# ECONOMIC IMPACT OF COVID-19 PANDEMIC

**Technical Report** · July 2020



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**ABSTRACT**

The COVID-19 pandemic was caused when SARS-CoV2 virus spread among people all over the world. It created a widespread global shock creating a severe economic slowdown. There has been a slowdown in all economic sectors worldwide and more than one third of global population was placed under lock-down [1].In this paper I analyze the economic impact of COVID-19 on the following sectors, namely, tourism industry, oil industry, aviation industry,financial sector and healthcare sector. I will analyze the economic data from each industry and graphically represent the losses in each industry as a result of COVID-19 pandemic. My research will give readers a clear understanding of the effect of external macroeconomic shocks on the global economy.

***K*eywords** COVID-19 · SARS-Cov2 · lock-down · economic impact · slowdown · industry · sector · macroeconomic · global shock

## 1 Introduction

Coronavirus was initially identified in Wuhan China, and it gave rise to a pandemic all over the world. Initially maximum number of cases were identified in China but the the virus spread across Europe and then to the Americas. Italy had experienced a devastating impact of the virus and has 233,836 COVID-19 positive cases with 33,601 deaths [2] at the time of this paper. Spain has also experienced a devastating effect of the virus with 287,406 cases and 27,128 deaths [2] at the time of this paper. There were several reasons why the effect of the virus in Italy and other European Union countries was so severe. Firstly, there was a delay or ignorance to analyze the conditions that led to the spread of the virus and there also was indecisiveness to enact the 'stay-at-home' isolation requirement. There was also insufficient information given by the policy makers to the people. In the absence of proper information and proper communication, people were unable to take proper prevention measures to deal with the pandemic. Also the virus is more fatal for elderly population. This is because the immune system of elderly people is already compromised which makes them more vulnerable to the effect of the virus. There is a very large number of old people in Northern Italy [3]. In Italy during the initial stages of the pandemic, hospitals and retirement homes were more severely affected by the virus. Hospitals were perplexed with the huge number of cases they were receiving daily and due to shortage of masks and other protective clothing, nurses and hospital staff, who were essentially the front line workers, continued to help patients without adequate protection [4]. Also Italy is a very densely populated country and the people are not very accustomed to social distancing. The population density in Italy is 533 people per square mile [5]. This can be another reason for the spread of the virus in Italy. In Milan's main cemetery, graves were indicated by a white plastic cross marked with surname, initial or first name of the deceased. As the capacity of morgues were exhausted and there was shortage of burial ground due to large number of deaths occurring as a result of the virus, the authorities had no other option but to bury the unclaimed bodies in this manner [6].

Spain also has a record number of COVID-19 positive cases and deaths. A certain type of virus strain, the S-Spain cluster was already in Spain by February 14, 2020 and another type of virus strain the G-Spain cluster was prevalent in Madrid, Spain by February 18, 2020 [7].In Spain all COVID-19 cases were not accompanied with fever, but in some cases virus spread from one person to another without displaying any symptoms. A Champions League soccer match was held between Atalanta B.C., the Italian team, and Valencia CF, the Spanish team, on February 19, 2020 in Milan, Italy. This is determined to be one of the major reasons why the virus spread to such a great extent in Italy and Spain.

This Champions League match was considered to be a "biological bomb" as there were about 2500 Valencia supporters who attended the match to cheer for their team and around 35% of Valencia's soccer team was tested COVID-19 positive [8]. This Champions League soccer match, a delay in government action, people crowding in beaches and cafes' were the major reasons for the rapid spread of the coronavirus in Spain. Initially the Spanish Government did not take any major steps to limit the freedom of the people, not did they issue a complete lock-down order initially. These two measures were absolutely essential to curb the transmission of the virus. Instead, people were allowed to move around freely as they desired. People were allowed to visit cafes' and bars. The weather was sunny and comfortable which encouraged people to go out on the streets. There were International Women's Day rallies taking place in Spain on March 8, 2020 which brought thousands of people on the street across Spain [9]. Due to a considerable delay by the Government in imposing complete lock-down measures, Spain has been badly affected by the virus as the virulence of the virus could not be comprehended initially and many cases were asymptomatic for several weeks. This is why Spain suffered such a devastating impact of the virus.

Among the emerging nations, Brazil has experienced a very large number of COVID-19 positive cases with 560,737 cases and 31,417 deaths [2] at the time of this paper. Brazil is a developing country and the common people have less regard for safety and social distancing practices. Brazil has a very high rate of inequality. Healthcare access is not uniform for all people within the country. Brazil has a large number of indigenous communities many of whom reside in small areas of the Amazon rain forest with no proper healthcare facilities and sanitation arrangements. These communities are particularly vulnerable to the coronavirus pandemic. The coronavirus is expected to create a severe economic impact in Brazil. The economy is expected to go into a major recession with decreasing income among a large proportion of working population who are unable to work from home, and who work in the informal sector. The proportion of people surviving in abject poverty is expected to face a hunger crisis. In São Paulo, Brazil, Intensive Care Unit (ICU) beds are full upto 90% capacity. In Rio de Janeiro the number of people waiting for hospital beds exceeded 1000 with the second week of May and the emergency facilities were full to 90% capacity [10]. Also, in Brazil around 11 million people live in 'favelas' which are low income slum neighborhoods on the outskirts of big cities. These areas have cramped houses with lack of space to move about. Also these areas have lack of water and lack of safe and clean working environment. As a result of these deficiencies, these areas were severely affected by the virus [10]. Despite the substantial rise in the number of COVID-19 positive cases in Brazil, President Jair Bolsonaro showed little concern. Bolsonaro had initially stated that the coronavirus was nothing more than a "little flu", and he did not believe that the coronavirus restrictions were very important. He also suggested that Brazilian's follow some uncommon remedies such as praying to God to save themselves from the virus. Bolsonaro had suggested that Brazilian's use chloroquine, which is a drug primarily used to cure malaria, in order to treat COVID-19 positive patients. But, in reality there has been no substantial proof that chloroquine is an effective drug to treat COVID-19 patients. It is estimated that hundreds of COVID-19 positive patients have died in their homes after using chloroquine without proper medical supervision. Many healthcare officials in Brazil have determined that the number of COVID-19 positive cases in Brazil is actually 15 times higher than it is stated in the available data and in the absence of hospital vacancy, a large number of coronavirus positive patients are passing away in their homes [11].

The United States of America has recorded the largest number of coronavirus cases with 1,928,412 COVID-19 positive cases and 110,347 deaths related to coronavirus. There were several reasons for tremendous rise in the number of COVID-19 cases in the United States. The U.S. President in the begining became complacent and did not put too much importance to the warnings of the healthcare officials that the virus could spread to a large extent. The testing done in the U.S. was very slow so the healthcare officials were unable to perform adequate analysis of how people came in contact with the virus. Also, there had been too many laws and regulations to be complied with initially and states and healthcare authorities were unable to develop test kits as per instructions of the World Health Organization(WHO) all all samples were initially dispatched to Centers for Disease Control and Prevention (CDC) in Atlanta. After this, the CDC dispatched defective test kits to the states. This created a time lapse for proper testing and virus detection [12]. The President of the United States of America initially did not make the country ready to fight the pandemic even after repeated warnings by healthcare officials. The U.S. Congress planned on stopping funding to the World Health Organization at a time when number of coronavirus cases continue to rise. The U.S. government initially failed to understand the severity of the pandemic. They did not isolate individuals who displayed the COVID-19 symptoms. There was inadequate screening of symptomatic individuals in airports, train stations and other public places. The government initially did not urge people to wear face masks and use hand sanitizers [13]. It is because of these reasons that there was an explosion of the number of COVID-19 cases in the U.S.

COVID-19 has been stated as a "black-swan-effect". The widespread outbreak could not have been predicted very early and the economies around the world including strong economies like the U.S. went into a state of global shock. The economic effect includes both demand and supply shocks. The supply disruption in advanced economies like the U.S. is because of dependence on goods manufactured by China is imported by the U.S. Due to lock-down and "stay-at-home" measures in China, the manufacturing, electronics and apparel industry is facing severe disruptions which results in reduction in stock and a fall in sales [14]. Also, people are stocking up essential goods hand-sanitizers and face masks. This has created a supply shortage for these products as manufacturers are unable to meet demand for these products as a result of panic buying by consumers [1]. There are also demand disruptions as a result of the pandemic.Due to quarantine declaration and "stay-at-home" restrictions imposed by countries, the consumption of goods is affected as well. The U.S. government has declared a State of Emergency and has tried to refrain people from public gatherings. All concerts, sporting events and public events have cancellations and delays as a result of the pandemic. Airline industry, hospitality and leisure industry and other service sectors have witnessed a severe economic slowdown [14].

The government of different countries are expecting to "flatten the curve" and are trying to encourage people to adhere to travel restrictions and "stay at home" orders. Some countries have even closed their international borders in order to limit the spread of the virus [15]. The coronavirus pandemic is causing extensive upheaval in the entire economy [16, 17, 18]. The GDP of the European Nations experienced a contraction of about 3.8% at the first quarter of 2020 [19]. It is tough to ascertain how long the pandemic will last and what will be the long term effect of the coronavirus pandemic. The time taken by countries to return to the pre-COVID stage is based on how long the lock down will last, which industries are most severely affected by the virus and how soon the country can return to the pre-pandemic phase [20].Some countries have been successful in their attempt to treat the coronavirus cases in an efficient manner, it is difficult to ascertain when new cases would arise [21]. The COVID-19 pandemic is presenting unexpected situations to each aspect of the U.S. Economy. It is therefore, essential for the government to design a well researched and thorough economic policy to enable the country to recover from the crisis. In Berkeley Conversations: COVID-19 series, the policy makers stated that they need to formulate extensive measures to enable the workforce, state governments and businesses recover from the pandemic. The relief efforts will pay special attention to communities of color who are suffering as a result of the pandemic. Jesse Rothstein, who is the director of Berkeley's Institute for Research on Labor and Employment (IRLE) stated that the U.S. economy is proceeding towards something which is deeper than the Great Recession and is similar to the Great Depression. Ellora Derenoncourt, who is an assistant professor of Economics and Public Policy at Berkeley, starting in fall, stated that on the basis of the available data from New York City, it can be observed that people of color are dying at a much greater proportion as compared to white Americans. This is because most of them are unable to work from home. Therefore, are suffering to a greater extent as a result of the pandemic [22].

U.S. President Donald Trump framed a policy prohibiting a portion of US Immigration. This order follows multiple measures that were taken by the government restricting travellers from China, Iran and 28 European countries along with shutting down borders with Mexico and Canada. The immigration suspension applies to around 32% green card applicants.Despite these exceptions, the immigration suspension is not beneficial in all respects, as as the suspension is not very likely to have a positive impact on economy of the country. Also, the order specifies procedures for more restrictions to be imposed which could harm the ability of the economy to revive from the pandemic [23]. The U.S. government decided to shut down the land borders of the country to restrict the entry of immigrants who pose a significant threat to health and safety. After planning with the government of Canada and Mexico, the U.S. has decided on closing its borders in the north and south other than for travel for essential purposes. Migrant workers work in some of the most essential occupations which are important in the war against the pandemic which comprises of healthcare, elder people care, delivery services, food services and day care. These industries have been severely affected by the pandemic.Though the U.S. Senate announced around $2 trillion COVID-19 stimulus package, it did not benefit the migrants who suffered the most in the absence of proper medical testing and healthcare. Around 93% of people born in the U.S. are covered by health insurance, while only 80% of people born outside U.S. are covered by health insurance. In case of unauthorized migrants, the proportion of people covered by health insurance is a mere 47% [24].

In a period of six weeks from March 15, 2020 to April 25, 2020 around 30.2 million Americans registered for unemployment benefits, claiming benefits for the first time, as per U.S. Department of Labour statistics. The rate of unemployment was around 14.7% in April as per data released by U.S. Bureau of Labor Statistics, and some estimates reveal a higher unemployment rate of around 20% [25]. In the U.S., the GDP contracted by 4.8% in the first quarter of 2020, as a result of the pandemic. It is expected that the U.S. economy will go into a recession with a fall in GDP of around 5% [21, 26].

## 2 Sectors

In this section, we will discuss the impact of COVID-19 on different sectors of the economy.

### 2.1 Aviation Industry

The COVID-19 pandemic has severely affected the airline industry due to restrictions on travel and cancellation of flights in order to mitigate the effect of coronavirus. The aviation industry as well as airports are facing a huge slowdown as a result of lack of air traffic and loss of revenues. Airports Council International(ACI) World determines that there would be a fall of around 2 billion airline passengers globally in the second quarter of 2020, and a reduction of around 4.6 billion passengers for the entire 2020 year. The profit of airports has experienced severe contraction due to the imposition of travel restrictions. The fall in airport revenues globally is determined to be $39.2 billion in the second quarter of 2020 and around $97 billion for the entire 2020 [27].

Oxford Economics Study, predicts that there will be an estimated $ 519 billion reduction in travel expenditure in U.S. for 2020. Due to this, the economic output will decline by $1.2 trillion. In the second quarter of 2020, it is estimated that around 6.9 million jobs in the travel area could be lost. Approximately 57% of wide body aircrafts, narrow body aircrafts and regional jets are in storage. It is estimated that losses in the travel industry will create an effect on GDP for an amount of $651 million. Some of the most prominent U.S. airlines have implemented certain policies with respect to flight change, waiver of flight cancellation fees and capacity changes, in response to the COVID-19 pandemic. American Airlines has formulated a policy that if a ticket is purchased before March 1, 2020 for travel upto May 31,2020, flights can be changed without fee payment. If a ticket expires between March 1, 2020 and September 30, 2020, the amount un-utilized on the ticket can be applied towards travel till December 31, 2021. Also American Airlines decreased its international flight capacity by 80-90% upto May 2020. Domestic flight capacity for April 2020 is reduced by 60-70% as compared to the previous year, and the capacity for May 2020 is reduced by 70-80% as compared with previous year. In case of Delta Airlines, for all airline travel upto September 3,2020, it is possible to alter the flight for one time without payment of fees. In case of flight cancellation, it is possible to get an eCredit voucher for travel in future, but getting a refund is not possible.Pre existing vouchers can be extended upto May 31, 2022. If a ticket is purchased between March 1, 2020 and May 31, 2020, unlimited changes in travel plans is possible without payment of fees. But departure should be prior to March 12, 2021. Delta Airlines tickets for March 2020 or April 2020 which are going to expire before June 30, 2020, will be granted an extension until December 31, 2020 expiration date. Also, Delta Airlines reduced its international flight capacity by 80% and domestic flight capacity by 70% starting from the end of March 2020 till the end of May 2020 [28].

The various steps taken by airlines in order to mitigate the losses include reduction of capacity, parking or retiring aircrafts that have become old, reducing compensation paid to executives and taking measures regarding voluntary leave or early retirement programs for employees, reduction in new employee hiring, minimizing non essential spending (such as on employee travel, events, consultants, marketing) , closing down airport lounges, pausing real estate projects, limiting food and beverage served onboard, stalling the delivery of aircrafts, minimizing non-aircraft capital outflow, applying for both secured and unsecured loans for cash flow requirements, selling shares, selling or loaning aircrafts, engines as well as other assets and stopping repurchase of shares and dividend payments [29].

The main reason why the aviation industry is suffering economically is the cancellation of domestic and international flights across the world to stop the spread of coronavirus. There are several travel restrictions because of which the government of different countries worldwide are not issuing visas to foreigners and are shutting down regions affected by the virus. This has resulted in an economic downturn in the aviation industry. The various divisions within the airline industry are passenger airlines, cargo airlines, aircraft manufacturing companies, airport managing companies and catering and service providing companies. Among these, passenger airline division is expected to be most severely affected as a result of the pandemic, as well as catering and service providing segment. Aircraft manufacturing companies may also be affected as a result of the pandemic due to cancellation of airplane orders. In the U.S. the government has declared a national emergency as a result of COVID-19 pandemic so most areas within the country have 'stay-at-home' order in place. This is decreasing domestic travel inside the country. Some of the major airline companies that are affected due to the pandemic include Qatar Airways, Emirates and Lufthansa. Qatar Airways cancelled all its flights to and from Italy, as it was very severely affected by the pandemic. The company has also cut down on its activities and has grounded the aircrafts that are not cost effective. Qatar Airways has shut down operations of ten of its A380 aircraft until May 31, 2020 to curb the transmission of coronavirus. Emirates has also paused most of its functioning as a precautionary measure due to the COVID-19 pandemic [30].

Figure 1 displays the unemployment in the air transport industry in various regions as a result of the coronavirus pandemic. It can be said from the figure that in the Middle East an estimated 0.9 million people working in the aviation industry are unemployed as a result of COVID-19 pandemic, whereas, in Asia Pacific, approximately 11.2 million people working in the aviation industry are unemployed as a result of COVID-19 pandemic. In Europe the unemployment number in the air transport industry is around 5.6 million. According to International Air Transport Association(IATA) statistics, approximately 25 million people employed in the aviation industry may lose their jobs as a result of reduction in demand for travel during COVID-19 pandemic. Across the world around 65.5 million people are dependent on the airline industry for their livelihood, which includes the people employed in the tourism industry [31]. As a result of decrease in travel spending by customers and lack of purchases by businesses during COVID-19 pandemic, the airline industry is cutting down expenses to a great extent. Pilots, flight attendants, baggage handlers and other people employed in the airline industry are losing their job security. Economists regard the aviation industry as a tradable industry. This is because it causes income from customers in different locations to be brought to a local market which creates other local jobs. If there is excessive unemployment in the aviation industry and unemployment insurance is inadequate, then such unemployment might generate losses in income in metropolitan areas [32].

Figure 2 shows the loss in revenue in the air transport industry of different regions as a result of COVID-19 pandemic. The maximum loss in revenue in aviation industry is observed in case of Asia Pacific, which records a loss of -$113 billion. In Europe, the loss of revenue in the aviation industry is -$89 billion. The loss of revenue in Africa is the least, around, -$6 billion. The expected decline in passenger revenue in the aviation industry is around $252 billion(-44%) in 2020, in contrast with 2019. The aviation industry would be most severely affected in the second quarter of 2020 as the demand in the industry is estimated to fall by approximately 70% and airline industry has exhausted approximately $61 billion in cash [31].

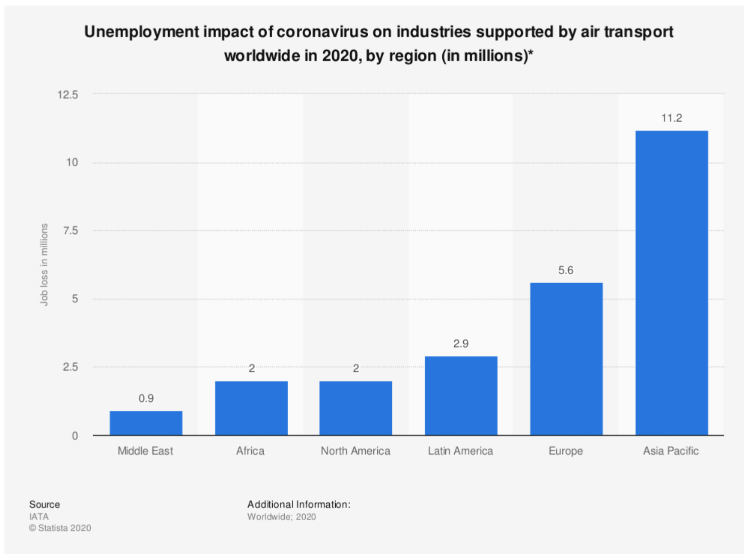


Figure 1: Airline Industry Unemployment Due to COVID-19 Outbreak

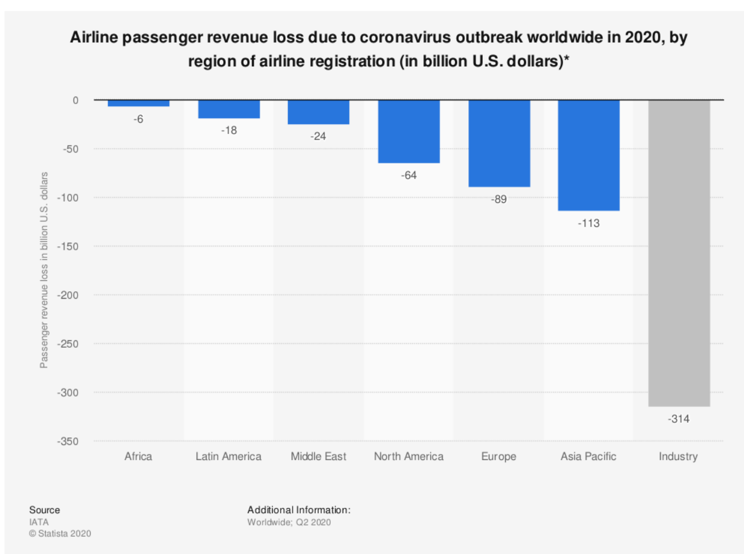


Figure 2: Airline Passenger Revenue Loss Due to COVID-19 Outbreak

## 2.2 Oil Industry

The shock from COVID-19 pandemic and disruptions in negotiations between Organization of the Petroleum Exporting Countries(OPEC) and its associates resulted in a fall in oil prices. On March 5, 2020 OPEC planned a 1.5 million barrel per day (mb/d) drop in production on the second quarter of 2020. Out of this, 1 mb/d would be production cut for OPEC countries and 0.5 mb/d would be the production cut from non OPEC but associated producers, mainly including Russia. The next day, the plan was disapproved by Russia resulting in the world's most prominent exporter of oil, Saudi Arabia, to enhance production to 12.3 mb/d, which is its full capacity. Saudi Arabia declared discounts of approximately 20% in major markets. This resulted in a fall of approximately 30% in oil prices and the declines continued since then. The dual shock of COVID-19 and fall in oil prices are interlinked, yet different. The demand portion of oil shock is related to a fall in consumption of oil as a result of safety practices to curb the spread of coronavirus. This has occured due to 'stay-at-home' orders which has caused severe slowdown to the global economy. Rystad Energy has determined a fall in the consumption of oil by 10% since 2019( approximately 10 mb/d) due to fall in air and road transport. The emerging economies which have balance of payment or fiscal problems, receive the aid of international financial institutions in their fight against the coronavirus. These international institutions can make available zero to low interest financing opportunities with lengthy maturity periods. These institutions are capable of helping countries in the Middle East and North Africa (MENA) and other emerging economies to cope with the dual economic shock. When the virus has been controlled, the economy will return to its normal stage as the quarantine measures will be suspended. The rate of economic recovery is based on the how efficiently and effectively the government frames policies to recover the economy from financial losses suffered as a result of COVID-19 pandemic. But the supply part of oil shock is expected to stay and cause oil prices to stay low for a greater period of time.In order to determine the effect of oil prices on global economy, economists differentiate between supply and demand driven oil shocks. Demand driven shocks are interlinked with worldwide demand and do not have a stand alone impact on the economy. In comparison, supply driven shocks are determined to have a stand alone impact on the economy. This might not be true in the case of COVID-19 pandemic. This is because, the fall in oil prices have resulted in fluctuations in the market for bonds, equities and non-oil commodities. In MENA countries, a fall in oil prices is expected to adversely affect importers as well as exporters. Exporters are affected directly and importers are affected indirectly due to fall in foreign direct investment, remittances, grants from exporters and tourism. Countries such as Gulf Cooperation Council, should utilize their buffers. Oil exporters including Algeria and Iran have worn out their capacity and are depending on flexible exchange rates to deal with he crisis. Oil importers such as Lebanon, Jordan and Egypt will go have an economic slowdown, which will cause an adverse impact on their large amount of debt [33].

The COVID-19 pandemic created an adverse effect on oil dependent countries. The fall in oil price along with a decrease in demand for oil products in international markets resulted in a loss in revenue for countries dependent on oil, that led to a rise in current account deficits and created an adverse impact on balance of payment position of many countries depending on oil including Venezuela and Nigeria. The foreign exchange reserves of these countries was severely affected which in turn led to a fall in value of their regional currencies in comparison with the U.S. dollar. The fall in price of oil due to coronavirus affected the national budget for oil dependent economies. A restructuring of the national budget of such countries was necessary as the budget was based on a higher oil price since 2019. This gave rise to deficits in the national budget of oil dependent economies. Therefore, these economies were compelled to borrow funds from IMF or World Bank to finance their budget deficits or structure a revised budget using the current reduced market price of oil [34].

In 2020 the worldwide demand for oil fell due to COVID-19 pandemic. In order to curb the spread of the virus, the government of economies worldwide has implemented certain restrictions on travel, which has created a fall in demand of oil. The aviation industry is one of the main consumers of oil and constitutes 11% of demand for oil in the transport sector. The Organization of the Petroleum Exporting Countries(OPEC) stated that the consumption of oil in the aviation sector is 6 million barrels per day. The international travel restrictions has an adverse impact on oil demand, as a result of which supply side of oil has been severely affected by the restrictions. In 2020, the International Energy Agency (IEA) stated that the worldwide demand for oil is 99.9 million barrels per day, which has declined by approximately 90000 barrels per day from 2019. This is a decrease in determination by IEA in February where it expected that the worldwide demand for oil will increase by 825000 barrels per day in 2020. The production of oil offshore is negatively affected as a result of the pandemic. The energy production offshore is one of the major constituents for worldwide supply of oil and natural gas which is one of the major sources of renewable electricity. Oil companies across the world are decreasing the number of offshore workers to curb the spread of coronavirus. The government of countries around the world are also backing up the policy to decrease offshore workers which will result in a decline in oil production [35].

Figure 3 shows a decline in oil prices. In the beginning of 2020, the novel coronavirus was discovered and the infections spread throughout China. This gave rise to a decrease in oil prices by approximately $20 a barrel till March 2020, due to the expected decline in oil demand as COVID-19 pandemic led to a decline in output. The Chinese authorities shut down its production systems to curb the spread of coronavirus, the demand for oil from China fell to a great extent [36].

Figure 4 shows that in 2020 the growth of worldwide demand for oil will decline for the first time since 2009. The decline in demand of 0.09 mbd in March is 1.1 mbd lower than the February estimate, which is below the January estimate. The IEA forecasts the worldwide oil demand to decline by 2.5 million barrels per day in the first quarter of 2020 [37].

Figure 5 shows that in April 2020, West Texas Intermediate(WTI) which is traded on New York Mercantile Exchange (NYMEX) was valued at negative dollars per barrel(bbl), which was the first time this had happened since trading started in the year 1983. The trading price of WTI became as low as -$40.32 per barrel, and prices were below zero for a proportion of the following trading day [37]. The drop in futures contract for U.S. crude oil prices by more than 100% and then turning negative, demonstrates the fall in demand as a result of COVID-19 pandemic. This negative price had never occurred earlier for an oil future contract. The WTI contract for June, expiring on May 19, dropped by approximately 18% and settled at $20.43 per barrel. The contract for July was approximately 11% lower priced at $26.18 per barrel. The COVID-19 pandemic led to an economic slowdown across the globe, as a result of which, the demand for oil fell. The OPEC and its allies entered into an agreement to decrease production of oil by 9.7 million barrels per day from May 1, 2020, but the demand would still be lower than that. The lack of balance between oil supply and demand worldwide, is representing itself in oil prices. Spot prices of oil futures contract is weak as a result of fall in demand for oil and unavailability of storage facilities [38].

Unavailability and rising costs of crude oil storage implies that various market participants would be inclined to close their positions before physical settlement of the contracts. Some futures contract holders were even inclined to settle their contracts at negative prices and resorted to paying a counter party to let them exit their position. The occurrence of negative WTI prices, would be limited to financial markets with only a small number of sellers in physical market who are paying to sell oil. Crude oil and petroleum consumption has reduced to a great extent due to reduction in travelling and slowdown in the economy to curb the spread of coronavirus [37].

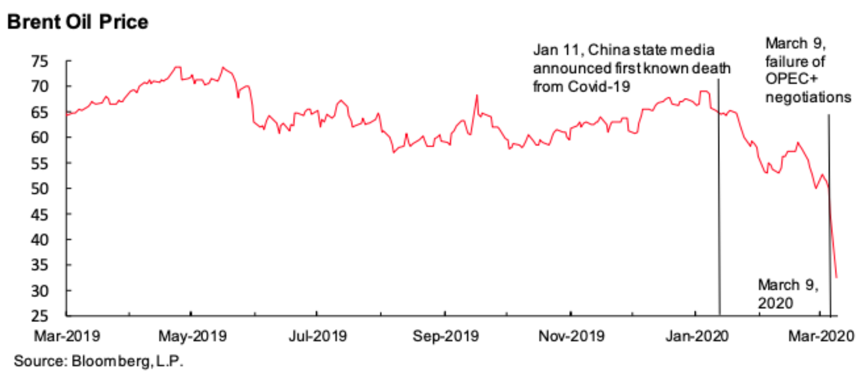


Figure 3: Oil Price Collapse Due to COVID-19

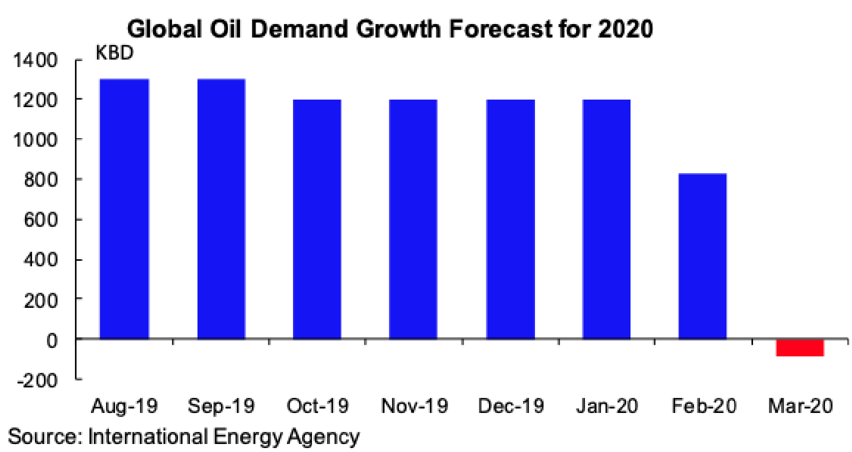


Figure 4: Fall in Oil Demand Due to COVID-19

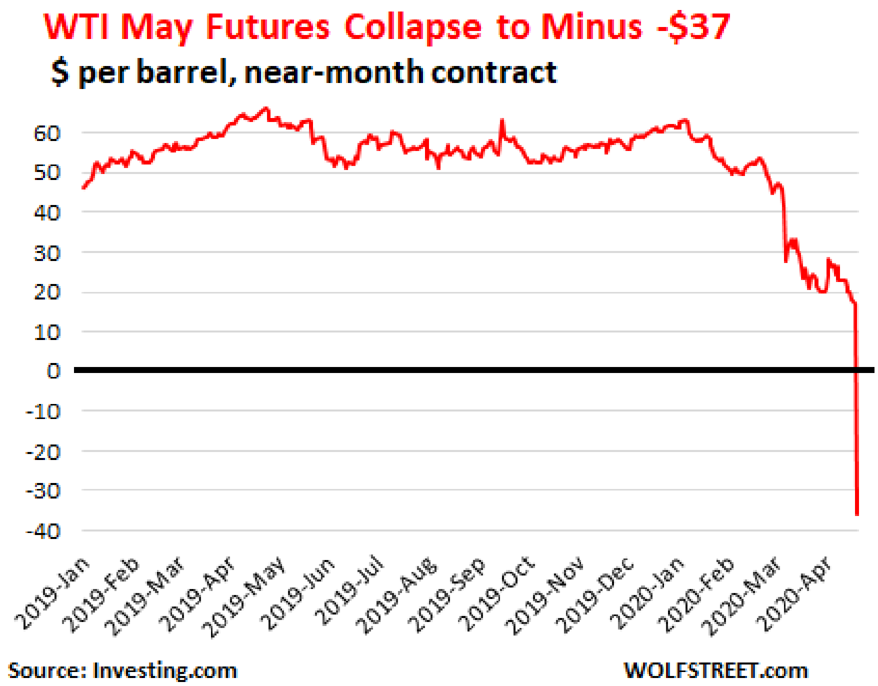


Figure 5: WTI Crude Oil Futures Collapse

### 2.3 Tourism Industry

On a worldwide basis, as a result of COVID-19 pandemic, a few coutries are striving to recover themselves from extensive lock-downs, while other countries have the stay at home order in place to curb the spread of coronavirus. The COVID-19 pandemic will have a long standing effect on worldwide tourism, and it is still uncertain if tourist destinations in Europe or North America will have sufficient tourists to maintain the local industries. The international borders of countries are still shut down and airplanes are also non operative, and even if tourism resumes across the world, it will involve social distancing measures. The number of COVID-19 positive cases might increase as a result of reducing restrictions and re-opening hotels and resorts too early.Summer season is the primary tourist season for European countries such as Spain and Italy. Even before the COVID-19 pandemic became widespread, these countries were already facing economic slowdown as a result of a large amount of debt and unemployment. Therefore, these economies would be more vulnerable to an economic recession as a result of COVID-19 pandemic. Data obtained from World Travel & Tourism Council demonstrates that the contribution of travel and tourism to Spanish and Italian GDP is 14.3% and 13% respectively in 2019. This number represents contributions from hotels, travel agents, airlines, restaurants as well as other sectors which are benefited as a result of expenditures by tourists. In the U.S. travel and tourism contributes 8.6% to the country's GDP but still this number is substantial. This number is also based on the country's reopening plan, whether easing restriction leads to the widespread rise in people infected with the coronavirus. As per data obtained from U.S. Travel Association and Oxford Economics it is observed that the job loss in the American tourism industry is approximately 8 million, and the spending on travel and tourism is estimated to reduce by $500 billion in the current year [39].

The tourism sector has always been severely affected by pandemics and macroeconomic shocks. Historically, the tourism industry has been heavily burdened by various pandemics including Black Death (1346-1353), Spanish Flu (1918-1920), SARS (2002-2004), H1N1 Swine Flu (2009-2010) and Ebola Virus (2014-2016). The Spanish flu created travel restrictions for four months and resulted in the death of 21 million people. The Swine Flu led to an economic downturn in the Mexican tourism industry and led to a loss of a million international tourists in a period of five months, and the industry lost approximately $2.8 billion. The tourism industry involves people moving from one place to another and it increases virus infection among people. Therefore, it can be understood that the tourism industry both increases the spread of virus and also suffers as a result of virus spread. The COVID-19 pandemic is turning people away from popular tourist spots as they fear the spread of the virus. During the pandemic, restrictions on travel, shutting down of international borders, and lock-down measures are instituted by the government of countries across the world to control the spread of coronavirus. The World Health Organization advises people not to venture out on tourist excursions during the pandemic. Also, the news on the media, deters tourists from people visiting destinations which are severely affected by the virus. Thus, there is widespread cancellation of flights, hotel bookings and special events. Italy, which is one of the countries most severely affected by COVID-19 pandemic, has witnessed a huge drop in tourist numbers and the occupancy rates of attractive tourist spots like Rome, Milan and Venice has fallen as low as 6%. The World Travel and Tourism Council has estimated that around 50 million people employed in the tourism sector, might face unemployment [40].

The COVID-19 pandemic and the worldwide measures taken to curb the spread of the virus, might cause the international tourism sector to shrink by 45% to 70%. The pandemic also has an adverse effect on tourism within the country, and a large proportion of the world population is restricted by the effort to curb the spread of the virus [41]. Resorts, dining services, tour agents, airplane operators and cruises have minimized their activities to a great extent. In hotel and restaurant businesses, 51 million businesses are facing economic difficulty and a large number of people working in these sectors might face unemployment [42]. As the industry is going through financial losses, people employed in the tourism industry are facing reduced work hours, a fear of unemployment and difficulties at work [42]. In the hotel and restaurant industry, small and micro organisations represent a large number of employers, especially in developing countries, they lack access to credit facilities, have minimal assets and are not very capable of receiving benefits from financial stimulus packages without proper support [43].

In Brazil, the tourism sector went through a major setback and approximately 80% of its hotels and its parks and tourist locations are shut down. In the absence of public transportation, the tourism sector in Brazil could suffer a loss of approximately \$6.2 billion and tourists arriving in Brazil can reduce by approximately 50% in 2020 [44]. By March end approximately 75000 restaurants closed down in France as a result of issuance of 'stay-at-home' order. Also, approximately 3000 clubs and 40000 cafes closed down in France, as a result of which approximately 1 million employees were technically unemployed [45]. In the tourist areas of United Kingdom, approximately 80% workers in the accommodation and food services sector were placed on leave, and one -third of jobs were at risk of unemployment [46]. In the U.S. hotel occupancy rate fell sharply due to the COVID-19 pandemic. An estimated 1.6 million people working at hotels were removed from their positions or put on leave and and around 3.9 million hotel support workers were unemployed [47]. The sectors on which the tourism industry has an essential multiplier effect including aviation industry, handicraft industry, agriculture sector and accommodation and food services industry have been adversely affected as a result of the COVID-19 pandemic. Due to cancellation of flights and shutting down of airports, approximately 10 million aviation industry workers fear risk of unemployment [43].

Tourism is one of the main source's of income in some of the Least Developed Countries(LDCs) throughout the world and constitutes 9.5% of GDP of LDCs and an equivalent proportion of employment.Tourism mainly involves travelling and communicating, this sector is facing a slowdown as a result of efforts taken by government of different countries to curb the spread of coronavirus. According to data obtained from World Tourism Organization(UNWTO) it can be determined that tourism industry has been adversely affected as a result of the pandemic. This implies that international tourists worldwide could reduce by 20-30%, from an expected growth of 3-4% in January 2020. This indicates a reduction of \$30-50 billion international tourist spending. For a few of LDC countries, the tourism sector has been severely affected. The 47 LDCs in the world has a population of approximately 900 million, and have social and economic instability and are prone to natural disasters and are not properly equipped to fight against the COVID-19 pandemic. The LDCs that are largely reliant on tourism, the effect of COVID-19 on the economic condition of people would be substantial. Among all LDCs, 14 Commonwealth LDCs are largely affected as a result of their dependence on earnings from tourism. These LDCs include Bangladesh, Gambia, Kiribati, Lesotho, Malawi, Mozambique, Rwanda, Sierra Leone, Solomon Islands, Tanzania, Tuvalu, Uganda, Vanuatu and Zambia. In case of LDCs, the contribution of tourism to total export of goods and services is around 7%. Tourism industry is one of the major players in the growth and employment of LDCs. The contribution of the tourism sector was the major reason for Cabo Verde, the Maldives and Samoa to rise above the LDC status. As a result of the COVID-19 pandemic, the LDCs which are heavily reliant on tourism and are on the track of rising above the LDC status, their progress could be severely hindered. The Pacific countries are largely represented by tourism by airplanes and cruise ships. Closing down of airports and restrictions on docking has brought air and cruise tourism in these countries to a halt. The continent of Africa has a significant number of COVID-19 cases, and the COVID-19 pandemic is creating financial problems in the 33 LDCs in Africa.The United Nations determined that tourism accounts for over one million employment in Nigeria, Ethiopia, South Africa, Kenya and Tanzania. They also estimate that tourism accounts for above 20% employment in Seychelles, Cabo Verde, São Tomé and Príncipe and Mauritius. The COVID-19 pandemic has created an adverse situation in these and other African LDCs [48].

It is estimated that Asia will witness the highest drop in revenue from travel and tourism in 2020, and China will incur the majority share of revenue loss from tourism [49]. In Europe approximately 13 million people are employed by the tourism industry, around 1 billion Euros is estimated to be the loss in tourism revenue, as major tourist destinations such as Spain and Italy are closed to international tourists as a result of COVID-19 pandemic. Italy is estimated to have 60% less tourist arrivals as compared to 2019 [50]. The tourism industry in Spain is estimated to incur losses of approximately 55 billion Euros by 2020, and the Catalonia region is estimated to be most severely affected and the reduction in tourism revenue is estimated to be approximately 11 billion Euros [51]. Small Island Developing States(SIDS), are facing a severe shock as a consequence of COVID-19 pandemic, because tourism industry constitutes around 30% of their economies and a severe economic shocks such as the COVID-19 pandemic is harsh for these small economies as they lack alternative channels of foreign exchange earnings which is required to repay external debts or pay for imports [52]. The COVID-19 economic shock will also have its impact on Sub-Saharan Africa where the tourism sector employs one out of every twenty workers. Data obtained from a recent study in the African Union [55] determines that travel and tourism industry in Africa could wind up in a loss of $50 billion as a consequence of COVID-19 pandemic, and approximately 2 million people employed directly or indirectly in the travel and tourism sector may face unemployment [52].

Figure 6 shows the forecasted change in revenue from the tourism sector in different regions from 2019 to 2020. This change was brought about by the COVID-19 pandemic. The graph demonstrates that the tourism sector in Europe is most severely affected by the pandemic and its revenue is expected to decline from $211.97 billion in 2019 to $124.2 billion in 2020. Europe is followed by Asia where the revenue from tourism sector declined from $225.88 billion in 2019 to $150.4 billion in 2020.

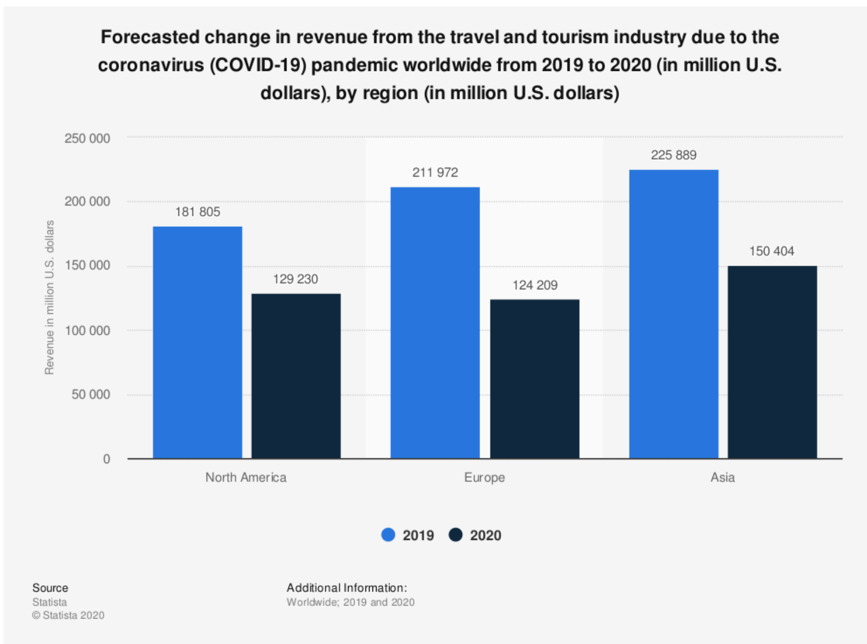


Figure 6: Forecasted change in Revenue in the Travel and Tourism Industry due to COVID-19 pandemic(in million U.S. dollars)

### 2.4 Financial Sector

Towards the end of February 2020, there was uncertainty, volatility and risk observed in the financial markets. There was an abrupt decline in the equity markets and there loss in market value was approximately 30% within a few weeks and the sell-off speed was more than that of the Global Financial Crisis(GFC) which occurred in 2008-09. By the beginning of March 2020, the market for short term funds and the market for U.S. dollar funds demonstrated stress signals and in the upcoming weeks, the U.S. treasury market, which is a very liquid financial market, displayed lack of liquidity. These disturbances continued into credit markets making it tough for firms and governments to make borrowing of funds for any duration. Central banks reacted efficiently to the stress and adopted measures which were applied during the GFC. U.S. Federal Reserve and other central banks dealt with funding market loss within days, in order to prevent stresses in the funding market from creating market wide disturbances. Also, central banks announced plans for purchase of assets in order to propagate liquidity in the key asset classes. This measure surprised some market participants who had initially thought that the central bank would respond in a more subdued manner.All market participants and stakeholders have a high level of uncertainty about the disturbances occurring in the financial markets and financial institutions as a result of COVID-19 pandemic. The do not know for sure about the effect of the virus on different countries, for what duration the mitigation measures will last in various markets, the appropriateness of various procedures to make up for activity forgone and the procedure in which households and firms will change their activities in the medium term. The economic slowdown may create new problems in the financial system,and if it continues, it may eventually result in a financial crisis. Equity markets have recovered to a certain extent since their march lows, the recovery does not properly display the possible downside situations. Market participants stated that the instability in price of equity demonstrates movement between optimistic and pessimistic macroeconomic outlook of the stakeholders. Continuous lack of liquidity in financial markets can result in forced sell-offs by owners or managers of assets due to a fall in credit rating. A lengthy economic slowdown and lack of government aid, can cause certain firms' debt profiles to move beneath investment grade and this can cause asset owners like pension funds to offload bonds into a non liquid market. Market participants are also concerned about the financial and economic uncertainties in developing economies and emerging markets as many of them have already faced adverse situations such as that encountered in 1990 or GFC. The reason why these economies face severe impact of the crisis is because of fall in prices of commodities due to subsequent demand and supply shock, supply chain disturbances, fall in exports due to recession in advanced countries and the requirement for domestic application of COVID-19 prevention measures. The developed countries are dealing with the recessions with the aid of fiscal packages but developing countries do not have the fiscal help needed to manage the crisis. Some developing countries do not have bilateral swap lines with U.S. Federal Reserve and have started utilizing the Fed's FIMA Repo Facility. Market participants from some of these countries have stated that this facility will enable the emerging nations to obtain short-term U.S. dollar liquidity [53].

Banks have been severely affected as a result of the COVID-19 pandemic. Borrowers and businesses are facing unemployment, reduction in sales and fall in profits as the spread of the coronavirus continues on a global scale. Banks are playing their part in an effort to curb the spread of coronavirus. Several banks are encouraging employees to work from home. In an effort to mitigate the spread of coronavirus, banks are setting up digital banking facilities so that customers can carry out their banking processes online, without difficulty. As a result of community spread of coronavirus, World Health Organization(WHO) has encouraged people to carry out contact-less payments and refrain from touching bank notes. The reason for this is that coronavirus may continue to be active on bank notes for several days, and this propagates the disease spread. Paper money is considered to be a potential carrier of coronavirus infection. The Federal Financial Institutions Examinations Council asked U.S. banks to test their digital systems in order to meet digital banking demands of customers. The agency encouraged more dependence on online banking, telephone banking and call center services [54].

The chief concerns faced by banks as a result of COVID-19 pandemic are travel restrictions, disturbances within workforce, rise in call volume, lack of social distancing, lack of complete digitization of all banking services, lack of customer confidence and trust, emerging risks such as unavailability of adequate number of staff in branches and call centers as well as increase in cyber crimes and recession in the business environment. The possible solutions to these problems faced by banks can be video banking, e-learning, Artificial Intelligence(AI) forecasting tools, management of calls remotely, development of mobile applications, predictive deep learning techniques with procedures for artificial intelligence and machine learning [55].

The stock market has demonstrated fluctuations and uncertainty as a result of COVID-19 pandemic due to fear and panic among traders. Due to this, market-wide circuit-breakers in order to refrain from panic-trading has been put into action four times in March. The volatility in the market is due to a fall in the market which has put into action market-wide circuit breakers four times in March. This pauses trading for fifteen minutes with the expectation that the market would calm down. The U.S. Securities and Exchange Commission has made it compulsory to establish market-wide circuit-breakers so that the October 19, 1987 market crash in which the Dow dropped 22.6% does not occur again. Since that time, the circuit-breakers have been put into action once in 1997 and four times in March, 2020. The present rules allow a 15 minute halt in trading in all stock exchanges in the U.S. if the drop in S&P 500 index is greater than 7% prior to 3:25 pm in New York time. The circuit breakers are meant to slow down the markets by pausing trading at the time of market fluctuations. The initial two levels of circuit breakers aim at pausing trading for 15 minutes and the third level stops trading for the rest of the day.Dow and S&P has witnessed drop in value as a result of volatility due to COVID-19 pandemic and Chicago Board of Exchange Volatility Index has been going up since the middle of February 2020 as coronavirus began to affect different parts of the world. Due to market fluctuations caused by coronavirus, there has been one of the most prominent single day drops in Dow Jones Industrial Average from March 2020 [56].

The Novel Coronavirus originated in China's Hubei region and became a worldwide pandemic. This led to a fall in the value of equity and there was extreme market fluctuations across the world. In the U.S. the market wide fluctuations in the middle of March 2020, exceeded the volatility last observed in October 1987 and December 2008. The fluctuations showed signs of slowing down by end April 2020, but the fluctuations continued to be higher than that before the coronavirus outbreak [57]. The spread of coronavirus was first detected in Asia by the end of December 2019 and the fear concerning the outbreak caused the markets to plummet. The value of Shanghai Stock Exchange Composite

Index and Nikkei Stock Average Index has fallen as a result of the pandemic. Japan had a further economic slowdown with the news that Tokyo 2020 Olympic games will be scheduled a year later. The coronavirus outbreak gave rise to a widespread fear and uncertainty in the U.S. economy. The S&P 500 index and Nasdaq Composite Index have fought to remain strong in the adverse economic conditions surrounding the COVID-19 pandemic.This economic uncertainty and market fluctuations has resulted in the U.S. Senate passing a bill regarding a two trillion U.S. dollar coronavirus stimulus package in order to propagate the U.S. economy [58].

The statements about the pandemic from World Health Organization(WHO) and officials in charge of public health was responsible for molding the attitudes of investors at the time of the pandemic [59]. When the stock market demonstrates a rising pattern, the investor has less fear of uncertainty and they demonstrate a more positive attitude. When the market falls, the investor doesn't have a positive attitude and will not intend to enter the market until the market rises again [60, 61]. This causes investors to overreact in the short term. As a result of globalization, markets across the world have become correlated. This creates correlation among stock markets across the world and this has an effect of investors' decisions worldwide on asset allocation as well as on economic measures taken to propagate stability in the economy [62]. The stakeholders do not take rational decisions in the market during the pandemic is because there is disruption of personal lives during lock-downs or lock-down like conditions. Also, occurrence of illness and death throughout the world causes fear and panic due to the virus outbreak. These macroeconomic shocks causes economic slowdown and changes the attitudes of investors in the market. The countries which have a culture of following the group consensus and have limited institutional participation, the investor attitude has more effect on the stock market [63, 64].

As per Duan, Wang and Yang [65], the small and mid size oraganizations which have an important role in China, have been adversely affected as a result of fall in consumption and fixed outflows on rent, wages and interest. This can cause disruptions in the banking system. In the article titled 'Sneezy Money' [66] it is stated that coronavirus harms the economy by interfering with labour supply as well as with the supply of commodities and services. It is determined by Goldman Sachs that the GDP worldwide will shrink at a yearly rate of 2.5% in the first quarter. Initially the COVID-19 outbreak was in China, and this had an impact on the Chinese stock market. Volatility in the stock market in China, may impact the correlation among different economies. Though China is slowly controlling the spread of the virus, the outbreak is continuing in other economies which might indirectly influence China's financial market [67].

The outbreak of coronavirus will lower the financial activity for a variable time period. The economic conditions following the pandemic are unexpected. This has caused financial markets to go through a slowdown and as a result of this, the Federal Reserve has reacted rapidly. The prices of stocks reduced by more than 30% between February 19, 2020 and March 23, 2020 during COVID-19 pandemic. In comparison, the fall in the stock market was 57% from October 2007 to March 2009 at the time of the Financial Crisis of 2007-09. There has been high stock volatility when measured by VIX index. The stock market recovered to a certain extent from March 23 2020, the recovery rate being approximately 14% by March 27,2020, after the information on Federal Reserve intervention and stimulus package became known to public. At the time of stock market crisis, The Federal Reserve works on reducing stress by providing substantial liquidity. In order to do this, the Federal Reserve reduced its policy rate to zero and put forth credit arrangements in response to the financial crisis. The credit facilities include Money Market Mutual Fund Liquidity Facility, Primary Dealer Credit Facility and the Commercial Paper Funding Facility [68]. In March 2020, the economy of the United States faced a severe recession. Output contraction in the second quarter was between 10% to 30% at yearly rates. The rate of unemployment is expected to rise from 3.5% in February 2020 to approximately 6% to 13% in the second quarter of 2020. It is unpredictable if small and medium sized organizations can cope with the lengthy lock-down. International trade and exchange with China and worldwide supply chains will be reconsidered. The international labor mobility may face disruptions. These conditions might cause reduction in output. A subsequent wave of coronavirus infections might occur in 2021 which can prolong the recovery process [69].

Figure 7 shows that Dow Jones has declined by 19%, Nikkei has declined by 27% and FTSE has declined by 33% as a result of uncertainties and market volatility surrounding the COVID-19 pandemic. Dow Jones had fallen 10959.49 points or 37.1% from its closing value on February 12, 2020 of 29559.42 to its March 23, 2020 closing low of 18591.93 and had gone up 5387 points or 29% since then to go back over 49.1% of the decline [70]. The drop in Nikkei was due to fear and panic in the minds of Japanese investors regarding the effect of COVID-19 pandemic on corporate earnings. The companies that had pushed back their earnings declaration as a result of COVID-19 pandemic faced extreme stress and pressure [71]. By the last hour of March 9, 2020(Monday) the drop in FTSE-100 index was approximately 7.7% as a result of widespread fear and panic due to coronavirus outbreak and the possibility of the economy going into recession. This was the most prominent fall in FTSE-100 from October 10, 2008, which was due to the crash in financial markets in 2008 [72].

Figure 8 shows the plunge in S&P 500 index as a result of market volatility during the pandemic. This is because the stock market is going through uncertainty as a consequence of COVID-19 pandemic. There is also a lot of fluctuations in the stock market. The investors in the market get very optimistic when positive news comes into the market. But they demonstrate extreme pessimism when negative news flows into the market. Consumption expenditure in the U.S. is falling as people lack jobs and a source of income. If people do not have any source of income , it will reduce consumption expenditure even further. Some experts advised the U.S. President to introduce negative interest rates which would encourage banks to give more loans to people, which in turn would motivate people to make more purchases. But Jerome Powell, who was the chairman of the Federal Reserve did not agree to that decision. He said that a negative interest rate policy was not suitable in the United States and he did not regard such a policy. As negative interest rates is not regarded by the Federal Reserve, economists are asking the President to give a larger stimulus package to residents, exceeding the existing $1200 stimulus. This will enable people to purchase more consumer goods which would enhance the process of economic recovery [73].

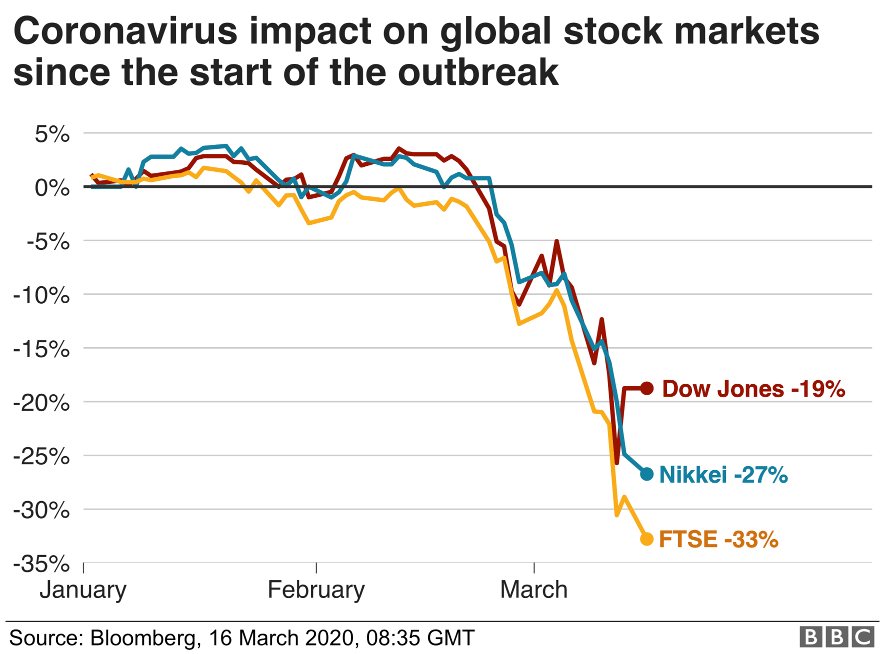


Figure 7: Impact of Coronavirus on worldwide stock market


Figure 8: Stock Market plunge due to COVID-19 pandemic

### 2.5 Healthcare Sector

In the past, healthcare has not been much affected by crisis and economic slowdown. Regardless of whether the economic conditions are favourable or unfavourable, people still need healthcare. People who possess health insurance do not have much out of pocket expenses and are able to receive quality medical treatment. But the COVID-19 pandemic control measures encourage people to stay at home under lock-down, so people who would normally avail healthcare are at home under lock-down. People are also trying to refrain from going to medical centers as they fear risk of infection. People are delaying non-essential medical procedures such as imaging services, elective surgeries, filling of prescription drugs among others. Though healthcare workers are striving to treat COVID-19 patients, the clinics and hospitals are facing a reduction in other patients. Primary care practices are facing a 70% decline in the number of patients. Salaries of healthcare workers are minimized or frozen and some staff are being put on leave. The claims of unemployment insurance from healthcare business has also increased manifold. As long as the community spread of coronavirus continues, people would not be willing to gather or crowd public places. There are policy measures taken to encourage people to stay at home and people are also reluctant to go outside and engage, in order to curb the spread of the virus. So, it is not likely that the healthcare sector will recover from the crisis it faces unless the COVID-19 situation is addressed. A lengthy recession will result in economic slowdown. It will be tough for businesses to deal with lengthy close down. Many people will be laid off, and those who are employed will go through salary reductions. This will reduce expenditure and the cycle will go on [74].

As the coronavirus spreads across the globe, it has caused immense pressure on medical centers and hospitals due to a shortage in medical supplies and testing capacity, to lack of healthcare access to rural and underprivileged people. This outbreak has revealed certain gaps in the healthcare system that can affect healthcare providers as well as patients. Lynn Bar, CEO of a group of medical organizations known as Caravan Health has stated that the coronavirus pandemic brought into light the shortcomings of fee-for-service healthcare model. In several rural areas visits to hospitals and medical centers have reduced to a great extent which has caused payment reduction for medical care providers. Jane Garcia who is the CEO of La Clínica de la Raza, which is a network of medical centers in the East Bay has stated that there is a reduction in patient visits which has led to approximately 25% drop in the workers. She has stated that universal coverage is extremely important and also it is important to give patients access to healthcare even if they are physically not capable of visiting clinics.Telemedicine is one such development [75].

The response of the Federal Government quick and well formulated. The Federal Reserve is reducing interest rates and bringing cash into the market. The $ 2 trillion coronavirus relief bill was enacted to provide U.S. families with cash,give loans to ensure the running of small businesses and provides $100 billion to hospitals overflowing with COVID-19 patients. There are certain disruptions brought about by the recession due to COVID-19 pandemic in case of healthcare workers and medical institutions. Due to people being laid off, there is a fall in the insurance coverage provided by employers. Many people will be uninsured or on Medicaid where co-payments are reduced. With expenditures exceeding state and local budgets, governments might institute reductions in Medicaid fees and reduced payments from insurance plans of public sector employees. These conditions may stay in place for years [76].

Improvement in technology, reduction in healthcare costs and ensuring more healthcare access will be primary constituents of healthcare developments following the COVID-19 pandemic. Countries with substantial amount spent on healthcare spending will do better in the pandemic. Companies are working to increase production of diagnostic tests and therapeutics to enable people suffering from the pandemic to be detected and initiate a speedy recovery. A vaccine which is capable of being commercially produced and sold is still 12-18 months away. The major pharmaceutical companies are getting government support to propagate human testing of vaccines. Several countries are banning export of medical equipment thereby affecting worldwide supply chain. In order to make a profit many local businesses interested in producing medical equipment. Patients having surgeries scheduled for their medical ailments are facing longer waiting times as healthcare workers are busy treating COVID-19 patients. Non liquidity and pressure on administration is causing delay in payments to healthcare workers. As a result of the pandemic, digital health and telehealth has gained popularity. It focusses on remote diagnosis, consultation and treatment. It causes less pressure on hospitals over-burdened with COVID-19 patients [77].

In order to curb the spread of the virus, medical professionals all across the globe are trying to reduce face to face interaction with patients. This has created an adverse impact on prenatal care which ensures that pregnant women and developing babies get proper care during the pregnancy period. But the COVID-19 pandemic has adversely affected the ability of pregnant mothers to consult the gynecologist on a regular basis. In the U.S. gynecologists have stated that patient visits have significantly reduced as a consequence of COVID-19 pandemic, or patients have completely switched to telemedicine. Many healthcare professionals prefer telemedicine during the pandemic as it is safer for pregnant women than in person clinic appointments. According to U.S. Centers for Disease Control and Prevention(CDC) certain doctors deem it essential to separate woman and child post birth if they determine that the woman has been affected with coronavirus. Also, due to the pandemic, the partners of the pregnant women are concerned that they may not be allowed to enter the delivery room or maternity unit. The CDC still allows people to visit these areas at the time of labor and delivery if they take proper protection and show no signs of coronavirus infection. In the United Kingdom, certain hospitals are prohibiting people from visiting maternity wards. In Germany, certain hospitals are not allowing the partners of pregnant women to enter the delivery room [78].

The healthcare organizations in several countries developed detailed plans to continue daily services but coordination of these services with COVID-19 treatment has created certain difficulties. In Japan the hospitals authorized to serve as COVID-19 treatment centers have exceeded their capacity and it is becoming difficult to integrate the working of hospitals with local authorities. In Singapore, from the start of the coronavirus outbreak, provision of information to private sector is facing disruptions. In many countries the bed capacity of intensive care units is restricted. Also, substantial availability of protective equipment to protect against COVID-19 infection is a major concern for hospitals. In Japan and Hong Kong, hospital supplies are diminishing but it has not yet affected the treatment of patients. In all regions across the world there will be an emphasis on critical care as a result of continuous rise in COVID-19 positive cases. In Japan there could be a shortage of specialists qualified to treat infectious diseases. Healthcare workers are in short supply and are working at their maximum capacity. In Singapore there are regular meetings with Regional Health System managers, hospital leaders and the Ministry of Health. In Japan sharing of information across prefectures is still needed to be improved. The coordination between government health centers and private hospitals in Hong Kong is not sufficient [79].

The bond credit rating agency Moody's Investor Service has changed its opinion for non-profit and public hospitals in the U.S. from stable to negative in the middle of March, 2020 [80]. This gives a signal to the investment society about the financial viability of the health sector in these uncertain times. The negative rating is because of the reduction in cash flows in the healthcare sector because of a fall in revenue generating services in order to prepare for COVID-19 cases. Also there in a rise in expenses in the healthcare sector because there is higher demand for healthcare workers which increases recruitment costs. Also there is more utilization of costly Intensive Care Unit(ICU). An increase in the rate of unemployment may result in lack of health benefits for patients [81].

The increase in the number of COVID-19 positive cases has disrupted the supply chain of pharmaceutical products. Pharmaceutical companies across the world require certain ingredients manufactured in China for the production of drugs. Approximately 60% of the Active Pharmaceutical Ingredients(API) required all over the world was produced in Chinese factories prior to COVID-19. Many such factories in China was placed under lock down to curb the spread of coronavirus. Many drug companies in the world did not have adequate APIs stored in their warehouse, or even if they did they did not want to sell it to other companies that needed it, or agreed to sell at a steep price. This created a shortage in availability of essential medicines [34].

After the COVID-19 curve flattens and communities begin to return to pre-covid phase, the impact of coronavirus will continue in medical, economic and recruitment disruptions. Many hospitals and healthcare organizations across the U.S. has been adversely affected by the coronavirus pandemic. A minimum of 150 hospitals in the U.S. had to put employees on leave or lay them off, cut back the salary of doctors or reduce the available benefits [82]. Some patients might be reluctant to reschedule physician appointments in fear of contacting the coronavirus infection, and some physicians might not have workers or facilities needed to treat patients. Healthcare centers might face difficulty finding an appropriate payer or guarantor for COVID-19 treatment due to an enormous number of uninsured and underinsured patients. Many healthcare organizations are facing problems in finding sufficient healthcare workers to cope with the huge increase in the number of COVID-19 positive patients. The healthcare organizations are also facing problems of underpayments and denials which are adversely affecting their revenue stream. The COVID-19 stimulus package covers the testing of COVID-19 but it may not cover all stages of the coronavirus treatment. Not-for-profit hospitals with a high number of COVID-19 positive cases will have revenue loss as patients are cancelling elective surgeries and treatments and high costs involved in staffing. One of the not-for-profit hospitals in Michigan, Beaumont Health, projects its revenue to fall between 20% to 40% [83]. The government has authorized $100 billion to be paid to U.S. hospitals to meet their healthcare related expenses. This amount will help hospitals provide free of cost COVID-19 testing and treatment and help hospitals meet with capital expansion and infrastructure expenses [84].

Figure 9 shows that in the U.S. there are lesser number of doctors per 1000 people when compared with similar economically advanced countries. Both Spain and Italy have 4.1 physicians per 1000 people and both these countries were having difficulty coping up with the increase in number of COVID-19 positive cases. Since the United States has the highest number of COVID-19 positive cases in the world with fewer physicians per 1000 people, the country is facing difficulty managing the outbreak. India is a developing country with its population more than the U.S. and it has 0.8 physicians per 1000 people. The effect of the pandemic in India would be even more severe as a the number of physicians is very low when compared to the population. Therefore, the pandemic will pose a major health risk in developing nations such as India.

## 3 Conclusion

The coronavirus spread rapidly throughout the world. The pandemic created severe economic impact in different sectors of the economy negatively affecting global trade, interest rates, financial market liquidity and creating demand

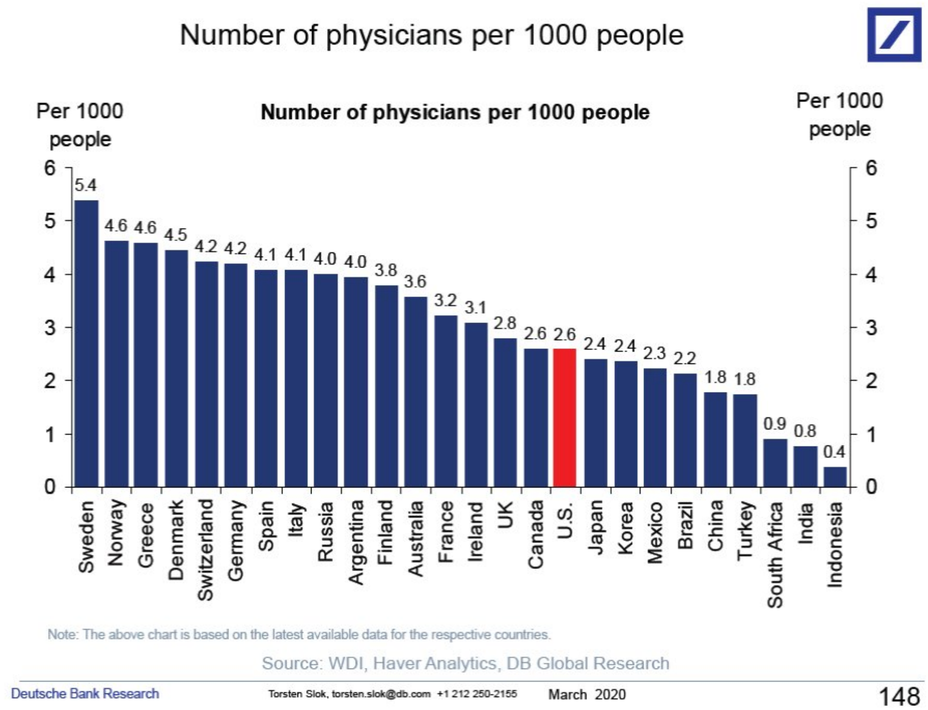


Figure 9: Physicians per 1000 people in different countries

and supply shocks. It is uncertain when the economies around the world will recover from the global pandemic or how long the recovery efforts would take. In my research I have analyzed the economic impact of COVID-19 on five economic sectors. But there are many other sectors adversely affected by the pandemic and my paper will help the readers do additional research on various other sectors. A global economic recession due to COVID-19 pandemic seems inevitable but it is uncertain as to how long the recession will last. It is uncertain when the countries around the world can fully recover from the pandemic. The recovery procedures will require collaborative action of governments, policy-makers, healthcare professionals as well as the common people. A smooth recovery is not possible if people don't abide by the social distancing policies framed by the government and policy makers. Also there should be more testing facilities available to people and people should have easy access to essential commodities needed to fight the pandemic such as face masks and hand sanitizers. Also, development of vaccine is crucial for people to fight against the pandemic. Many medical and pharmaceutical organizations are united in their effort to develop a vaccine for coronavirus. Clover Biopharmaceuticals in China has started Phase 1 trials of COVID-19 vaccine in association with its Australian subsidiary Clover Australia. The trials have begun in Australia. The researchers at University of Oxford are collaborating with AstraZeneca to launch a vaccine for coronavirus [85].

The biotech company Novavax is supported by the U.S. Government in for manufacturing and testing of coronavirus vaccine. The company has been awarded a grant of$1.6 billion for carrying out clinical trials and increasing manufacturing capacity [86]. GlaxoSmithKline(GSK) has provided its vaccine booster technology to develop a new vaccine for coronavirus in collaboration with a Candian biopharmaceutical company and is supported by the tobacco company Philip Morris. GSK has provided technological support to seven other companies developing COVID-19 vaccine including Sanofi and Clover [87].

This paper will help readers understand how the COVID-19 pandemic has created a widespread economic slowdown and has affected different sectors of the economy. A deep analysis of each of the sectors discussed in this paper has been conducted which will give readers a clear understanding of the severe economic and financial downturn faced by each sector as a result of the pandemic. Readers are encouraged to conduct additional research on the social, economic and financial effect of the coronavirus pandemic.

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