Changes in fiscal risk against natural disasters due to Covid-19

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Title:
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Abstract:
The coronavirus pandemic caused serious social and economic impacts around the world. Governments implemented massive fiscal stimulus and protection packages to counteract these severe consequences which lead them into weak fiscal positions and elevated debt. This affects the fiscal risk to natural hazards governments are exposed to as well. To shed light on this issue we compare fiscal risk due to natural disaster events pre-Covid and for today to indicate the magnitude of change. This is done by applying the so-called CatSim model which combines natural disaster risk and corresponding losses a government is exposed to with financial resources it has available to finance them. While only indicative due to data limitations our results can be interpreted as a warning call to not underestimate disaster risks that can realize any moment and that will be much more difficult to be efficiently responded to compared to the pre-Covid era. Especially the poor are now in a significant weaker position than before. We suggest some possible ways forward how to enable a more integrated perspective and to track progress of fiscal risks over time.

Keywords: Government, Fiscal Risk, Covid-19, Multi-Hazard, Country Level, Global.

Acknowledgements

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1. Introduction

The coronavirus (COVID-19) pandemic has already made and will further make serious social and economic impacts around the world [1]. Many governments have, therefore, implemented massive fiscal stimulus packages, for instance, to protect public health and to stabilize incomes [2]. However, significant decrease in economic growth as well as high spending levels have led to weak fiscal positions and mounting debt in nearly all countries around the world [3]. While it is generally acknowledged that fiscal support is crucial during and after the pandemic, there is also increasing concern about how to deal with other potential emerging risks, currently and in the future, whilst supporting sustainable and resilient development [2,4]. In the context of natural disasters, views diverge on how to treat the pandemic, i.e. if it best be dealt with, for instance, within the Sendai Framework for Risk Reduction [5] or as fundamentally different compared to other natural hazards [6]. Be that as it may, perspectives agree with the fact that the consequences caused by the pandemic will affect the risk to natural hazards one is exposed to as well. To shed light on this issue, we compare fiscal risk due to natural disaster events pre-Covid and today and indicate the magnitude of change of said risk. Our results can be interpreted as a warning call for governments not to neglect disaster risks in the current situation as it will be much more difficult to respond to them compared to the pre-Covid era.

Our assessment builds on the so-called CatSim (Catastrophe Simulation) framework and its basic idea to combine losses due to natural disaster events with the financial resources to finance them [7]. In doing so, a measure of risk, the so-called fiscal resource gap year event, can be calculated and further be used for risk management purposes as well as for a comparison of risk levels between countries or country groups [8]. For example, the fiscal resource gap year event for Madagascar is calculated to be 11, i.e. on average, every 11 years (or with 9 percent probability each year) Madagascar will experience a shortage of financial resources to cover the losses it is responsible for. In contrast, the fiscal resource gap year event of the United States lies above 1000, meaning that in nearly all cases of natural hazard events, the U.S. would have enough financial resources available to cover the losses. Hence, both, the combination of absolute losses and the resources to finance them constitute the actual country risk level, e.g., even if Madagascar incurs smaller absolute losses compared to the U.S, it still faces a higher fiscal risk due to limited financial resources available. During the Covid-19 pandemic, the fiscal position, especially budget and debt levels, has dramatically worsened for many countries in the world leading to current discussions on debt relief for climate-vulnerable countries and funding needed to build back better from Covid-19 [9]. In that regard the fiscal resource gap year event can provide insights into the magnitude of change in fiscal risks due to the Covid-19 pandemic. We find a quite dramatic increase in fiscal risk for nearly all countries in the world – a trend which is especially alarming for the already very climate-vulnerable ones.

Our paper is organized as follows. In the next section we briefly discuss the main ideas of the CatSim methodology and the assumptions used for the pre- Covid and the current Covid scenario. Next, we present the results and apply a so-called risk layer approach to give a summary of changes in fiscal risks due to the Covid-19 pandemic on the global level. Finally, the last section summarises our findings and presents an outlook on the future.

2. Methodology

Natural disaster events are inherently random and cannot be predicted with certainty. However, they can be assessed probabilistically, for instance, by using catastrophe modelling approaches [10] or statistical methods [11]. If a natural disaster event occurs, it usually causes large losses in the private sector entities (e.g., households and firms) as well as the public sector (e.g., infrastructure).

Each of the affected entities has different means to finance these losses, e.g., using savings or taking loans (for a general discussion see [12]. Furthermore, there are losses that are directly caused by the natural hazard event itself as well as so-called indirect losses which are caused due to follow-on effects such as business interruptions. In this paper we employ a probabilistic (often also called risk-based) approach and limit our attention to direct losses for which the government is assumed to be financially responsible. It should be noted that total losses, which comprise both direct and indirect losses, are usually much higher; therefore, our analysis must be seen to represent a lower bound on fiscal risk. Furthermore, before moving forward, the concept of responsibility must be rendered more precisely in the context of fiscal risk within a liability framework, which is done next.

Our starting point for our discussion is within a government liability setup (the following discussion is based on [13]). It is now well known that the identification of government liabilities (such as natural disaster events) is a pre-requisite towards understanding the risk to its fiscal stability and for achieving short- and long-term goals (e.g. as set out in global agendas such as the Sendai Framework for Risk Reduction, the Sustainable Development Goals as well as the Paris Agreement, [14,15]. Governments typically plan and budget for direct liabilities, that is, liabilities that manifest themselves through certain and annually recurrent expenditures. These liabilities can be termed *explicit* (as recognized by law or contract); however, *implicit* liabilities, i.e. due to moral obligations or public expectations, must also be assumed. In contrast to direct liabilities, costs associated with disaster event losses enter the balance sheet as *contingent liabilities*, i.e. obligations that arise only when an event occurs. In the case of natural disaster events, one can additionally distinguish between explicit and implicit liabilities. Explicit contingent liabilities are those costs that deal with the reconstruction of infrastructure destroyed by events for which the government is explicitly responsible. In contrast, disaster related implicit contingent obligations are associated with providing financial relief and ensuring that affected communities and economies continue to function well – commonly considered as a moral liability for governments.

The Covid-19 pandemic can be related to contingent liabilities involving moral obligations (e.g. lessening the impact on very vulnerable parts of the society) as well as to ensuring the functioning of markets and society (e.g. economic- or health-related). These contingent liabilities due to Covid-19 can be seen as pure downside risk, e.g. they cause costs which need to be financed. Similarly, if a disaster event occurs, the government can expect contingent explicit and implicit liabilities (either due to direct or indirect losses), which it needs to finance through ex-post measures such as budget diversion or taking loans. As natural disasters are random in nature, contingent explicit and implicit liabilities have to be assessed probabilistically (where possible). It should be noted that pandemics may have to be treated fundamentally differently in that regard (we neglect this issue here and will only focus on the effects of the pandemic on fiscal risk to disasters; for a discussion of this point see [6]). The so-called CatSim (Catastrophe Simulation) model [7] is an analytical framework that aims to explicitly address the question of contingent liabilities and contingent risk (however, it should be noted that other frameworks and models exist as well, e.g. [16]). Our fiscal risk analysis using the CatSim framework is done in four steps as visualized in Figure 1.

The first step consists of calculating available fiscal resources to financial losses from extremes. This includes various measures, such as budget diversion, outside assistance, domestic credits, taxation and international borrowing (see step 1 in Figure 1, top left corner). Details on how the resources for each of these measures can be estimated are given in [8]. If, for example, a government runs a budget deficit greater than 5%, no budget diversion capability is assumed; otherwise, a maximum of 10% of total revenue can be diverted to finance losses. Estimations of how much a central government would be able to borrow on international markets and from Multilateral Financing

Institutions are based on numerous factors. Such factors include, for instance, the present value of debt as a percentage of exports, as it is assumed that loans are only possible if this value does not exceed 150%. Domestic credits can be taken by various means, either by printing money, issuing bonds, or borrowing from domestic sources. This parameter must also be estimated on a country-by-country basis, as it is very specific to individual conditions. We use the gross domestic credit from private banks as a proxy. In the second step, the risk that a country is exposed to needs to be estimated. As indicated, risk in the CatSim approach is represented in the form of annual loss distributions (depicted in step 2 in Figure 1, top right corner). A loss distribution shows the probability that a given loss, say, x, is not exceeded, indicated as P($X \leq x$) (for more information we refer to [11]).

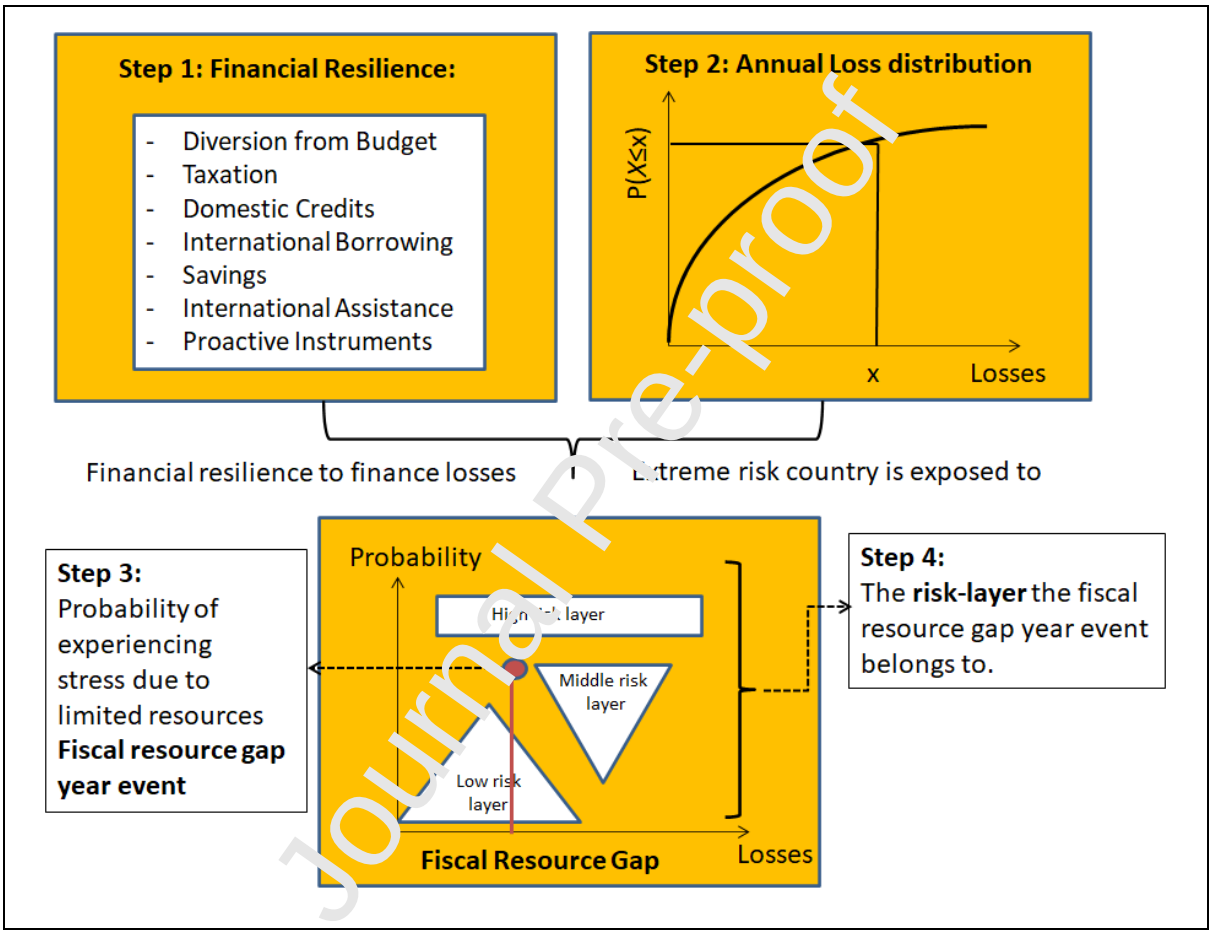


Figure 1. CatSim methodological approach. Source: Adapted from [8].

The available loss distributions shows the correspondence between the probability of an event occurring and the related losses. Losses have to be financed using available resources. At some point, however, the losses might become so large that they can no longer be financed. Step 3 (Figure 1, bottom) identifies these events and their corresponding probability of occurrence by combining the loss distributions with the financial resilience estimates. The first event where it is no longer possible to finance all the losses is called the fiscal resource gap year event and can be used as a risk measure for governments on their fiscal position. For example, a 50-year return period event means that such an event happens, on average, every 50 years – thus, it describes the frequency of such an event happening. In a final step 4, the resource gap year event can be related to risk layers which subsequently can be used to indicate if the occurrence of a fiscal shortage is very probable or highly unlikely. These risk-layers can be related to an traffic light kind of system to visualize and track progress over time. While the CatSim approach has been applied in various instances in the past (see

[17] for a summary), here, we specifically look at the fiscal resource gap under a pre-Covid and a current Covid scenario in order to indicate the magnitude of change in risk due to the pandemic. In the next section, we explain our assumptions in detail and give some specific examples to illustrate our approach.

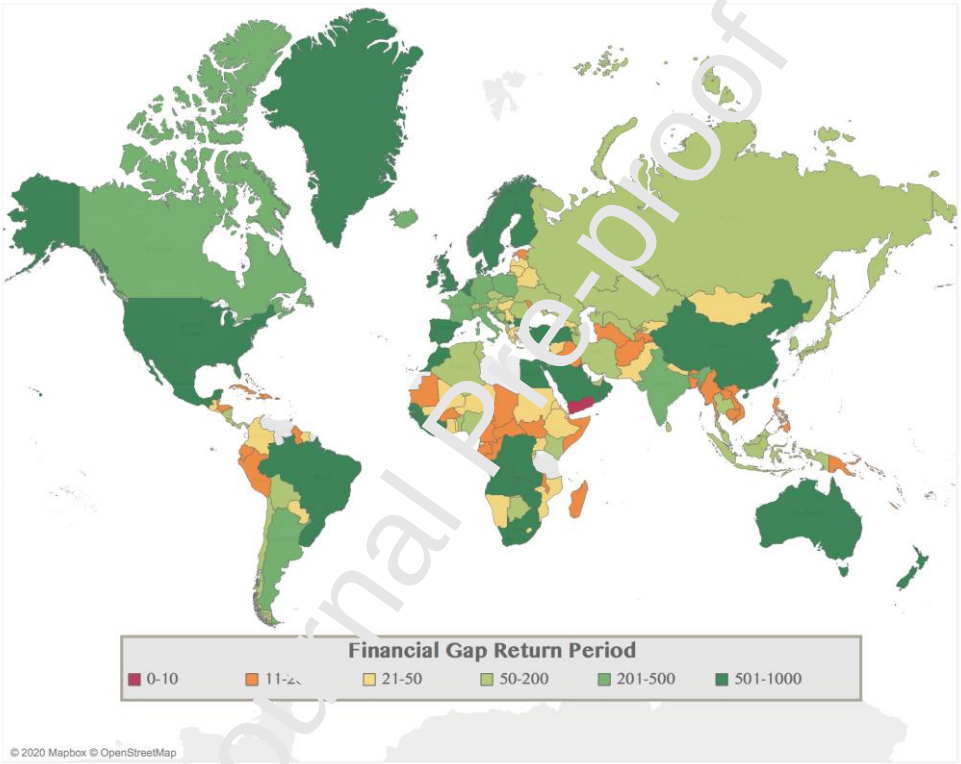
3. Pre-Covid and Covid Scenario Assumptions

For the pre-Covid scenario (from now on called baseline scenario), we assume the hazard risk, exposure as well as resilience sources of 2018. The resilience parameters were recalculated based on the work done in [18], which used the approach as described above. The loss distribution used represents a multi-hazard distribution for five different hazards (floods, earthquakes, wind, storm surge and tsunamis) as described above and is based on the data of the Global Assessment Report 2018 [19]. The other additional assumption relevant here is the already described explicit and implicit obligation for the government, which is set to be 50 percent of the total losses. As an illustrative example, the financial resilience for Albania in 2018 is estimated to have been around USD 358 million, while a 100-year event would create contingent explicit and implicit liabilities of around USD 411 million for the government. Assuming outside assistance to be around 10.3 percent of total losses, a 100-year loss event would therefore not overwhelm the financial resilience of Albania. Indeed, the fiscal resource gap year event for Albania would be the 117-year event. In the case of Madagascar, financial resources are estimated to have amounted to around USD 72 million and, given its high cyclone risk (e.g. a 20-year loss event would cause 450 million USD losses), the fiscal resource gap year event is found to be 11. For the U.S., as mentioned above, there is no fiscal resource gap year event below the mark of 1000, as financial resilience is high (with more than USD 540 billion available) even though high levels of absolute loss are reached as well.

The Covid scenario keeps the levels of hazard risk and exposure as well as responsibilities of the government the same but significantly changes the resilience sources. Due to data limitations, it is not possible to apply the CatSim resilience sources estimate procedure for 2020/21 as not all variables necessary for the calculations are available yet. Therefore, we base our assumption on some heuristic arguments. For example, looking at reviews of GDP growth rates and debt projections on the global scale based on various source [3,9], one can assume that budget diversion under the current situation is difficult for all countries in the world, especially as revenues have drastically declined nearly everywhere. Also due to high debt spending, the ability to take loans is more difficult [9]. For the Covid scenario we, therefore, assume that no resources are available through budget diversion and outside assistance is limited due to the fiscal stress in most countries in the world. Thus, both parameters are set to zero, in the estimation of the fiscal gap for the Covid scenario. Taking domestic credits and taxation is also not regarded feasible in the current situation of high fiscal stress and low growth. Borrowing, too, is heavily constrained, however, in the absence of any reliable estimates of the possible current credit buffer (e.g. how much money a country is able to borrow), we still assume that this can be done under the same conditions as in 2018. The Covid scenario is, therefore, still a rather optimistic scenario given the high indebtedness levels today and the very likely even higher debt levels in the near future. Under these assumptions, the fiscal risk of Albania increases drastically going from a 117 to a 22 fiscal resource gap year event under the Covid scenario. The same can be said for Madagascar and the U.S.. It should be stressed that the estimates presented here have to be treated as indicative. For an individual country fiscal risk analysis, additional steps have to be taken, including workshops with respective ministries to update and make exact estimations using in-house and expert knowledge [20,21]. Therefore, the focus of our results is on the global level rather than on the country specific consequences. We discuss these issues in the concluding section in more detail.

4. Results

We now present the results on the global level using the approach as discussed in the previous section. Figure 2a below shows the results for the baseline scenario. As one can see, European countries as well as industrialized countries seem quite resilient against multi-hazard events. Especially some Latin American, African as well as Caribbean and Asian countries are, however, quite at risk. This analysis is in line with other research on disaster risk in these regions [12], however, it should be acknowledged that the countries shown as less risky may still have problems financing their losses due to indirect effects, which are now one of the rising concerns for governments in wealthier countries [11,22,23]. This is due to the fact that industrialized countries are characterized by a high degree of specialization and strong inter-sectoral linkages, which can cause cascading effects and eventually lead to systemic risks [24].



2a

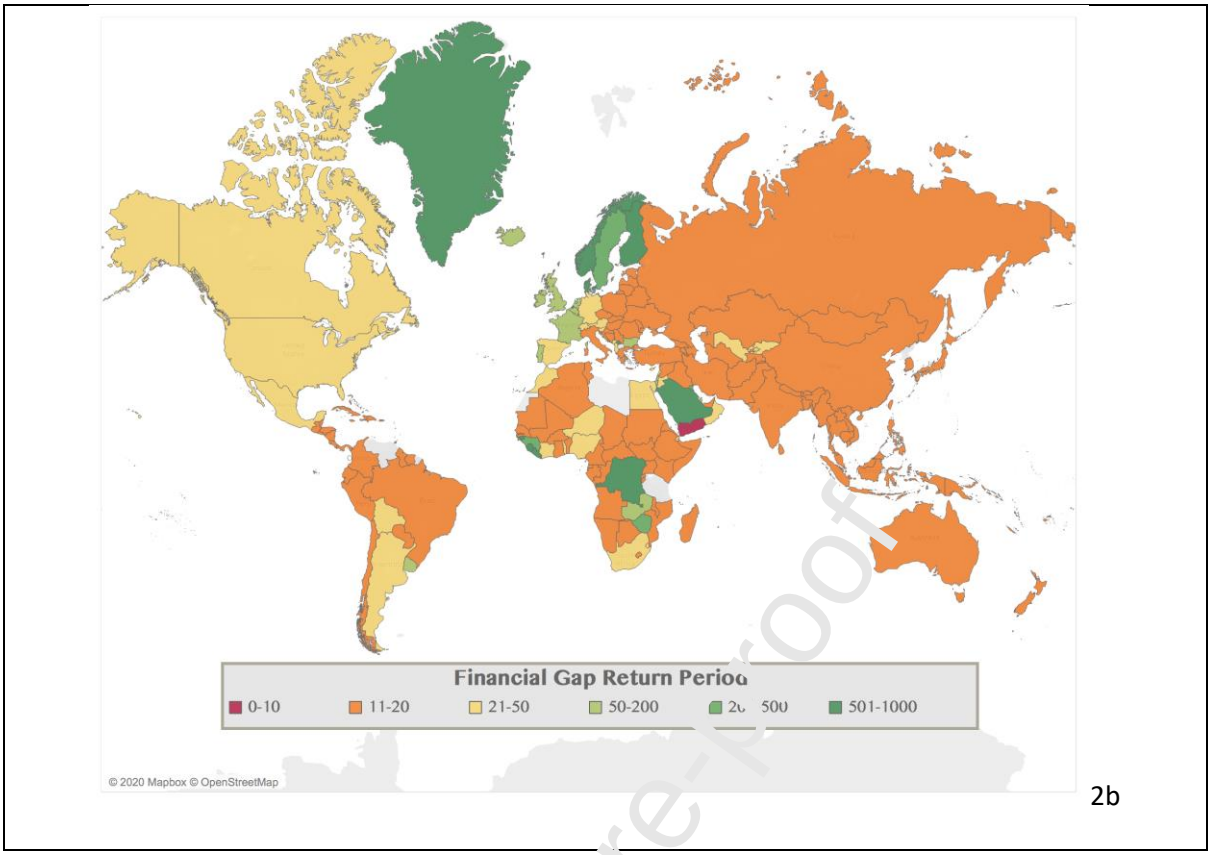


Figure 2. Fiscal Resource Gap Return Period for the baseline scenario (top, a) and Covid scenario (bottom, b). Colours indicate countries belonging to different ranges of fiscal risk. Red countries experience a gap below the 10-year event, orange coloured countries experience a gap between the 11- and 20-year event, yellow between the 21- and 50-year event, light green between the 50- and 200-year event, green between the 201- and 500-year event, and dark green above the 501-year event.

It is no understatement that the Covid-19 pandemic significantly increases the fiscal risk of governments against natural disasters (Figure 2b). However, not all countries are affected by the pandemic to the same extent. Especially poor and already quite fiscally vulnerable countries are more seriously affected, e.g. countries in Latin America, the Caribbean, Africa and Asia. As we assumed that the borrowing levels correspond to those in pre-Covid eras, some countries may be even more severely affected in the future if debt financing or debt relief are further limited [9]. This has important policy implications as these results suggest that the ability to borrow is one of the few remaining options for climate-vulnerable countries to financially deal with disasters in the current situation.

To provide a global picture of changes in fiscal risk and for ease of interpretation, we introduce a risk layer approach. As already indicated in Figure 1, the fiscal resource gap year event can be combined with a so-called risk layer approach. We suggest defining three distinct risk layers according to the return period of the fiscal resource gap. The layers are defined according to [25] who suggest differentiating between a risk layer which includes events up to the 100-year return period event, a risk layer which includes all events up to 250-year events and finally a risk layer for events above the 250-year event. Note, the smaller the number of the return period, the larger the fiscal risk; consequently, we will call the three layers mentioned above, the high risk, the middle risk and the low risk layer, respectively.

Using this risk layer terminology, globally, 70 countries experience a fiscal resource gap above the 250-year return period in the baseline scenario. In other words, these countries belong to the low risk layer (in the sense that only for very large losses or events which occur with very small probability a fiscal gap will occur) and they can be seen as rather financially safe (however, just in terms of direct risk). 21 countries belong in the middle risk layer (between the 100- and 250-year return period) and quite a lot of countries, namely 87, belong to the high risk layer (in the sense that a fiscal gap may occur rather frequently, e.g. here below the 100-year return period). This number rises up to 104 countries for the Covid situation with only 6 and 29 countries belonging to the middle and low risk layer, respectively. Hence, even under a quite optimistic scenario, there are strong indications that due to Covid many more countries are now vulnerable to experiencing fiscal problems as a result of natural disaster events compared to the baseline case – an increase which the above figures illustrate quite dramatically. As indicated, poor countries are even more vulnerable to natural disaster risks than before, which gives reason for concern.

5. Discussion and Conclusion

In the above, we presented some indicative results about changes in fiscal risk in connection with natural disasters due to Covid-19 using the CatSim approach. In doing so, we showed fiscally vulnerable countries and regions exposed to natural disaster risks in the pre-Covid (2018) and the current Covid (2021) situation. The risk measure used for this purpose was the fiscal resource gap year event which indicates the probability that governments experience difficulties in financing direct losses from natural disaster events. The lower this number of gap year events, the higher the fiscal risk. One can, therefore, distinguish between country groups according to the risk layer they belong to, with specific ranges of fiscal resource gap year events constituting a certain risk layer. We found that many more countries are now vulnerable to experience fiscal problems, especially, poor and climate-vulnerable countries heavily dependent on borrowing. This has important policy implications as limiting their borrowing capacities under the current situation would put them under even more fiscal stress [9]. Again, it should be stressed that these results must be treated as merely indicative as additional steps have to be taken for an individual country´s fiscal risk analysis, including workshops with respective ministries make (and update) exact estimations using in-house and expert knowledge [21]. Furthermore, options have to be stressed on how to jointly move forward including global monitoring of changes in fiscal risk and ways to strengthen financial resilience, e.g. through regional insurance pools, reserve funds, or debt relief for the most vulnerable.

In that regard an traffic light kind of system using colours to indicate danger levels, may provide a promising way forward to monitor and incentivize strategies to decrease fiscal risk over time. Based on the risk layer approach introduced above, such a system can be easily established where each risk-layer is assigned a specific colour. This, in turn, can be used to track progress in fiscal risk management over time in an easily understandable and visually compelling way. It is obvious that the pandemic heavily affects fiscal risk due to natural disasters in all countries . However, this situation will not stay constant over time but change according to the underlying drivers of fiscal risk. Given these dynamics and high uncertainties in the future, analyses such as this and the proposed traffic light system should be embedded in an iterative framework. The benefits of iterative approaches are well documented in the literature, but most importantly, they enable a more dynamic, proactive and risk-based assessment and management of future challenges ahead [12]. In particular, they can enable learning and eventually a reframing of the problem; the latter may be needed due to the uncertainties associated with the complex dynamics of socio-ecological systems and their interactions especially now in the Covid-19 pandemic [26].

Concluding, while the analysis should be seen as only indicative as resilience estimates on the global level are, by definition, rough approximations and have to be made more precise through country specific investigations, nevertheless, they show an urgent need to bring disaster risk back on the agenda for future sustainable and resilient development during and after Covid-19.

Declaration of interests

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References:

[1] The Global Risks Report 2021. World Econ. Forum, 2021.

[2] DeWit A, Shaw R, Djalante R. An integrated approach to sustainable development, National Resilience, and COVID-19 responses: The case of Japan. Int J Disaster Risk Reduct 2020:101808.

[3] World Economic Outlook Update, January. IMF, International Monitary Fund; 2021.

[4] Kimhi S, Marciano H, Eshel Y, Adini B. Recovery from the COVID-19 pandemic: Distress and resilience. Int J Disaster Risk Reduct 2020;50:101843.

[5] Djalante R, Shaw R, DeWit A. Building resilience against biological hazards and pandemics: COVID-19 and its implications for the Sendai Framework. Prog Disaster Sci 2020;6:100080.

[6] Peleg K, Bodas M, Hertelendy AJ, Kirsch TD. The COVID-19 Pandemic Challenge to the All-Hazards Approach for Disaster Planning. Int J Disaster Risk Reduct 2021:102103.

[7] Mechler R, Hochrainer S, Linnerooth-Bayer J, Pflug G. Public sector financial vulnerability to disasters: The IIASA CATSIM model. Meas Vulnerability to Nat Hazards Towar Disaster Resilient Soc 2006.

[8] Hochrainer-Stigler S, Mechler R, Pflug G, Williges K. Funding public adaptation to climate-related disasters. Estimates for a global fund. Glob Environ Chang 2014;25:87–96.

[9] Climate should be factored into debt relief. IMF, International Monitary Fund; 2021.

[10] Grossi P, Kunreuther H, Windeler D. An introduction to catastrophe models and insurance. Catastr. Model. A new approach to Manag. risk, Springer; 2005, p. 23–42.

[11] Hochrainer-Stigler S. Extreme and Systemic Risk Analysis. Springer; 2020.

[12] SREX I. Managing the risks of extreme events and disasters to advance climate change adaptation. A Spec Rep Work Groups I II Intergov Panel Clim Chang Ed by Field, CB, Barros, V, Stock TF, Qin, D, Dokken, DJ, Ebi, KL, Mastrandrea, MD, Mach, KJ, Plattner, G-K, Allen, SK, Tignor, M, Midgley, PM, 2012.

[13] Mechler R, Hochrainer-Stigler S. Revisiting Arrow-Lind: managing sovereign disaster risk. J Nat Resour Policy Res 2014;6:93–100.

[14] UN. Sustainable Development Goals. Geneva, Switzerland: 2015.

[15] UNDRR. Sendai Framework for Disaster Risk Reduction 2015-2030. Geneva, Switzerland: 2015.

[16] Cardona OD, Ordaz MG, Marulanda MC, Carreño ML, Barbat AH. Disaster risk from a macroeconomic perspective: a metric for fiscal vulnerability evaluation. Disasters 2010;34:1064–83.

[17] Hochrainer-Stigler S, Mochizuki J, Williges K, Mechler R. Fiscal Resilience and Building Back Better: A Global Analysis for Disaster Risk Reduction Strategies. Disaster Risk Reduct. Resil., Springer; 2020, p. 213–30.

[18] Markanday A, de Murieta ES, Hochrainer-Stigler S, Mechler R, Zvěřinová I, Ščasný M, et al. D4. 1 Elicitation results and conceptual framework on risk attitudes. Brussels: 2020.

[19] Hochrainer-Stigler S, Mechler R, Laurien F. Fiscal resilience challenged 2017.

[20] Hochrainer-Stigler S, Mechler R, Mochizuki J. A risk management tool for tackling country-wide contingent disasters: A case study on Madagascar. Environ Model Softw 2015;72:44–55.

[21] Hochrainer-Stigler S, Mechler R. Assessing financial adaptation strategies to extreme events in Europe. Long-Term Gov Soc Chang 2013:93.
[22] Hallegatte S, Hourcade J-C, Dumas P. Why economic dynamics matter in assessing climate change damages: illustration on extreme events. Ecol Econ 2007;62:330–40.
[23] Bachner G. Assessing the economy-wide effects of climate change adaptation options of land transport systems in Austria. Reg Environ Chang 2017;17:929–40.
[24] Poledna S, Hochrainer-Stigler S, Miess MG, Klimek P, Schmelzer S, Sorger J, et al. When does a disaster become a systemic event? Estimating indirect economic losses from natural disasters. ArXiv Prepr ArXiv180109740 2018.
[25] Linnerooth-Bayer J, Hochrainer-Stigler S. Financial instruments for disaster risk management and climate change adaptation. Clim Change 2015;133:85–100.
[26] Schinko T, Mechler R. Applying recent insights from climate risk management to operationalize the loss and damage mechanism 2017.

Credit author statement

Stefan Hochrainer-Stigler: Conceptualization, Methodology, Modelling, Investigation, Writing and Editing.

Declaration of interests

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Highlights:

- Indication of high fiscal risk against natural disasters due to Covid-19
- Providing ways forward how track progress over time

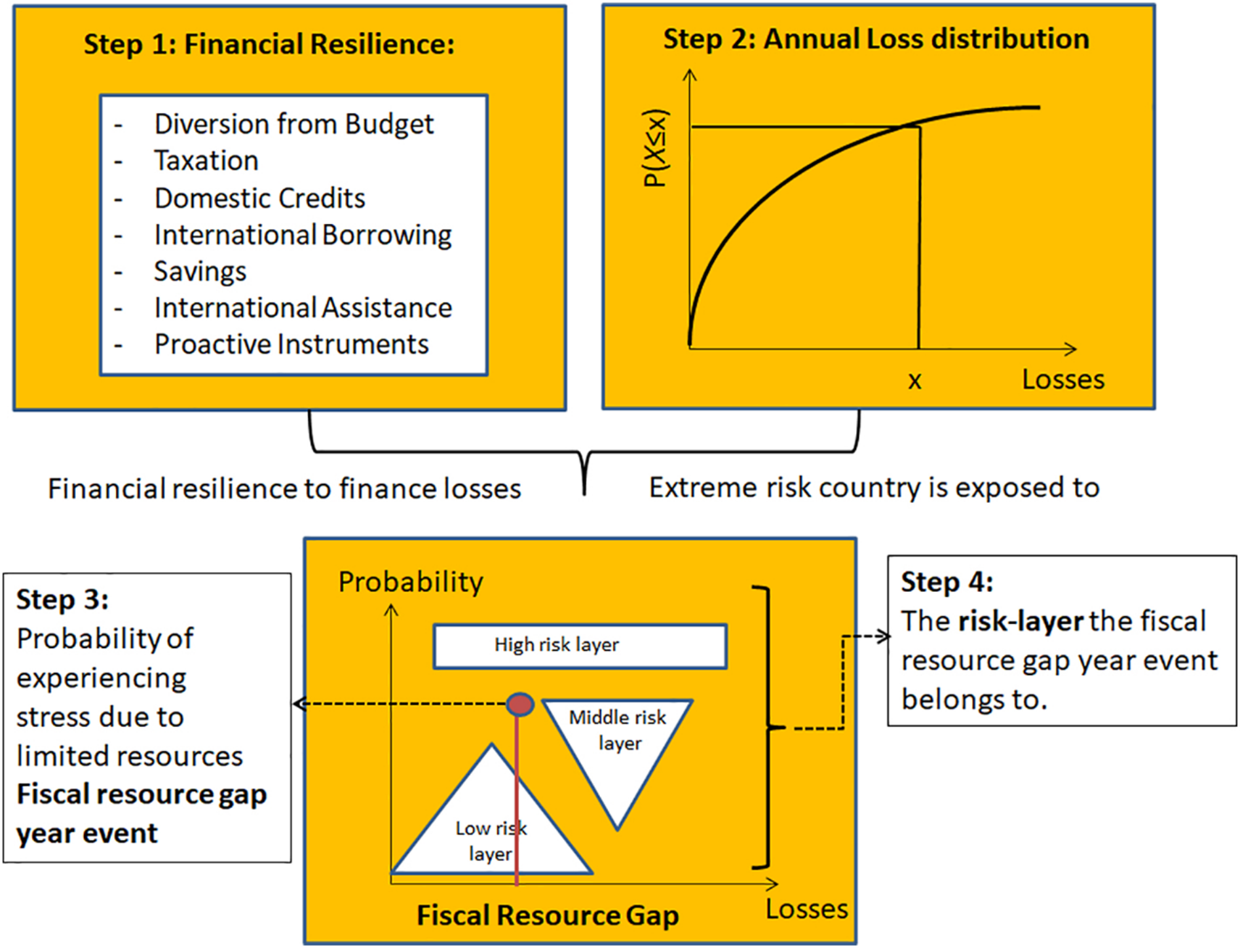

Step 1: Financial Resilience:
- Diversion from Budget
- Taxation
- Domestic Credits
- International Borrowing
- Savings
- International Assistance
- Proactive Instruments
Step 2: Annual Loss distribution
P(X≤x)
x
Losses
Financial resilience to finance losses
Extreme risk country is exposed to
Step 3:
Probability of experiencing stress due to limited resources
Fiscal resource gap year event
Probability
High risk layer
Middle risk layer
Low risk layer
Fiscal Resource Gap
Losses
Step 4:
The risk-layer the fiscal resource gap year event belongs to.

Figure 1

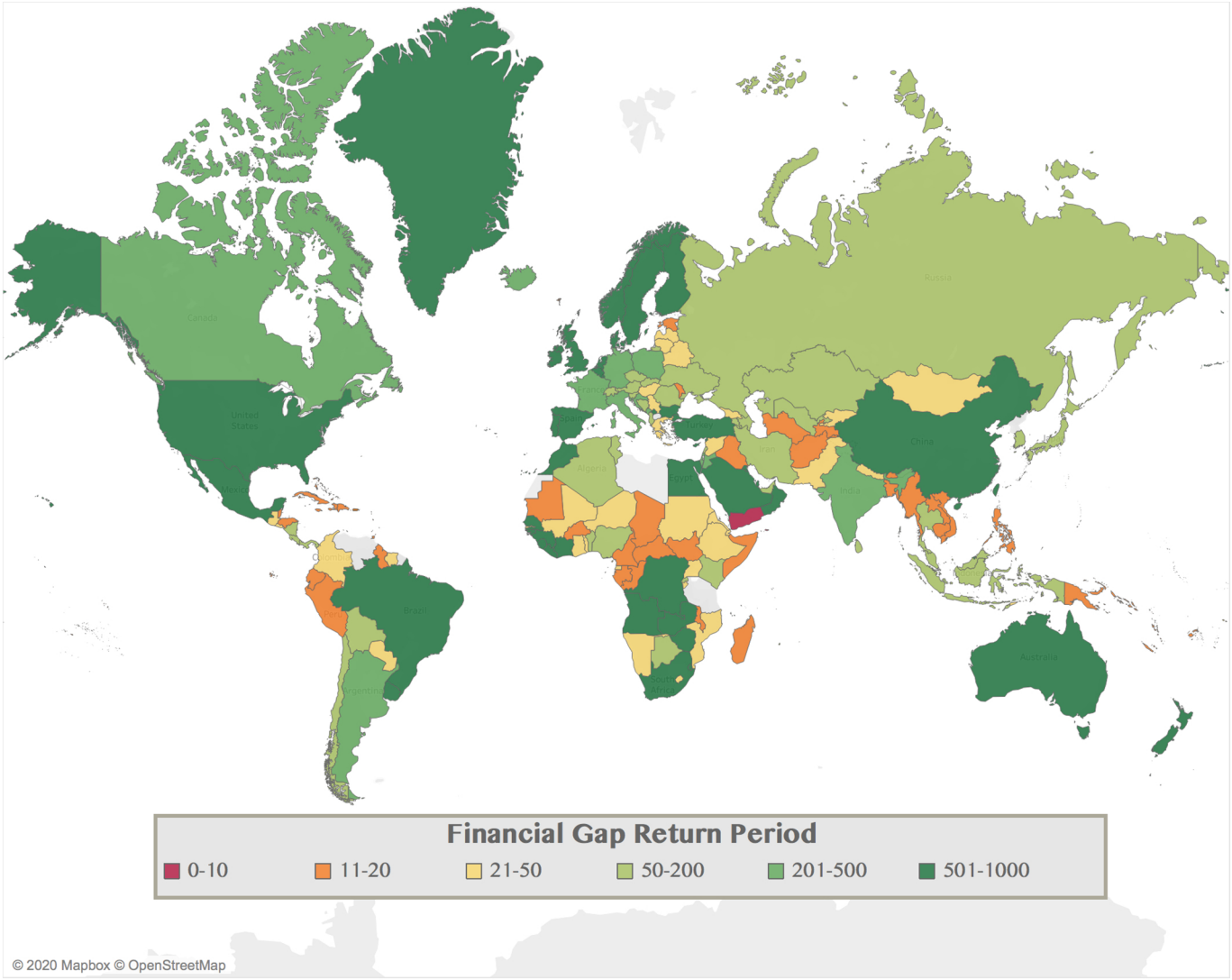

Financial Gap Return Period
0-10
11-20
21-50
50-200
201-500
501-1000
Canada
United States
Brazil
Russia
China
India
Australia
Iran
Algeria
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Figure 2a

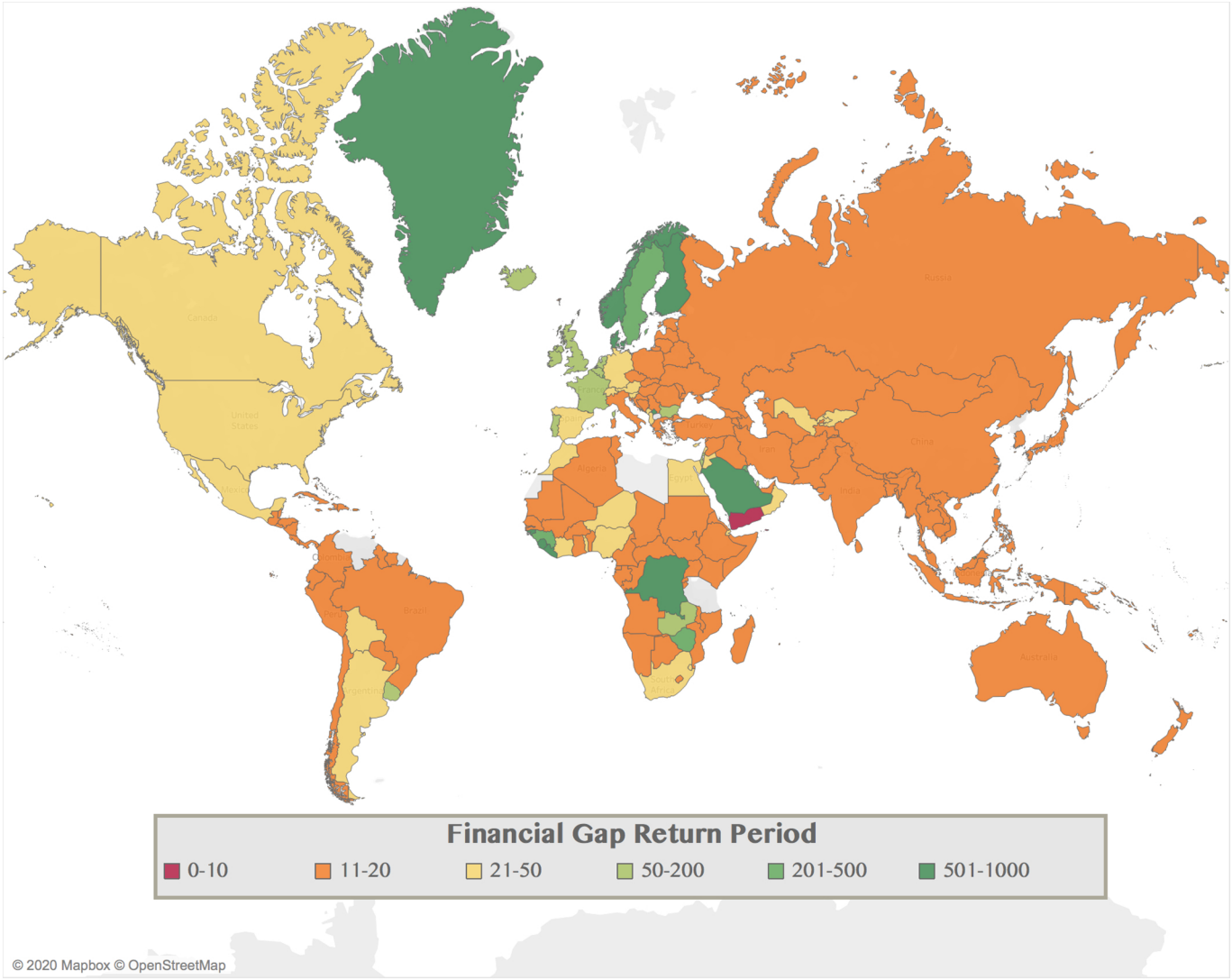
Financial Gap Return Period
0-10
11-20
21-50
50-200
201-500
501-1000
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Figure 2b