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# COVID-19 IMPACTS ANALYSIS ON SUPPLY CHAINS AND OIL INDUSTRY

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# INTRODUCTION

The covid-19 virus has changed everyone lives.

The thousands of deaths in all the world, the lockdown experience, all the new rules of social distancing and the obligation to wear mask in public place are maybe the most evident changes in everyday life, but in addition to the health crisis caused by the virus, the world is strained by the economic crisis caused by the collapse of global trade and the destruction of the global supply chain.

The virus spread from China to Eastern Asia, Europe, and North America, as well as other areas of South Asia, the Middle East, South and Central America, Africa, and every other country and region of the world. The globalization of the economy since the end of the 20th century accompanied not only the growth of the trade in final goods and services, but also the growth of the trade in intermediates goods via the global supply chain, which comprises two-thirds of global trade.

The effects of this calamity, and the need for individuals to protect themselves from the infection, have caused significant stagnation in supply and demand of goods and services.

Global trade in 2020 will fall in every region of the world and will affect all sectors of the economy.

This will impact countries that are strong exporters (no output for their local companies), but also those that are importers (lack of raw materials).

The most recent data from the National Bureau of Statistics showed how most analysts were wrong and underestimated the impact of the crisis.

This recently released data indicated that industrial output fell, in the first two months of 2020, by more than 13.5%.

The median forecast of analysts polled by Reuters predicted a gain of 1.5%. Similarly, investment in fixed assets fell 25% year-on-year. (Wakasugi Ryuhei, 2020)

This data is only a first indication of the seriousness of the current crisis but let us go a little more specifically and try to better analyse the overall situation.

# COVID-19 IMPACTS ANALYSIS ON SUPPLY CHAINS

## 1. The Keynesian supply shock

Fear of the growth of the epidemiological curve forced several nations to complete a total lockdown of production activities, that caused a negative supply shock. (Luca Fornaro, 2020)

This negative supply shock can trigger a demand shortage that leads to a contraction in output and employment larger than the supply shock itself.

We can call supply shocks with these properties Keynesian supply shocks.

Temporary negative supply shocks, such as those caused by covid-19, reduce output and employment.

However, can a supply shock induce too sharp a fall in output and employment, going beyond the efficient response? Can it lead to a drop in output and employment for sectors that are not directly affected by shutdowns?

Supply and demand forces are intertwined: demand is endogenous and affected by the supply shock and other features of the economy.

Why? It is simple: when workers lose their income, due to the shock, they reduce their consume, causing a contraction in demand. The question is whether this mechanism is strong enough to cause an overall shortfall in demand.

### 1.1 Multiple sectors model

The spread of the COVID-19 pandemic and the consequently containment policies have clearly had asymmetric effects on different sectors.

Obviously, sectors that require personal contact between consumers and workers are more damaged.

Let's assume we have two sectors, 1 and 2.

We assume that a fraction  $\phi$  of agents works in sector 1, and a fraction  $1 - \phi$  of agents works in sector 2. For now, we assume that workers are perfectly specialized in their sector.

Consumption and production in sector 1 may require consumers and producers to meet in person.

Consumption and production in sector 2, however, can take place without any personal contact.

The technology to produce both goods is linear:

$$Y_{xt} = N_{xt},$$

Competitive firms in sector  $x$  hire workers at the sector-specific wage  $W_{xt}$  and sell good  $x$  at price  $P_{xt}$ . Prices  $P_{xt}$  are flexible and, given the technology above, the price of good  $x$  will be  $P_{xt} = W_{xt}$ . Consumer preferences are now represented by the utility function:

$$\sum_{t=0}^{\infty} \beta^t U(c_{1t}, c_{2t}),$$

Where:

$$U(c_{1t}, c_{2t}) = \frac{1}{1-\sigma} \left[ \phi \rho c_{1t}^{1-\rho} + (1-\phi) \rho c_{2t}^{1-\rho} \right]^{1-\sigma},$$

so the utility function features constant elasticity  $1/\rho$  between the two goods and constant intertemporal elasticity of substitution  $1/\sigma$ .

To ensure that the model is well behaved under our supply shock, which prevents sector 1 agents from working, we assume for now that  $\rho < 1$ .

Consider first the economy in steady state, before the shock hits, assuming all prices adjust flexibly so the economy reaches full employment. The equilibrium allocation is:

$$c^*_{1t} = Y^*_{1t} = \phi n, \quad c^*_{2t} = Y^*_{2t} = (1-\phi) n.$$

By symmetry, the relative price of good 1 in terms of good 2 is:

$$p^* = 1.$$

## 1.2 Interest rate

The real interest rate is  $1/\beta$  as in the one good economy since consumption is constant in steady state. For reasons that will be clear shortly, it is useful to focus on the real interest rate in terms of good 2, defined as:

$$1 + r_t \equiv (1 + i_t) P_{2t} P_{2t+1}$$

where  $i_t$  denotes the nominal interest rate. At date  $t = 0$ , when the supply shock hits, production in sector 1 shuts down, so:

$$c_{10} = Y_{10} = n_{10} = 0.$$

Of course, there can no longer be full employment in sector 1. That is the inevitable effect of the shock.

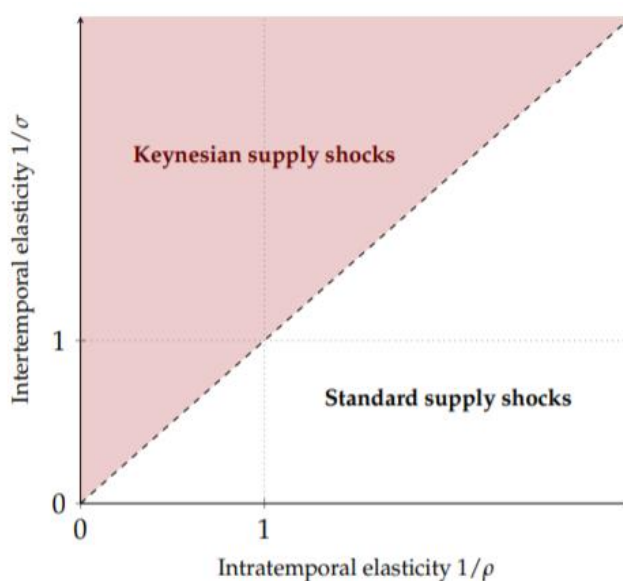
So, we ask what happens in sector 2. As before, the shock is temporary, and the economy goes back to steady state at  $t = 1$ . And, as before, we look first at what happens to the real interest rate to maintain full employment of the workers in sector 2; then we look at what happens to aggregate demand if the central bank keeps the real rate unchanged.

The natural rate after the shock is:

$$1 + r_0 = \frac{1}{\beta} \frac{U_{c2}(0, c^*_{2})}{U_{c2}(c^*_1, c^*_2)}$$

The natural interest rate falls due to the epidemic shock if the ratio of marginal utilities on the right-hand side is smaller than 1, or, using the functional forms introduced above, if the right-hand side is smaller than 1, or, using the functional forms introduced above, if:

$$(1 - \varphi) \rho^{-\sigma} < 1 - \rho < 1$$



1. When are supply shocks Keynesian with a representative agent?

An immediate consequence of this inequality is the following:

**In the multi-sector model with complete markets, the negative supply shock translates into a reduced natural interest rate if and only if  $1 - \rho < \rho^{-\sigma}$ .** (Veronica Guerrieri, 2020)

### 1.3 Consideration on the multi-sector model

The interpretation of this result is straightforward. If the inequality is satisfied the two goods are complements, so a drop in the production of good 1 increases the marginal utility of good 2, acting like a negative demand shock for good 2. To incentivize consumers to keep consuming enough of good 2 to keep employment at  $n$ , we need a drop in the interest rate. (National Bureau of economic research, 2020)

We have demonstrated that a supply shock causes a contraction to output and employment that need the intervention of fiscal policy to compensate the effect.

## 2. Covid-19 impact on world trade

Maybe the most evident consequence of the supply shock is the contraction of the world trade.

That because trade happens when things are made in one nation and purchased in another.

This, quite naturally, makes trade flows susceptible to demand shocks (purchases fall) and supply shocks (production falls).

Trade is surely one of the principle ways through which the virus damages domestic economies and spreads internationally. In fact, country most affected are mainly the ones who traded the most with the country where the epidemic broke out: China.

China is the most important world exporter, and this explain why is the country that more than the others (how we can see in the 2 table above) suffers this crisis.

Country	exports q4-2019	exports q1-2020	net change	% change
World	4790000	4303000	-487000	-0,1016701
European Union	1459631	1393717	-65914	-0,045158
China	673066	477628	-195438	-0,2903697
Usa	416615	395735	-20880	-0,0501182
Germany	367138	358923	-8215	-0,0223758
Japan	179688	166210	-13478	-0,0750078
United Kingdom	122080	107338	-14742	-0,1207569
France	144573	130128	-14445	-0,0999149
Netherlands	183442	172088	-11354	-0,0618942
Italy	136691	124063	-12628	-0,0923836

Figure2.

(Million us dollar)

q refers to quarter of year

Source: (world trade organization,

Country	imports q4-2019	imports q1 -2020	net change	%change
World	4852000	4434000	-418000	-0,08615
European Union	1381172	1315870	-65302	-0,04728
China	546237	464843	-81394	-0,14901
Usa	638345	585096	-53249	-0,08342
Germany	305271	300732	-4539	-0,01487
Japan	181856	168121	-13735	-0,07553
United Kingdom	174072	156018	-18054	-0,10372
France	162690	150952	-11738	-0,07215
Netherlands	163601	151158	-12443	-0,07606
Italy	116818	110532	-6286	-0,05381

Figure3.

(Million us dollar)

q refers to quarter of year

Source: (world trade organization,

We analysed the trade interconnectedness and density among the leading trading economies in the world are: US, UK, Germany, France, Italy, Japan, China, Netherlands.

We applied trade network analysis for specific points of time: q4 2019 and 2020 q1 and q2.

Trade density has decreased considerably from 0.833 to 0.429. (Vidya, 2020)

The COVID-19 pandemic has severely hit countries such as Germany, Italy, France, USA, UK. These countries show a steep reduction in degree centrality.

Evidently, there is noticeable change in the trade network structure in 2020 q1 compared to 2019.

## 2.1 Trade crisis in a globalized economy

Before COVID-19 the major segment of the world trade was characterized by global production networks (GPN) which benefited many developing economies and helped to promote industrialization and thereby increase productivity.

Trade diversification and fragmentation of production led to higher trade in intermediaries, and thus countries like India, China, and Korea emerged as the leaders and export hubs of goods in the global market (Vidya, 2020).

China turned out to be the core of the global supply chains in most manufactured goods due to their comparative advantage in production and distribution.

The globalization of the economy since the end of the 20 th century accompanied not only the growth of the trade in final goods and services, but also the growth of the trade in intermediates goods via the global supply chain, which comprises two-thirds of global trade.



The effects of this pandemic, and the need for individuals to protect themselves from the infection, have caused significant stagnation in supply and demand of goods and services.

Supply shocks in one nation, or in one industry within a nation, become a supply shock in other industries and nations when the thing being supplied is an input into the making of something else.

This ‘supply-chain contagion’ will surely be an important element of COVID-19’s economic crisis.

The three hard-hit East Asian manufacturing giants – China, South Korea, and Japan – account for over 25% of US imports, and over 50% of US imports of computer and electronics products. (Figure 3).

Apparel and footwear companies, car industries, electronics companies (just few example) are particularly vulnerable to East Asian supply disruptions.

By contrast, in so far as COVID-19 is a demand shock, imports will fall, and they will fall most in the trade partners of the nations that are most severely hit.

Given that the hardest-hit nations account for such a large share of world demand, this mechanism of contagion is likely to be important. (voth, 2020)

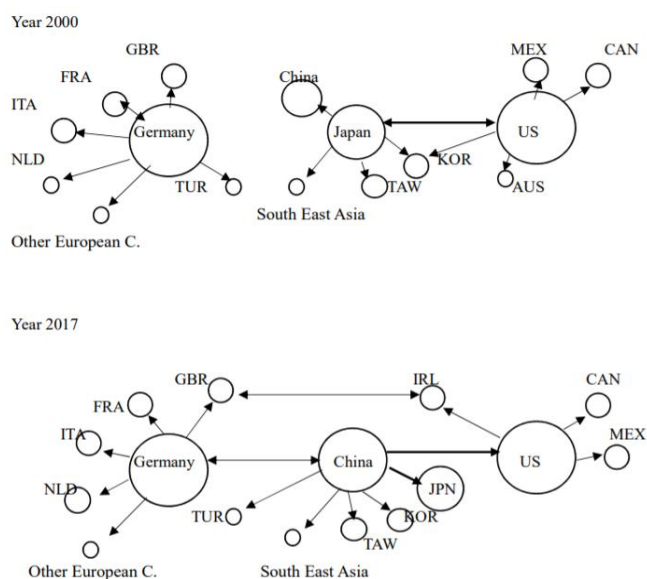


Figure 3. Changes of Supply Chain Network (in value added)

(Source) Xin Li, Bo Meng, and Zhi Wang (2019), “Recent patterns of global production and GVC participation”, WTO Global Value Chain Development Report 2019, Technical Innovation, Supply Chain Trade, and Workers in a Globalized World , Chapter 1, p27, Figure 25

China was the key centre of the trade during 2019 and is same during 2020q1.

Even though the COVID-19 pandemic originated in China in December 2019 and impacted its trade, the country’s relative position in the trade network has not changed drastically.

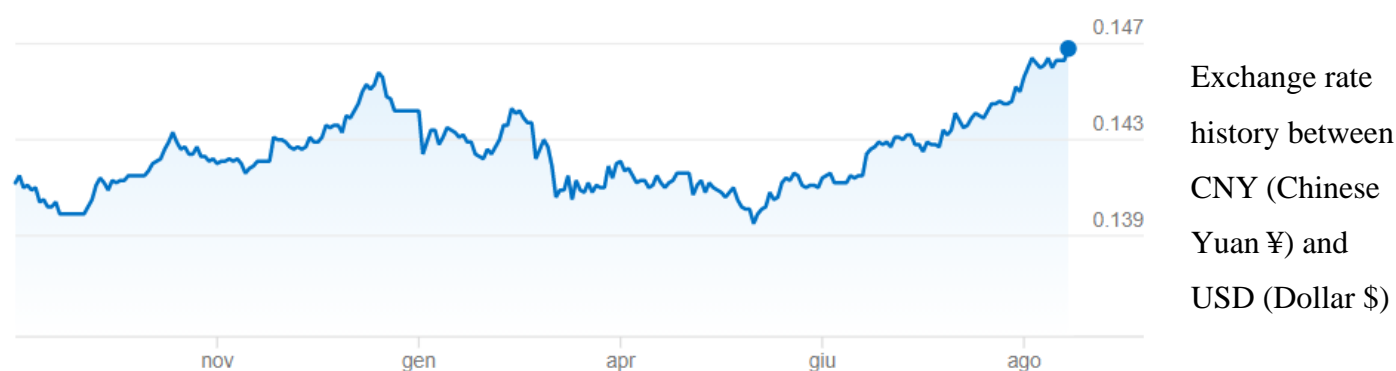
The forecasted exports and imports show a decline in all countries till December 2020.

The overall findings show that there will be a significant decline in trade in these economies due to the adverse impact of COVID-19 pandemic. (vidya, 2020)

## 2.2 Currency exchange rates

It is proven that the increase of trade balance is one of the reasons for depreciating of currency. (Datta, 2014)

Compare data on trade balance of q1 2020 (figure 1) and currency exchange rates in the same period:



From the two charts we can see a depreciation of the dollar with both the yuan and the euro. So, it seems that the previous statement on the depreciation of the currency caused by the increase in trade balance is false?

The answer is no: In fact, as we can see in February, when the crisis (especially on the trade volumes) was at its peak, Dollar has a strong appreciation caused by the collapse of import.

So, what is the reason for the dollar's weakness?

To explain the weakness of the dollar, therefore, the yield differential between the US government and those of the rest of the world is sufficient. (Fugnoli, 2020)

### 3. The manufacturing sector

As we have already seen all the biggest countries and almost all sectors are suffering great economic repercussions from the epidemic.

We can distinguish 3 different, but concatenate, consequence:

1. Direct supply disruptions will hinder production since the disease is focused on the world's manufacturing heartland (East Asia) and spreading fast in the other industrial giants – the US and Germany.
2. Supply-chain contagion will amplify the direct supply shocks as manufacturing sectors in less-affected nations find it harder and/or more expensive to acquire the necessary imported industrial inputs from the hard-hit nations, and subsequently from each other.
3. There will be demand disruptions (The Japan Times, 2020) due to macroeconomic drops in aggregate demand (Keynesian supply shock) and purchase delays by consumers and investment delays by firms. (Richard Baldwin, 2020)

Importation issues and staffing deficiencies stood out as the key concerns for businesses due to disruption to supply chains and self-isolation policies. Indeed, for many roles within a manufacturing company, 'working from home' is not a viable option. (Maria Nicolaa, 2020)

Workplace closures have an immediate and severe impact on enterprises and own-account workers current operations and leave them at high risk of insolvency.

Even once containment measures are lifted, surviving enterprises and own-account workers will continue to face challenges given that recovery is expected to be uncertain and slow.

For those that are engaged in global supply chains, disruptions are likely along the forward and backward linkages of the chain as other countries continue to face reductions in economic activity.

Restarting businesses will require significant adjustments with cost implications, including securing safe work environments.

Unless tackled by effective policies, these new requirements are likely to put a severe constraint on businesses.

The 81% of employers and 66% of own-account workers, live and work in countries affected by recommended or required workplace closures, with severe impacts on incomes and jobs.

Data indicate that the U.S. (12,5 %) will experience the greatest loss in working hours. (gisandata 2020)

It is interesting to know that lower-middle-income countries, are expected to register the highest rate of hours lost, at 12.5 per cent, but the impact is comparable across countries with different levels of income.

It is estimated that 436 million worldwide enterprises will be severely affected, almost half of these belong to the industry that intuitively suffers the effects of a global pandemic:

wholesale and retail trade, in this sector Own-account workers and small enterprises together account for more than 70 per cent of global employment, and this shows vulnerability of these sectors in the present economic crisis. (International labour organization, 2020)

Another important aspect to take into account is all the induced brought by what is defined as Informal economy, that is all those jobs that are not regulated by the states, and that are usually formed by small family activities, and this sector is very important in poor region like Africa and Latin America.

(International labour organization, 2020)

But now the question is: can we find the sectors and the countries that suffer most than others? And if yes, how?

### 3.1 The labour market

Sure, one of the most indicative data on the production level of a country is its employment rate, let's see the change between the last quarter of 2019 and the second of 2020.

Figure 4. Total, % of working age population Source: Labour market statistics (statistics, 2020)

LOCATION	Q4-2019	Q1-2020	Q2-2020	UNEMPLOYMENT RATE	CHANGE Q4-2019 Q2-2020
CANADA	74,4	73,23	64,73	35,27	-9,67
UNITED STATES	71,7	71,39	62,5	37,5	-9,2
AUSTRALIA	74,39	74,58	70,51	29,49	-3,88
ITALY	59,21	59,08	57,5	42,5	-1,71
KOREA	67,06	66,7	65,38	34,62	-1,68
GERMANY	76,82	76,1	75,2	24,8	-1,62
MEXICO	62,34	62,48	61,1	38,9	-1,24
JAPAN	78,02	77,95	77,01	22,99	-1,01
RUSSIA	71,09	71,08	70,18	29,82	-0,91
FRANCE	65,92	66,02	65,2	34,8	-0,72
UNITED KINGDOM	75,45	75,62	75	25	-0,45
CHINA	94,7	94,3	94,6	5,4	-0,1
TURKEY	50,3	49,17	51,5	48,5	1,2
SOUTH AFRICA	42,16	42,18	43,4	56,6	1,24

How we can see by data, surprisingly is not china the country with the most negative change between employment rate of the last quarter of 2019 and the second one of 2020, but is Canada, followed by United States, Australia, and Italy. What is the result of this? Sure, the political difference can explain this, but we need to investigate other causes.

### 3.2 Smart-Working

To contain the spread of the coronavirus and curb the contagion, a new organizational model of work, called “smart-working”, is becoming increasingly important: Smart working is known as a new model of work that uses the new technologies and the development of existing technologies to improve both the performance and the satisfaction that is obtained from the job. (Ehorus, 2016)

Workers can work outside their workplace and with a flexible time schedule, the possibility to work from home is used today to continue the work activities and avoid the collapse of the economy, In fact for a defined period of time the worker can work outside of the company’s physical workplace. During this period, there are no specific constraints on the time or location of work.

Due to the use of technology, smart workers may perform the same duties and activities as those of ordinary workers and achieve the same set targets and results while choosing a workplace and time schedule that are more convenient for both the activity to be performed and their personal needs.

But even though smart-working was very important during the lockdown so as not to bring down the global economy we still know very little about the economic effects of smart-working.

By working from home, smart working allows workers to reduce their commuting costs and firms to optimize their costs.

Moreover, home is only one possible alternative to the office, and not necessarily the more convenient alternative; the conflict between work and family may even become more visible when employees work from home for caring purposes.

It may also be the case that, for the same reduction of commuting time, the double gain of improving work-life balance and increasing productivity may be better obtained when workers work at a library, at a park, at a difference place close to their residence, or at a location that may change without the control of the employer, instead of home, where their family duties may interfere with their job activity.

Moreover, removing the fixed daily start and finish times gives employees the possibility of better managing their time according to their preferences; they can enjoy long or short breaks for personal or family reasons, and they can adapt their work hours to life changes without altering their compensation.

This increases their satisfaction and work-life balance, which ultimately makes this arrangement desirable to workers.

In parallel, firms may optimize by rewarding these employees based on effective productivity rather than on the hours worked.

Firms may also gain from the retention of talent and the reduction of days of absence, thus increasing their competitiveness.

On the other hand, smart working raises concerns about the organizational process, the productivity of workers and their well-being.

Some of these concerns are shared with the telecommuting experience; for example, working outside the workplace may reduce the commitment of workers, who can then take advantage of the flexibility to take part in activities different from work.

Moreover, by reducing interactions between workers and between workers and supervisors, there is a risk of a reduction in productivity, particularly in jobs with high interactions.

Finally, blurring the boundaries between work and home may increase the hours of overtime, the levels of employee stress and worsen work-life balance.

Moreover, the lack of rigid daily start and finish times can amplify the reduction of worker commitment, reduce their regular activity. (Marta Angelici, 2020)

### 3.3 Effect of lockdown on service sectors

Lockdown policies by design affect different sectors differently: While some sectors are deemed essential and are permitted to remain open, non-essential sectors are closed, if their nature makes social distancing hard. Because of this, service sector is not being able to provide their proper service. (Abid Haleem, 2020)

All sectors will be affected, but the consequences of COVID-19 will not be equally distributed throughout the economy.

The problems are particularly bad in hospitality related sectors. Indeed, the global travel industry—from airlines to cruise companies, from casinos to hotels—is facing reductions of activity of more than 90%. Tourist destinations are deserted, trade fairs and cruises are being cancelled, hotels and casinos closing all operations....

Besides these, there are other businesses that rely on tourism and will suffer spill over effects. On top of travel restrictions and quarantines, companies are cancelling travel and meetings, and governments have closed borders. Additionally, it is well known that Chinese tourists are the world's biggest spenders.

It is easy to understand that touristic and transport sector are the most affected by the restrictions on travel between countries; restaurants, bars and disco are the most affected by the social distancing restrictions, the examples are many, but surprisingly there are sectors that have not been affected by the crisis, but have benefited from it.

Some examples are the financial, telecommunications and technology, insurance, and pharmaceutical sectors.

Notably, these three sectors are also the most likely to be embracing technology, trade, and other initiatives to drive growth.

Financial and insurance services, telecommunications and technology are among the most likely to say that technology will be an important tool to help restart business post-lockdown, and they would most benefit from a Government grant to invest further in technology.

They are also the most likely to be actively taking, or planning to take, measures to boost export revenues.

In contrast, less technologically advanced sectors like the creative industries, beauty and wellbeing and construction are less likely to make use of technology and pursue growth initiatives, with overall lower confidence scores. (Globalbankingandfinance, 2020)

Another thing to keep in mind is that despite globalization, much activity remains local.

Many of the services we use daily are not traded and remain locally sourced. Here too, there is a strong negative impact to the economy.

As people cancel appointments at the dentist, postpone their haircuts, do not go out for dinner, or wait to put their house on the market, this is a strong blow to service oriented economies.

Indeed, in service sectors, most of the lost output is never going to be recovered.

To better explain this concept let us do this example:

If a consumer wanted to buy a product before lockdown has the opportunity to buy it online or wait for better times, instead if a consumer needs a service like it could be going out to dinner or cutting his hair, he can't meet his need in any way during the lockdown period, and also when the lockdown is over he will not go every day to the restaurant or to cut his hair to compensate for the period when he has been without the service.

To better understand the crisis exposure of the different sectors we represent their strength in the Cartesian reference system below: (Sage, 2020)

### Performance by Sector



Figure 5. source: (Sage, 2020)

In y axis we have Resilience.

Resilience is defined as the ability to meet external challenges and was calculated based on this indicators: revenue drop sector could absorb, the impact the crisis was having on revenue, companies access to finance and their ability to repay it, and how well companies were coping with the challenges they are facing. (Sage, 2020)

In x axis we have Growth.

Growth is defined as the confidence in future growth and the steps that they are taking to achieve it, and was calculated based on indicators including overall confidence, projected future sales and revenue, and what positive actions are being taken or planned to grow their business. (Sage, 2020)

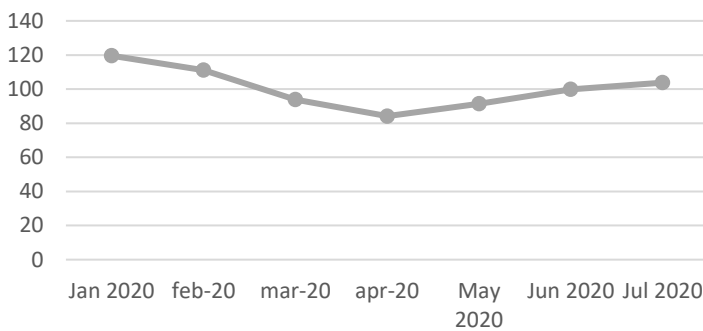


### 3.4 Commodity price

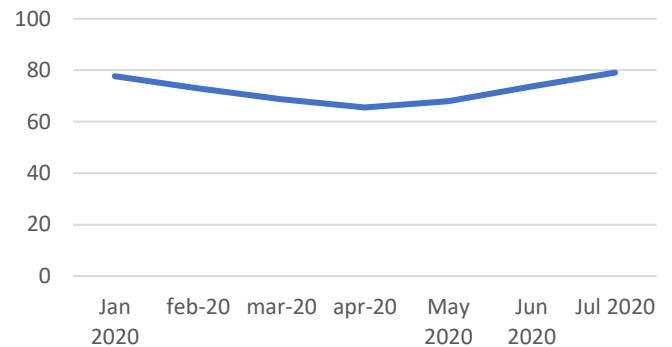
As mentioned above the globalized economy caused kind of addicted between western companies and eastern low-cost production process. To demonstrate this, we can control which sectors are most affected and compare production levels between East and West. Another data that prove the level of production in addition to employment rate is commodity price.

Here are the graphs of commodity price trends in recent months: (International monetary fund, 2020))

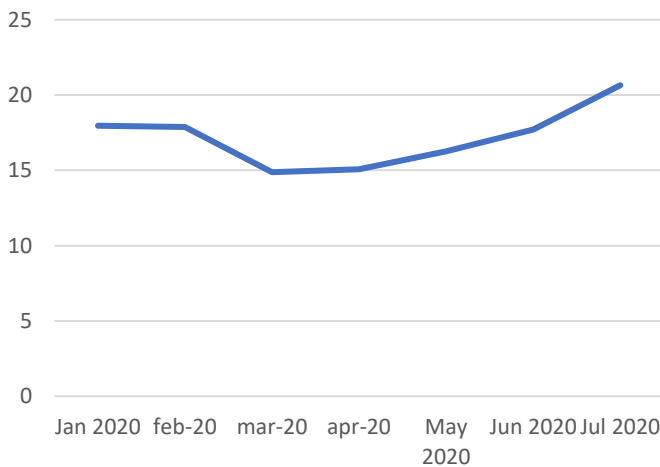
Commodity Price Index - Monthly Price



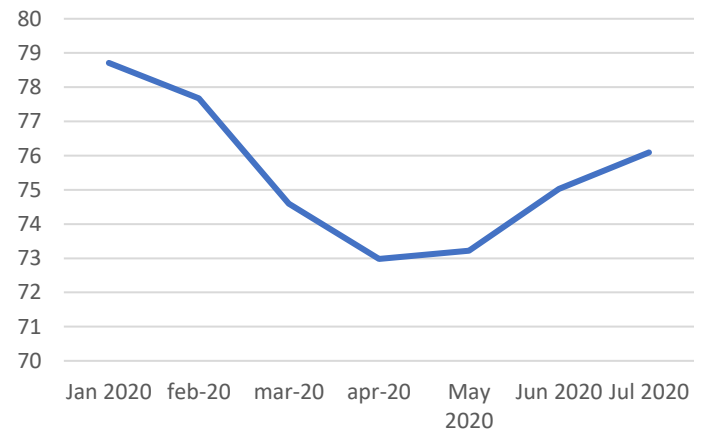
Commodity Metals Price Index - Monthly Price



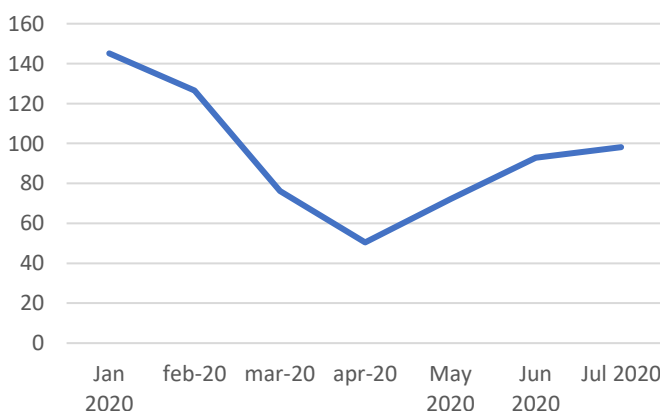
Silver - Monthly Price



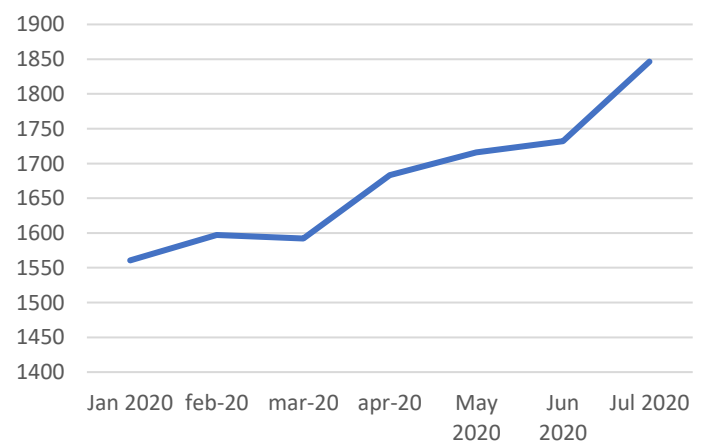
Commodity Agricultural Raw Materials Index - Monthly Price



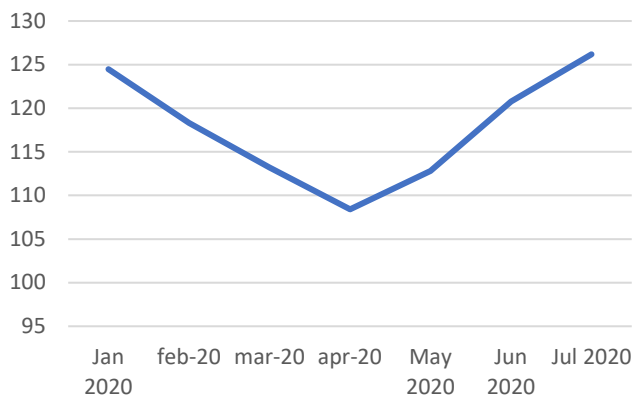
Crude Oil (petroleum), Price index - Monthly Price



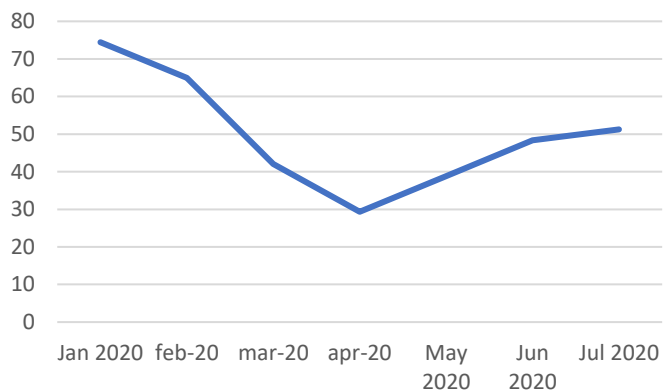
Gold - Monthly Price



Commodity Industrial Inputs Price Index - Monthly Price



Commodity Fuel (energy) Index - Monthly Price



The resilience of the agricultural sector has been tested by the COVID-19 outbreak. A global crash in demand from hotels and restaurants has seen prices of agricultural commodities drop by 20% (Rediff realtime News,, 2020).

Markets have gone a step further by shutting down floor trading which has impacted the ability to exchange commodities. The Chicago Mercantile Exchange is a recent example (Crain’s Chicago Business, 2020). ‘Panic buying’ is further complicating shortages beyond supermarket shelves. (Maria Nicolaa, 2020)

But as we can see the most affected sector is undoubtedly the energy sector, dragged down by the collapse in the oil price, meanwhile industrial sector(metals are the less volatile) seems for now react well to supply shock, but the demand shock consequence to the Keynesian supply shock could prove catastrophic in a longer period, as the industrial sector will be the most damaged by the 3 consequence of covid-19 world spread, described at the beginning of this chapter.

Another interesting data is the continue growth of the gold and silver (substitution of gold) that means poor fade of investors in a quick resumption of the global economy.

But Oil and gas activities are considered essential activities by governments and have been mostly exempt from the lockdown measures, nevertheless, the oil sector seems to be one of the hardest hits.

# OIL PRICE DROP

## 1. Causes of the big oil price drop

Tuesday 21/04/2020 something that never happened in the story occurred: futures on West Texas Intermediate fell by more than 100%, and then even touch the negative quote of -37 dollars per barrel. "Less than zero" was the title used by the Wall Street Journal.

The explain of this strange phenomenon of negative price is in the storage costs, in fact Brent oil price (benchmark for global oil prices) fell by "only" 8%, that's because Brent is priced on an island in the North Sea roughly 500 meters from the water, where tanker storage is accessible. In contrast, WTI is landlocked and 500 miles from water and this obviously increase the costs. (Forbes, 2020)

Is documented a negative and significant impact of the coronavirus crisis, but relatively small as compared to the effect of financial volatility and economic policy uncertainty on oil prices.

The COVID-19 impact on oil prices seems to be rather indirect, affecting first the financial markets volatility (Albulescu, 2020).

Even if the figures reported outside China seem to have, for the moment, no significant effect on oil prices in the long run, the exponential increase of new infection cases risks to block the world economy and to freeze oil prices at a low level for a long period.

The amplitude of the economic contraction will be correlated with the coronavirus persistence.

### 1.1 Covid-19

As in any other sector, oil must deal with the workforce shortages as employees are infected by the coronavirus and the practical difficulties in many cases of respect the social distancing.

Companies should, therefore, be prepared to operate with fewer employees to continue operations, with disruptions expected for the maintenance, inspection, repair and replacement of equipment and drilling activities.

Oil companies also must consider the prospect of sealing off wells as a result of the reduced number of personnel on drilling rigs falling below the level required by health and safety regulations and the reasonable and prudent operator standard.

As regards supply chain disruption, thought beyond the initial supplier in the supply chain will be required to identify who has supply chain risk, as disruption among second-tier and third-tier suppliers could ultimately affect both service companies and operators. Another cause of the crisis is the production freeze which also causes a collapse in energy demand in all major global economies.

But all these causes cannot explain this collapse in the price of oil, we must investigate other causes as well.

## 1.2 Oil overproduction

As we have seen oil is undoubtedly the raw material that more than the others seem to be suffering from the crisis, but are we sure that covid-19 is the only cause of this big drop?

If we delve into the issue, we find that even before the spread of the epidemic the oil industry showed signs of subsidence, in fact already before in the market there was a “price war”.

That’s because Saudi Arabia (the world's top exporter and the second world producer) and Russia (the third world producer) no longer respects the agreements (after 2016 oil price drop) to cut supply of 2.1 million barrels per day.

The reason of that it’s the will of the Russian president Vladimir Putin to not accept the Saudi Arabia's proposal to further cut production of 1.5 million barrels per day, and the reason it’s simple: another cut will ceding too much ground to American oil producers(the first world oil producer).

In response to this Saudi Arabia decided to fight for greater market share by slashing the prices its preferred customers pay by between \$4-\$7 a barrel.

The kingdom is also reportedly planning to lift production to over 10 million barrels a day.

In this scenario the coronavirus has undermined energy demand worldwide, but especially in China, which is now the number one importer of crude oil, guzzling roughly 10 million barrels a day.

Another crucial point is the sharp contraction of the travel market both of good and people, the new health rules to limit the spread of the virus, are causing a free fall in fuel and energy demand.

We therefore have the disastrous situation of an increase in production and a simultaneous decrease in demand.

The most Damaged countries for this situation are all the Oil dependent states, first of all United States, in fact meanwhile Saudi Arabia have a low cost of production, and Russia lot of other natural energetic resource, United States oil companies will heavy suffer this low prices. (Defterios, 2020)

## 2. Consequence of the oil price drop

Today the worth of the oil industry is US\$ 1.7 trillion.

It' intuitive to understand the importance of this sector for the global economy, oil is the most economically important commodity in the world, so an oil price drop is a very strong signal about the performance of the global economy.

That's a very unusual situation: there is a worldwide collapse of demand consequently to the supply shock, and it means a drop not only in oil but for all sectors, for example in the service sector, empty restaurant, empty hotels, empty airplanes.

The whole world is in a global deflationary force.

### 2.1 Effects on the energy sector

What will be the effects of this crisis on the energy sector? Will it be a further boost for renewable energy sources, or will oil continue to dominate this sector?

For many years now, there is a strong pressure to achieve a higher degree of security for energy supply. Concerns over energy security and global climate change enhance the expansion and search for alternative energy technologies, technology innovation in this sector provides a win-win solution to mitigate these issues and alternative (clean) energies, such as wind, solar, geothermal, ocean, or biomass, bring more market certainty and a healthier climate than crude oil does.

Intuitively we can think that a collapse in the price of oil may increase the will to produce energy from renewable sources, but the opposite phenomenon happens.

In fact rises in the prices of fossil fuels originate incentives to innovate in the generation of electricity from renewable energy sources (Urpelainen, 2012), if fossil fuels and alternative energies are considered substitutes in the technology portfolio of companies, facing a rise in the prices of fossil fuels, the innovation in fossil fuel technologies will decrease, while the innovation in alternative energies is expected to rise and the opposite happens if the price of oil goes down.

The prospects of growth and long-term sustainability of the renewable and alternative sectors cannot be isolated from the fossil fuel sector.

From an environmental perspective, oil producing countries benefit from global emissions reductions, but are also damaged, to different degrees, by demand drops, as oil prices impact world oil production and real activity of industrial commodities (Catalão-Lopes, 2015) also forcing oil companies to adopt hedging strategies to protect themselves from prices' volatility.

A correlation between global economic uncertainty and world crude oil market integration exists.

The positive reaction of innovation in alternative energy sources to oil price rises has thus been demonstrated in several studies.

Now the question is whether innovation in alternative energy sources decreases in the face of declining oil prices, and whether the two responses are symmetric.

Are countries really committed to invest and develop alternative sources of energy as a substitute for fossil fuels, namely oil? Is a long-run sustainability transition taking place or are countries just encouraging innovation in alternative energies in a short-run approach when it is needed given the conditions of fossil fuel markets? (Ines carrilho nunes, 2016)

## 2.2 Relation between oil price and stock markets

Oil prices play an important role in stock market performance of oil-importing economies.

A decline in oil prices reduces the cost of production and increases economic growth (KumarNarayan, 2014).

The effect of this is a rise in stock prices due to higher future earnings and dividends (Filis, 2010; Jones & Kaul, 1996; Sadorsky, 1999).

However, with this new oil price fall, also global stock markets fall. So, is true this inverse proportion between oil price and stock markets?

The COVID-19 pandemic and the consequent economic lockdowns globally have disrupted the global supply chains and reduced aggregate demand (Vidya, 2020), the need to revisit this hypothesis is imperative considering the on-going COVID-19 pandemic.

The existing literature on the relation between oil price and stock market is huge.

There is a consensus in this literature that a rise in oil prices increases stock prices in oil-exporting economies mainly due to higher revenues from oil exports. (Kilian, 2009).

Based on the work done by K.P. Prabheesh, Rakesh Padhan and Bhavesh Garg on the relation between oil price drops and stock markets in Asian importing oil countries, it has been empirically proven that: there is a positive relationship between oil price returns and stock price returns in all countries and the strength of the relationship increased significantly during the initial months of the COVID-19 pandemic. (Prabheesh, 2020)

## 2.3 Deflation risk?

Deflation is a general decline in prices for goods and services, typically associated with a contraction in the supply of money and credit in the economy.

During deflation, the purchasing power of currency rises over time. (CHAPPELOW, 2020)

So, is global economy in deflation?

The majority economist opinion says yes, because unemployment will be high and demand will be weak, while the supply chain is resilient and will storm back offering plenty of goods to tempt weak demand.

The new money pumped by central banks will allow companies the time to quickly pick up the slack in supply and buy time for companies to rebuild their business and the economy, but demand issues will lag supply capacity, driving prices down.

Companies propped up by cheap money will not only be able to survive but will also be able to trade for a time at a loss, which will let them cut prices.

But Milton Friedman said: “Inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output... A steady rate of monetary growth at a moderate level can provide a framework under which a country can have little inflation and much growth.” So, if Friedman is right the crucial point is the increase in the quantity of money than the respectively increase in output: if money increasing is faster than output, we will have inflation, contrary we will have deflation.

Inflation/deflation is not accidental, it is policy, inflation and deflation are the result of political necessities created by events. Nobody knows with certainty how the world economy will respond to this crisis; the situation changes day by day and uncertainty seems to dominate this period.

In my opinion I think that a deflation it is the worst possible scenario in the future, and central banks should do anything to avoid it.

# POLICY RESPONSES TO COVID-19

We have so far seen all the consequences of the pandemic and the resulting new rules of social distancing on trade and in general on the major global economies, but what are the responses of these countries to combat the crisis?

This chapter summarizes the key economic responses governments are taking to limit the human and economic impact of the COVID-19 pandemic, and concerns the major global economies, which are also the most affected by the crisis: China, United States and Euro Area country.

(Last updated on September 11, 2020)

## 1. EUROPEAN UNION

COVID-19 has spread across the European Union (EU) with a severe impact: real GDP contracted in the second quarter of 2020 14.4 percent in the EU. (tradingeconomics, 2020)

Most European countries have taken rigid containment measures like lockdowns and travel restrictions, school closures and bans on large gatherings for an extended period.

On May 20, the European Commission proposed country-specific recommendations providing economic policy guidance to all EU Member States, with a focus on the most urgent challenges brought about by the pandemic and on relaunching sustainable growth. (Commission, 2020)

The most important goals are to reduce and stabilize the contagion and sufficient health system capacity, so that national borders can be reopened without constrictions.

The European Council agreed on the Next Generation EU (NGEU) recovery fund on July 21. It will provide €750 billion in total, financed by borrowing at the EU level. The funds are split between grants (€390 billion) and loans (€360 billion) which will be channelled through a special Recovery and Resilience Facility (RRF).

High-debt countries hit hard by the pandemic (e.g., Italy, Spain) and Eastern European countries will be the biggest net beneficiaries from the RRF. Overall, 30 percent of the NGEU and the 2021-27 EU budget will be targeted towards climate change related spending.

The European Stability Mechanism (ESM) is another important tool in the hands of the states in fact grants up to €240 billion in total, to finance health related spending, providing €25 billion in government



guarantees to the European Investment Bank (EIB) to support up to €200 billion to finance to companies, with a focus on SME, creating a temporary loan-based instrument (SURE) of up to €100 billion to protect workers and jobs, supported by guarantees from EU Member States.

The European Commission also suspends the fiscal adjustment requirements for countries that are not at their medium-term objective and allows them to run deficits more than 3 percent of GDP.

The ECB decided to provide monetary policy support through additional asset purchases of €120 billion until end-2020, fixed rate temporary liquidity facility at the deposit facility rate and more favourable terms on existing targeted longer-term refinancing operations, with interest rates that can go as low as 50 bp below the average deposit facility rate.

In March, the ECB introduced an additional €750 billion asset purchase program of private and public sector securities (Pandemic Emergency Purchase Program, PEPP), initially through end-2020. On June 4, the weaker inflation outlook in the ECB's June projections prompted the Governing Council to expand the size of the PEPP by €600 billion to €1.35 trillion.

The duration of the program has been extended to at least June 2021, and the ECB will reinvest maturing securities until at least the end of 2022.

More recently, ECB Banking Supervision extended its recommendation on dividend distributions and share buy-backs until January 2021, asked banks to be moderate with regard to variable remuneration. The ECB Banking Supervision also provided some temporary capital relief for market risk by adjusting the prudential floor to banks' current minimum capital requirement. (ECB, 2020)

The latest measure that the European Commission proposed on July 24 a Capital Markets Recovery Package with targeted adjustments to capital market rules, which aim to encourage greater investments in the economy, allow for the rapid recapitalization of companies, and increase banks' capacity to finance the recovery. (International monetary fund, 2020)

## 2.CHINA

On early January 2020, the Chinese city of Wuhan is the first in which the virus spreads. The government imposed strict containment measures, including the lockdown of Hubei province, large-scale mobility restrictions at the national level, social distancing, quarantine period for returning migrant workers. Reflecting these containment measures, the economy contracted by 6.8 percent in Q1. (Santevecchi, 2020)

With the reduce of contagion the government has gradually removed mobility and activity restrictions, prioritizing essential sectors, specific industries, regions, and population groups based on ongoing risk assessments.

Most businesses and schools have reopened nationwide, but social distancing rules remain in place at the micro level and foreign entry remains restricted to contain imported cases.

With normalizing economic activity, real GDP growth rebounded by 3.2 percent in Q2.

An estimated total of 4.6 trillion of ¥ in fiscal measures have been announced.

Key measures include:

- Increased spending on epidemic prevention and control
- Production of medical equipment
- Accelerated disbursement of unemployment insurance and extension to migrant workers
- Tax relief and waived social security contributions
- Public investment

The Central bank provided monetary policy support and acted to safeguard financial market stability.

Key measures include: A liquidity injection into the banking system via open market operations (reverse repos and medium-term lending facilities), support manufacturers of medical supplies and daily necessities, micro-, small- and medium-sized firms and the agricultural sector.

The government has also taken multiple steps to limit tightening in financial conditions, including measured forbearance to provide financial relief to affected households, corporates, and regions facing repayment difficulties. The exchange rate has been allowed to adjust flexibly. Restrictions on the investment quota of foreign institutional investors were removed. (International monetary fund, 2020)

### 3. UNITED STATES

Reflecting the impact of the containment measures, the U.S. economy contracted at an annualized rate of 31.7 percent in the second quarter and the unemployment rate stayed at 8.4 percent in August.

Strong connectedness at low frequencies display that COVID-19 is expected to have a long-term negative effect on the geopolitical risk levels and economic uncertainty. (Arshian Sharif, 2020)

The oil slump had the strongest impact on the US stock markets, the COVID-19 pandemic is causing outcome disruption, an exceptional increase in the US economic policy uncertainty and unprecedented response of the stock market.

Due to heterogenous developments of the Covid-19 outbreak across states, progress on reopening the economy are varying across the country.

As of late August, meaningful restrictions were still in place in close to 20 states, where personal care services, indoor entertainment, restaurants, and bars are either closed or partially open, and only small group gatherings are permitted. And some minor restrictions remain in almost all other states.

President Trump issued executive orders, these included: (TRUMP, 2020)

- using \$44 billion from the disaster Relief Fund to provide extra unemployment benefits
- continuing student loan payment relief
- deferring collections of employee social security payroll taxes
- identifying options to help renters and homeowners avoid evictions and foreclosures.

An estimated US\$2.3 trillion (around 11% of GDP) Coronavirus Aid, Relief and Economy Security Act (“CARES Act”).

The Act includes: (McConnell, 2020)

- 1)US\$293 billion to provide one-time tax rebates to individuals.
- 2)US\$268 billion to expand unemployment benefits; US\$25 billion to provide a food safety net for the most vulnerable.
- 3)US\$510 billion to prevent corporate bankruptcy by providing loans, guarantees, and backstopping Federal Reserve.

4)US\$349 billion in forgivable Small Business Administration loans and guarantees to help small businesses that retain workers.

5)US\$100 billion for hospitals,

6)US\$150 billion in transfers to state and local governments

7)US\$49.9 billion for international assistance.

Federal funds rate was lowered by 150bp in March to 0-0.25bp. Purchase of Treasury and agency securities in the amount as needed.

Lowered cost of discount window lending.

Reduced existing cost of swap lines with major central banks and extended the maturity of FX operations; broadened U.S. dollar swap lines to more central banks; offered temporary repo facility for foreign and international monetary authorities. (International monetary fund, 2020)

# CONCLUSIONS

As we have seen in previous chapters, there are many challenges for the global economy.

The crisis began with the destruction of the Chinese production chain due to measures for social distancing, and like the virus, contagion has arrived in all major trading partners of China, first with a sharp reduction in production caused by the economic model of globalization, that involves the production of a product in several countries, and then with the spread of the virus with the actual blocking of production.

But as predicted by the theory of Keynesian supply shocks the supply crisis will turn into a crisis of demand at the moment of reopen of industry, because lot of them can't survive this moment without government help, and the reduce of output and the increasing employment risk being a huge blow to economic growth in the coming years.

We have also analysed the effects on global trade and the differences in crisis responses from different sectors, and while the sectors considered essential remain open, the service sector is seriously struggling, but with some important exceptions such as the financial sector that surprisingly grows, even in this difficult period.

Another important consequence of the pandemic is the collapse in the price of oil, caused both by reduced demand but also by an excess in production caused by the breakdown of the 2016 OPEC agreement. This low oil price has major implications for the energy sector, with the decrease in investment to find other renewable energy sources, and on the stock markets.

Finally, after ascertaining the risk of a deflationary force, we studied the responses of the European Union, the China and the United States to the crisis, both fiscally and macroeconomically with the various strategies of central banks to allow a rapid "healing" of the economy.

For now, all human efforts are against this sneaky and dangerous virus, with the hope that soon we can get back to being close, travel and be able to rediscover the beauty of being together.

With my elaborate I close the three academic years spent at LUISS Guido Carli in exceptional way, I would like to thank Professor Amin Ashtiani very much for his help and for his availability, and I also thank my family for their support. *Audentes fortuna Iuvant e Ad maiora semper!*

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