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International Journal of Innovation and Sustainable Development

ISSN online: 1740-8830 - ISSN print: 1740-8822
https://www.inderscience.com/ijisd

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Article History:
Received:
Accepted:
Published online: 03 December 2023

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1 Introduction

The new Coronavirus, commonly known as Covid-19 or SARS-CoV-2, was identified first in Wuhan, China, in 2019. However, it became a global pandemic within the first few months of 2020. Covid-19 has undergone numerous mutations between then and now, resulting in millions of infections and deaths worldwide. At the same time, the pandemic has created unprecedented global upheavals in every sphere of life. Sadly, any hopes of fully containing Covid-19 have remained uncertain since the pandemic has resurfaced in waves in most countries, demonstrating extreme resilience. As a result, Covid-19's economic burden has grown with each passing day.

In terms of the economic impacts, the global financial crisis (GFC) of 2007–2008 was the nearest rival. The GFC started in the housing market in the United States and spread throughout the global economy and financial system.[1] Covid-19 began in Wuhan in 2019 and has quickly spread to disrupt the entire human society in numerous ways. Both could

be traced back to a single source but with far-reaching implications, though the damage caused by Covid-19 has grown significantly higher in size, scope, and duration. However, globalisation may have played a role in the speed and spread of these disasters.

Expectedly, both large and small countries responded to contain the damage of the fast-developing pandemic in their ways. In that attempt, some countries have remained more effective in controlling the number of cases, deaths, and social and economic disruptions related to Covid-19 virus. In contrast, others have become less effective in coping with COVID-19 ramifications. The reality is, initially, most democratic countries in Asia, Europe, and the Americas struggled and suffered more to manage the disease than more regulated countries like China and Vietnam. Nevertheless, Covid-19 is becoming a leveller of late, affecting even those countries that were successful in containing it initially.

2 Literature review

The objective of this editorial is not to list and review recent works on Covid-19 and related issues. But it may be worthwhile to indicate the types of research works getting published all over the world. Indeed, all forms of publications dealing with various aspects of Covid-19 have been experiencing an unprecedented rise. However, the literature on the non-medical aspect of COVID-19 can be divided broadly into two categories: a set of studies dealing with the reasons for transmission and mortality (Goswami et al., 2020; Goswami et al., 2021) and another group dealing with its impact on inequality, the stock market, and other macro variables (Goswami and Labiba, 2021; Uddin et al., 2022). Another set of papers deals with geoeconomics and social and political issues (Barai and Dhar, 2021). The Post-Covid innovations and sustainability of many variables are of interest now. This issue of the International Journal of Innovation and Sustainable Development (IJISD) caters to that area of literature.

3 Covid-19: effects and innovations for future sustainability

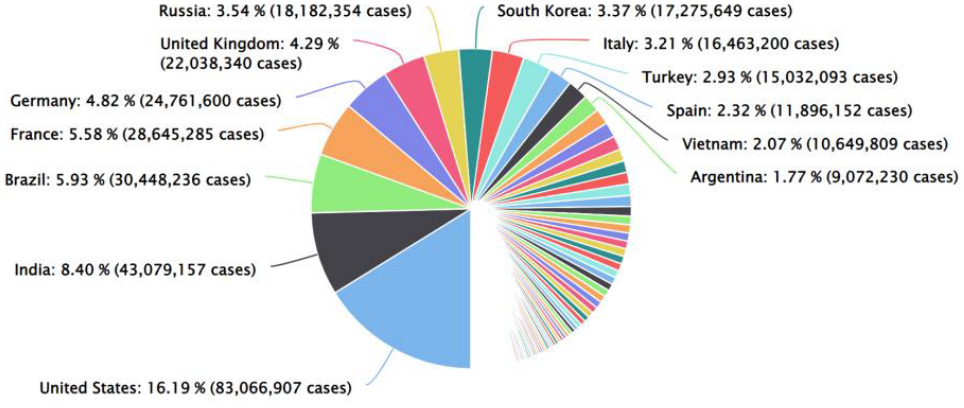
Covid-19 has more economic and social ramifications than the Spanish Flu or other infectious diseases. The negative impacts of COVID-19 are felt in science, arts, trade, economics, the global supply chain, technology, communications, mental and physical health, etc. The global supply chain has been severely disrupted, although, at the same time, a newer notion of local or regional supply chain relocation of vital goods is gaining traction. Aside from that, Covid-19 has been signalling a widening digital gap among the world's population. Except for the environment and online education, which may have benefited, Covid-19 has harmed most economic and social sectors. The flowing discussion gives us a brief idea of various effects and developments related to Covid-19 worldwide.

4 Human cost

John Hopkins University's Worldometers have become the primary data source for finding the pandemic's human costs to specific countries. As of May, 1, 2022, the virus

had infected about 513.3 million individuals in 228 countries and territories, with 6.26 million deaths (Worldometer, 2022). These numbers are rising, and no one knows how long this will last. Moreover, many nations are suspected of reporting fewer Covid-19 infections and mortalities. Ironically, the United States, the world's most advanced and powerful nation, has topped the list of Covid-19 infections and deaths so far (Figure 1). Emerging countries like Brazil, India, Indonesia, Mexico, etc., have experienced higher deaths and infections.

Figure 1 Distribution of Covid-19 cases in the world (as of 1 May, 2022) (see online version for colours)



Source: Worldometer – www.worldometers.info

5 Economic impacts

Covid-19 has significantly impacted the demand and supply sides worldwide. Aviation, tourism, transportation, agriculture, the cultural sector, manufacturing, and other industries, both locally and globally, have been severely harmed and are still struggling. Indeed, the pandemic's economic impact has exploded, with projections continuing to rise. The expense of Covid-19, according to the Asian Development Bank (ADB), might raise trade costs through transmission channels, damaging mobility, tourism, and other businesses, resulting in supply-side disruptions that adversely impact output and investment (ADB, 2020a). As per an estimate by The Economist (2021), the pandemic might have caused a loss of global GDP of US$10 trillion between 2020 and 2021. In the Updated Assessment of the Potential Economic Impact of *COVID-19,* ADB assessed the worldwide economic loss both with and without government policy actions. According to ADB (2020a), "economic losses in Asia and the Pacific might range from $1.7 trillion in a three-month short containment scenario to $2.5 trillion in a six-month-long containment scenario, with the region accounting for about 30% of the overall decline in world output". The report also estimated that Asian economies have lost between $359 billion and $550 billion due to employment losses.

Although exact quantification of the economic loss of school closures around the world is complex, an OECD report prepared by Hanushek and Woessmann (2020) suggests that grade 1–12 students affected by the pandemic expect to have a 3% lower

income over their entire lifetime, which will reduce the long-run GDP growth by 1.5% on average for the remainder of the century.

6 Employment effects

The global employment outlook is much more depressing in terms of job losses. According to the ADB (2020a), Covid-19 resulted in between 158 million and 242 million jobs lost worldwide. However, this only accounted for 30% of the global reduction in labour income. Another way, this worldwide job loss amounts to a labour income loss of $1.2 trillion to $1.8 trillion. On the other hand, Asia and the Pacific, on the other hand, account for 70% of all employment losses (ADB, 2020a). The World Travel and Tourism Council (2022) conducted an economic and employment study to estimate the impact of Covid-19 on 185 countries over 25 geographic regions. The study suggests that the travel and tourism sector alone has suffered a loss of 62 million jobs as international visitors' spending declined by 69.4% and domestic visitors' spending decreased by 45% in 2020 compared to 2019's level. However, employment in global trade-related sectors has remained stable on average as the government took various supportive measures.

7 International trade

The covid-19 pandemic not only changed the international trade structure in 2020 but also impacted different product categories on a larger scale than the trade impacts created by the financial crisis of 2008–2009. World trade output experienced the most significant reduction of 10% in the first half of 2020 since World War II due to supply chain disruption caused by the pandemic. However, the total trade value showed a V-shaped recovery in the second half of 2020 and continued to show robust growth in 2021. Nonetheless, the recovery and performance of different sectors and products showed diverse outcomes. While the trade-in of some goods like pharmaceutical products, protective gear, food, plastic, electronics, home appliances, etc., increased rapidly, the demand for motor vehicles, aircraft, travel, tourism, mechanical products, steel, and fuel declined substantially. Moreover, the value of goods exported displayed a much better recovery than services exported. For example, the value of merchandise exports fell by –8.2% compared to services exports -by 16.7% for OECD countries in 2020 (OECD, 2022).

World merchandise trade's total value and volume reached a historically high level and grew above 8% in 2021. However, this recovery was uneven across products, countries, and regions. China showed the most significant growth in its exports of goods in late 2020 and 2021 as China and other Asian countries rapidly recovered from the supply chain disruption created by Covid-19. The value of trade between the Euro area and the US has been recovering slowly. Nonetheless, the volume of trade has not reached the 2019 level yet. While Middle Eastern and African exports lag far behind, Latin America maintained its trade value by exporting raw materials. The merchandise export value for Australia declined by 11% in April 2020 from March 2020 but was only 1% down from April 2019 and recovered quickly over the year.

8 Global supply chain

Since 1978, when China opened its economy, the world has seen a concentration of the global production system in China. In the 1980s and 1990s, multinational corporations (MNCs) from Hong Kong, the United States, Japan, Germany, Taiwan, Singapore, South Korea, and ASEAN countries responded to various financial and regulatory incentives by investing in China. The amount of foreign direct investment (FDI) stock in China in 2019 was US $1.77 trillion (Statista, 2020), demonstrating the reason and depth of the creation of a China-centric GSC. China's exports and investment abroad have also helped cement its preeminent position in that chain. For example, in 2003, China accounted for only 6.8% of global total industrial value-added but accounted for 28.7% of global total industrial value-added in 2019 (Statista, 2021). In 2018, the country surpassed 120 countries and regions as the largest trading partner (Qiyuan, 2020). Chinese parts, including sub-assemblies, currently account for around 40% of large electronic equipment globally. Similarly, China and India provide 80% of the active chemicals to the European pharmaceutical industry (Cordon, 2020).

Even before Covid-19, however, there was a shift in the trend. Baker McKenzie and Silk Road Associates (SRA) conducted a study that looked at the export market share of 150 countries across 350 different product categories. According to the report, between 2018 and 2019, significant movements from China to other emerging markets were discovered in many, but not all, industries. The consumer goods sector was the most notable, with China's share of global exports falling by 4% (from 46% to 42%) in a single year (Baker, 2020). Table 1 shows that, whereas laptops and tablets have lost the most market share (4%), household electric goods have only lost 1%. The move has primarily benefited Southeast Asian countries.

Table 1 Global supply chains – moving beyond China?

	Phones	*Computers and tablets*	*Household electrical goods*	*Furniture*	*Clothing*
2018 (Market share in %)	57	49	43	37	31
2015–2018 (% Change in share)	3	1	0	1	–5
2018–2019 (% Change in share)	–3	–4	–1	–3	–3

Source: Modified data from Hille (2020)

Nonetheless, Covid-19 has highlighted the inherent dangers of inventory and single-sourcing models solely based on cost-cutting and lean manufacturing principles. Due to a lack of flexibility in their supplier base, manufacturers failed to pivot when Chinese plants closed due to Covid-19. The crisis has shown the GSC's vulnerability, established or joined over time by multinational businesses. The comprehensive reworking of GSC infrastructure and a new order in the post-Covid-19 era might be centred on three essential dimensions: globalisation to regionalisation, adaptability to significant catastrophic occurrences, and having a human dimension rather than being fully automated (Cordon, 2020). However, moving from the Chinese manufacturing hub to a

new supply chain paradigm will be difficult. Furthermore, quick, and widespread digitisation of the documentation associated with global trade will be required.

9 Travel and tourism sector

The global travel and tourism sector contributed 10.5% to the world GDP, equivalent to over $9.0 trillion, 27.4% of global services exports, about 9% of world exports, and created 10.6% of all global enjoyment in 2019. The sector comprises travel and tourism activities and is strongly associated with the other sectors like accommodation, food, entertainment, health, and insurance. However, the industry has been one of the most gravely affected sectors by the COVID-19 pandemic since early 2020. The value of service exports fell drastically due to border closures entirely for visitors in some countries, including the travel ban, lockdowns, quarantines, drastic drop in travellers, mandatory testing, and vaccination requirements. The education visitors will be closed worldwide until the end of 2021.

The sector continues to face uncertainties from the unpredictable travel and business environment even after more than 65% of the world population has taken at least a dose of the Covid-19 vaccine in the third year of the pandemic in 2022. The World Travel and Tourism Council (2022) study suggests that the sector suffered a loss of over $4.7 trillion in 2020 and a drop of 49% of the sector's GDP from 2019. The sector's loss assessments were transmitted to the national GDP of many countries, especially the small island countries, ranging from –54% for Macao SAR China, –33.5 for the Maldives, and –11% for the Seychelles (World Bank, 2021). As a result, several tourism companies, airlines, and cruise operators declared bankruptcies and took new debt or subsidies from their national government. Nonetheless, world tourism grew by 4% from its previous year, with 15 million more tourist arrivals in 2021. However, they are still 72% below the 2019 pre-pandemic level. Although the effect of the Omicron variant surged from the end of 2021, the pace of recovery was slow and uneven across the different regions of the world. However, the Asia and Pacific region showed a dismal dip in tourist arrivals in 2021, which fell by –65% from 2020 and -94% in 2019 (UNWTO, 2022).

10 Social effects

Covid-19 has a wide range of social consequences. Governments worldwide have established or enforced many economic and social policies to combat sickness. Even though they are required, the disruption caused people's all walks of life to halt. Isolation, sadness, and financial difficulties associated with Covid-19's impact on mental health crisis. Sociologists have long cautioned that this could result in more deaths than the disease itself. Domestic strife, mental-depression, violence, divorce, and suicide have all been reported in numerous societies. Another area of concern is physical and mental health and well-being.

The World Economic Forum (2022) suggests that the Covid-19 health crisis risks 14% of current global GDP due to school closures and economic loss, equivalent to $17 trillion in lifetime earnings of the school students affected by the pandemic. Most students and teachers reported that this teaching and learning disruption impacted on students' well-being and mental health. Some students felt uncertain, anxious, and

sometimes helpless about their learning status, and the teachers and parents reported their anxiety relating to increased workloads. Due to the pandemic, the lockdown of educational institutions also increased students' mental health problems of all ages and their parents.

Also, consider the case of Japan, a peaceful nation with law-abiding inhabitants. However, higher occurrences of suicide may have begun to demonstrate the impact of Covid-19 on society. According to government data, suicides jumped by 15.4% in August 2020. More women and children committed suicide during the height of Covid-pandemic in 2020 (Tomisawa and Katanuma, 2020). The ‘‘3 in Canada, New Zealand, and the USA have become another example of people's frustration with various Covid-19 related mandates imposed by the Canadian government on its own population.

11 Education sector

Education has become one of the most affected sectors in the world. Covid-19 has severely disrupted the teaching, learning, social and economic aspects by closures for an uncertain period, cancellations of face-to-face lectures, and reduced enrolment worldwide. Many countries imposed extended closures of educational institutions and domestic and international travel bans from early 2020 to late 2021 to combat the spread of several strands of coronavirus. At the pandemic's peak, 145 million students in 45 countries in Europe and Central Asia (World Bank, 2021). The disruption was more severe in developing countries.

Both the educational providers and the students have been suffering immensely due to the disruption to regular operations, which has had long-run implications for personal and aggregate learning, productivity and skills, and lifetime income losses. According to a joint report of UNICEF and the World Bank (2021), 1.6 billion learners have been affected due to school closures, and the risk of many millions of children never resuming their studies is relatively high as educational institutions remain closed after two years of the pandemic around the world. Based on survey data from a total of 16, 585 teachers and principals and 21,063 students in 11 countries conducted by UNESCO (2022) between December 2020 and July 2021, it indicates that most of the schools in these countries were closed for varying lengths of time within and across the nations. For example, schools were fully closed over the survey period in India, Kenya, Ethiopia, Rwanda, and Burkina Faso.

Most countries provided modified curricula to minimise academic loss. More than 50% of teaching staff admitted that students' learning progress did not occur to the extent it would have been expected without the disruption. It is also suggested that the loss of education will be felt more intensely by disadvantaged students worldwide.

The global higher education sector, which comprises 5 million students, was hit hard as the mobility of students across the globe fell drastically due to the travel ban. The total number of international students declined by 15% in 2020/21 from the previous year. The disruption created various challenges for the students of higher education, including studying conditions, funding for their studies, and their well-being. In particular, international students faced immense economic and social disadvantages, whereas the country's government-supported domestic students to some extent. This may have a long-run impact on inequalities in access and participation in higher education and future potential income (Farnell et al., 2021).

In most countries, many government and private schools have tried to engage their students with online teaching, and the mode has seen a massive boom since 2020. However, online instruction was, to some extent, effective because, with the help of this device, students could somehow maintain continuity in their education. Still, the question remains whether it was effective without face-to-face interaction between teachers and students. Nonetheless, the online-based digital activities were not that successful due to their nature, as they couldn't be used for motivating physical activities. The severity of the effect is the most disastrous for children because they always learn through games, sports, interaction, and physical activities in groups. Moreover, digital addiction could be another spillover of the use of electronic devices in the process.

12 Digital disparity and Covid-19 blessings

Lab-based education was seriously affected because it is challenging to conduct wet-lab activities from a remote control. That's why the negative effects of online teaching and learning are more severe in science education. The vaccination for children took a long time to finalise compared to the elderly and the adult population, which put children at a disadvantageous position in the same family. But this problem has been wiped out gradually in most countries. Covid-19 was a test case for inequality in developing and lower-income countries. But it helped them develop the internet infrastructure, which is primarily demand driven. Those underprivileged people did not know that they could use the internet. As a result, we can see COVID-19 as a boon rather than a curse for IT innovation and technological revolution-19 is a significant source of innovation and adaptability. There was a time when online teaching was a basic need for developed countries, but it was considered a luxury for developing countries. After Covid-19, this disparity has disappeared across nations. Usually, it takes several decades for technology to spill over from the North to the South, but due to Covid-19, the process has been transformed into an instantaneous one. COVID-19 has increased the disparity between rich and poor in the sense of the digital divide, and at the same time, it is also considered a blessing for narrowing down the digital gap.

13 Vaccine disparity

Many developed countries lagged behind others in Covid-19 transmission and mortality management in the initial stage. But gradually, the scenario changed entirely due to the first runner advantage in access to vaccination and technological know-how to produce vaccines in many wealthy nations. We can consider the case of the USA. Once one of the most severely affected countries in the world, the United States has become one of the world's largest exporters of COVID-19 vaccines due to increased access to technology. But access to vaccination at the grassroots level is still a challenge. For example, due to the lack of access to digital registration by the population's low-income segment, they were not fully covered. For instance, household heads are vaccinated, but their house-help is not vaccinated (Goswami and Labiba, 2021). But this situation is now changing due to the introduction of walk-in vaccination for unregistered people in Bangladesh.

14 Environment

Even though carbon emissions may be going down because people are doing less economic and non-economic things, the dumping of many things, like protective gear and billions of vaccine bottles, injection syringes, needles, and other things, is sure to cause environmental problems.

15 Innovation and sustainability

However, COVID-19 has gradually established many new normals in our lives, particularly in retail shopping, white-collar office work, learning, education at all levels, digital access, and various other services that rely on advanced technology support. During this process, many approaches, sectors, and management models will be tested, and some may even be phased out. Let us note some of the areas where Covid-19 has a positive influence.

Indeed, the pandemic has pushed many advancements in various aspects of our lives, including the global education industry. The traditional classroom education approach has been experiencing the most significant challenge, while we are seeing the global leapfrogging of 'Zoom education' side by side. As a result of Covid-19, though approximately 220 million higher education learners have been affected, teaching and learning have been developed and transformed online to combat the spread of the COVID-19 pandemic. Also, the research, engagement, governance, and administration of higher education have been carried out online to a different extent. Although many universities and colleges have adopted some form of online teaching, they face difficulties in providing an appropriate environment online for disciplines like medicine, agriculture, veterinary, technical, and technology, which have practical teaching and learning components.

Though the financial sector has accelerated its digitisation, face-to-face banking may be facing a greater threat than ever before. The spread of branchless agent banking through mobile banking in developing countries like Bangladesh, India, and Indonesia showed a trend, and Covid-19 has accelerated the financial inclusion process. For pizzas to perfumes, the business of delivery services has boomed all over the world during the pandemic.

Sustainability and innovation will undoubtedly touch several other sectors in the coming years, including trading, e-commerce, transportation, communication, health, tourism, airlines, etc. This will lead to the creation of new production, manufacturing, service, government, and entertainment industries.

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Note

[1]The financial crisis of 2007–2008, also called the subprime mortgage crisis, caused a severe contraction of liquidity in global financial markets that originated in the United States due to the collapse of the U.S. housing market (https://www.britannica.com/event/financial-crisis-of-2007-2008).

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