

Economic effects of Covid-19 in Luxembourg

First RECOVid working note with preliminary estimates

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While medical staff has been serving on the front lines since early March, each research discipline aims to offer its humble contribution to the battle against the pandemic. The public health crisis and the measures implemented to make it less severe are more than likely to lead to a deep economic recession which opens up the possibility of systemic collapse of the global economy or of the European financial market. Unsurprisingly, leading economists around the world have suggested plans of actions to mitigate economic damages from Covid-19. Yet, lack of hindsight and information available for research at present makes any forecasting exercise difficult.

In this note, *RECOVid* – a group of economists based in Luxembourg who join forces to assist the *Task Force for the Coordination of the Public Research Sector in the Context of the Covid-19 Pandemic* (Work Package 7 led by Aline Muller; see Section B) – aims to rough out the subject and provide knowledge on the economic issues related to the Covid-19 crisis. We provide a summary of ongoing research, proceed to back-of-the-envelope estimations of the “direct” economic impact of the health crisis and resulting policy measures, anticipate forces that may drive to a breakdown of the global economic system, discuss the policy options that are available to decision makers to mitigate the short-run costs and the risk of a systemic collapse, and provide suggestions for future research. Data and quantitative analyses are obviously needed to go further. However, in the face of such an unprecedented challenge, implementing preemptive measures and announcing future policy actions can help restore confidence in the future and reinforce trust in democracy, national and international institutions. We also discuss some “double-edged” mechanisms that can (i) either jeopardize the recovery and lead to protectionist and populist pressures... or make global institutions stronger in the longer term, (ii) either increase global inequality... or induce more solidarity between rich and poor countries, (iii) slow down technical progress... or accelerate a transition towards a new form of digital capitalism.

The main **messages to take away** from this note are the following:

- When looking at countries at a more advanced stage of the Covid-19 crisis (China, South Korea and Italy), **large effects on output growth rates and small businesses' revenues** were identified. In Asia, the prospects of recovery are still very uncertain. In Italy, territorial disparities exacerbate the effects of the shock and a large share of population does not have sufficient resources/deposits to maintain a decent standard of living in case of a long lockdown. See Sections 2.1 and 2.2.
- In the short-run, macroeconomic damages from Covid-19 are impelled by **mechanical effects and uncertain behavioral responses**: (i) mortality and morbidity impacts labor supply and the productivity of workers; (ii) necessary measures implemented to flatten the infection curve exert mechanical effects on output; (iii) in a globalized world, disrupting global supply chains induces contamination effects; (iv) the public health crisis alone can generate panic and (potentially drastic) changes in individual behaviors. See Section 2.3.
- Assuming a baseline-as-usual trend, back-of-the-envelope calculations suggest that the current lockdown **could reduce Luxembourg's monthly output by 28 to 42%** depending on the deterioration of the international economy and budget support policy. Each month of lockdown mechanically reduces Luxembourg's annual GDP by 2.0 to 3.5%. Greater or smaller effects can be obtained if we account for cascading business and individual bankruptcies, or if we assume greater resilience. Assuming the economy will ultimately get back to normalcy, the recession due to Covid-19 is likely to be deeper than the recession induced by the 2008 financial crisis. See Section 2.4.
- As workers in "lockdown industries" have lower earnings to start with, we may fear a rise in inequality. Very preliminary and provisional estimates suggest that a short lockdown will barely increase poverty rates and inequality indices on the yearly basis. Though, **many workers in lockdown industries (e.g. wholesale and retail trade, or accommodation and food service activities) can incur income losses. Fiscal measures are needed to compensate for their losses.** In addition, the effect on well-being goes well beyond the monetary impact of the crisis. Welfare losses might be more detrimental for health professionals and for minority groups such as single-person households and households without access to internet. See Section 2.5.
- During the lockdown, generous budget support policies are unanimously recommended and have been implemented to relieve corporate cash flow and household income. Maintaining a **satisfactory state of hibernation that allows the economy to recover quickly would require a deficit equal to the loss of activity due to the lockdown.** Assuming a two-month confinement, this means that Luxembourg's government could inject 3.9 to 5.9% of its baseline-as-usual GDP in the economy. While Luxembourg can probably afford this effort, many countries (including European member states) will not be able to cope alone and will need fiscal support. See Section 2.6.
- Given the previous finding, the risk of a **systemic collapse of the financial system both globally and at the European level** cannot be excluded. This would plunge many economies into a persistent recession, with drastic effects on Luxembourg's economy. Implementing coordinated and preemptive policies such as (i) defining a lender of last resort at the European and national levels and (ii) announcing an unconditional commitment of the EU to support all European economies, would reduce this systemic risk, thereby reducing investors' fear and guaranteeing that all other fiscal policies remain effective. See Section 2.7.

- Several strategies to bring workers back to work and unfold the return of economic activity have been discussed in recent works. The most compelling one relies on **massive double testing. Its implementation in the case of Luxembourg is complex** due to the high reliance on cross-border workers. What if the massive testing fails to be coordinated across countries? See Section 3.6.
- From a longer term perspective, the Covid-19 crisis might lead to **permanent effects**. In addition to slowing down capital accumulation, it might induce long-term changes in deep preference parameters and in political preferences, affect international linkages and cooperation, lead to a collapse of the neo-liberal model of globalization, and require increasing development assistance. See Section 3.

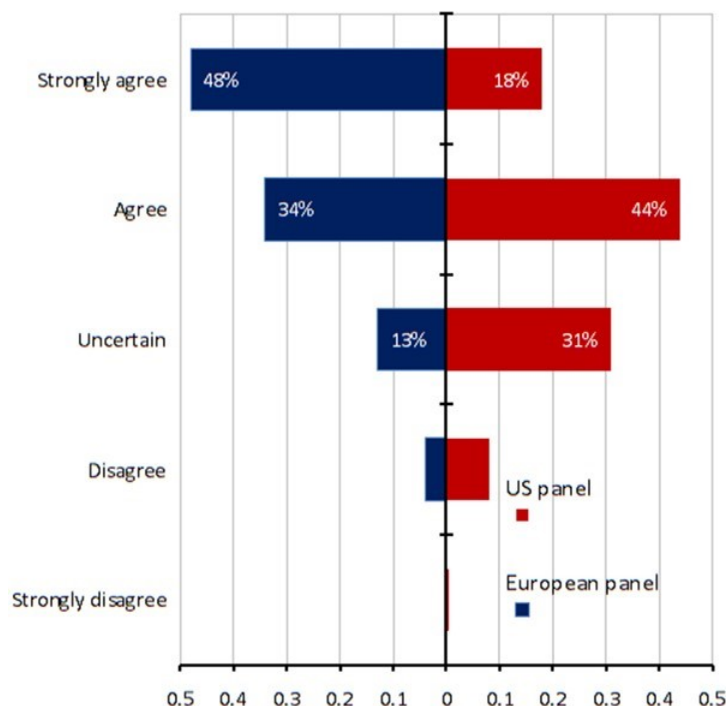
1 Humans are the real wealth of nations

To clarify our working philosophy, we wish to stress that Covid-19 crisis is above all a public health crisis that requires expertise from health scientists. In this note, we take no stance on the potential trade-off concerning human lives versus material goods and/or social losses in terms of interactions between people. The premise of this report is that all priority measures should be focused on saving lives and improving health of people. Our contributions and potential recommendations are adjusted/adapted to health experts' views. The main issues covered in this note are: What are the likely effects of Covid-19 on Luxembourg's economy? What can be done to maximize the likelihood of a quick recovery... and to minimize the adverse effects of the crisis on inequality, poverty and welfare? What are the strategies to exit the lockdown? What are the potential long-term effects on the economy?

The socioeconomic aspects of this crisis are crucial for society. Epidemiologists and virologists have recommended home-quarantine measures and general lockdowns to slow down the spread of the virus and flatten the infection curve. These social-distancing measures – usually referred to as *non-pharmaceutical interventions* – have been perceived as necessary to avoid overloading hospital capacity and its tragic/ethical consequences. Such containment measures have delivered seemingly good results in the region of Hubei, whereas South Korea followed a different strategy relying on massive testing and strict containment of infected people, and Sweden has allowed life to go on much closer to normal as is wagers on collective immunization. *By preventing workers from working (deepening the supply-side recession) and consumers from consuming (deepening the demand-side recession), lockdown measures are likely to lead to a severe recession.* The IGM Forum at Chicago Booth invited leading economists in the US and Europe to express their views on the likelihood of a major recession (Vaitilingam, 2020). Experts were asked if they agreed or disagreed with the following statement: “Even if the mortality of COVID-19 proves to be limited (similar to the number of flu deaths in a regular season), it is likely to cause a major recession.” The results described in Figure 1 show that there is a broad consensus on the fact that a major recession is likely. In Europe, 48% strongly agreed, 34% agreed, 13% were uncertain, and only 4% disagreed.

This being said, a vast majority of economists – who are sometimes criticized for developing dehumanized models – have unanimously supported these measures, placing human factors above all and defining the containment of the pandemic as the utmost priority. There is a relatively broad consensus that lockdowns and quarantine measures are necessary... as well as: rapid and accurate testing be made widely available, investing in hospital capacity, training medical personnel, providing ventilators, investing in research and development on antiviral

Figure 1: Experts' views on the likelihood of a major recession



Note: Responses are weighted by each expert's confidence. Results produced by IGM Forum at Chicago Booth and reported in [Vaitilingam \(2020\)](#).

therapies, vaccinations, etc. Health related measures should be treated as an absolute priority. In the meantime, our role as economists is to prepare an economic policy response to minimize the depth of the recession and avoid a surge in inequality, poverty and long-run welfare deterioration. [Gourinchas \(2020\)](#) says: “flattening the infection curve inevitably steepens the macroeconomic recession curve, [...] and the appropriate public health policy plunges the economy into a sudden stop.” In fact, the tradeoff between containment measures and the economic downturn is much more ambiguous as the recession could have been deeper without the lockdown ([Correia et al., 2020](#)). The only thing we can be sure about is that the lockdown “mechanically” impacts economic activities. An in-depth reflection on the costs and benefits of each policy option requires an assessment of their economic impact.

2 Looming spectre of a long and global recession

We discuss here the short-run economic impact (say, the impact on GDP in 2020 and in the following months) of the Covid-19 crisis and of the public policy measures implemented to eradicate the propagation of the virus. In addition, the pandemic will induce uncertain short- and long-term effects on firms and households' behaviors. The next section will address the mechanisms that could potentially govern the long-term impact of this health crisis.

2.1 What news from China?

There is a great deal of uncertainty about the extent of the expected recession and about the likelihood of a full post-crisis recovery. Economic statistics are still insufficient to assess the magnitude of these economic shocks. On the evidence so far, it is relevant to watch out for Asian countries at a more advanced stage of the recession, and Italy which is a few days ahead of the rest of Europe (see Section 2.2).

Let us focus on China first. The news on the novel coronavirus had started to rampantly spread across various media in China from January 21, 2020, four days before the Chinese New Year – the country’s most important festival. Two days later on January 23, Wuhan, the capital city of Hubei Province and the epicenter of China’s coronavirus outbreak, was locked down. This drastic measure urged other Chinese provinces to rapidly follow and adjust to the highest “level 1” response to the critical public health incident. The combination of Wuhan lockdown and nationwide “level 1” response reduced the number of Covid-19 cases in China, excluding Wuhan, from 744 to 29,549 thousand on February 19 (Tian et al., 2020). Without either one of the two measures above, the corresponding case number would have been about 200,000.

Though the transmission control measures taken in China are considerably effective, they have exerted tremendous negative influence on the Chinese and world economy. For instance, Lucrezia Reichlin and co-authors have recently developed nowcasting methods that enable to predict levels of macroeconomic variables at the present, the very near future and the very recent past. These nowcasting models have been used to predict the effect of Covid-19 on the Chinese economy. The results presented in Figure 2a suggest that the year-on-year growth rate of GDP in China will be negative, around -2% (i.e. 5 to 6 percentage points below trend), in the first quarter of the year 2020.¹ Relying on more detailed data, Figure 2b provides nowcasts for South Korea over the same period. It suggests that year-on-year growth rates become slightly negative, around 3 to 4 percentage points below trend. As the world’s factory and a vital player in trade, China’s restrictions in its own economic activities have disrupted the global supply chains. Companies around the world that rely on Chinese inputs have suffered production contractions.²

A complementary view is provided by Huang et al. (2020), who discuss the effect of Covid-19 on Chinese industries. Covid-19 has mostly affected the performance of Small and Medium Enterprises (henceforth, SME’s). Relying on a recent survey by Tsinghua University and Peking University of 995 SME’s, they show that only 4% of Chinese SME’s report that Covid-19 decreased their revenue by less than 10%. The shares of SME’s reporting that revenues decreased by 10-20%, 20-50% or more than 50% equal 17.0, 28.5, 29.5 and 21%, respectively. The adverse effects vary drastically across sectors.³ The survey reveals that all SME’s now have high

¹The reason why the effect is not visible in January and February is that nowcasting models are constrained by the availability of input data. The evidence of the slowdown in the real economy is perceptible in March because data on leading indicators were not available for February.

²As discussed in Section 2.4, McKibbin and Fernando (2020) simulate a global economic model to explore seven scenarios regarding the spread of Covid-19. Based on their simulation results, if Covid-19 evolved to be a pandemic as what is happening now, in the short term China and the UK would experience a GDP loss of 1.5-6%, and euro zone and the US would suffer around 2-8.5% decrease, all are percentage deviation from baseline. In the long term, China and euro zone would have a 2% reduction, and the US and the UK would experience a 1-1.5% shrink in their GDP compared to the baseline.

³Using stock market’s movement by industry from January 20 to February 5, Huang et al. (2020) find that the most affected sectors are service industries (such as accommodation, catering, warehousing, leasing, architecture,

expectations of substantial government support, including tax relief and subsidies.

During the first week of the Chinese New Year, Chinese people usually celebrate by reuniting with their family and visiting their relatives and friends. During this holiday period, the Chinese economy slows down correspondingly because of the pause in manufacturing industries and agriculture. When the holiday finishes, people typically return to work and the economic engine picks up again. However, due to the spread of Covid-19 people were isolated at home and the economic activities were restricted on a large scale. This situation persisted until mid-February. When the contagion was under control outside Hubei province, the Chinese government called to “restore work and production” in non-Hubei regions. China is one of the few countries in this stage of the crisis. Apart from Hubei province, where factories were ordered not to resume production until March 25, all other provinces officially began the process of restoring production from mid-February.

To bolster production restoration and facilitate SME’s to overcome difficulties, the Chinese government has implemented policies benefiting SME’s, such as tax and expense reduction, loan extension and interest rate reduction.⁴ The Chinese Ministry of Industry and Information Technology introduced that the rate of production restoration in Hubei Province has bounced back to 98% and this rate for SME’s nationwide has returned to 76% by the end of March after two months of almost complete lock-down.⁵ The Chinese National Bureau of Statistics also published that the PMI of manufacturing industries in March was 52%, the highest in recent years. Nevertheless, such a high value was because of the remarkably low index in February. Without seeing continuous high PMI in next months, it will be difficult to predict the economic trend. Other local and international media argue that official statistics overestimate economic recovery by leaving out hard-hit small businesses.⁶ Other investigations have raised suspicion that Chinese authorities are falsifying staff attendance and are fraudulently boosting electricity consumption and other metrics.⁷ Nonetheless, according to the data from Copernicus Sentinel-5P satellite, we see a large decrease in the nitrogen dioxide concentrations over China released by power plants, industrial facilities and vehicles in January and February. But these concentrations have returned fast since March, which indicates the production restoration.⁸ In sum, China’s current economic conditions and prospects of recovery are still very uncertain.

transportation) as well as manufacturing industries (such as shoemaking, woodworking) and agriculture. By contrast, the financial performance of health-care firms has increased.

⁴See People’s Daily online: <http://finance.people.com.cn/n1/2020/0313/c1004-31630862.html>, March 13, 2020

⁵See Xie, Z and N. Zhang, “The latest map of work restoration nationwide,” in 21st Century Economic Report, March 31, 2020.

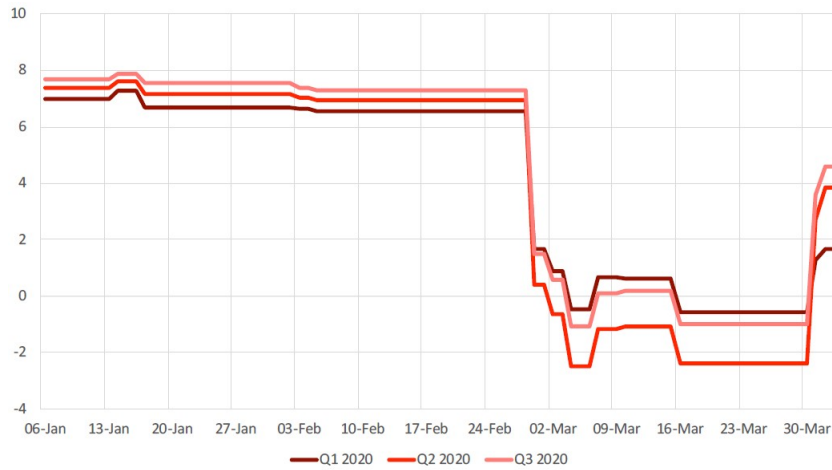
⁶See Zhou Xhin, “Recovery data fails to include struggling small firms,” in South China Morning Post.

⁷See Ruiyang, Y and I. Li, “Lights Are On but No One’s Working: How Local Governments Are Faking Coronavirus Recovery,” Caixin, March 4, 2020.

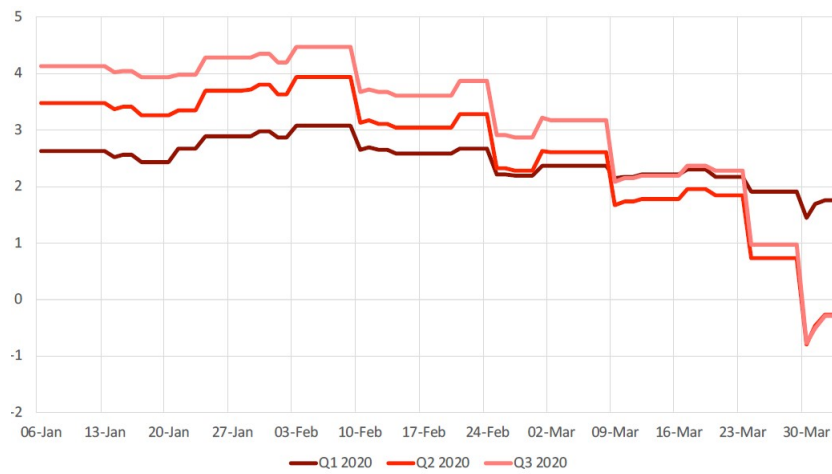
⁸See “COVID-19: nitrogen dioxide over China,” European Space Agency, March 19, 2020

Figure 2: The economic impact of Covid-19 in China, South Korea and Italy

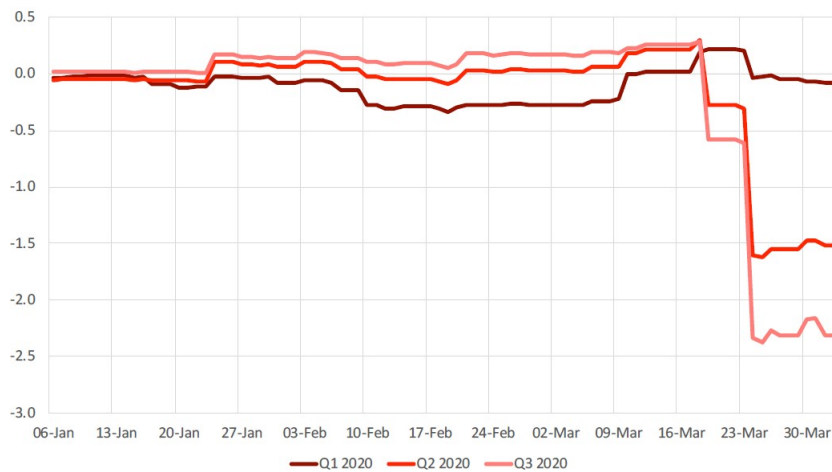
(a) GDP growth in China, Year-on-Year (as %)



(b) GDP growth in South Korea, Year-on-Year (as %)



(c) GDP growth in Italy, Quarter-on-Quarter (as %)



2.2 What news from Italy?

Italy is the first European country that has massively suffered from the Covid-19 pandemic. Local containment policies adopted in Japan and Korea were revealed to be unsuitable. Therefore a complete lockdown has been imposed since March 8, conveying a shocking message to the whole continent that Hubei is not so far and the global economy can spread any type of shock everywhere in real time: “Coronavirus is the Ebola of the rich and requires a coordinated transnational effort. It is not particularly lethal, but it is very contagious. The more medicalized and centralized the society, the more widespread the virus. This catastrophe unfolding in wealthy Lombardy could happen anywhere” (Nacoti et al., 2020). The internal shortage of masks and medical devices has increased the risk of contagion and affected the response of the Italian health sector, which is considered among the most effective at the world level.

A first outlook on the potential economic disruption due to Covid-19 in Italy shows that the most involved sectors cover more than 20% of GDP (Guiso and Terlizzese, 2020). Assuming that the remaining sectors are not affected, the absence of rebound in the production of the closed sectors, and an unchanged domestic demand, the authors compute a reduction in GDP for the current year by approximately 2.5% per month of lockdown. Nowcasting models suggest that the quarter-on-quarter growth rate of GDP in Italy decreases by 2 to 2.5 percentage points with respect to the trend (see Figure 2c).^{f4} Based on a survey of the Bank of Italy, Guiso and Terlizzese (2020) also estimate that 19% of Italian families are directly affected by the lockdown and for 40% of them the drop in income after two months would be greater than their deposits, entailing severe cuts in consumption. About 1/3 do not have sufficient resources to keep the level of income (and expenditure) unchanged, even by drawing on all available liquid assets; for 1/4 of households financial savings cover less than 70% of the decline in income, for 1/5 of households they cover less than half. This scenario is aggravated by territorial disparities, since in the South of the country 13% of individuals live in households without income earners, the employment rate is 44% (compared to 66% in the North), and undeclared labor is very high, concentrated in low-skill sectors with negligible levels of digitalization (Ardeni, 2020).

The manufacturing sector employs a quarter of the Italian workers with a moderate level of digitization and robotization. Boeri and Caiumi (2020) point out that about 3.5 million workers work closely to each other. The presence of small firms in traditional sectors further penalizes Italy compared to other countries, because small firms are less inclined to invest in technologies allowing remote work. Only one in five employees declared in 2018 that they had sometimes worked from home in the last year. Elsewhere in Europe, this ratio is one in three. Looking at the potential recovery in the next months, Boeri and Caiumi (2020) claim that “about a quarter of Italian employees perform a job that could be immediately performed from their home, a third can carry out their duties from home or move without necessarily having to have face-to-face contacts, and around half of the employed can work from home, go to work without personal contact or have them only sporadically.”

The question therefore arises about the costs of the digital divide in this unavoidable transformation in production. In Italy, only 75% of families have an Internet connection in the North, while this share falls to 60% in the South. These disparities also foster inequality of opportunity in education among children from rich and poor families and among the North and South of the country. About 1.5 million of the students stuck at home do not have access to internet. The digital divide then exacerbates social exclusion – mainly for women, people with a low level of education, individuals with manual employment (current or pre-retirement), people who live in

the South – and this is true also for the elderly who do not use information technology ([Cerati et al., 2020](#)).

Italians are internalizing government constraints, accepting several restrictions and lower living standards. However, the territorial disparities are dramatic, with a poverty rate above 25% in the Southern regions of the country, as shown in [Table 1](#). The image of cohesive people appearing on the balcony to sing and take courage can soon change, facing the risk of poverty and hunger. How long this resignation will persist is an issue, and accumulation of public debt could also become a necessary response to mitigate the growing signs of social unrest ([Passarelli and Tabellini, 2017](#)).

Table 1: Share of resident individuals living in relative poverty in 2018

Area	Share (as %)
Italy	15.0
North	8.7
Center	10.5
South/Islands	25.9

Source: ISTAT

The Italian Government is well aware of the situation: on March 17 the decree “Cura Italia” on a solidarity fund was issued that includes a transfer to the Communes for food stamps (600 euros for people with no other income sources), the possibility to postpone mortgage repayment, simplified procedure to claim unemployment benefits. Due to excess global demand for masks and other medical devices, the presence of adequate stocks and production capacity at national level is becoming a priority. New incentives have been introduced for the conversion of the production line of Italian firms, which have been financed for EUR 50 mil. The amount currently allocated for the “Cura Italia” plan amounts to EUR 25 bil. The fear is that this amount will not be sufficient if the production machine does not restart soon. The support for solidarity among EU Member States, possibly with the issue of Eurobonds, is seen in Italy as a fundamental step to face the current crisis and to prevent the collapse of the EU in the long run ([Giavazzi and Tabellini, 2020](#); [Monti, 2020](#)).

2.3 Economic damages in the rest of Europe

Let us now focus on the rest of Europe and discuss the potential short-run economic damages driven by the Covid-19 crisis. These effects have begun to materialize since the beginning of the year. [Bénassy-Quéré et al. \(2020\)](#) distinguish four (partially overlapping) phases in European countries:

- Phase 1 – *China shock* (January-March). Negative impact through global value chain. Macroeconomic effects were small given the size of the impacted sectors.
- Phase 2 - *Sectoral disruptions* (starting in February). Negative demand shock hitting mostly tourism, air transport, hospitality and entertainment. This shock is more important in some countries but is limited.
- Phase 3 – *Acute overall disruption* (starting early March in Italy, 1-3 weeks later in other

European countries). Negative demand and supply shock resulting from containment measures, school closures, financial disturbances and a drop in social consumption. Reduced oil prices act as a partial stabilizer, while other international spillovers are clearly negative.

- Phase 4 – *Recovery* (starting after the lockdown). A rebound is likely but may be muted by hysteresis (see discussion in Sections 2.7).

Uncertainty around the scale of the direct economic damages, behavioral responses, effectiveness of health and economic policy responses, and timing/extent of a potential recovery remains substantial. The *short-run* macroeconomic damages from Covid-19 will be governed by mechanical effects and uncertain behavioral responses. **Firstly**, mortality and morbidity impacts labor supply and the productivity of workers.⁹ **Secondly**, necessary measures implemented to flatten the infection curves induce mechanical effects on output. **Thirdly**, in a globalized world, disrupting global chains induces contamination effects: “this virus is as economically contagious as it is medically contagious” (Baldwin and Weder di Mauro, 2020). As the production of basic and intermediate goods in some countries is put on hold, the production of more advanced goods is also paralyzed.¹⁰ **Fourthly**, the public health crisis alone can generate panic and (potentially drastic) changes in individual behaviors. Many economic crises were associated with panics from depositors or from the banking sector.

Two recent studies provide estimates of the potential **output response to changes in mortality/morbidity** and some economically related spillovers (including automatic stabilizers and some behavioral responses). They implicitly or explicitly account for international linkages, by using ex-post reduced-form analyses of past pandemics, or by modeling these interdependencies in a structural framework. The second study disregards lockdown-type measures comparable to those currently implemented in Europe, and only accounts for limited behavioral responses.

Barro et al. (2020a) use a macroeconometric approach and consider *the 1918-1920 Great Influenza Pandemic (also known as the Spanish flu) as a worst-case scenario for outcomes under Covid-19*. This pandemic resulted in the death of 2% of the world population (which would translate into 150 million deaths nowadays), and in a mortality rate of 6% for the infected people. Their empirical analysis distinguishes the effects of the pandemic from the WWI by exploiting variations across countries in flu death rates from 1918 to 1920 and war death rates from 1914 to 1918. Overall, the Spanish flu is estimated to have reduced real per capita GDP and consumption of the typical country by 6.0% and 8.1%, respectively. Transposing these effects to the Covid-19 crisis is difficult. On the one hand, given epidemiological differences, advances in public health, and mitigating policies at play, the numbers have to be taken with caution. Barro et al. (2020a) consider their estimated effect of 6 to 8% as a *pessimistic scenario*. On the other hand, the world has changed. Global value chains and human mobility have increased interconnections between countries, which may result in stronger cascading effects.

McKibbin and Fernando (2020) uses a *multi-country and multi-sector, DSGE model* – the so-called G-Cubed model described in McKibbin and Wilcoxon (1999) and McKibbin and Wilcoxon (2013)) – to simulate the short-run impact of Covid-19 scenarios on the Chinese economy and

⁹In the same vein, the fact that healthcare services are massively allocated to the treatment of COVID-19 patients drastically limits their capacity to function normally, resulting in productivity losses.

¹⁰These disruptions induce shortages, especially, but not exclusively, in the healthcare sector, and result in surges in prices and competition between consumers and between countries, as discussed in the section on Italy.

on the global economy. The multi-country framework accounts for the disruptive effect of Covid-19 on global chains within countries (i.e. across sectors) and between countries (through trade flows). This means, for example, that a detrimental shock in China leads to a domestic economic recession that “contaminates” other countries through trade and foreign investments.

The analysis relies on three epidemiological scenarios defined in terms of attack rates (proportion of the entire population who becomes infected), of case-fatality rates (proportion of those infected who die), and of implied mortality rate (proportion of total population who die) assumed for China only, or for the global economy. These scenarios are described in the first three columns of Table 2. Scenarios I-III assume the epidemiological events are isolated to China. The economic impact on China and the spillovers to other countries are through trade, capital flows and the impacts of changes in risk premia in global financial markets – as determined by the model. Scenarios IV-VI are the pandemic scenarios where the epidemiological shocks occur in all countries to differing degrees. Scenarios I-VI assume the shocks are temporary. Scenario VII is a case where a mild pandemic is expected to be recurring each year for the indefinite future.

Covid-19 induces multiple shocks in each country. The main one is the shock to labor supply, which includes three components: mortality due to infection, morbidity due to infection and morbidity arising from caregiving for affected family members. The second one is a shock to equity risk premium of economic sectors. The third one is a shock to production costs. The fourth one is a shock to consumption demand due to precautionary savings. The fifth one is a shock to government expenditures, which takes the form of an increase in health expenditures.

Table 2: Epidemiological assumptions and GDP impact

Scenario	Attack rate	Case fatality	Mortality rate	Chinese GDP	EU GDP
I-Temp	1% (CHN)	2.0% (CHN)	0.02% (CHN)	-0.4%	-0.2%
II-Temp	10% (CHN)	2.5% (CHN)	0.25% (CHN)	-1.9%	-0.2%
III-Temp	30% (CHN)	3.0% (CHN)	0.90% (CHN)	-6.0%	-0.4%
IV-Temp	10% (ALL)	2.0% (ALL)	0.20% (ALL)	-1.6%	-2.1%
V-Temp	20% (ALL)	2.5% (ALL)	0.50% (ALL)	-3.6%	-4.8%
VI-Temp	30% (ALL)	3.0% (ALL)	0.90% (ALL)	-6.2%	-8.4%
VII-Perm	10% (ALL)	2.0% (ALL)	0.20% (ALL)	-2.2%	-1.9%

Source: Authors’ computations based on [McKibbin and Fernando \(2020\)](#).

The last two columns show the effect on GDP in China and in the euro zone. In the case of a temporary shock affecting all countries, *the effect on European GDP varies between -2.1% and -8.4%* depending on the scenario. The most optimistic scenario assumes a uniform attack rate of 10% over the year. On April 4, Luxembourg had about 2600 people identified as infected, which basically represents a lower-bound attack rate of 0.33%. In the absence of systematic testing, it is very likely that this percentage strongly underestimates the reality. Uncertainty about the actual attack rate and about the future of the pandemic is substantial. *If the yearly mean level of the attack/infection rate can be maintained below 10%, the study predicts that GDP would*

fall by at most 2.1% only. If the yearly mean level of the infection rates is contained below 1%, GDP would fall by 0.4% only. Note that *herd immunity* requires that a much larger proportion of people is immune (say, a share of 60% or so assuming a Covid-19 reproduction rate between 2 and 3). This does not mean that 60% of the population will be infected at the same time. Without massive testing, it is hard to identify who is immune or not, and we may hope that a future vaccine will help reaching herd immunity at moderate human cost.

It is hard to identify whether the measures implemented to curb the infection curves contribute to increase or decrease confidence in the economic system. As stated above, the public health crisis alone can generate panic and a severe economic recession. To illustrate this, a recent study by [Correia et al. \(2020\)](#) uses variation in the timing and intensity of social distancing measures across U.S. cities during the 1918 Flu Pandemic to study their economic effects. They find that areas with higher mortality rate experienced a sharp and persistent decline in economic activity, while early and extensive interventions (such as school closures, public gathering bans, quarantines and restricted business hours) had no adverse effect on local economic outcomes. Cities which intervened very aggressively – and did not lift these measures too early – even experienced a relative increase in manufacturing employment and output after the end of the pandemic.

Nonetheless, current **lockdown measures generate a disciplined and sizeable cut in output**. In terms of public health, these lockdown measures are necessary to avoid tragic consequences. Economically speaking, they avoid the collapse of our health care systems and probably worse impacts on economies tomorrow. In the short-run, however, they will lead to significant declines in GDP. [Gourinchas \(2020\)](#) says: “increasing social distances has required closing schools, universities, most non-essential businesses, and asking most of the working-age population to stay at home. While some people may be able to work from home, this remains a small fraction of the overall labor force. Even if working from home is an option, the short-term disruption to work and family routines is major and likely to affect productivity.” He proposes some back-of-the-envelope calculations of the cost of these lockdown measures, assuming arbitrarily that the monthly output loss varies between 25 and 75%.

Similar back-of-the-envelope calculations can be generalized, extended, and customized by country. In the United Kingdom, the CEBR (Centre for Economics and Business Research) has recently predicted that a Covid-19 lockdown would cost about 31% of the daily output level in London. In Belgium, the FEB (Fédération des entreprises de Belgique) estimates that the impact of a one-week lockdown amounts to EUR 2.4 billion, i.e. 0.55% of the annual GDP. In other words, each month of lockdown induces a 2.4% loss of annual GDP in Belgium, and about 28% of the monthly level of output. [OECD \(2020\)](#) generalized such studies and provided estimates of the lockdown measures for OECD and emerging countries. The impact of a one-month lockdown varies across countries according to differences in the industry shares in total output. The monthly loss varies between 15% in Ireland (18% in emerging countries such as China and India) to 29% in Spain and Germany (or even 35% in Greece). In the median OECD economy, output declines by 25%.

As far as Luxembourg is concerned, the OECD predicts a monthly output loss of 20% due to the lockdown. Their methodology is purely mechanical (assuming exogenous declines ranging from 50 to 100% in lockdown industries) and disregards effects resulting from global supply chain disruption and macroeconomic interdependencies between domestic economic actors. Can further progress be made in the assessment of the macroeconomic impact of Covid-19 for

Luxembourg?

2.4 Nowcasts for Luxembourg... assuming baseline-as-usual trend

We provide here rough estimates of the short-term effect of the Covid-19 crisis assuming a post-crisis return to normalcy, and disregarding the possibility of a systemic collapse of the global/European economy as well as drastic behavioral changes (i.e. assuming a baseline-as-usual trend). The lockdown measures affect Luxembourg industries in a very heterogeneous way. The decline in output in these lockdown industries and the decrease in final demand by domestic and foreign agents will lead to complex cascading effects and price responses. In the absence of model and accurate inputs, we use similar tools as the OECD, and consider simple scenarios to approximate the importance of these measures and their economic implications.

As illustrated in the bottom panel of Figure 3, we assume that lockdown measures decrease output:

- by 20% in real estate services as well as in administrative and support services;
- by 50% in the manufacturing industry as well as in transportation and storage services;
- by 90% in construction as well as in wholesale, retail trade and repair services;
- by 100% in accommodation and food services as well as in arts, entertainment and recreation services.

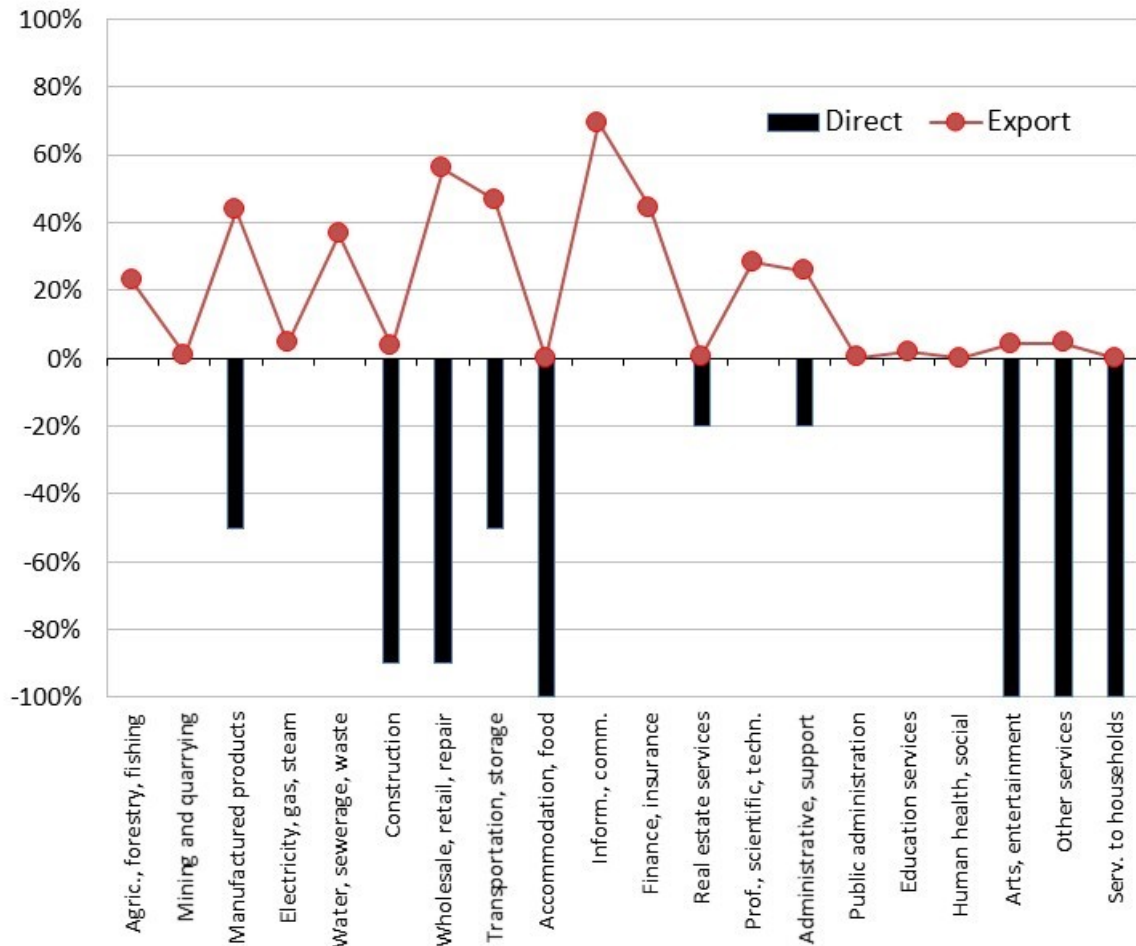
The other industries are not directly impacted.

Relying on the structure of output by industry observed in the last quarter of the year 2019, we mechanically compute the **direct impact** of the lockdown on the monthly level of GDP. Based on the scenario depicted in Figure 3, we obtain a monthly loss of 24%, implying that one month of lockdown has a direct effect on annual GDP equal to 2.0%. Although these estimates are slightly greater than those of [OECD \(2020\)](#), they are overly optimistic as they neglect intranational and international linkages. The disruption of global value chains and the substantial slowdown in demand for intermediate goods, domestic consumption and investment expenditures will reinforce the direct impact of the lockdown. To illustrate the potential magnitude of these effects, we now add scenarios about the international and national disruptive effects.

Let us first focus on **international linkages**. Economic activity is decelerating in all Luxembourg's trade partners, including China, the US and other European countries. Assuming that demand for exports decreases by 25% in all industries, a shock that is in line with the median impact found in the OECD study, we can roughly estimate the impact of the disruption of international value chains. Using the export shares in total sales by industry described in the top panel of Figure 3, we can estimate the indirect loss in the sectors that are not directly impacted by the lockdown. We now obtain a monthly output loss of 28%, implying that one month of "international lockdown" decreases Luxembourg annual GDP by 2.3%. This demonstrates that the magnitude of the recession will not only depend on policy measures implemented in Luxembourg, but also on policy measures and recovery prospects in the rest of the world in general, and in Europe in particular.

In the same vein, **local multipliers** also play a role. Assuming households and firms partly draw upon their reserves and/or credit lines (boosted by the fiscal stimulus), we now account for a very conservative 15% decrease in domestic demand – due to lower consumption, lower

Figure 3: A scenario of direct impact of lockdown measures and openness to export by industry in Luxembourg



Note: Own scenario of the direct impact of lockdown measures, and statistics on exports extracted from the Input-Output table of 2017 from STATEC.

investment, and lower “input-output” interactions between industries. This induces a monthly output loss of 34%, which translates into a 2.8% decrease in annual GDP per month of lockdown.

Finally, in a **more pessimistic scenario** (certainly not the most pessimistic scenario) where domestic demand and exports decrease by 30%, the monthly level of output loss reaches 42%, which implies a 3.5% decrease in annual GDP per month of lockdown. This illustrates that the capacity of households and firms to maintain decent levels of expenditures influences the magnitude of the recession. The latter scenario might correspond to a situation without fiscal stimulus, whereas the less pessimistic scenarios involve macroeconomic and redistributive policies. A challenging task for *RECOVid* is to assess the effect of Luxembourg’s policy measures on levels of consumption and investment during the lockdown.

Excluding the first optimistic variant, we roughly estimate that the Luxembourg lockdown mechanically induces a *loss of output varying between 28, 34 and 42% per month* depending

on the deterioration of the national and international economy. We insist again on the fact that these numbers are highly uncertain. Our accounting methodology used to produce such numbers assumes that the Covid-19 crisis will not induce a systemic collapse of our economic system. More pessimistic effects can be obtained if the main structural features of the global economy are deeply affected (see Section 2.7). In addition, even in the baseline-as-usual context, complex dynamic effects can be obtained due to cascading effects (e.g. business failures, financial fragilities, surge in layoffs) or to catching-up effects involving a stronger resilience of the economy. Such effects are illustrated in the appendix (Section A).

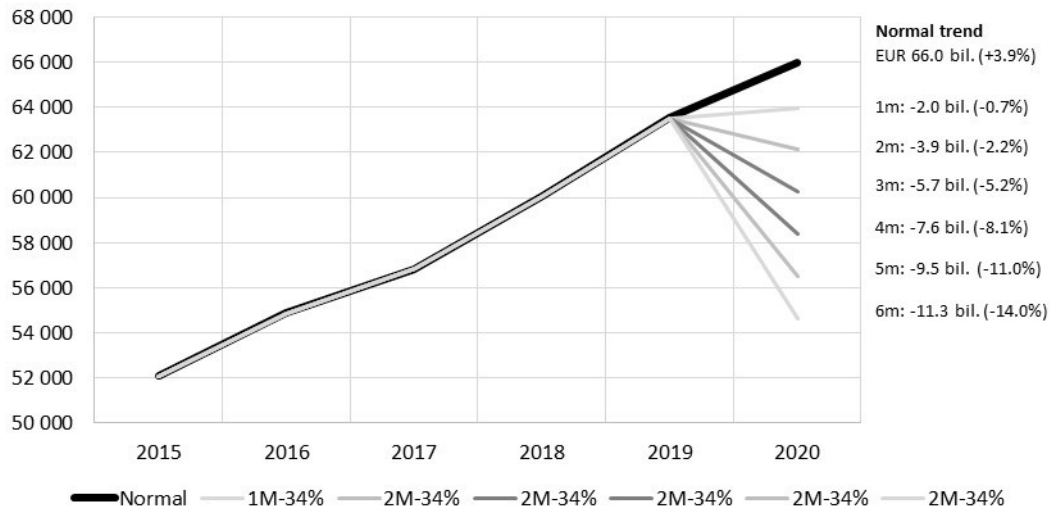
Considering the scenario with 34% of output loss per month of lockdown,¹¹ Figure 4 represents the evolution of Luxembourg's GDP during the last two decades. Before 2020, total GDP and GDP per capita increased by 5.2% and 2.9% respectively. In Figure 4a, we focus on 2010-2020 and add potential levels for the year 2020. Under a one-month lockdown, the cost of Covid-19 amounts to EUR 2 billion. Compared to 2019, this implies a GDP growth rate of 0.7% and a GDP per capita growth rate of 0.5%. Under a two-month or three-month lockdown, the cost reaches EUR 3.9 or 5.7 billion respectively, implying negative annual GDP growth rates of -2.2% and -5.2%, respectively... And the cost of a six-month lockdown amounts to EUR 11.3 billion. This translates into a 14% decline in GDP, thereby wiping out the benefits of 5 years of massive economic growth.

Such numbers are valid if the spread of the virus is well contained. Following McKibbin and Fernando (2020), the GDP loss might increase by 1.8 percentage point if the attack rate reaches 10% of the population (instead of 1%). For a matter of comparison, Figure 4b estimates the impact of the 2008-09 financial crisis, assuming a normal trend with a 5% growth rate in total GDP. The financial crisis decreased Luxembourg's GDP by EUR 0.9, 4.0 and 2.9 billion in 2008, 2009 and 2010, respectively. The resulting annual GDP growth rates were equal to 2.6% in 2008, -4.0% in 2009, and 8.7%, respectively. In sum, assuming the economy will ultimately get back to normalcy, the recession due to Covid-19 is likely to be much deeper than the recession induced by the 2008 financial crisis.

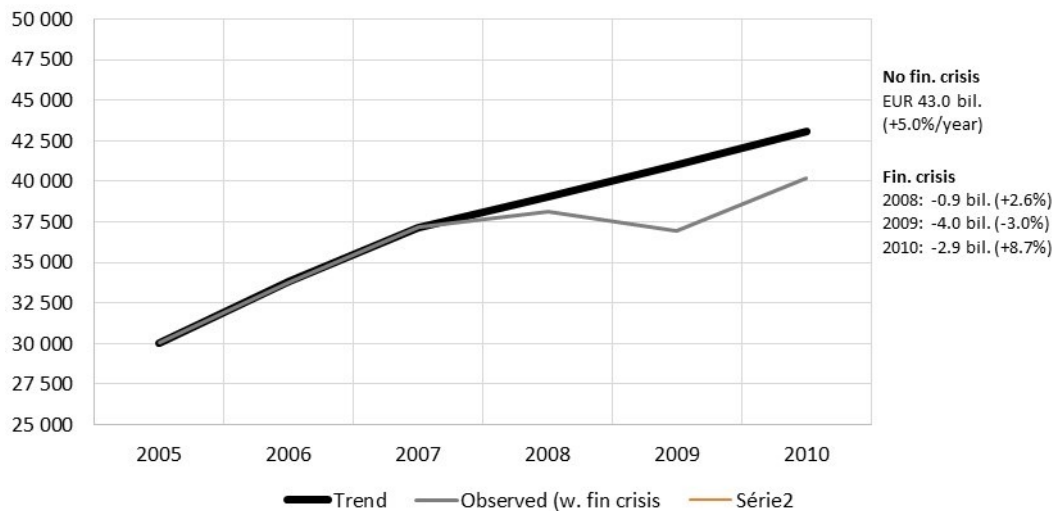
¹¹And disregarding cascading and resilience forces.

Figure 4: Evolution of Luxembourg's GDP

(a) GDP in 2020 as a function of the lockdown duration (from 1 to 6 months)



(b) Comparison with the 2008-2009 financial crisis



Note: Own calculations in Figure 4a. Infection rate equal to 1% of the population, combined with a WE-type scenario involving a monthly output loss of 34% over 1 to 6 months. Normal trend with a 5% annual growth rate in total GDP in Figure 4b. Data from Statec.

2.5 How many families will be severely impacted in Luxembourg?

While the crisis generated by COVID-19 is affecting pretty much everyone, some families will feel the shock much harder than others. Epidemiologists are making important predictions about the spread of the disease, mortality and morbidity rates. We focus here on families that may be severely affected in non-health dimensions. Examining data collected in the *EU Statistics on Income and Living Conditions in 2018* (henceforth, SILC 2018), a sample survey of 8,526 individuals (living in 3,715 households) representative of the population residing in private households in Luxembourg, we can make approximate guesses about how many individuals and families will be impacted by different aspects of the crisis. Results are summarized in Table 3.

Kids stay home. School closures impose pupils to stay home and forces parents to look after the learning of their children. This makes it much more difficult for parents to work as they usually do and therefore reduces the labor force that firms dispose of to continue business and production. This also pushes parents to take possibly unpaid or lower paid days off (reducing family income), gives parents teaching responsibilities they may not be ready for, and forces kids to adapt to new forms of learning processes. The last two points have unknown impact on skill acquisition, but we may expect that children from families with a lower socio-economic background will be more adversely affected.

Examining survey data collected from SILC 2018 for Luxembourg, we can estimate that about 13% of households residing in Luxembourg have at least one child in primary school age (between 6 and 12). This makes up a projected total of above 30,000 households. About 11% have a child in secondary school age (between 13 and 18) for a projected total of about 25,000 households. Allowing for double-counting of families that have children in both age ranges, we see that approximately one in five households in Luxembourg is likely to be impacted by school closures.

School closures affect pupils and their families, but they also affect teachers and people working in the educational sector. About 7,800 people declare themselves working as teaching professional and, mostly among them, 3,500 people declare working in the education sector.

Home alone. Social distancing measures, by definition, severely restrict social interactions. To the extent that in person contacts are not perfectly substituted by alternative means of communication, isolation can harm mental health and people living alone may be particularly at risk. According to SILC 2018, just under 20% of the population lives alone in Luxembourg. Half of them are people aged above 60. This means that about 45,000 people aged below 60 live alone and about the same number of people aged above 60 live alone in the country.

Social distancing measures mean that having access to the internet at home is critical, to be able to work from home and communicate, follow online media. According to the survey, 7 percent of the population, or about 33,000 people still did not have access to internet at home in 2018. With the rapid expansion of the web, we can however expect such a fraction to be lower in 2020.

Workers at risk. The main concern about the impact of the crisis – beyond the health hazard – is probably the fear that people will lose their job and/or see their income fall as a consequence of the economic slowdown induced by the disease and the measures taken to contain its progression. Assessing the size of the population at risk here is difficult: we do not know how many workers are actually seeing their jobs frozen, what are the characteristics

of these workers, what is the size of the income loss, etc. There is widespread agreement however that small business owners and workers are most at risk of facing an income loss – because they cannot work “remotely” (e.g. industrial machine operators), because their tasks cannot be done under social distancing rules (e.g. personal care), because the sectors they work in is shut down (workers in hotels and restaurants), and perhaps most importantly because they have unsecure/short-term employment contracts – are over-represented at the bottom of income distribution to start with. Being at the bottom of the income distribution also means that they may also be in families that are least able to absorb the income shock by relying on a financial assets (previous savings), and therefore are most vulnerable to financial distress. To put it simply, there is concern that the economic shock is not “socially neutral” but will have distributional consequences, hitting the poorest household disproportionately more. Preliminary evidence from the US and the UK confirm this concern ([Adams-Prassl et al., 2020a,b](#)).

The risk of financial distress in the face of an income loss is also greater for families that face large mortgage repayment obligations (or possibly large housing costs through rents). In the context of the high housing prices in Luxembourg, this can be an issue not just for families living on low incomes, but also much higher up the income distribution. Estimates from the Household Finance and Consumption Survey suggests that about 25% of households in Luxembourg have liquid wealth (e.g. savings accounts, obligations) worth less than 3 months of income. Unfortunately no sufficiently detailed pre-existing data are available to us to make truly useful projections about income impacts at this stage. But if we agree that some occupations and sectors are affected more than others, looking at some number of workers may still be of interest.

Let us look at occupations first. Again, it is difficult to identify exactly which occupations are most at risk, but adding up workers describing themselves as belonging to the following industries (ISCO-08 2-digit classification):

- 14 - Hospitality, Retail and Other Services Managers,
- 51 - Personal Services Workers,
- 52 - Sales Workers,
- 53 - Personal Care Workers,
- 91 - Cleaners and Helpers,
- 94 - Food Preparation Assistants,
- 95 - Street and Related Sales and Services Workers.

Their jobs can be directly affected either because it cannot be done remotely (e.g. personal care, excluding health professionals) or because it is suspended (e.g. hospitality related occupations), we obtain a projected total of about 67,000 workers potentially impacted. This represents about 22% of all resident workers. Adding “Legal, Social, Cultural and Related Associate Professionals (ISCO08 34)”, we reach almost 75,000 workers and 25% of the workforce (and about 7% of these workers a self-employed). Unsurprisingly, estimated average earnings of workers in 2018 in all these occupations were (well) below average earnings across all occupations.

Note that we count residents only. Many more jobs are potentially affected, but many of these are held by cross-border workers. Of course, we cannot insist enough that we can only produce rough numbers at this stage. Not all of the workers in these occupations will be hit (e.g. some cleaning and sales work continues), while many workers with other occupations may be hit.

Let us now focus on industries. Unfortunately, we do not have detailed description of the sector or activity of the survey respondents. We focus on two sectors: (i) Wholesale and retail trade (and repair of motor vehicles and motorcycles), and (ii) Accommodation and food service activities. The former is only partially impacted (especially non-food retail trade) but counts alone 22,000 workers (among which just 630 are self-employed), that is 9% of the total workforce. With an estimated average gross monthly employee income of 2900 euros (in 2018), earnings in the sector were about 30% lower than average earnings across all sectors... in the absence of the crisis.

Accommodation and food service is perhaps more informative since pretty much all activity here is strongly affected. Just above 13,000 workers (5.5% of the workforce) declared working in this sector, among which 660 are self-employed. With an estimated average gross monthly employee income of 2300 euros (in 2018), earnings in the sector were about 47% lower than average earnings across all sectors. So we have a set of workers paid relatively low in the baseline that are likely to be hit hard

Health professionals. We will conclude by looking at a sector that is, unfortunately, running at full speed: the health sector. Workers in the health sector and their families are put under exceptional stress and it is therefore also important to appreciate how many people are potentially impacted here. Again, the classification of occupations and sectors available to us is coarse, so projections may be very imprecise.

Almost 10,000 people declare working in occupations described as “health professionals” or “health associate professionals”. These people add up to about 9,000 households, representing about 3.6% of all households residing in the country. Considering the broader sector of “Human health and social work activities”, the number goes up to 25,000. This higher number includes loosely related social work activities, but also includes all hospital staff (not just health professionals, i.e. nurses and doctors).

Initial estimates of impacts on aggregate poverty and inequality indicators... are reassuringly small. Because workers in sectors most likely to be affected by the crisis generally have lower earnings to start with, we may fear that this crisis will induce large inequality effects. Of course, several mechanisms will mitigate the impact of the shock to earnings onto final disposable household income: families often rely on income from multiple sources (dual earners, public transfers, etc.) and income losses will be (partly) compensated by reduced tax liabilities and social insurance (fiscal stabilizers). While the latter might put stress on public finances, they will play their role in buffering family income.

To illustrate this, we quickly considered a scenario where all workers in one of the following three sectors would lose 20% of gross earnings for three months, ‘Wholesale and retail trade’, ‘Hotels and restaurants’, and ‘Construction’. To be clear, this is illustrative but not necessarily a realistic scenario. Using a population sample from the EU-SILC data collected in 2017 and the tax-benefit calculator EUROMOD for the tax-benefit system in place in 2019, we can simulate how aggregate indicators of inequality or poverty could respond (assuming no further behavioral or general equilibrium responses). Under such a scenario, and taking into account the income received during the whole year, neither poverty nor inequality of household disposable income would change significantly. According to our provisional estimates, poverty rates and inequality indices would only slightly increase. In a similar way, under a scenario where the self-employed have zero earnings for three months and returns to a normal level of activity after the crisis,

the poverty and inequality indicators do not show significant variations. If we assume a loss in the 3 sectors at the same time, the poverty rate will increase by 0.53pp (with a fixed poverty line). Of course, at this stage we do not know if such a scenario is close to realistic: it assumes that the shock is only short-term, that it affects only a small group of sectors, and that no-one loses her job (although all suffer a wage/income from self-employment cut). Longer cuts, lower market activity after the crisis, broader sectoral coverage and job losses might lead to some bigger impact, but at least initial impacts do not seem large.

Focusing on the poorest part of the population and social protection schemes, the impact of the Covid-19 crisis on unemployment is likely to push more residents to rely on the social protection offered by the *Revenu d'Inclusion Sociale* (REVIS). [Girardi et al. \(2019\)](#) suggest that, in these exceptional times, some aspects could be particularly challenging for social assistance beneficiaries in terms of:

- Access to minimum income support and in-kind support from social offices. Because of current eligibility criteria (based on residence and age) and difficulty to remotely access public services (no access to internet, no calling credit or language issue). These elements add up to the known problem of lack of information on existing services and stigma in claiming those services;
- Adequacy of minimum income support given the potential higher costs resulting from: (a) the impossibility of adopting the usual money saving strategies when social distancing measures are enforced and borders are closed (e.g. purchasing in neighboring countries, exchanging services with acquaintances); (b) increase in food price - if what is reported by the media is confirmed; (c) higher utility bills due to higher presence at home. This situation points to a general risk of over indebtedness which could be sharpened in the current context and result in eviction (after the end of the block of eviction during the emergency), especially for a vulnerable group that can not make up for the financial loss by drawing on savings or by borrowing;
- Maintenance of income support while needs persists. Income support is provided in a framework of obligations and sanctions. Without adaptation of the system, sanctions worsen the situation of people in need during a crisis in three ways: (a) social workers having to control compliance might end up with limited time to provide them with support; (b) sanctions exclude them and their families from the income support guarantee and from the affiliation to health care; (c) sanctions are known to have material (debt, rent arrears) and emotional (anger, depression and anxiety) repercussions (e.g. [Wright et al., 2020](#)).

If some of these challenges are specific to the status of social assistance beneficiaries in Luxembourg, others are common the low income segments of the population. In particular, negative income shocks exacerbate the well-known difficulties of Luxembourgish households to face high housing costs. The housing cost burden in 2018 was above 35% of the disposable income both for renters and for owners repaying a bank loan, reaching the impressive figure of 50% for the poorest 20% of the population.

Table 3: How many households can be severely impacted?

Household type	$N = \text{Nb. Obs.}$	$N^* = \text{Weighted obs.}$	Share in N^*
Kids stay home			
With children below age 6	551	26,894	11.1%
With children aged 6-12	614	31,159	12.8%
With children aged 13-18	529	26,027	10.7%
Single-person HH			
Person aged 60 and younger	367	45,430	9.6%
Person aged 60 and over	312	33,080	7.1%
Person aged 75 and over	117	12,447	2.7%
Access to internet			
Access to internet	8,047	445,374	93.1%
Cannot afford access	59	4,055	0.8%
No access for other reasons	387	29,214	6.1%
Shares by occupation			
Hosp., Retail, Other Serv Man.	108	5,081	1.7%
Legal, Soc., Cult., related Prof.	175	7,319	2.4%
Personal Services Workers	309	18,601	6.1%
Sales Workers	225	10,371	3.4%
Personal Care Workers	136	5,138	1.7%
Cleaners and Helpers	482	24,352	8.0%
Food Preparation Assistants	58	3,618	1.2%
Others	4,214	229,560	75.5%
Shares by industry			
Wholesale and retail trade, Repair.	466	21,889	8.9%
Accommodation and food service	208	13,125	5.4%
Health professionals	70	3,552	1.2%
Health associate professionals	124	5,977	2.0%
Human and social work activities	557	25,577	10.4%

Source: Authors' computations based EU Statistics on Income and Living Conditions in 2018.

2.6 Budget support policy during the lockdown

In this emergency situation, economic and social measures have been put in place to assist the private sector. Economically speaking, the current economic crisis is profoundly different from the financial crisis of 2008. It is an immediate crisis in the real economy. Potential demand and supply are still there, but the engine is idling because of rigid measures. As argued by the French economist Daniel Cohen,¹² **the major role of public policy in the outbreak phase is not to revive the economy, but to ensure that it remains in a satisfactory state of hibernation, which allows it to recover quickly:** "It is not credit that needs to be distributed, but direct budget support that relieves corporate cash flow and household income."

Such support policies have been implemented in many countries.¹³ In Luxembourg, an interdepartmental unit coordinates the initiatives of the different ministries. On March 25, the government announced a set of measures to support the economy during and after the health crisis. The package pursues four stated objectives: (i) meeting short term liquidity needs; (ii) helping people and firms to cope with cash-flow difficulties; (iii) facilitating corporate lending through state-backed guarantees; and (iv) securing job retention. Three types of measure have been implemented:¹⁴

- *Direct transfers to vulnerable firms* – These include an 80% coverage of partial unemployment benefit insurance by the state;¹⁵ anticipated and partial transfer of family holiday compensation to firms; capital grant advances to all types of businesses in order to help them pay wages and rents; emergency help for companies with less than nine employees; and accelerated reimbursement of VAT credits.
- *Postponement of payments to public authorities* – Payment of social contributions and taxes can be delayed during two trimesters.
- *Loans and loan guarantees* – Six banks which sustain an agency network in Luxembourg will cooperate with the government to provide a moratorium on repayment of firms' loans (principal and interest) for six months. The SNCI (a national public-law credit and investment institution) also postpones the reimbursement of loan installments. Special anti-crisis credits by the SNCI and the banking sector. Finally, new credits to firms can

¹²See "La crise du coronavirus signale l'accélération d'un nouveau capitalisme, le capitalisme numérique," *Le Monde*, April 2, 2020

¹³Based on the policy responses by the Chinese government, [Huang et al. \(2020\)](#) argue that the main lessons and experiences for European policymakers are: (i) *Time is crucial*: public health policy response should be the priority and conducted as early as possible; (ii) *Information transparency is necessary*: the digital economy and the availability of big data should be exploited to avoid misinformation; (iii) *Macro policies are fundamental*: saving SME's has proved to be a very strategic step in boosting domestic demand, the production networks and the global value chain. When the epidemic was under control, the Chinese government started to allow the resumption of work and stimulated production with fiscal policies (including tax deductions and subsidies for antivirus related industries), monetary policies (including credit easing, loan rate cuts and debt rollovers for SME's), and social insurance policies (including the delay or deduction of insurance payments for SME's and people). After the outbreak, the main objectives of the government were to avoid big losses in terms of SME's revenues, and to encourage private loans from the digital economy to industries in difficulty. The main measures were the following: fast reopening stock markets, fiscal stimulus, monetary and financial policies (loans, etc.) mainly for SME's, infrastructure investments, selective export tax rebates.

¹⁴<https://gouvernement.lu/dam-assets/documents/actualites/2020/03-mars/25-programme-de-stabilisation/Programme-stabilisation-economie.pdf>

¹⁵For an expected period of two months (as of March 16 for most lockdown industries and of March 20 for construction).

be guaranteed by the state for up to 85% of the amount and for a duration of up to six years.¹⁶

The government of Luxembourg also stressed that a pragmatic approach will be set up for the implementation of these measures, with an aim of reducing bureaucracy and allowing a *fast transfer of liquidity towards the companies*. Other decisions by the government were made to *reduce uncertainty of specific potentially critical life situations*.¹⁷ Yet, there is a pool of workers that are hit by the crisis but who are not included in these measures. Self-employed (e.g. cleaners, private tutors, sport trainers), freelancers, workers in the gig economy etc. will likely lose substantial business and income during lockdown. These are typically people who, because of young age or the nature of their job, are less likely to hold enough savings. The authorities should carefully identify such individuals and provide support similar to that for workers in salaried employment.

The question that arises is who will pay for the budget support measures? The government will most likely run a deficit and need to borrow. To stabilize the system, Daniel Cohen adds that the principle is simple: “the deficit must simply be equal to the loss of activity due to the pandemic.” In the example of a two-month lockdown, this means that Luxembourg’s government could inject 3.9 to 5.9% of its baseline-as-usual GDP in the economy. With a public debt around 21% of GDP, Luxembourg can afford using such a fiscal stimulus. This is not the case in many countries, including European Member States.

Funds can also be drawn from workers and industries hit less (or not hit) by the crisis. While a self-employed cleaner may see their income drop substantially due to social distancing, a public sector worker will likely benefit financially from working from home (he/she does not use her car to go to work) while also benefiting from job security that the public sector offers. An intra-societal transfer would imply that the second worker funds the first worker’s income support; this can be implemented very quickly by means of a tax on the second worker.¹⁸

2.7 Coordinated therapy to avoid a global and systemic collapse

As stated before, the existing empirical literature on the “Spanish Flu” shock to the economy, can provide some insights on how to perceive the impact of the Covid-19 shock to the world economy now.¹⁹ However, it is time to be extremely cautious because, in the 21st century, we live in a more globalized world of leveraged companies and business. Leveraging means that revenues, cash flows, and debt, have all been pre-calculated and priced through complex

¹⁶Additional short term support measures are also put in place by Professional Chambers. For example the Chambre of Commerce backs 50% of the credit lines up to an amount of 250.000 EUR through its mutuality. In order to secure the financial means to put in place the announced measures, the Minister of Finance will ask Parliament to validate a new 3 billion EUR loan.

¹⁷On March 19, the Ministry of Foreign Affairs announced that residence permits of third country nationals that would have expired after March 1 would be extended for the duration of the crisis. On March 26, the government announced that no eviction would be enacted during the crisis, both for private persons and firms. Several of the most populated municipalities, including Esch-sur Alzette and Luxembourg, had previously announced to put a moratorium on the rents that they perceive from businesses during the crisis.

¹⁸One form of tax one may consider is the in-kind tax. For example the government may temporarily freeze the public sector workers’ lunch vouchers and use the savings made to support the income of those in need.

¹⁹See, for example, Barro et al. (2020a), Barro et al. (2020b). Other relevant studies and estimates include, for example, Fan et al. (2016), Bobashev et al. (2011), Markowitz et al. (2019), Slusky and Zeckhauser (2018), Beach et al. (2018), Clay et al. (2018), and Yoo et al. (2010).

financial securities. Specifically, debts across companies intertwine in a complex international network involving a financial sector that is still recovering from the 2008 crisis. As the Covid-19 medical cure is likely to take long, a long disruption in production can influence the cash-flow position of a large number of companies, which can lead the whole international debt network to a collapse.

Hence, we must be exceptionally cautious when using standard business-cycles recession-analysis models that are used for forecasting during normal times. All these models pre-measure long-run trends and assume that the main structural features of the economy, key industries and the banking sector, are all in place throughout the recession.²⁰ This corresponds to our baseline-usual context of Section 2.4. However, this economic structure is at stake, with high *systemic risk* for a financial vicious circle described as:

- Low market liquidity worsens the liquidity position of banks;
- Bank liquidity problems worsen market liquidity;
- Markets see the vicious circle and become pessimistic about the future, demanding money instead of illiquid assets; and...
- The low price of assets traps everyone into fire sales, leading to lower market liquidity, sending the vicious circle back to the first effect above.

Entering such a vicious circle means weakening or losing the national fiscal instruments and European monetary tools: standard “fiscal multipliers” behind fiscal stimulus can be lost and monetary policy can be trapped itself into a liquidity trap. Even worse, a quick recovery may be unlikely for many countries, meaning that a slower growth trend might follow for many years, as in the great recession (Luxembourg can be at high risk for such a development). The *COVID-19 challenge is an out-of-sample experience requiring flexible models of endogenous leveraging of the financial sector*, such as the [Brunnermeier and Sannikov \(2014\)](#) model and the analysis by [Brunnermeier and Reis \(2019\)](#), in order to obtain additional policy insights.

If “**all goes well**”, workers must take a forced vacation for two or three months, the disease slows down considerably during summer times, workers make up for lost income in the summer, no significant number of companies declares bankruptcy, the financial sector stays intact, and the global economy recovers. The short-run, back-of-the-envelope calculations presented in Section 2.4 apply and the economy goes back to normalcy, with some short persistence or with a rebound. This scenario of a temporary recession is plausible, but probably not the most likely.

If “**things go wrong**”, a very large number of companies declare bankruptcy, a banking crisis follows, a financial crisis together with a sovereign crisis occur in many countries, and the world economy falls into a global economic depression, even a stagnation trap à la [Benigno and Fornaro \(2018\)](#), as argued in [Fornaro and Worlf \(2020\)](#). In the “all goes well” state of the world, typical fiscal remedies (as those described in Section 2.6) might be enough for dealing with a temporary recession. The other state of the world can be prevented through *preemptive policy*.

What does the presence of systemic risk imply for decision making? Firstly, it would be risky if policy makers confined exclusively their sources of advice to standard business-cycle experts at normal times. Instead, it is wise to seek additional advice from academics and practitioners

²⁰This holds even for global-disease models developed recently, as, for example, [Eichenbaum et al. \(2020\)](#) and [Atkeson \(2020\)](#).

who understand the systemic risk of a major financial crisis and how this can lead to losing substantial productive structure in a short period of time. *Preventive measures for avoiding systemic risk is putting weapons on the table that convince markets to stay invested.* Such weapons are guarantees of a cash injection from the future at the global level. This means a coordinated effort to borrow from future taxpayers in order to save the jobs of both the current and the future taxpayers: *credibly announcing a globally coordinated and financed fiscal tool, a lender of last resort, that can ensure that the production side does not lay off its workers.*

Strong benefits could be achieved if European leaders meet and act together for the EU, and if G8 and G20 leaders meet and act together for avoiding the possibility of a global economic crisis. The US and the EU are being hit by the crisis right now, and it is also in the interest of China to keep the US and the EU economies in order to avoid a possible collapse of its own banking system caused by a long slowdown in the demand for its products.

Large-scale appropriate weapons at the EU level are an expansion of the European Stability Mechanism (ESM) budget and responsibilities. Guarantees are necessary from all EU countries for fiscal contributions and guarantees for the banking sector. The ESM can serve as the ultimate lender of last resort to troubled EU governments.

At the national level, governments must ensure that firms can meet their obligations by providing loans, tax exemptions and subsidies. Governments should also examine developing a 'lender of last resort' system at the national level for their banks. Regarding the services sector, it is important to identify high-interpersonal-contact professions and to provide loans and transfers of income.²¹

The preemptive systemic-risk policy and the fine-tuning policies must co-exist, as fine-tuning policies cannot be as effective if systemic risk is not removed from the perceptions of investors. In addition, all policies must be clear, firm and coordinated at the international level. As Muller (2020) emphasizes, the government should not add policy uncertainty in the spirit of Bloom (2009); Bloom et al. (2007a).

2.8 Smooth exit from the lockdown... coordination again

After the first phase of lockdown measures, the restarting of the economy will require a clear logistic strategy that ideally (i) avoids a short-run relapse of the health crisis, (ii) helps workers to overcome the fear of being contaminated, and (iii) accounts for the constraints imposed by the global value chain (firms must be able to find suppliers of intermediate goods and services). A last consideration concerns (iv) workers' risk of contagion due to close contact with customers or suppliers. This risk of contamination governed "sectoral" lockdown decisions and should be accounted for when deciding to restart the economy.

When the congestion of healthcare systems is less critical, different and potentially interdependent **strategies to bring workers back to work and unfold the return of economic activity have been discussed in recent works.**²² Although these strategies are not im-

²¹See, for example, Faria-e Castro (2020) and Leibovici et al. (2020).

²²The lockdown policy has been implemented in most European countries and appears to be a good solution in the short term. It is however not an economically viable option as a vaccine-development time frame is around 18 months. A panel of experts of the Imperial College COVID-19 Response Team (see <https://intensiveblog.com/ferguson-et-al-2020-imperial-college-uk-covid-19-response-team-report/>) recently proposed an intermediate solution of intermittent lockdowns, allowing temporary phases of reopening.

plementable directly in the case of Luxembourg, a small open economy that heavily relies on cross-border commuting flows, they can be adapted and/or combined. Figure 5 provides some key “parameters” that govern the probability of success of these business resumption plans.

The first and arguably the most compelling plan, proposed by Dewatripont et al. (2020), is a **Risk-based** transition approach. A prerequisite to bringing workers back to work is a reliable identification of individuals who will not contract the virus or transmit it to others. A combination of serological and RT-PCR tests allows the detection of non infected and immune individuals (the latter have been infected by the virus and have recovered). The authors argue: “As asymptomatic individuals who test positive with a serological test may still carry the virus and infect others for a certain period of time, there is a need to verify, through a RT-PCR test, that these immune individuals are no longer carrying the virus. Only those who test positive with a serological test and negative with a RT-PCR test should be allowed to return to work.”

This *almost-risk-free* strategy establishes a lower bound for the risk that the virus will return within a few weeks of restrictions being lifted. Given logistical constraints, the strategy could be applied gradually, targeting healthcare professionals and holders of ‘essential jobs’ generating large multiplier effects on the rest of the economy in the first phase,²³ those for whom teleworking is not an option in a second phase, and the rest of the labor force in the third phase. Tests should be repeated at regular intervals and, in the case of Luxembourg, implemented on Luxembourgish and cross-border workers. The latter represent 44% of the total labor force and the majority of them come from the French Grand-Est and the Belgian Walloon regions, where Covid-19-driven death rates are considerably greater than in Luxembourg, as shown in Figure 5b.²⁴ A intensive coordination is needed to make sure that cross-border workers can be tested before they get back to work and re-tested on a repeated basis.

The second risk-minimizing (but not risk-free) plan, described in Monras (2020), is **Geography-based**. It applies to commuting zones, defined as spatial areas “where there is intense commuting inside the area, but little commuting outside of it”. The strategy consists of identifying commuting zones which have not registered new Covid-19 cases for a period of several weeks, and allow mobility within them. In contrast, mobility should be restricted in areas where new cases emerge and between commuting zones. Practically, this requires defining and patrolling internal borders.

In addition, given its economic structure and the heavy reliance on cross-border workers (including in the vital health sector), implementation of this strategy in Luxembourg would imply an intensive and seemingly unrealistic coordination with the authorities of neighboring regions within the Greater Region... which should effectively need to shield part of their territory from other areas in France, Belgium and Germany. Provided that these regions exhibit stable infection rates and are willing to partner with Luxembourg, this basically means that part of the Walloon region should be isolated from the rest of Belgium, part of Saarland and Rhineland-Palatinate should be isolated from the rest of Germany, and part of the Lorraine region should be isolated from the rest of France. Such a coordination seems untenable and unenforceable, which means that a strict application of the Geography-based strategy to Luxembourg would require excluding cross-border commuters. This seems impractical as the share of cross borders

²³E.g., public transportation, transportation and distribution of essential goods, gas service stations, etc.

²⁴Death rates are obviously influenced by regional factors such as the age and education structures of the population. Other measures such as the density of Covid-19 cases suffer from other limitations such as testing policies.

workers in the lockdown industries is high: 32% in the accommodation and food industry, 36% in arts and entertainment, 43% in the transportation and manufacturing sectors, and 63% in services to households (see Figure 5a)

A third risk-minimizing strategy, described in [Ichino et al. \(2020\)](#), is **Age-based**. It consists in gradually sending younger workers who face the lowest health risks back to work on a voluntary basis. To start with, priority sectors could be identified along with the minimum number of workers needed to have them running. The young workers should be temporarily separated from more vulnerable groups and hosted in unused hotels, whereas older workers should keep working from distance. Mobile workers would need to be frequently tested which, as the authors argue, would not only help to trace contagions quickly but also allow to answer important questions (such as whether immunity is obtained after a first infection). To facilitate the tracking of the disease, technological means, such as apps, could be used. If they become immune after a first infection, workers would be allowed to return home. These workers should be incentivized for this effort and, besides the hotels, a dedicated health infrastructure would need to be put in place where they could receive priority treatment. In a scenario where some firms would be allowed to resume their activity but others would not, there would be a need for an “emergency fiscal system to redistribute the profits of restarting firms”, such that part of the profits of working firms would sustain firms and workers on hold. [Ichino et al. \(2020\)](#) stress that such a strategy would work best if it was implemented across countries, with the support of an international task force.²⁵

The latter strategy is in spirit close to a military draft, where young people are mobilized, and involves many loose ends. It would not work if production involves a strong complementarity across age groups; Figure 5a shows that workers aged 45 and above represent 38% of total employment in Luxembourg, with greater fractions observed in lockdown industries such as accommodation/food or arts/entertainment (37%), transportation (47%), construction (55%), the wholesale and retail sector (58%) and the manufacturing industry (66%). This strategy also involves an implicit judgement about the value of life.

Although the first “risk-based” strategy seems to be the most convincing one, **its implementation in the case of Luxembourg raises tricky questions** related to the country’s high reliance on cross-border workers. A first aspect is that *this option is not fully in the hand of Luxembourg* since cross-border workers are subject to the rules of their country of residence. Neighboring countries might decide not to allow their residents to travel abroad. Although death rates show opposite patterns, recent statistics indicates that the evolution of the number of infections per inhabitant is more worrisome in Luxembourg than in Belgium, France and Germany. Therefore, one should not underestimate the risk of an opposition from border countries. Given the share of cross-border workers in their total labor force, it is also uncertain whether these countries would internalize the benefits of a back-to-work situation for these workers, and lift global restrictions of mobility. In this case, Luxembourg should negotiate with its neighboring countries some provisions specific to cross-border workers.

Suppose now that cross-border workers are allowed by their sovereign country to commute to

²⁵Though the authors argue that this transition phase should be launched as soon as possible, Luxembourg and most European countries have not reached the peak of the disease and would likely not be able to guarantee a dedicated health infrastructure for the workers. It is also not clear whether the country’s existing fiscal system would enable the transfers between working and non-working firms, which would be essential to sustain such a system.

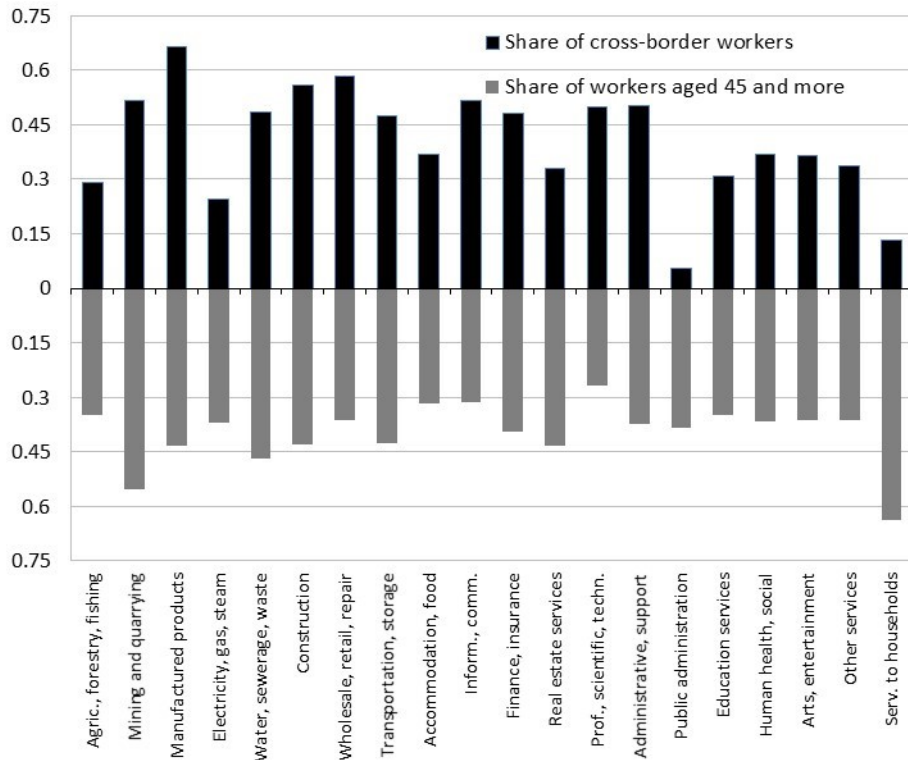
Luxembourg. In that case, easing of the border restrictions of course entails a risk of a new wave of infection if testing of the cross-border workers has not been done properly before. The key questions about the testing are: *where is the testing to be done and who should pay for its cost?*

Ideally, any cross-border worker willing to resume work in Luxembourg should be tested in her area of residence and should get a certificate allowing them to cross the border and get back to work. Germany has already announced its intention to conduct tests on its workers and to issue immunity certificates allowing them to resume work in Germany. The test could be ready by the end of April. The *cost-sharing issue* is even more tricky. On the one hand, it is in the interest of Luxembourgish firms to have these tests being done to resume their economic activity. This calls for a cost to be supported either by the firms or alternatively subsidized by Luxembourg's government. On the other hand, it is in the interest of the countries of origin to make sure that the cross-border workers getting back to their place of residence in the evening will not be infected and will not lead to a new wave of infection in these areas. It is also in the interest of the countries to see their cross-border workers return to work since they generate important positive spillovers in their areas of residence. All these considerations emphasize the need for a bargaining process between the government of Luxembourg and the neighboring countries to determine the respective share of the cost supported by each side.

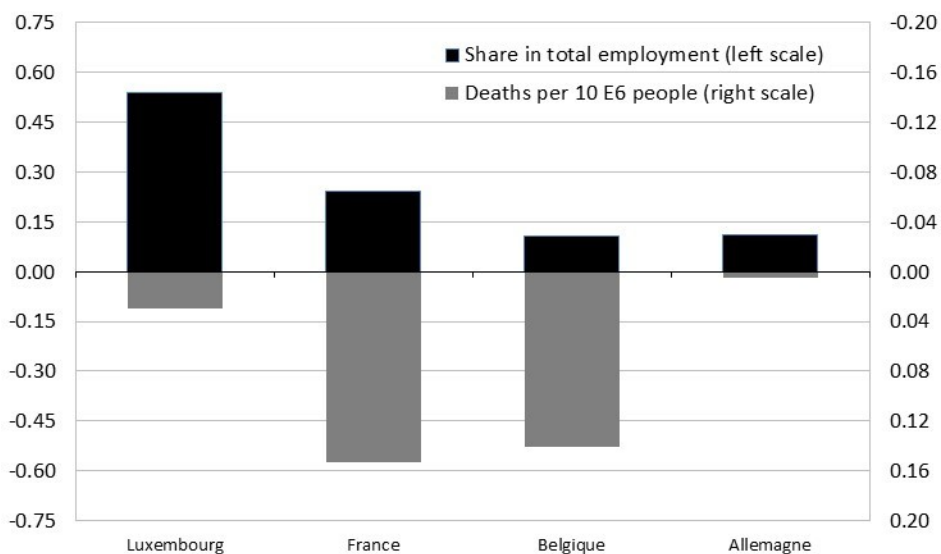
Last but not least, is the aspect that *this massive-testing policy should be fully coordinated across the four countries*. Any deviation from a global strategy of double testing will generate detrimental effects for all countries. If two countries, say Germany and Belgium, refuse to conduct the tests of their cross-border workers and allow the mobility of potentially infected workers, this will be detrimental for both countries. The same issue applies if two countries test the workers only partially. An important aspect is that this situation creates a free riding problem due to the public good nature of immunity. If all countries but one implement the double testing strategy, on paper, the fourth one does not need to implement it. In other terms, any partial agreement might be sub-optimal or might fail to achieve a satisfying agreement. This analysis calls therefore for a global coordination within the Great Region about the conditions under which the end of the lockdown and the resumption of activity should take place. While it might sound tautological, one should have in mind that at the start of the crisis, the various measures have been to a large extent uncoordinated across countries. Both the timing and the severity of the lockdown measures have been different across the four countries. Therefore, it seems important to stress the urgent need for a general coordination of policy measures.

Figure 5: Potential ingredients for a smooth exit from the lockdown

(a) Share of cross-border and older (45+) workers in employment by industry



(b) Share of cross-border workers and Covid-19 cases per 10E6 people by country of residence, as of March 29, 2020



Sources: Employment data from “Tableau de bord du marché du travail luxembourgeois,” Ministry of Social Security. Data on number of cases from various sources.

3 Long-term perspective

Within 12 to 18 months, we may expect that treatment and vaccines will be the ultimate solution to Covid-19. By analogy, research effort in social science is needed to propose preventive measures to limit the adverse consequences of the shock. As previously stated, the pandemic and the inevitable resulting recession might induce uncertain long-term effects on firms and individuals' behaviors. We discuss here other mechanisms – some beneficial and some detrimental – that could potentially govern the long-term impact of this health crisis – reduction in human and financial capital, household dynamics, emergence of a new form of digital capitalism with uncertain effects on welfare inequality, surge in populism, implications of increasing international linkages for international solidarity and cooperation, increasing need for development assistance to avoid humanitarian disasters and a long-term risk of relapse – and that involve more substantial mentality changes.

3.1 Reduction in capital stock

Physical, human and social capital are essential ingredients for raising productivity growth. One may fear that the Covid-19 crisis will have a negative impact on capital accumulation. Social capital responses will be discussed later (Section 3.5). As far as physical capital is concerned, most economic investments are financed by borrowed money and therefore by savings. Loss of income affects the household budget because households save less or use up their savings in order to fund consumption.²⁶ The impact on household budget is likely bigger among low earners who, due to the nature of their job, cannot work remotely (e.g. Kaplan et al., 2020). One may expect households to make up for foregone savings as soon the economy returns to normalcy (consider the shock as transitory); this depends ultimately on the length of the crisis. The longer the crisis lasts, the deeper such household budgets are affected with implications for future consumption, ability to service debt, investment in durable goods, etc.

As for human capital, school closures disrupt learning in the generation currently at school. Such learning disruption may be compared to *summer learning loss*, namely the depreciation of students' skills in the summer school break. The longer and more repetitive the disruption is, the more detrimental the effects on children's human capital will likely also be. Cooper et al. (1996) report that summer learning depreciation differs by subject and student grade. One may expect such depreciation to be exacerbated by a general lack of education alternative at the moment (i.e. a class meeting online like workers working from home currently do).

One may expect a similar disruption in the accumulation of human capital among young workers, especially those who have entered the job market recently or those who work in disrupted sectors (Glover et al., 2020). Possible reductions in training, lack of peer effects, or skill depreciation due to lack of work (e.g. a pilot who cannot fly her plane) may result in a generation of workers losing out on human capital. While this loss should generally be negligible if the current lockdown does not last long, it will certainly be substantial if the crisis is coupled with a job market crisis in the months and years following the pandemic. Both types of human capital (education, work-related skills) are typically associated positively with productivity, earnings, and job progression.

²⁶It may be possible that, everything else equal, *some* households increase their savings if, due to teleworking, they achieve savings on commuting, childcare, or food.

3.2 Changes in deep preference parameters

Capital accumulation can also be affected in a more sustainable way by changes in deep preferences. As highlighted by [Beine and Dupuy \(2020\)](#), recent academic research in social sciences shows that important events can affect the preferences of agents. For instance, the 2008 financial crisis has been found to increase risk aversion of some agents that were subject to its economic consequences. Similar changes are observed when people are confronted with natural disasters such as floods, earthquakes, tsunamis or hurricanes.²⁷ Hence, we might expect that on average, people will come out of this unprecedented crisis with greater risk aversion and greater preferences for the present. The magnitude of these effects will of course depend on the severity of the crisis and its duration.

[Beine and Dupuy \(2020\)](#) discuss the effect of Covid-19 on what economists and social scientists have called deep parameters. Some deep preference parameters are key for explaining important economic choices of agents; in particular, attitudes towards risk and preferences for the present have important implications for economic decisions like investment, entrepreneurship, consumption and many others. More risk aversion in a society will imply less investment, less innovation and less entrepreneurship to the extent that these decisions involve a lot of uncertainty. Time preferences relate to the preference people assign to immediate rewards compared to postponed ones. People with greater preference for the present will be more likely to accept important discounts in the payoffs they will receive today compared to tomorrow. These preferences also affect economic choices, like the aforementioned ones, but also other ones like the decision to invest in higher education. Even though the persistence of the effect on preferences is not known, [Beine and Dupuy \(2020\)](#) argue that the short-term effects are so large that even if they disappear over time, it will take months if not years. As a result, even in the medium term, the change in preferences caused by the crisis can open the door to expectation-driven stagnation traps (or supply-demand doom loop) by weakening the growth fundamentals of the economy ([Benigno and Fornaro, 2018](#)).

3.3 Emergence of a new form of digital capitalism

Daniel Cohen recently argued that this health crisis could mark the end – or the beginning of the decline – of the form of globalized capitalism that we have experienced for the last forty years. This means the continuous search for low costs by always producing more remotely. However, the crisis might also signal the acceleration of a new form of capitalism, digital capitalism.²⁸

This crisis offers the opportunity to consider digitalization from a less pessimistic perspective. As teleworking becomes a necessity during pandemics, it is reasonable to believe that certain companies and types of workers will adapt their operations and networks so that work from home becomes an easy fixed alternative to them. At face value, this is a welcome response of the economy as it becomes more resilient to similar shocks and digitally more friendly in general. In addition, digitalization is able to mitigate problems arising from social isolation resulting from

²⁷One needs not to suffer directly from a shock to be prone to changes in ones preferences. For example, [Ajzenman et al. \(2019\)](#) report that Europeans living near “refugee routes” – i.e. the routes followed by refugees during the crisis of 2015 – tend to declare higher risk-aversion and to engage less in entrepreneurial activity, which the authors interpret as resulting from a change of preferences sparked by witnessing others’ fate.

²⁸The concept of digital capitalism has been introduced by Schiller (1999), an American media communication scholar. Schiller expressed a pessimistic view about digitized networks claiming that they will be captured by the “dominant, neoliberal market structures” (Meier, 2019).

lockdown measures. It is certainly not a substitute for restoring social connectedness. However, information and communication technologies (i.g. Skype, Zoom, etc.), social networking sites (i.g. Facebook, Twitter, etc.) that are accessible to many people are ways to partially attenuate social distancing.

Lockdown disrupts production and capital formation as well as labor participation. The dissemination and the interconnectedness of digital devices among suppliers and consumers and among remote workers may lessen these problems without eliminating them. With the acceleration of the digital capitalism, we might assist to additional productivity increases, especially in industries highly depending on digitalization, as observed by Daniel Cohen. For example, teleworking allows by the interconnectedness of digital devices among workers can benefit from less commuting time and more flexible labor activity.

By contrast, one may expect this development to affect demand for labor differentially across skills, perhaps in a similar way to how automation affects different skills differently (e.g. [Acemoglu and Restrepo, 2019](#)). In ongoing work [Kaplan et al. \(2020\)](#) differentiate workers with respect to how easily they can carry out their work tasks from home. Such workers lose relatively less productivity during the pandemic, while others (e.g. car mechanics, waiters) lose much more. As the economy attempts to become resilient, demand for certain skills and jobs will fade, with consequences for individuals and households who cannot adapt and implications for society as a whole.

The current crisis shows that digitalization can lead to a division of society into those directly involved in the production process of intangible goods and those involved in hands-on activities who must closely interact with sales-markets. The former are generally the lower skilled and the latter should rather be the lower skilled. It follows that the lower skilled could probably be much less beneficiary of potential advantages of the digital capitalism. So, if long enough, there is a possibility that the current crisis will further transform the economy by accelerating the impact of digitization on many areas of business and production activities as well as the organization of the labor markets

3.4 Household dynamics

Media reports emerge that domestic abuse has surged during the Covid-19 lockdown.²⁹ Domestic abuse incidents intensify if households also face financial hardships or unemployment ([Anderberg et al., 2016](#)).³⁰ Assuming women are the main victims of such abuse, one would expect that such women may delay or reduce fertility, or divorce ([Anderberg et al., 2018](#)). Typically one would also expect that such women increase their labor supply; this is not possible in lockdown unless they engage in risky behaviour (for example, violate the lockdown restrictions). Changing fertility or marital patterns can have lasting consequences in the macro-economy ([Borella et al., 2018](#)), more so if coupled with changes in the victims' intrahousehold decision power or preferences for marriage and family (see section 3.2). The government of Luxembourg could launch and promote an easy-to-reach domestic abuse report and support

²⁹Nazia Parveen and Jamie Grierson report for The Guardian that there has been a rise in domestic abuse incidents in the UK directly related to the coronavirus outbreak; article accessed on April 3, 2020: www.theguardian.com/society/2020/mar/26/warning-over-rise-in-uk-domestic-abuse-cases-linked-to-coronavirus.

³⁰Physical violence is typically the tip of the iceberg as intra-household sabotage is another type of domestic abuse, albeit less visible than physical violence ([Anderberg and Rainer, 2013](#)).

hotline immediately (for example, through SMS or Whatsapp messages).

The popular press has long talked about “hurricane birth boom”, “Super Bowl babies”, and other fertility stories following major events. As one should take these reports cautiously (see for example [Grech and Masukume, 2017](#)), there is ultimately no certainty that a fertility boom may happen this time.

As couples spend more time together due to lockdown, it is possible that learning about each other will improve. This may be especially true among younger couples who have typically been together for less time than, say, a couple of 40 years. It is especially true for people who have not previously witnessed their spouse at work (now home is “at work”) and for anyone who has not lived through a quarantine before. Learning about one’s spouse may lead to some couples dissolving after the crisis as they find out they are not good matches for each other (in a labor market context, see [Jackson, 2013](#)). This is, however, not an unfortunate byproduct of the crisis as these couple would likely divorce in the future nonetheless.

3.5 Anti-globalization and populist movements...

Economists have also demonstrated that economic crises, alongside increases in unemployment and inequality, generate surges in populism and Eurosceptic voting. It is unclear whether or not the ultimate fallout of the virus will be to accelerate the breakdown of globalization, pushing firms to bring manufacturing back home so as to avoid future disruptions. In a recent interview, Richard Baldwin said: “In the longer run, it could encourage more populism and undo these value chains. [...] Or it might be that we finally understand that if somebody gets sick in China, it’s a problem for all the G-7 countries and end up boosting multilateral cooperation and coordination.” Alberto Alesina adds: “Populists everywhere are already using the panic created by Covid-19 to damage even more the perception of the EU amongst citizens blocked at home, without anything to do other than commiserate their fate and blame someone, the EU in particular.”

Rethinking globalization without preconceived ideas is a challenging task. Though it creates winners and losers, the broad consensus among economists is that trade induces large and unambiguous net gain for society and greater diversification of risk in normal times.³¹ During this crisis, the disruption of global value chain has generated epidemiology-type economic spillovers, and has highlighted the strong dependence of our health care system on overseas suppliers.

Debates about what should be globalized will be inevitable. On the one hand, many economists feel the tension between a general sense that globalization has gone too far. On the other hand, we also feel the rise of a global conscience that greater cooperation is needed to face global scourges (see Section 3.6). Populist movements and politicians exploit the former while efficient policymaking requires thinking globally. A fundamental question will be whether the current trends towards stronger demands for protection and equality will turn exclusive

³¹The economist Adam Posen, president of the Peterson Institute for International Economics, recently argued: “anti-globalization trends induced by the Covid-19 crisis might result in a new great recession in the global economy. Economic nationalism has resurfaced in a global economy already weakened by the Covid-19 pandemic. People and politicians try to look after those closest to them, hoarding medical equipment and withholding aid for poorer countries. But these policies are self-defeating. Over time, countries that try to decouple from the global economy will end up suffering more from lack of diversified sourcing and unavoidable local shocks.”

(contributing to isolate each country) or inclusive (i.e., include the sick and the poor beyond one's national borders). A key test for where we are heading will be the changes that will arise for immigration policies, including (especially in the case of Luxembourg) with regards to temporary and cross-border mobility of workers.

3.6 ... Or a greater cooperation to face global scourges?

Changing the way to conduct policies, reinforcing solidarity between regions and countries, and fighting short-termism should be the main lessons to be drawn from this crisis. International cooperation is required because the crisis is global and there are obvious externalities that can only be addressed cooperatively.

Research in social science has shown humanitarian conflicts – due to civil and interstate wars or health crises – reduce individualistic tendencies and increase empathy. People tend to behave in a more cooperative/altruistic manner and are more inclined to join social groups. In a recent column,³² Nobel Prize winner Jean Tirole argues the battle against Covid-19 has the advantage that the group extends, beyond its fellow citizens, to all of humanity and that there is no “outgroup” other than the virus. By rallying European and non-European people around the same cause, the health crisis can help policymakers reach two goals.

The first goal is to reinforce international cooperation and solidarity between countries, which is a fantastic opportunity to curb the trends towards populism, nationalism, ethnic and religious intolerance. This is good time for responsible position statement and for using a unifying narrative. A good example is European Commission President Ursula von der Leyen's recent message: “At this moment in Europe we are all Italians.” By contrast, a bad example is the recent declaration of Donald Trump referring to Covid-19 as a “Chinese disease.”

The second goal is to draw on the lessons of this crisis to rethink public policies in a cooperative way and with a longer term perspective. This health crisis has demonstrated the possible consequences of such short-term and shortsighted thinking. Jean Tirole emphasizes the need to invest more in effective health systems and promote research that will allow us to respond quickly to emerging threats. Coordinated investment in tracking and tracing technologies fulfilling the constraints of protection of privacy and personal data is a possibility. In this crisis, technology played a role in reducing uncertainty and improving surveillance activities. Pinelopi Koujianou Goldberg, a former World Bank Group chief economist, recently argued that: “Technology has been the true champion in the fight against the spread of COVID-19. Here, I don't mean the ICUs and respirators without which severely ill patients would not stand a chance. I mean the new data-driven technologies that enabled responsible governments to track the infected, contact them, and quarantine them early. COVID-19 reminds us that we may want to think carefully about the relative benefits of data sharing, as they may sometimes dominate the value of preserving privacy.”

Global crises are no longer rare events, and the great scourges of the 21st century include not only future health crises but also the underinvestment in research and education, climate change prospects, rising inequality, etc. The Covid-19 reminds us of our overall vulnerability in many dimensions. Changing mentalities towards more cooperation and more solidarity between

³²Jean Tirole: face au coronavirus, “allons-nous enfin apprendre notre leçon?” in Le Monde, March 25, 2020 (see https://www.lemonde.fr/idees/article/2020/03/25/jean-tirole-face-au-coronavirus-allons-nous-enfin-apprendre-notre-lecon_6034318_3232.html).

people, between countries and between generations would be at least a tribute to the victims of the virus, says Jean Tirole.

3.7 Need for increasing development aid

Besides coping with domestic budget problems, national and European governments must help developing countries cope with the health and economic implications of the Covid-19 crisis. Increasing development assistance is not only an ethical and humanitarian imperative, but also a strategy of relapse prevention in the long-term.

On the African continent, the first Covid-19 cases were reported on February 25th in Algeria. By March 24th, 1,716 cases had been reported in 38 African countries, most of them imported from Europe and the United States (by tourists or returnees), rather than from China.³³ The geographical expansion has been fast and the number of reported cases has almost doubled in one week to reach 3,497 on March 31.³⁴ In this early stage of the outbreak, the fatality rate is 2.2%, and men aged 41 year and older are disproportionately affected.³⁵

As in other parts of the world, the Covid-19 outbreak will spread in Africa with an exponential speed: in the absence of relevant public health policies, the number of cases will explode over the next few weeks.³⁶ To contain the spread of the Covid-19, prevention tips have been advertised massively, social distancing has been imposed, travels have been restricted and people have been asked to stay home. International borders have been closed and some countries are imposing a lockdown (South Africa, Kenya, Rwanda, Lagos, Niger, etc). The WHO has also recommended programs of massive testing, surveillance and quarantines of the infected people and tracing all potential contacts.

Implementing effectively these containing measures is very challenging within Africa. To mention a few obstacles, social distancing is almost impossible in slums where households are overcrowded, people mostly stay outdoors and handwashing facilities barely exist.³⁷ The lockdown is proving almost impossible and is generating important social tensions (e.g. in South Africa and Tunisia) because most people live on daily wage and manage food consumption daily. The laboratory testing capacity for Covid-19 has improved between February and March but it is still completely missing in 15 countries.³⁸ In addition, many countries have insufficient resources to scale up diagnosis capacities.

The infected population as well as the number of people in need of healthcare, in particular intensive health care, will increase significantly. However, the health care system in Africa is poorly equipped,³⁹ dysfunctional and the number of well-equipped intensive care units is very limited.⁴⁰ A surge of patients would cause the poor health system to run completely out of

³³See Ruth Maclean, "Africa Braces for Coronavirus, but Slowly," New York Times, March 17, 2020.

³⁴<https://who.maps.arcgis.com/apps/opsdashboard/index.html#/0c9b3a8b68d0437a8cf28581e9c063a9>

³⁵<https://www.afro.who.int/health-topics/coronavirus-covid-19#sitrep>

³⁶<https://medium.com/@tomaspueyo/coronavirus-the-hammer-and-the-dance-be9337092b56>

³⁷Only 25% of the population has access to handwashing facilities (including water and soap) in 2015 (World development indicators World Bank)

³⁸<https://www.afro.who.int/health-topics/coronavirus-covid-19#sitrep>

³⁹Less than one hospital bed per 1000 inhabitants compared to six per 1000 on average in Europe

⁴⁰The number of beds in intensive care in South Africa, the richest country in the continent with a population of 57 million, stands at 1,000, and it is just of 150 in the whole Ethiopia; See "Coronavirus: Regardons ce qui se passe en Afrique," Le Monde, March 26, 2020 (see <https://www.lemonde.fr/idees/article/2020/03/26/>)

control. It will threaten the life of health care workers, as was the case with EBOLA,⁴¹ and this will put the health system in a disastrous vicious circle.

It can be feared that the new pandemic will be difficult to keep under control in Africa and that Covid-19 might circulate within the continent for years. Among developed countries, it can be expected that the epidemic will eventually be under control with vaccines/drugs, partial herd immunity, and continued but less disruptive containment measures. In Africa, if the current virus follows patterns observed in the past, an efficient containment will require more time. EBOLA started in 2014 and was still present in the continent in 2019.⁴² A vaccine for measles has been available for more than fifty years, but measles is still killing people in Liberia, Madagascar and DRC.⁴³ Despite the improved knowledge on HIV-AIDS, one million new HIV infections were reported in Africa in 2019.⁴⁴ There are therefore important risks that, after a few years, Africa would re-export COVID-19 to the world and induce a rebound of the pandemic.

UN has estimated that 10% of the GDP of every country is urgently needed to contain and manage consequences of the outbreak of the Covid-19.⁴⁵ It has called for a USD 2.5 trillion Covid-19 rescue package for the world's emerging economies.⁴⁶ The amount would help strengthen healthcare systems and services, sustain the economy (business and the financial sector) and provide social assistance to households heavily hit. While developed countries can afford to generate these resources by themselves, it is virtually impossible for developing countries and in particular for African countries. Some countries, such as Mauritania (USD 65.7 million), Senegal (USD 103 million) and Ivory Coast (USD 2840 million, 5% of GDP), have committed to spend some resources but the amount is still far short of the 10% of the GDP needed.

Before the outbreak of the Covid-19, Africa was the epicentre of global poverty. Its economy was further deteriorated in early January 2020 with the drop in commodity prices and the drop in world demand cause by the outbreak of Covid-19 in China.⁴⁷ The lockdown in western countries and the closure of international borders restricted tourism and the export of raw materials that constitute considerable inflows of revenue. The flow of foreign direct investment is also at high risk and important outward capital flows are observed.⁴⁸ The global downturn of the economy will further hit the continent which is thus in dire need of international help.

The World Bank and IMF have stepped up emergency financing, which consist broadly in zero-interest loans. The IMF made available USD 10 billion and the World Bank offered USD 12

[coronavirus-regardons-ce-qui-se-passe-en-afrique_6034463_3232.html](#)).

⁴¹During the EBOLA crisis in 2014-2016, 10% of the health care workers died in Liberia.

⁴²Two thousand people died of EBOLA in 2019 in Democratic Republic of Congo (DRC).

⁴³Prevention and treatment protocols for malaria have been available for years but about 400 000 people died of malaria in 2018 in Sub Saharan-Africa. See <https://www.mesvaccins.net/web/news/15000-rapport-mondial-sur-le-paludisme-en-2019-des-progres-a-soutenir-pour-l-elimination-du-paludisme>

⁴⁴<https://aidsinfo.unaids.org/>

⁴⁵https://www.jeuneafrique.com/919158/politique/antonio-guterres-face-a-la-pandemie-un-moratoire-sur-la-dette-africaine-est-necessaire/?utm_source=newsletter-ja-eco&utm_medium=email&utm_campaign=newsletter-ja-eco-01-04-20

⁴⁶<https://news.un.org/en/story/2020/03/1060612>

⁴⁷Oil price dropped by 20% between January and February, and by 62% between January and April.

⁴⁸Investors have already removed USD 83 billion from emerging markets since the beginning of the crisis, the largest capital outflow ever recorded. (<https://www.imf.org/en/News/Articles/2020/03/23/pr2098-imf-managing-director-statement-following-a-g20-ministerial-call-on-the-coronavirus-emergency>)

billion to help emerging countries implement effective mitigation measures and policies. The African Development Bank has raised an exceptional USD 3 billion in three-year bonds to help alleviate the economic damages. This Fight Covid-19 social bond is the largest bond ever launched in international capital markets to date. The Bank will lend the money to countries at very subsidized interest rates. However, most African countries have already accumulated an important stock of debt (with an average of 55% of the GDP), and its service is consuming an important part of the national budgets. New debts might help alleviate short-term financial needs but countries urgently need a debt relief as was recommended by the UN trade and development body (UNCTAD). This would alleviate the debt service and provide countries with additional resources. Countries also need immediate budgetary support that will make cash available to provide urgent support to households and business owners, including those in the informal sector. Aid for development should be increased and delivered rapidly to help Africa contain the spread of COVID-19, save lives, mitigate its social consequences and save its economies. EU has already provided 450 million Euros to Morocco, a case which has to be exemplified. A failure to support the African continent will increase the risk of future resurgence of the virus. Further, economic collapses are also likely to increase legal and illegal migration pressures, in particular towards Europe. Hence, the international community should not close its eyes to the needs of developing and emerging countries.

4 Further research for informing decisions

New research is needed to better understand the impact of the Covid-19 crisis and to help decision-makers manage the crisis in the coming months. *RECOVid* members propose collaborative projects which take advantage of the synergies between members and institutions involved.

4.1 Adapting or developing modeling tools

Existing modeling tools can be used to **better estimate the macroeconomic effects of the crisis**. Back-of-the-envelope estimates of economic effects of the crisis on economic activity are provided in this note. STATEC CMP team (Conjoncture, modélisation et prévisions) has full-fledged modeling tools to refine these estimates and to elaborate medium- and long-term projections.⁴⁹ STATEC CMP uses detailed information on “chômage partiel,” “congé pour raisons familiales” to fine-tune more realistic scenarios illustrating the decline by industry. Most recent “make-and-use” tables can also be used to quantify the multiplier effect of each industry and corresponding Social Accounting Matrices could help to derive the impacts on households, firms and public finance. These tools account for macroeconomic interdependencies between output, income and savings, potential growth, euro area growth scenarios (e.g. provided by Oxford Economics) and all relevant public finance variables.⁵⁰ (leader: STATEC-CMP)

The same modeling tools can also be used **to predict the effects of restarting scenarios**, involving a total exit or a partial exit from the lockdown. These scenarios may involve specific

⁴⁹STATEC publishes every month a “Conjoncture flash” which analyses the most recent economic trends. On the 11th of June STATEC will publish its “Note de conjoncture 1-2020” including relevant studies and updated forecasts ([urlhttps://statistiques.public.lu/fr/publications/](https://statistiques.public.lu/fr/publications/)).

⁵⁰See [STATEC \(2007, 2010, 2018\)](#) for model descriptions and [STATEC \(2017, 2020\)](#) for recent scenarios of economic, demographic and greenhouse gas emission trends.

industries or types of workers (nationals and/or commuters, tested vs. not tested) and different timing. Population dynamics or energy consumption and related emissions are modelled as well and therefore consistently react to the economic downturn or recovery. (leader: STATEC-CMP)

Other labor market models can also be adapted and calibrated to assess the **impact of the lockdown on wage inequality and unemployment across occupations and regions**. Since the intensity of lockdown is strongly dependent on the type of work, employees in different occupations are heterogeneously affected by the lockdown restrictions. The same is true for firms across sectors, as the lockdown implies almost full stop for some production processes and service provisions, while other sectors are little affected by these changes. Developing a structural model of labor markets, in which people self-select across occupations, and respond to firms' demand for skills (the latter being affected by the crisis) it is possible to examine the consequences of (i) partial/total lockdown of selected occupations; (ii) bankruptcies of firms within specific sectors and (iii) mitigation policies targeted at preserving jobs for the following outcomes: (i) wage distributions and inequality measures across occupations and sectors, and (ii) employment and forced labor market inactivity. This can be done at the national (Luxembourg) or European scale. (leader: LISER-LM)

An important resource to analyze the economic disruption due to Covid-19 is represented by microsimulation models, which are designed to assess the ex-ante effects of potential interventions or to create prospective scenarios embedding the effects of economic shocks and fiscal policies. **Microsimulation models allow to assess the distributional effects of a variety of policy interventions to face the Covid-19 crisis**, looking at the distributional and revenue effects of tax changes and subsidies, work incentives and their impact on labor supply. Suitable microsimulation models calibrated for Luxembourg are LuxTaxBen ([Islam and Flood, 2020](#)), the SIMDECO household income generation model ([Sologon et al., 2018](#)), and the micro-simulation model for the European Union countries EUROMOD. EUROMOD is a unique source and a highly recognized tool for simulating the effect of tax-transfers reform of all EU countries. The model enables to simulate all individual and household income components (including net income) using available information from the European Union Statistics on Income and Living Conditions - EU-SILC.⁵¹ Assessing the distributional implications of the crisis helps identify who is most likely to suffer from income losses. This leads to more effective/efficient targeting of income support measures. Lack of data can be overcome by proposing a dynamic microsimulation approach to generate a counterfactual income distribution as a function of more timely external data than the underlying income survey. Nowcasting methods can be combined using publicly available data and the SIMDECO household income generation model to predict the distributional impact of the COVID ([Sologon et al., 2018](#)). (leader: LISER-LIC)

4.2 Investigating the cost of non-cooperative actions

In many places in this note, we emphasize that international cooperation is (more than ever) required because the crisis is global and because there are strong externalities linked to any policy decision. Yet, it seems that reaching a decent level of European coordination remains difficult. "Never let a good crisis go to waste", Churchill said. Let's rethink European policy coordination.

The implementation of **restarting policy is complex in the case of Luxembourg, due to**

⁵¹For details about EUROMOD, see [Sutherland and Figari \(2013\)](#)

the high reliance on cross-border workers. The reasons are that cross-border workers are under the rules of other countries, testing can be done abroad or in Luxembourg, testing can be financed by the country of residence or Luxembourg, imposing large-scale testing makes sense if all countries cooperate. There is uncertainty about the total costs of the testing strategy (combine use of PCR tests and serological tests) since multiple testing might be needed for each individual. There is also some uncertainty regarding the testing capacities of Luxembourg and in the neighbouring countries. Game-theoretic frameworks can be developed to highlight the benefits and costs of cooperative vs non-cooperative strategies. (leader: Unilu-Economics)

Turning to macroeconomic policy, an important message is the following: if financial systemic risk remains in the minds of investors, then fine-tuning fiscal stimulus can be quite ineffective. One reason coordinated preemptive policies must coexist with fine-tuning policies is that fine-tuning policies might work as anticipated only if the economy is insured from systemic risk. To convince policymakers that this need for acting and coordinating against systemic risk is crucial, studies can be conducted at the national level. Luxembourg is one of the countries with the highest household leveraging on private debt and mortgage loans. Important for the economy is to **examine the extent to which the number of households that have not been able to service their mortgages has increased and the extent to which banks in Luxembourg face a risk of increased non-performing loans.** If there is a problem with increased non-performing loans, then one should examine policies that can tackle this problem. Taking advantage of the BCL data collected in the CORE project of François Koulischer and Ulf von Lilienfeld-Toal and data from other countries, structural models (applied-theory modeling) of household finance with housing and nonperforming loans can be developed. (leader: Unilu-Finance)

4.3 Analyzing the effects on firms and households

A first descriptive analysis of the **impact of the crisis on business demography and firms' organization.** The effect of the crisis on firms' creation and destruction (exit of so-called zombie firms and/or viable firms, especially small firms and start-up) can be studied with firm-level data (business register, business demography). The timing of this analysis depends on the timeliness of data. In addition, *Global Entrepreneurship Monitor* data provide a timely source of data to analyse how the crisis has changed the experience of entrepreneurs, their new difficulties, their expectations and fears about the future, as well as the envisaged public support.. The effect on firm organization (including adoption of ICT) can be studied with data from Community Innovation Survey and ICT usage. The effect on international economic integration (very relevant in Luxembourg) can be studied using GVCs (which comprise both input and output supply chains), data from OECD's TiVA project and World Input-Output Tables. The Research Division of STATEC has access to the relevant data and aims to provide a timely report as soon as the data become available. Anyone with a strong interest and motivation is welcome to join. (leader: STATEC)

As far as households are concerned, analysis whether the crisis induces **changes in deep preferences and happiness** is important. The Covid-19 outbreak and its consequences at the individual level (loss of health, employment, etc.) might have deep implications on preferences and expectations. It might also change **people's confidence in institutions (trust), openness to globalization and well-being.** We envision a descriptive analysis of how people's perceptions, attitudes and preferences have changed as a consequence of the current crisis. Here,

the major challenge is data availability. Usually to study these variables researchers resort to Survey data, which have issues of timeliness. Nevertheless, access to Global Entrepreneurship Monitor, Labour Force Survey, Eurobarometer and Gallup World Poll data could allow us to address the following issues: impact of the crisis on people's trust, job and life satisfaction, confidence in institutions, acceptance of migrants and of globalization, and changes in their determinants. All these aspects are relevant to understand rising populism. We plan to use parametric techniques to predict how people's attitudes towards globalization, institutions, the environment have changed as a consequence of the outbreak. Additionally, Twitter data can be used to draw timely information on variables related to subjective well-being, trust and social capital (e.g. loneliness, fears, optimism, importance of social relations, confidence in institutions and in others, care for the environment, and globalization). Considering the wide spectrum of topics covered in this section, it is desirable to join forces with researchers from other Institutes in Luxembourg. (collaboration: STATEC & Unilu-Econ & LISER-CB)

The impact of **working from home and the use of new digital tools on workers' subjective well-being and productivity** is another important question. Which strategies and new organizational practices do firms adopt to cope with the crisis? What is the impact of various governmental support measures to firms, the self-employed and to workers? To address these questions a survey questionnaire needs to be run at least two times during the confinement and after six months. (leader: LISER-LM)

4.4 Quantifying migration pressures from developing countries

As European countries restart their economies, they will also consider reopening their internal and external borders. What will they do with regard to countries where the Covid-19 is not yet under control? In particular, the control over external borders is expected to remain for a (much) longer period if developing countries are unable to contain the spread of the virus. In particular, European countries, with or with coordination, are likely to close their borders and restrict entry to people from Africa and other poor regions. Such restrictions will probably affect either the selection of the destination country or the flow of illegal migration given that the pandemic will deteriorate living conditions in poor countries and intensify emigration pressure. Predicting legal and illegal migration flow under different migration policy regimes is important to understand the consequences of external border restrictions and to guide the timing of the reopening of EU borders. (leader: LISER-CB)

4.5 Normative analysis of non-pharmaceutical interventions

How should non-pharmaceutical interventions – social distancing, household quarantine, school and university closure – be designed in terms timing and targeting? The analysis should take into account the following aspects: (i) priority sectors (basics needs, risk of bankruptcy, risk of propagation via professional interactions; (ii) optimal selection of populations to test / to keep confined; (iii) capacity constraints on tests and protection equipment. “Optimal” in this setting clearly means second best since it is impossible to minimize the number of deaths while maintaining the economy, and the government cannot completely enforce the confinement of individuals over a long period of time. (leader LISER-LM)

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Appendix

A Cost of the lockdown with dynamic effects

Starting from the back-to-the-envelope scenarios described in Section 2.4, three types of dynamic pattern are compared here:

- Week-end pattern (*WE*) – The output “mechanically” decreases during the lockdown months and goes back to its benchmark value when it finishes.
- Inertia pattern (*IN*) – On top of the mechanical effect on output, the lockdown implies that firms cannot repay their debt towards banks and suppliers. In addition, investors and consumers can lose confidence in the economy (precautionary savings, lower productive investments). This can induce cascading business failures, financial fragilities, and an associated surge in layoffs. For illustrative purpose, our inertia scenario assumes that the losses in previous months generates an additional decrease in output in month t that corresponds to 10% of the effect in month $t - 1$, plus 5% of the effect in $t - 2$, plus 2.5% of the effect in $t - 3$.
- Catching-up pattern (*CU*) – By contrast, our (symmetric) catching-up scenario involves a stronger resilience. It assumes that 10% of the output loss in month $t - 1$, plus 5% of the loss in month $t - 2$, plus 2.5% of the loss in month $t - 3$ are recovered in month t .

Two possible scenarios are illustrated in Figure 6a. The solid grey curve illustrates a one-month confinement period generating an output loss of 34% in March 2020, followed by a restoration of normalcy in April. The dashed grey curves correspond to the same scenario with inertia (more pessimistic in April, May and June) or with partial recovery (more optimistic). The black curves illustrate a six-month confinement scenario from March to August.

Table 4 and Figure 6b gives the cumulated effect on annual GDP for various lockdown durations (from March to August), various monthly output losses (colors), and dynamic patterns (solid versus dashed black lines). Detailed results are provided in Table 2. In the *WE* variant, a one-month lockdown mechanically reduces annual GDP by 2.3 to 3.5% depending on the magnitude of the monthly effect on output (i.e., -28% vs -42%). In the most optimistic scenario (28% output loss with partial catching-up), a one-month lockdown reduces annual GDP by 2.0%. In the most pessimistic scenario (42% output loss with inertia), a one-month lockdown reduces annual GDP by 4.3%. These effects increases almost linearly with the duration of the lockdown. The annual GDP loss induced by a two-month lockdown varies between 3.9 and 8.6%... And the loss induced by a six-month lockdown varies between 8.4 and 32.3%.

We now put all ingredients together. A rough combination of the mechanisms at work enables to us to provide a coarse estimate of the economic joint impact of Covid-19 and the resulting lockdown measures. Assuming (perhaps optimistically) that 1% of the population will be infected by Covid-19 in 2020, the study by McKibbin and Fernando (2020) suggests that the mortality/morbidity channel should not reduce Luxembourg’s GDP by more than 0.2%. By contrast, the lockdown measures implemented to eradicate the progression of the virus will induce much larger losses. Expert analyses suggest, however, that the mechanical effect of containment and lockdown measures taken in phase 3 is likely to govern the size of the annual output loss. Our back-to-the-envelope calculations confirm these findings.

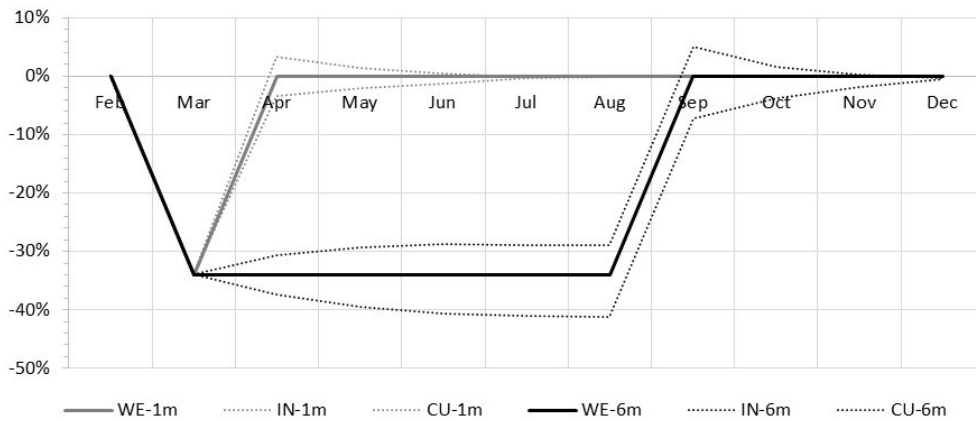
Table 4: Cumulated effect of the lockdown on GDP per capita in 2020

End of lockdown	Monthly loss of 28%			Monthly loss of 34%			Monthly loss of 42%		
	<i>WE</i>	<i>IN</i>	<i>CU^a</i>	<i>WE</i>	<i>IN</i>	<i>CU</i>	<i>WE</i>	<i>IN^b</i>	<i>CU</i>
Feb	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mar	-2.3%	-2.6%	-2.0%	-2.8%	-3.1%	-2.4%	-3.5%	-4.3%	-3.0%
Apr	-4.7%	-5.7%	-3.9%	-5.7%	-6.9%	-4.8%	-7.0%	-8.6%	-5.9%
May	-7.0%	-8.9%	-5.7%	-8.5%	-10.8%	-6.9%	-10.5%	-13.3%	-8.6%
Jun	-9.3%	-12.4%	-7.2%	-11.3%	-15.1%	-8.8%	-14.0%	-18.7%	-10.8%
Jul	-11.7%	-16.6%	-8.4%	-14.2%	-20.2%	-10.2%	-17.5%	-25.0%	-12.6%
Aug	-14.0%	-21.5%	-9.4%	-17.0%	-26.1%	-11.4%	-21.0%	-32.3%	-14.0%

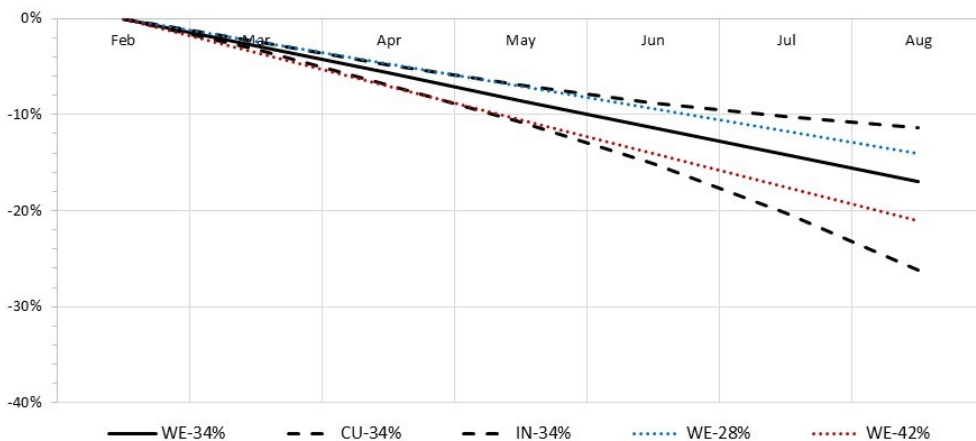
Source: Authors' computations. ^a Most optimistic; ^b Most pessimistic.

Figure 6: Lockdown scenarios and their economic impact

(a) Illustration of the three variants for a 34% output loss over 1 and 6 months



(b) Cumulated effect of the lockdown on GDP per capita in 2020 as a function of the lockdown duration (from 1 to 6 months)



B *RECOVid* members

RECOVid – Based on a voluntary and free participation, a group of economists based in Luxembourg joins forces to assist the *Task Force for the Coordination of the Public Research Sector in the Context of the Covid-19 Pandemic* (under WP7 led by Aline Muller), to help Luxembourg’s decision-makers understand the macroeconomic consequences of their actions (priority!), and to inform public opinion (in a second phase!). *RECOVid* members coordinate to gather expert analyses, write policy briefs, and prepare a list of Q&A for journalists. This document is a very preliminary and incomplete draft of first “emergency” policy brief. Its goal is summarized in five points: (1) Federate economists from Luxembourg and establish a research network with expertise in varied fields; (2) No stance on the trade-off concerning human lives versus material goods. Priority measures are focused on saving lives and improving health of people. *RECOVid* adjusts/adapts to health experts’ views and discusses measures to minimize adverse economic effects; (3) Provide back-to-the-envelope calculations or qualitative discussion of economic costs, identify vulnerable groups of people, and identify challenges for the future of Luxembourg’s economy; (4) Summarize policy options and discuss their pros and cons; (5) Define some research priorities to go further in the battle against the disease..

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REGOVID

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