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## Chapter

# Offshoring-Outsourcing and Onshoring Tradeoffs: The Impact of Coronavirus on Global Supply Chain

*George William Kajjumba, Oluka Pross Nagitta, Faisal A. Osra and Marcia Mkansi*

## Abstract

The world has become a global village with companies investing in different nations to remain afloat and competitive. In the process of offshoring- outsourcing, companies and nations have become interdependent in their efforts to bridge the supply chain network. However, during a pandemic, such as the Coronavirus (COVID-19) that involved the closure of borders, and during which there was a high demand of lifesaving machines and personal protective equipment, many countries were left scrambling for critical medical products such as ventilators and personal protective equipment for doctors. Hence, the tendency away from offshoring and outsourcing to onshoring production. COVID-19 has elicited that countries need to invest in an onshore business if they are to remain afloat. However, investing in onshore (local) business calls for a tradeoff, which some countries cannot afford. Many countries lack skilled labour (developing countries), and where available, it is too expensive (developed countries) making onshore an expensive venture. Besides, promoting manufacturing companies means increased air pollution and greenhouse gases that are responsible for 4.2–7.0 million premature deaths every year, and which costs \$4.6 trillion per year. Such death rates and cost can hinder the onshore business. Therefore, for countries to survive in the era of a pandemic, the best alternative is to build strong ties with offshore-outsource nations.

**Keywords:** coronavirus, air pollution, manufacturing, public health, president trump, COVID-19, pandemic, outsourcing, Onshoring, supply chain

## 1. Introduction

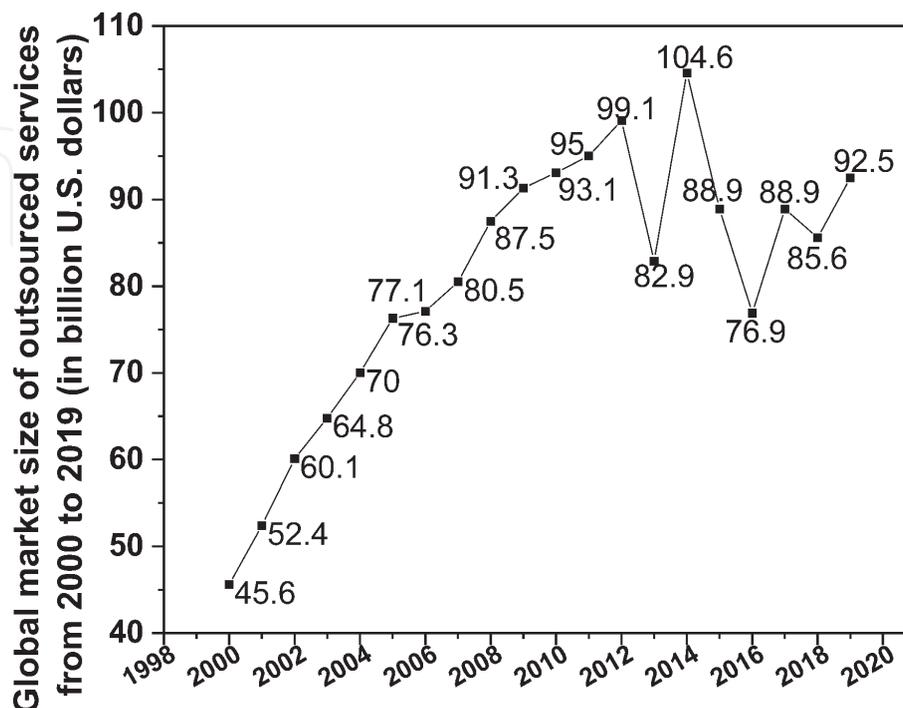
Offshoring is the act of delegating part of business work to an external and/or internal entity that is located somewhere else. Outsourcing involves obtaining certain services/products from a third party, while offshoring companies relocate some of their services/product lines to regions that offer them a competitive advantage. Due to the unifying factor of competitiveness, offshoring and outsourcing can be entangled, leaving a very thin line to separate them—especially in the service sector. Offshoring-outsourcing can involve captive outsourcing, nearshoring, and onshoring, depending on the location of the firm. By 2019, India was the number one

destination for most offshore-outsourcing activities, owing to its financial attractiveness and skilled labour [1].

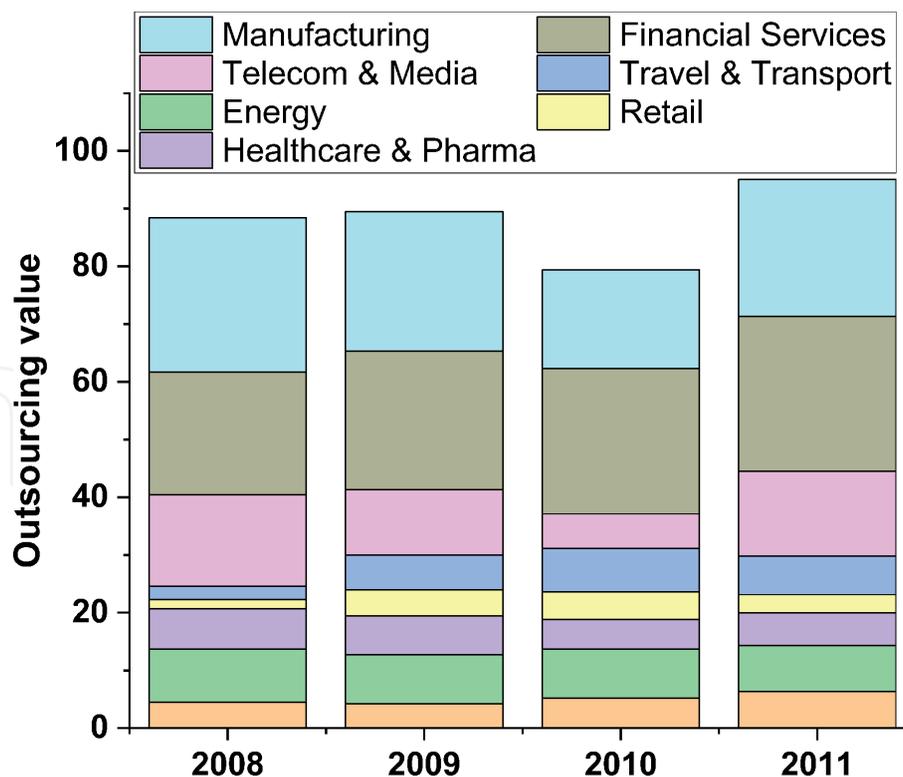
Since 2000, the revenue of the global outsourced services industry had been rising steadily, reaching a peak in 2011, after which it started losing ground, as illustrated by the graph in **Figure 1**. In 2016, the industry market size dropped to USD 76.9 billion, the lowest revenue since 2005. The largest share of the revenue for this industry came from the Americas, followed by Europe and the Middle East, while Africa barely featured. A much smaller share of global revenue came from the Asia-Pacific region [2]. The cardinal role of outsourcing-offshoring is to cut costs such as taxes and production. Some other drivers include enabling a focus on the core business and solving capacity issues. Apart from information technology that accounts for more than 50% of the global outsourcing revenue, other major sectors include business services, energy, healthcare and pharmaceuticals, retail, travel and transport, and telecom and media. **Figure 2** depicts the contribution of some of the selected sectors. However, since the outbreak of COVID-19, many industries have since been affected, causing slack in outsourcing/offshoring.

Ever since the first case of the novel coronavirus (2019-nCoV), was detected in Wuhan, China, towards the end of 2019, and declared a global pandemic on 11th March by the World Health Organisation (WHO) [3], attention has now turned to how countries can survive and revive their economies in the new normal. The magnitude of the resultant shock from COVID-19 has not only tested the healthcare and disaster management systems of countries and the agility of policy responses to a public health catastrophe, but it has also significantly impacted businesses and their offshore-outsourcing processes. Unprecedented interruptions to business-as-usual have quickly cascaded across industries and geographies, especially with the implementation of stay-at-home orders in all sub-Saharan countries.

In this chapter, we present how medical industry and other industries have been impacted during the COVID-19 pandemic in relation to offshoring-outsourcing business. COVID-19 pandemic resulted in border closure forcing nations to rethink of onshoring; in this chapter we present the tradeoffs between outsourcing-offshoring and onshoring.



**Figure 1.**  
Global market size of outsourced services from 2000 to 2019 [2].



**Figure 2.**  
*Comparison of the total contract value in the global outsourcing market by industry from 2008 to 2011 (in billion USD).*

## 2. Medical sector

Worldwide, the primary goals of the healthcare sector are to cut costs and improve the quality of care. With the acceleration of globalisation, healthcare services are impacted by healthcare outsourcing and offshoring [4]. The healthcare sector's reliance on offshoring-outsourcing is more pronounced in today's operating environment. Many incidences during the ongoing pandemic pointed towards either shortages or the non-availability of various materials at the point of requirement or consumption. The items included, among others, face masks and shields, hand sanitisers, surgical-grade materials, and other daily health supplies, escalating the 'bullwhip' effect on supply chains leading to onshoring [5].

Despite the opportunities for synergies and improved efficiencies of outsourcing/offshoring, the undertakings are more complex and create longer and more fragmented supply chains which could have disastrous consequences, particularly in the healthcare context [6]. In the first quarter of 2020 (the COVID-19 pandemic), the impact on the production and shipment of pharmaceuticals was not felt. However, the delivery of critical items, such as chemicals, soon started dwindling. The impact led regulators and world leaders to assess the extent to which China dominates the world's supply of active pharmaceutical ingredients and their chemical raw materials. An ongoing industry effort in the US and Europe to rebalance the pharmaceutical chemical supply chain is likely to be energised by government initiatives to ensure domestic production of drugs.

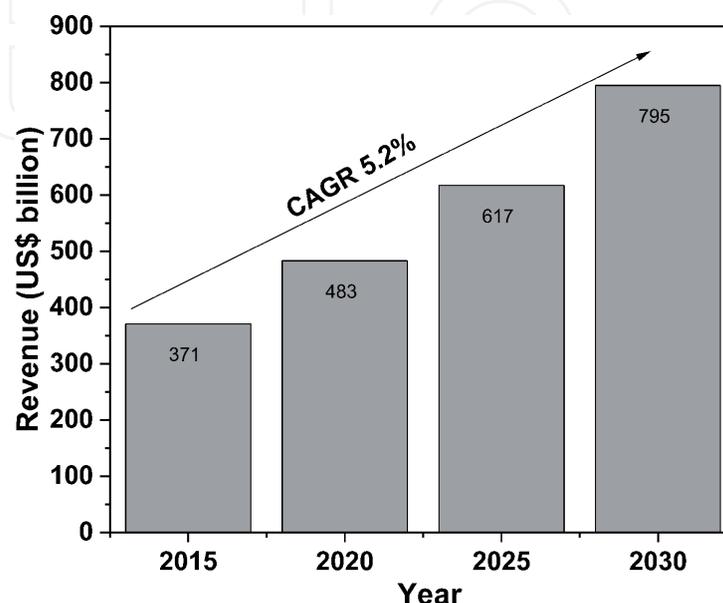
As the coronavirus virus (COVID-19) pandemic has spread, health facilities have become overwhelmed, with potentially infectious patients seeking testing kits and personal protective equipment (PPE) (goggles, gloves, face shield and masks, air-purifying respirators and gowns). These critical items, which have been either outsourced or offshored, are in high demand. Many locations have experienced a scarcity of these products, at a time when they are needed most to care for highly

infectious patients. An increase in PPE supply, in response to this new demand, would require a large increase in PPE manufacturing. An alternative is to outsource homemade masks, which feasibly could include scarves or bandanas. Some countries have even resorted to using unconventional solutions for PPE at local hospitals, such as plastic water bottle cut-outs for eye protection and plastic garbage bags for gowns. Calls for continuity of supplies through the repurposing of industrial capacity and other means seem unlikely to solve the shortage quickly enough, as supply chains have become more dysfunctional during the pandemic [7] and the global crisis can no longer be contained.

With the urgent need for a rapid acceleration in the manufacturing process for a wide range of test-kits (antibody tests, self-administered, and others), outsourcing and offshoring will play a crucial role in this endeavour. By 2019, the global medical device outsourcing market size was valued at USD 104.5 billion, and it was expected to grow at a compound annual growth rate (CAGR) of 5.2% from 2015 to 2030. Due to the increased spending on contract research organisation (CRO) services, the market for medical device outsourcing is expected to increase during the forecast period. As there is an increased demand for medical devices due to the rising prevalence of chronic diseases, various companies are shifting their focus to research and development, and are outsourcing medical devices [8].

Changes to the ISO standards are likely to drive the demand for specialists in regulatory affairs and quality assurance service providers in the developed countries, precisely due to small-medium enterprises requiring third-party assistance to comply with the new ISO standards. Original equipment manufacturers and subcontractors in developed countries, such as Canada, Japan, the US, and European Union countries, are anticipated to adopt new ISO standards, thereby driving the market for medical device outsourcing [9]. In addition, recent regulatory changes in Europe relating to the quality and outsourcing of medical devices are also anticipated to increase the demand for quality assurance services and regulatory affairs, thereby, accelerating the outsourcing offshoring market growth [9]. **Figure 3** shows the projected revenue growth of the outsourced medical service market.

Previously, medical device companies have tended to deliver value, mainly through outsourcing manufacturing and selling their products. However, in the new normal, with mounting pressure on the healthcare system, there are foundational



**Figure 3.**  
Global medical device sales forecast [8].

shifts in the care delivery model, and as a result, the industry value chain is set for a drastic overhaul. Therefore, companies will need to step out of their conventional manufacturing role [10]. The WHO reiterated this call to governments and industry to increase PPE manufacturing by 40% to meet rising global demand, and to avoid the severe and mounting disruption to the global supply of PPE being caused by rising demand, panic buying, hoarding and misuse. Thus, putting lives at risk from COVID-19 and other infectious diseases. There is no doubt that the lack of PPE puts health workers and patients at high risk of being infected and infecting others with COVID-19 [11].

### **3. Other industries**

Many outsourcing companies that have offshored operations in countries like India, China, Singapore and Vietnam have been devastated by the crisis. Since the global lockdown in March, companies have been failing to deliver orders due to the labour force being forced to stay home. However, although the global crisis damaged businesses, not all companies are losing money. As more people are working from home, the demand for technology that enables online group meetings has skyrocketed. For example, shares in Zoom™ video conferencing companies have risen by 50% since February 2020. Similarly, the demand for TV shows and movies to watch at home soared to the extent that giant streaming services like Netflix™ and YouTube™ reduced the quality of their streaming in Europe to ease the pressure on the internet. Thus, the offshoring-outsourcing of information technology and streaming services is expected to increase post-pandemic to meet the high demand.

The outsourced service industry seems to be less affected, and where it is affected, it is expected to recover shortly, as giant companies will be looking for better ways to cut costs in the post-pandemic era. However, the manufacturing industry has been strongly hit since it involves the movement of parts. In the midst of the pandemic, customers need advanced technology and automation to cope with the uncertainties that companies have been grappling with for the last decade. The outbreak of the coronavirus affected the supply chain and disrupted the supply chain/operation of manufacturing across the world. Companies that heavily offshore-outsourcing in Vietnam, China and India have been the most vulnerable. The global automotive industry, which imports more than \$14 billion (by 2017) in motor parts from China annually, was significantly impacted [12]. In fact, companies throughout the supply chain are being forced to make tough decisions, like slowing or halting production, resourcing products, and re-evaluating revenue. For example, the Italian-American automobile manufacturer, Fiat Chrysler Automobiles, halted their production in Serbia [13].

The Indian outsourcing market is worth approximately \$50 billion [14]. This includes companies that work in application development areas, such as quality assurance testing services. Companies that rely on outsourcing firms in India range from financial services providers to major technology companies, to name just two of many industries. However, outsourcing firms were simply not prepared for the pandemic and the ensuing lockdown. Outsourcing companies lacked the infrastructure to work remotely while continuing to manage the performance of their teams and meeting client requirements, and their customers are now feeling the pain in the loss of business continuity. Especially in offshore locations, much of the workforce has not previously been set up for this work-from-home scenario, presenting new tactical and operational challenges [15]. The notion of 'work from home' is generally not supported by outsourcing companies, and they do not typically provide workers with laptops to use at home. Even if workers have the technology to

work from home, including internet connections and secure systems access, many outsourcing firms require client permission for them to do so.

The outsourcing-offshoring industries do not lend themselves to working from home. For example, because of security concerns, some companies even ask employees to leave even their pens and pencils outside the office. Specifically, the companies that relied on outsourcing firms for their testing services were left in a lurch. Digital quality is now more critical than ever, given our global reliance on digital experiences, and the companies providing those digital experiences are unable to get the testing they need from offshoring-outsourcing firms. In technology, offshoring is simply moving testing from one office to another. Due to cultural and technological factors, that new office may be less capable of ensuring business continuity during a crisis. In addition, offshoring testing services does not equate to an increase in skill sets or the ability to do different types of testing.

#### **4. Pandemic offshore-outsourc tradeoff**

The pandemic has been a wake-up call for outsourcing-offshoring economies; why was the US manufacturing industry unable to supply the necessary materials like face masks, medical ventilators, and PPE? Taken together, the US and other advanced industrial economies have evolved a highly efficient and productive product manufacturing-and-delivery system that provides them with a cornucopia of products at relatively low costs. However, inherent to that system are dependencies and expectations that have been called into question by the pandemic. Such performance has fuelled politicians and policymakers to advocate for a reduction in the outsourcing-offshoring business—cementing President Trump’s call to bring the production industry back from overseas.

The US alone reduced the corporate rate from 35–21% to encourage companies to re-offshore. Besides that, some US policymakers are proposing a \$25 billion fund for companies to re-offshore/re-outsource back to the US from China for the next five years [16]. Companies like Telstra™ in Australia that depend heavily on the Philippines have enacted plans to hire more than 3500 workers back home [17]. At a glance, COVID-19 is likely to deaccelerate outsourcing-offshoring businesses. However, the issue is complex and defies easy solutions, as discussed in the following offshore-outsourc tradeoffs.

##### **4.1 Offshore-outsourc vs. onshore skills**

The challenge lies in a combination of how modern supply networks are structured and the operational metrics that apply to manufacturers. Gone are the days when one giant manufacturer, like CAT™ or Toyota™, could design, manufacture, and assemble the components needed to make a product. Today’s manufacturing technology is too complicated to have all the skills in one place. Thus, manufacturers have resorted to outsourcing-offshoring to search for those missing skills at a lower cost. Even something as simple as a lightbulb has components like LED lights that must be made in high-tech industries. Day-to-day equipment like smartphones, computers, and medical equipment contain components that require a great deal of precision and accuracy, and that need considerable training and experience.

During the pandemic, among the items in most demand were PPE (e.g. masks and gloves) and ventilators; the latter being the most technical that requires detailed skills and experience to manufacture. A ventilator blows air and oxygen into the patient’s lungs, preventing them from collapsing. They are complicated pieces of machinery that cannot be created or grafted quickly. At the start of the

pandemic, the US had 62,000 fully functioning ventilators and nearly 100,000 older model ventilators. With COVID-19 hitting every corner of the country, nearly a million ventilators were required to treat the patients [18]. A single ventilator contains hundreds of parts, and it takes days for an experienced team to make and assemble such parts to produce a ventilator. Ford and GM, leading car manufacturers in the US, spent over 30 days trying to organise the production lines and training workers to produce ventilators [19].

South Africa (SA) was the most affected country in Africa, with almost 750,000 cases of COVID-19 infection by November 2020. For years, South Africa has depended on the United Kingdom (UK) to outsource medical equipment, ventilators included. During the peak of the pandemic in Europe (end of March 2020), Penlon, the leading manufacturer of ventilators in the UK, could not supply SA, citing the incapability of the company to produce extra ventilators for the SA community. In addition, SA could not reproduce the ventilators due to patent rights. The situation reflects the dangers of relying on offshoring or outsourcing vital equipment. However, once SA was able to acquire the patent rights to produce the ventilators, the country did have the necessary skills to produce them. It took weeks for the SA government to find a local 'peep valve' manufacturer, a vital component that allows patients to exhale. The skills needed to produce a single medical ventilator range from fabrication, material processing and simulation to software coding, and such skills are hard to find in a single onshore organisation. Thus, to ameliorate production and meet the much-needed demand, outsourcing/offshoring, some of the parts and skills is the only viable option.

Similarly, the development of a vaccine is one of the critical measures to mitigate the effect of COVID-19. However, very few countries could respond with the required expertise, capacity, and abundant resources. This is mainly because vaccine production methods place certain requirements on the supply chain that include, but are not limited to, novel skills set, meticulous maintenance, production equipment, and ultra-cold chain storage and shipping process. These rigorous requirements have left many countries with the option of outsourcing the service from leading foreign organisations [20]. Storage is a key part of the vaccine process and requires precise conditions of light, glass vials, and a specific  $-80^{\circ}\text{C}$  across the entire supply network to preserve and maintain the effectiveness of the vaccine. The nature of vaccine supply means that there are often several places (warehouses and stores) where items have to be stored before they are finally delivered or administered to beneficiaries. Thus, this is another pandemic tradeoff between outsourcing vs. onshore skills vis-a-vis resources. In particular, the tradeoff is between the onshore skills related to vaccine production to ensure a rapid response and to prevent morbidity and mortality versus costly outsourcing; a demand which is most likely to exceed supply, and which will leave many nations vulnerable and defenceless.

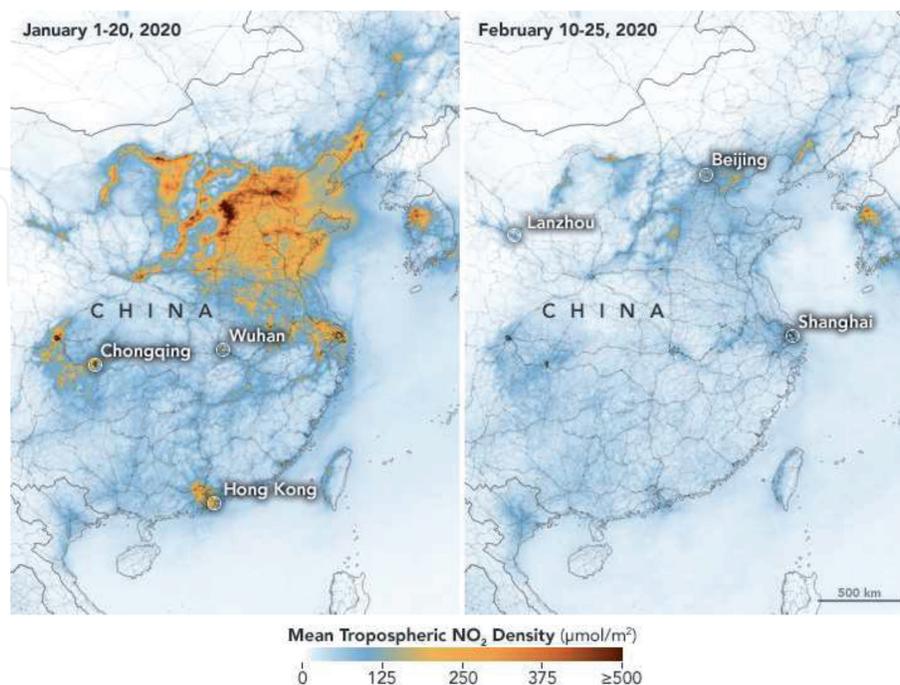
#### **4.2 Offshore-outsource vs. air pollution tradeoff**

Materials that feed the manufacturing industry are localised. The transport of raw materials from Uganda, the Philippines or Vietnam to outsourcing-offshoring economies could mean incurring high transportation costs. Besides, the stringent environmental laws in developed economies could make the processing of such materials practically impossible. Before the UK and US started practising outsourcing-offshoring of some types of business, they had some of the worst air pollutions in the world. The processing operations were sent to the likes of China and India, countries that are now experiencing the worst air pollution ever [21, 22]. Though outsourcing-offshoring countries have paid some price in terms of job losses, the benefit of improved air and water quality somewhat outweighs the price.

Air pollution is responsible for 4.2–7.0 million premature deaths every year [3, 23], and it costs \$4.6 trillion per year [24]. This number barely makes headlines, although it is more than five times the current COVID-19 deaths. COVID-19 has elicited that there is a clear correlation between emissions and outsourcing-offshoring. **Figure 4** shows the mean tropospheric nitrogen dioxide concentration ( $\mu\text{mol}/\text{m}^2$ ) as a satellite image from the National Aeronautics and Space Administration (NASA) in January and February 2020. The levels of  $\text{NO}_2$  plummeted following the virus outbreak in far Asia [25] due to the closure of factories and reduced movement of workers that use cars to go to work. The decrease in ozone precursors, like  $\text{NO}_2$ , could reflect a reduction in ozone levels; however, ozone concentration increased. Ozone breathing triggers COVID-19 like symptoms like chest pain, coughing, and airway inflammation [26]. Another pollutant that is related to manufacturing is particulate matter (PM). PM elevates cancer, premature deaths, coughing and eye diseases, among others [27]. The production of particulate matter below 2.5 microns ( $\text{PM}_{2.5}$ ), a harmful emission, accelerated in countries like China [28] due to outsourcing-offshoring business in the country. As countries are rushing to tradeoff offshoring and outsourcing companies back home, they should meticulously calculate the cost related to air pollution; otherwise, pollution costs might outweigh such a venture.

#### 4.3 Offshore-outsourcer vs. carbon dioxide tradeoff

Among the major greenhouse gases (GHGs), carbon dioxide ( $\text{CO}_2$ ) tops the list. The emission of  $\text{CO}_2$  causes global warming and erratic Climate changes (e.g. flooding). By 2018, China was the leading producer of  $\text{CO}_2$ , 10.06 GT (28% of the total  $\text{CO}_2$  emission), with almost half to the second producer of  $\text{CO}_2$ , the US (5.41 GT, 15% of the world total). The huge amount of  $\text{CO}_2$  production is attributed to the high number of offshore-outsourcer manufacturing companies in the country, as China is the number one destination for offshore-outsourcer companies. The Paris



**Figure 4.**  $\text{NO}_2$  distribution in eastern Asia in January and February 2020, as reported by NASA. The images were captured by Sentinel-5 satellite [25].

Agreement on limiting the global temperature targets a maximum increase of 1.5°C by 2100; however, the current trends in GHG production show that this goal cannot be achieved. In 2015 and 2016, total warming exceeded 1.0°C [29]. Mitigation pathways to limit the warming by 1.5°C by the end of the century are far behind, and they have received little attention. It is estimated that it will cost US\$ 50 trillion to keep the global temperature rise below 3.0°C by the end of the 21st century [30]. If countries are to implement onshoring, and this cost is to be shared based on the emission percentage, it could be too expensive for nations like Brazil and SA to implement onshoring. SA contributes 1% of total CO<sub>2</sub> emission; coal contributes 77% of SA's energy needs. Thus, any manufacturing activity risks the production of CO<sub>2</sub>—a cost SA may not be able to afford.

#### **4.4 Offshore-outsource vs. livelihoods**

Another pandemic tradeoff is that of offshore-outsource vs. livelihoods. Most people, especially in many developing nations, live on the poverty line, depending mainly on COVID-19-impacted industries such as travel, tourism, hospitality, call centres, and manufacturing. However, the pandemic presents a catch-22 situation for those nations that provide offshoring and outsourcing business services to multinationals. On the one hand, the countries that provide outsourcing and offshoring services are unable to fulfil their targets due to lockdown, an impact which drives multinationals into bankruptcy and out of their countries. As such, many nations are caught between maintaining their livelihoods by keeping multinational businesses in their countries, which ensures employment, food on the table, jobs, and which prevents multiple deaths from hunger and poverty. On the other hand, against the need to maintain offshore and outsource services, is the risk of increased morbidity and mortality from COVID-19 which places a greater demand on an already strained healthcare system and limited resources such as ventilators and PPE. This has left many nations vulnerable and defenceless to both challenging instances.

Thus, this requires creating an imminent negative or positive restructuring of offshore-outsource strategies. For example, the several research studies that required clinical trials and the collaborative participation of multinationals in the fight against diseases such as Parkinson's disease, and leishmaniasis (a parasitic disease associated with poverty and malnutrition) have been suspended. The suspension threatens livelihoods that relied on outsourced and offshored clinical services, and the research skills to reduce the impact of such diseases in society [31]. Also, the disruption to the distribution of outsourced malaria-prevention products, such as insecticidal nets, could lead to an increase in malaria deaths in sub-Saharan Africa. Yet, the continuation of offshore-outsource production and research services equally increase morbidity and COVID-19 mortality.

## **5. Conclusion**

Outsourcing-offshoring has played a cardinal role in the development of our economies and is the backbone of the global market. Our study provides a comprehensive analysis of the current and future trend of outsource-offshore post-COVID-19. The current trend of border closure and transport restriction does not favour outsource-offshore practices, rather onshore business. However, meticulous analysis of the supply chain, shows that the cost of onshore outweighs outsource-offshore as summarised in the following tradeoff benefits.

1. **Skills:** No nation can have all the skills needed to sustain its population, especially in the developing economies. In countries where skills are available, they are expensive to recall offshore businesses. During the pandemic, South Africa had to depend on Penlon skills to get ventilator rights. It took more than six weeks for South Africa to find a “peep valve” manufacturer, a vital component in ventilators. Besides, in the race to find the coronavirus vaccine, most countries must depend on offshore-outsourcing business to access the vaccine.
2. **Air pollution:** If countries are to practice onshore, their air pollution is expected to become worse, especially in countries that depend on unrenovable resources. Air pollution is responsible for 4.2–7.0 million premature deaths every year, and it costs \$4.6 trillion per year; this number is three times compared to current COVID-19 deaths. Also, production of nitrous gases and particulate matter particles will increase upon onshoring. Particulate matter elevates cancer, coughing, eye diseases, among others. Such costs make offshoring-outsourcing a better alternative.
3. **Carbon dioxide:** Carbon dioxide is one of the leading causes of global warming and climate change. Today China contributes 28% of total CO<sub>2</sub> emission (10.06 GT), mainly due to onshoring. Such emission has increased flooding in the region and has affected farming in a sector that contributes over 10% of China’s Gross domestic product (GDP). If developing countries that depend on agriculture are to practice onshoring, the cost will be too high—thus practising offshoring-outsourcing offers a better alternative.
4. **Livelihood:** Offshore-outsourcing is the bedrock for economic activities that can improve livelihoods and the GDP for countries that offer the business activities for multinationals but keeping the lights on can spiral the COVID-19 cases. However, turning off offshore-outsourcing activities to combat the upsurge of Covid-19 leads to job loss, economy plunge, livelihood loss, and rise of other healthcare issues induced by poverty, starvation, and mental health. Thus, countries must find an offshore-outsourcing onshore balancing point that is trailed to their own situation.
5. **Demand for medical supplies:** As governments and industries increase manufacturing to meet the rising global demand of especially medical supplies to avoid the severe and mounting disruption to the worldwide supply, offshoring/outsourcing and onshoring models will have to be revised to suit the context while meeting the demand caused by immobility pandemics.

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## Author details

George William Kajjumba<sup>1\*</sup>, Oluca Pross Nagitta<sup>2</sup>, Faisal A. Osra<sup>3</sup>  
and Marcia Mkansi<sup>4</sup>

<sup>1</sup> Department of Civil and Environmental Engineering and Construction,  
University of Nevada, Las Vegas, Las Vegas, NV, USA

<sup>2</sup> Department of Economics and Managerial Sciences, Uganda Management  
Institute, Kampala, Uganda

<sup>3</sup> Department of Civil Engineering, Umm AlQura University, Makkah, Saudi Arabia

<sup>4</sup> Department of Operations Management, University of South Africa,  
Preller St, Muckleneuk, Pretoria, South Africa

\*Address all correspondence to: [gwkajjumba@gmail.com](mailto:gwkajjumba@gmail.com)

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