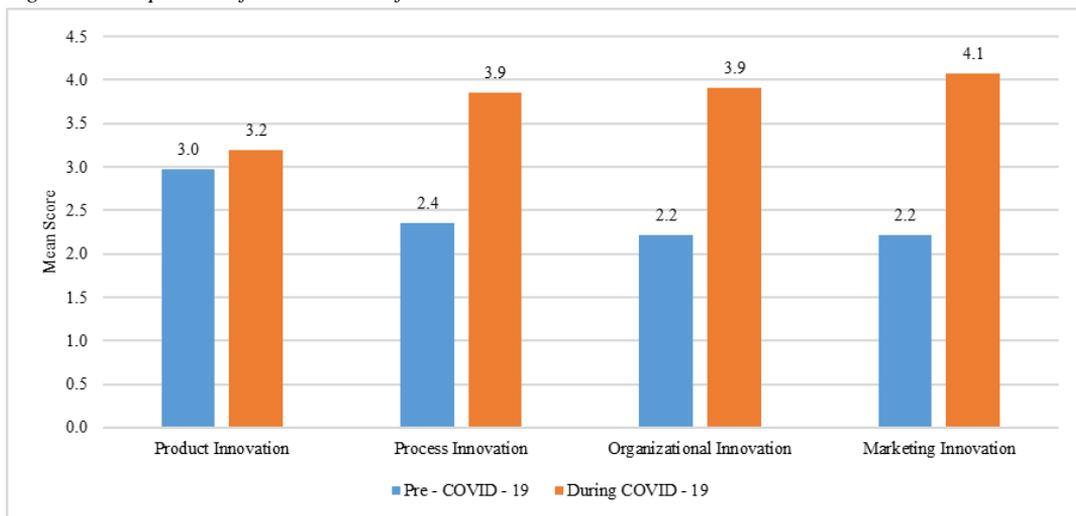*Source: Created by authors based on survey data*

As table 7 indicates, the Pre-COVID mean values related to all indicators of SMEs' financial performance are statistically different from the mean values of the COVID-19 period. In fact, P-values related to all indicators confirm that mean difference between pre and during COVID-19 periods are statistically significant

at 1% level and therefore it can be further emphasized that COVID-19 has worsen the financial performance of SMEs in Sri Lanka. The financial ability and performance of any organization mainly depends on the sale of their products and cost of manufacturing. COVID-19 pandemic has drastically affected sale of the products due to Island-wide lock down and travel restrictions. Moreover, shutting down of airports and harbours also reduce SME's ability to cope with global value chain. Apart from that, such lock downs and shutting down of airports and harbours restrict the imports and therefore SMEs are unable to acquire the required inputs and raw materials for their industries. Ultimately, their production cost increases lowering their profit margins. Thus, COVID-19 slashes financial performance of SME in multiple ways.

4.2.2. Comparison of Innovative Performance before and during COVID-19

Innovativeness of SMEs has been recognized as the one of the key dimensions of SMEs' performance. Indicators such as product, process, organizational and marketing innovations are used to measure the innovative performance. Each indicator of the innovative performance has been illustrated in figure 2. Interestingly, innovative performance of SMEs has increased during the COVID-19 period compared to Pre-COVID period.

Figure 2: Comparison of Innovative Performance

Source: Created by authors based on survey data

Specifically, organizational innovation and marketing innovation have increased from 2.2% to 3.9% and 2.2% to 4.1% respectively between COVID-19 and Pre-COVID-19 periods. Similarly, process innovation has increased from 2.4% to 3.9%, despite product innovation has shown only a marginal increment from 3.0% to 3.2% between COVID-19 and Pre-COVID-19 periods.

Moreover, t-test analysis was also applied to check whether there is a statistically significant difference in the mean values of each indicator related to innovative performance during COVID-19 and Pre-COVID-19. According to table 8, all mean values related to during COVID-19 are considerably higher than that of Pre-COVID-19 and moreover all mean differences are statistically significant at 1% level.

Table 8: t -Test analysis of Innovative Performance.

Indicators of Innovative Performance	Mean (Pre-COVID)	Mean (During COVID)	t Critical Value	P(T<=t)

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Product Innovation	2.97	3.19	-1.5734	0.0000
Process Innovation	2.36	3.86	-44.1547	0.0000
Organization Innovation	2.22	3.91	-47.5961	0.0000
Marketing Innovation	2.21	4.08	-49.1272	0.0000

Source: Created by authors based on survey data

Hence, it is confirmed that COVID-19 has positively affected the innovativeness of SMEs in Sri Lanka and therefore innovative performance has increased during COVID-19 period compared to Pre-COVID-19 period.

In fact, COVID-19 based travel restrictions and lock downs motivate SMEs to look at novel approaches of doing their business. As a result, most of the SMEs introduced novel working cultures such as 'Work from Home' and specially most of Sri Lankan Information Technology (IT) industries are practicing this concept and continue their business successfully. Similarly, SMEs shifted from physical marketing strategies to online marketing strategies. Apart from that, some SMEs have shifted to timely important new products such as producing face masks and sanitizers. Thus, SMEs' innovative performance has significantly increased during the COVID-19 outbreak and this can be considered as a positive impact of COVID-19 on SMEs in Sri Lanka.

4.2.3. Comparison of Operational Performance before and during COVID-19

Operational performance which is measured by using indicators such as cost, speed, flexibility, quality and dependability has been partly affected by COVID-19. According to figure 3, the mean score related to cost indicator during COVID-19 period (2.13) is lower than that of Pre-COVID-19 period (3.51). This might be a good positive impact of COVID-19 and mainly this cost reduction is due to the concept of 'Work from Home' and cutting down of unnecessary workers. However, if the cost reduction is driven by the shrinking of production process,

it cannot be considered as a positive impact and such organization may end up with shutting down of their firms. Apart from that, speed of the production process has remarkably reduced during the COVID-19 period. It is understandable that reduced demand for the products and service, discourages the SMEs and therefore they have deviated from their regular production process that has been practiced Pre-COVID-19 period.

Figure 3: comparison of Operational Performance
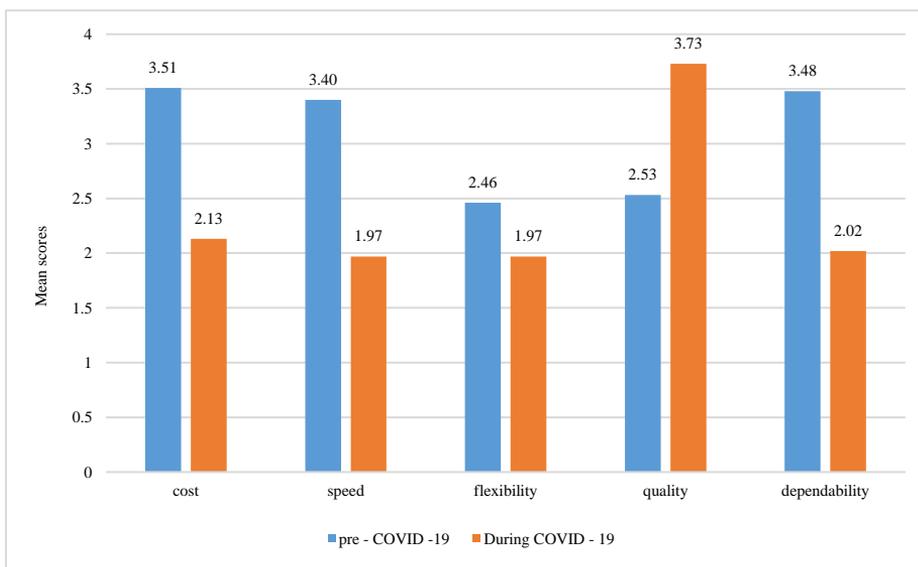
Source: Created by authors based on survey data

The indicator called flexibility implies the flexibility of the production process. As figure 3 depicts, the flexibility of SMEs during the COVID-19 period has declined down to 1.97 from 3.40 in Pre-COVID-19 period. Certainly, during the COVID-19 period, most of the SMEs do not have a flexible environment and therefore SMEs have to proceed with available opportunities. Interestingly, the quality of the products and services and also the production process has considerably increased (up to 3.73) during the COVID-19 period compared to Pre-COVID-19 period. Most of the SMEs have been trying to secure their

customer-base amidst the pandemic and hence they more concern about the quality of their products and services. Similarly, large-scale production processes are scale-down to medium or small scales due to the COVID outbreak and it allowed organizations to check and monitor the quality of their output more closely. In turn, the quality of the output and processes have increased during the COVID-19 compared to Pre-COVID-19 situation. The indicator dependability expresses the degree of depending on their customers. As figure 3 illustrates, SMEs dependability has significantly reduced during the COVID-19 period (down to 2.02) compared to 3.48 in Pre-COVID-19 situation. Mainly, customer-base of SMEs has drastically declined during the COVID-19 period due to Island-wide lock down and travel restrictions and therefore SMEs seem not rely on their customers as previously.

Table 9: t-Test Analysis of Operational Performance

Indicators of Marketing Performance	Mean (Pre-COVID)	Mean (During COVID)	t Critical Value	P(T<=t)
Cost	3.51	2.13	45.2801	0.0000
Speed	3.40	1.97	34.2792	0.0000
Flexibility	2.46	1.97	9.1845	0.0000
Quality	2.53	3.73	-25.3357	0.0000
Dependability	3.48	2.02	30.8556	0.0000

Source: Created by authors based on survey data

Moreover, the t-test analysis indicated in table 9 also confirms that mean scores of each indicator related to operational performance during the COVID-19 period are statistically different from those of Pre-COVID-19. Particularly, mean differences of scores are statistically different at 1% level and therefore, it is proven that there is a significant difference in operational performances during and before COVID-19.

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4.3. Analysing the Impact of COVId-19 on SMEs' Performance

The impact of COVID-19 on SMEs performance was analysed using the Ordinary Least Squares (OLS) based cross sectional regression analysis. The model indicated in equation 2 was empirically estimated and the results are summarized in table 10. As table 10 indicates, three models were estimated by adding independent variables gradually in order to check the robustness of the impact of COVID-19 on SMEs performance. The variables labelled 'Moderately Affected', 'Affected' and 'Severely Affected' are the key dummy variables which were used to measure the impact of COVID-19 on SMEs performance in Sri Lanka. All these three dummy variables were included into all three models to check the robustness of estimated relationship when adding other control variables. The model 3 can be considered as the complete model which includes all control variables selected for the present analysis.

As expected, all three key variables – 'Moderately Affected', 'Affected' and 'Severely Affected' have negative coefficients reflecting that the performances of COVID-19 affected SMEs are lower than that of Not-Affected' category which is considered as the reference group. More specifically, the estimated coefficients get higher negative values when the magnitude of COVID-19 impact increases. For instance, the estimated coefficient of 'Moderately Affected' category in the model 01 is -0.6721 while the estimated coefficient of 'Servery Affected' is -0.8091. This pattern of the estimated coefficients is consistent across all three models and all the estimated coefficients are statistically significant at 1% and 5% levels (In the model 03). In fact, COVID-19 caused to impose travel restrictions and Island-wide lock down since 18th of March, 2020. In turn, most of the SMEs had to stop their manufacturing, marketing and distribution processes. Despite some SMEs continue their business adopting to the health guidelines, they have find it difficult to fulfil the inputs and raw material requirements due to import restrictions. Similarly, most of the SMEs link with

Global Value Chain (GVC) have been unable to ensure smooth link with the chain due to shutting down of airports and seaports. Apart from that, weakening of domestic demand also reduce the sales revenue of all most all SMEs while new start-ups collapsed due to COVID-19. Moreover, the government has still failed to form appropriate policy interventions to protect SME industry and therefore SMEs' performance has drastically been affected by COVID-19.

Table 10: Regression Results on Impact of COVID-19 on SMEs Performance (The Dependent Variable is SMEs' Performance)

Variable Name	Model 01	Model 02	Model 03
COVID-19 (Not Affected)			
Moderately Affected	-0.6721***	-0.5431**	-0.5021**
	(0.1254)	(0.2352)	(0.1853)
Affected	-0.7651***	-0.7054***	-0.6974**
	(0.2074)	(0.2142)	(0.2874)
Severely Affected	-0.8091***	-0.7863***	-0.7123**
	(0.1321)	(0.2314)	(0.3076)
Capital	0.6723***	0.6451**	0.6801**
	(0.2021)	(0.2842)	(0.3087)
Labor	0.2131**	0.2102**	0.2032**
	(0.0784)	(0.0898)	(0.0906)
Human Capital	0.0792**	0.0698**	0.0681**
	(0.0379)	(0.0277)	(0.0275)
Sales Revenue		0.8101**	0.7901**
		(0.2973)	(0.3678)
Training		0.0235*	0.0262
		(0.0125)	(0.0305)
R & D		0.0205*	0.0201
		(0.0108)	(0.0285)
Age		0.8321	0.7901
		(0.8854)	(0.8202)
Access to Formal Finance (No Access to Formal Finance)			
Have Access to Formal Finance		0.1776***	0.2986**
		(0.0551)	(0.1102)
Location (Estate)			
Urban			0.2113**
			(0.0808)
Rural			0.0882**
			(0.0403)
Access to BDS (No Access to BDS)			

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Have Access to BDS			0.0624 (0.7965)
Constant	7.7061*** (0.9061)	6.8270*** (0.6101)	5.4323*** (0.7267)
Number of Observations	304	304	304
R²	0.4675	0.5987	0.7956
Prob on F	0.0000	0.0000	0.0000

Source: Created by authors based on survey data

Note: Standard Errors are in parentheses

*** - 1% significance level   ** - 5% significance level   * - 1% significance level

In addition to the key findings related to impact of COVID-19 on SMEs' performance, the study also investigated other factors which affect SMEs performance. According to the model 3, variables such as Capital, Labour, Human Capital and Sale Revenue positively correlate with SMEs' performance and the estimated coefficients are statistically significant at 5% level. Apart from that, access to finance has been a crucial factor of explaining SMEs' performances, despite the Business Development Services (BDS) doesn't show any statistically significant relationship with SMEs' performance. Moreover, it is apparent from table 10 that, performance of SMEs located in both urban and rural sectors are significantly higher than that of located in estate sector of Sri Lanka. These findings are consistent with studies such as Gamage (2003), Vijayakumar (2013) and Priyanath & Premaratne (2014). The estimated models are statistically significant at 1% level in overall and also have higher R^2 value in model 03 (0.7956) ensuring higher level of goodness of fit.

5. CONCLUSIONS AND RECOMMENDATIONS

The current study attempts to examine the impact of COVID-19 on SMEs' performance in Sri Lanka, highlighting the differences in SMEs' performance between pre-COVID-19 and during COVID-19 periods while quantify the impact

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of COVID-19 on SMEs' performance in Sri Lanka. The study focuses on nine districts, representing nine provinces in Sri Lanka and an online survey was carried out to collect required data to accomplish the objectives of the research. 304 SMEs responded to the online questionnaire and statistical and econometric techniques were used to analyse the collected data. Specifically, the study employs t-Test analysis to check whether there is a statistically significant deference in SMEs' performance between pre-COVID-19 and during COVID-19 periods. Apart from that, OLS based regression analysis was applied to quantify the impacts of COVID-19 on SMEs performance in Sri Lanka. According to the profiling of SMEs in selected districts, it is observed that majority of SMEs are performing at micro or medium level and ownership of SMEs is dominated by males. Despite there is a district level variation in educational attainments, primary and secondary educational levels can be considered as the most common educational attainments of SME holders. Considering the income level of SMEs, more than half of the SMEs earn monthly income between LKR 45,000 – LKR 105,000 and SMEs located in districts such as Colombo, Galle, Kandy and Rathnapura earn higher monthly income compared to the SMEs in other districts. According to the type of business, Food & Beverages and Hotels & Hospitality are the most common SME sectors in all selected districts. SMEs performance was measured by using three dimensions such as financial performance, innovative performance and operational performance. The t-test analysis clearly indicates that there is a statistically significant difference in SMEs' performance between pre-COVID-19 and during COVID-19 periods. More specifically, both financial and operational performance have reduced while increasing the innovative performance during the COVID-19 period compared to Pre-COVID-19 period. Especially, the innovativeness of SMEs has increased considerably during COVID-19 period as the SME holders attempts to explore novel ways of doing business during the COVID-19 period in order to ensure the stability of their organizations. The econometrics analysis clearly emphasizes that COVID-

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19 has adversely affected the performance of SMEs in Sri Lanka. The empirical model has estimated statistically significant negative coefficients for all COVID-19 related dummy variables indicating that SMEs affected by COVID-19 account for lower performance compared to those who are not affected by COVID-19. More specifically, the negative impact on SMEs performance gets higher when the magnitude of COVID-19 impact increases. Hence, it is apparent that COVID-19 has drastically affected the SMEs' performance in Sri Lanka. In fact, SMEs account for more than 50% of GDP of Sri Lanka and therefore it is essential to take immediate remedies to protect SMEs during the pandemic period in order to ensure the well-functioning of the economy. Therefore, the present study emphasizes the importance of government proactive policies to re-emerge SMEs while SMEs should themselves organize to battle with the COVID-19 outbreak.

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