

ROLE OF COVID-19 PANDEMIC AND GLOBAL ECONOMIC POLICY UNCERTAINTY ON FIRMS' PARTICIPATION IN INNOVATION: AN EMPIRICAL STUDY IN SUB-SAHARAN AFRICA SMES.

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Abstract

Since the year 2020, the degree of uncertainty has by far surpassed any record of the past, even the period of global financial crises of 2007-2009 is unmatched. Prior studies attribute the soaring of the global economic policy uncertainty (GEPU) index to the Covid 19 pandemic, however literature on this subject is still scant, thus, there is no strong empirical support. The novel pandemic led to innovative policy responses across the globe such as; lockdowns, social distancing and stimulus packages inter alia. There is too much uncertainty surrounding these policy responses since policymakers and economic agents are not sure whether the responses will be temporary or permanent. This is likely to put firms in an intractable dilemma on whether to invest in innovation or not. However, some innovations have been made especially on vaccines in developed countries. In contrast, little has been done in Africa, hence warrants an investigation. Considering the growing importance of SMEs in Africa, understanding how the pandemic and global economic policy uncertainty is influencing firms' participation in innovation is of central importance to policy makers across Africa in their search for resilient policies. Thus, the objectives of this study is to examine the impact of Covid 19 and global economic policy uncertainty on firms' participation in innovation, evidence from five Sub-Saharan African countries namely; Democratic Republic of Congo, Ghana, Tanzania, Uganda and Zambia. OLS estimation technique is applied using panel data so as to report within country variations to the effects of the pandemic and GEPU. The study envisages a negative impact of the pandemic and GEPU on innovation. Thus, policy initiatives aimed at minimising the spread of the virus and increasing economic activities are critical.

Key words: Covid-19, Global Economic Policy Uncertainty, Innovation, Small and Medium Enterprise

1.0 INTRODUCTION

Despite the unprecedented increase in fatality rates across the globe, the global lockdown has negatively affected economies in ways that are very different from other past crises. These rare features are sprouting and noticeable all over the world, regardless of country size, geographic region, or production structure of economies (Gopinath, 2020). The novel Covid-19 pandemic led to innovative policy responses across the globe such as; lockdowns, social distancing and stimulus packages inter alia. However, there is too much uncertainty surrounding these policy responses since policymakers and economic agents are not sure whether the responses will be temporary or permanent. Thus, recent studies are attributing the rising of the global economic policy uncertainty (GEPU) index to the Covid 19 pandemic.

Since first half of 2021, Africa has registered an increase in Covid 19 related deaths but the statistics remains markedly lower compared to the Americas, Europe and Asia. Notwithstanding the reportedly lower cases and deaths in Africa, the coronavirus pandemic have had more severe economic consequences in Africa than any other continent in the world (Lakemann et al., 2020). The pandemic has exacerbated the deteriorating economic situation in Africa and curtailed the growth of Small and Medium Enterprises (SMEs) which are a vital engine in African economy. With the soaring of Covid-19 induced uncertainty, the stance of SMEs

participation in innovation is unknown in Africa. Too much uncertainty surrounding policy responses such as lockdowns, in terms of whether they will be temporary or permanent is likely to put firms in an intractable dilemma on whether to invest in innovation or not.

The interest of this study stems from two matters of concern. Firstly, literature is replete with innovations done in developed countries for example Covid-19 vaccines in the face of the pandemic, however, participation of Africa in innovation during the pandemic is unknown. Secondly, the effect of the pandemic and global economic policy uncertainty on Africa's labour productivity growth is not self-evident. Baker et al (2016) noted that, in times of crisis and economic policy uncertainty, firms tend to slower the hiring process as they try to save costs. Consequently, the key objective of the study is to examine the impact of Covid-19 and global economic policy uncertainty on firms' participation in innovation both (i) manufacturing and (ii) service firms in Sub-Saharan Africa. Considering the growing importance of SMEs in Africa, findings of this study are of central importance to policy makers across Africa in their search for resilient policies.

2.0 LITERATURE REVIEW

2.1 Characteristics of African SMEs

SMEs play an integral role in the development of a country. These firms are everywhere across the world and many of the large businesses today started small. Therefore, SMEs require constant attention as they contribute significantly to; job creation especially among youth, global economic development and spearhead innovation. In Africa, SMEs have a great potential to become the largest corporations that are needed across the continent, for it to continue on the paths to growth and prosperity. Fjose et al, (2010) noted that 99% of firms in Sub-Saharan Africa were SMEs. Unlike their counterparts in emerging economies, African SMEs face a myriad of challenges such as; corruption, lack of training and experience, poor infrastructure, lack of financial support and inadequate profits inter alia. A study by World Bank in 2017 revealed that, Sub-Saharan African SMEs grapple with huge obstacles due to heavy taxation and corruption in their economies as well as unfriendly business environment compared to SMEs in other countries. Further, the adverse impact of the Covid-19 pandemic has not spared these SMEs in Africa but rather dampen their economic prospects. The extant literature provide evidence that, African SMEs largely operate in uncertain and hostile environments. It is generally believed that, these challenges faced by SMEs in Africa inhibit their innovativeness. Goedhuys et al (2016) revealed evidence about the negative impact of corruption on SMEs innovativeness in Egypt and Tunisia.

2.2 Factors affecting innovation

The role played by firm-level innovations in the 'so called' newly developed countries for instance South Korea, Singapore, Malaysia and, most recently, China in leapfrogging economic prosperity cannot be overemphasized. Therefore, understanding factors affecting innovations in Africa is imperative. A number of firm-level factors and economic factors, however, are identified to have an effect on innovation.

A study by Salavou et al (2004) concur that, strategy driven features for instance market-orientation and learning as well as competition-related characteristics are to a greater extent responsible for increasing innovation among Greek manufacturing SMEs. On the other hand, in Austria, transformational leadership at a management level has been cited to be useful for organisational innovation thus spurring growth and profitability (Matzler et al., 2008). A more recent study by Pezeshkan et al (2016) from a sample of SMEs in developing and emerging economies in South America, Europe and Middle East and North Africa found that, national level institutional factors have a bearing on innovativeness within firms. However, there seems to be a gap in the literature since limited research has paid attention to macroeconomic factors and their effect on innovation. Firms are likely to increase their propensity to innovate when there are significant improvements in the economy (Tomaszewski and Swiadek, 2017). Evidence emerged from Madrid-Guijaro et al (2016) that, financing constraints in the face of economic crisis inhibit innovation, at the same time the study found out that, long term relationships with banks reduce the effects of the crisis on innovation. Cowling (2015) demonstrate that, in time of crisis, lenders are much more likely to turn down credit line request for firms that are highly innovative. These present studies, however, do not discuss the innovation stance that firms take if they detect government policy uncertainty in advance during the period of world disasters such as Covid-19.

2.3 Covid 19, global economic policy uncertainty and innovation

Since the pandemic is relatively new across the world, the current literature is still scant therefore there is not much yet to review. Few studies can be reviewed and stated here; as such, the coverage of the review will not be that extensive.

Covid-19 cases in Africa and Sub-Saharan Africa were first detected and reported in Egypt and Nigeria on February 14th and 27th 2020, respectively (Egypt today, 2020 and Nigeria Centre for Disease Control, 2020).

Firstly, in Africa the health impacts and the spread of the pandemic has been seemingly different from other parts of the world. In mid-September 2020, the continent had comparably low absolute infections rates that is less than five percent of global confirmed Covid-19 cases and the continent account for about seventeen percent of the world population (Balde et al., 2020). Number of infections peaked daily in most African countries in July, to such an extent that the number of confirmed cases surpassed the August one-million mark. Approximately half of these cases were reported in South Africa. Secondly, except for South Africa, fatality seems to be lower in Africa than other regions in the whole world.

The novel pandemic led to innovative policy responses across the globe such as; lockdowns, social distancing and stimulus packages inter alia. However responses to the pandemic across Africa varied with some countries being very stringent while others were not. Further there is too much uncertainty surrounding these policy responses since policymakers and economic agents are not sure whether the responses will be temporary or permanent. This is likely to put firms in an intractable dilemma on whether to invest in innovation or not. Since its inception, governments, firms and individuals across the globe are making concerted efforts to find innovative ways to fight Covid-19. Literature is replete with innovations that were made to combat the deadly effects of the pandemic. Wellcome (2020) revealed that, less than a year after the pandemic started, about fifty developed countries by the end of December 2020 started producing the vaccines against the adage that vaccines takes more than ten years to develop. On the other hand, Callaway et al (2020) note that despite efforts aimed at developing vaccines, universities, public research institutions and pharmaceuticals and biotech firms in developed countries, often times in collaboration engaged in Research and Development efforts to swiftly develop new treatments for the pandemic, with mixed success. It can be noted that, innovations directed towards combating the pandemic came from the developed countries. Walton (2020) found a positive effect of Covid-19 on innovation in technology companies. These companies included some companies offering online gaming, video conferencing, video streaming, telemedicine, online learning and digital fitness.

However, innovation in Africa is not as much as that in the developed countries. A few countries engaged in innovations that combat the spread of the disease. Africa implemented physical distancing interventions, however enforcing these policies have been a great challenge to governments. Thus, some countries in Africa adopted technologies in different ways to “flatten the curve” of Covid-19 curses. For example Ethiopia introduced internet-based transportation payment system to enforce distancing for bus travellers (Ministry of transport- Ethiopia, 2020). Likewise, the government of Sierra Leone developed an electronic pass (e-pass) management system to limit movement of citizens. The government of Sierra Leone also used drones to monitor the degree of compliance of citizens during lockdowns in Freetown. African countries such as South Africa, Morocco and Tunisia also used the same technology (drones) to assess citizens’ compliance.

There are other interventions designed in Africa to spread awareness and hygiene messaging for instance Senegal government (2020) revealed that one of its SMEs developed an automatic hand sanitizer dispenser. This reduced the need to supervise hand washing. The government of Ethiopia (2020) also reported that a contactless electrical soap dispenser was developed by a young entrepreneur and used in communities in Ethiopia. Similarly, a solar-powered hand washing sink was developed by local innovators in Ghana and a touch-less hand washing station was developed and distributed in Uganda.

SMEs in several countries developed dashboards that were used to monitor case numbers and deaths for instance, in Rwanda, a GIS system was used to track cases at household level (Government of Rwanda, 2020). Further, Covid-19 information resource and a symptom checker was also launched in Sierra Leone which can be used on or off-internet. Sub Saharan African countries such as South Africa introduced handsets with features such as location-tracking technology and were distributed in the hot-spots of the pandemic to perform contact tracing (Government of South Africa, 2020). Similarly, Zambian innovators used nanopore sequencing to track mutations in Covid-19, thus, understanding the origin of the cases and track people in the chain of the infection.

However, testing capacity remains a challenge in many African countries. One of the SMEs in Senegal developed at-home test kits for Covid 19 and is reported to generate results in ten minutes (Borgen, 2020). Democratic Republic of Congo (DRC) has been steadily increasing investment in laboratory capacity and more importantly, genomic surveillance with DNA databases in order to trace the path of transmission and explain dynamics of the outbreak (Government of Democratic Republic of Congo, 2020). Furthermore, an open-source software developed in Tunisia was used to compare chest X-rays of patients suspected of having the virus to X-rays of patients with confirmed COVID-19 disease.

In summary, prior studies largely look at innovative ways implemented by various countries to mitigate the ravaging effects of the pandemic. For instance, Wellcome (2020) conducted a study on science, technology and innovation in the of face of Covid-19, and found that, less than a year after the pandemic started, about fifty

developed countries by the end of December 2020 started producing the vaccines. A more close study by Walton (2020) looked at the effect of Covid-19 on innovation in technology companies, however the study paid attention to only developed countries. Moreover, the role of global policy uncertainty on innovation has been largely overlooked in the literature. Investigating the role of Covid-19 and global economic policy uncertainty on innovation will help governments to device resilient policy initiatives that attract firms to participate in innovation during periods of crisis. It can never be business as usual in the face of a pandemic, thus, there is need for creative solutions and investment in technology to combat the spread of the pandemic.

2.3 Theory and hypothesis development

This study empirical work is based on an extension of the model presented in Acemoglu and Linn (2004), which examined the impact of market size on innovation. According to the model Research and Development effort (z_j) for the disease j is linked to the market size for the drug (Y_j). In contrast, we make two key modifications to their model.

Covid-19: First, we allow for the kind of the disease j to take into account that certain type of diseases have an effect on innovation especially diseases that affect the global health systems such as Covid-19.

Global economic policy uncertainty: Second, we consider the possibility that firms might not want to invest if there is too much uncertainty around the world. For instance the measures that are being introduced to curb the pandemic if there are there to stay or temporary. Policy uncertainty might limit firms to participate in innovation.

Other than these modifications, the setup of the model follows Acemoglu and Linn (2004) closely.

In the model, innovation is denoted by percentage of firms spending on R&D in period $t - 1$ in country (i) and global economic policy uncertainty is denoted by the GEPU index in period $t - 1$. Covid-19 was captured as a categorical variable (i) in period $t - 1$ and the model to be estimated is given as:

$$R\&D_{t-1} = \beta_0 + \beta_1 * COVID_{t-1} + \beta_2 * GEPU_{t-1} + \beta_3 * GDP_{t-1}$$

From the equation above, the expectation is that the coefficients for β_1 and β_2 are less than zero thereby indicating that Covid-19 negatively impacts R&D spending. Contrary, the expectation is that the coefficients for β_3 is positive thereby indicating that market size measured by GDP has a positive effect on innovation in line with the hypothesis corroborated by Acemoglu and Linn (2004).

3.0 DATA AND METHODOLOGY

The study obtained data from two key databases namely (i) World Bank Enterprise Surveys and (ii) the news-based measure of global economic policy uncertainty established by Baker et al (2016). The data collected in Enterprise surveys represent the private sector according to World Bank. World Bank's website reports that the surveys interview business owners and top managers within SMEs. Stratified random sampling technique was employed as it allows grouping of homogeneous samples. Consequently, random sampling was done to draw a sample from a specific set for the purpose of this research. Our sample comprises of both services and manufacturing firms. We have unique observations across 5 countries, extending between the years 2018 and 2021.

3.1 Variables

3.1.1 Dependent variable

The dependent variable is innovation and is measured by percentage of firms spending on research and development. Data on the dependent variable is obtained from the Innovation and Technology World Bank Enterprise Surveys.

3.1.2 Independent variables

The independent variables of interest were Covid-19 and global economic policy uncertainty. For Covid-19 a dummy variable was used in order to have sufficient observations for our estimations. The dummy variable captures periods before and after the pandemic. The variable global economic policy uncertainty is a news based measure developed by Backer (2016). The final GEPU measure is GDP weighted measure obtain from www.policyuncertainty.com. A number of studies use GEPU as an independent variable. This variable is found to significantly impact the prices of assets (Kang and Ratti, 2013; Yu, Fang, and Sun, 2018), as well as key corporate decisions (Wang et al., 2014). Further GDP was used as a control variable and a measure of market size as postulated in Acemoglu and Linn (2004) model.

3.2 Methodology

Multivariate regressions were used in many past studies that use World Bank Enterprise Surveys, particularly wherein constraints need to be factored in with regards to estimation (Mthimkhulu and Aziakpono, 2015). Other renowned studies have mainly used instrument variable regressions with the WBES variables for the purpose of estimation the models (Jaax, 2020). Unlike other studies, the dependent variable in this study is neither an indicator nor binary in nature, thus the need to use probit, logit or tobit regressions for the purposes of estimations is eliminated. Ordinary Least Square (OLS) technique is used for estimation purposes. Given that the sample constitute 5 countries, it is paramount to see how the pandemic and GEPU impacts outcome variables in each country. Fixed effects and random effects are conducted. In addition, using a fixed effects model over a random effects model takes into consideration time-invariant differences between individual countries and escapes biased co-efficients that could occur due to omission of time-invariant characteristics (as in the case of a random effects model) (Kohler & Kreuter, 2012). In order to decide on which model to use between the two, a Hausman test is conducted. Lastly, robust standard errors are reported to account for the effects of heteroskedasticity.

4.0 FINDINGS

Table 1: OLS results for firms

Variables	(a) Services	(b) Manufacturing
Covid	-0.0325** (0.0134)	-0.0243** (0.0134)
Change in GEPU	-0.0307** (0.0308)	-0.0289** (0.0184)
GDP (in billion dollars)	0.000500 (0.000378)	0.000746* (0.000411)
Constant	-13.78000 (20.25)	-27.56*** (6.627)
R Squared	0.078	0.231

Standard errors in parenthesis

***p<0.01, **p<0.05, *p<0.1

4.1 Discussion of findings

In line with the theoretical arguments of this research, the assertion is that, firms are likely to reduce their propensity to invest in innovation in times of crisis and high levels of policy uncertainty at the global level. This is partly explained by risk aversion on the part of firms. The empirical findings provide evidence that research and development spending by SMEs are significantly reduced in Sub-Saharan Africa. This indicates that proportion of firms participating in innovation is small in the region. According to the Hausman test results, fixed effects model was reported for the regressions pertaining the impact of Covid and global economic policy uncertainty on innovation. The results shows that Covid-19 and global economic policy uncertainty negatively impacts the proportion of firms spending on R&D in both service and manufacturing firms. Further, the results show a R^2 (0.23) is higher for manufacturing firms than service firms (0.07) indicating that manufacturing firms spend more on R&D than service firms which are more human capital intensive (Brouthers and Brouthers, 2003). Service firms do not require as much investments in innovation as the manufacturing firms. However, both service and manufacturing firms are likely to view R&D spending as a risky endeavour (Hirshleifer, Low & Teoh, 2012) and hence are likely to refrain from participating in innovation activities during times of pandemic such as Covid -19 and high economic uncertainty. The results of this study support Madrid-Guijaro et al (2016) who established that, economic crisis inhibit innovation. However, of interest is the conflicting result of this study with that Walton (2020) who found a positive effect of the pandemic on innovation in developed countries. This dissimilarity could be explained by increase in R&D spending in developed countries in search for effective vaccines and technology that curb the spread of Covid-19. The findings of this study benefit policy makers in governments to make informed policy decisions in periods of pandemic-induced uncertainty as firms and consumers may be less optimistic.

5.0 SUMMARY AND CONCLUSIONS

The study examined the impact of Covid-19 and global economic policy uncertainty on innovation in Sub-Saharan Africa using a sample of five countries namely; Democratic Republic of Congo, Ghana, Tanzania, Uganda and Zambia. Our regression estimates suggest that the COVID-19 outbreak and global economic police uncertainty have a negative and statistically significant impact on innovation in Sub-Saharan Africa. However, the results of the study were against what was discovered in developed countries. A number of studies reported a positive impact of Covid-19 on innovation. Contrary, the unprecedented global R&D response to

fight COVID-19 through speedy discovery of vaccines shows that the aggregate innovation effort may be operating significantly below its potential even in developed countries. The high global economic policy uncertainty have implications on the economies of Africa. Firms and consumers might be less optimistic thus, the economies can register a decline in; investment in innovation, production, employment and consumption inter alia. Therefore policy initiatives aimed at pursuing consistent expansionary policies to avoid substantial fall in economic activities are required, at the same time implementing safety measures to reduce the spread of the virus.

Significant advancement in health care through government subsidies to technological companies can go a long way to reduce the spread of the virus by using technologies such as; (Artificial Intelligence, satellite imagery, drones, robotics, and cloud computing). Similarly, sound institutions and regulatory frameworks that promote patents rights are critical in attracting SMEs to participate in innovation and foster entrepreneurship.

6.0 LIMITATIONS AND FUTURE RESEARCH

The study is one of its own kind as it utilizes a rarely used macroeconomic variable (global economic policy uncertainty in examining the impact of covid-19 on innovation. However, there are some limitations to the study's findings. One of the key limitation is that, data on global economic policy uncertainty is only available for about twenty developed countries based on their GDP ranking, however the challenge is that none of the African countries is listed in this index. Thus, the findings are somewhat generalised since there was no specific data for policy uncertainty in each individual country. A potential future avenue concerning data collection could be to develop an aggregated news-based index of policy uncertainty solely for African countries. Further, future studies can make use of case studies and look for firm specific data and analyse the impact of Covid-19 and economic policy uncertainty on firm's participation in innovation.

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