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Government Interventions to Ameliorate COVID-19 Recession: The Case of Small, Micro, and Medium Firm's Survival in South Africa

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This paper analyzes the impact of government economic interventions to ameliorate the COVID-19 pandemic on the survival of small, micro, and medium enterprises (SMMEs) in South Africa. We use the Cox Proportional Hazards approach and cross-sectional data from King Cetshwayo District Municipality covering 641 SMMEs. The study finds that tax relief was the most important intervention used to sustain SMMEs during the pandemic. Other interventions, such as cash grants and cheap credit, were also used during the period but had a small impact. Our findings support the interventions used by the South African government in mitigating the negative consequences of the pandemic-induced lockdown on small businesses. However, we also note that the magnitude at which the interventions were made could have been lower than what is optimal. The paper recommends the need to increase and have sustainable targeted expenditure during the difficult times to enhance the resilience of SMMEs to accelerate economic development and growth.

Keywords: Cash grants; COVID-19 pandemic; government intervention; SMMEs survival.

JEL Classifications: O17, O23, O55

1. Introduction

The pandemic affected the growth and survival of small, micro, and medium enterprises (SMMEs) in South Africa. This is mainly attributed to the strict measures that restricted human movements and economic activities as some businesses were closed (Ikwegbue *et al.*, 2021). The effect of COVID-19 on businesses has led to an interest among researchers and business leaders in understanding how SMMEs can survive

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economic shocks (Oni and Omonona, 2020; Adam and Alarifi, 2021). SMMEs are important for the economic development of nations as they generate different sources of income, employment, and enhance innovation (Kaberia and Muathe, 2020). Therefore, several studies have embarked to analyze the impact of different interventions on the survival of SMMEs (Juergensen *et al.*, 2020; Le *et al.*, 2020; Fitriasari, 2020; Tuffour *et al.*, 2021). However, aside from the study by Tuffour *et al.* (2021) who evaluated the effectiveness of government interventions to support SMMEs in Ghana, we do not find studies that focus on the interventions used during the pandemic.

In South Africa, lockdowns may have severely affected small businesses, which are vulnerable to prolonged economic crises due to limited resources and smaller markets, which they serve (Bourletidis and Triantafyllopoulos, 2014). It is reported that larger businesses, which have better risk management strategies and are better capitalized were not as severely affected during lockdowns as these businesses remained open, providing essential services, whereas small businesses and those in the informal sector were forced to close (Ikwegbue *et al.*, 2021). The cash flows and liquidity of small businesses were adversely affected during the COVID-19 pandemic and even during the times of recovery (Oni and Omonona, 2020). Booyens *et al.* (2022) also supported the notion that it is small businesses that were mainly affected by COVID-19. Employees lost their jobs, increasing unemployment, and hurting the economy's prospects of turning around.

Amankwah-Amoah *et al.* (2020) argued that the pandemic had a negative impact on both formal and informal firms, particularly the small-scale business which has led to some of them being permanently shut down. SMMEs in the South African context were the most vulnerable compared to larger firms during the crisis. Both small and large firms were totally unprepared and unready, which led to a drastic increase in financially distressed firms. According to Faria-E-Castro (2021), the pandemic induced both a supply and a demand shock, which left SMMEs struggling to sustain their operations. On the one side, the disruptions in the global value chain restricted access to suppliers and resulted in increased prices for most goods and services (Faria-E-Castro, 2021). On the other hand, increased unemployment and reduced consumption stimulated by the uncertainty led to a demand shock, leaving firms with less income compared to the period before the pandemic. As SMMEs are the backbone of the South African economy, accounting for around 90% of businesses (Jili *et al.*, 2017), this resulted in a huge negative impact on the South African economy.

Compared to corporates, SMMEs are exposed to major vulnerabilities due to their inability to sustain debt repayments and lack of liquidity during economic shocks such as the COVID-19-induced recession (Nyanga and Zirima, 2020). The COVID-19 pandemic had the greatest impact on the local, national, and global economies, and negatively affected socio-economic outcomes in both low-income and developed countries. However, low-income economies were disproportionately affected by the pandemic-induced recession and South Africa was the most hard-hit country in Africa (Rogerson and Rogerson, 2020). The recession that ensued from the pandemic

increased the risk of survival for SMMEs. South Africa is known for its high level of income inequality in the world, and the pandemic worsened this outcome as many low-income households that depend on small businesses for survival lost income (Ncanywa and Ralarala, 2020). Lockdowns instituted by the government led to a country-wide halt of business activities for nonessential operators. This led to the closure of many SMMEs and has resulted in many small businesses struggling to resume operations. Evidently, interruption caused by the COVID-19 pandemic has led to the shutdown of millions of small and medium firms' operations across the world, including in advanced economies and emerging markets (Nicola *et al.*, 2020; Dai *et al.*, 2021). The COVID-19 pandemic has exposed the weaknesses of many governments' responses to crises, particularly in Africa, where comparable responses to those used in advanced economies were only done at a very low scale (Danielli *et al.*, 2021).

On the backdrop of the highlighted challenges, the pandemic put pressure on the public and private sectors to formulate responses to mitigate the negative social-economic outcomes emanating from the pandemic (Aladejebi, 2020). However, some scholars have raised concerns about the effectiveness of these interventions (Clauw *et al.*, 2020). Clauw *et al.* (2020) opined that although social relief and economic support packages were in place, most SMMEs would not survive and operate beyond the pandemic due to stringent requirements to access funds from the government. We concur that, while the interventions were in place, their scale (size) and implementation challenges reduced their potency to address economic issues such as production, supply chain, and market disruptions during the national lockdown levels.

This study contributes to the literature on SMMEs and their survival by analyzing the extent to which government interventions during the pandemic improved the resilience of SMMEs. Specifically, we evaluate the impact of government economic interventions in the SMMEs sector on the survival of SMMEs in the King Cetshwayo District, in South Africa. This is the first of such evaluative studies in the South African context and is central to the evaluation of policy decisions pertaining to business sustainability. We find that tax relief was the most popular and effective intervention in stimulating and sustaining the operations of SMMEs. Other sources of support, such as cash grants, credit guarantees (cheap credit), donations, and technical support, were also analyzed and showed marginal gains when using the graphical Kaplan–Meier approach.

In this section, we introduced the study. The rest of the paper is arranged as follows. Section 2 reviews both the theoretical and empirical literature on government interventions and SMMEs survival. In Sec. 3, we discuss the methodology used in the study, and in Sec. 4, the results of the analysis are reported and discussed. Section 5 concludes the paper.

2. Government Interventions and Small and Medium Businesses

The contribution of small and medium firms as a vehicle to create jobs, add value to the Gross Domestic Product and innovation was threatened during the pandemic. This

resulted in severe cash flow constraints, which required government's intervention to ease the economic effects caused by the pandemic (Oni and Omonona, 2020). The interventions were meant to ensure continuity and sustainability to deal with the negative economic impact on the sector. Government cash grants to SMMEs, tax relief measures, tax difference, unemployment insurance (temporary employer/employee relief scheme), and credit guarantees were used to assist those who have severely lost income and profit, and the potential beneficiaries were required to provide evidence on the impact of COVID-19 on their businesses. However, the interventions from the government have not been meaningfully formulated, larger proportion of these firms were not beneficiaries due to limited financial resources, and this has greatly reduced the GDP contribution of the local market (Ikwegbue *et al.*, 2021). We define small, micro, and medium firms following the definition suggested by the government of South Africa (Department of Small Business Development, 2019). However, due to the differences in revenue thresholds for different industries, we focus on the number of employees, which seems consistent for all industries. According to Department of Small Business Development (2019), a micro-enterprise is a business with 10 employees or less. A small enterprise has 11–50 employees, whereas a medium enterprise has between 51 and 250 employees inclusive. These three categories are also referred to as small businesses in the South African context.

2.1. *Theoretical framework*

There are many theories that are relevant to disaster management especially the current pandemic that is affecting the world since 2019 December. These theories include structural inertia, resources or orchestrated theory, game theory, and institutional theory, tournament theory, institutional theory, real options theory, events systems theory, resource dependency theory, prospect theory, and game theory. Based on this paper, the writers will be discussing the game theory and chaos theories to capture both government decision-making and responsiveness of firms to crises.

2.2. *The game theory*

Different scholars have written about game theory being used as a guide to solve problems relating to how government intervened in the issue of pandemic that affected businesses (Aladejebi, 2020; Craighead *et al.*, 2020; Enesi and Ibrahim, 2021; Kabir and Tanimoto, 2020). The main aim of game theory is to prognosticate, and this uses a set of rules that actors will use while communicating with one another (Aladejebi, 2020; Loi *et al.*, 2021; Von Neumann and Morgenstern, 1944). This theory admits that self-centered choices are created when communication is in place (Aladejebi, 2020). Bo (2005) further stated that when actors repeat communications among themselves, it leads to cooperation, this self-centered act leads to further reprisal. The assumption is that game theory states that organizations with the aim of striving against one another are probably going to collaborate during pandemic since

there is a high cost attached to noncompliance (Craighead *et al.*, 2020). This theory will enable the government to act on small businesses without being biased on which SME will benefit from the governmental intervention.

2.3. *The chaos theory*

This theory emphasizes on how to build survival models for SMMEs (Le Nguyen and Kock, 2011). Chaos theory suggests that most small businesses have limited resources to predict future risk but can be flexible to survive among their rivals/competitors (Arıcıoğlu *et al.*, 2021; Bayaga *et al.*, 2017). It further stated that management of businesses should emphasize on adaptability, initiative and entrepreneurial innovation, and creativity to cope with an unknown future (Arıcıoğlu *et al.*, 2021). This will enable SMMEs to be aware that as the future is unknown, then there must be flexibility to adapt when any unforeseen circumstance erupts. It prepares small businesses for an uncertain future that will make them adjust to new situations. This theory allows SMMEs to understand the dynamic evolution of companies and allows organization to be proactive and accommodate uncertainties.

2.4. *Empirical literature*

Extensive literature exists on small business survival both in the African context and at the global level (Chimucheka, 2013; Nyide and Zunckel, 2019; Van Praag, 2003; Bourletidis and Triantafyllopoulos, 2014). However, fewer studies have investigated the implications of government policy on survival of small, medium, and micro enterprises (Bartlett and Morse, 2020). Bartlett and Morse (2020) analyzed factors that contributed to survival of small business during the COVID-19 pandemic in the United States. Their approach involved investigating resilience of small businesses in relation to revenue, labor flexibility, and sunk costs. They find that in the presence of revenue resilience and labor flexibility, high committed costs threaten the survival of small businesses. They also found that policy intervention such as the Payroll Protection Program increased the probability of small business survival by 20.5%.

Nyide and Zunckel (2019) and Chimucheka (2013) investigated SMMEs survival in South Africa. Nyide and Zunckel (2019) analyzed the impact of capital structure on SMMEs survival. They find that personal savings, retained earnings and cash donations from relatives and friends which contributed significantly to the survival of SMMEs. However, they do not find any significant impact of bank borrowing, which may indicate the lower capacity for SMMEs to handle high risk transactions. Chimucheka (2013) analyzed the impact of entrepreneurship education on SMMEs, survival in Buffalo City Metropolitan Municipality. Their study found a positive relationship between SMMEs, survival and entrepreneurship education.

Adam and Alarifi (2021) analyzed the role of innovation in driving resilience among small and medium enterprises (SMEs) in Saudi Arabia. Using the cross-

sectional data and structural equation modeling techniques, they find survival of SMEs to be positively related with innovative actions of SMEs. In addition, they show that the external interventions targeted at sustaining SMEs have direct impact on business innovation rather than performance. In a related study, Clover and Darroch (2005) used data on small businesses in the Agribusiness sector to analyze factors that influence SMMEs survival. They identified internal and external factors that determine whether a business succeeds or not. Internal factors include lack of collateral assets, liquidity management, lack of managerial skills, and compliance costs. External factors include lack of funding, lack of institutional support, and insufficient training and development opportunities.

Other studies have looked at how some forms of interventions can enhance the survival of SMMEs (Allah *et al.*, 2013; Masutha and Rogerson, 2014; Rogerson, 2017). Business incubation has been widely used around the world as an intervention tool to support SMMEs survival (Ayatse *et al.*, 2017; Mian *et al.*, 2016). Rogerson (2017) and Masutha and Rogerson (2014) investigated the use of incubators to develop and grow SMMEs and avoid early liquidations within the South African context. Rogerson (2017) highlighted the need for business incubators in the tourism industry in South Africa as a way of increasing sustainability of small businesses. Masutha and Rogerson (2014) also discussed about the incubators in the context of South Africa and highlighted the number of public and private incubators. They found private incubators to be more potent and helpful compared to their public counterparts.

During the COVID-19 pandemic, policy-makers used various other initiatives to promote SMME survival. These include a wide range of policy interventions targeted at supporting business continuity (Adam and Alarifi, 2021; Juergensen *et al.*, 2020; Le *et al.*, 2020). Two strands of literature are identifiable in this group. First, there are studies that proposed possible government policy interventions to save SMMEs during the early days of the pandemic (Le *et al.*, 2020; Fitriasari, 2020). These studies seek to provide governments with tool kits they could use to help SMMEs ameliorate the pandemic. Le *et al.* (2020), for example, showed that government tax policy, cash grants, and bank loan guarantees were expected to impact survival of SMMEs positively. Islam *et al.* (2021) employed a qualitative approach and gathered information from various sources, including a focus group to propose a blueprint for SMEs support in Malaysia. Their suggested model can identify factors that affect SME survival in Malaysia and provide suggestions on how both government and private sector can assist small business during crises.

Juergensen *et al.* (2020) evaluated possible policy interventions to support SMEs in the Euro region. They suggested both short-term interventions and long-term interventions. In the short-term liquidity support, financial support and payroll support were identified. Long-term interventions include increased digital investments and strengthening networks. The second group of studies evaluates government policy implemented in different countries. Adam and Alarifi (2021) quantitatively analyzed the relationship between innovative practices and SMME survival in Saudi Arabia.

Their study found that innovation used included increased use of external knowledge, leadership, and flexible employee activities. Tuffour *et al.* (2021) used data from 150 managers to evaluate the effectiveness of government interventions to support SMMEs in Ghana. Their study, which is closer to ours, suggested that government soft loans, bank guarantees, and suspension of statutory payments were the most effective interventions.

3. Methodology

The study is based on a survey supported and funded by the National Institute of Humanities and Social Sciences (NHISS). The survey was undertaken between October and December 2021. A total of 641 observations were used in the study covering SMMEs. Primary cross-sectional data were collected from the King Cetshwayo District in KwaZulu-Natal, South Africa. The study covered all the five municipalities in the district, namely uMhlathuze, Nkandla, uMlalazi, Mthonjaneni, and uMfolozi. The main variables (interventions) analyzed in the study are cash grants, tax relief, cheap credit, donations, and technical support. In the estimated model, we use control variables on the level of education, number of workers, and location of the business. Level of education was a categorical variable with five categories, which we separate in our analysis. That is, some primary education (some primary), completed primary education (comp primary), completed high school (high school), obtained a diploma, certificate, or bachelor's degree (Dip/Cert/Degree). The fifth category was whether a person has postgraduate degree (postgraduate). In addition, we also control for the number of workers in the firm.

We conducted a survival analysis to determine how government packages influenced the survival rates of small and medium firms during the COVID-19 pandemic. The application of survival techniques relies on two vital concepts namely the hazard rate and the survivor function. The survivor function is essentially a continuous function that captures the probability that the firm's "failure time" T is greater than time t.

$$S(t) = \Pr(T > t), \tag{1}$$

where the hazard function $h(t)$ is conditional upon the firm's survival up to time t as given below.

$$h(t) = \lim_{\delta t \to 0} \left(\frac{\Pr(t \leq T \leq t + \delta t | T > t}{\delta t} \right). \tag{2}$$

The hazard rate and the survivor function are linked by the cumulative hazard rate $\Lambda(t)$ which is technical defined as

$$\Lambda(t) = \int_0^t h(u)du - \log S(t). \tag{3}$$

Since the relevant data will be sourced from firms themselves, the model will assume discrete periodic, preferably monthly, and time intervals. The survivor function is then

the probability that the firm in question will still be operational in the first t years while the hazard function on the other hand may be viewed as the probability of a given firm "surviving" to year t, going out of business in the subsequent period. One can, therefore, compute comparative global survivor functions and hazard rate estimates for the different groups of firms (i.e., those that receive government relief grants and those that do not) to establish the survival rates by plotting the periodic survival rates. In this case, interest will be on comparing the survival rates between beneficiaries and non-beneficiaries of government social relief grants during the pandemic.

Cox Proportional Hazards by Cox (1972) and Therneau and Grambsch (2000) approach to survival analysis enabled the construction of firms surviving or exiting the business for specific combinations of characteristics specific to each firm. This approach assumes the existence of a "baseline hazard" $h_0(t)$ common to each firm in the sample. This baseline hazard is then multiplied by a term which in turn depends on both the observable characteristics nested in vector x of the firm and on time-dependent covariates $y(t)$. Thus, the hazard rate t periods, is modeled as

$$h(t; x, y(t)) = h_0(t)e^{\beta_1^T X + \beta_2^T y(t)}, \tag{4}$$

where β embeds the model coefficients and vector x captures explanatory variables which include a dummy variable taking the value one if a firm is a recipient of a government social relief grant.

4. Results and Discussion

In this section, we present, interpret, and discuss the empirical findings on government support and the survival of SMMEs in the eight study areas of KwaZulu-Natal. We begin in Table 1 with the tabulation of support across the eight study areas. The aim, at this preliminary phase, is to gain an understanding of how each type of support was distributed across the study areas from the data collected. For the analysis, we divide

Table 1. Government support by location.

	Cash_grants	Tax_reliefs	Cheap_credit	Donations	Technical_support
Nkandla	11.54	4.23	6.17	16.02	20.62
Mthonjaneni	15.38	8.45	14.20	17.75	17.01
uMlalazi	0.00	18.31	14.20	26.84	0.52
uMfolozi	23.08	25.35	32.72	12.12	15.46
Esikhawini	19.23	12.68	3.09	9.52	15.46
Empangeni	11.54	21.13	19.14	10.39	12.89
Richards Bay	3.85	5.63	4.94	3.46	9.28
Dlangezwa	15.38	4.23	5.56	3.90	8.76
	100.00	100.00	100.00	100.00	100.00

Note: Pearson $\text{Chi}^2 = 139.77$; Prob = 0.0000.

uMhlathuze into four areas that were largely represented in the sample, namely Esikhawini, Dlangezwa, Empangeni, and Richards Bay. As Table 1 indicates, majority of cash grant beneficiaries were firms from uMfolozi (23.08%) followed by firms in Mthonjaneni, Dlangezwa, and Esikhawini, respectively. The least recipients of cash grants were Richards Bay and uMlalazi. The former accounted for only 3.85% of total cash grants while none of the firms in the latter benefitted from cash grants. Instead, majority of firms in uMlalazi primarily benefited from donations (26.84%) and tax relief (18.31%) while Richards Bay had relatively more firms that benefitted from technical support (9.28%) as compared to other types of support (cash grants, tax relief, cheap credit, and donations).

We proceed with our inference on government support during the COVID-19 pandemic and the survival of SMMEs across the eight study areas. Intuitively, government support is meant to bail out businesses whose financial health may have been compromised by the pandemic through both demand and supply side shocks. The nationwide lockdown in particular subdued demand for most goods and services while simultaneously disrupting supply chains. This, in turn, had a concomitant effect on financial viability of most businesses particularly those that faced high fixed costs. The question therefore is, to what extent did government intervention programs help prevent business failure and increase their survival rates against this background? Were beneficiaries of government intervention programs likely to survive longer than nonbeneficiaries?

From the SMMEs questionnaires, we were particularly interested in three forms of intervention namely tax relief, cash grants, and cheap credit under the credit guaranteed scheme. In Tables 2–4, we present results for these respective interventions. In each case, we present the deaths (business closures), survival rates, and their corresponding standard errors for beneficiaries and nonbeneficiaries. In particular, we find in Table 2 that 58.6% of the tax relief beneficiaries survived two months or more

Table 2. Tax relief and business survival.

Interval	Beginning total	Deaths	Lost	Survival	Standard error
Tax relief = 1					
0–30	360	53	23	0.8479	0.0192
30–60	284	81	43	0.5863	0.0276
60–90	160	108	43	0.1291	0.0215
90–120	9	0	2	0.1291	0.0215
120–150	7	1	3	0.1056	0.0276
180–210	3	3	0	0.0000	
Tax relief = 0					
0–30	340	80	17	0.7587	0.0235
30–60	243	81	22	0.4938	0.0282
60–90	140	109	30	0.0632	0.0152
120–150	1	1	0	0.0000	

Table 3. Cheap credit and business survival.

Interval	Beginning total	Deaths	Lost	Survival	Standard error
Credit = 1					
0–30	446	75	26	0.8268	0.0182
30–60	345	103	42	0.5640	0.0247
60–90	200	149	45	0.0906	0.0160
90–120	6	0	1	0.0906	0.0160
120–150	5	1	2	0.0679	0.0230
180–210	2	2	0	0.0000	
Credit = 0					
0–30	248	56	14	0.7676	0.0272
30–60	178	57	24	0.5040	0.0335
60–90	97	66	27	0.1056	0.0235
90–120	4	0	1	0.1056	0.0235
120–150	3	1	1	0.0634	0.0356
180–210	1	1	0	0.0000	

Table 4. Cash grants and business survival.

Interval	Beginning total	Deaths	Lost	Survival	Standard error
Cash grant = 1					
0–30	74	11	3	0.8483	0.0421
30–60	60	7	19	0.7307	0.0549
60–90	34	19	13	0.2259	0.0666
120–150	2	1	0	0.1129	0.0865
180–210	1	1	0	0.0000	
Cash grant = 0					
0–30	609	119	37	0.7985	0.0165
30–60	453	153	44	0.5150	0.0213
60–90	256	191	57	0.0826	0.0130
90–120	8	0	2	0.0826	0.0130
120–150	6	1	3	0.0643	0.0191
180–210	2	2	0	0.0000	

during the pandemic which is roughly 9 percentage points higher than the 49.3% observed in the case of nonbeneficiaries. As expected, nonbeneficiaries had a relatively low survival rate with none such firm surviving beyond 5 months (150 days). Beneficiaries of tax relief interventions on the contrary appear to have survived much longer than their counterparts with 10.5% of the firms surviving beyond 5 months. The longest surviving firm is, as expected, observed under the tax relief beneficiaries group reaching 210 days. This result is consistent with earlier empirical literature such as Tse and Soufani (2003), Martinez (2009), and Peck *et al.* (2014) in which tax relief

schemes are found to benefit small businesses through reducing costs and easing their revenue streams. As indicated by Peck *et al.* (2014), SMMEs tend to face high fixed cost which they do not have control over. This characteristic is significant with respect to the effect that a tax relief package may ultimately have on SMMEs. Fixed costs can be a financial burden for SMMEs during a global pandemic in which shrinking revenues streams can squeeze out profitability. Tax relief packages can, therefore, serve as a policy intervention that helps SMMEs stay afloat for much longer during periods of tight profit margins.

The standard errors are fairly low demonstrating a reasonable degree of precision in the presented survival rates. In the next table, we present the survival rates of SMMEs for two categories namely beneficiaries and nonbeneficiaries of cheap credit. The cheap credit form of intervention was to a large extent aided by a combination of the COVID-19 Loan Guarantee Scheme and an expansionary monetary policy during the early stages of the pandemic which culminated into lower prime lending rates. In theory, access to cheap credit is expected to benefit SMMEs through easing liquidity constraints. Beneficiaries of cheap credit can meet short- to medium-term operational capital requirements such as rentals and wages which is ultimately expected to increase their survival rates relative to firms with limited access to cheap credit. Table 3 validates this proposition albeit in the short term. We find that beneficiaries of cheap credit had higher survival rates particularly in the first 2 months (60 days) relative to nonbeneficiaries.

According to the results, 56.4% of the beneficiaries survived beyond 60 days which is relatively higher than the 50.4% observed under the nonbeneficiary category. Interestingly beyond 2 months (60 days), we do not find any significant differences between beneficiaries and nonbeneficiaries in the survival rates. This suggests that the effect of cheap credit is particularly more relevant in the short to medium term when firms are adjusting to revenue shocks. SMMEs with access to credit have higher survival rates in the short to medium term as they were able to cushion out the mismatches between income streams and expenditure in the early stages of the pandemic better than nonbeneficiaries. This result is in tandem with Oh *et al.* (2009) who, in evaluating the effect of credit guarantee schemes using the propensity score matching technique, concluded that an increase in access to cheap credit significantly improves firms' ability to increase their survival rate. Similarly, in the case of Nigeria, Okpara (2011) identified limited access to cheap credit as one of the key short-term constraints hindering the survival of small businesses.

A similar pattern is observed under cash grants in Table 4. The survival rate of cash grant beneficiaries was relatively higher than that of nonbeneficiaries particularly in the first 2 to 3 months. Looking at Table 4, 73% of the firms survived beyond 2 months under cash grants beneficiaries which is higher than the 51.5% observed under nonbeneficiaries. Looking at deaths defined as business closures, we find from Table 4 that the nonbeneficiary category posted more deaths in relative terms throughout the first 3 months. This is expected and unsurprising as most SMMEs (particularly those

that could not secure cash grants) went through a spell of financial difficulties during the pandemic. Majority of the interviewed SMMEs had less resilience and limited flexibility in coping with the costs that the pandemic entailed. The costs particularly ranged from prevention to the changes that were necessary in work processes such as remote and teleworking which required a level of digitalization beyond their reach. Cash grants cushioned some of these adverse effects and provided a shield which was necessary for these SMMEs to stay in businesses in such testing times.

Empirically, our result in Table 4 is in tandem with Nyawo (2020) who, in the case of SMMEs of South Africa's tourism sector documented an important role of government grants in giving firms the necessary although not sufficient financial support to sail through the raving and deleterious effects of COVID-19. Other studies that have reported a significant impact of government grants during the pandemic include but are not limited to Rogerson and Rogerson (2020), Meyburgh (2021) and Devereux (2021). An important take away point from these similar studies which could particularly help what appears to be a positive but short-lived lift in our study relates to the short-term nature of some of these grants. In some instances, as noted during the interviews, beneficiaries of the grants could not receive the grants timeously while others regarded the assistance as welcome but inadequate.

We proceed with graphical plots of survival rates from the nonparametric Kaplan–Meier survival curve. The Kaplan–Meier survival curve provides the survival function defined technically as the probability that a business hasn't closed. We are particularly interested in comparing the survival rates of beneficiaries with respect to each type of support. Technically, the survival rate is taken to represent the time in days to an event of interest which is, in the present case, the closure of the business. The first figure, Fig. 1, plots the survival function for beneficiaries and nonbeneficiaries of tax relief

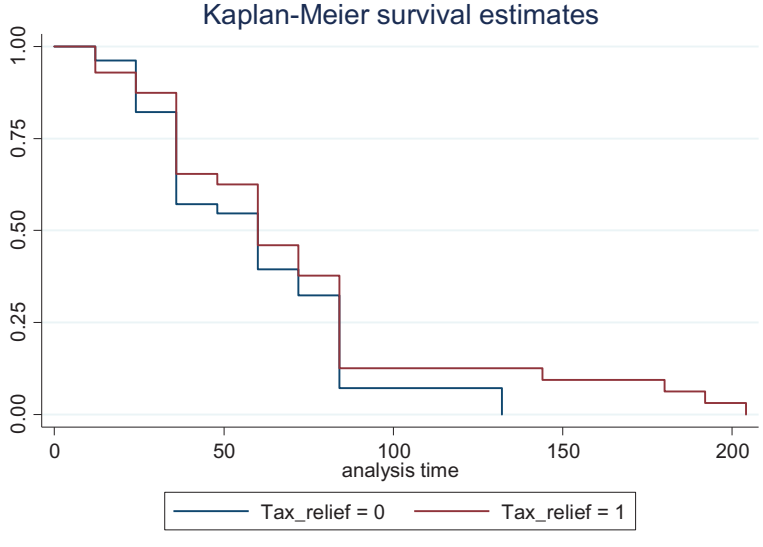

Figure 1. Kaplan–Meier survival analysis — Tax relief.

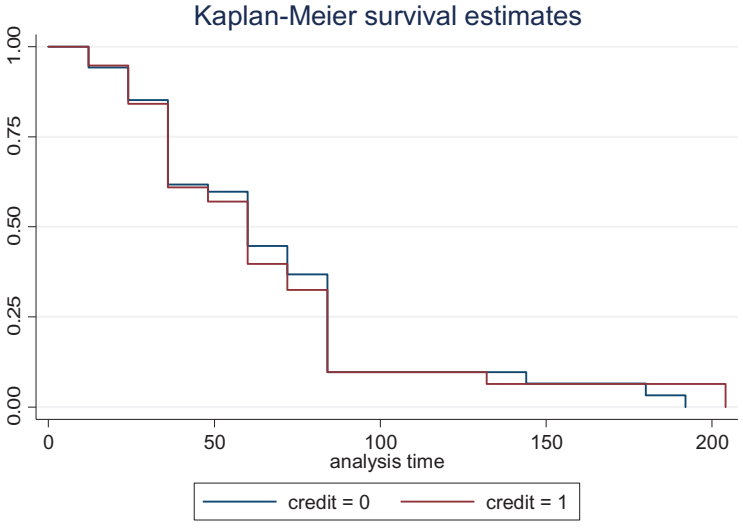

Figure 2. Kaplan–Meier survival analysis — Cheap credit.

interventions. A quick visual inspection of the graphs confirms that beneficiaries of tax relief interventions had a higher survival rate than nonbeneficiaries.

Figure 2 displays the survival rates of beneficiaries and nonbeneficiaries of cheap credit. Evidently, this graph indicates survival beyond 200 days for beneficiaries of cheap credit. This is strikingly different from nonbeneficiaries who clearly had a 0% survival chance beyond 190–200 days.

Finally, Fig. 3 reconfirms the relatively higher survival rate of cash grant beneficiaries over that of nonbeneficiaries. As clearly displayed, the probability of survival went to 0 before 200 days which is slightly shorter than that of cash grant beneficiaries.

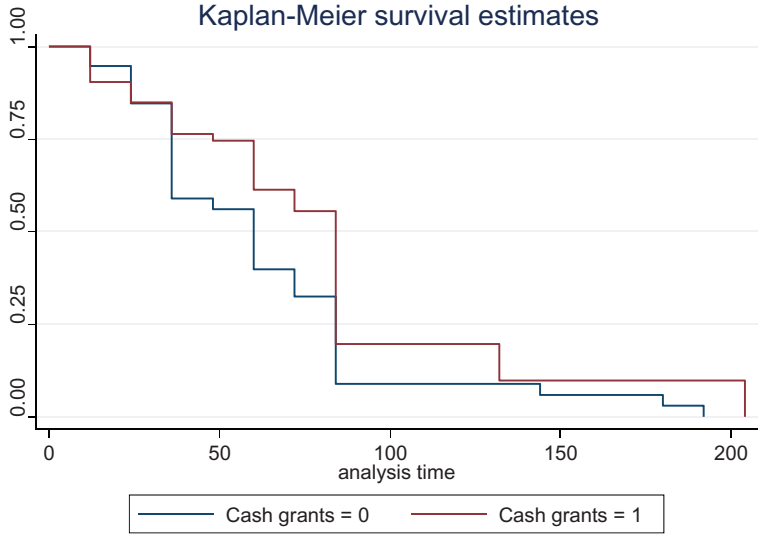

Figure 3. Kaplan–Meier survival analysis – Cash grants.

The Kaplan–Meier method is intuitive and nonparametric and, therefore, requires few assumptions. However, its weakness lies in the failure to accommodate predictor variables into the model. Cognisance of this limitation, we proceed with the Cox-proportional hazard model which fills this void by incorporating predictor variables. This feature of the Cox-proportional hazard model is attractive for our study in so far as it allows us to statistically compare the differences in survival rates between beneficiaries and nonbeneficiaries of the three selected types of government interventions during the pandemic. Note that the donations were dropped as a control group to avoid running a dummy variable trap.

We find that beneficiaries of the tax relief package have relatively lower hazards and, therefore, possess a longer survival time controlling for education of the business owner, number of workers employed, and locational differences. On the other hand, being a beneficiary of cheap credit, cash grants and technical support does not seem to make much difference in statistical sense. In other words, Table 5 provides an important result that only tax relief appears to have had a significant impact on survival chances of SMMEs when compared to cash grants, donations, technical support, and cheap credit. The insignificant results could be indicating the smaller impact these interventions had. For instance, the literature shows that subsidies that were given to firms and households in developing economies were smaller in magnitude, which could explain the little effect of ash grants. Again, due to the nature of the pandemic, donations were smaller as potential donors also found themselves threatened by the pandemic. Informality and general lack of information concerning the government guaranteed credit may also have limited access to this kind of support at a larger scale.

According to the result confirmed across all the seven regression variants, being a beneficiary of the tax relief intervention cuts the hazard to about three quarters its previous value which is consistent with the view that tax relief packages do provide SMMEs the breathing space they need financially to survive much longer during a pandemic in which both demand and supply are subdued.

With respect to control variables, we do find in one out of the regression variants the hazard ratio of firm owners with either a diploma, certificate, or a degree relatively lower by one-fifth. Put differently, being a firm owner with a diploma, certificate, or a degree reduces the hazard ratio to about four-fifth of its previous value. The coefficient for postgraduate takes the right sign but is statistically insignificant, which might be due to fewer firm owners possessing postgraduate qualifications. This result is in line with the general view that education enables business owners to make productive and informed decisions necessary to increase both sustainability and survival chances of a business. With respect to employment, evidence in Table 5 suggests that raising the number of workers employed at each SMME by one worker increased the hazard of failure by roughly one-tenth which is not surprising since increasing employment during a pandemic is essentially a cost addition to a business that is already facing financial difficulties.

Table 5. Cox-proportional hazard estimated results — Hazard ratios.

	(1) Hazard. ratio	(2) Hazard. ratio	(3) Hazard. ratio	(4) Hazard. ratio	(5) Hazard. ratio	(6) Hazard. ratio	(7) Hazard. ratio
Tax relief	0.792***	0.773***	0.809***	0.770***	0.772***	0.778***	0.732***
	(0.046)	(0.009)	(0.024)	(0.035)	(0.0300)	(0.056)	(0.057)
Cheap credit		0.919	0.963	0.916	0.924	0.918	0.857
		(0.147)	(0.136)	(0.200)	(0.210)	(0.226)	(0.223)
Cash grants			1.101	1.048	1.032	0.996	0.959
			(0.064)	(0.037)	(0.058)	(0.058)	(0.093)
Tech support				0.945	0.935	0.913	0.894
				(0.080)	(0.085)	(0.093)	(0.107)
Some primary					1.030	1.077	1.077
					(0.402)	(0.441)	(0.410)
Comp primary					0.728	0.757	0.721
					(0.167)	(0.192)	(0.147)
High school					0.864	0.929	0.918
					(0.089)	(0.155)	(0.120)
Dip/Cert/Degree					0.817*	0.882	0.871
					(0.084)	(0.157)	(0.128)
Post-graduate					0.917	0.998	0.981
					(0.113)	(0.158)	(0.109)
No of workers						1.096*	1.098**
						(0.052)	(0.046)
Mthonjaneni							1.393***
							(0.102)
Empangeni							1.049
							(0.125)
uMlalazi							1.386**
							(0.211)
uMfolozi							1.459***
							(0.007)
Nkandla							1.428***
							(0.198)
Esikhawini							1.271
							(0.186)
Dlangezwa							1.204**
							(0.099)
Observations	641	641	641	641	641	641	641

Notes: Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Location dummies were also included in the model as an attempt to capture the potential heterogeneity in survival rates of businesses across the eight study areas. As Table 5 shows, only seven dummies were included following the $m - 1$ rule (where m is the total number of categories) which is necessary in preventing a dummy variable

trap. In this case as the table confirms, Richards Bay was dropped as the baseline group. Looking at the results, being in each of the specified locations (except Esikhawini and Empangeni which are statistically insignificant) increases the hazard of failure by about one-fifth for Dlangezwa and two-fifth for uMlalazi and Mthonjaneni. For uMfolozi and Nkandla, the hazard of failure is higher by about half the previous value relative to an average firm from Richards Bay. These results may be taken to suggest that businesses in mostly rural and underdeveloped places (Dlangezwa, uMlalazi, Nkandla, and uMfolozi) are more vulnerable to business failure than business firms in relatively urban and more developed places such as Richards Bay in the present case. Lending further support and plausibility for this possible explanation is the statistical insignificance of Empangeni and Esikhawini which, like Richards Bay, are both relatively urban. Their insignificance, therefore, statistically implies that the survival rates of business firms in either of the two places (Esikhawini and Empangeni) are not significantly different from those of firms in Richards Bay which is comparably urban.

Table 6 presents the corresponding coefficients associated with the hazard ratios presented in Table 5. The negative coefficient on tax relief (−0.233) in the first variant (which is equivalent to the hazard ratio of 0.792 in Table 5, i.e., exp −0.233 = 0.792) reconfirms the importance of tax relief interventions in reducing the chances of business failure.

Table 6. Cox-proportional hazard estimated results — Coefficients.

	(1) Coefs	(2) Coefs	(3) Coefs	(4) Coefs	(5) Coefs	(6) Coefs	(7) Coefs
Tax relief	−0.233***	−0.257***	−0.211***	−0.261***	−0.258***	−0.250***	−0.311***
	(0.0593)	(0.0117)	(0.0297)	(0.0465)	(0.0400)	(0.0724)	(0.0783)
Cheap credit		−0.0838	−0.0375	−0.0870	−0.0790	−0.0855	−0.153
		(0.161)	(0.142)	(0.218)	(0.227)	(0.246)	(0.261)
Cash grants			0.0971	0.0477	0.0319	−0.00346	−0.0417
			(0.0603)	(0.0361)	(0.0564)	(0.0584)	(0.0977)
Tech support				−0.0560	−0.0663	−0.0902	−0.112
				(0.0852)	(0.0917)	(0.103)	(0.120)
Some primary					0.0298	0.0745	0.0744
					(0.391)	(0.410)	(0.381)
Comp primary					−0.317	−0.278	−0.326
					(0.230)	(0.254)	(0.205)
High school					−0.146	−0.0733	−0.0853
					(0.104)	(0.167)	(0.131)
Dip/Cert/Degree					−0.202*	−0.126	−0.138
					(0.104)	(0.179)	(0.148)
Post-graduate					−0.0861	−0.00175	−0.0185
					(0.123)	(0.158)	(0.112)
No. of workers						0.0922*	0.0944**
						(0.0480)	(0.0424)

Table 6. (*Continued*)

	(1) Coefs	(2) Coefs	(3) Coefs	(4) Coefs	(5) Coefs	(6) Coefs	(7) Coefs
Mthonjaneni							0.332***
							(0.0736)
Empangeni							0.0479
							(0.120)
UMlalazi							0.327**
							(0.153)
UMfolozi							0.378***
							(0.00539)
Nkandla							0.356***
							(0.137)
Esikhawini							0.240
							(0.147)
Dlangezwa							0.186**
							(0.0824)
Harrel's C							0.5828
Gönen and Heller's K							0.5612
Observations	641	641	641	641	641	641	641

Notes: Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

We employed the Harrell's C test and the Gönen and Heller's estimate as diagnostic tests on the main model in which locational dummies, the number of employed workers, and the education level of the business owner were included as control variables. The former test by Harrell *et al.* (1982) specifically uses a C-index defined as the proportion of all usable subject pairs in which the predictions and outcomes are concordant, and it ranges from 0 to 1. By interpretation, a value of 0.5 suggests no predictive discrimination, while values of 0 and 1 would reflect a perfect separation of subjects with distinct outcomes. As the lower part of Table 6 shows a Harrell's C-index of 0.58 suggesting that we can accurately compute survival times for pairs of firms 58% of the time on the basis of measurement of all the right-hand side variables. Gönen and Heller's also estimate the concordance probability, K is about 0.56. Although the Gönen and Heller's estimate is slightly lower, they both confirm an accuracy level above 50% in our survival analysis.

5. Conclusion and Recommendations

The paper confirms that government interventions to ameliorate the COVID-19 pandemic were effective in stimulating and sustaining business activity in the Small-, Micro- and Medium-sized entities. Tax relief appears to be statistically significant using both the Kaplan–Meier and Cox-proportional hazard methods. Receiving tax

cuts or deference increased the chances of survival for smaller businesses in South Africa. Other forms of intervention considered show little to no effect on the survival of small businesses. For instance, while cash grants and cheap credit show smaller improvements in survival when we use the Kaplan–Meier method, their coefficients are not statistically significant under the Cox-proportional hazard method. We conclude that these had only a weak effect on SMMEs survival. We also do not find a significant effect of interventions in kind, via technical know-how in driving the survival of SMMEs during the pandemic. The paper recommends that the government increase their targeted stimulus expenditure during hard times to enhance the capacity of small and medium firms to ensure resilience to accelerate economic development and growth. The increase in government funding should be accompanied by improvements in efficiency when allocating the resources to ensure optimal resource distribution. Targeted relief, such as grants for qualifying Broad-based Black Economic Empowerment (BBBEE) firms could be used, while Public Private Partnership (PPP) initiatives can be used to formulate support for small, micro, and medium firms.

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