OECD publishing

Managing rising subnational fiscal risks

Luiz de Mello and
Teresa Ter-Minassian

OECD WORKING PAPERS
ON FISCAL FEDERALISM

June 2024 No. 46

OECD
BETTER POLICIES FOR BETTER LIVES

OECD NETWORK ON FISCAL RELATIONS ACROSS LEVELS OF GOVERNMENT (THE "FISCAL NETWORK")

OECD Working Papers on Fiscal Federalism

This series is designed to make available to a wider readership selected studies drawing on the work of the OECD's Network on Fiscal Relations across Levels of Government. Authorship is usually collective, but principal writers are named. The papers are generally available only in their original language (English or French) with a short summary available in the other.

OECD Working Papers should not be reported as representing the official views of the OECD or its member countries. The opinions expressed and arguments employed are those of the author(s).

Working Papers describe preliminary results or research in progress by the author(s) and are published to stimulate discussion on a broad range of issues on which the OECD works. This working paper has been authorised for release by Elsa Pilichowski, Director of the OECD Public Governance Directorate.

Comments on Working Papers are welcome, and should be sent to either fiscalnetwork@oecd.org or the OECD Network on Fiscal Relations, 2 rue André Pascal, 75775 Paris Cedex 16, France.

Abstract

Managing rising subnational fiscal risks

Subnational governments face a range of fiscal risks, defined as events whose realisation leads to significant deviations of revenue and/or expenditure from budgeted amounts. Fiscal risks reflect unforeseen macroeconomic developments, as well as structural shifts in the economy, including digitalisation and climate change. Sound management of these risks requires a comprehensive framework involving their identification, analysis, mitigation, sharing or transfer, and prudent accommodation. Within this framework, subnational governments need to strengthen their capacity to manage their own risks, but national governments also have a role to play. This includes mitigating risks created by national policies, minimising moral hazard in supporting subnational governments affected by exogenous shocks, and using their legislative powers to avert excessive subnational risk-taking. Effective intergovernmental cooperation is key to the sound management of subnational fiscal risks. The paper discusses how different levels of government can work together in applying this framework to the main types of risks. It also provides some examples of good international practices in the management of risks.

Keywords: subnational governments, fiscal risks, risk management, intergovernmental relations, fiscal sustainability

JEL classification: H12; H70; H77

Managing rising subnational fiscal risks

By Luiz de Mello and Teresa Ter-Minassian[1]

Key messages

- **Subnational governments (SNGs) face a range of fiscal risks** as a result of unforeseen macroeconomic developments and structural shifts in the economy, such as digitalisation and climate change. They should take responsibility for these risks and strengthen their capacity to manage them.
- **A comprehensive subnational risk management framework** includes steps to identify, analyse, mitigate, and when appropriate transfer such risks, as well as to accommodate responsibly the materialisation of residual ones.
- **National governments (NGs)** should strive to mitigate subnational fiscal risks created by their own policies, and their support to SNGs affected by exogenous shocks should minimise moral hazard.
- Sound **intergovernmental cooperation** is key for the effective management of subnational fiscal risks.

1. Introduction

1. Governments traditionally face a range of fiscal risks, defined as events whose realisation leads to significant deviations of revenue and/or expenditure from budgeted amounts. These risks stem from various sources, including unforeseen macroeconomic developments – such as a more severe-than-projected cyclical downturn – or exogenous shocks, such as natural disasters. Additionally, risks may arise from weaknesses in budget institutions and processes, or from the materialisation of contingent liabilities that were not budgeted for. Longer-term trends, such as digitalisation and climate change, can also pose risks for subnational finances, which need to be met through the creation of fiscal buffers and other policy changes. The materialisation of large fiscal risks, or even a frequent occurrence of smaller ones, can jeopardise fiscal sustainability, as well as the effective provision of essential public goods and services to the population.

[1] This document was discussed at the 2024 Meeting of the Network on Fiscal Relations across Levels of Government on 25-26 April 2024. We thank Sean Dougherty, Delphine Moretti, Stéphane Jacobzone, Sandeep Saxena and Network delegates for their helpful comments but remain solely responsible for any remaining errors or omissions.

2. The number and severity of fiscal risks are currently rising in both advanced and developing countries as a result of a number of trends:

- Climate change and its impact on the frequency and magnitude of natural disasters, such as hurricanes, floods, droughts and wildfires, to name just a few;
- Uncertainties connected with the transition away from fossil fuels;
- The increasing incidence of endemic diseases related to population ageing or environmental degradation;
- Increased geopolitical tensions and trade fragmentation leading to more frequent supply shocks; and
- Technological innovation and digitalisation.

3. Most of these risks are inherently asymmetric in their incidence, varying in significance and intensity across national territory, reflecting differences in geographic, demographic and economic conditions, as well as the characteristics of a country's intergovernmental fiscal relations, such as the distribution of revenue-raising and spending responsibilities among levels of government. Such asymmetries mean that SNGs differ both in their degree of exposure to risks and in their capacity to manage them effectively.

4. While fiscal risks at the national level of government have been the subject of a growing literature, especially after the 2008 global financial crisis,[2] there is limited analysis and empirical evidence on how SNGs are affected by, prepare for, and respond to, the range of fiscal risks facing them. This paper makes a first attempt at filling this gap by discussing the factors that affect the incidence of different types of risks across SNGs, and the steps that both subnational and national governments can take to mitigate the impact of such risks. While current data limitations do not allow for rigorous empirical analyses in this area, the paper includes some examples of good practices that could give rise to positive demonstration effects.

5. A key message of the paper is that SNGs have significant responsibilities and powers to manage their risks. For their part, NGs can support these efforts not only through the provision of financial resources, but also through policy coordination, technical assistance, and strengthening incentives for SNGs to effectively utilise the instruments at their disposal.

6. Section 2 of the paper discusses how different types of risks can impact subnational finances, focusing in particular on the above-mentioned areas in which risks are currently on a rising trend. Section 3 outlines the main elements of an effective risk management framework at the subnational government level. Section 4 discusses how NGs can support subnational risk management efforts. Section 5 offers some summary conclusions.

2. Main types of risks for the subnational finances

2.1. Macroeconomic risks

7. SNG finances are vulnerable to a range of risks stemming from unanticipated macroeconomic developments. This vulnerability has been heightened in recent years by the increased macroeconomic volatility and uncertainty stemming from geopolitical tensions and related geo-economic fragmentation and supply chain disturbances.[3] Increased risks affect subnational revenues, expenditures and balance sheets.

[2] See, e.g., IMF (2016 and 2020); Mechler et al. (2016); OECD/The World Bank (2019); Moretti (2021); Valencia et al. (2022); Fuje et al. (2023); and OECD (2023a).

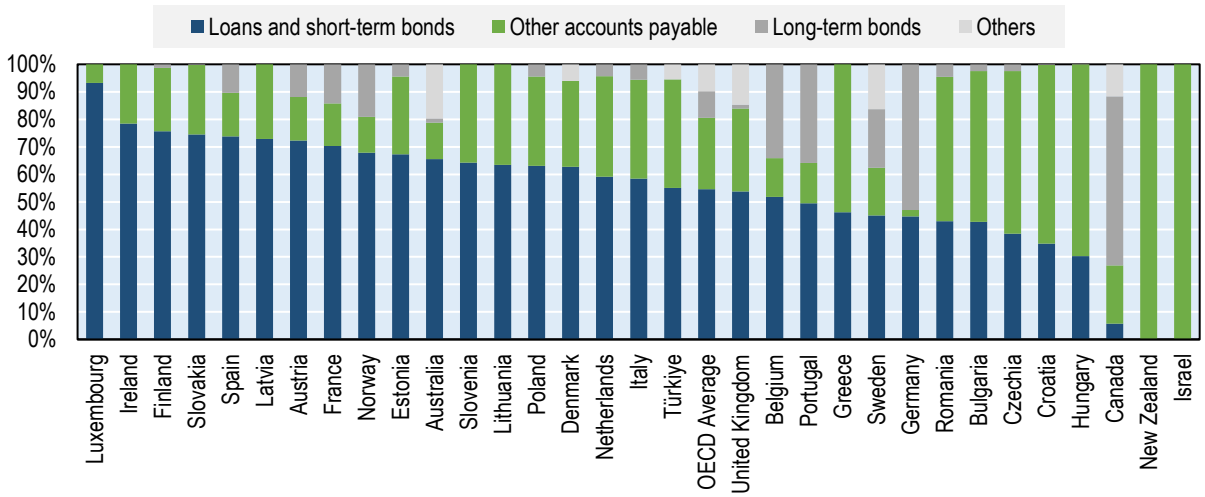
[3] See e.g. IMF (2023), OECD (2023a) and Alvarez et al. (2023) for analyses of the impact of geoeconomic fragmentation on growth and inflation.

8. SNGs' own revenues are affected by changes in real GDP growth and its composition, and by inflation. The sensitivity of own revenues to such developments depends on their composition. Typically, subnational income taxes (or surcharges on national income taxes) can be expected to exhibit larger income and price buoyancies (and therefore greater volatility) than taxes based on consumption (e.g., retail sales taxes, which are mainly used by intermediate-level governments and by some large cities) or on property (which are the main revenue source for local governments) (Dougherty and de Biase, 2021).

9. Shared revenues tend to be more volatile than subnational own revenues. This is because they reflect the higher cyclical sensitivity of the income, and in some cases consumption, taxes that are the national revenues typically shared with SNGs, as well as of shared royalties in countries dependent on non-renewable natural resources. Also, in the absence of compensating measures, shared revenues can be adversely affected by unanticipated changes in national tax policies, such as tax reliefs or forbearance during downturns, which often force SNGs into procyclical spending cuts. Intergovernmental grants, especially those of a discretionary nature, are typically quite volatile, and they are sometimes cut back by financially hard-pressed NGs during cyclical downturns. Therefore, ceteris paribus, the vulnerability of SNGs' revenues to macroeconomic shocks can be expected to increase with their degree of dependence on intergovernmental transfers and with the business cycle sensitivity of their own tax bases.

10. Unexpected deviations of economic growth, and especially inflation, from projections, can pose fiscal risks on the spending side of the budget as well, especially for subnational wages, subsidies or social transfers that are indexed to prices. Moreover, surprise developments in interest and exchange rates can have significant effects on the service of subnational debts, although the magnitude and speed of these effects depend importantly on the level, composition (e.g., domestic vs. external, fixed vs. variable rate) and maturity profile of the individual SNGs' debt. Indeed, since over 50 per cent of subnational debt consists of bank loans and short-term bonds on average in the OECD area (Figure 1), SNGs are more vulnerable to changes in interest rates than NGs, which typically fund themselves mainly through medium and long-term bonds. In addition, SNGs may be less able than their respective NGs to issue local currency-denominated bonds in international capital markets and, in the absence of appropriate restrictions, may end up more indebted in foreign currency, and therefore more vulnerable to exchange rate volatility, than would be prudent (see Brochado, de Biase and Dougherty, 2024).

Figure 1. Share of SNG's debt exposed to interest rate risk in the short term



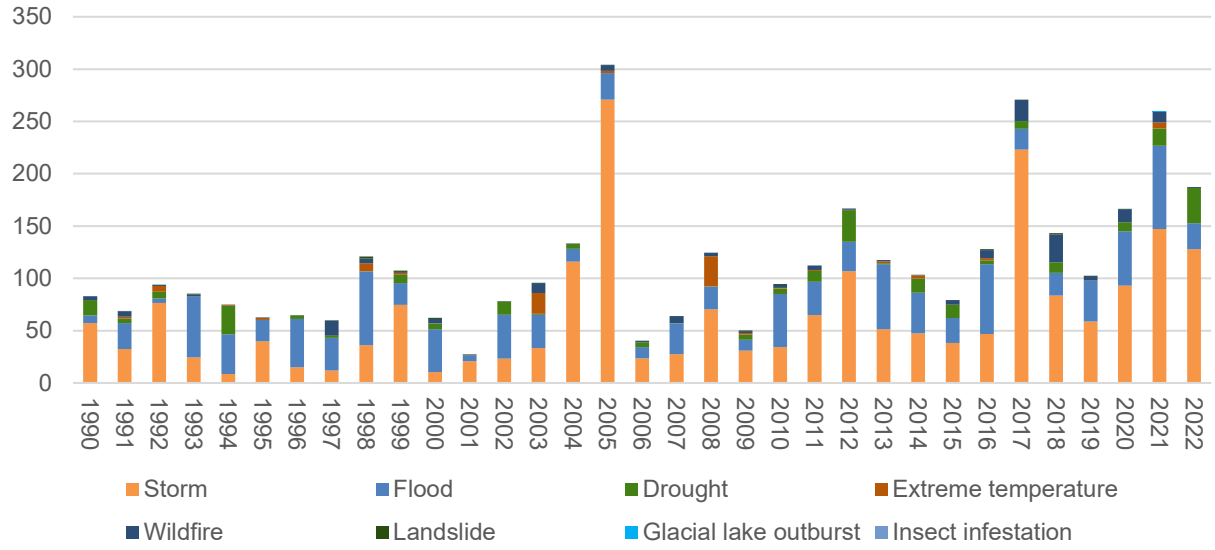
Notes: Countries are ordered by the share of short-term maturing debt (up to one year) over total SNGs' debt.
Source: OECD Intergovernmental Fiscal Outlook for 2023 and 2024: https://oe.cd/IFO23i.

2.2. Risks from climate change and natural disasters

11. Climate change is contributing to a significant increase in the frequency and severity of weather-related natural disasters, including droughts, floods, hurricanes and wildfires. According to the OECD, economic losses from natural disasters amounted to close to USD 200 billion in 2022 alone (Figure 2) (OECD, 2023b). Information from other sources puts such losses at an even higher level, at USD 270 billion in the same year, with insured losses estimated at about USD 120 billion (Munich RE, 2023), while over 30 thousand lives are estimated to have been lost as a result of natural disasters (CRED, 2023).

Figure 2. Economic losses associated with extreme weather events, 1990-2022

In USD billions, OECD and OECD partner countries



Source: OECD calculations based on data from EM-DAT.

12. The respective roles of the NGs and SNGs in dealing with the economic and social impacts of natural disasters vary among countries, depending on the distribution of revenue, and especially spending, responsibilities, but in most countries, SNGs contribute to the provision of initial aid to their affected populations, to the restoration of essential public services disrupted by the disaster, and to the rehabilitation or reconstruction of impacted infrastructure (de Mello and Ter-Minassian, 2024; de Mello and Jalles, 2024). Importantly, as discussed further in Section 3 below, SNGs are, or should be, involved in the prevention and mitigation of natural disasters likely to affect their respective jurisdictions.

13. Within each country, the vulnerability of subnational finances to natural disasters depends on geographic characteristics, such as proximity to rivers and the sea, geological fault lines, or forests; on economic conditions, in particular the level of income in the community, which in turn affects the quality and resilience of public services and infrastructure; and on the degree to which preventive policies (e.g., mitigation and adaptation investments and regulations) have been put in place. These characteristics also influence the preparedness of each community to deal with disasters and their outcomes in terms of economic and human losses.

14. National and subnational policies to promote a transition to greener energy sources, while essential to mitigate climate change, can also pose challenges for SNG finances, especially for regions and localities heavily dependent on revenues from fossil fuels. The volatility of international energy prices and uncertainties about the nature and pace of national transition policies can make it especially difficult

for affected SNGs to estimate the extent and time profile of the attendant risks for their finances, making close cooperation with the respective NGs all the more necessary (as discussed further in Section 4 below). Institutional features (such as restrictions on labour and capital mobility, and insolvency regimes) can increase the severity of subnational fiscal risks from the energy transition, by preventing or slowing the reallocation of productive resources to greener industries and services within affected regional and local economies (de Mello and Ter-Minassian, 2024).

2.3. Public health risks

15. Spending on health and long-term care has been on a rising trend relative to GDP in most countries over the last decade, reflecting the ageing of populations, a relatively high elasticity of demand for health services to incomes, and increasing costs of medical technologies. Public health spending was also further significantly boosted worldwide by the Covid-19 pandemic. Moreover, public health budgets are expected to be under pressure as a result of the effects of population ageing on revenue, given the contraction in the share of working-age individuals in the population and its attendant impact on tax collection. This is all the more important in countries where health budgets are financed through earmarked taxes and/or social security contributions. Long-term projections point to a continuation of these trends over the next decades in both advanced and emerging-market economies (e.g., Kim and Dougherty, 2020; European Commission, 2021; Pessino and Ter-Minassian, 2021). OECD analysis indeed shows that, without policy changes, maintaining current public service standards and benefits while keeping public debt ratios stable could increase fiscal pressure in the median OECD country by 6¼ per cent of GDP between 2024 and 2060, most of which arising from demographic changes (Guillemette and Chateau, 2023).

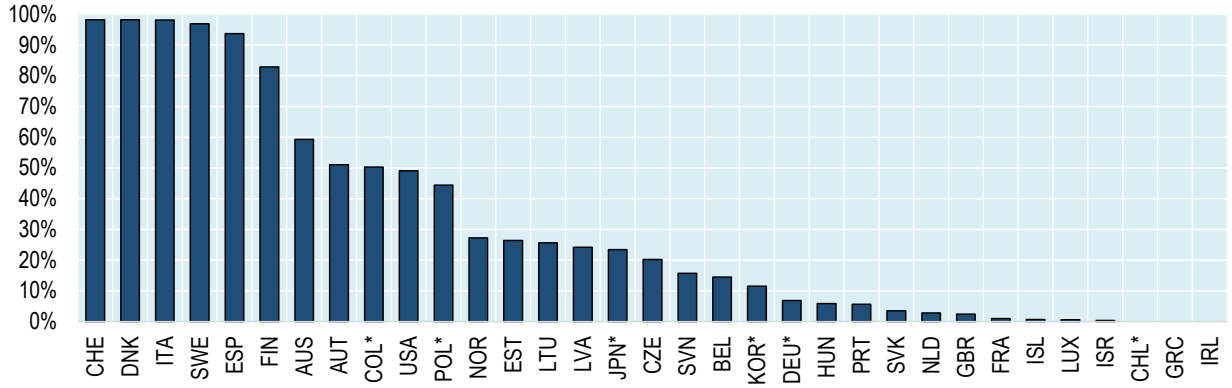
16. While ageing-related pressures on public health budgets are well understood, fiscal risks may arise from deviations of spending and revenue from long-term projections. Downside risks are related primarily to an underestimation of population ageing effects on both spending and revenue, while upside risks may arise, for example, due to an underestimation of net migration, which could offset at least part of the adverse effects of demographics on public finances. Of course, these effects take time to materialise, which allows policymakers to take corrective action, where needed, notwithstanding the political economy challenges posed by structural reform in this area.

17. At the same time, shorter-term risks to public health budgets may arise from a recurrence of epidemics and pandemics, as warned by, among others, the Global Preparedness Monitoring Board (GPMB) set up jointly by the World Health Organisation and the World Bank and the Independent Panel for Pandemic Preparedness and Response (IPPPR).[4] There is a growing consensus that climate change and more generally environmental degradation (especially deforestation and related increased proximity of wildlife to urban communities) increase the risk of zoonotic diseases, which can spread rapidly across national borders, as did the Covid-19 pandemic. Also, there are growing indications of increasing resistance of microorganisms to antibiotics, antifungals and other drugs. Moreover, the occurrence of natural disasters, such as earthquakes or floods, or of armed conflicts is also generally accompanied by health crises in the affected populations. All these risks are short-term in nature, unlike those related to adverse demographics, whose implications are comparatively easier to assess and take time to materialise.

18. The vulnerability of subnational finances to these short and longer-term risks depends in the first instance on the distribution of public health spending responsibilities among government levels in individual countries. According to de Biase, Dougherty and Lorenzoni (2022), the subnational share of health spending varies substantially across OECD countries, from over 80 per cent in Switzerland, Denmark, Italy, Sweden, and Finland, to under 10 per cent in several other countries, including France, Germany, and the United Kingdom (Figure 3).

[4] See e.g. the 2023 Annual Report of the GPMB and various reports of the IPPPR, available at: https://theindependentpanel.org/documents/

Figure 3. SNG's health expenditures as a % of general government spending, 2019 (pre-COVID)



Note: Consolidated data is shown for countries without asterisks. Consolidation was performed in each level of government by subtracting the values of property income, other current transfers and capital transfers paid to other levels of government. As a result, the data shown here capture the health care expenditures "expended by" the respective level of government, regardless of their source of funding (i.e., expenditures funded by earmarked or non-earmarked transfers from higher levels of government are considered to be a subnational expenditure even if the funding comes from elsewhere). All the health expenditure data in this report follow this same principle, unless stated otherwise.
Source: de Biase et al. (2021).

19. Within each country, the degree of exposure of individual SNGs to health-related fiscal risks depends first and foremost on the demographic profile of its population, as well as geographic factors, such as climatic conditions conducive to diseases[5] and vulnerability to natural disasters, which shape morbidity risks and the related costs for the SNG's finances. Economic factors, such as a jurisdiction's income and level of development, and institutional ones, such as the coverage of private health insurance and the state of public health care facilities, early warning systems and other preparedness mechanisms also influence the vulnerability of SNG finances to health-related risks.

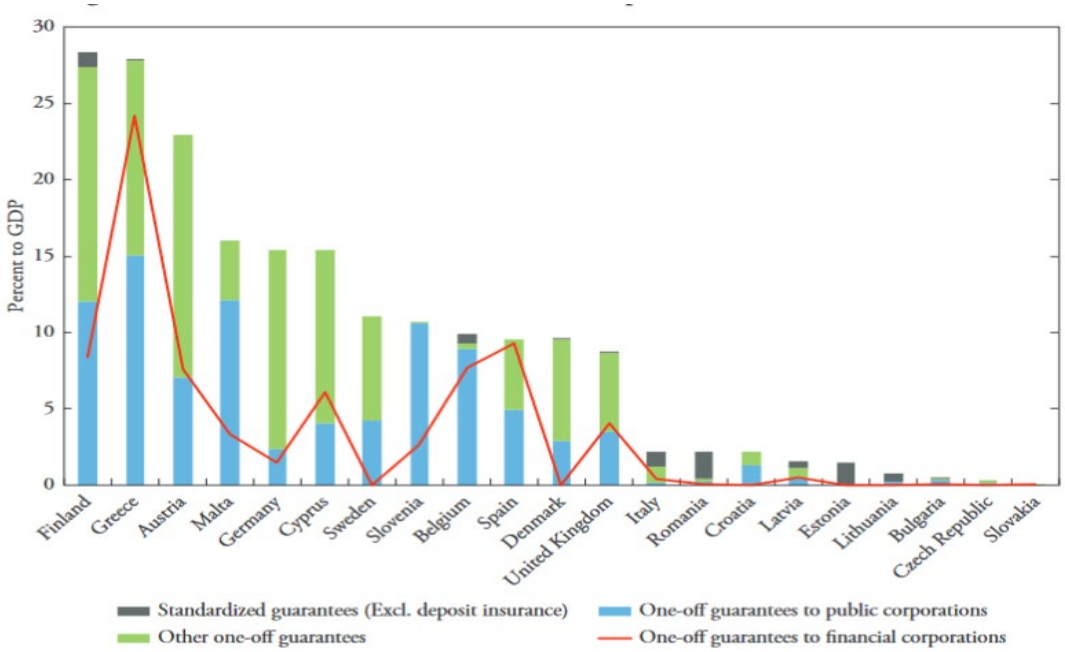
2.4. Contingent liabilities

20. SNGs' finances are exposed to risks from the accumulation of a range of explicit and implicit contingent liabilities. The main sources of explicit contingent liabilities are guarantees and pending claims from litigation. Guarantees are a major source of fiscal risks at the NG level in many countries (see e.g. Figure 4 below for EU countries).

21. SNGs provide explicit guarantees most frequently to borrowing by their enterprises and utilities. Increasingly, however, they have also been extending them to private partners in PPP arrangements. The latter guarantees may cover demand risks (e.g., minimum revenue guarantees for state or municipal toll roads), foreign exchange risks for loans or bonds issued in foreign currency to finance PPP investments, or other risks, related to land use and other regulatory issues).

[5] However, the rapid post-Covid growth of cross-border tourism facilitates the propagation of tropical diseases to temperate environments whose populations have less immunity to them (de Bolle and Obstfeld, 2024).

Figure 4. Stock of government guarantees in European countries



Source: Saxena (2017).

22. Litigation is an often underappreciated but significant source of fiscal risks. These risks depend on the legal tradition of each country, and their materialisation can have near or longer-term impacts on public finances, depending on the timelines imposed by the judicial system, including appeal procedures, where applicable (Dougherty and Mora, 2024). Litigation may involve direct costs to the budget related to court orders or administrative decisions, including disbursements to settle a dispute or to pay for damages. Indirect costs arise in the form of enhanced uncertainty and/or reputational losses for the government, which impinge on the business climate. Litigation often occurs in tax, regulatory, and human resource matters; the management of social benefits; and contractual matters related to public procurement, concessions and public-private partnerships.

23. Public information about the number and disputed amounts for judicial claims is typically quite scarce. An analysis by Bova et al. (2016) of fiscal risks from judicial claims against NGs for a sample of 80 advanced and developing countries over the period 1990-2014 suggests that they have been less frequent than some other types of risks but have reached substantial levels (some 8 per cent of GDP on average) in a subset of countries.

24. SNGs are generally less exposed to implicit contingent liabilities than their respective NGs, which tend to be seen as the first line of support to citizens, firms and banks. The main sources of implicit contingent liabilities for SNGs are the need to rescue failing subnational enterprises and to take action in the event of natural disasters, as discussed above. Intermediate-level governments may also face strong pressures to bail out financially distressed local governments in their respective jurisdictions. Moreover, even in the absence of explicit guarantees, SNGs may need to renegotiate PPP contracts or provide unbudgeted-for financial support to the private partner, to avoid a more costly early termination of the arrangement (Herrera-Dappe et al., 2023).

2.5. Weaknesses in budget institutions and processes

25. The ability of SNGs to identify vulnerabilities and deal with fiscal risks is often undermined by weaknesses in subnational budget institutions and processes. Fiscal risks for SNGs can also be created

by inadequate national forecasts of the key macroeconomic variables used by SNGs for their fiscal projections. Subnational weaknesses include, on the revenue side, inadequate capacity to forecast and collect own revenues, and to budget for tax expenditures, particularly when the authority to grant tax benefits is dispersed. Subnational budgets are often also adversely affected by unexpected shortfalls in transfers from higher levels of government. These may be related to mismatches in budget projections across levels of government due to capacity/coordination weaknesses and/or reflect SNGs' uncertainty about the actual magnitude of transfers that are not formula-based.

26. On the spending side, weaknesses in forecasting capacity and expenditure management can also give rise to significant fiscal risks. *Ex-ante*, they may lead to an underestimation of spending needs and/or to unbudgeted policy initiatives (e.g., wage increases for civil servants or new investments). *Ex post*, poor control of payment arrears and inadequate monitoring of the execution of investment projects can result in significant deviations of outturns from initial budgets. These risks are exacerbated by inadequate accounting, reporting, and transparency regulations and practices of SNGs, especially but not exclusively in developing countries.[6]

2.6. Digitalisation-related challenges

27. As discussed in detail in de Mello and Ter-Minassian (2016), the ongoing digital transition (encompassing well-established technologies such as 5G networks, the internet of things, blockchains, and big data, and emerging ones such as generative AI) involves substantial potential benefits for the finances of intermediate and local governments. However, it also poses significant challenges for SNGs, including building up the requisite skills, addressing inadequacies in physical infrastructure and citizens' privacy concerns, and tackling cyber security risks. Subnational capacities to deal with such challenges can be expected to vary widely both across and within countries.

28. Moreover, the digital transition and especially the spreading of generative AI can engender dislocations in economic activity and employment, with adverse repercussions for subnational finances. Recent research (e.g., Felten et al., 2021; Pizzinelli et al., 2023; Lane et al., 2023; IMF, 2024) finds that the impact of AI on employment and incomes in different countries depends on the extent to which jobs in each area are likely to be substituted by or complemented by AI. This depends in turn on both the nature of the jobs and socio-institutional factors, such as the degree to which human supervision is required by legislation or regulations for the activities being performed through AI. The research suggests that, in contrast to experiences with prior major technological advances, AI can disrupt not only mainly manual, low-skills jobs but also those with higher cognitive requirements. At the same time, it can enhance the productivity of jobs that are complementary to it. However, to take advantage of this opportunity, workers need to acquire new skills in the use of AI technologies.

29. Developments in this area have implications for SNGs, as the nature of economic activities and jobs typically varies widely within countries. Regions and localities with a prevalence of jobs likely to be substituted by AI are more likely to experience protracted increases in unemployment and related declines in own revenues. They may also have to fund, at least in part, education and training programs to upgrade the digital skills of workers in their communities.

30. Many of the risks mentioned in the subsections above are likely to be positively correlated. In particular, adverse macroeconomic developments, such as recessions, bouts of inflation and related increases in interest rates, and exchange rate depreciations, tend to increase the likelihood of materialisation of explicit and implicit contingent liabilities. Weaknesses in budget institutions tend to amplify the fiscal impact of macroeconomic risks. Climate change increases the risk of both natural disasters and endemic diseases. A case in point is the presence of tipping points in different ecosystems, i.e. critical points that, when crossed, accelerate further climate change that affects the distribution of

[6] Irwin and Moretti (2020) document weaknesses in accounting systems and practices in a number of OECD countries.

natural hazards and therefore of both physical and fiscal risks. These correlations need to be appropriately factored into the assessment and management of subnational fiscal risks, which is the focus of the next section of this paper.

3. The role of subnational governments in the management of fiscal risks

31. SNGs have a primary role in managing their fiscal risks. A comprehensive framework for managing these risks includes several elements, which are discussed in turn in the following subsections. They include risk identification, analysis (and, to the extent possible, quantification), reporting and disclosure; and choice of options for risk prevention, mitigation and, when appropriate, sharing/transfer; and financial accommodation and operational management of the materialisation of non-transferred risks.

32. Effective subnational fiscal risk management requires appropriate governance arrangements. The information required to identify and analyse risks is frequently limited and dispersed among different government units that may not share it in full and on a timely basis. Moreover, the authority to take on certain risks, such as guarantees, and to analyse, select and manage options for risk mitigation and sharing/transfer is also often fragmented within an SNG's organisational structure. Institutional reforms to overcome such fragmentation are becoming more necessary, as the number and severity of the risks increase.

33. Efforts have been made to improve the governance of fiscal risks. For example, the OECD Recommendation on Budgetary Governance highlights the importance of appropriate mechanisms for identifying and managing fiscal risks, as well as accounting for them in fiscal policymaking (OECD, 2015). Similar advice is provided by other international organisations (IMF, 2016; OECD/World Bank, 2019). Some examples of good practices in this area, so far mostly at the NG level, are discussed in the following subsections.

3.1. Risk identification, analysis, reporting and disclosure

3.1.1. Risk identification

34. The first step in the management of fiscal risks is the identification of vulnerabilities. As discussed in the previous section, the exposure of individual intermediate and local governments to fiscal risks is influenced by a range of factors, including geographical conditions; demographic profile; economic characteristics, such as the composition of the economic base and the labour force, and the level and composition of subnational debt; institutional settings, especially the distribution of revenue and spending responsibilities among and within government levels; and the soundness and transparency of budgetary processes, including the granting of guarantees. Therefore, not all categories of risks may be relevant for a specific SNG at any given time or within a given time horizon.

35. The information needed to assess the relevance of specific risks varies by type of risk and is likely to be dispersed among different governmental units. Specifically, the finance department is best placed to identify the main macroeconomic risks – also drawing on information provided by the national economic authorities (the Ministry of Finance and the Central Bank) – as well as risks associated with the materialisation of contingent liabilities, public financial management weaknesses and technology. On the other hand, the health department is typically responsible for monitoring the indicators needed for the identification of public health risks. The departments in charge of housing, transport and other infrastructure would have the expertise and experience needed to identify and monitor risks from climate change in their respective areas.

36. To ensure that a comprehensive picture of the risks relevant to each SNG – as well as of their likely correlations – is available on a timely basis, robust institutional mechanisms for a smooth exchange of information about the involved organisational units should be put in place. To promote such exchanges

and establish respective accountabilities, a central focal point, preferably at the finance department, should be set up. It should be provided the legal authority and resources to obtain the needed information from the rest of the government, as well as from other relevant public and private parties. It should also be made responsible for maintaining an up-to-date inventory of the main fiscal risks facing the specific SNG. Indeed, action to this end features prominently in the OECD Recommendation on the Governance of Critical Risks for NGs (OECD, 2014).[7] Central risk management units set up, typically within the Ministry of Finance/Treasury, at the NG level in countries like New Zealand, South Africa, the United States and the United Kingdom (IMF, 2016; Moretti, 2021), can provide useful models for similar subnational units, especially for intermediate-level SNGs and for larger municipalities.

3.1.2. Risk analysis and quantification

37. The central risk management unit should also be responsible for analysing and, as much as possible, quantifying the exposure of the respective SNG to each type of risk. Such analysis should involve assessments of both the likelihood of materialisation of each type of risk and its fiscal cost, as well as of correlations among them. Risk assessment can be carried out through foresight and scenario analysis, and financing frameworks to better anticipate complex and wide-ranging impacts. The quantification of the risks is useful in the choice and design of mitigation measures, and in the assessment of the impact of unmitigated risks on the sustainability of a government's finances.

38. A number of methodologies for risk quantification (briefly reviewed in the rest of this subsection) have been developed and are being utilised by NGs. Several of them, however, are likely to exceed the capacities of smaller or less developed SNGs. Such governments may need to rely mainly on qualitative judgements (high, medium, or low) of the likelihood and expected budgetary cost of the materialisation of the main risks identified as relevant in their specific circumstances. This judgement can usefully be informed by history. This underlines the importance, even for small SNGs, of building and maintaining a database on the budgetary impact of past macroeconomic and other shocks, and of the realisation of contingent liabilities.

***i*) Macroeconomic risks**

39. Scenario analysis is the instrument of choice to model the impact of different macroeconomic risks on key fiscal aggregates (revenues, expenditures, and debt) based on deviations of the main macroeconomic variables (GDP growth, inflation, selected commodity prices, interest rates, and exchange rates) from baseline projections underlying the budget. Deviations can be calibrated on past history as standard deviations around the means of the time series of the relevant macro variables. Stress tests can be used to gauge the effects of the simultaneous occurrence of different types of macroeconomic risks, even though these tests do not take account of possible interactions among different risks. Stochastic (Monte Carlo-type) simulations allow for the computation of confidence intervals around baseline budget projections based on history (Celasun et al., 2006; IMF, 2021). Risk analysis is more challenging in the absence of experience to allow for inference about the distribution of specific risks and in the presence of non-linearities arising from interactions among different risks. Policymakers may resort to qualitative scenario analysis to inform policy choices in this case.

***ii*) Risks from natural disasters**

40. An analysis of fiscal risks from natural disasters should include assessments of both their direct cost; namely, their likely damage to, and loss of, public assets (buildings and other infrastructure) needed for the provision of critical public services, as well as indirect costs related to revenue losses and

[7] The Recommendation includes the assignment of leadership at the national level to drive policy implementation, connect policy agendas and align competing priorities across ministries and between central and local government through the establishment of multidisciplinary, interagency approaches (OECD, 2014).

expenditure pressures to provide relief to the affected population. A regularly updated inventory of public assets, including information on their location, physical conditions, and likely replacement cost, is essential for the ex-ante assessment of the direct costs of disasters. Governments nevertheless seldom maintain inventories of assets at risk, unlike private businesses, which are mandated to do so and can therefore insure those assets (OECD, 2021).

41. Risk assessment in this area has backward and forward-looking aspects. Past occurrences and associated budgetary costs of the types of natural disasters more relevant for individual SNGs are often used for a first estimate of the likelihood and prospective cost of disasters. This task is also complicated by the patchy and difficult-to-collect nature of the data on past losses and damages (OECD, 2018). However, this backwards-looking information needs to be supplemented by more forward-looking analysis based on relevant scientific information on the distribution of relevant hazards and their evolution over time, as well as physical exposures based on the location of assets at risk. A case in point concerns risks for which there is no or limited guidance from experience, such as risks that assets may be stranded as a result of the adoption of stricter regulations and other climate change mitigation policies, including different pricing mechanisms, which influence their valuation. The materialisation of these risks may lead to financial instability, with consequences for subnational public finances, for example by increasing the level and/or volatility of subnational borrowing costs.

42. A variety of methodologies and tools have been developed to estimate the impacts of natural disasters (Box 1).

Box 1. Estimation of the impact of natural disasters

Various methodologies are available, for example:

The Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness and the European Commission have created a multi-stakeholder forum for carrying out shared, quantitative analysis relevant to humanitarian crises and disasters. The forum has developed a composite Index for Risk Management (INFORM) that combines 54 indicators into three dimensions of risk: Hazards (events that could occur) and exposure to them, vulnerability (the susceptibility of communities to those hazards) and coping capacity (resources that can alleviate the impact). The index's results are published twice a year. They give an overall risk score out of 10 for each country and for each of the dimensions, categories and components of risk. The analysis is currently carried out at the NG level, but the forum is also proposing to support SNGs interested in applying the methodology.

DG ECHO has also developed a large set of tools to highlight how to best estimate the impact of disasters. This includes two major studies, one on investment in disaster risk management, and one on financial risk and opportunities to build resilience in Europe, as well as reports on tools for investment.

The World Bank integrates a Damage and Loss Assessment into its Post-Disaster Needs Assessment (PDNA) tool. However, this tool is a post-disaster exercise and does not necessarily provide guidance for disaster preparedness and fiscal planning.

The Pacific Catastrophe Risk Assessment and Financing Initiative applies probabilistic disaster risk modelling and assessment tools to estimate the economic and fiscal losses caused by natural disasters. This Initiative provides Pacific island countries with insurance and technical assistance in natural disaster management.

The Catastrophe Simulation model, developed by the International Institute for Applied Systems Analysis, is a risk-based economic framework designed and used to conduct a stochastic analysis of a natural disaster's impact.

Source: Cevik and Huang (2018); DG ECHO.

iii) Risks from guarantees

43. As in the previous risks listed above, information is essential for the assessment of risks associated with guarantees. This requires the maintenance of a comprehensive and frequently updated inventory of guarantees extended by an SNG, their nature, face value, maturity, and the evolution of disbursements and repayments of guaranteed loans. Such inventories are essential tools for the identification and analysis of the fiscal risks associated with guarantees. Efforts in this area are nevertheless frequently hindered by fragmentation of the guarantee-granting authority within governments.

44. Risk analysis in this area requires different steps. The first involves an assessment of the likelihood of realisation of each guarantee, or at least of each guarantee whose face value exceeds a chosen threshold. The second step is an estimation of the fiscal costs entailed by the calling of a guarantee. Different methods can be used for the probability assessment, each with advantages and disadvantages, as summarized in Box 2 below (World Bank Treasury, 2019). Given capacity limitations in many SNGs, a credit rating method may be preferred by most. Even this method requires, however, sufficient understanding of the factors influencing the realisation of each guarantee, in particular the financial condition of the beneficiary. Indicators, such as debt-to-equity, debt-service-to-revenues, and liquidity ratios, can provide useful signals in this respect. Finally, estimated losses from guarantees should be integrated into debt sustainability analyses (DSAs) to assess the impact of their realisation on a government's solvency over the medium term.[8]

45. The central government has a role to play in this area. Reporting requirements and the conditions under which SNGs are allowed to extend guarantees are often set by the central government. In Spain, for example, legislation on subnational finances requires the Autonomous Communities to manage financial risks appropriately, including those related to public guarantees, contingent liabilities and other extrabudgetary support measures. The legislation includes limits on guarantees and disclosure requirements. In the event of non-compliance with fiscal rules, central government authorization is required for the extension of guarantees. In addition, central governments can support the development of SNGs' capacity to manage risks from guarantees through technical assistance, including by creating a central unit in the Ministry of Finance responsible for the provision of such assistance to SNGs (Irwing & Moretti, 2020).

iv) Risks from litigation

46. To assess risks from judicial claims against them, SNGs should maintain comprehensive, detailed and frequently updated databases of past and ongoing such claims. Records of judicial decisions on various types of claims provide useful inputs into the assessment of probabilities of the claims being realized and of their associated cost. These records need to be supplemented by assessments by the government's legal defence teams of future claims that may differ in nature from prior experience.

47. Colombia provides a useful example in this respect. To improve the understanding of growing risks from legal claims and the budgeting for future payments, the NG has implemented a valuation methodology combining information from historical experience and the qualitative assessment from defence lawyers for each case currently pending.[9] Previous experience is used to infer probabilities of rulings, assuming that historical patterns in court decisions persist. The probabilistic analysis is complemented with expert opinions by the state lawyers defending each case, structured along specified criteria.

---

[8] Standard methodologies are available from several sources. The IMF's DSA template for sovereign market borrowers and the IMF-WB DSA template for lower-income countries, which include standardised stress tests for different types of contingent liabilities, can be used as models for such assessments by SNGs. The OECD also uses a methodology to compare the evolution of sovereign debt and assess risks to the sustainability of public finances across countries.

[9] A probability tree, which represents the dynamics of the litigation procedures filed against the government, is constructed to understand the potential pathways of a legal case, including the various court instances, and the likelihood of an out-of-court settlement, until a final ruling is reached (World Bank Treasury, 2019). In each node (instances of the process), the outcome may either be favourable or unfavourable to the government. To assess these probabilities, risk managers constructed a historical database that is sufficiently robust in terms of quality and quantity of information to calculate the relative frequencies in each node and, thus, determine the probability of the event.

Box 2. Estimating the likelihood and loss from the calling of guarantees

1. Methods to estimate the likelihood of calling of guarantees

- *Credit rating method*. Key risk factors are scored and aggregated to arrive at an overall ordinal risk rating for beneficiaries of the guarantees. Credit ratings can be translated into probabilities of default by using information about how often entities with a specific rating defaulted in the past. This method requires qualitative and quantitative information about rated entities and a good understanding of fundamental risk drivers per type of beneficiary. It is relatively less demanding analytically and flexible in analysing specific risk drivers, but it involves significant reliance on analysts' judgement. It is used by, among others, the NGs of Ghana, Indonesia, South Africa, and Thailand.
- *Statistical models*. Econometric analysis is used to predict the probability of financial distress (dependent variable) of beneficiaries of the guarantees, based on their relevant characteristics (independent variables). It requires a sufficiently large dataset of historic financial distress events, paired with relevant firm characteristics to calibrate the model. An example is Altman's Z-score, which characterises firms as being in safe, grey, or distress zones, based on a weighted average of their key financial ratios. This approach is used by the Turkish National Treasury.
- *Financial models*. The finances of a guarantee's beneficiary are modelled under alternative scenarios (deterministic or stochastic) to assess its ability to service debt. Deterministic scenarios allow the estimation of potential losses under the specific scenario assumptions. Stochastic scenarios allow the estimation of a probability density function of such losses. This approach requires a good understanding of the relationships between scenario variables and the financial performance of beneficiary entities, as well as significant modelling capacity. Therefore, they have been mainly used to analyse risks from complex, large-scale projects (e.g. the Oresund bridge between Denmark and Sweden)

2. Measures of potential fiscal costs

- *Maximum exposure*. The worst loss that a government may sustain from a guarantee (e.g., in a loan guarantee, the face value of the loan).
- *Expected loss*. The loss that a government would expect from a guarantee on average over time (i.e. the loss that is not exceeded in 50% of loss occurrences). It is calculated as the product of exposure at the time of distress; the estimated probability of distress; and the loss given distress (the share of exposure that is not expected to be recovered e.g., through the realisation of collateral). The expected loss from a portfolio of guarantees is the sum of the expected losses of the guarantees in the portfolio.
- *Unexpected loss*. The difference between actual and expected loss. Unexpected losses are estimated at given confidence intervals. To estimate the aggregate unexpected loss from the portfolio, correlations among component guarantees must be taken into account.

Source: World Bank Treasury (2019).

v) Main risks from implicit contingent liabilities

48. As indicated in Section 1 above, the main implicit contingent liabilities for SNGs relate to their enterprises and PPPs. As for national SOEs, risks of financial distress for subnational SOEs reflect the inability of the respective SNGs to impose a hard budget constraint on them (Ter-Minassian, 2017). An important source of soft budget constraints on subnational SOEs is the imposition by the SNGs on their enterprises of public policy objectives and practices that are not compensated through commensurate budgetary transfers. Such policies include setting energy and utility prices at levels that do not allow for cost recovery at an adequate level of efficiency; encouraging or mandating excessively high wages or employment; requiring SOEs to undertake activities unrelated to their business objectives, such as social expenditures and development projects; payment forbearance, resulting in an accumulation of arrears or energy distribution losses; and politically motivated interference in business operations, including decisions on the location and types of investment, recruitment, procurement, etc.

49. Soft budget constraints also result from government controls on SOE budgets and debt management that depend heavily on discretion, thus opening the scope for bargaining. In addition, weak reporting and transparency requirements result in information asymmetries between the SNG (the shareholder) and the SOE management, weakening financial market oversight and arm's-length operations between the SNG and its SOEs.

50. To assess both the likelihood and prospective severity of risks from their SOEs, SNGs need to have timely and reliable information on the potential sources of soft budget constraints, as well as on the current financial conditions of each enterprise. Risks from flaws in the fiscal governance of SOEs may be masked for sometimes lengthy periods by factors, such as the strength of the economy, favourable developments in commodity prices, and even accounting gimmickry. Therefore, SNGs need to invest in robust and timely systems to monitor all the factors relevant to the finances of their SOEs.

51. As regards fiscal risks from PPPs, the first essential step towards addressing them is the compilation and frequent updating of a database on existing PPP projects and contractual terms, with sufficient detail to identify future obligations for availability payments, guarantees and other potential costs. SNGs may use simple methodologies to identify and assess the probability of realisation and expected losses from explicit and implicit guarantees in PPP contracts, including the PPP Fiscal Risk Assessment Model (PFRAM)[10] developed by the IMF and World Bank. Several countries (e.g., Chile, Colombia and the United Kingdom) utilise more sophisticated tools (including stochastic analysis) to quantify risks from specific PPP projects (Irwin et al., 2018).

3.1.3. Risk reporting and disclosure

52. Requirements for SNGs to disclose the results of their fiscal risk analyses can strengthen both incentives and accountabilities for managing such risks effectively. For this purpose, subnational fiscal responsibility laws or organic budget laws should require the preparation and inclusion in the annual budgets of an Annex of Fiscal Risks, detailing the main identified risks, an assessment of the probability of their realisation and expected cost, and the main measures to mitigate them (as discussed in the next sub-section). The Annex should also include an account of the realisation of risks during the current year and their management.

[10] The IMF and World Bank have developed a spreadsheet-based tool: PPP Fiscal Risk Assessment Model, PFRAM. Detailed information on PFRAM is available at PPPs and PFRAM (imf.org). On the basis of project-specific information and macroeconomic assumptions, PFRAM generates qualitative (low, medium or high) assessments of the fiscal impact of different project risks, displayed in matrix form. These can then be aggregated across projects in a country's PPP portfolio, taking into account likely correlations.

53. The degree of detail and analytical content of the Annex will inevitably be influenced by the capacity of individual SNGs, as well as the nature of risks. For instance, smaller and less developed SNGs will likely be able to provide only qualitative assessments of risks and associated budgetary costs, and aggregate estimates for the main categories of risk. Larger and more advanced SNGs may also need to avoid publishing quantitative estimates of the likelihood and cost of individual risks (e.g., the realisation of implicit guarantees) if their disclosure would give rise to significant moral hazard. Outside scrutiny of the Fiscal Risk Annex, including by an independent fiscal institution, can help ensure an appropriate balance of transparency objectives with the avoidance of moral hazard.

3.2. Risk mitigation

54. SNGs can take a range of actions to mitigate fiscal risks. Some of the actions aim at preventing the materialisation of risks, while other measures aim at moderating their impact, and sharing them with other parties. Different risks call for different mixes of these actions, and for this reason, timely and comprehensive identification and analysis of the risks facing each SNG are important for designing and implementing a risk mitigation strategy in each case. This subsection of the paper discusses the considerations that can usefully inform the choice of mitigation tools for different types of risks and SNGs.

3.2.1. Risk prevention and moderation

55. SNGs have generally limited control over macroeconomic risks. GDP growth, the rate of inflation and developments in commodity prices, interest rates and exchange rates are largely influenced by international developments and by policies of the NG. Nevertheless, SNGs can reduce their vulnerability to some of these risks through their own policy choices. For example, they can index some of their revenues (excise taxes and user fees) to inflation, eschew borrowing in foreign currency, and strive to increase the fixed-rate share of their domestic currency debt. Larger SNGs (e.g., states, provinces, and cities) often have a dedicated unit in their Finance Department to carry out an active management of their debt.

56. While SNGs cannot typically prevent weather-related and other natural disasters, they can use their revenue, spending, and especially regulatory powers to moderate their impact, as discussed in de Mello and Ter-Minassian (2024). Specifically, they can:

- Regulate land use in several ways. For example, they can influence households' and firms' location decisions (including relocation from more disaster-prone areas) through appropriately enforced regulation (e.g., zoning, transferability of development rights), subsidies, and levies and fees related to natural disaster risks.
- Provide financial and technical support to farmers in their areas to shift to drought-resistant crops and invest in improving irrigation networks.
- Control deforestation to help minimise the risk of landslides and exercise or mandate forest management techniques that reduce the risk of wildfires. They can also invest in expanding green spaces in urban areas to mitigate the impact of heat waves.
- Strengthen and appropriately enforce building codes, with a view to reducing the vulnerability of houses and other private and public buildings to fires, floods, and storms.
- Increase the resilience of the electric grid in their communities to extreme weather events through direct investments, investments by controlled SOEs, or by regulation of private electricity companies, as relevant in each case; and
- Improve the resilience of other infrastructure in their jurisdictions, such as ports, levees, bridges, and roads, to weather-induced damages through improved maintenance, as well as through new investments, as appropriate.

57. Appropriate management of guarantees is another important component of SNGs' risk mitigation strategies. The key elements of such a management should include a robust approval process for new guarantees. This includes the definition of a government-wide policy framework for the granting of guarantees, preferably reflected in legislation; the centralisation in the finance department of the authority to include new guarantees in the budget proposal, as discussed above; and the definition of a checklist of questions to be addressed when deciding on specific new guarantees, regarding consistency with the policy framework, and assessment of credit risks.[11] Appropriate management can be improved by setting aggregate, and possibly categorical, limits on the stock of guarantees (in terms of maximum exposure). These limits should be consistent, in terms of expected values, with debt sustainability analysis. Useful examples of limits on guarantees (mostly at the NG level) can be found in most advanced and a number of emerging economies.[12]

58. Other useful tools are available to limit risks from guarantees. They include partial guarantees, and the levying of fees for guarantees, preferably differentiated by assessment of credit risk (as is the case in Australia), to limit beneficiaries' moral hazard; a requirement of collateral (e.g., liquid financial assets, future revenue streams);[13] the inclusion of covenants in the guarantee to limit actions by beneficiaries that increase the likelihood of guarantees being called;[14] appropriate hedging of some risks covered by the guarantee (e.g., foreign exchange risk); and the creation of notional (e.g., India, Sweden, United States) or actual (e.g., Colombia) contingency reserve funds.

59. Existing guarantees should be closely monitored. SNGs should routinely review the financial performance of the beneficiaries of their guarantees, with a view to detecting early signs of distress. The monitoring should also include watching over compliance with the guarantee agreement, in particular: the proper use of the guaranteed funds; the timeliness of the repayment of guaranteed obligations; the balance of the guaranteed amount; timely payment of guarantee fees; and, in case of a called guarantee, the recoveries to be made. In many countries, at the NG level, responsibility for the management of guarantees (including their monitoring) is assigned to a specialised unit within the Ministry of Finance, working in close collaboration with the line ministries sponsoring the different types of guarantees.

60. The multiplicity of potential sources of soft budget constraints for subnational SOEs and their relative weight in different circumstances imply that there is no one-size-fits-all prescription for minimising fiscal risks from the SOEs. Appropriate mitigating strategies must be designed on an SNG-specific basis. Nevertheless, international experience, especially for national SOEs, points to some potentially useful approaches (Ter-Minassian, 2017). They include minimising requirements for SOE's pricing, employment and procurement policies that differ from those for comparable private enterprises, as well as compensating SOEs for the burden of any remaining differences; establishing a clear and stable dividend

[11] A useful example in this respect, at the NG level, is the checklist used by the UK Treasury to vet requests for new guarantees.

[12] For example, in Brazil, limits on federal guarantees are established by the Senate. States' guarantees are limited to 22 percent of their net recurrent revenue (total tax revenue less transfers to other levels of government). All guarantees must be collateralized. In Colombia, the law imposes a limit of US$4.5 billion or equivalent (about 1.6 percent of GDP) on the stock of guarantees. A second limit (0.4 percent of GDP) is applied to cap the annual obligations arising from PPP projects, including availability payments and called guarantees. In India, the fiscal responsibility legislation places an annual cap on central government guarantees of 0.5 percent of GDP. In South Africa and Thailand, guarantees are counted within the debt limit. In Spain, as noted above, limits and authorization requirements are in place for the extension of guarantees by the Autonomous Communities.

[13] This is the case, for example, of Brazil, Colombia and Iceland.

[14] Covenants are employed in Indonesia and Sweden, for example. In Sweden, covenants include financial ones, to prevent the beneficiary from excessive risk taking (e.g., cash flow covenants, debt service covenants, and debt covenants); corporate governance ones to limit management risk (e.g., limits on management remuneration); and information ones to facilitate monitoring the developments of the guarantee's beneficiary.

policy, taking into account the SOEs' investment programmes and capitalisation needs; a rules-based system of controls on SOE borrowing, reflecting their debt-servicing capacity and liquidity; and strengthening requirements for sound planning, budgeting, accounting and reporting by SOEs.

61. SNGs have a number of tools to mitigate fiscal risks from PPPs. They include adopting accounting rules that do not create inappropriate incentives to choose between PPPs and direct public procurement of infrastructure; establishing a "gateway" process for the approval and monitoring of PPP projects, centred on the finance department (as is the case at the NG level in, e.g., Australia, Chile, South Africa and the United Kingdom), and developing in the gateway unit appropriate technical capacity to evaluate PPP project proposals, tenders and contracts, and to analyse their fiscal costs and risks; eschewing unsolicited PPP proposals; developing a framework for risk sharing in line with sound allocation principles, as outlined by among others, the IMF (Irwin et al., 2018), the OECD (2012) and the World Bank (2016). Additional tools at the disposal of SNGs include using variable-term contracts to reduce demand risks and share in upside potential, as is the case in Chile (Engel et al., 2022); adopting and publicising clear regulations for contract renegotiations, dispute resolution and project termination; ensuring adequate disclosure of PPP contract terms and their future (certain and contingent) fiscal costs; and setting appropriate limits on the stock of guarantees and on annual or pluriannual availability payments for PPPs (e.g., Brazil, Colombia, Peru and the United Kingdom).[15]

3.2.2. Risk sharing/transfer

62. As part of their risk mitigation strategy, SNGs should analyse the benefits and costs of risk sharing/transfer options. As many of these options involve (sometimes significant) financial costs, they are mainly useful to manage large but infrequent risks.

63. Some macroeconomic risks can be transferred through the use of derivatives. Interest and exchange rate risk can be mitigated through interest or currency swaps, and risks from commodity price fluctuations through commodity swaps or options. Such transactions are frequently undertaken by NGs, and their SOEs, sometimes through the intermediation of multilateral development banks (MDBs). In addition to their cost, transactions in derivatives require significant financial expertise and therefore are only usable by larger, more developed SNGs. Some NGs even bar, or severely limit, their use by SNGs.

64. A number of instruments can be used by SNGs to transfer (or at least share) risks from natural disasters. In addition to entering into cost-sharing arrangements with the NG (discussed in Section 4 below), SNGs can acquire traditional or parametric[16] insurance for their own assets and can incentivise or require private agents (households and firms) to insure themselves against relevant natural hazards. Among the countries that use extensively private insurance for public assets are Australia, Costa Rica, France, Mexico, New Zealand and Peru (OECD/The World Bank, 2019). Portugal and Turkey require homeowners to insure their properties against earthquake risks in relevant areas. Japan mandates insurance companies to bundle earthquake insurance in the fire insurance contracts that they offer to Japanese households. Being earthquake-prone, New Zealand established in 1993 a Natural Disaster

[15] In Brazil, there is a legal ceiling on annual payments to PPP companies of 1 percent of revenues at the federal government level, and of 5 percent at the state and local levels. In Colombia, the NG is required to limit its annual PPP-related payments to 0.4 percent of GDP. In the United Kingdom, the executive has set a limit on PPP spending, expressed in pounds, over the medium term. Alternatively, the limit can apply to the stock of the government's commitments: in Peru, the law limits the value of the government's outstanding obligations to 7 percent of GDP (Irwin et al. 2018).

[16] In contrast to traditional insurance, parametric insurance payouts are based on predetermined triggers, such as hurricane wind speed, rainfall levels or ground acceleration from earthquakes. Parametric insurance contracts have the advantages of lower transaction costs, and greater certainty and speed of disbursement, but their payouts are only loosely linked to the actual extent of the insured disasters when they occur (Cevik and Huang, 2017).

Fund, fed by a surcharge on homeowners' insurance premia. It provides additional insurance for the impact of specified natural disasters on residential buildings. It is backed by a government guarantee but is managed by an autonomous entity (EQC) with strict transparency requirements.

65. Another mechanism for the transfer of risks from natural disasters is the issuance of state-contingent debt instruments (SCDIs) embedding an insurance component that can alleviate pressures on government debt and financing needs, should a disaster occur. One type of SCDI is a catastrophe (CAT) bond, which offers investors a high coupon but provides for the forgiveness of bond principal, in the event of a disaster. This frees the issuer's resources to be used to cover post-disaster recovery and reconstruction. Mexico was one of the first countries to issue this type of bond, which has now become fairly common for countries that are highly exposed to natural disasters. Some smaller island countries have joined facilities that offer or facilitate pooled insurance against disaster risks (e.g., the Caribbean Catastrophe Risk Insurance Facility and the Pacific Catastrophe Risk Assessment and Financing Initiative). These may offer useful models for SNGs facing similar, but not necessarily simultaneous, risks.

3.3. Management of residual risks

66. Sound management of subnational fiscal risks includes creating fiscal and financial headroom to accommodate the materialisation of those that cannot be fully transferred or mitigated. This involves a range of actions, depending on the nature and expected frequency and extent of the risks. Specifically, on the fiscal side:

- Subnational medium-term and annual budgetary targets should be set at levels that, at prudent confidence intervals, ensure that the materialisation of macroeconomic risks does not result in deficits that are not financeable, do not comply with applicable fiscal rules, or significantly jeopardise medium-term debt sustainability. The scenario analyses discussed above provide useful inputs in this respect.[17]
- Expected losses from the calling of guarantees should be provisioned for in the annual budget.
- A contingency reserve, equivalent to a small percentage of budgeted expenditures, should be included in the annual budget to accommodate the cost of small natural hazards and other unexpected events. Its use should be regulated by the applicable organic budget law.
- The same law should specify conditions, limits and procedures regulating the transfer of budget lines to accommodate spending needs from the materialisation of relatively small shocks. It should also specify any allowed simplification of procurement procedures to facilitate the timely disbursement of the expenditures required by natural or health shocks.
- Subnational fiscal rules and fiscal responsibility frameworks should include a well-structured escape clause to accommodate the materialisation of large shocks. Such clauses should specify as clearly as possible the nature and extent of the shock; the authority to invoke the application of the clause; limits on its duration; and the path to return to the rule.

67. SNGs also need to create buffers to finance the revenue shortfalls or additional spending from the materialisation of unbudgeted-for risks. A relatively common approach in this area is the creation of rainy-day or natural disaster funds. Rainy-day funds are widely used by the states in the United States, for example (Box 3).

[17] Akanbi et al. (2023) proposes a toolkit to estimate prudent public debt anchors and calibrate fiscal deficit or expenditure rules to incorporate increased risks of occurrence of natural disasters. The toolkit allows for inputs to parameterise the frequency and intensity of natural disaster risks; modelling of asymmetric growth shocks to reflect the effect of natural disasters; other mitigating mechanisms, such as disbursements from regional insurance schemes or external financing when natural disasters occur; and inputs for adaptation investment needs when countries set an expenditure or budget balance rule.

Box 3. US states' practices with rainy-day funds

US states determine the amount of money to deposit in their rainy-day funds through various methods, and the rules for contributions can vary considerably. Some states deposit only whatever surpluses are left over at the end of the year, while others (Arizona, Idaho, Indiana, Michigan, Tennessee, and Virginia) use formulas based on growth in tax revenues or personal income to determine when the rainy-day fund will receive funding. Other types of deposit rules force the state to make deposits when it cannot afford to. For instance, California, Florida, Hawaii, Maryland, Missouri, and Rhode Island require annual contributions to their rainy-day fund without regard to the state's financial situation.

Rules for the utilisation of accumulated funds also vary across states. Specifically:

- Eighteen states allow withdrawals from their rainy-day funds based on current-year or anticipated budget gaps. This means the fund can be accessed when revenue comes in—or is projected to come in—below appropriations for a given fiscal year. Some states restrict this to the fiscal year in progress or just completed, while others allow for appropriations from the rainy-day fund when preparing the budget for the upcoming year.
- Six states have no legal conditions for when funds should be withdrawn, offering a high degree of flexibility. In contrast, ten states have unclear conditions for withdrawals, and twenty-nine states do not include revenue or economic fluctuations as criteria for determining when withdrawals are appropriate.
- Ten states require withdrawals from their funds to be approved by a supermajority in their legislative bodies.

The total stock of rainy-day funds reached an unprecedented USD 136 billion in 2022, reflecting the post-Covid rebound of revenues and the Covid-related increase in federal grants to the states. This was equivalent to about 42 days of state spending on average, but with huge variation across states (from under 5 days in Washington state to nearly one year in Wyoming).

68. Another tool is the creation of a natural disaster fund. Such funds can be used to finance the expenditures needed in the different phases of a large natural shock, i.e. short-term emergency assistance, medium-term recovery, as well as longer-term reconstruction and improving resilience to future shocks. Many countries have created such funds at the NG level, with varying characteristics and rules regarding accumulation and withdrawals (see Cevik and Huang, 2017 for examples). Best practices in this area include ensuring careful calibration of their target level, to avoid both under and over-funding; a clear specification of the rules regarding the use of the fund, including procurement regulations, and of the accounting of its operations; full transparency; and requiring investment of the unused funds in liquid instruments, to ensure prompt availability when disasters strike.

69. In addition to rainy-day or natural disaster funds, SNGs can arrange contingent credit lines with financial institutions to ensure a rapid disbursement of funds needed to provide emergency assistance to their affected populations in the event of natural disasters. As with insurance, such facilities being expensive should only be used to finance the impact of large shocks.

4. Role of NGs in the management of subnational fiscal risks

70. There are several reasons why national governments (NGs) should have an important role in the management of subnational fiscal risks. First and foremost, most of these risks are directly affected by the characteristics of the intergovernmental fiscal relations system, and several are also affected by policy decisions of the NGs, as discussed in section II above. Also, poor management by affected SNGs of some asymmetric shocks, such as the outbreak of infectious diseases, can have significant adverse spillovers on other SNGs. More generally, poor risk management leading to subnational financial crises can create significant fiscal risks for the NG, as witnessed by international experience (Ter-Minassian, 2015). Moreover, the greater budgetary resources and borrowing capacity of NGs enable them to support affected SNGs in catastrophic events, and NGs have typically greater technical expertise in risk management than their SNGs.

71. It is not surprising that SNGs expect their respective NGs to come to their rescue when shocks occur. This creates, however, significant scope for moral hazard and saps incentives for effective *ex-ante* management, including the prevention, mitigation and, when appropriate, sharing of risks by SNGs. Accordingly, NGs' involvement in the management of subnational risks should be guided by two main overarching principles. First, NGs should strive to mitigate subnational fiscal risks created by their own policies, and their support to SNGs affected by exogenous shocks should minimise moral hazard. Second, NGs should use the powers granted to them by national legislation (including the Constitution) vis-à-vis their SNGs to minimise the risk of subnational financial crises.

72. The rest of this section discusses how NGs can effectively contribute to the sound management of different types of subnational fiscal risks. In each case, it highlights the importance of well-functioning intergovernmental cooperation arrangements and provides selected examples of good international practices in this area.

4.1. Macroeconomic risks

73. NGs' macroeconomic policies are (and should be) primarily informed by nationwide objectives, such as sustainable economic growth, achievement of inflation targets, and the maintenance of international competitiveness. However, as discussed in Section 2 above, some of these policies can create significant fiscal risks for SNGs. NGs can take a number of steps to moderate these risks.

74. First, they can use medium-term fiscal frameworks (MTFFs) to signal to their SNGs their budgetary, and in particular tax policy, intentions to help SNGs better forecast shared revenues, as well as cyclically sensitive own revenues. Timely communication by the NG to SNGs of the guidelines for its annual budget preparation is also useful in this respect. When previously unplanned tax policy changes are required by short-term economic stabilisation objectives, NGs should assess their impact on shared revenues and consider temporary compensating adjustments in intergovernmental transfers, to avoid subnational budgetary responses that may run counter to the stabilisation objectives.

75. More generally, volatile and unpredictable intergovernmental transfers create significant fiscal risk for SNGs, especially those more heavily dependent on such transfers. NGs can take some steps to moderate this risk. They can rely mostly on formula-based transfers, or at least on transfers based on transparently prespecified criteria.[18] They could also consider basing shared revenues on moving averages over several years, to reduce their cyclicality.

[18] For example, the Fiscal Stabilisation programme in Canada provides financial assistance to provinces experiencing substantial year-to-year declines in revenues through a federal transfer indexed to the growth of national per-capita GDP.

76. As mentioned in Section 2 above, unexpected changes in NG spending and income policies (such as new subnational spending mandates, and changes in national minimum wages or public employment regulations) can also create fiscal risks for SNGs. The consequences of such policies should be openly discussed with SNGs prior to their adoption, to assess any need for compensatory measures and, at a minimum, to allow time for subnational budgets to be adjusted.

77. These considerations highlight the importance of well-functioning cooperation forums, with appropriate representation of the different levels of government, to promote an open and constructive intergovernmental dialogue on the consequences of national macroeconomic policies for subnational finances. Ter-Minassian and de Mello (2016) discuss the challenges in setting up and ensuring a smooth operation of such forums and provide various examples of more or less effective international experiences in this area. Independent fiscal institutions can play a constructive role in this area.

78. Such forums can also facilitate intergovernmental dialogue on the potential macroeconomic consequences of subnational policies and actions. Such a dialogue is especially important in federations, where the powers of the federal government vis-à-vis their regional governments (states or provinces) may be significantly constrained by the Constitution. In such cases, NGs can use an intergovernmental forum to highlight the adverse spillovers of fiscal irresponsibility of one or more regions to promote peer pressure by the others. They can also use the forums to foster positive demonstration effects, including the adoption and compliance by the regions of sound fiscal responsibility frameworks and fiscal rules.

79. In unitary countries, and even in some federations, NGs have both the responsibility and the legal authority to prevent fiscally undisciplined subnational policies through controls on SNG borrowing or through fiscal rules. The now extensive literature on subnational fiscal rules[19] highlights the advantages of fiscal rules over discretionary administrative controls in terms of transparency and avoidance of political bargaining. It also shows, however, that the effectiveness of rules as a disciplining mechanism depends on several conditions: an adequately strong legal basis; an appropriately comprehensive definition of the base of the rule (e.g., the inclusion in it of the expected value of calling of guarantees); a careful balancing of predictability and flexibility (including through clear escape clauses and correction requirements); and, especially, a close monitoring and enforcement of their compliance. Appropriate and timely accounting and reporting requirements for the SNGs are, in turn, key to allowing effective monitoring by the NG of the observance of the rules (Irwin and Moretti, 2020).

80. Empirical research has also highlighted the importance of subnational "ownership" of fiscal rules. NGs can use intergovernmental cooperation forums to foster such ownership through dialogue on the design, implementation and, when needed, reform of such rules. NGs can also provide technical and financial support to SNGs in strengthening their revenue administration and budgetary systems, as well as the management of their debt and contingent liabilities, which are key to compliance with the rules.[20]

4.2. Risks from natural and health hazards

81. The NGs' greater resource availability, national solidarity considerations and public opinion pressure typically lead them to take the brunt of the financial cost of natural disasters and epidemics, when they materialize. This, however, weakens incentives for SNGs to take appropriate preventive and mitigating actions. To reduce this moral hazard, NGs need to both cooperate closely with SNGs in *ex-ante*

[19] See, e.g., Sutherland et al. (2006), Ter-Minassian (2007 and 2015), Vammalle and Bambalaite (2021) and de Biase and Dougherty (2022).

[20] A good example in this respect is the Brazilian PROFISCO program, through which the federal government has been utilising loans and technical assistance by the InterAmerican Development Bank (the IDB) to strengthen the tax administration and public financial management of states and some large municipalities over the last several years.

disaster management and embed in this cooperation incentives for the SNGs to do their share in such management, along the lines discussed in Section 3 above. NGs have a range of potential instruments towards these objectives, some of which call for greater policy alignment with SNGs, which are discussed in OECD (2022).

82. Subnational investment in climate change mitigation, and especially adaptation, is an important component of the prevention of climate change-induced natural and health disasters. NGs can support such investment by assigning adequate own revenue sources to SNGs, setting up dedicated calls for competitive funding, and through a steady and predictable provision of relevant special-purpose grants; by adopting fiscal rules that allow SNGs' access to investment financing in line with their debt servicing capacity and liquidity needs; and by supporting the development of orderly and liquid markets for subnational debt instruments (de Mello and Ter-Minassian, 2024). Effective fulfilment of such roles by the NGs is facilitated by an alignment of subnational investment plans with national objectives. Well-functioning intergovernmental cooperation arrangements in the housing, transport, energy, agriculture, and health sectors are key to promoting such an alignment.

83. NGs can also support subnational risk transfer efforts, especially for poorer or rural SNGs, by providing subsidies or facilitating reinsurance for the insurance of public assets, and for the residents of subnational communities facing especially high and rising costs of insurance against natural disasters. Prespecified cost-sharing arrangements between NGs and SNGs can provide significant incentives for the latter to adopt effective risk management strategies (see Box 4 and OECD, 2022). The NG's share could be graduated to reflect equity considerations. For instance, it could be inversely related to the SNGs' level of per capita income or other indicators of their revenue capacity; it could also increase in line with indicators of the severity of the disasters covered. To reinforce its incentive effects, the arrangement could be made conditional on the beneficiary SNG having adopted some prespecified mitigation measures.

Box 4. Cost-sharing arrangements: International experience

A number of countries have such cost-sharing arrangements in place. For example:

- In Australia, the federal government compensates up to 75 per cent of eligible costs of relief and recovery incurred by SNGs, with the specific percentage depending on the funding capacity of individual states; eligible costs are clearly defined and range widely, from emergency assistance for the affected populations to the restoration of public assets and assistance to small businesses. In Canada, the federal Disaster Financial Assistance Arrangements programme covers a share of the response and recovery costs incurred by the provinces and territories after a disaster.
- In Japan, the SNGs are required to set aside 0.5 per cent of general-purpose local tax revenues as reserves to finance emergency relief efforts. The NG pays 50 per cent of the cost of a disaster if this cost amounts to less than 2 per cent of the SNG's tax revenue, and 90 per cent if it is higher. Two-thirds of expenditures for public infrastructure recovery are covered by the NG, and one-third by the affected SNG. If SNGs issue bonds to finance their share of these expenditures, 95 per cent of the interest can be covered by the NG.
- In New Zealand, the NG normally reimburses SNGs 100 per cent of the costs that they incur to care for affected people; 60 per cent of other costs to reduce immediate danger to human life (e.g. draining floodwaters); and 60 per cent of essential infrastructure recovery costs. However, in the aftermath of the major earthquakes in 2010, 2011, and 2016, the NG assumed costs incurred by SNGs that far exceeded its legal obligation.

Source: OECD-World Bank (2019).

84. NGs also support SNGs' management of risks from natural and health disasters through technical and operational assistance. International experience with the management of the Covid-19 pandemic (de Biase and Dougherty, 2021) shows the importance of having in place well-functioning policy and operational coordination mechanisms in sectors of shared responsibility when a disaster strikes, including between centres of government and local governments (Jacobzone, 2020). Indeed, according to the latest survey of Centres of Government (CoGs) conducted by the OECD, in response to the pandemic, CoGs enhanced their coordination efforts, including by broadening the range of stakeholders engaged in coordination initiatives and seeking to align strategic plans and fiscal frameworks (OECD, 2024).

5. Conclusions

85. Much of the now extensive literature on the management of fiscal risks has focused on NGs. Yet, SNGs are also exposed to significant fiscal risks which, if not properly managed, can lead to the accumulation of subnational deficits and debt (sometimes hidden through payment arrears) and eventually to financial crises, and/or can disrupt the provision of important public services. Subnational fiscal risks can reflect an asymmetric incidence within a national territory of macroeconomic risks – including from business cycles, geopolitically induced economic disruptions, and more structural trends, such as the energy transition and the digital revolution – and weather-related and other natural and public health hazards. They can also be the result of policy volatility of the NG or the SNGs themselves. And they can reflect SNGs' institutional weaknesses in the budget process and the management of contingent liabilities.

86. A key message of this paper is that SNGs should take greater responsibility and strengthen their capacity to manage their own risks, with the NG supporting their efforts through policy and institutional measures of the types discussed in Section 4 above. The paper has outlined key ingredients of effective SNG risk management, including steps to identify, analyse and as much as feasible quantify, prevent, mitigate and, where appropriate, share/transfer various types of risks, as well as to create financial buffers to accommodate residual ones when they materialize.

87. SNGs' capacity to manage their fiscal risks is likely to vary significantly, reflecting their size and level of development, as well as various features of the intergovernmental fiscal relations system, such as the degree of revenue autonomy. These differences call for also differentiated degrees and forms of NGs' support to subnational risk management before and after risks materialise. Also key are incentives for SNGs to use and strengthen their capacity, and the NG can play a substantial role in this respect by minimising moral hazard, as discussed in Section 4 above. The paper also calls for a combination of backward-looking approaches, based on previous experience with risk management, and forward-looking ones, given that the nature and distribution of risks change over time, as evidenced by climate change, for example, which requires strategic foresight on the part of subnational policymakers.

88. The analysis in this paper has been mostly qualitative and normative, with only anecdotal references to good international practices, given the current dearth of national and cross-country databases on the incidence and management of subnational fiscal risks. The evolving nature and distribution of most of these risks point to the importance of beginning quickly to build such databases, possibly starting with some country pilots. These should include information on the past incidence and main determinants of different fiscal risks and indicators of the quality of subnational risk management for different types of SNGs. Such databases would allow, among other things, the construction of a composite index of subnational risk management quality, a ranking of SNGs according to such indices, and analyses of the relation of the ranking with subnational fiscal outcomes.

References

Akanby, A.A., W. Gbohoui and W.R. Lam (2023), "Calibrating Fiscal Rules: A Consideration of Natural Disaster Risks", *IMF Technical Notes and Manuals*, No. TNM/2023/02, International Monetary Fund, Washington, D.C.

Alvarez, J., Benatiya Andaloussi, M., Maggi, C., Sollaci, A., Stuermer, M. and P. Topalova (2023), "Geoeconomic Fragmentation and Commodity Markets", *IMF Working Papers*, No. 23/201, International Monetary Fund, Washington, D.C.

Bova, E., Ruiz-Arranz, M., Toscani, F. and H. E. Ture (2016), "The Fiscal Costs of Contingent Liabilities: A New Dataset", *IMF Working Papers*, No. WP/16/14, International Monetary Fund, Washington, D.C.

Brochado, A., S. Dougherty and P. de Biase (2024), "Riding the rollercoaster: Subnational debt in turbulent times", *OECD Working Papers on Fiscal Federalism*, OECD, Paris.

Celasun, O., X. Debrun and J. Ostry (2006), "Primary Surplus Behavior and risks to Fiscal Sustainability in Emerging Market Countries: A Fan-Chart Approach", *IMF Staff Papers*, 53(3), International Monetary Fund, Washington, D.C.

Cevik, S. and G. Huang (2018), "How to Manage the Fiscal Costs of Natural Disasters", IMF How-to-Note, No. 18/03, International Monetary Fund, Washington, D.C.

CRED (2023), *2022 Disasters in Numbers*, CRED.

de Biase, P. and S. Dougherty (2022), "The past and future of subnational fiscal rules: an analysis of fiscal rules over time", *OECD Working Papers on Fiscal Federalism*, No. 41, OECD, Paris.

de Biase, P., S. Dougherty and L. Lorenzoni (2022), "Ageing and the Long-run Fiscal Sustainability of Health Care across Levels of Government", *OECD Working Papers on Fiscal Federalism*, No. 38, OECD, Paris.

de Bolle, M. and M. Obstfeld (2024), "On pandemic preparedness, world leaders are asleep at the wheel", Peterson Institute of Economics, Washington, D.C.

de Mello, L. and J.T. Jalles (2024), "Natural disasters, epidemics and intergovernmental relations: More or less decentralisation?", *Regional Studies* 58, *forthcoming*.

de Mello, L. and T. Ter-Minassian (2020), "Digitalisation challenges and opportunities for subnational governments", *OECD Working Papers on Fiscal Federalism*, no. 31.

de Mello, L. and T. Ter-Minassian (2024), "Subnational investments in mitigation and adaptation to climate change: some financing and governance issues", *Public Finance and Management*, *forthcoming*.

Dougherty, S. and P. de Biase (2021), "Who absorbs the shock? An analysis of the fiscal impact of the COVID-19 crisis on different levels of government", *International Economics and Economic Policy* 18, pp. 517-540.

Engel, E., Ferrari, M., Fischer, R. and A. Galetovic (2022), "Managing fiscal risks wrought by PPPs: A simple framework and some lessons from Chile", *World Bank Policy Research Working Papers*, No. 10056, World Bank, Washington, D.C.

European Commission (2021), "2021 Ageing Report: Economic and Budgetary Projections for the EU Member States (2019-2070)", *Institutional Paper*, No. 148, Brussels.

Dougherty, S. and T. Mota (2024), "Navigating Conflict and Fostering Cooperation in Fiscal Federalism", *OECD Working Papers on Fiscal Federalism*, OECD, Paris, *forthcoming*.

Felten, E., M. Raj and R. Seamans (2021), "Occupational, Industry, and Geographic Exposure to Artificial Intelligence: A Novel Dataset and Its Potential Uses", *Strategic Management Journal*, Vol. 42(12), pp. 2195-2217.

Fuje, H. et al. (2023), “Fiscal Impacts of Climate Disasters in Emerging Markets and Developing Economies”, *IMF Working Papers*, No. WP/23/261, International Monetary Fund, Washington, D.C.

Guerson, A. (2016), “Assessing Government Self-Insurance Needs against Natural Disasters: An Application to the ECCU”, *IMF Country Report*, No. 16/333, International Monetary Fund, Washington, D.C.

Guillemette, Y. and J. Château (2023), “Long-term scenarios: incorporating the energy transition”, *OECD Economic Policy Papers*, No. 33, OECD, Paris.

Herrera Dappe, M., Foster, V., Musacchio, A, Ter-Minassian, T. and B. Turkgulu (2023), *Off the Books: Understanding and Mitigating the Fiscal Risks of Infrastructure*, World Bank, Washington, D.C.

IMF (2016), “Analyzing and Managing Fiscal Risks - Best Practices”, *IMF Policy Papers*, May 4, 2016, International Monetary Fund, Washington, D.C.

IMF (2020), “Managing Fiscal Risks Under Fiscal Stress”, *Note in Special Series on COVID-19*, International Monetary Fund, Washington, D.C.

IMF (2021), “Review of the Debt Sustainability Framework for Market-Access Countries”, *IMF Policy Paper*, International Monetary Fund, Washington, D.C..

IMF (2023), “Geoeconomic Fragmentation and the Future of Multilateralism”, *Staff Discussion Note*, No. 2023/001, International Monetary Fund, Washington, D.C.

IMF (2024), “Gen-AI: Artificial Intelligence and the Future of Work”, *Staff Discussion Note*, No. 2024/001, International Monetary Fund, Washington, D.C.

International Monetary Fund and World Bank Group (2016), “Public-private Partnerships Fiscal Risk Assessment Model (PFRAM) User Guide”, Washington, D.C.

Irwin, T., S. Mazraani and S. Saxena (2018), “How to Control the Fiscal Costs of Public-Private Partnerships”, *IMF How-to-Note*, No. 18/04, International Monetary Fund, Washington, D.C.

Irwin, T. and D. Moretti (2020), “Can subnational accounting give an early warning of fiscal risks?”, *OECD Journal on Budgeting*, 2020(2), OECD, Paris.

Jacobzone, S. and A. Ostry (2020), “Building resilience to the Covid-19 pandemic: The role of Centres of Government”, *OECD Policy Responses to Coronavirus*, 2 September.

Kim, J. and S. Dougherty, eds. (2020), *Ageing and Fiscal Challenges across Levels of Government*, OECD Fiscal Federalism Studies, OECD, Paris.

Lane, M., M. Williams and S. Broecke (2023), “The impact of AI on the workplace: Main findings from the OECD AI surveys of employers and workers”, *OECD Social, Employment and Migration Working Papers*, No. 288, OECD, Paris.

Mechler, R., J. Mochizuki and S. Hochrainer-Stigler (2016), “Disaster Risk Management and Fiscal Policy”, *World Bank Policy Research Working Papers*, No. 7635, World Bank, Washington, D.C.

Melecky, M. and C. Raddatz (2011), “How Do Governments Respond after Catastrophes? Natural-Disaster Shocks and the Fiscal Stance”, *World Bank Policy Research Working Papers*, No. 5564, World Bank, Washington, D.C.

Moretti, D. (2021), “Managing fiscal risks: Lessons from case studies of selected OECD countries”, *OECD Journal on Budgeting*, Vol. 2021(1), OECD, Paris.

Munich RE (2023), *Climate change and La Niña driving losses: the natural disaster figures for 2022*, Munich Re.

OECD (2012), *Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships*, OECD, Paris.

OECD (2014), *Recommendation of the Council on the Governance of Critical Risks*, OECD, Paris.

OECD (2015), *Recommendation of the Council on Budgetary Governance*, OECD, Paris.

OECD (2018), *Assessing the Real Cost of Disasters: the Need for Better Evidence*, OECD, Paris.

OECD/The World Bank (2019), *Fiscal Resilience to Natural Disasters: Lessons from Country Experiences*, OECD, Paris.

OECD (2021), *Government at a Glance*, OECD, Paris.

OECD (2022), *Building Financial Resilience to Climate Impacts: A Framework for Governments to Manage the Risks of Losses and Damages*, OECD, Paris.

OECD (2023a), *Economic Outlook, December*, OECD, Paris.

OECD (2023b), *Climate Action Monitor 2023*, OECD, Paris.

OECD (2023c), *Recommendation of the Council on Building Financial Resilience to Disaster Risks*, OECD, Paris.

OECD (2024), *Steering from the Centre of Government in Times of Complexity: Compendium of Practices*, OECD, Paris.

Pessino, C. and T. Ter-Minassian (2021), "Addressing the Fiscal Costs of Population Aging in Latin America and the Caribbean, with Lessons from Advanced Countries", *IDB Discussion Papers*, No. DP-859, Interamerican Development Bank, Washington, D.C.

Pizzinelli, C., Panton, A., Tavares, M., Cazzaniga, M. and L. Li (2023), "Labor Market Exposure to AI: Cross-Country Differences and Distributional Implications", *IMF Working Papers*, No. 2023/216, International Monetary Fund, Washington, D.C.

Saxena, S. (2017), "How to Strengthen the Management of Government Guarantees", *IMF How-to-Note*, No. 17/06, International Monetary Fund, Washington, D.C.

Sutherland, D., R. Price and I. Joumard (2006), "Sub-central government fiscal rules", *OECD Economic Studies*, Vol. 41, OECD, Paris.

Ter-Minassian, T. (2007), "Fiscal Rules for Subnational Governments", *OECD Journal on Budgeting*, Vol. 6(3), OECD, Paris.

Ter-Minassian, T. (2015), "Promoting responsible and sustainable fiscal decentralisation", in E. Ahmad and G. Brosio (eds.), *Handbook of Multilevel Finance*, E. Elgar, London.

Ter-Minassian, T. (2017), "Identifying and Mitigating Fiscal Risks from State-Owned Enterprises", *IDB Discussion Paper*, No. DP-546, Interamerican Development Bank, Washington, D.C.

Ter-Minassian, T. and L. de Mello (2016), "Intergovernmental Fiscal Cooperation – International Experiences and Possible Lessons for Brazil", *IDB Technical Note*, No. TN-1048, Interamerican Development Bank, Washington, D.C.

Valencia, O., D. Parra and J.C. Diaz (2022), "Assessing Macro-fiscal Risk for Latin America and Caribbean Countries", *IDB Working Paper*, No. WP-1346, Interamerican Development Bank, Washington, D.C.

Vammalle, C. and I. Bambalaite (2021), "Fiscal Rules for Subnational Governments: The Devil's in the Details", *OECD Working Papers on Fiscal Federalism*, No. 35, OECD, Paris.

World Bank (2016), "Allocating Risks in Public-Private Partnerships", World Bank, Washington, D.C.

World Bank Treasury – Public Debt Management Advisory (2019), "Assessing and Managing Credit Risk from Contingent Liabilities: A Focus on Government Guarantees", World Bank, Washington, D.C.