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

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Abstract

Corona virus pandemic is a current misery not only to health status but also to economic wellbeing and to the world at large. This study examines the relationship between the pandemic outbreak and economic welfare using daily data on proximate economic welfare measures-real GDP and changes in consumer price index-and the disease indicator variables-discharge rate, fatality rate, spread rate and number of tested cases. The Prosperity theory is adopted and the estimation issue is rooted from the robust least squares technique due to the failed normality assumption of the conventional least squares. Results indicate that corona virus due to its spread lowers labour supply and causes production shortages and subsequently results in hike in price and loss of real income value. High discharge rate can increase real income value and hence economic welfare. Immediate Financing, regulatory, equity and diversification strategies are needed to revive the Nigerian economy.

Keywords: Economic Welfare, COVID-19, Robust Regression

JEL: D60, E01, E21, E31

1. INTRODUCTION

COVID-19, a pandemic which has cut across the world economy started as an outbreak in Wuhan, China towards end of 2019. Since then there has been continuous rise in the spread rate and number of cases amidst health care intervention though with some recovery rates. As at March 5, 2020, the 10 nations worst hit were almost within the 10 largest economies of the world except Iran and

Indian (Baldwin and Weder di Mauro, 2020). The lack of testing ability, political expediency and clinical conditions characterized by long period of demonstration of asymptomatic signs, are major factors rendering statistics from this unreliable particularly for African countries. According to 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 are upper middle income or lower middle income based on World Bank definition while 3 are high-income. United States had 4.29 million cases followed by India with 1.48 million cases, others are Russia (0.82 million), South Africa (0.45 million) Mexico (0.40 million) and Peru (0.39 million). Chile, United Kingdom and Iran are at the bottom with 0.35 million, 0.30 million and 0.29 million cases respectively. It is quite obvious that countries have different spread rates depending on the control measures. Already the COVID-19, a public health crisis, has had huge economic effects compared to similar epidemics of Severe Acute Respiratory Syndrome (*SARS*) and Middle East Respiratory Syndrome (MERS) outbreak of the 2003 and 2015 respectively. It has 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. This study is strongly motivated by the fact that aside from health risk induced by the corona-virus crisis, it strongly retards economic progress going by the low performance of world economies Africa inclusive; 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 West 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 being some of the key elements of development. Given the advent of the COVID-19 and its associated economic crisis, then the question of "to what extent do the pandemic and the response to

the pandemic impact on the population’s economic welfare in Nigeria become very pertinent”? Thus, this research aims at evaluating the impact of covid-19 on economic welfare and the relationship between the response and economic welfare in Nigeria. Following the introduction is section II which reviews the relevant literature and section III which discusses the theory and methodology. Section IV is the empirical analysis and discussion while section V concludes.

2. COVID-19 AND WELFARE IN NIGERIA

Generally, spread of COVID-19 has been on the rising trend across the globe since its inception in December, 2019. Within West Africa, Ghana’s first 2 cases came up on 12th March, 2020 and by 8th April, 2020, it was 313 confirmed cases. The news of the corona virus spread into Nigeria particularly in January and major preparedness was to be made to mitigate its entry. Nigeria’s first COVID-19 case appeared on 27th February, 2020 and by April 8, with 22 new cases; 276 confirmed cases were observed. In Benin, a 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 Corona virus pandemic across countries of the world have initiated homogeneous measures as a way of reducing the effects on health and economic risks.

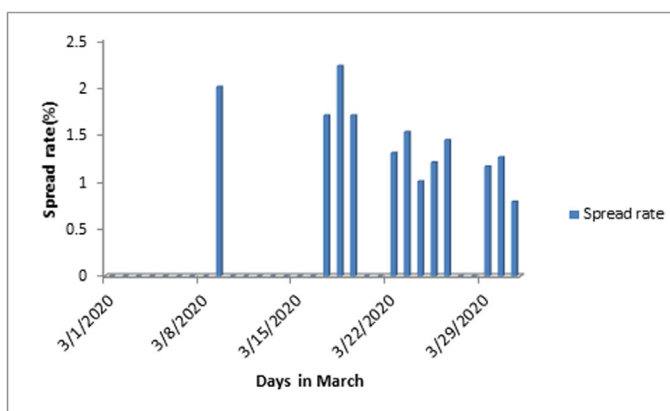


Figure I: COVID-19 Spread Rate in March, 2020
Source: computed using Nigeria Centre for Disease Control data

The economic and health impact was obvious in March, 2020. As observed in Figure I above, the most noticeable spike in the spread came up on March 18 reaching about 167% and remained the highest so far since 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 compared to that of April. April recorded a complete scenario in the spread with all days in April experiencing spread with varying magnitude. April 1 came with 25.2% spread rate and was highest for the month with the least spread of 1.6% for 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 partly connected to the partial non-compliant to the rule and the emergence of tested cases. The partial non-compliant was also linked to the worsening welfare conditions due to the pandemic. This period was characterized by closure of businesses, travel and job restrictions etc 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 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 more felt 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 buying 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 respectively over the preceding month. The worsening welfare conditions forced some individuals living from hand to mouth out seeking 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, 2020). The problem with this however was not distribution parse but the distributive channels as many Nigerians complained of non-uniform spread of the palliative care. On the 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, 2020). Nigeria stimulus package is only 0.34% of the GDP which is highly insignificant to boost the currently fragile economy (Nairametrics 2020).

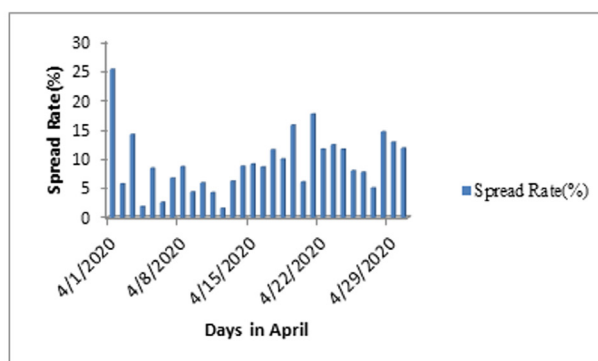


Figure II: COVID-19 Spread Rate in April, 2020

Source: computed using data from the Nigeria Centre for Disease Control data

The Months of May and June followed similar trend in terms of the spread except that early part of May 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. The reason for this was partly due to the more stringent policy in complying with the pandemic rule and the medical attention to infected individuals during the period 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 but with adherence to the pandemic rule of using nose mask, social distancing among others. While the hike in food prices still persists, 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.

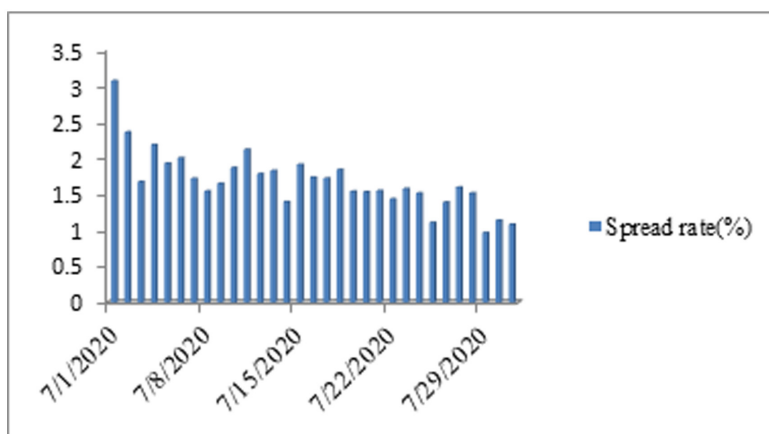


Figure III: Spread Rate (%) in July, 2020

Source: computed using Nigeria Centre for Disease Control data

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 since the pandemic started and up to July 31, 2020, a total number of confirmed fatalities of 879 and discharged cases of 19,565 are 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, 35%. It should be noted that deaths and discharge cases did not commence immediately confirmed cases began; hence spread rates which were generated from the confirmed cases are given more attention and also determine fatalities and discharged cases.

Table I: Composite CPI Index (February –July)

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

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 has increased by 0.38 percent point. It is demonstrating a major decline in welfare of the populace. The rise in inflation was 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 laid down operating rules. Generally, Gross Domestic Product (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.

3. THEORETICAL REVIEW

Description of economic wellbeing could first 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 research works have shown support for the household as being more appealing in the description of decision-making units. This is illustrated in the

framework of (Samuelson, 1956) on the theory of household behaviour. The focus on the household is in line with the fact that information relating to consumption or income is usually collected for household and not individuals. Moreover, households may have obvious 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, expand 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, electricity consumption etc (UN-ECE, 2011). Meanwhile, economic theory of equivalence scales gives a preliminary view and explains that equivalence scales as the proportional change in expenditure 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 behaviour. Basically, economists have developed several theories of welfare economics with no agreement on the measure of economic welfare. Welfare theories can be seen in two basic ways: To Pareto and his followers, 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 because some policies seem to favour some people and becomes a cost to some 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 possibility of interpersonal comparison of welfare conditions through various comparisons of various welfare functions for various individuals called social welfare functions with value judgments.

A reference based-utility theory as suggested by the Prospect theory need 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 have their origin from the national accounts with attempts to include leisure and other adjustments of production boundary to create GDP extended ideas and other approaches. However, the Stiglitz report (Stiglitz et al, 2010) highlights the limitation of employing GDP. Distribution in welfare assessment has also become more popular in recent times. It has been suggested that different approaches to measuring economic progress aside from the standard GDP measures should be considered. Pandemics are envisaged to result in at least negative short-run impacts on economic activities. Theoretically, shock tends to adversely affect the economy through three main transmission mechanisms. Based on (Carlsson-Szlezak et al., 2020a) and (Carlsson-Szlezak et al, 2020b), these mechanisms are the direct and indirect impacts and the supply side disruption. The direct impact relates 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, offsetting and minimizing the effects. Although with social distancing policy, spread rate is contained and medical treatment and expenses minimized (Pindyck, 2020), some studies such as (Jonung & Roeger, 2006) anticipate negative economic impact of corona virus. For example, their forecast is 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 on corona virus even within the short period. (Elgin et al., 2020) adopt 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 find that economic stimulus is higher for countries characterized by higher corona virus infections, median age and income per capita. Again 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 (Weder di Mauro, 2020).

4. THEORETICAL FRAMEWORK AND METHODOLOGY

Though the Prosperity Theory inspires the poverty and welfare measures but attention here is focused 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

$u(x)$ (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 behaviour and measures his wellbeing. If we further assume that this is measurable with interpersonal comparison, then the social welfare function is

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

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

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

Considering uncertainty, standard utility function can be replaced with expected utility. In modifying the conventional approach to prosperity theory, we consider the fact that welfare measure is independent on income levels but dependent on changes from a reference point, loss of aversion, diminishing sensitivity and adoption of subjectivity probability distribution compared to objective distribution. 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 be replaced by the value function determined over changes in income level from a point of reference. Suppose the value function is defined as

$$v_f(\varepsilon)$$

(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 Kahneman 1992, p. 303).

We again consider a functional form specification capturing essential features of the Prosperity Theory since the idea is to relate analysis to welfare indices. Now consider a Constant Relative Risk Aversion (CRRA) utility function upon which a welfare measure may be based. That is,

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

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 sum total of utility from current income and departures from base income. This indeed retains the property of the lead Prosperity theory.

An Attempt to measure economic welfare in all honesty appears a difficult task as 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 in economic welfare (Pettinger, 2017). Furthermore, economic welfare may be more than increase in income level but incorporates other welfare driven quality of life factors such as health care levels, environmental factors such as congestion and pollution.

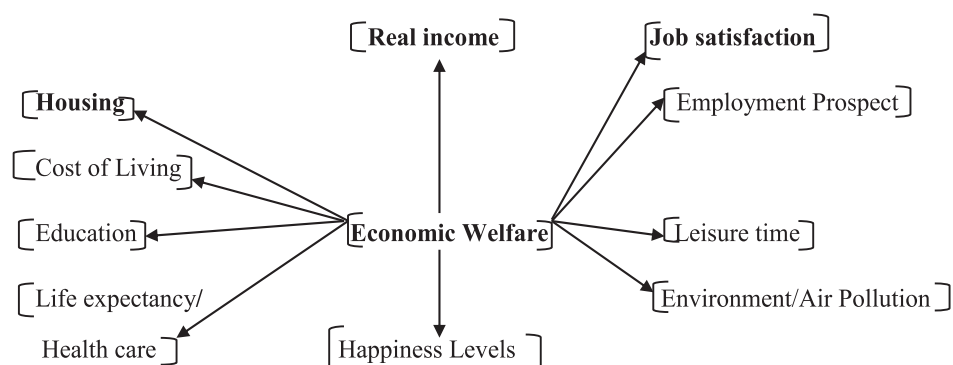


Figure IV: Some determinants of Economic Welfare

Source: www.economicshelp.org

Figure IV describes some 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 can positively influence economic welfare likewise better health conditions accompanied by longevity. Sound health increases skills and productivity levels. Conversely, in a pandemic like this, infected cases reduce health conditions and thus the number of manpower for productive investment. Happiness level is normative but can psychologically positively contribute to welfare if it is on the increasing level. Finally, economic growth due to expansion of activities can give rise to pollution which subsequently affect 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 gives alternative proximate measures of economic welfare but 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 present study. Real *Gdp* has been accepted widely as a measure of economic welfare even though with some short comings. For comparison purpose, the study also employs the consumer price index which measures changes in the prices of goods and services consumed by individuals and hence such changes affect consumers' real purchasing power and their welfare. Corona virus indicator variables employed are death rate, discharge rate and spread rate. To suit our purpose, the real *Gdp* was disaggregated through averaging over the number of days of each month to obtain daily data since the intention is to operate on data with same frequencies and to increase the data points. Although there are fundamental determinants of growth but they are mostly not available on daily basis. Because the real *Gdp* growth equation is fundamental in the present study, and the intention is to retain it, other

determinants including exchange rate, interest rate and oil price which can, to many extent, exist on daily basis, have been incorporated. However, the fear of omitted variable bias, a potential econometric problem is inevitable in this type of situation.

The baseline models are therefore:

$$\begin{aligned}
 Avrgdp = & \alpha_0 + \alpha_1 Death_case + \alpha_2 Dis_case + \alpha_3 Exr + \alpha_4 Intr \\
 & + \alpha_5 oil_pr + \alpha_6 sprd_rt + \mu_1
 \end{aligned}
 \tag{7}$$

$$\begin{aligned}
 CPI = & \beta_0 + \beta_1 Death_case + \beta_2 Dis_case + \beta_3 Exr + \beta_4 Intr + \\
 & \beta_5 oil_pr + \beta_6 Sprd_rt + \mu_2
 \end{aligned}
 \tag{8}$$

Where *Avrgdp* is average daily real *Gdp*, *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 α_1, \dots, β_4 represent slope coefficients. Data for real *Gdp* and in *CPI* was obtained from the National Bureau of Statistics. Data on number of death cases and discharged rate were sourced from the Nigeria Centre for Disease Control (NCDC) which mainly reports daily Nigeria statistics of corona virus. The spread rate data was computed based on the number of confirmed cases data from NCDC. In all, data was collected from January-July 2020. January and February were included for discussion because effects of corona virus were already being felt globally and the negative multiplier effects gradually making their way into Nigeria.

The descriptive statistics among other information indicates that the residuals are not normally distributed or that there exist some outliers in the model. Following

this scenario, this study employs the robust least square method, an important technique for analyzing 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 as it detect outliers and gives 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

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

Therefore, $E[\theta_n (X_1, X_2, X_3, \dots, X_n)] = \theta$

$$\tag{10}$$

Hence, $\theta = \theta_n (X_1, X_2, X_3, \dots, X_n)$ is unbiased and has minimum variance. So M-estimation has the smallest variance estimator compared

to other estimators of variance; i.e $Var(\tilde{\theta}) \geq \frac{[\tilde{\theta}]^2}{n E \left(\frac{d}{d\theta} \right) \ln f(X_i, \theta)^2}$

$$\tag{11}$$

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

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

We seek the solution for

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

(13)

5. ANALYSIS AND DISCUSSION

Table II: Descriptive statistics

	<i>Avrgdp</i>	<i>CPI</i>	<i>Death_case</i>	<i>Dis_case</i>	<i>Exr</i>	<i>Intr</i>	<i>Oil_pr</i>	<i>Sprd_rt</i>
<i>Mean</i>	-0.15	2.52	4.16	6.10	5.87	2.57	3.38	1.35
<i>Mean s.e</i>	0.01	0.001	0.20	0.29	0.01	0.003	0.05	0.08
<i>Median</i>	-0.20	2.52	5.20	7.33	5.89	2.60	3.59	1.21
<i>Stddev</i>	0.11	0.01	2.44	3.35	0.06	0.04	0.48	0.99
<i>Skew</i>	1.48	-0.02	-0.63	-0.73	-2.09	-0.42	-0.96	0.91
<i>Kurt</i>	3.19	1.46	1.85	2.16	5.37	1.18	2.87	4.10
<i>J – B.Prob</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Correlation Matrix

	<i>Avrgdp</i>	<i>CPI</i>	<i>Death_case</i>	<i>Dis_rt</i>	<i>Exr</i>	<i>Intr</i>	<i>Oil_pr</i>	<i>Sprd_rt</i>
<i>Avrgdp</i>	1							
<i>CPI</i>	-0.69	1						
<i>Death_case</i>	-0.79	0.87	1					
<i>Dis_case</i>	-0.88	0.87	0.98	1				
<i>Exr</i>	-0.64	0.45	0.55	0.61	1			
<i>Intr</i>	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

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, tested cases are as shown on table II above. Only the average real GDP has a negative mean value (-0.15) during the first half of 2020. The perception here is that the positive growth in the 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 corona virus pandemic. Thus, the latest quarterly growth decline has a greater negative and significant effect on economic welfare. The consumer price index was averaged 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 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 corona virus spread rate and next to the discharge rate (3.37) and death rate (2.44) during the first half and this is 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 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 the real growth and the spread rate show 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. More so, the residual terms are non-normally distributed and this calls for concern 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 III: Unit root test Results

<i>Var</i>	<i>TestEq</i>	<i>Testmthd</i>	<i>Pr ob</i>	<i>Decision</i>	<i>O.I</i>
<i>Avrgdp</i>	<i>C</i>	<i>ADF</i>	0.00	<i>Stationary</i>	<i>I(1)</i>
<i>CPI</i>	<i>C,T</i>	<i>ADF</i>	0.00	<i>Stationary</i>	<i>I(1)</i>
<i>Death case</i>	<i>None</i>	<i>ADF</i>	0.00	<i>Stationary</i>	<i>I(1)</i>
<i>Dis _ case</i>	<i>C,T</i>	<i>ADF</i>	0.00	<i>Stationary</i>	<i>I(1)</i>
<i>Exr</i>	<i>C</i>	<i>ADF</i>	0.00	<i>Stationary</i>	<i>I(1)</i>
<i>Intr</i>	<i>C</i>	<i>ADF</i>	0.00	<i>Stationary</i>	<i>I(1)</i>
<i>Oil _ pr</i>	<i>C</i>	<i>ADF</i>	0.00	<i>Stationary</i>	<i>I(1)</i>
<i>Sprd _ rt</i>	<i>None</i>	<i>ADF</i>	0.00	<i>Stationary</i>	<i>I(1)</i>

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 employs 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) as cited in (Arltova & Fedorova, 2016) is a popular test and is widely applied (Dickey, Fuller, 1979) as cited in (Arltova & Fedorova, 2016). The test equation adopted is a combination of "Intercept, Intercept and Trend and None". Results show that all the variables are stationary in their first differences; hence, they are I (1) variables.

Table IV: Test for Equality of Means

<i>Method</i>	<i>df</i>	<i>Value</i>	<i>Pr ob</i>
<i>Anova F – test</i>	(8,1263)	721.7215	0.00

<i>Welch F – test</i>	(8,458.755)	56286.44	0.00
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Table IV above indicates that the Anova F and Welch F tests (0.00, 0.00) support that the mean across all levels of observations are unequal. This is not surprising due to the dynamic nature of the health and economic variables within the period.

Table V: *Real Gdp growth robust regression statistics Changes in CPI robust regression statistics*

<i>Dep.var :</i> <i>Avrgdp</i>	<i>Coeff.</i>	<i>Std error</i>	<i>Pr ob</i>	<i>Dep.var : CPI</i>	<i>Coeff.</i>	<i>Std error</i>	<i>Pr ob.</i>
<i>c</i>	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
<i>Dis _rt</i>	-0.10	0.01	0.00		0.001	0.0003	0.00
<i>Exr</i>	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
<i>Sprd _rt</i>	-0.004	0.01	0.22		-0.0001	0.0001	0.51
<i>R</i> ²	0.49				0.80		
<i>-</i> <i>R</i> ²	0.46				0.78		
<i>AIC</i>	104.16				119.16		
<i>SC</i>	125.35				138.77		

The robust regression estimation is as provided on table V above using the real *Gdp* growth and consumer price index as approximate alternative measures of economic welfare as evaluated in the theoretical issues. First on the relationship between real growth and corona virus 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 dependants or mainly unproductive in the labour force; more so that the aged are known to be more vulnerable. For the consumer price index counterpart, the discharge rate maintains positive impact on the consumer price index. 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 who are less likely to contribute significantly to the nation's subsequently add to the existing demand for goods and services already in short supply. However, while the number of death cases due to COVID-19 has positive relationship with consumer price index, thus reducing economic welfare, it shows the very negligible impact on welfare using the real *Gdp* measures. The spread rate variable, which is key in the corona virus pandemic impacts negatively on real growth (-0.004) as expected implying 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 corona virus 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 consumer price index as the spread increases is insufficient to sustain positive economic welfare. This may be explained by the slow response of price levels to corona virus spread as evident from its 0.001% reduction for a 10% increase in the spread. Exchange rate, interest rate and oil price represent economic variables and to some extent measure 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 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 impact negatively (-0.01) on the consumer price index 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 consumer price index (-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, then growth declines leading 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 consumer price index. 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 consumer price index respectively. A 10% increase in oil price leads to about 0.3% rise in the real growth and about 0.01% decrease in the consumer price index. 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 and thus welfare; this is further worsened by the mono-product nature of the economy. The decline in consumer price index from the increase in oil price is not sufficient to create a better living standard as is often experienced.

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. Thus, the corona virus indicators explain more about the consumer price index fluctuation than the real growth rate used proximate measure of economic welfare

6. CONCLUSION AND POLICY IMPLICATIONS

This study examined the relationship between economic welfare and the corona virus pandemic for the first half of 2020. The current pandemic has had a series of economic, political and social implications much more even pronounced than its spread. The economic effects are so pronounced to the extent that containing these effects on population seems a difficult task. Access to resources useful for the day to day economic activities becomes limited and, in some cases,

unavailable; hence worsening living standards. One of the key policies to reduce the COVID-19 contagion effect is the emergence of social distancing globally including Nigeria. This policy entails business closures, travel restrictions and social gatherings of various kinds at the initial level. While this remains the only effective tool for now, it has 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 behaviour. The low production results in shrinking supply and hence rise in prices; this consequently lowers the value of constant real income of consumers implying declining welfare. The robust regression estimation showed that spread of corona virus pandemic reduced labour supply and thus production thereby encouraging a reduction in real income and hike in price which are proximate measures of economic welfare in this paper. An effective way to boost the economy from the corona virus recession is to make the economy more open but with strict adherence to measures containing the virus spread. Adequate cushioning strategies to reduce general cost of living and boost purchasing power should be in force. Hike in transportation fare is being detrimental to welfare and consequently, there should be massive alternative transportation options which characterized by low prices together with enlightening transporters to also bear the burden by not unnecessarily increasing fares. 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 effective and not indiscriminate financing of domestic farmers. The Apex bank mission of loans disbursement to small and medium scale enterprising is a welcoming development but 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 only that it is a short-lived approach to poverty alleviation. Be that as it may, the initiative should be directed at the target population through making it autonomous and avoiding any influence from the top. Already, these jobs as temporary as they are, are still inadequate compared to the Nigeria's teeming unemployed population. In some states like Ogun, higher degree holders ranging from PhD, MSc etc are

already showing interest and in densely populated states like Lagos, massive applications even beyond Lagos quota are highly envisaged. These demonstrate extent of unemployment and poverty in the Nigerian society. Nigeria should desist from huge debt accumulation; the current debt secured should be directed towards productive investment. Currently most economies operate inward policy by protecting their resources from external usage. Hence, this calls for a more diversified Nigeria economy. Issue of diversification from oil has long been advised but personal interest has often retarded the progress. Agriculture is the main stay of the economy; oil can only complement it.

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