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Coping with a dual shock: The economic effects of COVID-19 and oil price crises on African economies[☆]

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ABSTRACT

Oil-dependent countries face a twin-shock: in addition to the COVID-19 outbreak, they are facing an oil price collapse. In this paper, we study the impact of this dual shock on the forecasted GDP growth in Africa using the COVID-19 outbreak as a natural experiment. We use the IMF World Economic Outlook's GDP growth forecasts before and after the outbreak. We find that COVID-19 related deaths result in -2.75 percentage points forecasted GDP growth loss in the all sample while oil-dependence induces -7.6 percentage points loss. We document that the joint shock entails higher forecasted growth loss in oil-dependent economies (-10.75 percentage points). Based on oil price forecasts and our empirical findings, we identify five recovery policies with high potential: social safety net policy, economic diversification, innovation and technological transformation, fiscal discipline, and climate-friendly recovery policy.

1. Introduction

The COVID-19 outbreak is inducing an unprecedented economic crisis in Africa even though the continent remains the least affected in terms of recorded cases.¹ According to the April 2020 forecast of the IMF, the continent's GDP is expected to decrease by 1.6 percent in 2020, the lowest on record and 5.2 percentage points drop compared to the October 2019 forecast (IMF, 2020). It would require three times the 2018' Official Development Aid (ODA) for Sub-Saharan African countries to fully recover from the COVID-19 shock (Adam et al., 2020).

Worldwide, no country will be spared; and the economic and social consequences remain uncertain. However, the magnitude of the effect will be disproportionate both within and between countries and regions (Furceri et al., 2020). The impacts of the crisis depend, among others, on the pre-COVID-19 economic conditions and governance systems. While some sectors may experience either a supply or demand shock, others will experience both shocks (del Rio-Chanona et al., 2020). African economies in general and oil-dependent economies, in particular, are at the heart of this asymmetry. Oil-dependent countries

face a twin-shock: the current health crisis and its attendant impact on their economy and a collapsing oil price. Not only does the pandemic induces a negative oil price for the first time in history, it also creates uncertainty around the future of the oil economy.

The COVID-19 crisis predominantly impacted the carbon-intensive industries (fossil fuel industry and transport among others) (Mukanjari and Sterner, 2020). A major shift in investment from carbon-intensive sectors to climate-friendly sectors is expected (Dutta et al., 2020). The investment in the oil and gas industry cut down by around \$30 billion in 2020.² This time is an opportunity to push forward the climate agenda (Hepburn et al., 2020). Therefore, oil-dependent economies have to deal with a permanent shock beyond the initial price collapse. Since the onset of the health emergency, the call for green recovery measures is strengthening (Mukanjari and Sterner, 2020). As William McDonough stresses early in 2005, “the Stone Age did not end because humans ran out of stones. It ended because it was time for a re-think about how we live”.³ The Oil Age may not end because the world ran out of oil.

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¹ As to the number of COVID-19 cases and related deaths at May 19, 2020.

² <https://www.energylivenews.com/2020/03/02/coronavirus-to-cut-2020-oil-and-gas-investments-by-30bn/>

³ <http://news.bbc.co.uk/2/hi/science/nature/4682011.stm>

⁴ Oil-intensive economies or oil-dependent economies refer to countries where net oil exports are greater or equal to 30 percent of total export as considered by the IMF.

Also, oil-intensive countries⁴ in Africa are vulnerable and less resilient to shocks for at least three reasons. Firstly, their economies are poorly diversified and the oil price collapse will induce a substantial decline in export revenues. Secondly, oil revenue constitutes an important share of the government budget in oil-dependent countries. Since the health crisis requires major urgent fiscal responses, and oil price collapse has a significant impact on government revenue, countries will have less fiscal space to adequately respond to the crises. Thirdly, natural resource-rich countries in Africa, specifically oil-dependent economies, tend to have weaker governance and less fiscal discipline (Busse and Gröning, 2013; Knutsen et al., 2017; Ross, 2015). In fact, African oil-dependent countries had little fiscal space even before the COVID-19 outbreak.

This paper aims to shed some light on the impact of COVID-19 outbreak and the oil price shock on economic growth in Africa. Specifically, it investigates the effect of the COVID-19 shock, the oil price shock on the forecasted GDP growth on the one hand, and the joint shock on the other hand. The paper is related to two strands of the previous literature. The first strand is the literature on the effects of a pandemic on economic growth, which mostly focuses on developed countries. Evidence from this literature shows that a pandemic can result in a substantial growth loss (Barro et al., 2020; Beach et al., 2020; Carillo and Jappelli, 2020; Dahl et al., 2020). Barro et al. (2020) using panel-data from 43 countries from 1901 to 1929 find that the Influenza pandemic resulted in a 6% real GDP per capita decline. Carillo and Jappelli (2020) using Italian municipality data find that the 1918 Great Influenza had a strong and significant adverse effect on regional growth. The most affected Italian regions by Influenza experienced a 6.5% decline in real GDP compared to the least affected regions. Dahl et al. (2020) find similar results using 76 Danish municipality data. Evidence on developing countries is scant and the existing studies on COVID-19 rely on a single-country and simulation model based on different scenarios of COVID-19 (Adam et al., 2020; Kinda et al., 2020). In this paper, we investigate the effect of the COVID-19 pandemic in addition to an oil shock on a sample of developing countries in Africa. The paper is also related to the well-known literature on the resource curse (Sachs and Warner, 2001), and particularly the vulnerability of oil-dependent countries to price shocks (Van der Ploeg and Poelhekke, 2009).

Based on our difference-in-differences strategy, we find that COVID-19 shock results in -2.75 percentage points forecasted GDP growth loss in the all sample while oil-dependence induces -7.60 percentage points loss. The joint shock engenders -10.75 percentage points forecasted GDP growth loss, supporting our intuition that the shock is dual and more severe in oil-dependent countries in Africa. The results are robust to alternative measure of oil-dependence.

The remaining of the paper is organized as follows: The second section discusses the pre-COVID-19 macroeconomic conditions in Africa, presents briefly the history of oil shock episodes and why this time could be different. The third and fourth sections respectively describe the data and our empirical strategy. The fifth section lays out the results. The sixth section undertakes out a robustness analysis. The last section concludes and draws policy recommendations.

2. African economies under the wake of COVID-19 crisis

2.1. COVID-19 in Africa

Despite the continent poor health system,⁵ Africa remains the least affected in terms of the number of confirmed cases and fatalities. As of 19th May 2020, the continent has 88 700 confirmed cases of COVID-19 roughly representing 66.17 confirmed cases per million people. The

⁵ <https://aercafrica.org/latest-news/the-consequential-impacts-of-the-covid-19-crisis-and-fragile-growth-in-africa/>

cases are still rising in some countries and the statistics are fragile due to limited testing capacities in many countries but, the trends show that the pessimistic predictions made earlier will fortunately not materialize. The reasons for these seemingly unexpected lower cases are unknown. Although, some speculations are rife that the weather conditions, the demographic structure (relatively younger population), the low urbanization rate, and the lack of public transport play a critical role (Chitungo et al., 2020; Lawal, 2020).⁶ In some sense, one can say that Africa's relative deprivation saved people's life (at least for the direct impact).

For oil-dependent countries,⁷ the total number of confirmed cases is 20145 (58 confirmed cases per million people) on 19th May 2020. These countries account for approximately 19% of the continent's GDP and 26% of its population in 2018. Nigeria, Angola and Algeria are the three larger oil producers in Africa. Five countries out of the ten are above the African average. As of 19th May 2020, Gabon, Equatorial Guinean, and Algeria were the most affected among oil-intensive countries, in terms of cases per million people with 643.38; 512.48; 164.22 cases per million people respectively (Fig. 1).

2.2. The pre-COVID-19 macroeconomic conditions in Africa

We picture the preexisting economic conditions of African countries through the lens of four critical variables: economic growth over the last decades, the government's revenue dependence on oil revenue, fiscal space, and export diversification. Under good governance, these are critical parameters for economic resilience to the shocks and government capacity to respond particularly for oil-dependent countries.

Fig. 2 displays the average GDP per capita growth in oil-dependent countries as compared to non-oil-dependent ones for each decade since the 1960s. GDP per capita growth is more volatile in oil-dependent countries as emphasized in the literature (Van der Ploeg and Poelhekke, 2009). The growth rate in oil-dependent economies follows the trend of oil-price. In the decades 1970s, 1990s and 2000s, oil-dependent economies in Africa experienced strong GDP per capita growth. However, when the oil-price collapsed, the GDP growth rate was negative in the 1980s and the 2010s. Fig. 2 illustrates the tough pre-existing economic conditions for oil-dependent countries in the decade before the crisis.

Table 1 shows the debt, oil revenue as a share of government fiscal revenue, revenue from oil export as a share of total export, and the average GDP growth over the last ten years (2010–2019) in Africa on average as compared to the oil-dependent countries.

The government debt data reveal that some countries (Angola, the Republic of Congo, and Gabon) are already highly indebted. This situation limits countries' fiscal space at a time where governments are in dire need to respond to both the health as well as the looming economic and social crisis. Debt sustainability and financial stability could thus be problematic in these countries. Furthermore, previous debt relief efforts have been jeopardized. The current international solidarity, including the debt service suspension initiative, may be insufficient to compensate previous limited fiscal discipline.⁸

Oil revenue represents a large share of the government's fiscal revenue in all oil-dependent economies in Africa. It represents more than 60% in all the seven countries for which the data are available and even reaches 95% in South Sudan. Oil revenue collapse will significantly

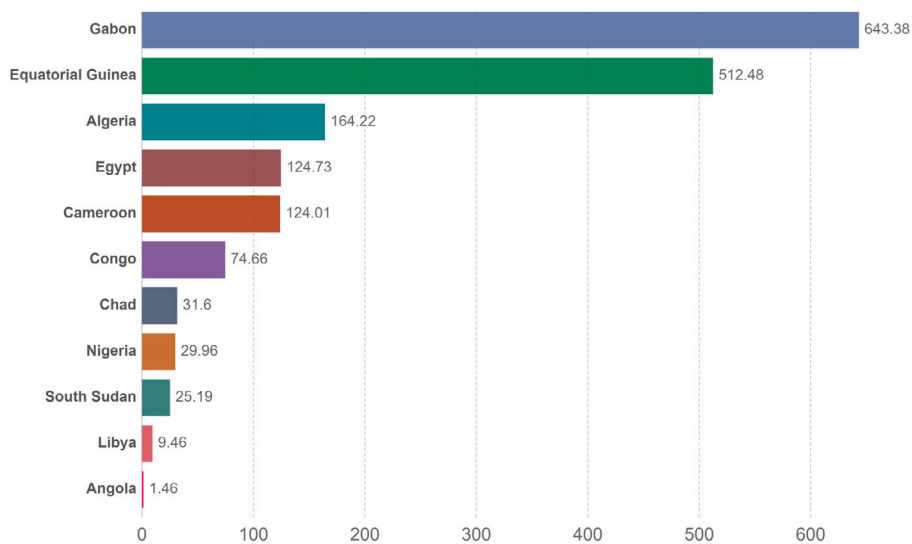
⁶ <https://www.afro.who.int/news/social-environmental-factors-seen-behind-africas-low-covid-19-cases>

⁷ Algeria, Angola, Cameroon, Chad, Republic of Congo, Equatorial Guinea, Gabon, Libya, Nigeria and South Sudan.

⁸ <https://www.brookings.edu/blog/africa-in-focus/2020/04/18/covid-19-and-debt-standstill-for-africa-the-g-20s-action-is-an-important-first-step-that-must-be-complemented-scaled-up-and-broadened/>

Cumulative confirmed COVID-19 cases per million people, May 19, 2020

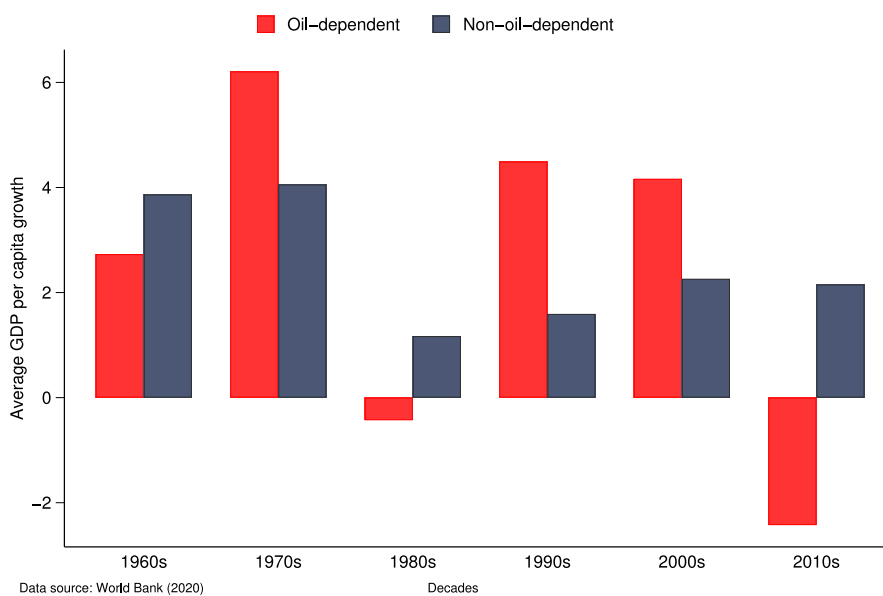
The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.



Source: European CDC – Situation Update Worldwide – Last updated 29 August, 10:04 (London time)

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Fig. 1. Number of confirmed cases per million people.



Data source: World Bank (2020)

Decades

Fig. 2. Average GDP per capita growth by decades.

Table 1

Macroeconomic conditions in Africa.

Source: IMF (2019) for GDP growth, AEC (2020) for oil export and WDI (2019) for Debt data *Sub-Saharan Africa. Left in blank are missing data.

Countries	Government Debt in Oil revenue (% of 2019 (% of GDP)	Government revenue) 2018	Oil export % of total export	Average GDP growth (2010–2019)
African average	50.1*	0.20	51	4
Algeria	46.1	76.3	95	2,86
Angola	110	75	96	2,34
Cameroon	34	0.12	43	4,53
Chad	44.2	0.24		3,37
Congo, Rep.	95.3	0.47	45	2,96
Equatorial Guinea	41.4	80		-3,08
Gabon	58.8	60	83	3,88
Libya	16.5	86.5		1,38
Nigeria	29.4	65.9	94	3,82
South Sudan	34.4	95		-4,47

affect the government's revenue and hence undermine its ability to recover. As long as it takes for the oil price to restore, governments' budgets in oil intensive countries will be substantially affected.

Oil export revenue also constitutes a large share of total export revenue in oil-intensive countries. This makes these economies vulnerable to oil price instability. Since their export basket is concentrated and with oil price decreasing, oil-dependent economies may run out of foreign currency to cover its import. This may result in the current account deficit and financial crisis.

The average GDP growth in the previous decade shows that some countries (Equatorial Guinea, South Sudan) were already in recession before the outbreak even though the oil price was relatively high. The growth rate was lower than 3% in most of the oil-dependent countries. This economic gloom before the crisis limits countries' capacity to respond at a hard time.

2.3. Governance

Governance is key to the response to the COVID-19 pandemic. Fig. 3 displays the evolution of the average control of corruption in oil-dependent countries compared to other countries. The trend shows, not only does the control of corruption is sharply declining in oil-intensive countries, it also illustrates that control of corruption is much lower than in other countries.

Data on government effectiveness display similar patterns (Fig. 4). While good governance is crucial to an effective response to the health crisis and the post-COVID-19 economic stimulus policy, oil-dependent economies in Africa exhibit lower and declining institutional quality.

2.4. Oil shocks: Why this time may be different?

On April 20, 2020, the US oil prices turned negative for the first time in history due to the demand collapse following the lockdown and the disagreements between members of the OPEC (principally Saudi Arabia and Russia) to cut down oil production. Even though the forecasts are optimistic about a possible increase in the prices in 2021, the expected oil price is around US\$34.13 per barrel in 2020 on average. A durable low price will postpone or cancel some investment in the sector.

Fig. 5 shows the evolution of the crude oil price in US dollars per barrel since 1960. Hamilton (2011) identifies six major episodes of oil price downfall between 1960 and 2010. In December of 1968, a strike by east coast oil delivers in the US contributes to the end of a decade of oil price increases. The period 1981–1986 corresponds to the so-called “the great price collapse”. The nominal oil price decreases by 25% (much higher in real terms) due to the Iran–Iraqi war. Between 1985 and 1986 oil price collapsed from \$27 per barrel in 1985 to \$12 per barrel.

At the beginning and the end of the 1990s, oil price also experiences two downward shocks. First, crude oil price slightly decreases in 1990–1991 due to the First Persian Gulf War (Kilian, 2008). Then, the Asian financial crisis started in the summer of 1997 in countries such as Thailand, South Korea, increasing investors' doubt about Asian growth prospects and oil price collapse, falling below \$12 per barrel by the end of 1998 (Hamilton, 2011).

Oil prices began to bounce back between 1999 and 2000 and since 2000, prices have been marked by sharp increases followed by successive episodes of price decreases in 2009, 2014 and 2020. The increasing trend in the 2000s is associated with higher demand, particularly from emerging markets, and the relative slowdown in supply growth (Hamilton, 2011). It reaches a record level of 111.67 US dollars per barrel of Brent in 2012. However, since 2012, not only has the overall trend is downward but also the episodes of falls are vertiginous.

Notwithstanding the oil price volatilities, the COVID-19 crisis has three particularities. Firstly, it comes just as some producing countries have not yet recovered from the oil price falls in 2015 and 2016. Indeed, countries such as Angola, Cameroon, Chad, Republic of Congo,

Table 2

Descriptive statistics.

Variables	Mean	st. dev.	Min	Max
GDP growth forecast October	4.024	2.55	-4.992	8.213
GDP growth forecast April	-2.293	8.58	-58.66	4.89
COVID-19 deaths per million people	40.65	120.6	0	856.3
COVID-19 Incidence (per million people)	0.81	1.62	0	8.55
Oil dependence based on exports (dummy)	0.185	0.39	0	1
Oil dependence based on oil revenue (dummy)	0.148	.357	0	1
COVID-19 death (dummy)	0.70	0.46	0	1
Forecasted GDP growth loss	6.317	7.65	0.500	58.63

Notes: Number of countries (N = 54).

Equatorial Guinea, and Gabon were under the IMF assistance program before the outbreak.⁹ Secondly, the post-COVID-19 oil price shock is historically one of the largest prices collapse in a short period. The oil price decreases by more than 60% since January before falling to its lowest record in history in April 2020. Thirdly, there is great uncertainty about the outcome of the oil economy as it emerges from this crisis. The world is already facing a climate emergency that calls for consistent responses which have so far been slow to come. The COVID-19 crisis could accelerate a change in lifestyle that will have a long-lasting impact on oil demand. Indeed, according to the U.S. Energy Information Administration (EIA)'s forecast, the oil price will remain low (Fig. 6).

3. Data

We use three data sources. The growth forecast data before and after the COVID-19 outbreak are from the IMF (World Economic Outlook, October 2019 and April 2020 respectively). The COVID-19 data, taken from the Our World in Data database (OWID, the University of Oxford), are the number of reported cases and deaths related to COVID as of April 20, the date of the IMF publication of the forecasts. The data on oil-revenue as a share of government revenue are computed from the ICTD/UNU-WIDER (2020) dataset.

We use two dependent variables. For our cross-sectional regression, the dependent variable is the forecasted gap of GDP growth forecast between October, 2019 and April, 2020 measured as $\Delta_i^{growth} = |growth_{April2020,i} - growth_{October2019,i}|$ for country i . For the difference-in-differences method, the outcome variable is the forecasted GDP growth. Our variables of interest are oil-dependence, the incidence of COVID-19 which is the number of COVID-19 cases divided by the total population (expressed in terms of cases per million people), and COVID-19 related deaths per million people. Also, we measure COVID-19 deaths as a dummy variable which is equal to 1 if a country reports at least one COVID-19 related death by the time of the forecast and 0 otherwise. Oil-dependence is a dummy variable equal to 1 if the country oil export revenue is greater or equal to 30% of the total export revenue as classified by the IMF. Alternatively, we use the oil revenue as a share of government revenue for robustness check. We create these dummy variables because oil price crash predominantly affects the oil-dependent economies.

Table 2 presents the descriptive statistics. The expected average GDP growth in Africa before the outbreak is 4.02% with a minimum of -5% and a maximum of 8.2%. After the outbreak, the expected average growth is -23%. The minimum is -58.66% (Libya) and the maximum 4.9% (South Sudan). By the time of the forecast, the number of COVID-19 cases and deaths are 40.65 and 0.81 per million people respectively in Libya and South Sudan. As of the date of the publication of the forecasts, (April 20, 2020), 38 out of the 54 African countries (70%) recorded at least one COVID-19 related death.

⁹ <https://www.imf.org/external/np/fin/tad/extarr11.aspx?memberKey1=ZZZZ&date1key=2020-02-29>

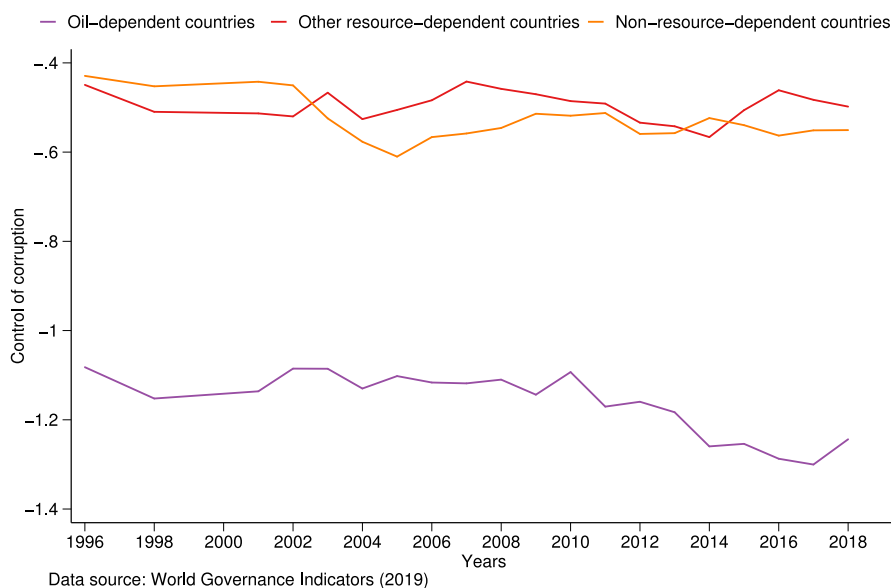


Fig. 3. Control of corruption in Oil-dependent countries compared to others.

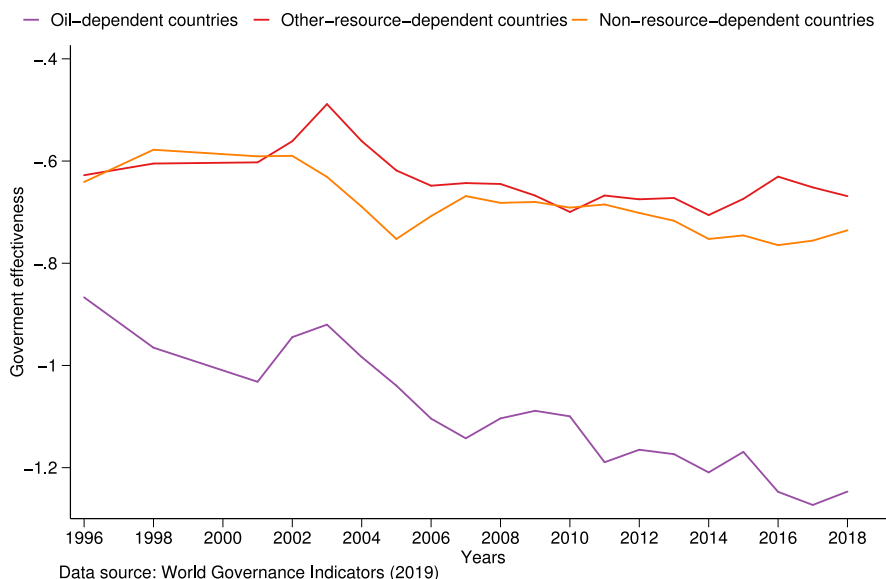


Fig. 4. Government effectiveness in Oil-dependent countries compared to others.

Table 3

Forecasted GDP growth: Mean difference test.

	GDP growth October	GDP growth April	Difference	Mean difference test
Oil-dependent countries		-7.60	10.29	1.75 (9.68)
Non oil-dependent countries	4.33	-1.08	5.41	8.43 (70.92)
Difference	1.64	6.52		
Mean difference test	1.4 (10.65)	1.3 (9.16)		

Notes: Standard errors in parentheses, mean test with unequal variance.

Table 3 presents the average forecasted GDP growth of oil-dependent and non-oil-dependent countries in Africa before and after the COVID outbreak. Before the COVID-19 outbreak, the average GDP growth is 2.7% in oil-dependent countries while it is 4.3% in non-oil-dependent countries. However, the difference between these two means is not statistically different from zero. After the outbreak, the average

forecasted GDP growth is -7.6% in oil-dependent countries whereas it is -1.1% in non-oil-dependent ones.

For the pre-COVID-19 forecast, we test the difference in forecasted GDP growth for oil-dependent and non-oil-dependent countries assuming unequal variances between the two samples. The null hypothesis is that this difference is equal to zero against three alternative hypotheses: the difference is less than zero; different from zero; and greater than

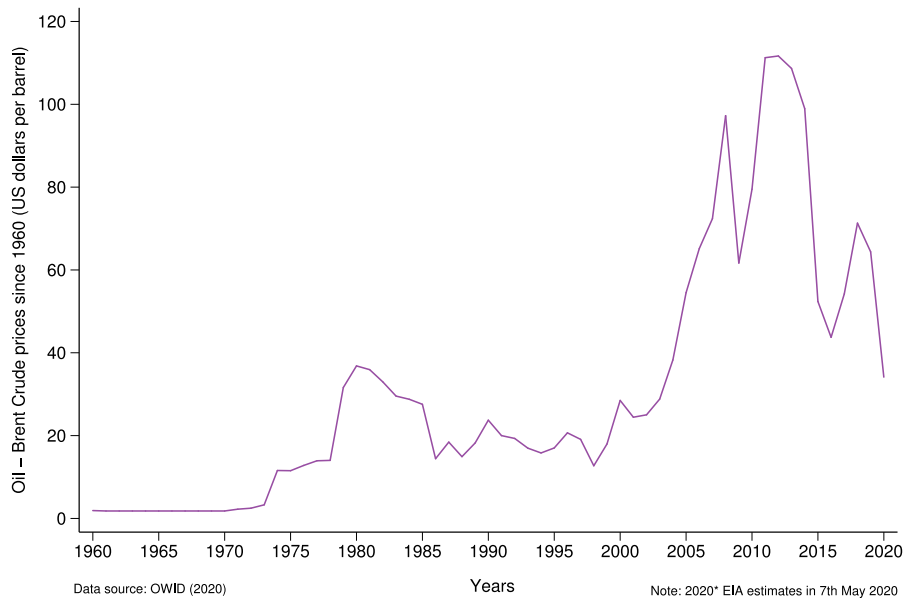


Fig. 5. Brent crude oil price (\$US per barrel-yearly average).

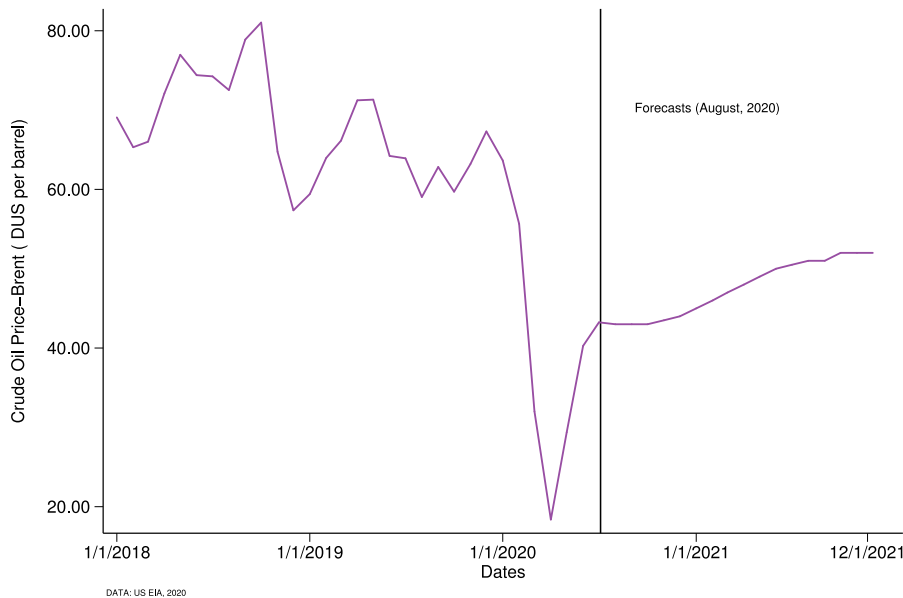


Fig. 6. Brent crude oil price (\$US per barrel-monthly average).

zero. In these three cases, we failed to reject the null hypothesis that the difference in growth forecast in the two groups before the outbreak is equal to zero at 5% level. The probabilities are respectively $Pr(T < t) = 0.91$; $Pr(|T| > |t|) = 0.19$; and $Pr(T > t) = 0.094$. Hence, we can use the non-oil-dependent countries as a control group for our difference-in-differences estimation.

4. Empirical strategy

We aim to evaluate the extent and the magnitude of the impact of both the COVID-19 outbreak and the oil price crash on African economies. To do so, we use the forecasted growth before and after the outbreak as our outcome variable. We use two specifications (cross-sectional and difference-in-differences model) to estimate the effect of COVID-19 and oil-dependence on forecasted growth loss.

4.1. Cross-sectional model

The first model is a cross-sectional regression where we specify the following equation (Eq. (1) below):

$$\Delta_i^{growth} = \alpha + \beta_1 Oildependent_i + \beta_2 COVID_i + \beta_3 Oildependent_i \times COVID_i + \beta_4 SSA + \epsilon_i \tag{1}$$

where Δ_i^{growth} is the difference between GDP growth forecast before and after the COVID-19 outbreak as previously defined. Our variables of interest are $Oildependent_i$ and $COVID_i$, measured by the COVID-19 incidence or COVID-19 related deaths per million people by the time of the forecast, for a country i . SSA denotes the Sub-Saharan Africa dummy taking the value 1 if the country is in SSA and 0 otherwise. The identification assumption is that $E(\epsilon_i|x) = 0$ with x denoting the explanatory variables $Oildependent$, $COVID$ and the interactive term.

This model estimates a correlation between the variables of interest and the dependent variable. The net correlation of oil-dependence

on the forecasted GDP growth loss after the outbreak is given by $\beta_1 + \beta_3 \overline{COVID}$ while the net correlation of COVID-19 is given by $\beta_2 + \beta_3 \overline{Oildependent}$. \overline{COVID} and $\overline{Oildependent}$ denote respectively the average COVID-19 incidence or COVID-19 deaths per million people and the proportion of oil-dependent countries in the sample. In the next model, we go beyond the correlation to estimate the causal impact of the joint shock on the forecasted GDP growth.

4.2. Impact analysis: difference-in-differences model

The second model is a difference-in-differences regression using COVID-19 related death (having reported at least one death) and being oil-dependent countries as treatment variables. We assume that the oil-dependence is not endogenous to the difference in the forecast. Also, the mean test shows that there is no systematic difference between the average forecasted GDP growth between oil-dependent and non-oil-dependent countries before the outbreak (October 2019). With the COVID-19 being an exogenous shock, we use the COVID-19 outbreak as a natural experiment (Cameron and Trivedi, 2005) to estimate the causal effect of both the oil-dependence and the COVID-19 outbreak on the forecasted GDP growth.

We specify the following model (Eq. (2) below):

$$\Delta^{DID} = [Y_t^1 - Y_{t'}^0 | D = 1] - [Y_t^0 - Y_{t'}^0 | D = 0] \quad (2)$$

where Y is our outcome variable (GDP growth forecast) with Y^1 and Y^0 for treated and untreated outcomes. The subscripts t' and t are respectively the period before and after the COVID-19 outbreak. $D = 0$ and $D = 1$ denote the group of untreated and treated respectively.

The identifying assumption of Eq. (2) is that $E(Y_t^0 - Y_{t'}^0 | D = 1) = E(Y_t^0 - Y_{t'}^0 | D = 0)$ (Heckman et al., 1998). This assumption is the crucial identifying restriction in difference-in-difference regression (Cameron and Trivedi, 2005; List, 2011; Wolpin et al., 2000). It implies that, in the absence of the treatment, the average outcome would have been parallel conditional to the covariates. Regarding the short period of time and the unpreparedness of countries worldwide, the change in the forecast between October 2019 and April 2020 is mainly driven by the COVID-19 shock. The April forecasts are the latest data available and best suit the analysis since these data could not consider countries' responses.

5. Results

5.1. Results for the cross-sectional regression

Table 4 reports the results of our estimates of the cross-sectional regression. We compute the net marginal effects of oil-dependence and those of COVID-19 on the forecasted GDP growth gap. Oil-dependence is positively correlated with forecasted GDP growth loss. The coefficient is greater when we control for the COVID-19 incidence (6) as compared to the related deaths (9.6). The net effect is, however, not significant for the COVID-19 incidence. The net marginal effect of COVID-19 is not statistically significant. Sub-Saharan Africa membership is associated with lower forecasted growth loss compared to the Northern Africa.

Net marginal effects of oil-dependence

Figs. 7 and 8 show the marginal effects of oil-dependence on the growth revision conditional to the COVID-19 incidence and COVID-19 related deaths per million people respectively ($\beta_1 + \beta_3 \overline{COVID}$). These graphs show that oil-dependent countries exhibit higher growth losses. These gaps are lower and closer to zero for non-oil-dependent countries. The marginal effect decreases as the incidence increases for oil-dependent countries. The effect remains unchanged following the COVID-19 cases. Oil-dependent economies suffer not only from the COVID-19 crisis and its primary consequences on the economy as any other country in the world, but they are also affected by the oil-price collapse. Oil-dependent countries are experiencing higher downward growth revision both in North Africa and in Sub-Saharan Africa.

Table 4
Effect of Oil-dependence and COVID-19 on forecasted growth loss (OLS).

Dependent variable: Gap in GDP growth forecast	(1) ^a	(2) ^a
	Oil dependence	6.004** (2.761)
COVID-19 deaths per million people	-0.0666 (0.838)	
Oil dependence x COVID-19 per million people	-1.337 (1.211)	
COVID-19 incidence		-0.0053 (0.008)
Oil dependence x COVID-19 incidence		-0.213** (0.0942)
Sub Saharan Africa	-8.685*** (2.925)	-8.464*** (2.782)
Net effect of oil dependence ^b	4.922* (2.95)	0.933 (3.033)
Net effect of COVID-19 ^b	-0.96 (1.888)	-0.0447 (0.0387)
Constant	12.96*** (2.933)	12.96*** (2.746)
Observations	54	54
R-squared	0.216	0.266

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

^aColumn (1) is for COVID-19 related deaths and column (2) is for its incidence.

^bThe net effects are computed using bootstrap.

Net marginal effects of COVID-19

Figs. 9 and 10 show the net effects of the COVID-19 (incidence and related deaths respectively) conditional to oil-dependence ($\beta_2 + \beta_3 \overline{Oildependent}$). For non-oil-dependent countries, the net marginal effects are constant over the incidence (Fig. 9) and the number of COVID-19 related deaths (Fig. 10). By contrast, in the oil-dependent countries the net marginal effects are decreasing.

5.2. Results for the difference-in-differences regression

Table 5 shows the change in growth forecasts with three treatment variables: being an oil-dependent country, having at least one confirmed COVID-19 related death at the date of the forecast release, and having both.

Using the COVID-19 deaths as our treatment, we find that having recorded at least one COVID death by the time of the forecast results in 2.75 percentage points growth loss. For oil-dependence as a treatment variable, the results show that it induces 7.6 percentage point forecasted growth loss. Turning to the joint effect, we use the interaction between the COVID-19 related deaths and oil dependence. The joint effect is -10.75 percentage points, larger than each exclusive effect. Overall, these results suggest that oil-dependent countries in Africa are facing a twin shock as the forecasted GDP loss in these countries is higher relative to the non-oil-dependent economies.

6. Robustness check¹⁰

We use oil-revenue as a percent of government revenue as a measure of oil-dependence for robustness analysis.¹¹ We create a dummy variable, which is equal to one if the oil revenue is greater than the 30% threshold and zero otherwise. The results for our cross-sectional and difference-in-differences regressions are in Tables 6 and 7 respectively.

¹⁰ We thank the anonymous referee for suggesting this robustness check.

¹¹ An alternative measure suggested by the reviewer is the foreign reserves before and after the COVID-19 outbreak. We did not find the data on this variable.

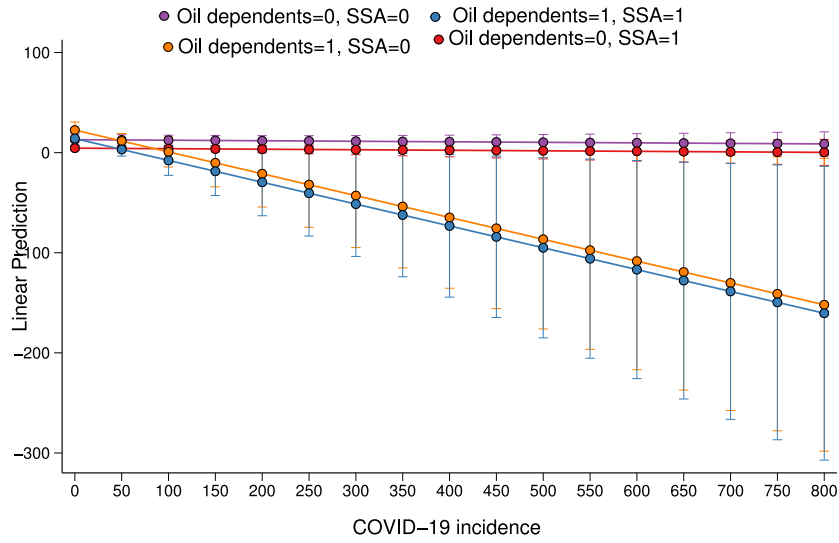


Fig. 7. Margins of oil dependence conditional to COVID-19 incidence (95% confidence interval).

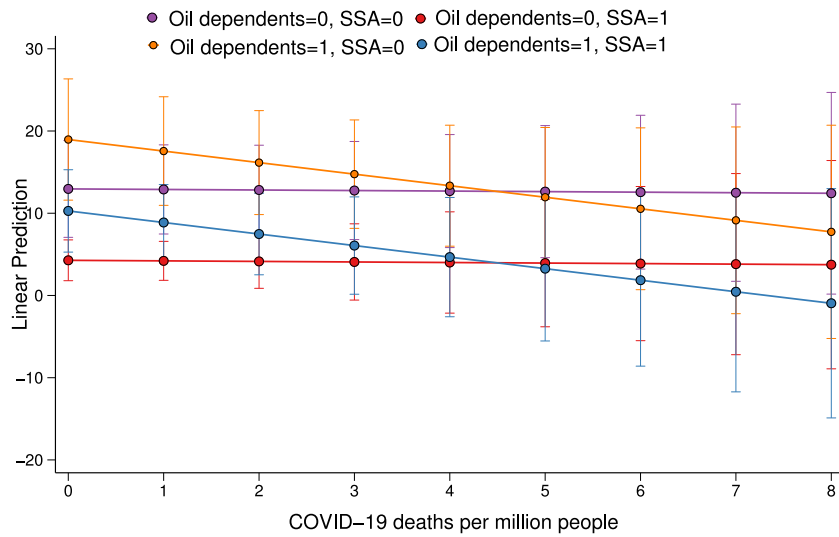


Fig. 8. Margins of oil dependence conditional to the COVID-19 deaths (95% confidence interval).

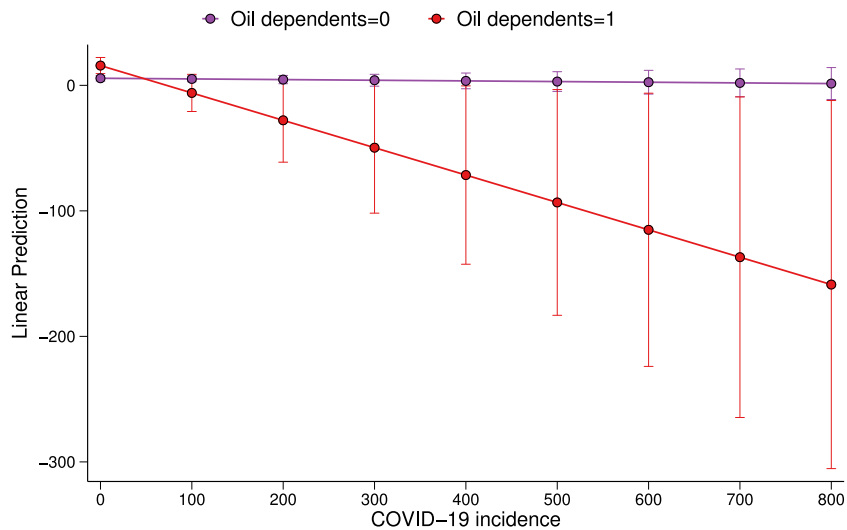


Fig. 9. Margins of COVID-19 incidence (95% confidence interval).

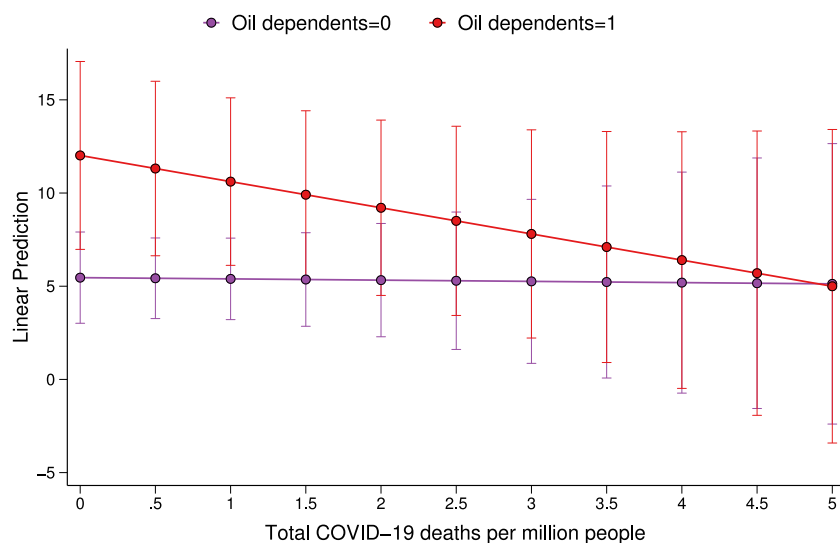


Fig. 10. Margins of COVID-19 related deaths (95% confidence interval).

The cross-sectional regression results show that oil-dependence is associated with greater forecasted growth loss 6.27 and 10.21 respectively when controlling for COVID-19 deaths and COVID-19 incidence (Table 6). Sub-Saharan African dummy is associated with less forecasted growth loss compared to other countries as in our previous results.

In the difference-in-differences estimations, oil-dependence is associated with -9.08 percentage points forecasted growth loss, higher than the previous results (-7.6 percentage points). Similarly, the joint shock entails a larger forecasted growth loss (-12.01 percentage points) as compared to the previous results (-10.75 percentage points) (see Table 7).

Overall, using oil-revenue as a share of government revenue yields similar results as oil exports as a share of total exports. However, oil revenue as a share of government revenue better captures the oil-dependence.

7. Conclusion and policy options

The COVID-19 outbreak is inducing unprecedented economic and social disruptions. Although all countries are experiencing this crisis, the size of the effects are different across countries and regions regarding the economic conditions and the policy responses. This paper documents the effect of both COVID-19 and oil price collapse on the forecasted GDP growth in Africa. We find a negative effect of the COVID-19 crisis on the forecasted GDP growth in the continent. However, the joint shock is higher in oil-dependent economies. In addition to the urgent need to address the health issues (in both the short and the long run), we identify five high potential economic policies for a sustainable and speedy recovery: social safety net policy, economic diversification and structural transformation, innovation, public finances management and green and climate-friendly policies.

Redistribution policy toward vulnerable groups

The crisis could undermine decades of efforts toward poverty reduction. Evidence on the current and previous pandemics shows that a pandemic disproportionately affects the poorest: they are more likely to be infected and less resilient (Adams-Prassl et al., 2020; Alon et al., 2020; Galletta and Giommoni, 2020). The effect on inequality is even persistent after a century (Galletta and Giommoni, 2020). The issue is more problematic in oil-dependent economies where growth is less inclusive (Leamer et al., 1999). In the short-term governments should help smooth the impact of the crisis on the most vulnerable and prevent a humanitarian distress. Technologies such as mobile money services can help targeted programs to reach the most vulnerable.

Diversification and structural transformation

African economies rely heavily on commodity export specifically natural resources dependent countries. The 1990s liberalization policies under the aegis of the “Washington consensus” contribute to weakening the embryonic industrial sector. For instance, oil exports and oil revenue represent respectively more than 80% of total exports and 60% of total domestic revenue in most oil-rich countries in Africa (Algeria, Angola, Gabon and Nigeria). Oil sector investments also constitute an important part of the investments. The low oil price will dry up a larger share of investments in particular foreign direct investment in Africa. Thus, economic diversification and structural transformation policy are key to speed up the recovery and build back strong and resilient economies. To do so, governments can build forward and backward linkages between the natural resources sector and the rest of the economy. This requires exploiting the value chains in sectors with high growth and job creation potentials such as agriculture and livestock.

Regional integration, in particular deepening intra-regional trade, is essential to structural transformation. The newly launched African Continental Free Trade Area will be ineffective without supporting infrastructures including physical and virtual infrastructure. African governments should increase efforts toward infrastructure development across the continent.

Innovation and new technology

Africa is showing creativity in addressing the health crisis. Since the COVID-19 outbreak, several innovations ranging from handwashing facilities to robotic nurses have been seen across the continent. These dynamics across African countries should be mobilized toward other economic activities (industrial, social, medical, etc.). Also, the deployment and use of digital technology in financial services, E-government services and online learning have supported most economic activities. This is particularly important since evidence from the literature shows that pandemic curbs productivity (Azomahou et al., 2016; Boucekkinne et al., 2008).

Table 5
Difference-in-differences estimates.

Regression with COVID-19 deaths as treatment variable	
Dependent variable: Growth forecast	Marginal effects
COVID deaths= 0; T = 0	4.072** (2.56)
COVID deaths= 0; T = 1	-1.218 (-0.77)
COVID deaths= 1; T = 0	4.003*** (3.88)
COVID deaths= 1; T = 1	-2.746*** (-2.66)
T = 1	COVID deaths=0 -5.291** (-2.35)
	COVID deaths=1 -6.749*** (-4.62)
Observations	108
Regression with oil dependence as treatment variable	
Dependent variable: Growth forecast	Marginal effects
Oil intense = 0 ; T = 0	4.327*** (4.70)
Oil intense = 0 ; T = 1	-1.087 (-1.18)
Oil intense = 1 ; T = 0	2.689 (1.39)
Oil intense = 1 ; T = 1	-7.602*** (-3.94)
T = 1	Oil intense = 0 -5.414*** (-4.16)
	Oil intense = 1 -10.291*** (-3.77)
Observations	108
Regression with COVID-19xoil dependence deaths as treatment variable	
Dependent variable: Growth forecast	Marginal effects
COVID deaths x oil intense = 0 ; T = 0	4.235** (4.90)
COVID deaths x oil intense = 0 ; T = 1	-1.034 (-1.20)
COVID deaths x oil intense = 1; T = 0	2.604 (1.16)
COVID deaths x oil intense = 1; T = 1	-10.751** (-4.80)
T = 1	COVID deaths x oil intense= 0 -5.268** (-4.31)
	COVID deaths x oil intense = 1 -13.356** (-4.22)
Observations	108

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; t statistics in parentheses.

T = 0/T = 1 are respectively time before and after the COVID-19 outbreak.

Smart and transparent public finances management

The crisis has shown solidarity within and across countries. Organizations such as the World Bank, the IMF,¹² the G-20, and bilateral donors have taken measures to support developing countries including new assistance and debt service suspension. This solidarity helps some countries to regain fiscal space. However, governments should further increase transparency in revenue management regarding the level of governance in particular in oil-dependent countries.

Also, countries should be ingenious in mobilizing domestic resources. Most countries can broaden their tax base without increasing the tax rate. Reforms of tax administrations are needed for more efficiency in revenue mobilization. In the long-run, the reforms should be expended to address public debt sustainability.

¹² <https://www.worldbank.org/en/news/press-release/2020/04/02/world-bank-group-launches-first-operations-for-covid-19-coronavirus-emergency-health-support-strengthening-developing-country-responses>

Table 6
Effect of Oil-dependence and COVID-19 on forecasted growth loss.

Dependent variable: Gap in GDP growth forecast		
	(1)	(2)
Oil dependence	6.267** (3.009)	10.21*** (3.664)
COVID-19 deaths per million people	-0.0551 (0.834)	
Oil dependence x COVID-19 per million people	-1.326 (1.217)	
COVID-19 incidence		-0.00529 (0.00829)
Oil dependence x COVID-19 incidence		-0.225** (0.0992)
Sub Saharan Africa	-8.417*** (2.944)	-8.250*** (2.805)
Net effect of oil dependence ^b	1.08 (43.855)	-0.0468 (0.208)
Net effect of COVID-19 ^b	5.193 (43.647)	-0.300 (12.90***)
Constant	12.86*** (2.957)	12.90*** (2.770)
Observations	54	54
R-squared	0.211	0.263

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

^aColumn (1) is for COVID-19 related deaths and column (2) is for its incidence.

^bThe net effects are computed using bootstrap.

Table 7
Difference-in-differences estimates.

Regression with oil dependence as treatment variable	
Dependent variable: Growth forecast	Marginal effects
COVID deaths x oil intense = 0 ; T = 0	4.387*** (0.888)
COVID deaths x oil intense = 0 ; T = 1	-1.112 (0.888)
COVID deaths x oil intense = 1; T = 0	1.933 2.128
COVID deaths x oil intense = 1; T = 1	-9.084*** (2.128)
T = 1	COVID deaths x oil intense= 0 -5.499*** (1.255)
	COVID deaths x oil intense = 1 -11.0175*** 3.009
Observations	108
Regression with COVID-19xoil dependence deaths as treatment variable	
Dependent variable: Growth forecast	Marginal effect
COVID deaths x oil intense = 0 ; T = 0	4.271*** (5.04)
COVID deaths x oil intense = 0 ; T = 1	-1.078 (-1.27)
COVID deaths x oil intense = 1; T = 0	2.041 (0.85)
COVID deaths x oil intense = 1; T = 1	-12.013*** (-5.02)
T = 1	T = 1 COVID deaths x oil intense = 0 -5.350*** (1.197)
	COVID deaths x oil intense = 1 -14.053*** (3.387)
Observations	108

* $p < 0,1$; ** $p < 0,05$; *** $p < 0,01$.

Green and climate-friendly economy

Unlike previous oil price crashes, the current crisis is likely to span over a long period of time and the price of oil could remain low, not only because of the fall in demand but also because of the climate emergency. Many experts stress that the crisis is an opportunity to push the climate agenda forward. After all, the parallelism between the

COVID-19 crisis and the climate crisis clearly shows how much we need to rethink our way of life (Allan et al., 2020).

As the COVID-19 crisis is an opportunity to address the climate emergency, African countries should be taking a step forward moving out of the fossil fuel economy and considering climate-friendly packages in their recovery policies. A promising policy step would be the implementation of 'A science panel for the Congo Basin'. The Congo Basin is the world's second-largest rainforest after the Amazon.¹³ The idea of a scientific panel for the Congo Basin is based on the "science panel for the Amazon forest" launched in 2019 under the sponsorships of the Sustainable Development Solutions Network (SDSN) (Bruna and Pietras, 2019).

Under a similar framework, a science panel on the Congo Basin could gather leading experts from different disciplines working on issues related to the Congo Basin forest. Their tasks may include collecting better data on the forest, building indicators, connecting scientific evidence to the public discourse and policy through advocacy, being a collective and audible voice to inform the public, and monitoring policy.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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¹³ Yale University: <https://globalforestatlas.yale.edu/region/congo>.