Fighting the COVID-19 pandemic is a good rehearsal for tackling the global challenges the world will have to face in the 21st century. If we are smart, we can learn a lot from it.

COVID-19 is more than a pandemic

By KOEN DE BOSSCHERE

Small crises lead to small changes; large crises lead to large changes. COVID-19 is a large crisis but, at this moment in time, it is hard to tell what its long-lasting impacts on society and the economy will be. One thing is sure: we will all make a distinction between the time before Corona and the time after Corona, and the new normal is very likely to be different from the old normal, no matter how hard people try to go back to the latter. Historically, it might become as impactful as the fall of the Berlin Wall, or 9/11.

Although it is still premature to talk about the new normal, it is good to start thinking about it by analyzing how society is dealing with COVID-19 at the moment, and by looking at the trends and trying to imagine how they will evolve in the near future.

Key insights

- Thanks to all the previous efforts to digitize society and the economy, western countries were ready to go online quickly and without major disruption to essential services. A stable broadband internet connection at home has proven to be as essential as water and electricity.
- COVID-19 speeds up innovation and digitization, which creates huge opportunities for the computing industry in the coming years: more online services and automation in all economic sectors, more remote working, more e-commerce.
- COVID-19 is an opportunity to rethink and restructure the economy, and to prepare it for the challenges ahead of us. The post-COVID world will be different from the pre-COVID world: politically, economically, and societally. COVID-19 is a once in a lifetime opportunity to redesign the world we live in.

Key recommendations

- Europe should use the momentum generated by the COVID-19 pandemic to speed up digitalization of Europe by investing in broadband access for all, 5G, e-commerce, smart transportation, smart cities, …

When COVID-19 emerged in late 2019, most people could not imagine the impact it was going to have on the world. In the space of just three months, it spread to every continent, initially leading to the isolation of individuals, followed by a lockdown of cities and eventually a lockdown of most European countries in Spring and Autumn 2020. Only essential workers were allowed to go to work. All non-essential businesses had to close and large gatherings, including activities in schools and higher education institutions, were forbidden for months. Private mobility was severely restricted. Cities and countries came to a standstill.

Most European countries succeeded in reducing case numbers enough to allow them to cautiously reopen the economy by June, in time for the holiday season. However, only weeks after the start of the season, the number of cases started rising again, eventually leading to a resurgence (the 'second wave') in autumn. It then became clear that without the vaccination of the global population, the virus would continue to spread, leading to massive economic and human losses. Until a vaccine becomes available, the only option left is to learn to live with the virus.

For most people, more than anything else, the virus has impacted their lifestyle: less social interaction, less travel, fewer events, less personal freedom. Many people have struggled to believe that this is happening to them in the 21st century, and still hope that it is just an ordinary nightmare. Unfortunately, it is a reality, and it is both sobering and humbling.

The lockdown is without any doubt the biggest economic and social experiment of the early 21st century. A lockdown was completely unimaginable just a year before the pandemic struck. Such an experiment creates unprecedented learning opportunities: what went well, what went wrong, who was forgotten, how should we prepare for a recovery, what is the role of science in dealing with a global crisis, and how can we take advantage of this situation to do better in the future?

The situation is often compared with the Spanish flu of 1918-1919, which

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infected about 500 million people, killing 50 million. It is also compared with the Black Death of 1347-1351, which led to an estimated death toll of 75-200 million people. Both pandemics led not only to a lot of human suffering but also to profound and lasting societal and economic change. The Black Death dramatically improved the standard of living of the masses (due to a shortage in the labour force, they could negotiate better conditions), and it eventually marked the end of feudalism in Europe and the onset of the early Renaissance. The Spanish flu in time led to public healthcare systems and socialized medicine and healthcare [1, 2].

COVID-19 exposes existing strengths and weaknesses

Crises always put stress on systems, and, when a system is stressed, its strengths and weaknesses are exposed. Some wealthy countries did not have the courage or hesitated to make fast draconian decisions at the beginning of the pandemic with the hope of protecting their (large) economies as much as possible. In some cases, their hesitation led to additional economic and human devastation. The virus treats rich and poor countries alike. Many poor countries suffered a lot due to a lack of resources, but some of them dealt remarkably well with the pandemic. The resilience they need to survive in a normal situation might have helped them deal with the COVID-19 virus and its effects.

One notable case is the United States, where the presidential election campaign coincided with and became, in a sense, part of the pandemic, heavily politicizing measures to fight the virus. At state level, policy was determined not only by public health considerations but also by electoral considerations, and by the choice between *people first* and *economy first*. In some states, this approach has led to very high case counts, a severely stressed healthcare system and high mortality. It is surprising that the richest and smartest country in the world did not perform better, and was not able to reduce the case count far enough to allow a safe reopening of the economy. Indeed, four months was not even sufficient for the country to set up an effective nationwide testing system, while other western countries and some developing countries managed to set up a testing system in just a couple of months.

In Europe, over 30 sovereign countries had to fight the pandemic in their own territory, with their own resources. The public healthcare systems of most European countries did not collapse in the spring and were able to give care to the patients who needed it (but still with a high death toll). The United Kingdom and Sweden were two special cases: the UK was late to announce a lockdown, and Sweden decided to let the virus spread in its population in an unsuccessful effort to protect its economy. Future analysis will show what the best approach was. Surprisingly and unfortunately, no leadership or substantial help came at European level until mid-2020, when a recovery deal was approved.

The United States and Europe both suffered a serious second wave while many Asian countries were able to prevent it. For the first wave, one could argue that the virus was new, and that we were not prepared, but that argument does not hold for the second wave. The second wave was accurately predicted by the scientists, and still it caught us off guard. This brings back reminiscences of the 2008 financial crisis that we could not prevent and did not manage very well. It shows that the West is

not always superior to the rest of the world. Both events are damaging for the reputation of the United States and Europe, especially in Asia and in the Pacific. One day, these countries might question the preeminence of the United States and Europe in some areas and start wondering why, for example, the head of the World Bank is always an American and the IMF always European. Hence COVID-19 might eventually change the world order (a bit) [13].

There is a clear parallel between the second wave and climate change [8]: scientists have been warning politicians of its dangers for years and their models are quite accurate. It is a process with feedback loops, long delays and a potential tipping point. It is a global shift that requires urgent action and international collaboration to stop it, and the short-term solutions seem to hurt the economy. Hopefully, we will learn from COVID-19 how to best tackle that challenge [9].

The impact of COVID-19 on the economy

Given the duration of the pandemic, and the impact on society and the economy, it will take time to recover from the recession that follows the lockdown. Many economists were hoping that, after a short pandemic, the economy would experience a quick V-shaped recovery. Unfortunately, the longer the pandemic lasts, the less likely it is that we will see a fast recovery across all sectors of the economy. There is little hope that we will be back to normal before there is a vaccine that leads to herd immunity of the population. Vaccines will be available early 2021, but there will be an inevitable lag before a sufficiently large portion of the world population is inoculated.

The economic impact, however, depends on the sector. Important economic sectors like energy, construction and manufacturing were shut down for a relatively short time, and are recovering fast. Other sectors including the events sector (trade fairs, cultural events, sports), tourism and the hospitality sector, will not fully recover until an effective COVID-19 cure is found. Until then, these businesses will have to scale down, and many of them might go out of business, leading to considerable unemployment. According to the Federal Reserve Chairman Jerome Powell, the economy as we knew it might be over because the pandemic has accelerated the introduction of technology, e-commerce, telework and automation, and the lower-paid workers will be impacted more than higher-paid workers. It might take years to for the market to adjust [12].

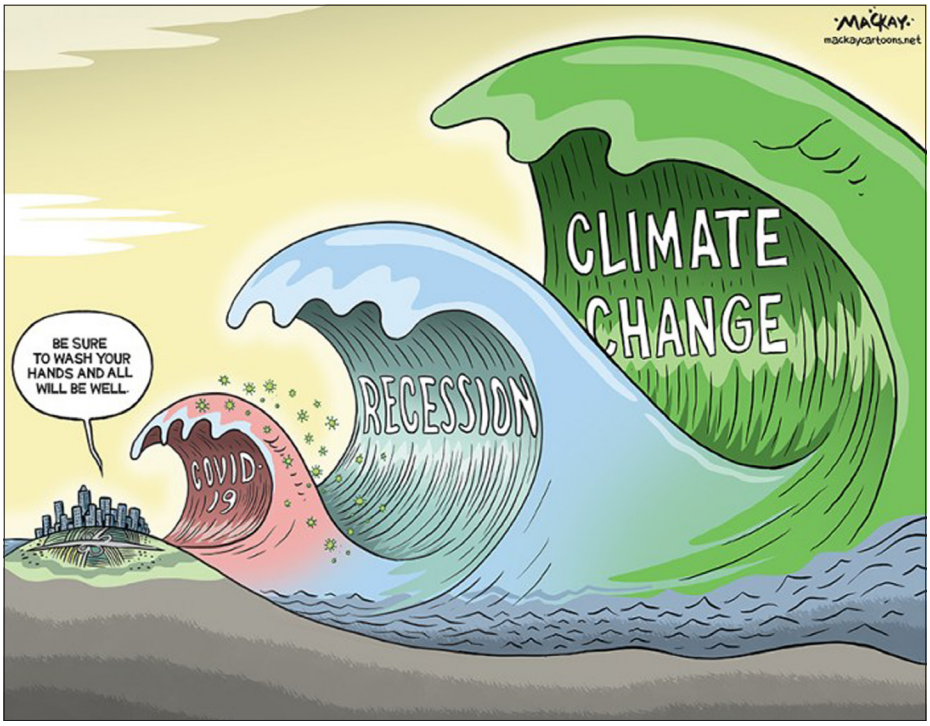

Figure 1: COVID-19 will not be the last global crisis (Source: https://mackaycartoons.net)

A shrinking economy leads to a shrinking tax revenue, and lower public spending (or increased debts). This is a double whammy: after all the extra expenses incurred to fight the virus, countries will need more money to support their economy and their social security (health care, unemployment benefits) at the very time that the budget is decreasing. Together with the rising costs associated with an ageing population and investments to fight climate change, this turns the aftermath of the pandemic into a perfect storm for years to come. In that budget situation, countries might become more self-centric, focused on their own problems, and less willing to help each other, or refuse to contribute to international organizations. Early signs of this are the growing number of countries that are leaving international agreements, or lose interest in international leadership. COVID-19 was the first pandemic for which the G7 could not agree on a common text because one country wanted to refer to COVID-19 as the "China virus" [7]. COVID-19 has already had an impact on the progress of the sustainable development goals [3].

At the same time, this situation might also be an opportunity to rethink the economy. Mass tourism has become a burden in many places, and air travel is one of the causes of climate change. Ecologists have long been advocating short food supply chains. Some countries tried hard to bring back manufacturing from the low wage countries. Donald Trump accelerated this process at a global scale with his "America first" stance.

Some economists are advocating new economic models like the doughnut economy [4], or other economic models that look not only at growth but also at other metrics to assess progress. All these models encourage governments to no longer invest in old industries with a large carbon footprint, but instead to invest in a green recovery [3] by supporting companies that work on sustainable solutions. Europe and Canada seem to be eager to take that path [11].

If we act smartly, the COVID-19 recession offers a unique opportunity to replace lost jobs with more sustainable jobs that compensate for the losses. Unfortunately, this will take some time.

Sovereignty

COVID-19 has shown a weakness of the global market. The international supply chains on which many countries rely for essential goods are not guaranteed to work well in the case of a major international crisis. In normal circumstances, if demand goes up, production is increased, and everything goes back to normal. This works well in the absence of natural disasters, export restrictions, war, etc.

The COVID-19 crisis has shown how dependent all countries are on the rest of the world. Most countries were not able to quickly produce the personal protective equipment (PPE) and the testing equipment they needed. Over the course of recent decades, many countries gave up manufacturing low cost commodity products, because they could be bought at a cheaper price in low-wage countries. At the same time, stockpiles were reduced because money could be saved by ordering in the moment. This works fine in a normal situation, but not in a global pandemic where a large part of the planet is in lockdown, and where the whole world is simultaneously and frantically trying to buy the same products (ranging from facemasks to ventilators to toilet paper). Setting up large-scale local manufacturing in a crisis situation is not simple and takes time. Even after six months, some countries were still struggling to get enough PPE for hospitals and nursing homes. This lack of PPE has led directly to the loss of thousands of healthcare workers across the world.

There is a lesson to be learned from this experience. Optimizing supply chains by buying from the cheapest supplier, and eliminating all buffers to save money, kills resilience. Even without man-made export restrictions, there can be situations in which supply chains are broken by external causes (natural disasters, war, global hoarding/stockpiling). For essential goods and raw materials, it is wise to always have at least one local source. It is worrisome that, today, some essential life-saving drugs are produced in a very small number of countries (90% of all penicillin is produced in China; Europe no longer produces paracetamol [7]. Europe might consider as a future requirement that essential goods like commodity medical equipment and life-saving drugs that are admitted to the European market are also (partially) produced in Europe.

Broken supply chains eventually get restored, and all the stakeholders involved work together to restore them as soon as possible. Export and import restrictions are totally different. They are political (e.g. to protect a country's own industry, or as a retaliation measure), which means that the industrial stakeholders involved can do little to lift the restrictions (especially if they were imposed by a different country). Only the politicians can do this, and the interests of a handful of companies might not weigh enough to change relations between countries.

The growing interest in sovereignty will unavoidably lead to further de-globalization, which has been an ongoing process over the last decade [7].

COVID-19 accelerates digital transformation

The sudden lockdowns in many countries forced companies and organizations to figure out how they could continue their operations under the restrictions and stay-at-home orders. Projects that would normally take months or years to implement were implemented in days, weeks or months. Examples of transformations that happened almost overnight are:

- Cashless payments. Today an increasing number of businesses simply refuse to accept cash. Such a transition would normally take years to complete in a cash-based economy, and require extra legislation. It is not likely that cash will make a massive comeback after COVID-19.
- Online teaching and testing. This was completely uncharted territory for most primary and secondary schools, but it has now become common in many places. For higher education, online teaching was not new, but the speed at which it was scaled up is unseen. It is clear that after the schools go back to normal, online teaching will be retained for some activities.
- Digital signing. Wet signatures on paper are impractical under stringent stay-at-home orders. It did not take long for digital signatures to be widely accepted for most documents that need to be signed. It is unlikely that wet signatures will come back. Governments should instead work on the infrastructure to support digital signatures.
- E-commerce. Companies that invested in an online shop before COVID-19 did not have to completely close their business during the lockdown and could continue to serve their customers. Major online

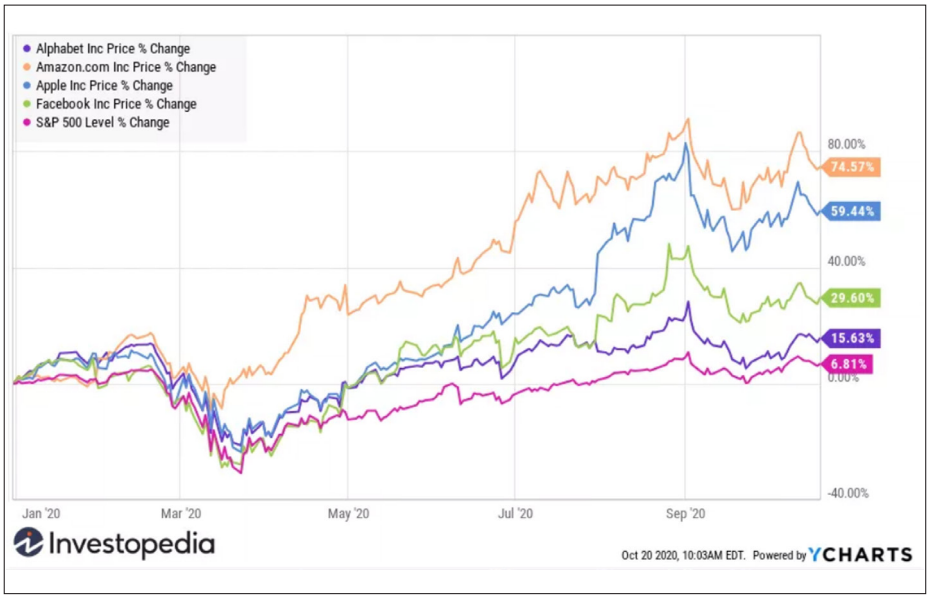

Figure 2: Evolution of the shares of big tech companies since the lockdown in mid-March.

shops experienced a large increase in trading, as did the shipping and courier companies. The fact that Amazon became one of the most valuable companies on the planet is no surprise (Figure 2).

- Remote working. Stay-at-home orders led to unemployment for people working in non-essential jobs that could not be done remotely and to home working for the rest. Whereas office work used to be the norm, and remote working the exception (often granted to the employee as a favour), telework has now become the new normal, and office work the exception, in many companies. Employers' attitudes towards home working have changed, and many employees have discovered its advantages (no time lost to commuting, more flexibility). Office work will return, but it will not replace all telework. This evolution will also impact the real estate market. Many people are looking for an apartment or a house with an extra room for a home office.
- Online meetings. Many people have discovered online video meetings during the lockdown period and have learned that they can be quite efficient for certain types of discussion. They also discovered the disadvantages: less opportunity for informal contact, less information about other participants from body language, more fatigue and exhaustion. Nevertheless, after COVID-19, online meetings will stay with us. Even medical doctors discovered that they could diagnose some of their patients remotely via a video chat – completely eliminating the risk of infection.

It is almost a miracle that this transition was able to happen so fast with the lockdown and stay-at-home-orders in place. This was only possible thanks to the fact that all the underlying technologies and infrastructure were already in place, and were ready to be scaled up via huge global data centres. Industry was ready for it; it only had to push the button. In the early days, there were some bandwidth and stability problems, but most of them disappeared very quickly. Lockdown and social distancing also created opportunities for innovative digital startups, which saw a surge in the adoption of their solutions, like companies producing rapid tests, vaccines, solutions for efficiently disinfecting objects, models to predict the evolution of the pandemic, …. It is fair to say that COVID-19 has spurred innovation, and that it is an accelerator for the adoption of digital technologies. It also unveiled the weaknesses of the adopted solutions. Since the COVID-19 situation will last for a year or longer, several of the ad hoc solutions will become permanent and there is a huge opportunity for the computing industry to launch new solutions.

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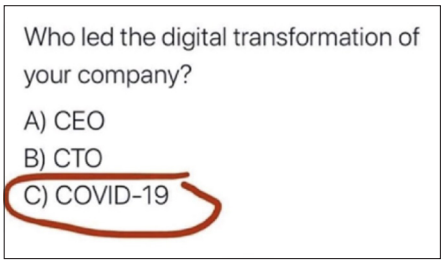

Figure 3: COVID-19 was in 2020 a main driver for digital transformation (Source: https://journal.laurea.fi/welcome-our-new-digital-transformation-officer-COVID-19/)

COVID-19 increases inequality

COVID-19 has impacted the less educated more than it has the well-educated and has affected females more than males. The reason is clear: those with lower levels of education more often carry out jobs that were affected by the lockdown (retail, hospitality) or carry out essential jobs (food preparation, cleaning, nursing, transport), which exposed them more to the virus (and to the costs of a treatment in the event of infection). Those with higher levels of education are more likely to have office jobs that can be done from home (teachers, managers, accountants), and they live in better homes, making it easier for them to stay at home and avoid infection. A stay-at-home order is simpler in a suburban house with a garden, a pool and a broadband internet connection than in a one-bedroom apartment in a city. To make things worse, a less educated person who lost their job will find it more difficult to find a new one, further increasing inequality. This is different from the situation after the Black Death, where there was much more work to be done than there were available workers.

But there is more. The impact of COVID-19 also has a varying impact on the different generations.

- Children will forever remember the year that they did not have to go to school. Children from underprivileged families were severely hit (no computer at home for online lessons, no daily hot meal at school, overcrowded homes with domestic violence, in some cases). This might have a lasting impact on their further development. Children from middle-class families might experience a far less negative impact from COVID-19.

Figure 4: Levels are historically high.

- University students (generation Z or zoomers) were suddenly studying at an online university, and many decided to move back to their parents' home after having lived for a couple of years in a university residence. This has social implications for both the students and their parents. Students found it more difficult to find student jobs (which had previously often been in bars and restaurants) to help pay for their study. Students graduating in 2020 and 2021 might end up with a higher student debt and might have a harder time finding a first job.
- Working parents with young children (the millennials) had a hard time too. They had to find a solution for their children who could not attend school, and were expected to help them with their schoolwork. At the same time, they also had to work full time, either at the workplace or at home.
- Working or recently-retired people in the 50-70 age group (baby-boomers) were probably hit the least. They do not have to combine caring for children with a job or retirement activities, and their age group was less vulnerable than the over-70s.

Depending on how hard the post COVID-19 recession hits and how long it takes to overcome it, the intergenerational solidarity between the boomers and the zoomers might be severely tested. The baby boom generation is now 55+, has built up some wealth and has recently retired or is looking forward to retirement. Many of them were not hit hard by COVID-19 or the recession. The zoomers, however, are now entering higher education. They will enter a job market that might not offer them full employment and many of them will carry a student debt. They will have to pay taxes to pay back the public debt incurred during the pandemic, for climate action and to support the ageing population (boomers and older). Debt levels have now surpassed the global debt level seen at the end of the Second World War (expressed at % of GDP, see Figure 4) [10].

When the boomers pass away, their wealth will be transferred to the zoomers' parents (millennials), not to the zoomers. So, COVID-19 might lead to serious discussions about new forms of intergenerational solidarity [5, 6].

Conclusion

COVID-19 is more than a pandemic; it has the potential to change the world as we know it. We will have to make the right decisions, and change the world for the better: more sustainable, more equal, more diverse. It is important to imagine the world you want in 2040, and then to work towards it, one step at a time. The world needs visionaries to show the rest of the world the possibilities.

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