The importance of compound risk in the nexus of COVID-19, climate change and finance

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Abstract:

Current approaches to manage the COVID-19 pandemic have a narrow focus on public health and on the short-term economic and financial repercussions. This prevents us to look at how pandemic risk interplays with sustainable and inclusive development goals in the next decade. To fill this gap, we analyse how risk can compound in the nexus of non-linear interactions among pandemic, climate change and finance. We show that neglecting compound risk can lead to a massive underestimation of losses, which can be amplified by financial complexity, as well as to policies that impose unnecessary trade-offs among the economic recovery, health and climate objectives. To address these challenges, we propose an interdisciplinary research agenda to inform effective policies and improve the resilience of our socio-economic systems.

COVID-19 and interconnected risks. Since the first reported case of pneumonia on 31 December 2019 in the Chinese city of Wuhan, the COVID-19 epidemics has quickly developed into a global crisis with severe repercussions on the economy and finance. On the one hand, lockdown and social distancing measures triggered supply and demand shocks that spread globally via interconnected value chains (*1*). On the other hand, the shock reached financial actors via their exposures to economic activities (*2*), further amplified by financial interconnectedness and complexity (*3,4*).

As a result, the pandemic is suddenly recognised as a source of global and material risk along with climate change and financial crises. Pandemic risk has been analysed in connection to few specific domains beyond public health, such as social justice (*5,6*) and the low-carbon transition (*7*).

However, the full set of relations among pandemic risk, climate change risk and financial risk have not been analysed systematically. These three sources of risk interact non-linearly in space and time in a nexus, giving rise to compound risk. Understanding compounding is critical because when shocks interact, they can amplify losses and thus counteract efforts to build resilience.

The recognition of the nexus among these three sources of risk is currently missing. It requires a new approach to both policy and research, able to deal with the complexity and uncertainty of risk in decision making and society. Here, we analyse in sequence the main relations among pandemic risk and other sources of risk, following the diagram presented in Fig. 1. This

analysis is preliminary to the development of a quantitative framework for compound risk management under uncertainty.

COVID-19, economic and financial risks. The economic and financial consequences of the COVID-19 containment measures have materialised in the timespan of two months. In April 2020, the International Monetary Fund (IMF) projected the global economy to contract by –3 percent in 2020, overall the worst economic contraction since 1929. Nevertheless, the impact of the COVID-19 on the economy and finance is regarded as reversible in nature and limited in time, given that effective policy interventions are put in place.

Restrictions to mobility had immediate negative impacts on the transport sector and on the demand for energy. This, in turn, affected global oil prices, which plunged to historical low records (futures went even negative). In addition, limitations to travelling affected the economy of countries where tourism plays a relevant role on GDP (see e.g. the Caribbean). In contrast, containment measures had a positive impact on other economic activities such as agri-food retail and pharmaceutics.

As a consequence, since economic activities are financed via financial instruments, such as equity, bonds and loans, negative shocks on firms' profitability have caused drops in the value of corporate and sovereign financial securities. Eventually, these changes affect the performance of investors' portfolios, including pension funds and thus households.

The shock transmission from the economy to finance (Fig. 1, respectively loops 2 and 3), is relatively well understood, while *the shock transmission in the opposite direction, i.e. from finance to the economy is much less understood.* In the mid-term, shocks on finance impact back on the economy via the freezing of credit markets and increased credit costs for firms in affected sectors, as already observed in the 2008 financial crisis (*8*). Moreover, the interconnectedness of economic activities and financial complexity (*4*), contributes to increase systemic risk (*9*).

An important channel that has not been yet considered is the shock transmission from finance to pandemic. Shocks on private financial risk (consider for instance the ability of households and firms to repay banks' loans) and on sovereign financial risk contribute to increase the pandemic risk by decreasing public spending on health infrastructures. Governments with tight budget constraints and high stocks of debt face a trade-off in public spending between economic recovery and social measures (e.g. unemployment benefits, credit guarantees) and the investments needed to strengthen distributed health care systems. This, in turn, feeds back, possibly in a persistent way, on the ability of the country to build resilience to future pandemic shocks, thus challenging the idea that effects are reversible and short-term.

COVID-19 and climate risk. Climate change can compound with pandemic risk (*10*): the increasing frequency of climate-related hazards damages socio-economic infrastructures (such as hospitals, supply chain of pharmaceuticals) that are critical to contain epidemic spreading, thus requiring policy preparedness (*11*). Individual countries vary in their exposure to climate risks and also in their ability to build resilience (*12*).
Furthermore, many processes causing greenhouse gas emissions (e.g. heating of building or transportation using internal combustion engines) cause also the presence of airborne pollutants (e.g. PM10) that make people's respiratory and immune systems weaker (*13*). It is also currently investigated whether airborne pollutants could act as a carrier of virus diffusion (*14,15*).

In turn, pandemics make communities more vulnerable to the effects of extreme weather events. For instance, supporting communities hit by climate-led disasters (e.g. floods our droughts) is harder when social distancing measures are in place. Further, some climate adaptation activities (such as river flood security) are hampered by pandemic due to trade interruption that limits the supply of goods and services needed. Importantly, the public and private cost of the pandemic recovery competes with resources for climate mitigation and adaptation investments needed to build resilience to climate change. In countries with high public debt ratio and/or considered as risky borrowers (e.g. Argentina), governments cannot easily finance the pandemic spending by accessing international markets. In this context, governments could opt for a short-sighted strategy to finance recovery measures by redirecting spending from other priorities, such as the climate agenda.

Climate risk and financial risk. Climate change represents a new source of risk for economic and financial stability (*16*). Climate physical risk refers to damages to physical assets, natural capital, and human lives resulting in losses of productive capacity and thus output and Gross Domestic Product (GDP), due to climate-induced hazards. The increase in economic damages are already visible, with consequences both at the firm and macroeconomic level (*17*). In contrast, climate transition risk refers to the economic and financial losses arising from a sudden revaluation of carbon-intensive and low-carbon assets induced by a change in policy (*18*) and/or regulation that cannot be fully anticipated by financial actors (*19*).

The Climate Stress test of the financial sector (*19*) showed that individual financial actors have large direct and indirect exposures to climate transition risk via the Climate Policy Relevant Sectors (CPRS), i.e. economic activities that would lose value and become stranded assets in a disorderly low-carbon transition. These exposures amount to more than 40% for the equity portfolios of pension funds and investment funds. Due to financial complexity, the losses driven by climate transition risk could be amplified by financial interconnectedness, with implications on systemic risk (*20*).

Compound risk in the nexus of pandemic risk, climate risk and financial risk. Since the nexus analysed above contains three reinforcing feedback loops, it follows that pandemic, climate and financial risk are interrelated phenomena that amplify each other. Fig. 1 shows the channels of risk transmission in the nexus.

This means that the assessment of risk conducted by focusing separately on each source of risk leads to a failure to understand the very nature of the problem. Currently, there is insufficient recognition of both how risk can compound in the nexus, and of the mechanisms of transmission and their pathways.

This is not just a problem of scientific understanding. Indeed, the failure to recognize the nexus prevents society and the economy to develop along a resilient path. In particular, we can identify two key societal challenges.

First, neglecting the compound nature of the risk implies a potential massive underestimation of losses and their socio-economic and financial implications (e.g. in terms of affected activities and communities).

Second, the trade-off between public investments in the short-term COVID-19 response and the long term climate objectives could be unnecessary. For instance it is possible to implement

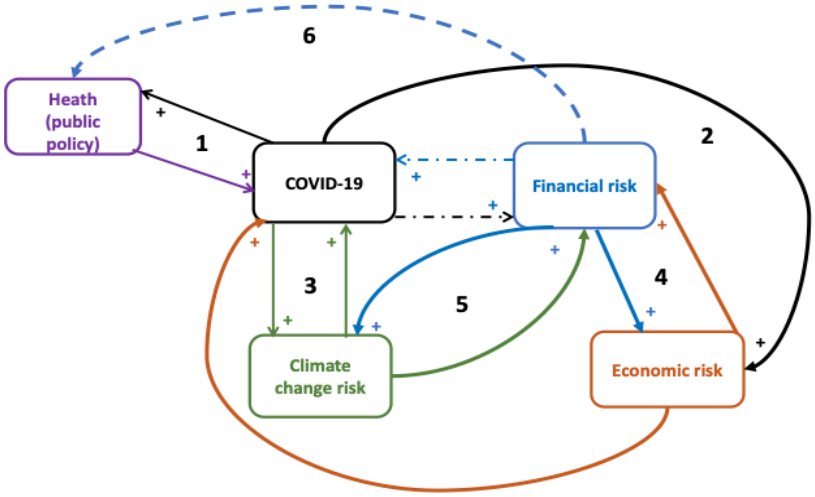
investment policies that contribute at the same time to build resilience to pandemic and to climate change, e.g. in the context of the Green Deal.

Understanding the compound risk in the pandemic, climate, finance nexus requires a new approach to both policy and research. There are several possible reasons for the limited understanding of the nexus. The most important is that a fundamental barrier to assess compound risk stands in the inadequacy of the current economic risk assessment framework to deal with the complexity and uncertainty of risk in decision making and society. Most economic and financial risk assessment approaches are sector-specific or hazard-specific. In contrast, compound risk emerges from the interaction among different events that are not studied within the same field of research (such as in the case of climate change and finance). Thus, a truly interdisciplinary risk assessment framework aimed to understand and anticipate compound risks is therefore urgently needed in order to assess countries' exposure to compound risk and in order to build resilience against such adverse scenarios.

In particular, our analysis points to the need to leverage on interdisciplinary knowledge to develop new research in three main avenues: (i) assess the risk transmission pathways of compound epidemics and climate shocks considering interconnectedness in the economy and finance, (ii) identify under which conditions (structural and behavioral) shocks' interactions could give rise to non-linearities and risk amplification, and (iii) analyse the nodes that could drive cascading effects to other sectors and contribute to systemic risk.

Given the magnitude of the challenge ahead, enormous benefit would be drawn from academic research, industry and policy makers working together to make timely and comprehensive compound risk assessment possible. It is crucial that research funding agencies and scientific journals, including in traditional areas of economics and finance, understand the need and the value, both scientific and societal, of this type of research.

Fig.1. Compound risk of COVID-19, climate change, economics and finance. *The figure represents the channels of risk transmission that involve COVID-19, climate change, economics and finance discussed above. Loop n. 1 dual risk transmission between COVID-19 to healthcare; loop n. 2 dual risk transmission between COVID-19 and economics; loop n. 3 dual risk transmission between COVID-19 and climate change; loop n. 4 dual risk transmission between economics and finance; loop n. 5 dual risk transmission between climate change and finance; loop n. 6 dual risk transmission between finance and healthcare public policy. Dotted lines represent the risk channels not yet analysed in the literature. The directionality of the relation is represented by the signs (+/-) of the arrow, where + represents a reinforcing feedback while - represents a balancing feedback.*



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Acknowledgments: IM acknowledges follow the references and notes but are not numbered. Acknowledgments should be gathered into a paragraph after the final numbered reference. This section should start by acknowledging non-author contributions and then should provide information under the following headings:

Funding: IM acknowledges the support of the Klimafonds+ project GreenFin (KR18AC0K14634) and of the EC H2020 project CASCADES (GA ID: 821010). IM and MB acknowledge the support of the World Bank research project "COVID-19 Pandemic, Financial Shock and Natural Disasters: Assessing compound risks in four countries" (PO: 7195811). SB acknowledges the support of the Schwyzer Stiftung and of the Institute of New Economic Thinking (INET) through the Task Force in Macroeconomic Efficiency and Stability.

Author contributions: IM, MB and SB developed the concept of the paper; IM and SB prepared the manuscript; IM, MB and SB revised the manuscript; IM and SB conducted the analysis.