Economic Welfare and the COVID-19 Pandemic in Nigeria: Overview of the First Half of 2020

Olakunle Jimoh*

Department of Economics, Lagos State University, Ojo, Nigeria.

Abstract

The COVID-19 pandemic is not only a significant threat worldwide that tends to affect the health status, it also affects the economic wellbeing of the people at large. The current study examined the relationship between the pandemic outbreak and economic welfare. This relationship was determined using daily data on proximate economic welfare measures, real Gross Domestic Product (GDP), and changes in Consumer Price Index (CPI) with variables-discharge rate, fatality rate, spread rate, and number of tested cases as disease indicators. The prosperity theory was adopted and the estimation issue was rooted from/resolved using the robust least squares technique due to the failed normality assumption of the conventional least squares. The results indicated that COVID-19 outbreak lowers the labor supply and causes production shortages which subsequently result in price hike and loss of real income value. On the contrary, a high discharge rate increases the real income value. Hence, economic welfare, immediate financing, regulatory, equity, and diversification strategies are needed to revive the Nigerian economy.

***Keywords*:** COVID-19 pandemic, discharge rate, economic welfare, labor supply, robust regression

JEL Codes: D60, E01, E21, E31

Introduction

The COVID-19 pandemic has cut the world's economy across the globe. The outbreak of COVID-19 erupted in Wuhan, China towards the end of 2019. Since then, there has been a continuous surge in the spread rate as well as the number of cases amidst health care intervention, though with some recovery rates. On March 5, 2020, ten (10) countries worst hit by COVID-19 pandemic were the 10 largest economies of the world, except Iran and India (Baldwin & di Mauro, 2020). The lack of testing ability, political expediency, and clinical conditions characterized by longer period

* Corresponding Author: ghafarshahiiui@gmail.com

of demonstration of asymptomatic signs are the major factors rendering statistics unreliable, particularly for African countries.

According to the Center for Systems Science and Engineering at Johns Hopkins University and World Bank Credit: Alyson Hurt/NPR, by July 27, 2020 (which falls within the scope of this research), of the top 10 countries hit by the pandemic, 7 were upper middle income or lower middle-income countries based on World Bank's definition, while 3 were high-income. The United States had 4.29 million cases followed by India with 1.48 million cases, others were Russia (0.82 million), South Africa (0.45 million) Mexico (0.40 million), and Peru (0.39 million). Chile, United Kingdom, and Iran were at the bottom with 0.35 million, 0.30 million, and 0.29 million cases, respectively. All these countries had different spread rates depending on their control measures.

Already, the COVID-19 pandemic, a public health crisis, has had huge economic effects as compared to similar epidemics of Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) outbreak of the 2003 and 2015, respectively. It successfully moderated peoples' movement and reduced both, production and supply chains. Worst still are the negative effects on economic welfare as demonstrated by the trend in welfare indicators, such as cost of living, real income, health care, education, degree of happiness, and environmental quality among others. The current study was strongly motivated by the fact that apart from health risk induced by the COVID-19 pandemic, it strongly retards the economic progress by the low performance of world economies (inclusive of Africa). Economic regression was stimulated by shrinking production level, rising prices, exchange rate instability, oil price fluctuation, rising unemployment crisis, and general increasing level of poverty. The level of dependence in Western Africa, particularly Nigeria, further triggers instability level.

The frequent international oil price reduction exposes the economy into greater economic risks arising from drastic reduction of revenue to cater for the cost of governance. Nigeria responded to the short fall of revenue by cutting the budget expenditure to form a new equilibrium position surprisingly focusing on education and health expenditures as some of the key elements of development. Given the advent of the COVID-19 pandemic and its associated economic crisis, the question of "to what extent the pandemic and the response to the pandemic impacts the population's

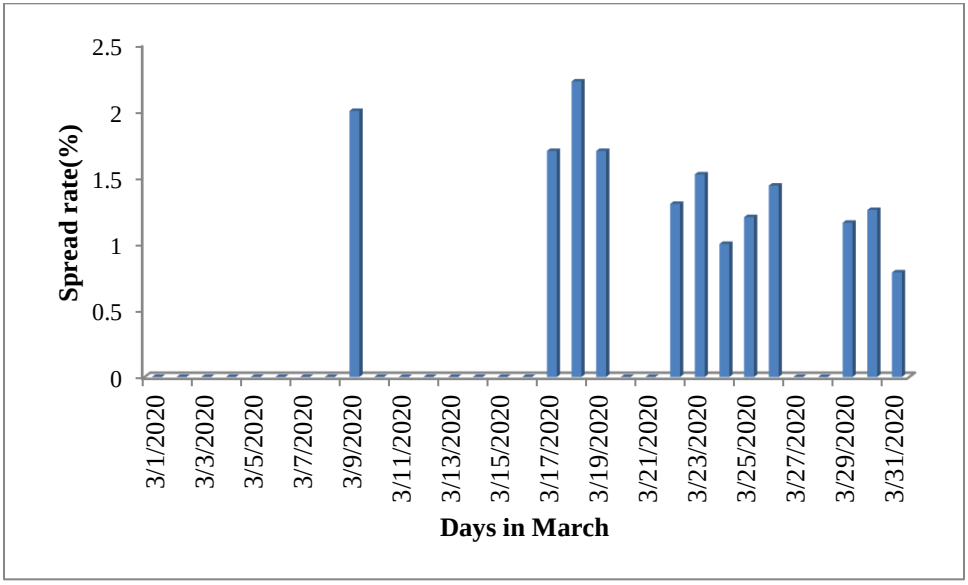
economic welfare in Nigeria," becomes very pertinent? Therefore, this research aimed to evaluate the impact of COVID-19 on economic welfare and the relationship between response and economic welfare in Nigeria. The introduction in section II reviews the relevant literature and section III discusses the theory and methodology. Section IV discusses the empirical analysis and discussion while section V is based on conclusion.

COVID-19 and Welfare in Nigeria

Generally, COVID-19 surge has been a rising trend across the globe since its inception in December, 2019. Within West Africa, Ghana's first 2 cases occurred on 12th March, 2020 and by 8th April, 2020, the confirmed cases reached up to 313 in number. The news of the COVID-19 pandemic surging in Nigeria, particularly in January and major preparedness was to be made to mitigate its entry. Nigeria's first COVID-19 case appeared on 27 February, 2020 and by April 8, with 22 new cases and 276 confirmed cases were observed. In Benin, the first case was recorded on March 16, 2020 and three days later, another second confirmed case occurred translating to 100% spread rate. The ravaging effects of Coronavirus across the world initiated homogeneous measures to reduce the effects on health and economic risks.

Figure 1

COVID-19 Spread Rate in March, 2020



Note. Source: Computed using Nigerian Centre for Disease Control Data

The economic and health impact was obvious in March, 2020. According to the Figure 1 above, the most noticeable spike in the spread of COVID-19 occurred on March 18, reaching about 167% of the population and remained the highest since its inception. Although, the spread rate was nil in early March. The spread rate gives the severity of infections for the months under review. The continuous spread pushed the first lock down initiative of March 30 across three major cities including Abuja, Lagos, and Ogun lasting for two weeks. However, the impact this time on economic activities was minimal as compared to that of April. April recorded a surge with varying magnitude and it came with 25.2% spread rate. Moreover, it was highest with the least spread of 1.6% for the same month. At the expiration of the initial lock down and following the continuous rise in the spread, the lockdown was again extended. The continuous spread was connected with the partial non-compliance to the rules and the emergence of tested cases. This partial non-compliance was also linked with the worsening welfare conditions due to the pandemic. This period was characterized by closure of businesses, traveling, and job restrictions to maintain social distancing policy.

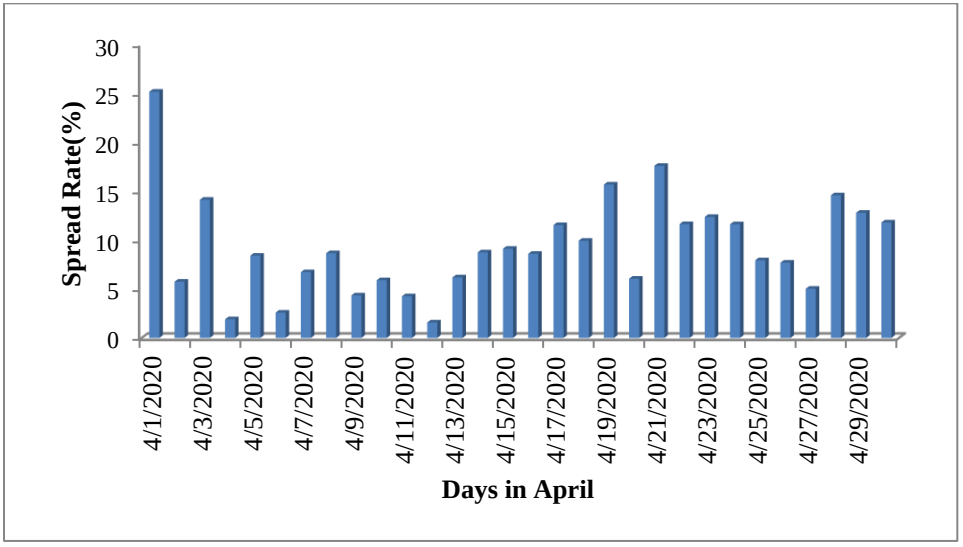
The consequence was low income for day to day economic activities amidst rising food prices due to supply restrictions. The implication of rising inflation is the worsening level of consumers' purchasing power and reduction in the quantity purchased amidst low level of income. On month-on-month basis, Consumer Price Index (CPI) stood at 0.84 in March as compared to 0.79 in February, translating to 0.05 percentage basis point difference. January, however, recorded an index of 0.87 even higher than February. This may be linked to low production arising from late resumption from festive break. The lockdown would not have had a major impact on the inflation trend for these months as its effect was felt more from April. Similarly, increases resulted for the year-on-year and twelve-month-year-on-year inflation rates. Huge demand in the agricultural sector in anticipation of economic slow-down due to the pandemic led to panic and thus increased commodity prices. The index stood at 1.02 on month-on-month basis in April demonstrating a 0.18 percent point increase over the preceding month. This rise among other factors was partly connected with shrinking supply resulting from preventive measures of the pandemic.

Urban and rural indices rose to 1.06 and 0.98, respectively increasing by 0.18 and 0.88 over the preceding month.

The worsening welfare conditions forced some individuals living from hand to mouth to seek survival means. Thereafter, these conditions initiated the welcoming palliative care measures by the government including downward review of interest rates on all applicable intervention facilities from 9% to 5% per annum for 1 year (Nairametrics, 2020a). The problem with this was not distribution parse, however, the distributive channels as many Nigerians complained of non-uniform spread of the palliative care. On average, the size of stimulus packages in GDP for advanced economies is 12% with United States having 11%. In sub-Saharan Africa, it is about 0.4% giving a percentage point difference of 11.6 (Nairametrics, 2020b). Nigeria's stimulus package is only 0.34% of the GDP which is highly insignificant to boost the currently fragile economy (Nairametrics 2020b).

Figure 2

COVID-19 Spread Rate in April, 2020



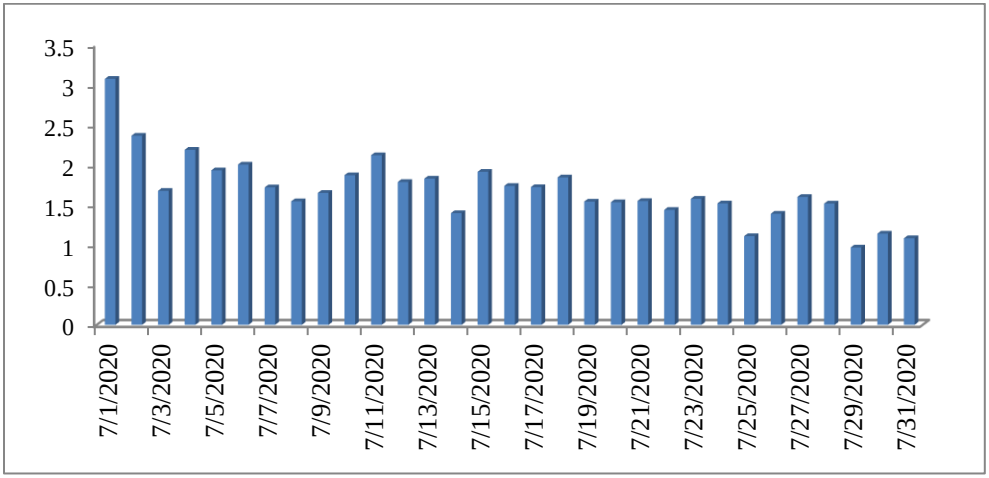
Note. Source: Computed using Nigerian Centre for Disease Control Data

May and June followed a similar trend in terms of the spread except early part of May that witnessed some little spikes in the spread with highest spread rate of 12.3% on May 1. Generally, an average spread rate of 4.4% was witnessed for the months of May and June demonstrating an obvious

departure from huge spikes as experienced in previous months. It was due to the more stringent policy in complying with the pandemic rule and the medical attention to infected individuals during the period as compared to the previous months. However, there was still low income distribution due to low income inflows arising from business closures and non-payment of salaries, particularly in the private sectors. Ease of lockdown was further initiated, however, with adherence to the pandemic rule of using nose mask and social distancing among others. While, the hike in food prices still persists and transportation fares further contribute to worsening economic conditions. The regulation of reducing commuters by 50% in commercial vehicles unnecessarily inflates the fare borne by the innocent commuters without necessarily providing a subsidy to cushion this effect.

Figure 3

Spread Rate (%) in July, 2020



Note. Source: Computed using Nigerian Centre for Disease Control Data

As compared to previous months, the average spread rate in July read 1.7%, demonstrating an obvious reduction and may be connected to some fair adherence to the preventive rule and more enlightenment on the danger of the virus. Cumulatively, ever since the outbreak of the COVID-19 pandemic and up to July 31, 2020, a total number of confirmed fatalities of 879 and discharged cases of 19,565 have been discovered. Out of the total number of confirmed cases of 43, 151, the males are more vulnerable and constituted 65% of the total while females constituted 35%. It should be noted that deaths and discharge cases did not commence immediately as

confirmed cases. Hence, spread rates which were generated from the confirmed cases are given more attention and also determine fatalities and discharged cases.

Table 1

Composite CPI Index (February –July 2020)

Month	M-O-M	Y-O-Y	12-MA
January	0.87	12.13	11.46
February	0.79	12.20	11.54
March	0.84	12.26	11.62
April	1.02	12.34	11.71
May	1.17	12.40	11.79
June	1.21	12.56	11.90
July	1.25	12.82	12.05

Note. Source: National Bureau of Statistics

Inflation index on month-on-month basis increased to 1.17% in May, translating to 0.15 percent point higher than that of April, further reducing the purchasing power. This later increased as expected to 1.21% in June and by July it was already 1.25%. From January up to July only, the index increased by 0.38 percent. It demonstrated a major decline in welfare of the populace. The rise in inflation further worsened by the increase in road transportation prices, medical services, core food items, and exchange rate depreciation. The tension surrounding the worsening standard of living amidst poor distribution of palliative, motivated the gradual ease of the lock down rule. This called for the partial resumption of private and public sectors and businesses with government laying down operating rules. Generally, GDP grew by 1.87% in real terms in the first quarter of 2020 (NBS) based on poor performance of the non-oil sector, reduced demand for oil, and obvious restriction of international trading activities (Naira metrics). Real GDP growth declined further by 6.10 % in the second quarter amidst the existence of the pandemic.

Theoretical Review

The description of economic wellbeing could firstly be viewed from the microeconomic level with reference to the consuming units on the distinction between households and individuals. While, the traditional theory is based on the former. Further researches have shown support for the household as more appealing in the description of decision-making

units. It has been illustrated in the framework of (Samuelson, 1956) on the theory of household behavior. The focus on the household is in line with the fact that information related to consumption or income is usually collected for household and not individuals. Moreover, households may have distinct characteristics due to different individuals constituting each household. An important characteristic employed here is the household size based on the premise that household needs, such as income, expansion with the inclusion of more members in the group, and following economies of scale to keep same level of living standard with those whose sizes are non-increasing. This may, however, not necessarily be same for needs, such as social infrastructure including housing spaces and electricity consumption (United Nations Economic Commission for Europe [UN-ECE], 2011).

Meanwhile, economic theory of equivalence scales provides a preliminary view. Moreover, it also explains that equivalence scales as the proportional change in expenditure is required in ensuring that utility between two individuals with different characteristics is the same. Since the equivalence scales depend on expenditure patterns, aside from varying with household sizes, they equally vary with prices and household characteristics that remain a function of expenditure behavior. Basically, economists have developed several theories on welfare economics with no agreement on the measure of economic welfare. Welfare theories can be seen in two basic ways. Firstly, to Pareto and his followers and secondly, welfare is justifiable when it is beneficial to at least one person without worsening any other person's welfare conditions in the society. Social welfare is obtainable through the summation of individuals' welfare. In real life complexities, Pareto criterion is inapplicable since some policies seem to favor some people and becomes a cost to others. Moreover, this theory excludes interpersonal comparison in terms of utility and welfare. In the Samuelson and Bergson theory, there is sense of value judgments together with the possibility of interpersonal comparison of welfare conditions. It is done through various comparisons of several welfare functions for various individuals called social welfare functions with value judgments.

A reference based-utility theory as suggested by the Prospect theory needs to be considered. This theory by (Kahneman & Tversky, 1979) has become a main alternative to the expected utility approach for decision-making under uncertainty with much empirical supports. Besides, this theory considers reference-dependence, loss aversion, and principles of

diminishing sensitivity as observed. Many studies within and outside the scope of economics have widened the understanding of welfare growth. Some originate from the national accounts with attempts to include leisure and other adjustments of production boundary in order to create GDP, extended ideas, and other approaches. However, the Stiglitz report (Stiglitz et al., 2010) highlighted the limitation of employing GDP. The distribution in welfare assessment has also become more popular in recent times. It has been suggested that different approaches to measure the economic progress aside from the standard GDP measures must be considered. Pandemics are envisaged to result in negative short-run impacts on economic activities. Theoretically, shock adversely affects the economy through three main transmission mechanisms.

Based on the studies of Carlsson-Szlezak et al. (2020a) and Carlsson-Szlezak et al. (2020b), these mechanisms are the direct and indirect impacts along with the supply side disruption. The direct impact is related to reduced consumption level due to prolonged pandemic and social distancing measures. The indirect impact reflects the effect of financial market shocks on the real economy and the supply side disruption relates to negative multiplier effects on supply chain. The impacts based on (Jonas, 2013) may be observed through preventing reactions based on social distancing strategies, incurring direct costs and larger indirect costs along with offsetting and minimizing the effects. Although, with social distancing policy, spread rate is contained and medical treatment and expenses are minimized (Pindyck, 2020). Some studies, such as (Jonung & Roeger, 2006) anticipate negative economic impact of Coronavirus. For instance, they forecast that a hypothetical global pandemic may result in 1.6% reduction in GDP of the European Union (EU), a consequence of demand and supply factors. Based on historical comparison, (Barro et al, 2020) observed that ceteris paribus, the 2.1 % death rate of the Spanish Influenza Pandemic would have translated into about 150 million deaths globally during the present pandemic and accordingly the 2.1% death on the average is equivalent to 6.1% reduction in GDP and 8% reduction in private consumption. Empirical studies have been carried out on Coronaviruses even within the short period. (Elgin et al., 2020) adopted the Principal Component Analysis (PCA) in developing their COVID-19 stimulus in 166 countries. The authors link the standard index with government predictor's response including population characteristics and economic variables among others. They determine that economic stimulus is higher for

countries characterized by higher Coronavirus infections, median age, and income per capita. The 'Stringency' policy which the authors develop, is not found to be a significant predictor of economic stimulus suggesting that public health measures are not drivers of economic stimulus measures (di Mauro, 2020).

Theoretical Framework and Methodology

Though the Prosperity Theory inspires the poverty and welfare measures, however, attention here is on the welfare aspect. It is, therefore, important to highlight the principles behind the conventional welfare issues as a guide towards the abovementioned theory. In welfare analysis, an individual is presumed to derive utility

$$u(x) \tag{1}$$

from the consumption of commodity x, with the assumptions that $\frac{\partial u}{\partial x} > 0, \frac{\partial^2 u}{\partial x^2} < 0$. The utility function predicts his behavior and measures his wellbeing. If assumed further that this is measurable with interpersonal comparison, then the social welfare function is

$$swf_t = u_1(x_{1,t}) + u_2(x_{2,t}) + u_3(x_{3,t}) + ... + u_n(x_{n,t}) = \sum_i^n u(x_{i,t}) \tag{2}$$

Here, i refers to individual consumer and t, time period in which income or consumption is measured. Changes in welfare can be reflected and suppose this is reflected within two consecutive periods such that,

$$\Delta swf = \sum_i^n [u(x_{i,t}) - u(x_{i,t-1})] \tag{3}$$

Considering uncertainty, standard utility function can be replaced with expected utility. In order to modify the conventional approach to prosperity theory, the fact that welfare measure is independent on income levels, however, dependent on changes from a reference point, loss of aversion, diminishing sensitivity, and adoption of subjectivity probability distribution as compared to objective distribution, has been considered. Since, the theory of Prosperity was developed to capture welfare uncertainty, the model would consider income or consumption uncertainty making the idea of subjective probability distribution become highly relevant. The

Prosperity theory ensures that the welfare function must be replaced by the value function determined over changes in income level from a point of reference. Suppose the value function is defined as

$$v_f(\varepsilon) \tag{4}$$

where $\varepsilon = m_i - \bar{m}_i$ is the income change from the reference point $\bar{m}_i$. The value function is such that

(i) $v_f' > 0$, (ii) $v_f'(-\varepsilon) \geq v_f'(\varepsilon)$, (iii) $v_f'' > 0$ for $m < 0$ and $v_f'' < 0$ for $m > 0$. Property (ii) which allows for non-differentiability in $v_f(\varepsilon)$ at $\varepsilon = 0$, considers the principles of loss aversion, and that losses cause more harm than corresponding gains (Tversky and Kahneman1992, p. 303).

A functional form specification has been considered again that captures essential features of the Prosperity theory since the idea is to relate analysis to welfare indices. A Constant Relative Risk Aversion (CRRA) utility function is to be considered upon which a welfare measure may be based. That is,

$$swf = \sum_i^n \frac{m^{1-\theta}}{1-\theta} \text{ for } \theta \neq 1, \sum_i^n \ln(m_i) \tag{5}$$

Equation (5) is true if $m_i > 0$, equals 0 if $m_i = 0$ and equals $-\beta \sum_i^n \frac{(-m_i)^{1-\theta}}{1-\theta}$ for $\theta < 1$ and correspondingly for $\theta = 1. \beta > 1$ is a loss aversion parameter. Prosperity theory relates to changes in welfare and plays little significant role about its level. Therefore, attention is on the hybrid form as observed in Koszegi and Rabin (2006) on reference dependent utility function so that

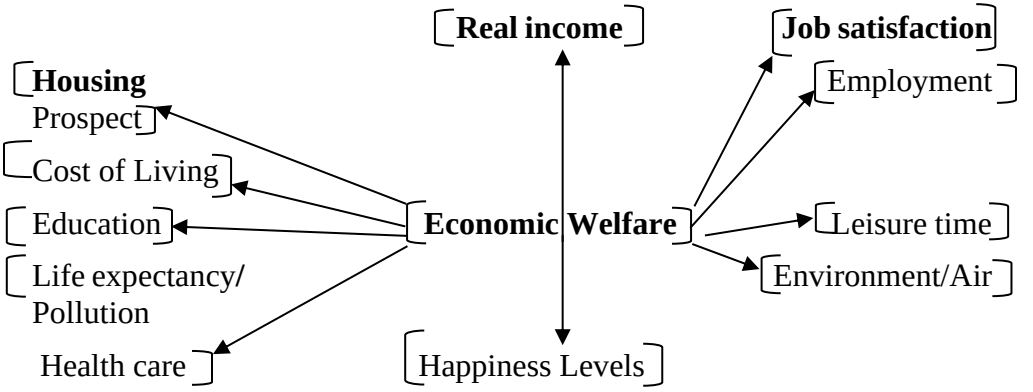
$$\kappa(m_{i,t}) = u(\bar{m}_{i,t}) + v(m_{i,t} - \bar{m}_{i,t}) \tag{6}$$

Equation (6) implies that individual consumer's wellbeing is the total sum of utility from current income and departures from base income. This indeed retains the property of the lead Prosperity theory.

An attempt to measure the economic welfare appears a difficult task since there have been continuous debates in this regard and is further compounded during the COVID-19 pandemic. As described above, an increase in real income suggests population being better off and hence, increases economic welfare (Pettinger, 2017). Furthermore, economic welfare may be more than the increase in income level, however, it incorporates other welfare driven quality of life factors, such as health care levels and environmental factors, such as congestion and pollution.

Figure 4

Some Determinants of Economic Welfare



Note. Source: *www.economicshelp.org*

Figure 4 describes quality of life factors influencing welfare of individuals. Real income drives potential consumption to determine the level of enjoyment. Increase in potential consumption originates from gainful employment, particularly with job satisfaction. However, high wages with lower leisure time potentially reduce economic welfare. Even with high income level, unaffordable housing schemes diminish economic welfare. Increasing capacity building through education positively influences economic welfare likewise better health conditions accompanied by longevity. Sound health tends to increase skills and productivity levels. Conversely, in a pandemic like this, infected cases reduce health conditions along with the number of manpower for productive investment. Happiness level is normative, however, it can psychologically positively contribute to welfare if it is increasing. Finally, economic growth due to expansion of activities gives rise to pollution which subsequently affects health, increases health cost, and hence diminishes welfare. Social distancing policy, if

breached, results in various body contacts and increases the likelihood of the virus spread. This subsequently diminishes health conditions and increases health care cost.

The foregoing discussion provides alternative proximate measures of economic welfare. However, unfortunately only the cost of living, representing the consumer price index and real growth variables appear, either on a daily or quarterly basis. Given the short period into the current pandemic, data on daily and/or quarterly basis suits the mission of the current study. Real Gdp has been accepted widely as a measure of economic welfare, however, with some short comings. For comparison purpose, the study also employed CPI which measures changes in the prices of goods and services consumed by individuals. Hence, such changes affect consumers' real purchasing power and their welfare. Coronavirus indicator variables include death rate, discharge rate, and spread rate. The real Gdp was disaggregated through averaging the number of days of each month to obtain daily data, since the intention was to operate on data with same frequencies and to increase the data points. Although, there are fundamental determinants of growth, however, they are mostly not available on daily basis. Since the real Gdp growth equation is fundamental in the current study and the intention is to retain it, other determinants including exchange rate, interest rate, and oil price which can exist on daily basis to a greater extent, have been incorporated. However, the fear of omitted variable bias and a potential econometric problem is inevitable in this type of situation.

The baseline models are therefore:

$$Avrgdp = \alpha_0 + \alpha_1 Death\_case + \alpha_2 Dis\_case + \alpha_3 Exr + \alpha_4 Intr + \alpha_5 oil\_pr + \alpha_6 sprd\_rt + \mu_1 \quad (7)$$

$$CPI = \beta_0 + \beta_1 Death\_case + \beta_2 Dis\_case + \beta_3 Exr + \beta_4 Intr + \beta_5 oil\_pr + \beta_6 Sprd\_rt + \mu_2 \quad (8)$$

Where $Avrgdp$ is average daily real Gdp, is CPI consumer price index , $Death\_case$ is the number of death cases, Dis_case represents the number of discharged cases, Exr is exchange rate , $Intr$ represents interest rate, oil_pr is the oil price, $Sprd\_rt$ is spread rate and $\mu_1 = \mu_2 = \mu$ represents error terms assumed to be independently and identically

distributed. α_0, β_0 are intercepts and $\alpha_1, ..., \beta_4$ represent slope coefficients. The data for real Gdp and in CPI was obtained from the National Bureau of Statistics. The data on number of death cases and discharged rate was sourced from the Nigeria Centre for Disease Control (NCDC) which mainly reports daily Nigerien statistics of Coronavirus. The spread rate data was computed based on the data of the number of confirmed cases from NCDC. The data was collected from January-July 2020. January and February were included for discussion since effects of Coronavirus were already being felt globally and the negative multiplier effects gradually making their way into Nigeria.

The descriptive statistics including other information indicates that the residuals are not normally distributed or that there exist some outliers in the model. Following this scenario, the current study employed the robust least square method, an important technique for analyzing the data characterized by outliers so that the new models correct for the outliers. When regression assumptions fail and any transformation fails to eliminate the outliers, then the robust regression which is resistant to the outliers becomes the best method since it detects outliers and provides results that are insensitive to the outliers. The M estimation method is one of the variants of the robust regression estimation which considers estimation of the maximum likelihood type. Given that the estimator at M-estimation is

$$\hat{\theta} = \theta_n \left(X_1, X_2, X_3, ..., X_n \right) \tag{9}$$

$$\text{Therefore, } \in [\theta_n \left(X_1, X_2, X_3, ..., X_n \right)] = \theta \tag{10}$$

Hence, $\theta = \theta_n \left(X_1, X_2, X_3, ..., X_n \right)$ is unbiased and has minimum variance. Therefore, M-estimation has the smallest variance estimator as compared to other estimators of variance, *i.e*

$$Var(\tilde{\tilde{\theta}}) \geq \frac{[\tilde{\tilde{\theta}}]^2}{n \in \left(\frac{d}{d\theta} \right) \ln f(X_i, \theta)^2} \tag{11}$$

Where $\tilde{\tilde{\theta}}$ is other linear and unbiased estimator for θ. M-estimation demonstrates an extension of the maximum likelihood estimate and robust estimation. The principle here is to minimize the residual function

$$\rho \text{ in } \hat{\theta}_m = \min_\theta \rho\left(y_i - \sum_{j=0}^{k} X_{ij}\theta_j \right) \tag{12}$$

Seeking the solution for

$$\min_\theta \rho(\mu_i) = \min_\theta \sum_{i=1}^{n} \rho\left(\frac{\varepsilon_i}{\sigma}\right) = \min_\theta \left(\frac{y_i - \sum_{j=0}^{k} X_{ij}\theta_j}{\sigma} \right) \tag{13}$$

Analysis and Discussion

Table 2

Descriptive Statistics

	Avrgdp	CPI	Death Case	Dis Case	Exr	Intr	Oil_pr	Sprd_rt
Mean	-0.15	2.52	4.16	6.10	5.87	2.57	3.38	1.35
Mean *SE*	0.01	0.001	0.20	0.29	0.01	0.003	0.05	0.08
Median	-0.20	2.52	5.20	7.33	5.89	2.60	3.59	1.21
SD	0.11	0.01	2.44	3.35	0.06	0.04	0.48	0.99
Skewness	1.48	-0.02	-0.63	-0.73	-2.09	-0.42	-0.96	0.91
Kurtosis	3.19	1.46	1.85	2.16	5.37	1.18	2.87	4.10
J-*B* Prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Variables	Correlation Matrix							
Avrgdp	1							
CPI	-0.69	1						
Death_Case	-0.79	0.87	1					
Dis_Case	-0.88	0.87	0.98	1				
Exr	-0.64	0.45	0.55	0.61	1			
Intr	0.24	-0.78	-0.46	-0.45	-0.15	1		
Oil_pr	-0.05	-0.14	-0.05	-0.03	0.47	0.18	1	
Sprd_rt	-0.17	0.48	0.59	0.49	-0.17	-0.33	-0.29	1

Note. Source: Author's computation using e-views

The statistical properties of the variables-average real *Gdp* growth rate, change in consumer price index which are proximate measures of economic

welfare, discharge rate and spread rate along with tested cases are shown in table 2 above. Only the average real GDP shows a negative mean value (-0.15) during the first half of 2020. The perception here is that the positive growth in GDP for the first quarter was much less than the decline in the growth around the second quarter due to the halt in economic activities amidst COVID-19 pandemic. Thus, the latest quarterly growth decline has a greater negative and significant effect on economic welfare. The CPI was averaged to be 2.52 for the period showing significant rise in the cost of living with a detrimental effect on welfare through increasing prices of goods and services. The number of discharged cases averaged 6.10 shows more medical attention on infected people even though the extent of infections is observed through testing. The median statistics show similar pattern as the mean for the variables. Standard deviation which essentially measures the spread of a variable, was 0.99 for the COVID-19 spread rate and next to the discharge rate (3.37) with death rate (2.44) during the first half. This was further confirmed by the mean standard errors under the category statistics demonstrating the worsening situation of the pandemic. This is in line with rapid rate of infections, particularly around the end of March and April as a result of low level of health risk prevention. Among the economic variables, oil price has the highest spread (0.48) in line with its fluctuation trend, though with its mean lower than that of the exchange rate (5.87). Only real growth and the spread rate shows positive coefficient of skewness and all show positive kurtosis coefficients. On normality issue, all the variables are shown to be non-normally distributed over the period. Moreover, the residual terms are non-normally distributed and this calls for concern for the choice of estimation technique. Correlation coefficients computed to give a rough check of the presence of multicollinearity show that it is not likely to be a major problem as the coefficients are low in most cases. However, the discharge rate and death cases demonstrate a very strong correlation.

Table 3
Unit Root Test Results

Variables	Test Eq.	Test Method	Prob	Decision	O.I
Avrgdp	C	ADF	0.00	Stationary	*I*(1)
CPI	C, T	ADF	0.00	Stationary	*I*(1)
Death_Case	None	ADF	0.00	Stationary	*I*(1)

Variables	Test Eq.	Test Method	Prob	Decision	O.I
Dis_Case	C, T	ADF	0.00	Stationary	*I*(1)
Exr	C	ADF	0.00	Stationary	*I*(1)
Intr	C	ADF	0.00	Stationary	*I*(1)
Oil_pr	C	ADF	0.00	Stationary	*I*(1)
Sprd_rt	None	ADF	0.00	Stationary	*I*(1)

Note. Source: Author's computation using E-views

To further ascertain the statistical nature of the data employed as a guide towards averting a spurious result, the study employed the Unit Root test within the realm of the Augmented Dickey Fuller (ADF) test. ADF test is a modified version of Dickey Fuller (DF) test which results when autocorrelation is observed in the non-systematic component of the DF models. DF test, based on the first order autoregressive process (Box & Jenkins, 1970), is a popular test and is widely applied (Arltova & Fedorova, 2016). The test equation adopted is a combination of "Intercept, Intercept and Trend, and None". The results show that all the variables are stationary in their first differences. Hence, they are I (1) variables.

Table 4

Test for Equality of Means

Method	*df*	*Value*	Prob
Anova *F*-test	(8,1263)	721.7215	0.00
Welch *F* Test	(8,458.755)	56286.44	0.00

Table 4 indicates that the Anova *F* and Welch *F* tests (0.00, 0.00) support that the mean across all levels of observations is unequal. This is not surprising due to the dynamic nature of the health and economic variables within the period.

Table5

Real GDP Growth Robust Regression Statistics Changes in CPI Robust Regression Statistics

	Avr gpd			CPI		
	Coeff.	Std Error	Prob	Coeff.	Std Error	Prob
c	0.89	0.77	0.25	-2.93	0.03	0.00
Death Case	0.08	0.01	0.00	0.0004	0.0004	0.37
Dis rt	-0.10	0.01	0.00	0.001	0.0003	0.00

	Avr gpd			CPI		
	Coeff.	Std Error	Prob	Coeff.	Std Error	Prob
Exr	0.09	0.12	0.42	-0.01	0.005	0.31
Intr	-0.56	0.13	0.00	-0.15	0.006	0.00
Oil pr	0.03	0.004	0.02	-0.001	0.001	0.21
Sprd rt	-0.004	0.01	0.22	-0.0001	0.0001	0.51
R^2	0.49			0.80		
$\bar{R}^2$	0.46			0.78		
AIC	104.16			119.16		
SC	125.35			138.77		

The robust regression estimation is provided in table 5 above using the real GDP growth and consumer price index as approximate alternative measures of economic welfare as evaluated in the theoretical issues. Firstly, on the relationship between real growth and coronavirus health indices, results show that the discharge rate relates negatively (-0.10) and significantly to the real growth. A 1% increase in the discharge rate results in about 0.1% decline in the real Gdp growth. Though this is negligible, increase in the discharge rate is expected to have a positive impact on real Gdp and hence on economic welfare. A plausible reason for this may be that the components of discharge rate be largely dependents or mainly unproductive in the labor force.

Moreover, the aged are known to be more vulnerable. For the CPI counterpart, the discharge rate maintains a positive impact on the CPI. This implies that increasing number of discharge rate worsens economic welfare through rising cost of living. In line with the first argument, the number of discharged people who are less likely to contribute significantly to the nation subsequently add to the existing demand for goods and services already in short supply. However, the number of death cases due to COVID-19 have positive relationship with CPI, thus reducing economic welfare. It shows the very negligible impact on welfare using the real Gdp measures. The spread rate variable which plays a key role in the COVID-19 pandemic, impacts negatively on real growth (-0.004) as expected. It implies that a 10% increase in the rate, results in a decline in real growth by about 0.04%, demonstrating worsening economic welfare conditions. This provides a strong proof that as the COVID-19 infection cases worsen, economic

welfare deteriorates using the real Gdp. However, the spread rate has an unexpected sign in the CPI equation.

The reduction in the CPI, as the COVID-19 cases surge, is insufficient to sustain positive economic welfare. This may be explained by the slow response of price levels to COVID-19 spread as evident from its 0.001% reduction for a 10% increase in the spread. Exchange rate, interest rate, and oil price represents economic variables and to some extent measures extent of instability during the period. For the exchange rate, results show that it is positively (0.09) related to the real Gdp. A 1% increase in exchange rate results in about 0.9% increase in real Gdp growth. By implication, a 1% depreciation in the local currency increases growth in real terms by 0.09%. This could be due to the reason that depreciation enhances the country's international competitiveness which tends to result in exports and foreign exchange supplies and thus increasing the country's capacity to import its needs. However, exchange rate impacts negatively (-0.01) on CPI showing a declining welfare by 0.01% for a 1% decrease in exchange rate. Interest rate impacts negatively on both, the real Gdp (-0.56) and CPI (-0.15). The negative impact of interest rate on real Gdp follows from theoretical assertion.

A rising interest rate means a falling investment volume and since investment is a fundamental determinant of growth, growth then declines which leads to worsening welfare conditions. This explains the fact that COVID-19 period is characterized by low investment due to shrinking investment funds and productivity. Similarly, interest rate shows a negative impact on CPI. This could be explained by the fact that although investment increases with falling interest rate, it may have been insufficient to reduce price indices over time due to inadequate supply. Oil price shows positive and negative impacts on real growth and CPI, respectively. A 10% increase in oil price leads to 0.3% rise in the real growth and 0.01% decrease in the CPI. Oil price is expected to stimulate growth through appropriate diversification of revenue. Unfortunately, the Dutch disease syndrome has for long been persisting. The fall in the oil price due to the pandemic drastically reduces real economic growth. Thus, welfare is further worsened by the mono-product nature of the economy. The decline in CPI from the increase in oil price is not sufficient to create a better living standard.

Both, the COVID-19 related and economic variables all jointly explain about 49% variation in real *Gdp* growth and 80% variation in CPI. The remaining variations are left unexplained. Therefore, the corona virus indicators explain more about the CPI fluctuation than the real growth rate used proximate measure of economic welfare.

Conclusion and Policy Implications

The current study examined the relationship between economic welfare and the COVID-19 pandemic for the first half of 2020. The pandemic has had a series of economic, political, and social implications, much more pronounced than its spread. The economic effects are so pronounced that containing these effects on the population seems a difficult task. During the said period, access to resources that are useful for the day-to-day economic activities was restricted and in some cases, unavailable. Hence, it led to worsening living standards. A key policy measure implemented to reduce the COVID-19 contagion effect was social distancing. This policy measure entailed business closures, travel restrictions, and cancellation of social gatherings of various kinds at the initial level. While, this remains the only effective tool for now, it bears a great cost in terms of worsening economic conditions including production shut down, lost income, rising unemployment, price dynamics against local consumers, and job losses at intervals, as shown by the trend behavior.

Low production results in shrinking supply leading to a rise in prices. This consequently lowers the value of the constant real income of consumers, thus implying declining welfare. The robust regression estimation showed that the spread of the COVID-19 pandemic reduced labor supply and production, thereby encouraging a reduction in real income and a hike in prices, which remain the proximate measures of economic welfare in this study. An effective way to boost the economy from the COVID-19 induced recession is to make the economy more open, while strictly adhering to measures that contain the virus spread. Adequate cushioning strategies to reduce the general cost of living and boost purchasing power must be in force. Hike in the transportation fare is detrimental to welfare and consequently, there should be a number of alternative transportation options characterized by low prices, together with enlightening transporters to bear the burden by not increasing fares unnecessarily. Food price inflation is already on course. This can be effectively controlled through embarking on enormous agricultural

practices which is not a new request. What is needed is just an effective but not indiscriminate financing of domestic farmers.

The Apex bank mission of loans disbursement to small and medium scale enterprises is a welcoming development, however, it is not yet making any positive multiplier effects as most complain of the rigour and even the uncertainty involved. The nation-wide 774,000 job creation initiative is good to cushion the negative effect of the pandemic on welfare but it is a short-lived approach to poverty alleviation. This initiative must be directed at the target population by making it autonomous and by avoiding any influence from the top. These jobs are temporary and inadequate for Nigeria's teeming unemployed population. In some states, such as Ogun, higher degree holders ranging from PhD and MSc are already showing interest and in densely populated states like Lagos, massive applications even beyond Lagos quota are highly envisaged. These demonstrate the extent of unemployment and poverty in the Nigerian society. Nigeria should desist from huge debt accumulation and the current debt secured must be directed towards productive investment. Currently, most economies operate an inward policy by protecting their resources from external usage. Hence, this calls for a more diversified Nigerian economy. The issue of diversification from oil has long been advised, however, personal interest has often retarded the progress. Although, agriculture is the main stay of the economy, oil can only complement it.

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