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Global Economic Contraction

Re-assessing the impact of COVID-19

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Summary

- We have revised our economic forecasts and expect the global economy to contract by 2.6% in 2020.
- Countries that are expected to face the largest contraction are the US (-6.4%), Italy (-7.2%) and the UK (-6.8)
- If the lockdowns are successful in containing the virus, we expect to see the first (tentative) signs of a recovery in Q3 2020. Hence, we do not include a second wave of infections in late 2020, nor do we assume an extension of the lockdowns beyond Q2
- Governments have rolled out historically large fiscal stimulus packages to fight the crisis. These are mainly focussed on helping firms stay afloat instead keeping consumption up
- Emerging markets will face severe pressure due to the combination of battling COVID-19, currency depreciations, capital outflows, weak commodity prices and weak external demand
- In a risk scenario where the global lockdowns would be extended by three months, we expect the global economy to contract by -8.9% in 2020
- Although in this scenario we also expect a rebound in 2021, global GDP will still end up 6% below its pre-coronavirus trend
- In addition, countries with flexible labor markets (the US and UK) and open economies (the Netherlands and Belgium) would face the deepest troughs in this scenario
- How quick the recovery will be after the coronacrisis depends on how fast people get back to work and whether productivity growth is permanently damaged

Downward revision of global economic outlook

COVID-19 is affecting the global economy in a way most of us have never seen before. Over the course of the last couple of weeks, it has been challenging to translate the rapidly changing developments into our economic forecasts. On 1 March we [lowered](#) our global economic outlook and on 19 March we [shifted](#) to the pandemic scenario, slashing global growth even further. However, given the extreme economic events taking place, it became apparent that even this scenario was likely too optimistic. In the last couple of weeks, therefore, we have looked at our assumptions in more detail and have revised our forecasts again. **We now expect global GDP to decline by 2.6% in 2020 (Table 1)**. In terms of the peak in contraction, we expect the impact of the corona-crisis to overshadow even the impact of the Global Financial Crisis (see Table 1).

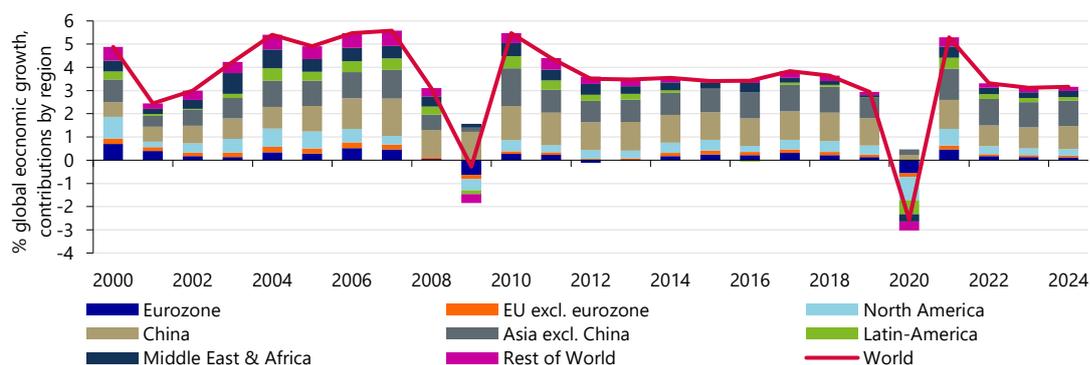
Table 1: Global GDP is expected to contract by 2.6% in 2020

GDP growth (volumes, %)	'19	'20	'21
Gross domestic product			
World	2.9	-2.6	5.3
US	2.3	-6.4	4.5
Eurozone	1.2	-5.2	4.3
- Germany	0.6	-4.6	4.2
- France	1.2	-4.6	3.8
- Italy	0.2	-7.2	3.6
- Spain	2.4	-5.9	5.0
United Kingdom	1.3	-6.8	4.6
China	6.1	1.2	6.2
Japan	0.8	-4.8	4.0
Brazil	1.1	-1.8	3.2
India	5.3	1.3	7.6
Australia	1.8	-3.2	4.1
Level in US dollar			
Oil	64	45	61

Source: Rabobank, NiGEM, Macrobond

We expect economic growth to plunge in all major economies, with the US, Italy and the UK seeing the largest GDP declines (more than 6%, see Figure 1). Large emerging markets such as China and India are expected to grow by a little over 1% in 2020. However, keep in mind that these economies would under normal condition be able to grow by 5% to 6%.

Figure 1: Global growth is taking a more severe hit than the Great Financial Crisis

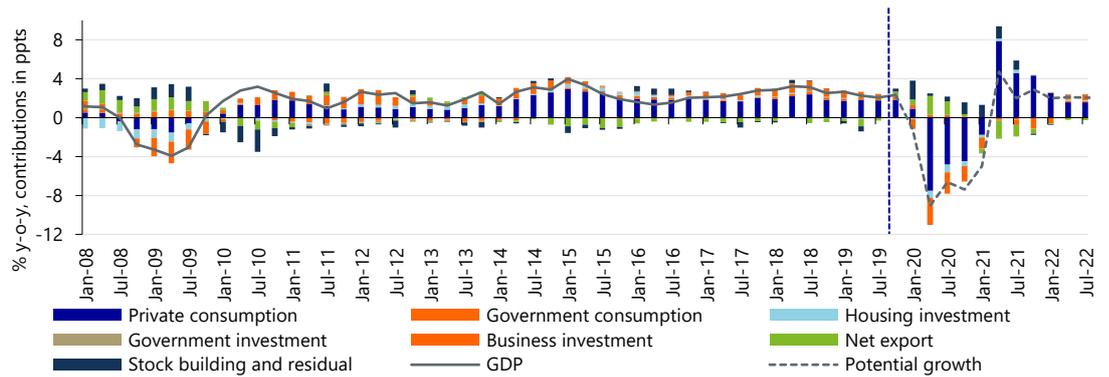


Source: Rabobank, Macrobond, IMF

Timing and depth

In terms of timing, we expect a sharp contraction of economic activity in Q1 2020 in countries that were the first to be exposed to the COVID-19 outbreak, such as China, Singapore, and South Korea. Countries that experienced the corona-epidemic at a later stage are expected to face the peak in contraction in Q2 (see Figure 2).

Figure 2: US economy will go off a cliff in Q2



Source: Macrobond, Rabobank, BEA

Many countries across the globe have implemented some sort of lockdown to contain COVID-19. If these lockdowns are successful in containing the virus, we expect to see the first (tentative) signs of a recovery in Q3 of 2020. Thus, as of now, we do not assume in our forecast a second wave of infections in late 2020, nor do we expect an extension of the lockdowns beyond Q2. Given the information we have at this moment, it seems likely that lockdowns will continue to be in place in the coming weeks, with each lockdown lasting anywhere between 3 to 10 weeks (see Appendix B).

However, the longer the lockdowns will last, the more likely it will become that economies are scarred structurally, and the lower the expected rebound after 2020. Essentially this is because the demand shock that follows the supply shock would be even bigger. Therefore, we have also looked at **two risk scenarios** in this report. In the first risk scenario, we have assessed the economic damage in case the lockdowns are extended by three more months. We have also quantitatively calculated the impact on the global economy in this scenario. In the second scenario, we discuss qualitatively how the global economy would be affected in case the current health crisis results in a credit crunch comparable to the 2008-09 Global Financial Crisis. We discuss the results of these scenarios in more detail further in this report.

What has happened so far?

Lockdowns across the globe

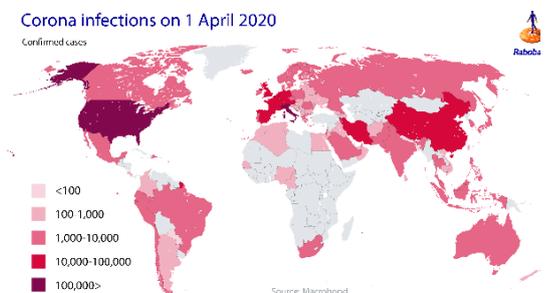
COVID-19 has spread from China to virtually every county on the planet (see Figures 3 and 4), with Italy and the US currently being the epicentres of the virus.

Figure 3: The epicentre of COVID-19...



Source: European Centre for Disease Prevention & Control

Figure 4: ...has shifted to the US and Italy



Source: European Centre for Disease Prevention & Control

As a result of the global spread of COVID-19, governments have increasingly started implementing lockdowns. Not all lockdowns are equally severe, but many share the following characteristics: people are being told to stay at home most of the day; non-essential businesses

are being shuttered; and international travel, even within the Eurozone, has largely ground to a halt. Consequently, there is weak economic activity in virtually all sectors, with restaurants, hotels, bars, retailers, tourism and leisure (e.g. airlines and cinema's) hit hardest. Unemployment is also skyrocketing.

In order to gauge the impact of the lockdowns on the economy for our economic forecasts, we have used a bottom-up sectoral approach rather than the top-down estimation that we used in our previous forecast (see Appendix A for our methodology).

Trade collapses

With unprecedented simultaneous supply and demand shocks to the economy, international trade has also collapsed. This will hurt open economies such as Singapore, Belgium, and the Netherlands. Next to diminishing demand from abroad, international trade will become more cumbersome due to higher transaction costs. Due to travel restrictions and factory shut-downs certain inputs will simply not be available (forcing firms to look for alternative suppliers), and for those that are available to deliver, the time to market will be longer. Moreover, we have seen a resurgence in protectionist actions. Some, such as Vietnam, Russia, and Ukraine, are hoarding key crop exports, while almost all are either hoarding key medical supplies or desperately trying to boost their domestic production of them to limit their external reliance.

To take into account the impact of trade disruptions in our revised forecasts, we have imposed trade-related shocks to all countries across the globe (see Appendix B), where in our previous calculations these shocks were limited to China. Finally, we have adopted higher food prices due to global food supply bottlenecks (see box below and Appendix B).

Impact of COVID-19 on global F&A sector

The food sector is currently experiencing **logistics and supply chain uncertainties**, including e.g. border closures, port lockdowns, flight cancellations and disruptions of goods transport. There are concerns about food becoming scarce since some key exporting countries have imposed **export restrictions** on some of their key food products like rice (for example [Vietnam](#)) and wheat. Meanwhile, some major importing countries are ramping up purchases to stock up on inventories and ensure food security.

Food security partially depends on farmers' and food producers' capacity to maintain production and supply goods to local and global markets. Many of the above described disruption effects are expected to last only temporarily, but the current **uncertainty might lead to production cuts which often cannot be reversed quickly**. Here it helps to realize that food production depends how labor intensive and difficult to store it is.

For example, fresh produce are labor intensive and difficult to store, and farmers need to decide at the time of planting if sufficient labor is available to harvest the fruits or vegetable. Moreover, these farmers have to assess whether there will be sufficient demand for their products at harvest time, as storing is costly and entails quality losses. In the current uncertain environment, this can result in production cuts and, given the growing seasons, such changes can only be reversed in the next planting season one year later. Grain farming might be more resilient, as it involves limited manual labor and grains can be stored relatively simple and for a long period of time.

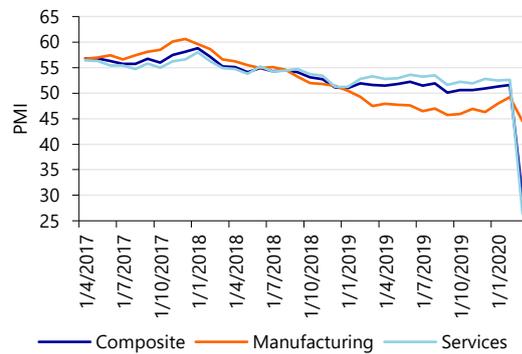
In short: **if the current virus control measures in countries are removed after a relatively short period of time then disruption of overall global food supplies can largely be avoided**. However, if more severe and long-lasting restrictions were to remain in place in a larger number of countries then the impact on the F&A sector would be felt in more severe disruptions of global supply chains. Food security in the developed world would still remain

intact, but not all products would always be available. Importing countries in the developing world, on the other hands, would likely experience a negative impact on food security – with potential (geo)political consequences. All of our F&A reports related to COVID-19 can be found [here](#).

High-frequency economic data sketch grim picture

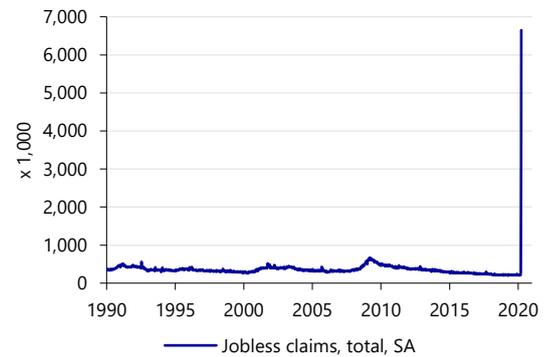
We already see some of the impact of both government-imposed lockdowns and of voluntary public ones in some high-frequency data. European and US PMIs are deep in recessionary territory (Figure 5). For example, Italy’s services PMI in March came in at 17.4, the lowest PMI number ever measured and commensurate with a crippling economic downturn.

Figure 5: Eurozone PMIs have plummeted, with services taking the biggest hit



Source: Macrobond

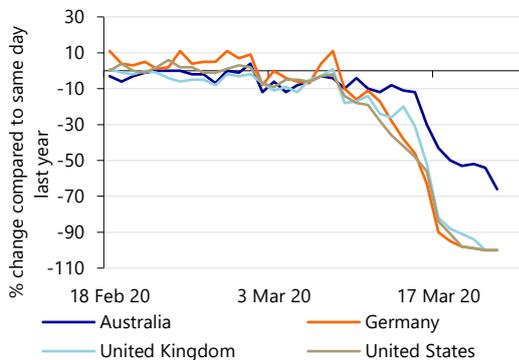
Figure 6: 10 million US unemployment claims in two weeks



Source: US Department of Labor, Macrobond

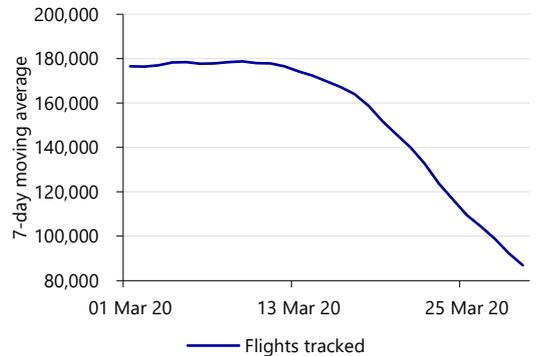
As telling are timely labour market data. The US already has seen back-to-back initial unemployment claims of 3.3 million and 6.6 million in two weeks (Figure 6). This was then followed up by a -701K print in US non-farm payrolls for March. In short, unemployment levels in the US are expected to rise substantially. Going forward, unemployment is expected to increase sharply as firms around the world are forced to lay off workers to save on fixed costs. Workers with flexible contracts will bear the initial brunt of these lay-offs, and we expect a very sharp rise of unemployment in countries with flexible labour markets, such as the US and the UK.

Figure 7: Restaurant bookings have collapsed



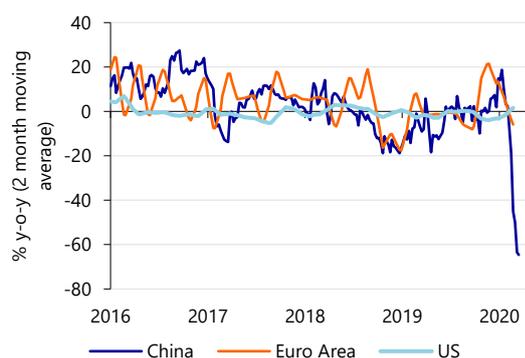
Source: OpenBook

Figure 8: Flights have been cancelled



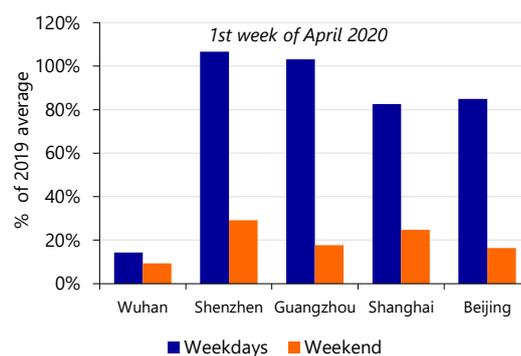
Source: Flightradar24

Figure 9: Automotive sector awaits major shock



Source: ECB, China Passenger Car Association, BEA, Macrobond

Figure 10: Traffic data in China does not show a rebound, especially not during weekends



Source: TomTom Traffic Index

Households already cannot spend because they are in lockdown, but now many are threatened with losing their jobs as well, reducing spending further and pulling down business activity in tandem. Data on auto sales, the number of global flights taken and restaurant bookings all sketch a grim picture. In many respects, this is almost the perfect economic storm of collapsing demand and supply feeding on each other – and the longer the crisis goes on, the deeper the damage is and the harder it will be to reverse after the virus has been overcome. In some cases, unemployment could rise from 4% to 20% in just a few months: but can it return from 20% to 4% as rapidly after the worst of the virus has passed? That crucially depends on whether a spike in bankruptcies can be avoided.

No quick rebound

China is showing that even with the virus apparently under control the economy does not quickly rebound in the next quarter. We saw a collapse in February PMI surveys to levels below those recorded during the trough of the 2008 global financial crisis. March saw a bounce-back to over 50 in manufacturing, but this was merely an indication of relative month-to-month improvement rather than an indication that business is back to normal. Indeed, traffic data shows that movement in large metropolises in China is still far below normal levels, especially during weekends (Figure 10). Meanwhile, China has been forced to close its cinemas after re-opening; social distancing measures remain in place; unemployment remains elevated; confidence has been hit; its international borders are largely closed; and, importantly, its exporters have nobody to sell to. All in all, the relatively strict lockdown in Q1 and Q2 will likely be followed by a “smart” lockdown in which restrictions will be relaxed, but life and the economy will be far from normal Q3 and Q4.

We also expect some productivity damage by the coronacrisis, because less trade will lead to lower knowledge spillovers and competitive pressures. Moreover, domestic investment in innovation is expected to be scaled down by firms, as their operating costs are expected to rise substantially, forcing them to critically re-assess budgets for R&D. In contrast, we expect public R&D spending to increase significantly due to global efforts to find a vaccine for COVID-19. Moreover, it seems possible that the post-corona landscape may be dominated by surviving larger firms, and/or by firms who have come to rely on government support – an acceleration of the ‘zombification’ trend already underway globally.

In order to take into account productivity effects in our forecasts, we have calculated endogenous Total Factor Productivity (TFP) effects for the US, China, Germany, the Netherlands and India (see Appendix A and B). The effects of these individual countries have also been mapped to developed countries and emerging economies which share the same economic characteristics.

Policy measures - from billions to trillions

Governments and central banks have not stood by. Instead, we have seen what is in effect war-time economic policy rolled out. The mitigating impact of the various government packages has been taken along in our economic forecasts (see Appendix B). Below we give a short overview.

Monetary policy response

Central bank policy rates have been slashed to the zero lower bound in almost all major economies with the exception of China, and towards zero even in some emerging markets. Extraordinary monetary policy such as QE has been expanded or introduced for the first time even in traditionally conservative locations such as Australia and New Zealand. Yield curve control policies have also been introduced as well to ensure that treasury bond yields remain low beyond the very short end. Central banks are also making clear that they will support fiscal expansion – in Europe's case the ECB is openly lobbying for it.

Moreover, many central banks have made clear that they will inject liquidity directly into the economy if necessary too via loan support for firms large and small. If 2008-09 was the "too big to fail" crisis, 2020 is the "too many to fail" version: central banks cannot allow a swathe of firms to collapse domino fashion for fear that the economic damage will be so severe that any V-shaped recovery would prove impossible.

Internationally, the Fed has also expanded its swap lines with other central banks, and has offered a new repo facility for any central bank, not just for G10 or major economies, who are holding US Treasuries to try to alleviate USD liquidity pressures.

Fiscal policy response

Meanwhile, governments have massively expanded fiscal stimulus in tandem. With new spending measures being rolled out on an almost weekly basis, including direct payment of wages for furloughed workers or 'helicopter money' cash transfers to households – even in some emerging markets. These policies take us in to new political-economy territory in most cases.

It is difficult to capture accurately how large the fiscal packages being offered are because a lot is contingent loan guarantees that may not be triggered. However the US has passed a USD 2.2 trillion virus-fighting package on top of a pre-existing USD 1 trillion fiscal deficit, is planning to top this up with a further USD 600bn in a phase three package, add another USD 250bn to help SMES, and there is also talk of a USD 1 (or 2!) trillion phase four focused on infrastructure. In short, it is clear that we are in entirely new fiscal territory - even more so when the central bank is prepared to finance this state spending via QE. Indeed, as we underlined before this actually occurred, the fight against the virus would require a World War II level of fiscal deficit – and is now appearing. Indeed, Japan is also rolling out a fiscal stimulus package totalling up to 20% of GDP (JPY 108 trillion, the largest stimulus package in Japan's history), the UK one of 15% but potentially far higher, and even Germany is pledging at least 10% of GDP. We estimate the German budget balance to deteriorate by 5.8%-points, but debt to GDP is likely to rise significantly more than that due to government lending schemes and loan guarantees.

Also worth noting is that while some economies move closer to so-called Modern Monetary Theory (MMT), Europe still remains limited by the fiscal straitjacket of the Euro: as such, political pressure is building for the introduction of 'coronabonds' allowing debt burden-sharing, which is obviously extremely controversial. Some member states argue that this takes away the external incentive for countries to manage their debt levels and as such it has re-exposed the North-South divide. For now we assume that other avenues (which circumvent the more 'permanent' liability sharing issue) will be used to finance programmes. This may include ESM credit lines (with eased conditions) and additional room in the EU budget. But market pressures may rise and force Eurozone members into more lasting solutions further down the line.

From a purely economic perspective, there is also one crucial question: will even these vast fiscal packages prove enough to reverse the devastating economic downturn being experienced in the real economy? Fiscal support for loans or loan guarantees could keep companies in operation but will not stimulate the recovery. Indeed, without putting money directly into the pockets of consumers to generate demand, firms may lack the confidence to borrow.

Emerging Markets set for far more pain

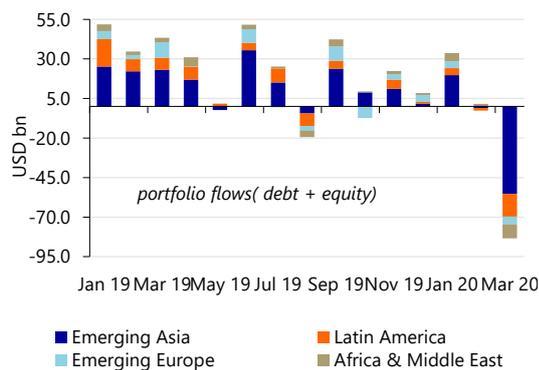
While developed economies and China are clearly set for real economic distress, the pain in emerging markets is arguably going to be far worse. Most emerging markets seem to be at the beginning of their virus outbreak. Yet when COVID-19 arrives, it will hit economies unable to physically handle the requirements of social distancing and regular hand-washing. Where lockdowns are imposed in EMs there are concerns over social unrest and/or humanitarian disasters. In addition, most emerging markets also have poor public health-care facilities, which means they will easily be swamped once COVID-19 spreads.

From a macroeconomic perspective, emerging markets also have relatively limited fiscal resources to cushion the blows of any lockdowns; they cannot afford to pay people to sit at home and wait this out; neither can they bail out all suffering firms with loans. On the monetary policy side, policy rates are being cut which will not boost demand due to extreme uncertainty – fiscal policy is key, as we see in the West.

The collapse in global trade means that emerging-market exports, both in volume and price, are about to take a huge hit – to say nothing of tourism services. To give an example, the main export products of Russia, Brazil and Indonesia are crude oil, soy beans and palm oil, respectively. The value of these commodities has declined by 47%, 13% and 29% respectively since the beginning of 2020. For many EMs, such declines in commodity prices means a major slump in growth that the state is unable to mitigate fiscally. It also means a plunge in crucial USD earnings needed for foreign debt servicing and imports.

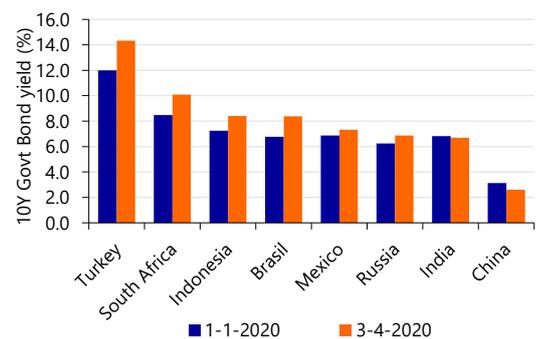
As a result, we are already seeing capital flight (Figure 11) and emerging market currencies have been slumping vs. the US Dollar. Many countries will inevitably be forced to seek the aid of the IMF: indeed [85](#) already have. Yet the scale of the help required is potentially enormous.

Figure 11: Recording capital outflows, driven by emerging Asia



Source: Institute of International Finance

Figure 12: Borrowing costs to fight COVID-19 are going up, not down



Source: Macrobond

Risk scenarios

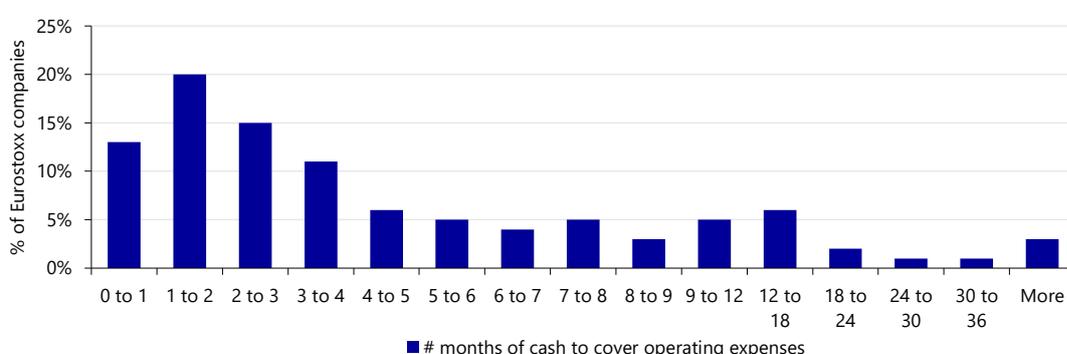
With events moving as rapidly as they are at present, looking ahead is particularly perilous. Nonetheless, we have quantified one key downside risk scenario: an extension of the lockdown by three months, and we will discuss other risks.

Extended lockdown

Worryingly, there is no guarantee at all that lockdowns for three months will work in dealing with the virus threat. Restarting economic activity might well spark another outbreak, a risk that China and Iran are now taking, and which parts of Europe may soon opt to follow. Should we see the virus return as soon as controls are lifted, prompting an immediate full or partial reversal--and flagging that there is no way out of this crisis until a vaccine is available to all - then the economic damage would be *extremely* severe.

To give an idea of the economic impact, we have quantified a risk scenario where the global lockdown would be extended by an additional three months (see Appendix A for the lockdown period in our baseline). Effectively, this means that there will be a total lockdown in 2020 of *on average* four to five months in all countries across the globe. In this scenario, certain industries that rely heavily on the summer will be hit, for example the events sector. More generally, we expect bankruptcies to increase significantly, as firms run out of cash to pay for their fixed costs. In Europe, for example, 70% of listed firms have less than 6 months' worth of cash to cover their operating expenses (figure 13).

Figure 13: Listed firms in Europe do not have enough cash to withstand a prolonged lockdown



Source: Bloomberg

Note: this is a 'conservative' analysis as it does not adjust for depreciation and assumes zero revenues

The impact of an additional global lockdown of three months will be devastating (Table 2). We expect the global economy to contract by -8.9% in 2020, and a rebound of 9.4% in 2021. The large adverse effects are not surprising, because in this scenario the global economy is practically shutdown for almost half a year.

Table 2: Impact in extended lockdown scenario

GDP growth (volumes, %)	'19	'20	'21
Gross domestic product			
World	2.9	-8.9	9.4
US	2.3	-16.9	12.0
Eurozone	1.2	-12.0	8.3
- Germany	0.6	-11.1	8.4
- France	1.2	-11.3	7.7
- Italy	0.2	-12.6	4.8
- Spain	2.4	-13.5	9.4
United Kingdom	1.3	-13.9	8.3
China	6.1	-3.2	9.6
Japan	0.8	-12.7	11.6
Brazil	1.1	-7.1	10.7
India	5.3	-3.8	9.0
Australia	1.8	-7.8	7.4
Level in US dollar			
Oil	64	45	61

Source: Rabobank

In our extended lockdown scenario the US (-16.9%) and UK (-13.9%) are hit substantially due to flexible labor market dynamics. As unemployment would skyrocket, there is substantial risk of adverse knock-on effects on aggregate demand which is causing an extra deep through. Small open economies would also bear the brunt, such as the Netherlands (-14%) and Belgium (-15.1), as these countries can rely less on a big internal market to keep the economy going to some extent.

Additional risks: credit crunch

Additional knock-on effects, such as a financial crisis and credit crunch, seem much more likely in this scenario than a shorter lockdown. It goes without saying that a breakdown in the real economy and financial markets would indeed be a meltdown that would both extend and deepen a downturn that will already dwarf that seen during the GFC. We have not explicitly modelled, that, however, in our current scenario exercise.

What might the recovery look like?

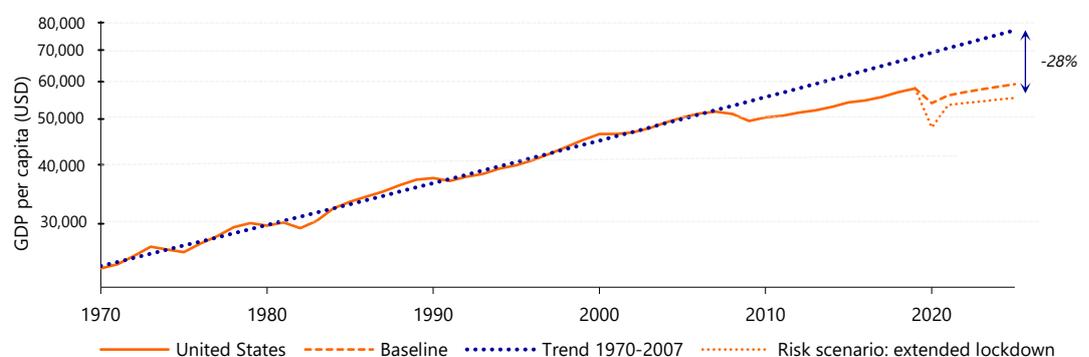
An important question is what the economic recovery look like after the corona crisis. In short, whether we go back to GDP levels before the crisis quickly or stay below these levels depends on the **labor market recovery** and potential **damage to productivity growth**.

Regarding the labour market, even in our base case, unemployment in many countries will not go down directly. Even if demand picks up directly, it generally [takes half a year](#) for employment to pick up as well. What might aggravate the labor market recovery even more is that demand could be subdued for some time as well, as a feeling of uncertainty will linger among consumers and companies.

If we end up in one of our downside risk scenario's, the long-term damage to the economy will be more substantial, which could harm growth potential as well. This means that the slope of the economic growth trend will go down and it will take a longer time to go back to pre-crisis GDP levels.

Damage to economic growth potential is more likely if spells of unemployment are longer, as this can result in so-called [scarring](#). Namely, being unemployed for too long can result in a loss of people's skill set, which leads them to become 'trapped' in less-paid jobs in the future. There are indeed studies that find that (early) unemployment spells result in a 'wage penalty' of 13% to 20% (compared to a situation without unemployment). People that cannot find a job can also become discouraged and withdraw from the labor market entirely, which will hurt structural labor supply going forward.

Figure 14: Together, two severe crises have led to 28% of missed welfare for each US citizen



Source: Rabobank

Finally, there is a chance that the current crisis has a permanent impact on productivity. This happens, for example, if trade is disrupted for several years and impediments to global knowledge

spillovers rise. Furthermore, in times of a finance distress, firms might choose to cut down on investment in innovation, human capital and R&D. Finally, it seems possible that the post-corona landscape may be dominated by larger firms, less entrepreneurship and/or by firms who have come to rely on government support, which might foreshadow an acceleration of the [‘zombification’](#) trend already underway globally.

Appendix A: Methodology of economic forecasts

Econometric global trade model NiGEM

For our economic forecasts and scenario analysis, we use the macro-econometric world trade model NiGEM. NiGEM is developed by NIESR, estimated in a 'New-Keynesian' framework. This means agents are forward-looking, but rigidities result in a slow adjustment process in case of external events or shocks. Rabobank has been using this econometric model for over a decade now and other institutions, such as the Europe Central Bank and the Bank of England, use the model as well. We actively conduct forecasts for the following countries: Japan, Indonesia, India, China, the US, Chile, Mexico, Canada, Brazil, the UK, the Netherlands, Germany, France, Spain, Italy, Belgium, Australia and New Zealand. The forecasts for other countries are endogenously being determined in the model.

Using NiGEM has three main benefits. First, the model allows us to assess the impact of several key variables in the short to medium term, such as exchange rate fluctuations, impediments to trade, foreign direct investment and the labor market. Second, countries are linked to each other through trade and competition, interaction of financial markets and international asset stocks. NiGEM ensures that all economic variables are viewed within a closed accounting setting and economic shocks, such as several shocks due to the corona pandemic, are accounted for via these interdependencies. Third, NiGEM is an error-correction model, which means that short-term deviations of GDP from a country's growth potential are made up eventually. So in the long-run, growth is driven by structural factors, such as capital formation, structural employment and labor-augmented technological change.

Productivity models

A disadvantage of NiGEM is that productivity effects are more or less fixed, as labor-augmented technological change on the supply side of the model is exogenous. However, the dynamic productivity effects of disruptions on globally integrated supply chains can potentially be substantial. There is a vast strand of literature that shows that *trade* has a significant impact on productivity. See [Erken, Donselaar and Thurik \(2016\)](#) for an overview. First, knowledge developed abroad positively affects domestic productivity, but these spillovers are not automatic or exogenous. Well-known conduits of international knowledge spillovers are [human capital mobility](#), [foreign direct investment](#) and [trade](#). Trade fosters foreign knowledge spillover effects, as firms can use [foreign-produced intermediate inputs](#). Moreover, downstream users can reverse engineer technologies embodied in innovative final imports and use this knowledge in their own production processes.

Nevertheless, developed economies are also affected directly by the trade disruptions, as openness to foreign trade fosters market competition, which stimulates firms to reduce their X-inefficiencies and increase efforts to innovate. In this sense, import competition will result in more innovative, more efficient firms (the *within* firm effect). Secondly, there are [sector composition effects](#) (the *between* firm effect): lower trade costs will result in reallocation of labor and capital toward more productive and skill-intensive firms within sectors and toward skill-intensive sectors in all countries. Within and [between-industry reallocations](#) of economic activity during periods of trade liberalization raised average productivity in all industries, but more so in the comparative advantage industries. For European firms, [Bloom, Draca and Van Reenen \(2016\)](#) find that Chinese import competition has increased technical change within European firms (*within effect*) and also caused a shift of employment towards technologically more advanced firms (*sector composition effect*). Taken together, these effects account for 14% of European technology upgrading in the period 2000-2007. Other studies ([here](#) and [here](#)) that find a robust direct positive effect of international trade on productivity. As trade has a beneficial impact on labor productivity development, a pullback in trade caused by higher trade costs should have an adverse impact on

productivity. Besides adverse productivity effects due to disrupted trade, domestic investment in innovation is expected to be scaled down by firms, as operating costs are expected to rise substantially, forcing firms to critically re-assess budgets for R&D. Finally, entrepreneurship might end up on a lower level due to the coronacrisis, which results in less Schumpeterian creative destruction necessary to reallocate production factors to their most productive needs.

In the past years, we have developed productivity models for the [US](#), [Germany](#), [the Netherlands](#) and [India](#) to gauge dynamic productivity effect in scenario analyses. For an extensive review of all the models that have been developed, we refer to the reports in the hyperlinks. For China, we have developed a more sophisticated TFP model than in our [study](#) dating back from 2018.

Appendix B: Assumptions

Impact of lockdowns

To gauge the impact of lockdowns on lower economic activity, we have used a bottom-up approach rather than the crude top-down estimation that was used in our previous [forecast](#). In this bottom-up approach we used data from the [EUKLEMS database](#) to break down the division of labor in terms of hours worked across 37 industries in all the economies that we forecast.¹ Next, we used input from Rabobank's country and industry experts who made an assessment of lower economic activity across these 37 industries due to the lockdowns. Combining both parameters, for each industry we have calculated the effect of the lockdown in terms of a change in hours worked per quarter. Finally, we have translated the lockdown impact in the agriculture, mining and manufacturing sectors into a macro economic shock on *inventories*, which we use as input in NiGEM. The idea is that supply-side shocks due to lockdown in these specific sectors result in lower production, whereas consumption remains partly intact. Firms consequently scale down on inventories to be able to meet demand. As stocks are not an adjustment factor in the services sector, we translate the lockdown effects on production in these specific sectors into a macroeconomic shock on private consumption.

In our baseline scenario, we assume lockdowns will be in place mostly in Q2 of 2020. Table B.1 provides an overview of the (expected) lengths of the lockdown per country.

Table B.1: Expected length of lockdown in weeks

Country	Q1 2020	Q2 2020	Expected end of lockdown
Australia	1	4	End April
Belgium	2	8	End May
Brazil	1	3	Second week April
Canada	-	3	Mid-April
China	6	2	Second week April
Mexico	-	4	End April
New Zealand	1	4	End April
Netherland	2	8	End May
India	1	2	Second week April
Indonesia	1	4	End April
Italy	3	8	End May
Japan	1	4	End April
France	2	8	End May
Germany	2	8	End May
Spain	2	8	End May
United Kingdom	1	8	End May
United States	2	8	End May

Source: Rabobank

¹

Trade disruptions

We assume that trade around the world will become more cumbersome because of disrupted supply chains. Because trading (key) intermediate inputs will take more time and effort, essentially the transaction costs of trade will increase. These transactions are not related to tariffs, rather they represent the costs of (for example) waiting for needed inputs and/or contracting new suppliers. [Linders \(2006\)](#) calls these trade frictions *intangible barriers to trade* and argues that they reduce global trade. We translate these intangible trade barriers into *ad valorem* tariff equivalents, which we apply as shocks to export prices in NiGEM.

We translate intangible trade barriers into a tariff equivalent using a [OECD](#) study that estimates the ad valorem price equivalents (AVE) of various non-tariff-measures (NTMs) for individual industries per country. We use two types of these NTMs: sanitary and phytosanitary measures (SPS) and border control measures (BCM). We believe these NTMs are a fair proxy for trade frictions resulting from disrupted supply chains due to the coronavirus. For our baseline scenario we adopt three SPS. For our extended lockdown scenario, we adopt five SPS and one BCM.

Ultimately, the AVE of each measure differs per sector and per country. For each country we take an industry-weighted AVE, which is our proxy for that country's higher trade (export) costs. Table B.2 presents an overview of the country-specific AVEs in each scenario.

Table B.2 : Ad valorem tariffs as proxy for intangible trade barriers

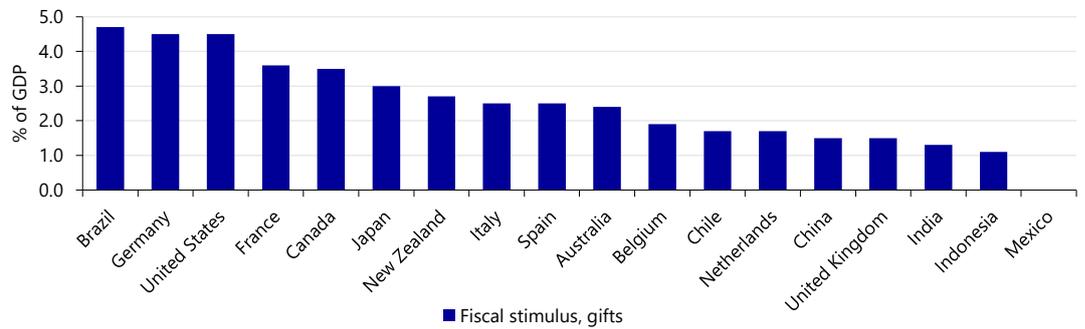
Country	Baseline scenario	Risk scenario 1: extended lockdown
Australia	3%	5%
Belgium	7%	11%
Brazil	11%	19%
Canada	4%	7%
China	8%	14%
Mexico	2%	4%
New Zealand	5%	9%
Netherland	4%	7%
India	4%	7%
Indonesia	6%	10%
Italy	5%	9%
Japan	1%	3%
France	2%	4%
Germany	7%	12%
Spain	9%	16%
United Kingdom	4%	7%
United States	2%	4%

Source: Rabobank, OECD

Government stimulus

In order to estimate the mitigating effect of fiscal stimulus, we have crowd sourced the opinions and knowledge of our economists and estimated the impact of fiscal stimulus in (percentage of GDP) for each country. In doing this, we have tried to only incorporate fiscal measures which we think are representative of a gift to households instead of loans to firms. The latter are for example guarantees on loans, direct loans, or relaxed borrowing requirements for companies. Such loans do not add directly to consumption, rather they keep unemployment from increasing by keeping firms afloat. Moreover, in our assessment of the size of the fiscal stimulus, we have kept in mind that this stimulus will only partially lead to an increase in consumption as consumers at the height of the pandemic will be reluctant to consume the extra income and will more likely save it. Figure B.1 contains the outcome of the whole exercise. We have used these fiscal stimulus estimates as input in our model (NiGEM) to simulate the effect of fiscal stimulus on private consumption.

Figure B.1: Fiscal stimulus targeted to households for selected countries



Source: Rabobank, country government websites, media

Food prices

We assume a relatively modest impact on food prices, despite some countries having tried to hoard food exports. We think that ultimately many of these countries will also take into account the much needed foreign currency from food exports, as well as the geopolitical ramifications food export bans might have. Vietnam for example initially announced an export ban on rice, which it scaled down later.

For the expected increase in food prices we again use the [OECD study](#) on non-tariff-measures (NTMs). Since limiting the export of a particular food type is in a way a NTM. A food ban can be classified as a quantitative restriction (QR). We calculate the ad valorem price equivalent (AVE) corresponding to QR for four food categories. Those categories are processed food, live animals, fats and oil and vegetable products. We calculate the weighted average of the four AVEs belonging to these different food types. The weights are based on their share in global trade. Ultimately, the weighted average of AVEs amounts to **5%**, which is the overall estimate of the global food price increase in case countries restrict their food exports (Table B.3).

Table B.3: Estimate of world food price increase

	<i>Share in total food trade (A)</i>	<i>Estimate of price increase, based on OECD (B)</i>	<i>Weighted average (A*B)</i>
Vegetable products	31%	3%	0.9%
Live animals	13%	4.4%	0.6%
Processed food	47%	6.6%	3.1%
Fats and oil	9%	4.6%	0.4%
Total / average	100%	4.7%	5%

Sources: OECD, GTAP trade model, Rabobank

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