

A Systemic Approach to Dealing with Covid-19 and Future Shocks

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New Approaches to Economic Challenges (NAEC)

Recent decades have emphasised efficiency in the operation, management and outcomes of various economic and social systems. This was not a conscious collective choice but rather the response of the whole system to the incentives that individual components face. This has brought much of the world to rely upon complex, nested, and interconnected systems to deliver goods and services around the globe. While this has provided considerable opportunities, it has also made the systems we rely on in our daily lives (e.g. international supply chains) vulnerable to sudden and unexpected disruption, as the result of an external shock, the way the system has self-organised, or a combination of both.

The Covid-19 outbreak was, at the outset, the result of the appearance of a new coronavirus which was probably transmitted to humans by a bat. This has generated the first global pandemic to be caused by a coronavirus, leading to an emergent crisis with considerable cascading losses in terms of health but also to much of the global economy, with high social costs.

Resilience, or the ability to recover and adapt to unexpected threats, has been a focus of specific parts of our system, and both the military and public health authorities are aware of this. But the notions of viability and resilience developed for example by Jean-Pierre Aubin and others at the International Institute for Applied Systems Analysis (IIASA) over decades, are in conflict with short-term profitability and apparent efficiency. The disastrous consequences of recent bush fires and extensive flooding, both attributable to global warming, show that resilience must become a core philosophy within system management and operation to ensure we are able to continue to function in the midst of these disruptions, and particularly such as those provoked by Covid-19.

The OECD response has been twofold: address immediate concerns, and propose an approach to dealing with the longer-term issues the virus highlights. In the short term, that means identifying the people and activities most affected, assessing how measures to help them will impact others, and underlining that difficult trade-offs between health, economic, social, and other goals are inevitable. In the longer term, an approach that reacts to the systemic origins and impacts of major shocks is needed if policies are to be effective. The Covid-19 crisis also shows how important it is to keep resources in reserve for times when unexpected upheavals in the system prevent it from functioning normally. Furthermore, given the interdependence of our economies and social systems, the virus also highlights the need for international co-operation based on evidence to tackle systemic threats and help avert systemic collapse.

1.) *The Covid-19 Outbreak*

The New Approaches to Economic Challenges (NAEC) Group Conference in September 2019 on [Averting Systemic Collapse](#) identified how growing complexity and interdependence has made various systems (economic, public health, cyber, etc.) susceptible to widespread, irreversible, and cascading failure. Aspiring for maximum efficiency and optimisation, such systems have neglected resilience against disruptions whose shocks may leave governments, the public, and the environment in a weakened state. More specifically, the concentration of industrial capacities and economic activity into smaller and more efficient sectors, up to the international level, has produced highly lucrative yet fragile supply chains, and economic exchanges whose disruptions could have sweeping effects in unexpected areas.

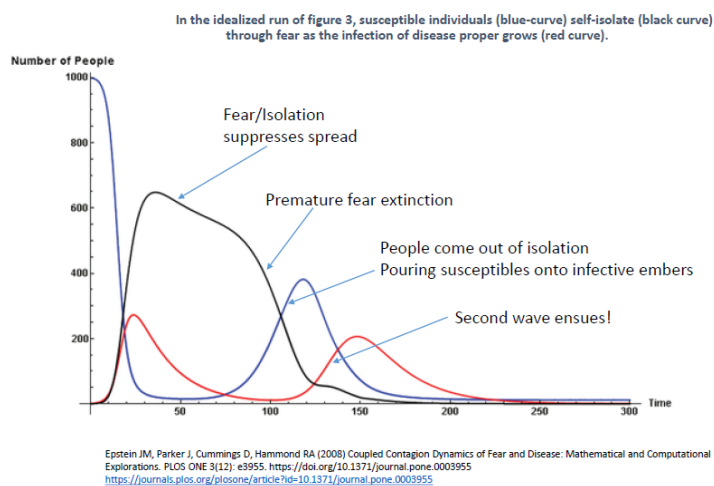
Such notions have been thoroughly described by leading economists and scholars since the onset of the 2007-2009 Financial Crisis, yet primarily in an abstract context. A key question, therefore, focused not

upon whether systemic risk would cause substantial cascading losses to the international economy, but more on what type of disruption would trigger such a chain of events in the first place.

Enter the 2019-2020 coronavirus outbreak. Declared a pandemic by the World Health Organization (WHO) on 11 March 2020, Covid-19 had quickly spread to dozens of countries, infected 124,000, and killed 4,500 by the time of the WHO announcement.

The NAEC conference on [Integrative Economics](#) highlighted that the outbreak was a perfect example of a long-standing message of NAEC. We are not living in a linear, Newtonian world where actions cause predictable reactions. We are in fact part of a complex system of environmental, socio-political and economic systems that we are constantly reconfiguring and that is constantly affecting us. We define “Integrative” as an economics that calls on the insights and methods of the range of disciplines needed to paint a realistic picture of how the economic system is shaped and helps shape the larger “system of systems” it is part of. Furthermore, systems thinking allows us to identify the key drivers, interactions, and dynamics of the economic, social, and environmental nexus that policy seeks to shape, and to select points of intervention in a selective, adaptive way. Critically, this allows us to emphasise the importance of system resilience to a variety of shocks and stresses, allowing systems to recover from lost functionality and adapt to new realities regarding international economics, societal needs, and human behaviour.

Epidemiologist Joshua Epstein from New York University outlined the global spread of pandemics with a focus on COVID-19. This included the idea of a coupled contagion – the pandemic and fear about it (which affects health and economic behaviour) – and how their interactions produce volatile dynamics. Individuals contract fear through contact with the disease-infected (the sick), the fear-infected (the scared), and those infected with both fear and disease (the sick and scared). Scared individuals - whether sick or not - withdraw from circulation with a certain probability, which affects the course of the disease epidemic proper. If individuals recover from fear and return to circulation, the disease dynamics become rich, and include multiple waves of infection, such as occurred in the 1918 Influenza Pandemic (see figure below).




One could push the argument further, using the example of financial system. The two epidemics, contagion and fear, operate in tandem and the behaviour of individuals is changed. The movements in capital markets engendered by the change in decisions of market participants, who were originally affected neither by the virus or fear of it, may set off an epidemic of market movements. This can lead, as we have observed recently, to a crash of unprecedented proportions.

2.) What are the impacts?

Economic

The OECD Interim Economic Outlook released on 2 March 2020 shows how restrictions on movement of people, goods and services, added to containment measures such as business closures, have cut



manufacturing and domestic demand sharply in China, and how the impact on the rest of the world is growing through business travel and tourism, global supply chains, commodities, and loss of confidence. The Outlook projects a 0.5% lowering of global GDP relative to previous expectations (under a “contained outbreak scenario) and a 1.5% lowering of global GDP (under a downside scenario assuming an intensive outbreak across Asia-Pacific, Europe and North America). Since the declaration on the 11th of March by the WHO characterising the Covid-19 epidemic as a pandemic, it is clear that the situation has evolved towards the downside scenario. These predictions are based on only the two extreme scenarios, but have to be qualified by the sort of considerations mentioned earlier. The interlocking network structure of the economic system and the lags with which one component affects another make its evolution extremely difficult to predict.

The Covid-19 epidemic and measures to counteract it are likely to disproportionately affect poorer people. “How’s Life?” 2020 shows that 36% of people in OECD countries are financially vulnerable, meaning they lack the financial assets needed to avoid at risk of falling into poverty if they lost 3 months of their income. This figure climbs to over 60% in some OECD countries.

Those working in the “gig economy” are the most exposed. These workers often work on short contracts, sometimes with weak or no social protections, with limited options for working remotely, and with risks of job loss and forgone earnings if they have to remain away from their place of work due to illness, quarantine, or government-mandated closures of specific activities. Anti-virus measures will affect them significantly since they are often employed in occupations demanding a high degree of contact with a wide range of clients, such as restaurants, taxis, and delivery services. Measures to compensate people and firms for lost earnings, involving postponement of taxes, and debt repayments and government paid leave for people in countries which do not have paid sick leave will alleviate the situation. But in countries where there are short-term contracts, and poorer people have few savings, no amount of monetary stimulus will re-energise demand. As to the supply side of the economy, firms that have had to reduce their activities will take time to restart production and to contribute to global supply chains.


In the longer term, two impacts could be especially serious.


The first is the impact on international relations and the vectors of globalisation. China’s merchandise trade was down 17% in the first two months of the year. While trade may rebound when the situation improves, there may be longer term, structural effects: firms may retreat from globalisation, seeking shortened supply chains and suppliers located in countries that seem less prone to disruption. This would have consequences for production structures, jobs, and income in different parts of the world. This adds business reasons to the more political reasons that have already led to a backlash against globalisation in recent years, partly because globalisation hasn’t delivered well-being for all, and partly because a number of countries have embraced trade protectionism and border controls. This is worrying when international cooperation is literally vital in coordinating the response to Covid-19 and future systemic threats. But, unfortunately the mechanisms that might provide a coordinated international response do not exist, except for limited monetary arrangements.

The international financial system is already seeing the impacts of Covid-19, with increased volatility and sharp drops in share prices. If these falls are the beginning of a longer downward trend, there is a direct negative wealth impact on asset holders. This may in particular affect funded pensions and pensioners’ living standards. Further easing of monetary policies by central banks (especially by the ECB where deposit rates are already negative) may reinforce the income effect for pensioners or push savers to higher risk investment. On the other hand, low interest rates may further fuel inflation in assets that are considered safe havens (real estate, gold, government bonds) making inequalities in wealth worse.

Health and social impacts

The elderly are the most affected, but the effects on them do not depend on biological factors alone. A number of factors contribute to the total impact. The elderly are exceptionally exposed to risks arising from isolation and weak social ties, compounded by the fragmentation of health and social care services. Nearly one-third of adults aged 65 and older in many G20 countries are estimated to live alone, and older





people are almost three times more likely to lack social support than younger people. If they do fall ill, it may take longer to detect, and care at home may be impractical. This is, of course, highly dependent on the country in question and older people are much better cared for in those with a better social safety net.

School closures are the main impact on children and young people, but this varies according to socioeconomic status, with those from low-income and/or single-parent families likely to be the most affected by the closure of schools and childcare facilities. The PISA 2015 surveys reveal that nearly a quarter of 15-year-olds of low socioeconomic status do not have an office or a quiet place to study; just over 1 in 5 teenagers in the same families have no access to a computer for school work and an internet connection. The poorest children will also suffer by being deprived of school meals and other support measures based on schools. During the Covid-19 epidemic despite government efforts, online courses and classes will be difficult to access for poorer students.

3.) Dealing with the Covid-19 shock and other epidemics through Resilience Strategies and Policies

So, how should we deal with the considerable shock that Covid-19 places upon international markets, public health, social activity, and governance? How can we address the cognitive effects of fear that trigger substantial slowdowns in economic activity, as well as the systemic effects that strain various sectors of international trade and governance?


Two overarching philosophies and methodologies are available for stakeholders to draw upon. Until recently, the consensus would have insisted upon preventing a threat from happening in the first place or substantially mitigating its consequences after the event if absolute prevention or avoidance is impossible. As the basis of conventional risk management (i.e. to prepare for and absorb threats), this option is politically appealing at the onset, as it offers the illusion that unacceptable risks may be bought down before they cause serious problems. In a world of rapid feedback loops and increasingly nested systems where cascading failures are inevitable, however, such options might be ineffective at protecting economic and social systems and calming perturbations, or would be ruinously expensive to implement to the extent needed to assure policymakers and other stakeholders of adequate protection.

The second approach is one that accepts the inherently uncertain, unpredictable, and even stochastic nature of systemic threats and addresses them through building system resilience. Rather than rely solely upon the ability of system operators to prevent, avoid, withstand, and absorb any and all threats, resilience emphasises the importance of recovery and adaptation in the aftermath of disruption. Such a mindset acknowledges that the infinite universe of future threats cannot be adequately predicted and measured, nor can their effects be fully understood. Resilience acknowledges that massive disruptions can and will happen, and it is essential that core systems have the capacity for recovery and adaptation to ensure their survival into the future, and even take advantage of new or revealed opportunities following the crises to improve the system through broader systemic changes. This is sometimes characterised as not just bouncing back, but “bouncing forward”.

4.) Recommendations

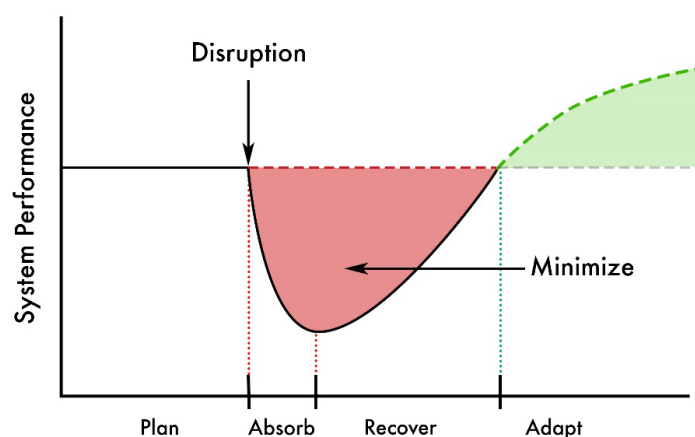
Covid-19 is simply the latest, albeit concerning, manifestation of an unpredictable shock to various interconnected systems, where international recovery will have vast implications for future economic, social, and governmental activity. Resilience must become a core philosophy within system management and operation to ensure we are able to continue to function despite disruptions like Covid-19, and are able not only to adapt and improve in its aftermath, but to seize upon new or revealed opportunities.

Interconnectivity between systems is one of the structuring and determining features of our modern world, which is becoming ever more complex and dynamic. This is a product of economic opportunity as well as global political interconnectedness, and has brought considerable benefits to much of the global population. An instinctive reaction to the Covid-19 outbreak would be to limit or reduce such interconnectedness, yet such sweeping policy changes would not better protect countries or international markets against future systemic threats. Instead, an emphasis upon developing resilience within the



international economic system is a necessary evolution for a post-Covid-19 world, where systems are designed to facilitate recovery and adaptation in the aftermath of disruption.


A shift from risk-based towards resilience-based approaches for management of epidemics, as well as for other systemic threats, is a necessity. The resilience we are talking about here, however, is not resilience in the traditional sense the OECD tended to use, meaning the capacity to resist downturns and get back to the same situation as before. There is an awareness that the systemic threats modern societies face are increasingly difficult to model, and are often too complex to be solved for the “optimal response” using traditional approaches of risk assessment that focus primarily upon system hardness and ability to absorb threats before breaking. The new approach to resilience will focus on the ability of a system to anticipate, absorb, recover from, and adapt to a wide array of systemic threats (see figure below).



The NAEC report “[Resilience Strategies and Policies to Contain Systemic Threats](#)” defines concepts related to systemic threats and reviews the analytical and governance approaches and strategies to manage these threats (including epidemics) and build resilience to contain their impacts. This aims to help policymakers build safeguards, buffers and ultimately resilience to physical, economic, social and environmental shocks. Recovery and adaptation in the aftermath of disruptions is a requirement for interconnected 21st Century economic, industrial, social, and health-based systems, and resilience is an increasingly crucial part of strategies to avoid systemic collapse. Based on NAEC reports and the resilience literature, specific recommendations for building resilience to contain epidemics and other systemic threats include:

1. Design systems, including infrastructure, supply chains, economic, financial and public health systems, to be resilient, i.e. recoverable and adaptable.
2. Develop methods for quantifying resilience so that trade-offs between a system’s efficiency and resilience can be made explicit and guide investments.
3. Control system complexity to minimize cascading failures resulting from unexpected disruption by decoupling unnecessary connections across infrastructure and make necessary connections controllable and visible.
4. Manage system topology by designing appropriate connection and communications across interconnected infrastructure.
5. Add resources and redundancies in system-crucial components to ensure functionality.
6. Develop real-time decision support tools integrating data and automating selection of management alternatives based on explicit policy trade-offs in real time.

Procedurally, a complement to such resilience-based approaches is included in the International Risk Governance Centre’s *Guidelines for the Governance of Systemic Risks* (IRGC 2018). The IRGC highlights a



multi-step procedure to identify, analyse, and govern systemic risks, as well as better prepare affected systems for such risks by mitigating possible threats and transitioning the system towards one of resiliency-by-design. As a cyclical process, the IRGC's process for the governance of systemic risk includes:

1. Explore the system, define its boundaries and dynamics.
2. Develop scenarios considering possible ongoing and future transitions.
3. Determine goals and the level of tolerability for risk and uncertainty.
4. Co-develop management strategies dealing with each scenario.
5. Address unanticipated barriers and sudden critical shifts.
6. Decide, test and implement strategies.
7. Monitor, learn from, review and adapt.


The purpose of IRGC's exercise is not to generate a deterministic model that applies to any and all systems – this is neither possible nor helpful. Instead, it is designed to produce more introspective, collaborative, and multi-system viewpoints regarding the threats that may be lingering along the peripheries of our systems, as well as where our system's critical functions or resilience challenges should be improved within future strategic management opportunities.

An example of applying similar approaches to disease epidemics is presented in Massaro et al (2018). The methodological resilience framework discussed above was applied to the analysis of spread of infectious diseases across connected populations. They monitor the system-level response to the epidemic by introducing a definition of engineering resilience that compounds both the disruption caused by the restricted travel and social distancing, and the incidence of the disease. They find that while intervention strategies, such as restricting travel and encouraging self-initiated social distancing, may reduce the risk to individuals of contracting the disease, they also progressively degrade population mobility and reduce the critical functionality, thus making the system less resilient.

While slowing down the epidemic's progression, such containment measures may drive the system into a path associated with long-lasting overall disruption and negative health and economic outcomes. The study highlights that multiple dimensions of a socio-technical system must be considered in epidemic management and sets out a new framework for analysing contingency plans at the national and international levels. For Covid-19, a multi-system approach bolstering recovery of international economic, public health, social welfare, and other affected systems will have the greatest return-on-investment not only in restoring the international baseline of growth and stability, but to 'bounce forward' in a way that leaves national and international systems in a far better state than before.

In the coming weeks, governments will consider a wide variety of political and economic policies to safeguard and recover lost economic and societal functions due to the COVID-19 pandemic. OECD's value-added to this exercise is to frame strategic opportunities to shape intermediate and future economic policy in a manner that not only preserves and recovers from this crisis, but also frames national and international economic systems. Policy actions to facilitate recovery must be analysed and selected now, and any policy decisions within the next two weeks will shape not only the nature of economic recovery in the next year, but the economic and political priorities of economic globalisation as well.

While governments are struggling with absorbing the shock, the international community will soon overcome the crisis and begin the recovery phase. In the immediate term, OECD can use economic models and other analytical resources to assess the efficiency of different regulatory policies discussed in Box 1. These immediate needs are of critical importance and should be addressed as a priority. In the long term, OECD can be instrumental in developing strategic priorities and building resilience in national and regional responses to the crises. In both cases, policy interventions and priorities to address COVID-19 must incorporate principles of system resilience to systemic disruption now, for not doing so will limit future socioeconomic recovery for the next decade.



Box 1: Strategic Policy Interventions for COVID-19: Recommendations to OECD

Recovery and Building Resilience in the Local Economy

Strategic Need: Preserve and Recover from Disruptions to Local Economies

Policy Opportunity: Identify interventions to improve business recovery post-COVID-19. Funding should be prioritized based on immediate needs for economic recovery at the system level that includes consideration of local demand and regional/global supply chain and impact of the region to regional, state, and global economy.

Economic Action: Prioritize and invest within critical economic sectors and businesses based upon value-added to local community (i.e. the dollar/euro yielded for taxes, salaries, local spending per dollar/euro invested into the company)

OECD Opportunity: Assist governments (both national and local) to prioritize (a) critical economic sectors, and (b) critical industries/businesses that have a socially and economically net-positive contribution to society. Any low-interest loans or targeted investment/disbursement should be targeted here, rather than prioritizing businesses or industries with social or economic net negatives/harms to broader society (i.e. high downstream costs with low immediate benefits via exploitative wages and sending money outside of the local economy).

(1) **Household Resilience**

Strategic Need: Bolster consumer/household resilience to shock

Policy Opportunity: Identify interventions to improve household recovery post-COVID-19. As the core of economic growth, individual households need to be provided resources/support at the system level across necessary goods, services, and social/cognitive support. Optimisation should be based on individual/community resilience to avoid the impact of shocks and optimise recovery.

Economic Action: Revisit recommended assumptions upon household budgets, and identify areas of required slack/redundancy in household spending/savings.

OECD Opportunity: First, analyse government stimulus proposals based upon their ability to meet all or most of the critical household needs of various segments of the population disrupted by the crisis. Second, adopt recommendations to prevent household brittleness or fragility to shock (high cost of core essentials like housing, food, utilities, education, public health, etc.). Identify governmental investments and policy options to mitigate rising cost concerns of core industries and incentivise 'slack', or household savings to accommodate disruption of lost wages.

(2) **Company/Business Resilience**

Strategic Need: Prevent Company Bankruptcies, Layoffs, and/or Shutdown While Complying With Pandemic Response Requirements.

Policy Opportunity: Identify critical companies whose disruptions and layoffs would reduce national capacities to deliver goods and services in a non-linear fashion (i.e. lost synergy, social capital, institutional memory, etc.)

Economic Action: Targeted loans and investments into select companies and large corporations whose disruptions are not easily recoverable, and losses in institutional memory/social capital would have long-term ramifications.

OECD Opportunity: Identify industries who historically have had difficulties in recovery post-disruption (i.e. the 'Dot Com Bubble', the September 11th Terrorist Attacks, the Financial Crisis/Great Recession of 2007-2009, etc. Within those industries, identify economic interventions (low/zero-interest loans or other investment) that have policy requirements of keeping sections of their labour force on payroll throughout the crisis and during recovery. Require the company to cover a portion of their payroll (i.e. 1 day each week), with government investments covering the majority of that time (i.e. 4 days each week). Labour covered by government investment should be in full compliance with WHO recommendations regarding social distancing and pandemic response requirements. This proposal will (a) prevent mass lay-offs of high-intensity corporations that require considerable institutional and technical knowledge to operate, and (b) remove the need for such workers to seek new economic opportunities for lost wages and remain in compliance with pandemic response requirements.

A resilience mind-set acknowledges that the infinite variety of future threats cannot be adequately predicted and measured, nor can their effects be fully understood. Adopting such an approach means rethinking our priorities, and especially the role of optimisation and efficiency. The science of systems engineering teaches us that when you try to optimise one part of a complex system, you can end up destabilising the system as a whole. We see that in global supply chains, surely one of the most efficient components of the international economy. The French Minister for the Economy, Bruno Le Maire, argues that there will be a before and after Covid-19 for the world economic system: "We need to draw all the conclusions from this epidemic on the way globalisation is organised, and notably value chains". When your highly optimised workflow is disrupted by shocks such as Covid-19, maybe just-in-time needs a dose of just-in-case.

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