

sigma

Indexing resilience: a primer for insurance markets and economies

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Executive summary

By closing existing protection gaps, insurers can strengthen global financial resilience by more than USD 1 trillion annually.

The advanced economies have become less and the emerging ones more resilient, according to our macro indices, which go well beyond traditional GDP metrics.

Our insurance indices, meanwhile, show notable gains in property resilience in advanced markets, and mortality protection in emerging economies.

A new record-high protection gap of USD 1.2 trillion for the three risk areas is a huge opportunity for insurers to build resilience.

In closing protection gaps, insurance boosts the resilience of entire economies.

The world economy has become less resilient but the insurance industry is keeping pace with changes in the risk landscape. Our jointly-developed Swiss Re Institute (SRI)-London School of Economics (LSE) Macroeconomic Resilience Index (E-RI), which is composed of a broad spectrum of variables to provide a more holistic assessment of economic health than gross domestic product (GDP) alone, shows that the global economy has less capacity to absorb the impact of a shock than it did 10 years ago. Meanwhile, our separately developed SRI Insurance Resilience Indices, based on measures of protection needed relative to that available, show a huge opportunity for insurers to close a combined record protection gap of USD 1.2 trillion in 2018 premium equivalent terms, in three main areas of risk: natural catastrophe, mortality and healthcare. We estimate that closing this protection gap would improve global financial resilience by more than USD 1 trillion each year.

Among the advanced markets, the main drivers of declining economic resilience have been a lack of structural reforms, exhaustion of monetary policy options and a challenging environment for banks. The US is more resilient than the euro area, while the Swiss and Canadian economies consistently rank among the top 3 most resilient. Importantly, resilience is a global responsibility: a high E-RI score does not mean a country can withstand any type of shock by itself, come what may. Encouragingly, the aggregate E-RI indicates that emerging economies have become slightly more resilient, and we expect higher-quality growth to continue this trend. Globally, more focus on environmental and societal sustainability would benefit resilience.

Separate to the E-RI, the SRI Insurance Resilience Indices (I-RIs) assess the positive contribution of insurance in helping households to better withstand shock scenarios. The I-RIs indicate that in relative terms, the insurance industry has kept pace with growing loss potential. In both the advanced and emerging markets, the composite I-RIs have improved since the turn of the century. The strongest increases have been in advanced economy property resilience and emerging market mortality protection. Notable also is the progress made in closing the health protection gap in Asia Pacific. Comparing the risk areas, the I-RIs for healthcare are higher than the others across all regions, a reflection of government and mandatory private insurance spending in this area, and because our index measures the funding gap only, not the treatment gap (our methodology is detailed in respective sections).

Our research also indicates that in absolute terms, the protection gap for the three risk areas combined more than doubled from 2000 to a new record high of USD 1.2 trillion in 2018. That is equivalent to a quarter of all premiums written by the global insurance industry in a single year and represents a large opportunity for the industry to further build resilience. We estimate that closing this protection gap would improve global financial resilience by more than USD 1 trillion each year in the form of average insurance claims pay-outs for covered events. In order to realise this potential, governments, regulators, insurers and businesses need to work together to overcome the different supply- and demand-side barriers that hold back greater uptake of insurance. As an aside, for insurers, closing the protection gap makes good commercial sense too, generating what we estimate to be additional industry profit potential of USD 60–80 billion each year.

Our analysis is holistic, demonstrating also that insurance strengthens the overall resilience of an economy. Economies with higher levels of insurance penetration tend to exhibit less volatile growth. Further, we model the response of GDP growth to major natural catastrophes and find that risk transfer to insurance markets boosts stronger recoveries post disaster, thereby increasing the resilience of entire economies. We also assess the sector growth potential presented by emerging risk pools in commercial insurance like cyber, intangible corporate asset and business disruption risks, and how this would further contribute to global economic resilience.

What is resilience?

The world faces a growing number of complex and interconnected risks, including slowing global growth, ballooning government debt, negative interest rates, rising political risk, inequality, catastrophe losses, and climate and technological change, among others. In this environment, it is important to understand the ability of countries and households to cope with shock events. Our newly-constructed resilience indices serve this purpose.

From a loss perspective, natural catastrophes are the main threats to global resilience.

What have been perceived as the main sources of risk facing the world has evolved since the turn of the century. For instance, in its inaugural *Global Risks Report* in 2006, the World Economic Forum (WEF) listed a few high-impact headline risks like terrorism and pandemics as the biggest threats to society. In 2008–09, the global financial crisis tuned awareness also onto economic and cross-border interconnectedness risks. And since 2017, environmental and technological risks have been included in the WEF's list of top 5 global risks. Another perspective is provided by the Cambridge Global Risk Index, which indicates that roughly a third of expected global losses from shock events come from natural catastrophes, and about a quarter are due to economic and financial market exposures.¹

Resilience: it's macro- and micro-level

Resilience is the ability to minimise losses resulting from different risk events.

We define resilience as the capacity of an economy or society to minimise income and asset losses resulting from shock events. Some events are big enough to create macroeconomic impact and to this end, societal resilience depends on the ability of the entire economy to cope with shocks. We refer to this as "macro" resilience. In insurance, the term resilience is broadly used in the context of natural disasters, terrorism and cyber threats among others, as major challenges to society. In this *sigma*, we coin the term "micro resilience" to represent the vulnerability and ability of individuals, households and businesses to withstand shock events.

Our concepts of macro- and micro resilience tally with the UN's 17 Sustainable Development Goals.

Insurance is a central component of building resilience at the macro- and micro levels. This is acknowledged in the United Nations (UN) Sustainable Development Goals (SDGs), which include insurance as a main tool to strengthen the resilience of societies. The 2030 Agenda for Sustainable Development makes explicit references to and includes numerous targets that capture various aspects of resilience.² Disaster risk reduction, in particular, is central to several SDGs. Others illustrate the role of insurance in achieving development goals such as inclusive and sustainable economic growth, social protection, food security, agricultural, rural and urban development, gender equality and women's economic empowerment, as well as micro-, small- and medium-enterprise development.

¹ *Global Risk Index 2019 Executive Summary*, Cambridge Centre for Risk Studies, University of Cambridge, 2018.

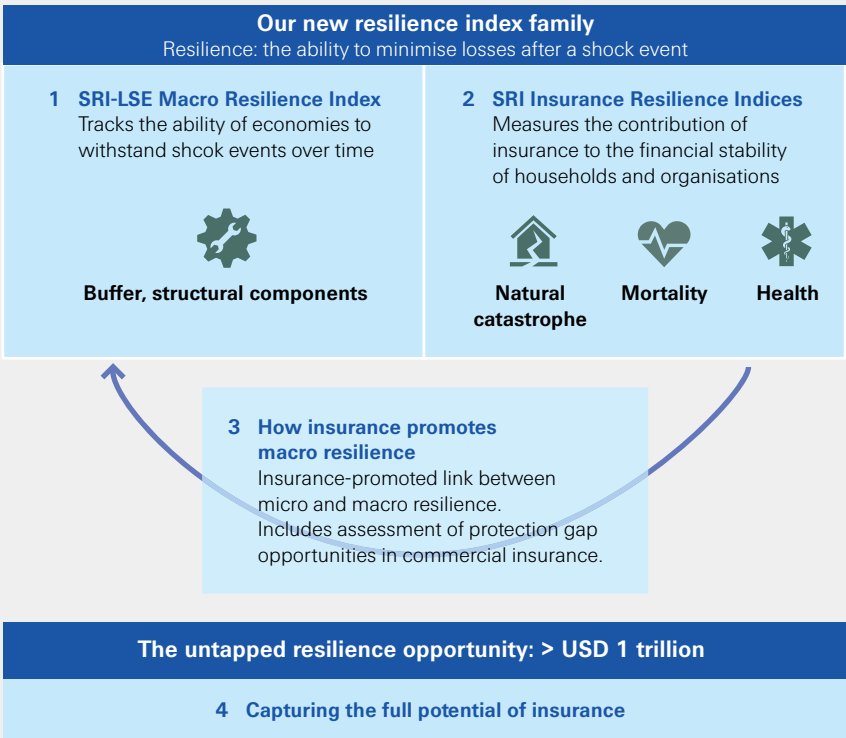
² *Transforming Our World: The 2030 Agenda for Sustainable Development*, United Nations, 2015.

We develop indices to measure the contribution of insurance to socio-economic well-being.

Scope of this *sigma*

This *sigma* quantifies the concept of resilience from both the macro- and micro perspectives in index format. We introduce the Swiss Re Institute (SRI)-London School of Economics (LSE) Macroeconomic Resilience Index, which measures and tracks economic resilience over time. The macro-resilience “scores” capture countries’ fiscal and monetary policy flexibility and capability, and also reflect their structural socio-economic frameworks. Second, we present SRI Insurance Resilience Indices, which measure the relevance and contribution of insurance to the financial stability of individuals and households in three main areas of risk and protection gap. Specifically, the indices estimate the contribution of insurance in covering losses after a natural catastrophe, the income replacement needs in case of the premature death of a household’s main earner, and the share of healthcare expenditure that causes financial stress. Figure 1 presents the narrative development of this *sigma* in the next chapters.

Figure 1
Conceptual framework of this *sigma*



Source: Swiss Re Institute

Measuring macroeconomic resilience

Our newly-developed SRI-LSE Macroeconomic Resilience Index shows that the global economy is less resilient today than in 2007. Lower buffers such as monetary policy being stretched to and beyond limits, and weaker structural factors (eg, a still challenging environment for banks), are the main drivers of lower resilience. On a positive note, the G4³ economies have space for fiscal policy action. Among advanced economies, the US is more resilient than the euro area. The Swiss and Canadian economies consistently rank among the Top 3 most resilient. Emerging market resilience has improved slightly and can be increased further by the transition from “quantity” to “quality” economic growth. Environmental and societal sustainability are key to macro resilience for all countries.

The inability of a country to absorb shocks can have deep economic consequences.

Together with the LSE, we have built an innovative index to gauge a country's economic shock absorption capacity.

The higher the shock absorption capacity, the more resilient an economy is.

The index also takes societal challenges into consideration.

The current slowdown in many economies raises questions about the ability of countries to absorb future shocks. A low level of macroeconomic resilience can lead to devastating consequences as demonstrated, for instance, by recent experience in Greece. The economy there lacked the necessary shock absorbing buffers and adjustment mechanisms to deal with the global financial crisis (GFC) that started in 2008 and then the subsequent euro area sovereign debt crises in 2012. As a result, the Greek economy went through a deeper downturn than the Great Depression of the 1930s in the US.⁴ Today, Greek society is still living with the repercussions and recovering from the shock, even with the strong progress that has since been made.

The SRI-LSE Macroeconomic Resilience Index

In the context of current global trends and country-specific developments, it is important to have a thorough understanding of the elements that make an economy more resilient. To this end, we present the jointly constructed SRI-LSE Macroeconomic Resilience Index (E-RI).⁵ The index allows comparison of resilience levels across national economies and time, with our model generating E-RI “scores”.

We define macroeconomic resilience as an economy's ability to absorb shocks. The higher the shock absorption capacity (score), the more resilient an economy is. In constructing our E-RI, we consider several dimensions. First, we propose new ways to measure the buffer capacity of traditional policy instruments such as fiscal and monetary policy. Second, and as a lesson from the GFC, we put financial indicators at the centre of macroeconomic stability.

Third, we go beyond traditional economic dimensions by including links to societal challenges in individual countries such as inequality and climate change to explain how these add, if at all, to an economy's resilience.⁶ We measure societal inequality indirectly. For example, in the assessment of labour market efficiency, we consider inequality measures such as the female participation ratio in the labour force, and the gender pay gap. We also take human capital into account as a measure of social mobility.⁷

³ G4 = the US, China, Japan and Germany.

⁴ M. King, “Europe Must Learn From the Greek Tragedy”, *bloomberg.com*, 11 July 2019.

⁵ LSE is the London School of Economics and Political Sciences. In particular, Swiss Re Institute thanks Simeon Djankov from the LSE for his contribution to the E-RI under the strategic SRI-LSE Resilience Research initiative.

⁶ *Climate change: a core financial stability risk*, The Institute of International Finance (IIF), 2019.

⁷ We omit the Gini ratio because of (1) data constraints; and (2) as inequality goes beyond income inequalities.

Our index includes a sample of 31 countries that make up about 75% of world GDP.

The index consists of macro buffers and structural elements.

Each component of the index is scored from 0 (minimal resilience) to 1 (maximum).

Methodology

To construct the E-RI, we use annual data from 2007 to 2018 for 31 advanced and emerging economies. The countries in our sample are of systemic importance to the world economy, together making up roughly 75% of global GDP. Importantly, these countries have complete, robust and reliable data series. The lack of data is the main reason for exclusion of other larger economies (eg, such as Argentina and Indonesia).

Table 1 below outlines the nine components that constitute the E-RI, and the rationale for their inclusion.⁸ The E-RI comprises two overarching dimensions: buffers and structural components.

- **Macro buffer** components include an economy's room to use monetary and fiscal policy. Broadly speaking, fiscal space measures how likely a country is to face fiscal distress, that is a time of extreme funding difficulty/loss of market access. The less likely a country is to face fiscal distress, the more fiscal space it has. The monetary policy space component measures the ability to ease or tighten policy. Among others, this includes the distance of short and long-term interest rates to the zero lower bound. This de facto captures the ability and effectiveness of interest rate cuts and quantitative easing.⁹
- **Structural** components are variables that define the fundamental framework of an economy and which evolve/develop slowly, such as access to talent and the challenges that banks face in a prevailing operating environment. To a large extent, a country's economic structure defines how dynamic a society's shock absorbing mechanisms are. All structural indicators are indices themselves, or components of other already-available indices.¹⁰

All component indicators have scores ranging between zero and one¹¹ and are weighted according to the weights in Table 1. One represents the highest score across time and sample countries, and zero is the lowest. A value of one means that a country is the most resilient in that particular category and year, while a value of zero infers minimal resilience. By averaging the scores of each of the nine components, we derive overall E-RI scores of each of our sample countries and regions, between 2007 and 2018 (see appendix for details).

⁸ While very important for different analysis such as recession likelihood estimation, indicators of imbalances are disregarded, as our index focuses on the shock absorption capacity of economies.

⁹ Given vastly different economic and policy environments, the approaches for advanced and emerging economies in our index are different. The standardization approach is also slightly different versus the rest of the variables. See appendix for more details.

¹⁰ Components that are indexes include the low-carbon economy index, for example. The soundness of banks is a component of the WEF's competitiveness index. More details are available in the appendix.

¹¹ The zero to one scores are created using a "min-max" approach. It is a technique that transforms data with different scales into values between zero to one.

Table 1
The components of the SRI–LSE Macroeconomic Resilience Index

Indicator	Weight	Source	Definition of indicator	Rationale
Macro buffers				
Fiscal space	35%	Swiss Re, based on data from World Bank(WB)/IMF	An empirical estimate of a country’s fiscal leeway. This includes the level of government debt as a percent of GDP, the sovereign debt rating, real GDP growth, the current account and primary balance, and a measure of FX pressure on the real economy. ¹² For emerging markets, we include FX reserves in terms of months of imports.	We consider fiscal policy to be the most important policy tool to mitigate the length and depth of an economic shock.
Monetary policy space	15%	Swiss Re, based on WB data	Measures the ability of a central bank to ease or tighten monetary policy. This includes the distance of short and long-term rates to the zero lower bound or to “fair-value” yield estimates. For emerging markets, a proxy of central bank independence and the policy differential against the US Federal Reserve are also included.	Monetary policy is a key policy instrument to absorb economic shocks.
Macro structural elements				
Banking industry backdrop	18%	WEF	The findings of a WEF survey of executives, indicating how sound a country’s banks are generally considered to be. The measure is not based on economic or accounting measures, but popular perceptions around dimensions influencing the health of the banking sector (eg. capital buffers, sustainability of business models, regulatory developments and the macro environment ¹³).	A fragile banking industry backdrop propagates shocks given the sector’s interconnectedness with the economy.
Labour market efficiency	12%	WEF	Includes flexibility of wage determination, hiring and firing practices, capacity to retain talent, female participation in the labour force, etc.	More efficient and dynamic labour markets allow for easier reallocation of workers during times of stress.
Financial market development	10%	IMF	This component is a summary of how developed financial markets are in terms of depth, access and efficiency.	Developed financial markets diversify the funding sources available for the real economy.
Economic complexity	4%	The Observatory of Economic Complexity	A holistic measure of the sophistication and variety of goods produced by and exported from an economy. It shows the breadth and depth of an economy’s production capacity.	An economy producing sophisticated and a variety of goods will be less affected by shocks in specific sectors.
Insurance penetration	2%	Swiss Re	Ratio of total (life and non-life) direct insurance premiums to GDP.	Insurance acts as a shock absorber and smoothenes financial volatility.
Human capital	2%	WB	Assesses how health and education levels shape the productivity and social mobility.	High social mobility and skill levels make a country more dynamic, such that it can better withstand and adjust to shocks.
Low-carbon economy	2%	Maplecroft	Measures the extent to which a country already is a low-carbon economy (low fossil fuel or de-carbonized in terms of output/emissions).	Climate change has disruptive effects on global supply chains and infrastructure. This negatively impacts government finances, firms’ capital, and household wealth. ¹⁴

Notes (1) For more on weights and empirical relevance of the index, see appendix. Robustness tests showed that changing the weights slightly does not meaningfully alter country rankings; (2) The fiscal space does not include market prices such as Credit Default Swaps, because prices are not available for all countries, and they do not allow for a further fundamental macro analysis of what increases a fiscal distress likelihood. (3) Insurance penetration has a low weight since its value proposition of financial volatility smoothing occurs mostly at the “micro” level (for households and corporates). Source: LSE, Swiss Re Institute

¹² The measure of FX pressure relates the PPP-implied exchange rate to the nominal exchange rate against the US dollar. An overvalued currency implies an economy is less competitive, which increases the fiscal default probability. We include FX pressure in the fiscal space indicator instead of the monetary policy space measure. This is because the euro area sovereign debt crisis showed that a country's inability to devalue quickly has severe repercussions for its fiscal position. In a currency union like the euro area, overvaluation can only be restored by devaluing the real economy, for example by lowering wages and prices, which is very costly in terms of GDP and employment levels. In any case, large economies with a free-floating exchange rate can also experience severe fiscal distress and adjustment, as was the case in the UK in 1976.

¹³ Regulatory filings such as banks' capital positions are not available for all countries and for a sufficient amount of time.

¹⁴ *Climate change: a core financial stability risk*, IIF, 2019.

The global economy has become less resilient since 2007.

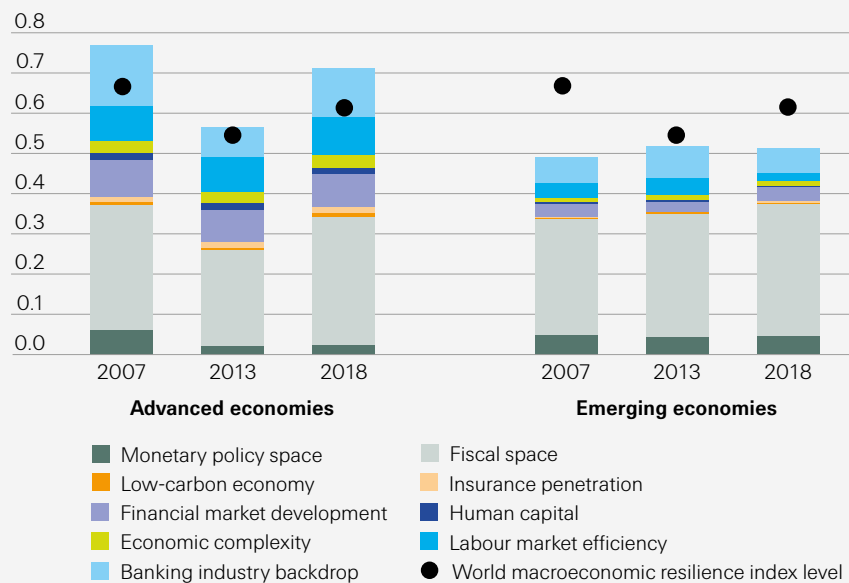
Changes in prevailing economic circumstances are behind fluctuating levels of resilience.

Global macro resilience today is lower than in 2007

Given the large share of global output that they represent (75%), the macro resilience scores of our 31 sample countries indicate that the world economy is less resilient today than it was a decade ago. Eighty percent of the countries in our sample had lower resilience scores for 2018 than for 2007, and 30% were significantly less resilient.¹⁵ The main drivers of this trend have been the exhaustion of monetary policy options in many advanced countries and an ongoing challenging operating environment for the banking sector, even as policy efforts have strengthened financial institutions since the GFC. Other indicators such as financial market development, the efficiency of labour markets and social mobility also deteriorated by roughly 10 percentage points (ppt) between 2007 and 2018. Meanwhile, fiscal space has increased marginally, the improvement largely emerging-market driven.

Figure 2 shows the changes in the composition of aggregate E-RIs in the advanced and emerging markets for our sample countries in 2007, 2013 and 2018. The changes reflect prevailing circumstances at each point in time. For instance, the estimate of shrunken fiscal leeway in the advanced economies in 2013 relative to 2007 can in part be explained by the euro area sovereign debt crisis that was in full flow at that time.

Figure 2
Composition and levels of advanced and emerging markets' macro resilience indices over time



Source: SRI-LSE Macroeconomic Resilience Index

¹⁵ For the 30%, resilience scores were at least 10 ppt lower than in 2007. The largest gains in resilience were made by Turkey. Starting from a very low base, Turkey was ranked lowest in the sample in 2007 compared to fifth lowest in 2018. The primary improvement factor was more fiscal space.

Advanced economies have added buffer capacity since 2010.

Advanced economies' resilience levels remain below 2007 levels, but in aggregate they have added some buffer capacity again since the low-point in 2010. This is primarily driven by increased fiscal space and signals of slowly improving confidence in the banking system. Importantly, financial markets have become less deep and less efficient since 2007.¹⁶ Policy makers should further strengthen private capital markets, as market participants have flagged the risk of a liquidity-driven crisis.¹⁷ Access to a more diverse source of funding is key for resilience. Further, higher insurance penetration rates can help reduce the impact on public finances and lower the need for private borrowing in case of an economic shock (see chapter *How insurance promotes macro resilience*).

Emerging markets have become slightly more resilient, and we expect more "higher-quality" growth to continue this trend.

Emerging market economies generally have lower resilience scores than advanced economies. Encouragingly, however, emerging market resilience scores have improved slightly over time. To some extent, the slow dynamics reflect that the emerging markets were less affected by the GFC. Still, on an absolute level, emerging economies have seen their fiscal stances improve substantially. Looking ahead, the upside is that as more emerging markets transition from "quantity" to "quality" economic growth,¹⁸ their macro resilience levels should naturally strengthen as well.

Global macro resilience could be much lower absent effective global crisis coordination.

Importantly, while at the global level the differences between 2007 and today may seem small at face value, the backdrop for crisis response has also changed. Rising geopolitical stresses of recent years could have the effect of undermining effective policy coordination, for example at the G20 level. In the absence of global crisis coordination, actual resilience levels are likely to be lower than the E-RI scores for the world, advanced and emerging markets would suggest.

¹⁶ The IMF financial market development index shows that financial markets in the advanced economies have become less developed since 2007.

¹⁷ *Ten Years After the Global Financial Crisis: A Changed World*, JP Morgan, 2018.

¹⁸ Emerging market economic growth rates are likely to be lower in the future, but the GDP composition will continue to evolve. The share of manufacturing within GDP is expected to decline, while services will increase in importance. See *sigma* 1/2019: Emerging markets – the silver lining amid a challenging outlook, Swiss Re Institute.

North America is the most resilient region today due to strong fundamentals and buffers.

Latin America's resilience levels have improved, but the structural picture remains challenging.

The resilience scores for Asia Pacific have been stable.

Australia's continued economic success will depend heavily on especially ensuring fiscal space.

Regional breakdown of macroeconomic resilience

In large regional aggregates, divergent developments of various countries can cancel out and provide an undifferentiated picture. Here we take a more granular look at regional and country index levels.¹⁹ According to our aggregate E-RIs, North America (meaning here the US and Canada) is the most resilient region today. Even though the US was the epicentre of the GFC, the US and Canada both have resilience levels well above the world average. This is due to strong economic fundamentals and buffers including efficient labour and open capital markets, and ample fiscal space. And, although low on an absolute level, there is more monetary policy space in the US and Canada than, for example, in the euro area.

Broadly in line with the emerging market aggregate, Latin America's resilience levels have improved slightly since 2007 (see Figure 3). However, the structural picture remains challenging: capital markets are not sufficiently developed, and labour markets show low workforce productivity and high levels of job informality.²⁰ In addition, the human capital backdrop is fragile with 38% of the population vulnerable to falling (back) into poverty.²¹ However, there are vast differences within the region. Chile is doing comparatively well due to sufficient fiscal space and a solid operating environment for banks. Mexico and Brazil, on the other hand, score lower than Chile on two thirds of the indicators.²²

Encouragingly, Asia and Oceania had quite stable macro resilience scores through 2007–2018, while global resilience has weakened. China and Japan's resilience levels have remained roughly unchanged.²³ Meanwhile, India has become a little less economically resilient, mostly due to lower scores for the financial sector component of the E-RI.²⁴ That said, India has made laudable efforts to move towards a low-carbon economy, an investment in future resilience.

A surprising result is Australia, which has been "recession-free"²⁵ for almost three decades, and where aggregate resilience has improved slightly since 2007. Even so, in E-RI terms, Australia ranks broadly in the middle of our country sample. The country's banking sector was stronger than in its advanced economy peers during the GFC, and Australia has also benefited from its proximity to and economic links with China.²⁶ However, it does not score well on index components such as a low-carbon economy, economic complexity and labour market efficiency. Further, in our view, more fiscal space will be very important to safeguarding continued resilience.

¹⁹ Our sample only includes one African country (South Africa) due to data limitations. Emerging economies in Europe and Asia are not broken out as separate categories.

²⁰ *Recent experiences of formalization in Latin America and the Caribbean*, International Labour Organisation, 2014.

²¹ *Will social mobility continue in Latin America?*, World Economic Forum, 2016.

²² For a more detailed analysis of Latin America's economic and insurance market environment, please see *Latin America regional market report 2019*, Swiss Re Institute.

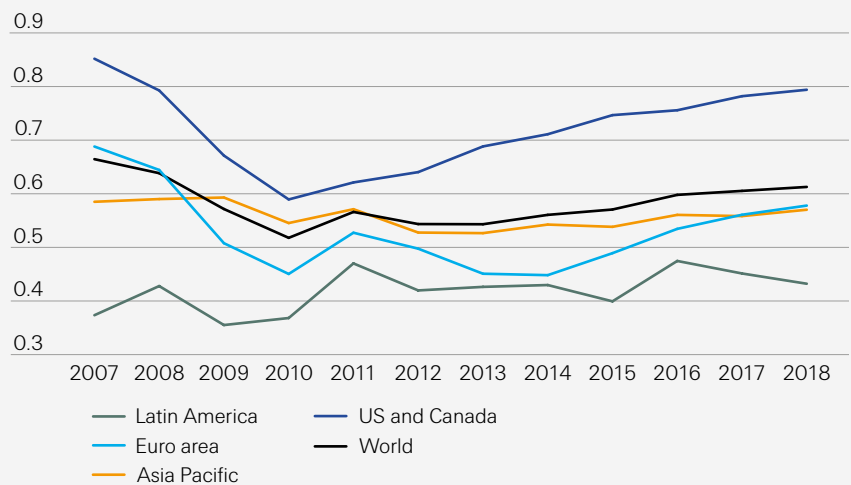
²³ Both countries are discussed in more detail further below.

²⁴ Including soundness of banks, insurance penetration and financial market development.

²⁵ "Recession free" is defined as avoiding two consecutive quarters of negative growth rates.

²⁶ *Australia – 2018 Article IV Consultation*, IMF, 2018, and N. Irwin, "What the Rest of the World Can Learn From the Australian Economic Miracle", *The New York Times*, 6 April 2019.

Figure 3
Absolute macro resilience levels
across regions and time



Source: SRI-LSE Macroeconomic Resilience Index

Resilience has weakened most in the
euro area since 2007...

Macroeconomic resilience in the euro area has decreased the most since 2007. Key contributors are (1) fragile fiscal positions in some countries; (2) exhaustion of monetary policy options; (3) endemic weaknesses in the banking system; (4) labour market inefficiency; and (5) underdeveloped financial markets. Exhausted monetary policy has key implications for fiscal space and other resilience categories. For example, although many countries in the euro area have more fiscal space now than in 2007 or 2012 due to fiscal consolidation, a substantial amount of this was facilitated by the European Central Bank (ECB).²⁷ Fiscal space is the ability to avoid extreme government funding difficulties. The ECB's policies of the past decade have prevented such severe funding conditions arising and when they did, they did not last very long. Should market stress resurface that the ECB cannot combat effectively, fiscal space in the euro area could be much more constrained than our current estimates suggest. In other words, while a decrease in monetary policy space has to some extent temporarily facilitated fiscal space, the euro area remains exposed to a negative shift in sentiment as buffers are thin. Furthermore, ultra-accommodative monetary policy has not contributed to more diversified funding sources of the real economy.²⁸ Meanwhile, the structural elements in our E-RI have weakened since 2007, suggesting that the euro area has not made sufficient progress in making the economy more dynamic since 2007.

²⁷ Ultra-accommodative monetary policy leads to a greater ability to run primary balance deficits, while it has also supported euro area growth. In our estimation, both factors increase fiscal space.

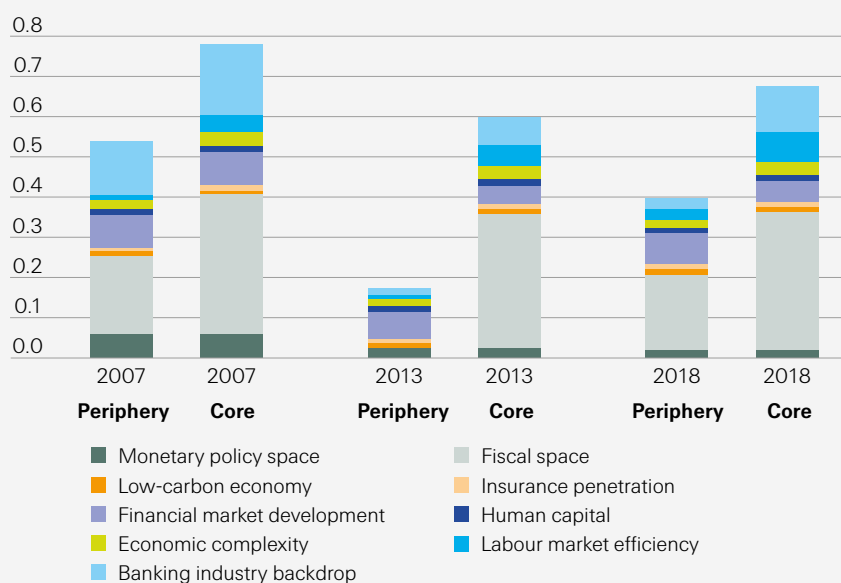
²⁸ The monetary policy space indicator and the IMF's financial market development index have a positive correlation of almost 0.9 in the euro area, meaning that more monetary intervention was accompanied by less breadth and depth of financial markets in the region

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...although levels of resilience are nuanced across the region.

Figure 4 shows that the peripheral countries are much less resilient than the core economies of the euro area.²⁹ The key contributors for lower resilience levels in peripheral countries are lower fiscal space and weaknesses in the banking sector. Greece and Italy have the lowest macro resilience levels and hence would gain most from strengthening their macro buffers and economic frameworks.

Figure 4
Decomposition of E-RI between euro area core and peripheral countries, 2007, 2013 and 2018



Source: SRI-LSE Macroeconomic Resilience Index

Progressing with the European Capital Market Union to diversify funding sources is key.

Given its weaker macroeconomic buffers, for the euro area to become more resilient, we believe progressing and finalizing the European Capital Market Union will be key. This would deepen financial markets and diversify the region's funding sources and take some pressure off monetary policy. Moving forward with bank consolidation and overhauling labour markets should also be top priorities, in our view.³⁰

²⁹ Peripheral countries include Italy, Portugal, Spain, Greece and Ireland. This definition is in line with the IMF, in *Macro-Financial Implications of Corporate (De)Leveraging in the Euro Area Periphery*, 2013. Core countries are Germany, France, Austria, The Netherlands and Belgium.

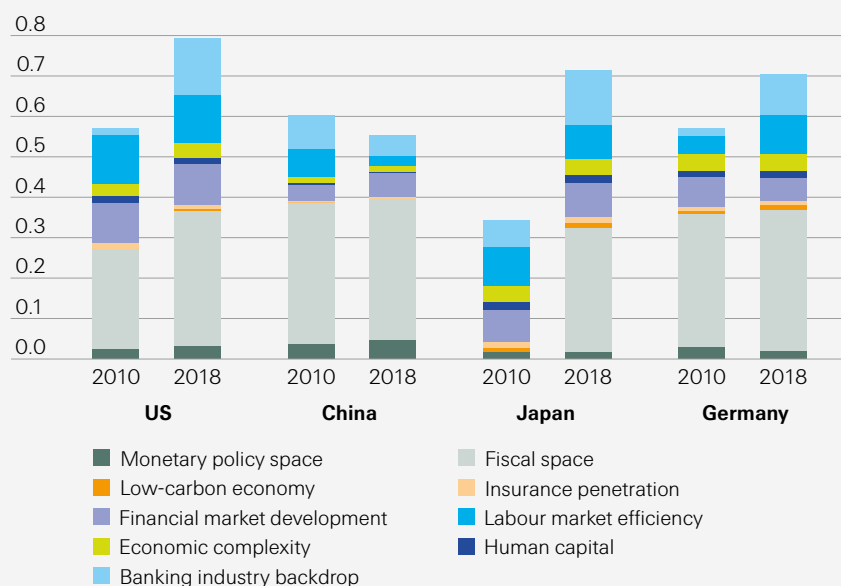
³⁰ *Euro Area – IMF Staff concluding Statement of the 2019 Article IV Mission*, IMF, 2019.

Strengthening the macroeconomic resilience of the "Big 4" will boost global shock absorbing capacity.

The "Big 4": US, China, Japan and Germany

The "Big 4" economic and insurance market heavyweights – the US, China, Japan and Germany (the G4) – matter greatly for global resilience. Although the four have different macro resilience levels, all currently have plenty of fiscal space. This wasn't always the case. For example, Japan had very low fiscal space between 2010 and 2013 due to a strong yen which made the economy less competitive. Furthermore, it simultaneously had very negative primary balances, which have since reduced. Our analysis suggests that Japan's high public debt burden becomes a real challenge if additional fiscal pressure points intensify. Also, and all else equal, fiscal space is generally lower in times of economic and financial stress. Our estimates of China's fiscal space come with some uncertainty, given the complexity of its public balance sheet data.³¹ However, and in any case, China has more monetary fire power as advanced economies have virtually all loosened policy over the past decade.

Figure 5
"Big 4" Macroeconomic Resilience scores and components, 2018



Source: SRI-LSE Macroeconomic Resilience Index

³¹ For more information, see *How China failed to fail*, Institute of International Finance, 2019. However, complicated data also applies for some other countries, particularly in emerging economies.

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China's ongoing financial de-risking is positive and is facilitated by ample fiscal and monetary policy space.

The "Big 4" should make environmental sustainability a key policy target.

Importantly, the economic structure of the G4 economies has in aggregate not become significantly more dynamic since 2007. However, there are some noteworthy country-level developments. For example, survey results suggest that the banking sector backdrop in the US is relatively solid, but less so in Germany. Notably, Germany's measure of labour market efficiency increased substantially between 2010 and 2018, which contributes to its higher E-RI score.³² China, meanwhile, is in transition. Financial de-risking is ongoing³³ and a wide range of reforms to facilitate economic liberalisation are being implemented. This transition also requires and is supported by ample fiscal and monetary policy space.

Given the dominance of these four countries to world output and global resilience, we encourage all to accelerate their move towards a low-carbon economy. There is substantial catch-up potential for all four on this front. Governments should make environmental sustainability a key target of national policy agendas. Germany is well positioned to emerge as a role model in this transition given its large cleantech industry, evolving energy mix and strong policy focus.³⁴ Domestic improvements at these levels would likely also have positive global spill-over effects.

Switzerland and Canada consistently rank as most economically resilient...

The world's most resilient economies

At the country level, the Swiss and Canadian economies have consistently ranked among the top three most resilient. Table 2 provides a snapshot of the individual components and overall E-RI scores for the five most resilient economies of our sample countries in 2018.

Table 2
The five most resilient countries in 2018

	Fiscal space	Monetary policy space	Low-carbon economy	Insurance penetration	Financial market development	Human capital	Economic complexity	Labour market efficiency	Banking industry backdrop	Economic Resilience Index (E-RI)
Switzerland	0.99	0.10	1	0.72	1	0.86	1	1	0.91	0.84
Canada	0.99	0.18	0.29	0.61	0.85	0.93	0.55	0.94	1	0.81
US	0.95	0.21	0.21	0.57	1	0.74	0.93	1	0.77	0.79
Finland	0.99	0.12	0.73	0.89	0.57	1	0.91	0.69	1	0.77
Norway	0.98	0.15	1	0.26	0.73	0.71	0.57	0.79	0.87	0.75

Note: the full country breakdown including sub-components is in the appendix.

Source: SRI-LSE Macroeconomic Resilience Index

³² For more information, see also *The German Labor Market Reforms and Post-Unemployment Earnings*, IMF, 2015.

³³ Financial sector de-risking is ongoing in China. See *People's Republic of China – 2018 Article IV Consultation*, IMF, 2018. For example, China's total private debt (households and non-financial corporates) to GDP was 210% in Q1 2019, according to the IIF's Global Debt Monitor database.

³⁴ For more information, see *Fragile Planet: The politics and economics of the low-carbon transition*, HSBC, 2019.

...with strong public finances, well-developed financial markets and high insurance penetration among common features in both.

Country resilience scores need to be viewed in a global context.

Absent stronger buffers, coordinated monetary and fiscal policy-making will be necessary in the event of another crisis...

The aggregate E-RI scores of Switzerland and Canada today (0.84 and 0.81, respectively) are slightly lower than in 2007 (0.89 and 0.83), but the two did recover relatively quickly after the GFC. Key pillars of their macro resilience in the intervening years to 2018 were (1) strong public finances; (2) well-developed financial markets and high insurance penetration rates; (3) low inequality through efficient labour markets and dynamic social mobility; and (4) an overall sound banking industry backdrop.³⁵ Switzerland also scores very well on the environmental sustainability perspective. A main resilience shortcoming of both nations today is lack of monetary policy leeway, which has weakened significantly since 2007. Finland and Norway, two other resilient countries, broadly share the same characteristics and also score well on the inequality and sustainability dimensions.

However, the resilience of any country needs to be interpreted within a broader context. For example, due to Switzerland's strong links to and the size of the euro area, lower resilience in its continental neighbours is a concern for the Swiss economy. The E-IR scores help us analyse why certain countries and regions are more or less resilient, but high resilience scores do not necessarily mean a country alone can withstand any type of shock, come what may. Resilience starts at home but ultimately, it is a shared and global responsibility.

Stylized macro resilience takeaways

Policy choices matter for economic resilience. The IMF shows that macroeconomic policies preceding the GFC and in its immediate aftermath influenced post crisis variations in output.³⁶ Strong fiscal positions and unprecedented policy actions, among other things, helped mitigate output losses. However, in aggregate today policy buffers are thinner than in 2007. In the absence of quicker and more vigorous efforts to strengthen macroeconomic resilience at the country and international level, we believe more coordinated action on monetary and fiscal policy will be necessary in the event of a next global crisis.³⁷

³⁵ More detail on the individual components is shown in the appendix.

³⁶ *The Global Economic Recovery 10 Years After the 2008 Financial Crisis*, IMF, 2019.

³⁷ Ideally, the government and central banks have transparent rules of how, when and what to apply in times of crisis. See also P. Bolton et al. "How to Keep Central Banks Independent", *Project Syndicate*, 11 July 2019.

...and the time to act is now.

Increasing shock absorption buffers while decreasing economic vulnerabilities often go hand in hand, and the time to act is now. Our macro resilience research provides several stylised takeaways:

- Ultra-accommodative monetary policy does more harm than good. It lowers resilience by leading to artificially benign fiscal positions, inhibiting further diversification of an economy's funding sources, and constrains structural reforms.
- Lower macro buffers and insufficient progress on structural reform are likely to result in more protracted recessions in the future.
- Countries should make environmental and societal sustainability a core target in their policy agendas. For example, the process of achieving the UN's SDGs and higher levels of resilience are mutually reinforcing. A society cannot pursue the SDGs without being economically resilient, and vice versa.³⁸ Fourteen of the 17 SDGs are directly or indirectly covered by the E-RI. Meanwhile inequalities, particularly on the gender and wage pay gap front, also need to be addressed. The IMF estimates that globally, the female labour force participation rate is about 25 ppt lower than the male rate, and gender wage gaps persist.³⁹ Gender inequalities restrict the talent pool of an economy and hinder efficient allocation of resources. How to move forward on such inequalities depends on a country's level of economic development. But a low level of development is no reason not to start to address the challenges, even if steps appear minor at first.
- Tackling just one area of resilience can have positive spill-over effect into other areas and regions. For example, deeper financial markets are associated with higher insurance penetration, higher human capital levels and more efficient labour markets.⁴⁰ Likewise, higher insurance penetration rates reduce the impact of a shock on public finances, and hence facilitate fiscal space in times of need. It also lowers the need of individuals to borrow. Targeted measures to improve one aspect of buffers or the fundamental economic framework can uplift other dimensions of resilience at the same time, initiating positive feedback loops.

Our analysis is a primer on macroeconomic resilience.

Our analysis is a primer on macroeconomic resilience. The research has received rigorous vetting from and with the LSE. All told, indexing the health of the global economy and determining the drivers of country and global shock absorption capacity is an ever-evolving exercise. We will update the country E-RIs annually, and also continuously review our methodological approach and data sources.

The private and public sectors are partners in building resilience.

The private and public sectors share a common interest in a resilient macroeconomy, and the private sector can help strengthen public sector resilience. Our public policy wish list below in Table 3 outlines some concrete actions which we believe would contribute to stronger global macroeconomic resilience.⁴¹

³⁸ SDGs such as peace, justice and strong institutions are preconditions for macro resilience. At the same time, goals around innovation, infrastructure, good health and education, and no poverty cannot be achieved without macroeconomic stability.

³⁹ *Pursuing Women's Economic Empowerment*, IMF, 2018.

⁴⁰ Positive correlations are between 0.4–0.55 across the entire sample.

⁴¹ This wish list is updated and amended from *sigma* 5/2018, Global economic and insurance outlook 2020, Swiss Re Institute. Other elements in that previous report, such as introducing a tradable asset class or having more public private partnerships, remain key to facilitating sustainable growth.

Table 3
Suggested actions to improve macro resilience

	Topic	Description
Institutions	Public institutions	■ Stronger public institutions, including independent central banks and multilateral institutions, are pre-conditions for a resilient economy. ■ However, just because such institutions are independent does not mean that they can be overburdened with policy responses. ■ Economic resilience is a shared task, across institutions and countries.
	More complete sovereign data and balance sheet collection efforts	■ Governments should contribute to the IMF's public-sector balance sheet data efforts to obtain a better overview of what governments owe and own (ie, net public wealth).⁴² ■ This will allow for clearer analysis of vulnerabilities, buffers and areas where action is needed.
Policies	Structural reform agenda	■ Reform agendas are country-specific, but should generally focus on: – Greater equality in human capital, greater efficiency and flexibility in labour markets, and better development of financial markets. – In the euro area, completing the Capital Markets Union is key.
	Solidify fiscal space	■ Encourage state-contingent financing instruments such as GDP-linked sovereign bonds and catastrophe risk transfers that act as counter cyclical stabilisers. ■ Address implicit public-sector contingent liabilities like longevity and climate risk.
	Broader use of automatic stabilisers to address vulnerabilities	■ Broader use of automatic stabilisers such as counter cyclical capital buffers for bank capital, and strong social security and unemployment insurance systems, etc. This will address economic and financial imbalances, and distribute policy responses among institutions.
	Infrastructure as a tradable asset class	■ Governments should have a "ready-to-be-deployed" infrastructure project list in place. This will support longer-term economic growth prospects. ■ Having a tradable infrastructure asset class would allow private-sector participation and help shoulder the investment costs.
	Broad-based digital strategy	■ To increase productivity, governments should introduce a broad-based digital strategy, including a focus on education.
Solutions	Encourage private capital market solutions	■ Ensure financial development through deeper and more efficient financial markets, including insurance. ■ With more supportive public policies, the private sector can play a bigger role in alleviating societal challenges and government contingent liabilities (eg, by providing capital market and re/insurance solutions to address the global retirement savings gap or public healthcare spending).
	Encourage sustainable investing	■ Further progress towards the 2015 climate accord and the UN's SDGs will strengthen macro resilience. The private sector can do its part if governments agree on a common taxonomy on sustainable finance and establish a risk-based market consistent regulatory framework for Environment, Social and Governance (ESG) investments.

Source: Swiss Re Institute

⁴² A Global Picture of Public Wealth, IMF, 2019.

Micro resilience – measuring protection gaps and insurance coverage in place

Resilience against three core areas of risk – natural catastrophes, mortality and healthcare spending – has improved in both the advanced and emerging markets since the year 2000, according to our independently-developed SRI Insurance Resilience Indices. Emerging economies' resilience against mortality and healthcare improved significantly before the GFC, but progress has since tapered off. Against the backdrop of an estimated protection gap for the three risk areas combined of USD 1.2 trillion in 2018, the highest ever, the strongest gains in resilience since 2000 have come in the advanced economy property catastrophe and emerging market mortality insurance sectors.

We have developed indices that measure how insurance promotes the capacity of households to withstand shocks.

At the micro level, a different definition of resilience is required compared to the macro realm.

The SRI Insurance Resilience Indices measure the relation between protection needed and available for three core areas of risk.

Defining and measuring micro (insurance) resilience

In this chapter we broaden the concept of resilience from the macro to the household and business level. In other words, micro-level resilience. We look at how insurance helps households better withstand the following shock events: natural catastrophes, death of a household's main earner, and catastrophic health expenditures, and have developed an insurance resilience index (I-RI) for each.

Micro exposures require a different definition of resilience than that used at the macro level. At the micro level, static resilience refers to the depth of the impact of a shock on a household's well-being at a point in time. Dynamic resilience refers to the ability of the household to recover from a shock. For instance, households with low resilience may be forced to sell off productive assets, put accumulation of retirement assets on hold, fail to maintain health or forego education or other, in order to cope.

Our I-RIs are based on research into protection gaps and measure the relation between protection needed and available. The methodologies are different for each peril but the concepts are designed to provide comparable metrics. Risk exposures, insurance premiums, savings and other relevant socio-economic variables evolve over time. To measure progress in building resilience, we estimate the trend in relative terms: the protection available divided by what is needed. This also allows for more meaningful comparisons between countries and regions. To be able to make those comparisons, the protection gaps are expressed in premium equivalent terms.

Insurance plays an instrumental part in protecting families from the financial consequences of natural disasters.

The SRI Natural Catastrophe Insurance Resilience Index

Natural catastrophes pose a major threat to households and businesses. Disasters lead to broad and often substantial negative impacts on the financial health of a household, with adverse impact across most associated measures including credit scores, debt in collections, bankruptcy, credit card debt, mortgage delinquency and foreclosures. These negative effects can persist or even grow over time.⁴³ Insurance plays an instrumental part in protecting policyholders from catastrophic financial consequences. Empirical research indicates that insurance cover increases the likelihood of rebuilding, minimises financial hardship, and speeds up recovery time.⁴⁴

Methodology

We follow these steps to derive the SRI Natural Catastrophe I-RI:⁴⁵

- Using *sigma* data, we estimate that insurance has covered around 33% of global economic losses from natural disasters over the last decade.
- However, the historical picture does not capture all underlying risk exposures. Many natural catastrophes are high-impact, low-frequency events. Major earthquakes in particular are infrequent and under-represented in historical data.
- Hence, we supplement historical data with a modelled forward-looking view, using Swiss Re's natural catastrophe risk model MultiSNAP.
- The model generates expected loss distributions for three major perils: seismic events, windstorms and floods in the countries with largest exposures.
- For our Natural Catastrophe I-RI, we use these probabilities and estimated market portfolios of economic and insured values to assess the annual expected total and insured losses caused by each peril in 2018, across a sample 34 countries.
- We complement the proprietary model scenarios with expected loss estimates for another 120 countries from the United Nations Office for Disaster Risk Reduction's *Global Assessment Report*.
- Regional index values back to 2000 are then derived by back-casting the current model estimates for 2018, based on changes in the share of average historic insured vs economic losses for a region, as per Swiss Re Institute's catastrophe loss database.

⁴³ *Insult to Injury: Natural Disasters and Financial Health Highlights*, Urban Institute, April 2019.

⁴⁴ C. Kousky, "The Role of Natural Disaster Insurance in Recovery and Risk Reduction", *Annual Review of Resource Economics* 11, 2019.

⁴⁵ In addition to personal lines risks, commercial risks are also included in the property catastrophe modeling underlying this index.

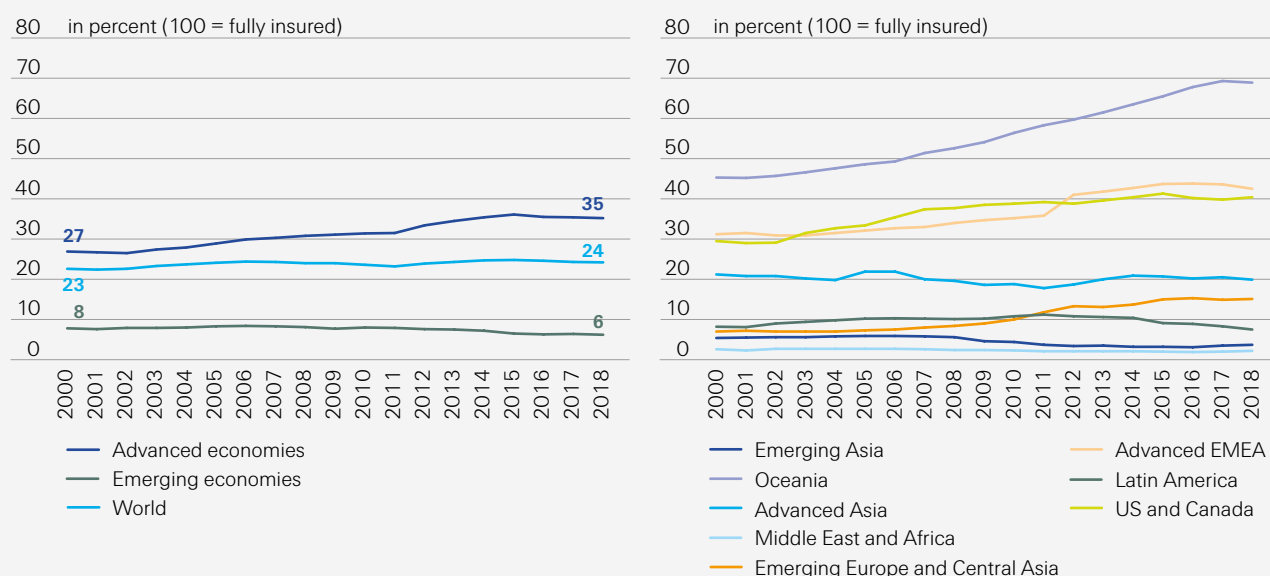
Micro resilience – measuring protection gaps and insurance coverage in place

The SRI Natural Catastrophe (storms, earthquakes and floods) Resilience Index for 2018 is at a low level.

We estimate global natural catastrophe losses resulting from the three named perils of USD 292 billion for 2018, and a protection gap of USD 222 billion in premium equivalent terms. The protection gap is 76% of the modeled exposure, meaning that the world I-RI for 2018 is 24%. The largest protection gap is for earthquakes (USD 135 billion), followed by floods (USD 50 billion) and storms (USD 37 billion). As a share of exposure, the gap varies widely by peril. It is highest for earthquakes (87%) and floods (73%), and lowest for storms (41%).

Figure 6

Global and regional natural catastrophe insurance resilience indices, 2000–18



Source: Swiss Re Institute

The global natural catastrophe I-RI has improved just modestly from 2000, as less resilient emerging economies gain importance.

The global natural catastrophe I-RI has increased just marginally over the last two decades, up 1.5 ppts between 2000 and 2018. The aggregate I-RI for advanced economies increased strongly (+8 ppt) over the same period, but declined slightly for emerging economies (–1.5 ppt, see Figure 6), particularly after 2007. The growing weight of emerging economies with lower I-RI values partly offsets the improvement in the mature economies in the aggregate world index. By region, Oceania has the highest I-RI score, due to compulsory earthquake covers in New Zealand, and success in efforts to increase uptake of flood insurance in Australia. Oceania, advanced EMEA, Emerging Europe and Central Asia saw the biggest improvements in their respective I-RIs through 2018.⁴⁶ Asia and Middle East saw just modest increases, and resilience in Africa declined. The decline in emerging economies' natural catastrophe I-RI is a consequence of strong economic growth over the last two decades having outpaced the development of the private insurance sector in many markets.

⁴⁶ For advanced EMEA, there was a significant increase in the flood insurance take-up in Germany and the introduction of the Flood Re scheme in the UK. For Turkey, a mandatory earthquake scheme was introduced in 2000. While the take-up rate was low at the beginning, it improved over time.

For decades, life insurers focused on selling savings rather than life coverage. This has changed since the global financial crisis.

The mortality protection gap is the difference between resources needed by surviving dependents to sustain living standards, and the resources available.

The SRI Mortality Insurance Resilience Index

Originally, risk protection – and mortality coverage in particular – was the main focus and value proposition of life insurers. Over time, however, many insurers have shifted their core competency away from risk protection to managing retirement savings.⁴⁷ This is reflected in the relatively small share of life insurance premiums stemming from risk protection compared to savings-type businesses. However, since the GFC and subsequent ultra-low interest rates, protection business has become more attractive again and life insurers have been promoting biometric risk products. This is a positive development given that many households still lack adequate financial protection against the premature death of a primary breadwinner.

The mortality protection gap is the difference between the amount needed to substitute a household's future income in the event of death of a major breadwinner, and the resources available to repay outstanding debts (eg, mortgages) and sustain living standards. Resources available include existing financial assets, proceeds from life insurance policies and social security payments. The portion of the need that cannot be replaced by these existing resources is the mortality protection gap. The gap increases with rising household incomes, as normally happens over the lifespan of a breadwinner, and over time as an economy develops. It also rises in tandem with increasing debt levels. The size of the gap is inversely correlated with the build-up of insurance coverage, financial assets and social security benefits.

Methodology

We follow these steps to derive the SRI Mortality I-RI:

- Based on limited data availability for the full distribution of households, mortality protection gap estimates are derived using average information for the working population with dependents:
 - average household income;
 - average net worth of households;
 - average social security payments to survivors; and
 - average life insurance coverage.
- We only estimate income replacement up to retirement age. The issue of insufficient funding of retirement savings is out of scope for this analysis.
- The Mortality I-RI measures the development of insurance protection in relative terms (ie, protection available divided by protection needed).
- Swiss Re Institute has published regional mortality protection gap numbers before, but not on a global basis.⁴⁸ In this *sigma*, the regional methodologies have been standardised across all markets studied, which means the resulting mortality protection gap figures may differ from previous region-specific publications.
- Also, our prior publications express mortality protection gaps in terms of sums assured. In this *sigma*, we use premium equivalent terms to facilitate comparison with natural catastrophe and health insurance protection gaps.

⁴⁷ See *sigma* 4/2004: Mortality protection: the core of life, Swiss Re.

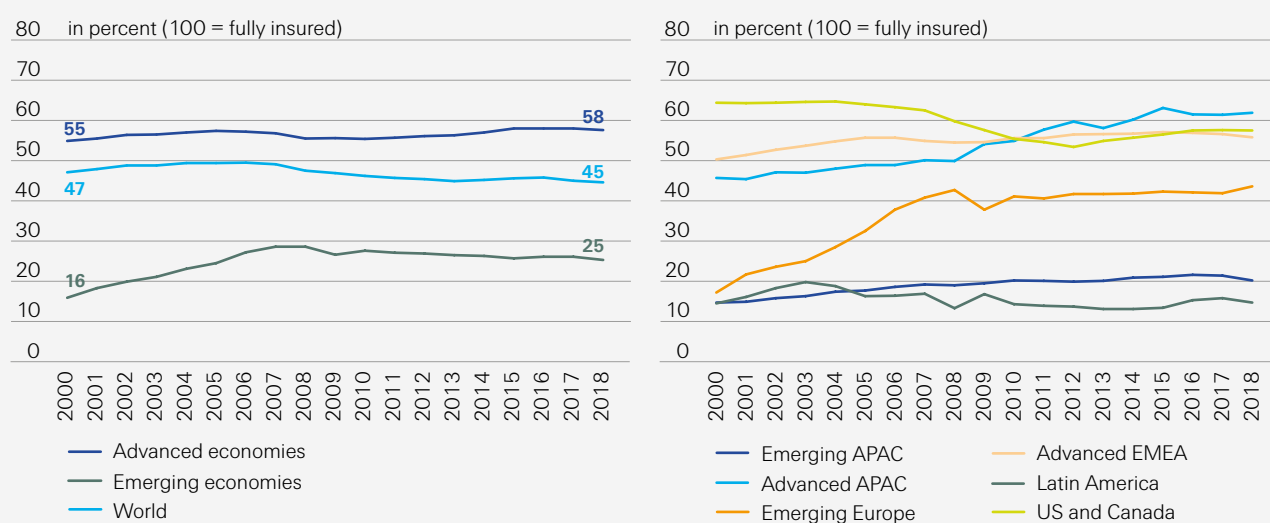
⁴⁸ For prior research and applications of similar methodologies see *Life underinsurance in the US: bridging the USD 25 trillion mortality protection gap*, Swiss Re Institute, 2018; *Mortality Protection Gap: Asia-Pacific*, Swiss Re, 2015; and *The Mortality Protection Gap in Latin America*, Swiss Re, 2013.

Micro resilience – measuring protection gaps and insurance coverage in place

In 2018, about 45% of the funds needed to maintain household living standards came from life insurance and other sources.

Subtracting protection available from protection needed, we estimate a global mortality protection gap in premium equivalent terms of USD 386 billion in 2018. This translates into a global Mortality I-RI (protection available as a % of protection needed) of 45% (see Figure 7). In other words, globally, 45% of funds needed to maintain household living standards in the event of the death of the primary breadwinner are “protected” by either life insurance, social security survivor benefits or through household savings. At aggregate level, this is a 2 ppt decline since 2000. As in the case of natural disaster risks, the decline in the global index has largely been driven by the increasing weight of emerging markets with lower I-RI values.

Figure 7
Global and regional mortality insurance resilience indices, 2000–18



Source: Swiss Re Institute

In relative terms, the insurance industry has made progress in narrowing the mortality protection gap since 2000, particularly in emerging markets.

Standing at 25% in 2018, the emerging market Mortality I-RI has risen strongly since 2000, by 9 ppt. The improvement was concentrated in the years before the GFC and peaked in 2007–08. The current level of the emerging market index is still less than half the I-RI level for advanced markets, which rose to 58% in 2018 from 55% at the turn of the century. In advanced markets, too, the I-RI climbed in the pre-crisis years and then dipped in 2009, before rising again. Among the advanced markets, the mortality I-RI for the US was noticeably lower in 2018 than in 2000, as wage replacement needs and debt have grown faster than accumulated financial assets and near-stagnant life coverage. Nevertheless, the mortality protection gap there has narrowed since 2012 in both real absolute terms and relative terms.

Europe and advanced Asia Pacific are likewise more resilient.

In Europe, most markets are relatively more resilient today than in 2000, but most of the improvement came before the GFC. In Asia Pacific (APAC), the mortality protection gap has widened in absolute terms in all countries except Japan since 2005, and most significantly in China and India. In relative terms, the insurance industry has made good progress in narrowing the gap in many countries in advanced APAC specifically: life insurance penetration rates in Taiwan, Hong Kong, South Korea and Japan are among the highest in the world, driven by savings-type products.

Each year, 100 million people are pushed into poverty on account of healthcare expenditures.

The SRI Health Insurance Resilience Index

Healthcare is an important contributor to a nation's micro resilience. According to the World Health Organization (WHO), more than half of the world's population still has no cover for essential health services. Further, about 100 million people are pushed into extreme poverty each year because of healthcare expenses (around every tenth spends at least 10% of the household budget on healthcare). All UN member states are targeting universal health coverage (UHC) by 2030 as part of the SDGs.⁴⁹

Methodology

We follow these steps to derive the SRI Health I-RI Index:

- Our index measures the healthcare funding gap (actual spending on healthcare not covered by government or insurance schemes) only. The index does not consider the so-called treatment gap (ie, required healthcare services not accessed because of lack of availability or affordability).
- We estimate the ratio between protection available from public and private schemes and protection needed. Available protection is the difference between total healthcare expenditures and households' stressful out-of-pocket (OOP) expenses. Needed protection is total healthcare expenditure.⁵⁰
- The index requires an estimation of what level of OOP spending on health is stressful for households, which depends on a country's development status. In advanced economies, for instance, a larger share of OOP healthcare expenditure is part of co-insurance and deductibles.
- These are a design element of insurance plans, the aim being to incentivise people to consume healthcare services responsibly and to reduce costs. See the appendix for further details on the determination of the benchmark for stressful OOP healthcare spending.
- Swiss Re Institute has published regional health protection gap numbers for Asia before, based on household survey data.⁵¹ For the global analysis conducted here, we have developed a benchmark model based on country-level macro data.
- Our prior publications express the healthcare protection gaps in terms of sums assured. Here we use premium equivalents to be able to compare with the other risk areas.

⁴⁹ UHC means all individuals receive the health services they need without suffering financial hardship.

⁵⁰ This concept is somewhat different from the other two perils covered in this chapter in terms of how insurance coverage plays a role in the definition of the resilience index.

⁵¹ *Closing Asia's USD 1.8 trillion health protection gap*, Swiss Re Institute, 2018.

Micro resilience – measuring protection gaps and insurance coverage in place

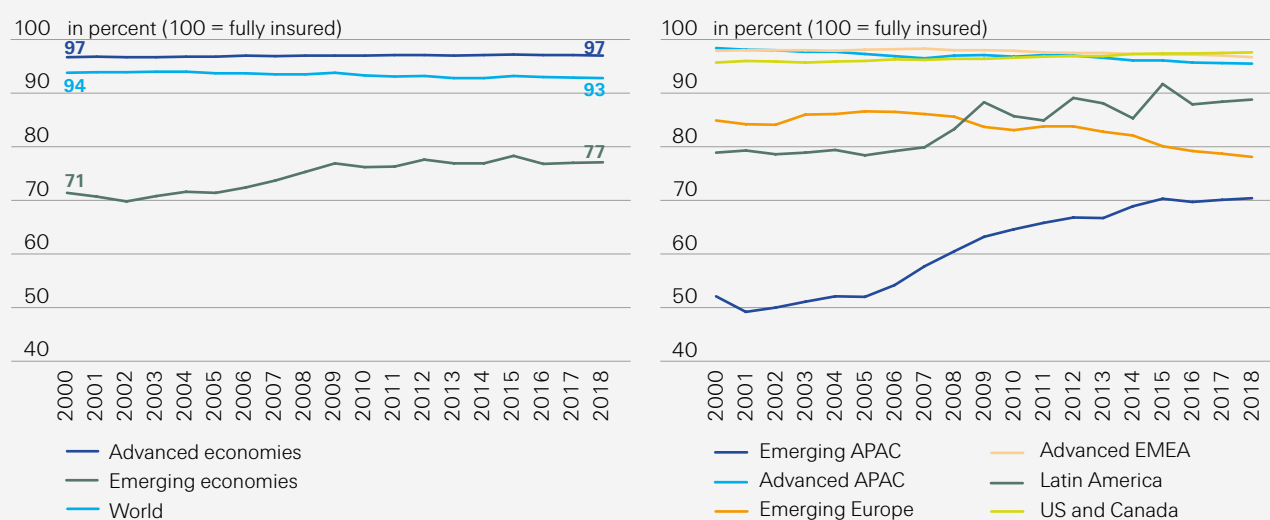
At 93%, the SRI Health I-RI is high compared to the other risk areas, due to UHC but also the specifics of our methodology.

In many countries, health insurance is seen as a social policy necessity.

Many countries have already made good progress in moving towards UHC. This in part explains why the I-RI for health is relatively high (93%) compared to the other risk areas in focus. Governments play a major role in this. Another reason for the relative strength of the healthcare index lies in our methodology, such that we only measure the funding gap, not the treatment gap. If the latter were included, the index value would be significantly lower. All told, even though the resilience index is high, at USD 616 billion the protection gap in terms of premium equivalents is the highest of the three risk areas. The sizable gap is due to the high spending on healthcare as a percentage of GDP. Most countries therefore have scope to expand pre-funded healthcare. However, the public sector is facing funding pressure in many areas, and governments are finding it increasingly difficult to cater to the growing healthcare needs of ageing populations and increasing associated costs.

Figure 8 shows how the Health I-RI has evolved since 2000.⁵² Globally, the I-RI decreased marginally from 94% in 2000 to 93% in 2018, the decline driven by the increasing weight of emerging markets in the world index. At the same time, the higher level of the index is not directly comparable to the natural catastrophe and mortality I-RIs. Estimated catastrophic OOP expenses are compared to total aggregate healthcare expenditures in the index, not just catastrophic expenses. The higher overall levels of coverage are also driven by the high share of government and mandatory private insurance spending on health. Compared to natural catastrophe events and premature death, the perception in many countries is that health insurance is a social policy necessity. Most progress over 2000 to 2018 was made in emerging APAC, where the Health I-RI increased from 52% to 70%. This reflects the major UHC reforms implemented in China, India, Indonesia, Philippines, Thailand and Vietnam.⁵³ Meanwhile, rising healthcare costs and ageing populations in most of advanced Asian and European countries have strained government budgets, leading to slower growth in public healthcare budgets and higher OOP spending.

Figure 8
Global and regional health insurance resilience indices, 2000–18



Source: Swiss Re Institute

⁵² Due to lack of data, the two most recent years (2017 and 2018) are projections.

⁵³ Wagstaff, A. et al "Measuring progress towards universal health coverage: with an application to 24 developing countries", *Oxford Review of Economic Policy*, 32(1), 2016.

The composite SRI Insurance Resilience Index

To assess the levels and changes in overall population welfare effects, it is helpful to aggregate the different sub-indices into a composite I-RI.

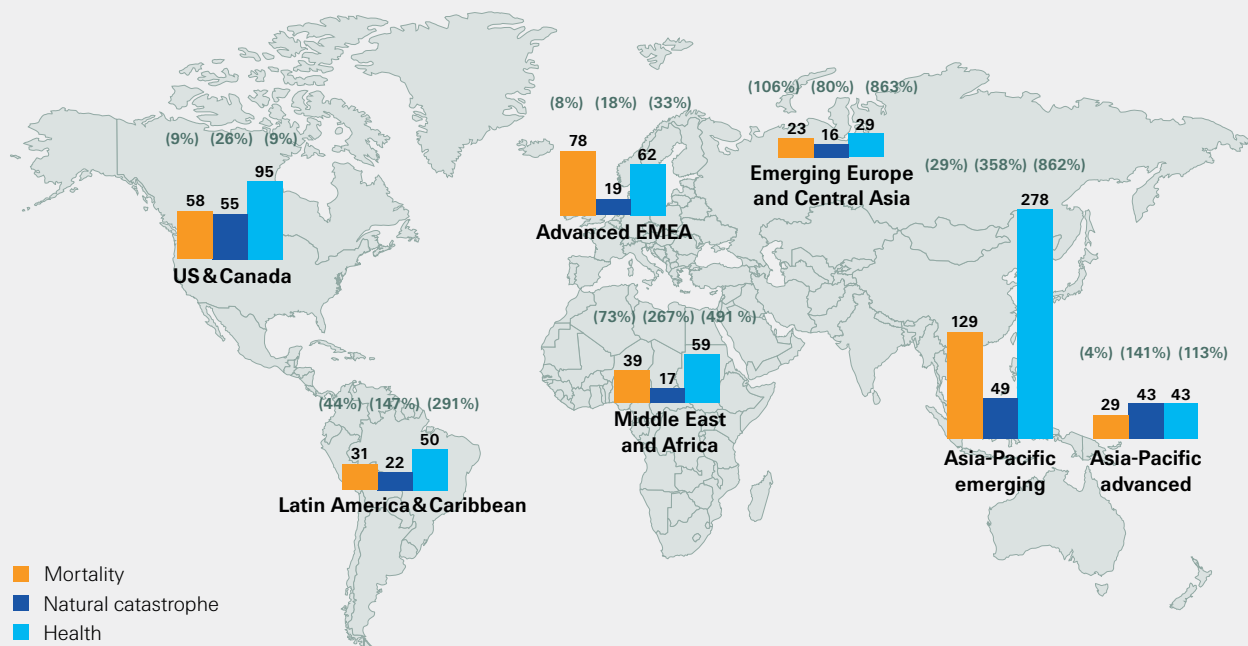
Towards a holistic measure of insurance resilience

The relevance of micro insurance resilience for policy makers lies in the aggregation of cover and vulnerabilities that drive the overall welfare of a population. To assess levels and changes in overall welfare effects, it is helpful to aggregate the above sub-indices into a composite I-RI. As a starting point, Figure 9 shows the regional distribution of protection gaps for our three main perils. Key observations are:

- The global natural catastrophe protection gap in premium equivalent terms was USD 222 billion in 2018. The protection gap for mortality risks was USD 386 billion, and it was USD 616 billion for healthcare spending risks.
- Emerging Asia has the largest aggregate protection gap for the three risk areas combined (USD 456 billion).
- The US and Canada combined have the second largest combined protection gap (USD 208 billion), mostly driven by the US (USD 194 billion).
- Advanced EMEA has the third largest combined protection gap (USD 159 billion). It is the only region where the mortality protection gap is the largest of the three. That includes higher than the healthcare protection gap, which reflects the well-established healthcare systems in the region.
- Advanced Asia is the only region where the natural catastrophe protection gap is the largest of the three, given the large earthquake exposures there.

Figure 9

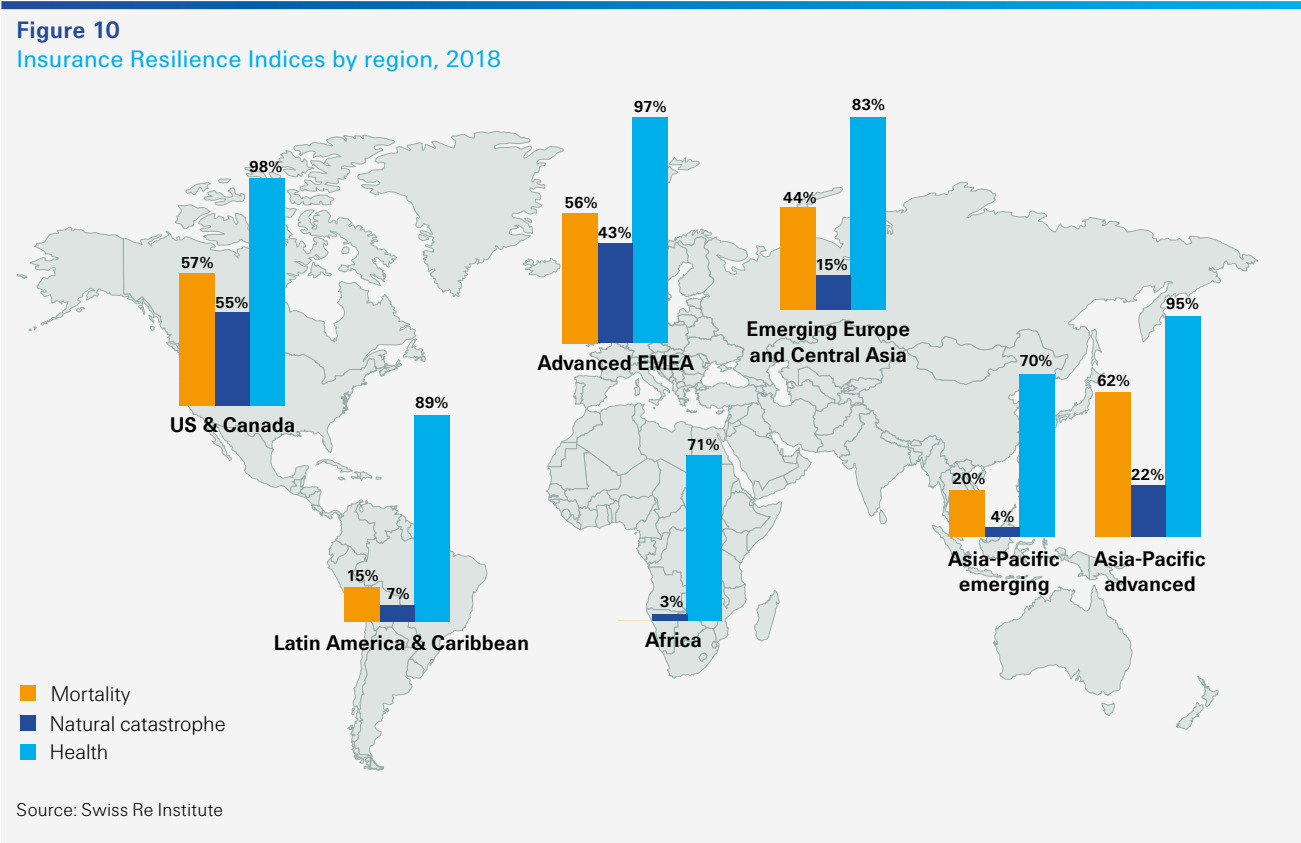
Protection gaps in USD billion premium equivalent terms and as % of direct premiums, by region, 2018



Note: The numbers in parenthesis refer to protection gaps as % of total direct premium written for the respective line of business. For mortality it refers to the whole life market, including savings premiums; for property catastrophe it is all property premiums. The global protection gap in 2018 for mortality risk was 14% of total direct premiums written. For natural catastrophe risk it was 56%, and for healthcare 46%.

Source: Swiss Re Institute

In relative terms, the US, Canada and advanced EMEA have the highest natural catastrophe I-RIs, advanced APAC the highest mortality I-RI, and the US, Canada and advanced EMEA the highest health I-RIs (see Figure 10).

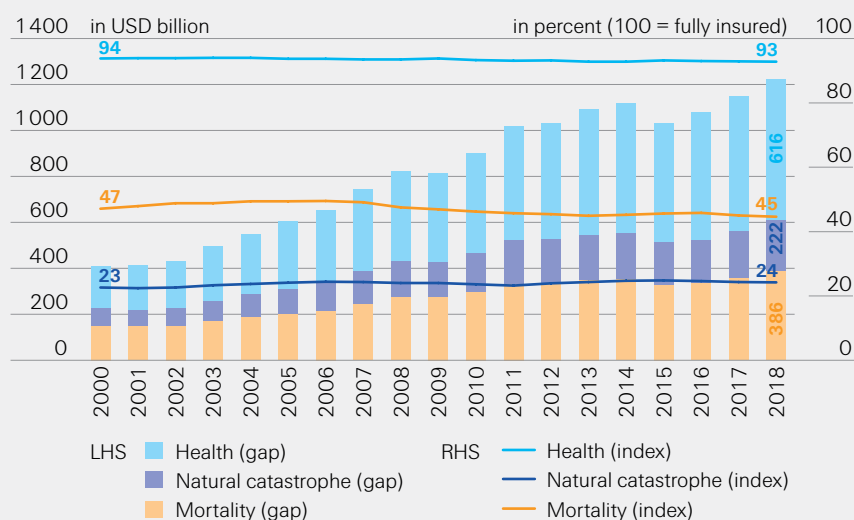


The I-RI values for the different risk areas are all lower in emerging economies.

Next we aggregate the regional I-RIs for the different risk areas into global I-RIs, weighted according to protection need. Figure 11 summarises the global insurance resilience sub-indices and the aggregate protection gaps for the three risk areas between 2000 and 2018. Due to conceptual differences, the levels of the sub-indices for different risks are not directly comparable. Changes in the indices, however, are. A summary of key observations and associated explanations:

- There was a marginal increase in the global resilience index against natural catastrophes from 2000 and 2018 to a low level of 24%; a small decline from 47% to 45% in the global mortality index; and a modest dip for in the health resilience index from 94% to 93%.
- The downward bias in the global aggregates is due to the stronger growth of the emerging economies over the last two decades, and the lower levels of insurance penetration in those countries. The I-RI values for all the different risk areas are lower in the emerging economies than in the advanced.
- Natural catastrophe is the only area where global insurance cover grew at a slightly higher pace (6.8%) than risk exposure. Nevertheless, the natural catastrophe protection gap grew by 6.4%, also faster than GDP growth of 5.3%.
- Strong improvements in emerging market mortality and healthcare resilience came in the years 2000–07. Improvements stalled and tapered off after the GFC.

Figure 11
Comparison of global protection gaps and SRI Insurance Resilience Indices



Source: Swiss Re Institute

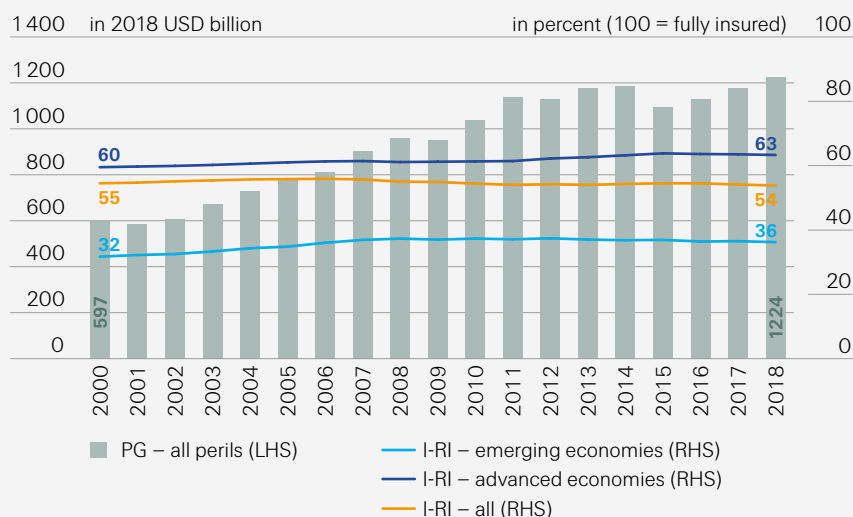
The composite I-RIs aggregating the three risk areas improved for both mature and emerging economies between 2000 and 2018.

Figure 12 shows the aggregation of the three sub-indices for the three risk areas into our global I-RI. Due to the differences between the three risks and the underlying concepts of their respective I-RIs, we use equal weights for each in the overall index.⁵⁴ Key observations are:

- The all-peril protection gap for global catastrophic health, mortality and natural catastrophe risks combined increased by about USD 627 billion to USD 1.2 trillion between 2000 and 2018 in premium dollar equivalent terms, the highest ever.
- The global composite all-peril index improved modestly before the GFC, reaching a peak of 55.9 in 2006, up 1.2 ppt from 2000. Thereafter, the index declined by 2.1 ppt to 2018, reflecting the different trends for the underlying perils.
- Between 2000 and 2018, there were declines in the mortality (–2.5 ppt) and health (–1.1 ppt) indices. The mortality index gained 2 ppt from 2000 to 2007, but this reversed after the GFC.
- Property catastrophe I-RI improved marginally (+1.5 ppt).
- The decline in the global index over the full time period is a macro phenomenon driven by the faster growth of emerging economies.
- The composite I-RIs improved in both the advanced (+3.8 ppt) and emerging economies (+4.5 ppt). However, average I-RIs are lower for emerging economies.

Figure 12

The SRI composite all-peril global protection gap and Insurance Resilience Index



Source: Swiss Re Institute

⁵⁴ The mortality protection gap is the estimation of a stream of lost income, while natural catastrophe and catastrophic health expenditures mostly relate to short-term expenses; the health I-RI is based on a different benchmark concept leading to a structurally higher level of the I-RIs.

How insurance promotes macro resilience

Beyond the benefits at the micro level, risk transfer to insurance markets boosts macroeconomic resilience by facilitating stronger recovery after a shock event, and through secondary network effects. In addition, in a different set of modelling, we find that higher insurance penetration is correlated with lower macroeconomic volatility. We also assess emerging risk pools in commercial insurance, particularly cyber threats, intangible corporate asset risks and business disruption as further opportunities for insurers to build resilience.

Individual-level impacts from major risks can accumulate and hit national economic welfare.

Our analysis of micro insurance resilience focuses on the impact of the major perils with potential for catastrophic financial impact – and the related degree of insurance protection – on the welfare of households. The relevance of these perils for the welfare of a country is so significant that in many nations, state programmes cover mortality and particularly health risks, at least to some degree. With respect to natural catastrophe risks, most governments focus on mitigation, while risk transfer is predominantly covered by private (property) insurance markets.

Insurance funding for reconstruction

The destruction of productive assets only shows up indirectly as a drop in potential GDP growth.

In this chapter, we focus on the effects of natural catastrophes⁵⁵ and insurance cover for related property damage on the economy as a whole. The primary economic effects of a major disaster are the destruction of peoples' assets and firms' capacity to produce. A secondary effect is the temporary disruption of economic activity because of road closures, breakdown in utility services provision, customers' and employees' inability to get to work etc. Both effects are negative, but the destruction of productive assets shows up only indirectly as a drop in potential GDP growth, and is difficult to quantify empirically. Some activity is only postponed (eg, consumption of durable items); some is lost permanently.

In our analysis, the negative effect from disruption outweighs the positive from re-building.

There is the counterforce of economic activity as measured by GDP getting a temporary boost after the initial destruction and disruption in the months after a natural disaster. This is the statistical reflection of emergency relief efforts and re-building that comes after the disaster. Clean-up, repairs and rebuilding all increase the demand for construction, building supplies and labour. The need to replace flood-damaged cars gives a boost to the sale of new vehicles. Our quantitative analysis suggests that on net, catastrophes reduce GDP growth. The negative effect from disruption outweighs the positive effects on growth from re-building. These findings are in line with prior research.⁵⁶ This body of research generally finds that having insurance increases the likelihood of rebuilding, minimises financial hardship post disaster, and accelerates recovery.

⁵⁵ Available data does not allow for similar modeling for the other two perils (mortality and healthcare).

⁵⁶ S. Hsiang, and A. Jina, "The causal effect of environmental catastrophe on long-run economic growth: Evidence from 6 700 cyclones", *National Bureau of Economic Research Working Paper*, No 20352, 2014.

How insurance promotes macro resilience

The degree of insurance cover is important for the speed and magnitude of recovery.

The degree of insurance cover is important for the speed and magnitude of recovery. Rebuilding homes and restoring businesses is dependent on funding. Insurance provides a permanent transfer of resources into a recovering region, thereby reducing disruption to economic activity and the financial stress on households and businesses. Without insurance claims payments, rebuilding would need to be financed through other means such as loans or divestment of assets. This in turn would reduce funds available for consumption and investment to the effect of curbing GDP growth in the future. Lack of funding can have a drastic negative impact on the ability to rebuild. This can be seen with the example of New Orleans: 13 years after Hurricane Katrina in 2005, last year the metro area was still around 10% smaller than before the disaster. This is because large numbers of people have chosen not to, or have been unable to return and rebuild.⁵⁷

Insurance allows for faster and more efficient reconstructing, and this reduces overall output losses.

Because insurance can allow for faster and more efficient reconstruction, overall output losses are reduced. Even if the insurance payout is not immediate, coverage facilitates immediate start of rebuilding if all relevant parties (eg, contractors) know that the money will be forthcoming at some point. This was the case, for example, in New Zealand following the 2010 earthquake in Christchurch, where reconstruction efforts were rapid despite the relatively slow initial insurance payouts due to the complexity of the disbursement system (which ran through the public Earthquake Commission).⁵⁸

Insurance can also have positive second-order network effects on the local economy.

An expectation of forthcoming insurance payouts for rebuilding can also have a positive second-order impact on economic activity, through network effects. For example, if local business owners in other sectors reasonably foresee their customers rebuilding and returning, they may be more willing themselves to invest after a disaster. Such micro-level decisions add to positive overall macro-level impact.

Our models confirm the positive effect of insurance on recovery through the funding of rebuilding.

Insurance plays a critical role in improving resilience by both promoting recovery and providing incentives for investments in hazard mitigation. Prior research suggests that insurance coverage does improve recovery outcomes but that impact on risk reduction may be modest.⁵⁹ We ran various econometric models that confirm the positive effect of insurance on growth/recovery through the funding of rebuild activities (see Figure 13 for a summary of results, and the Appendix for more details). The positive effect is strongest in the year of the event and still strong and significant in the following year (dynamic resilience). We could not verify the effect in further years given the influence of other macro factors on economic growth, and the winding down of rebuilding activities.

The insurance impact is stronger in the emerging than in advanced markets.

Our findings are complemented by a study by the Bank of International Settlements, which found that major natural catastrophes have a large and significant negative impact on economic activity, driven by uninsured losses. Where sufficiently insured, however, events are inconsequential in terms of foregone output.⁶⁰ This impact is particularly evident in low- to middle-income countries, which suffer more when uninsured but recover faster when insured. Our own analysis supports this finding: the positive growth effect from insured losses is stronger for emerging than for advanced economies.⁶¹

⁵⁷ US Census Bureau data.

⁵⁸ G. von Peter, S. von Dahlen, S. Saxena, *Unmitigated Disasters? New Evidence on the Macroeconomic Cost of Natural Catastrophes*, Bank for International Settlements Working Paper, 2012.

⁵⁹ C. Kousky, 2019, op. cit.

⁶⁰ G. von Peter, et al, 2012, op. cit.

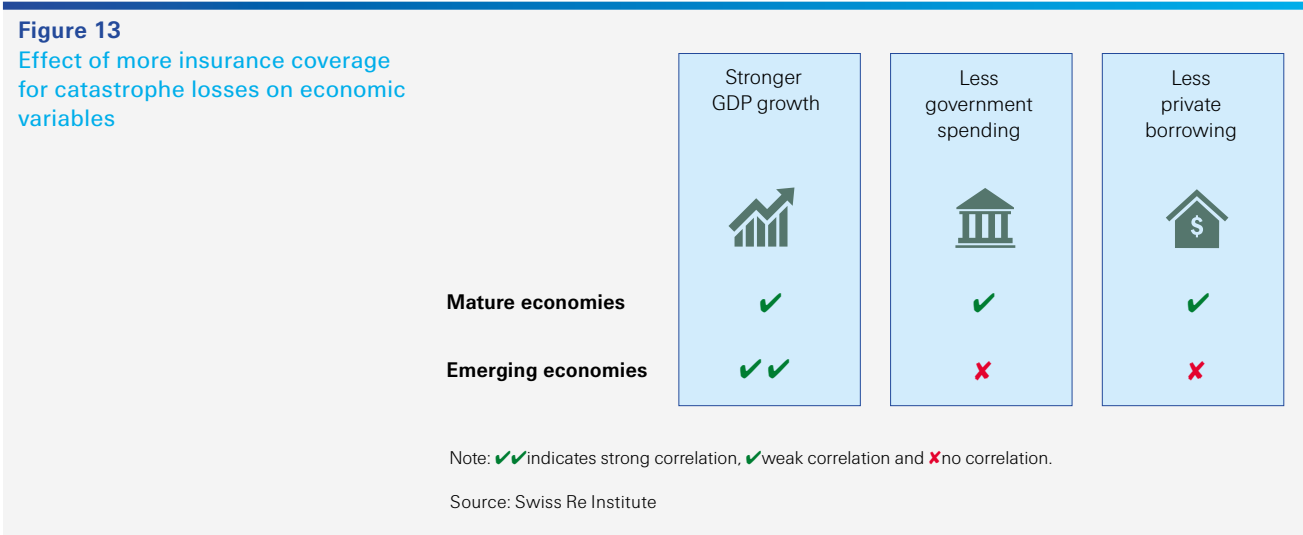
⁶¹ Opposite of result in M. Breckner et al *Economic Development and Resilience to Natural Catastrophes – Insurance Penetration and Institutions – Conference Paper*, 12 February 2016.

One reason for this is that developed markets have more alternatives to fund rebuilding.

The impact of insurance as shock absorber is more pronounced in emerging economies given more limited fiscal resources and access to credit.

The weaker statistical evidence for a positive effect from insurance in advanced economies is partly due to the lower average magnitude of catastrophes in relation to the more developed economic activity.⁶² It is also because in advanced markets, there are more well-established substitutes to fund re-building (eg. government assistance and better access to credit). Another way insurance contributes to reducing the economic disruption from disasters is by reducing the impact on public finances and lessening the need for private borrowing. Governments often provide financial assistance to households and businesses without sufficient insurance coverage, increasing deficits and constraining fiscal spending in other areas.

Figure 13 provides a summary of insurance coverage effects for catastrophe losses on economic variables.⁶³ From our data set we conclude that for advanced economies, a higher level of insurance penetration coincides with lower government expenditures post disaster. That is, in countries with high insurance penetration, disasters have smaller real consequences and do not result in deficit expansion. Similarly, advanced economies with higher insurance coverage have lower levels of debt to the private sector in the year after an event. Fiscal resources and access to credit are more limited in many emerging economies, which is why insurance plays a more important role as shock absorber there.⁶⁴



⁶² On average, catastrophe losses as a share of GDP are much lower for the developed markets in our sample, making it statistically more difficult to find a significant result.

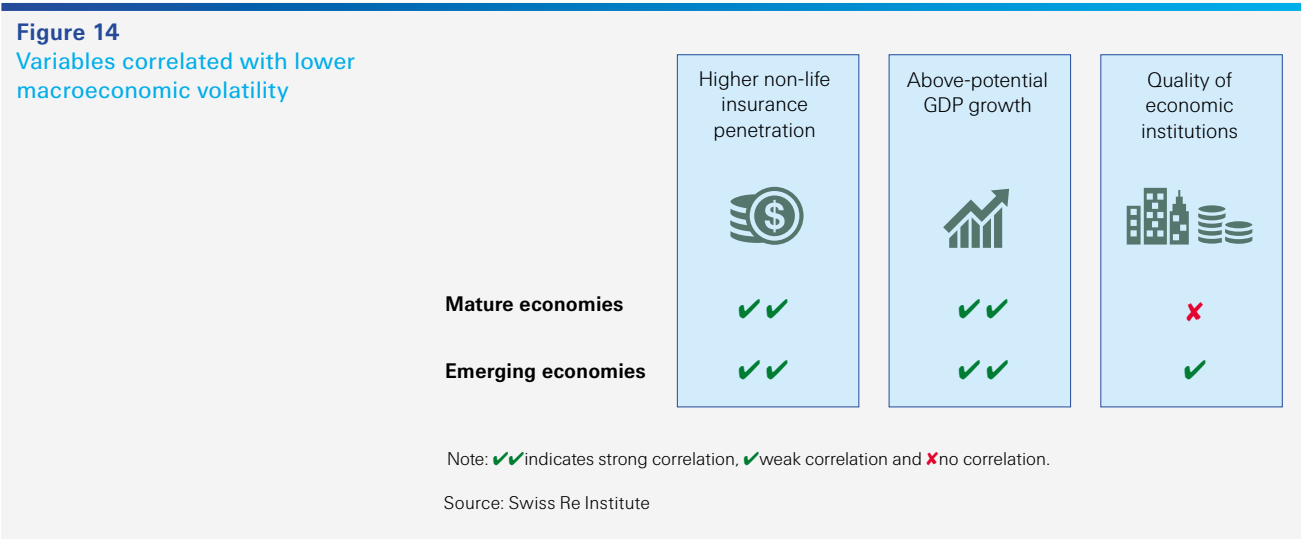
⁶³ *The Contribution of Reinsurance Markets to Managing Catastrophe Risk*, OECD, 2018.

⁶⁴ Emerging economies score lower, on average, for the category “fiscal space” in our macroeconomic resilience index.

Higher insurance penetration is correlated with lower macroeconomic volatility.

Higher insurance penetration and lower GDP volatility

Higher insurance penetration is correlated with lower macroeconomic volatility as measured by the standard deviation of GDP. In our econometric modelling, we find a statistically significant negative relationship between non-life insurance penetration and GDP volatility in a panel data set of more than 100 countries.⁶⁵ Though the literature on the volatility question is more sparse than that on the question of the insurance impact on growth, this finding agrees with previously published work.⁶⁶ In addition to insurance penetration, the quality of economic institutions also matters: the better the institutions, the lower the macroeconomic volatility of a country (see Figure 14).⁶⁷ These findings are consistent with inclusion of insurance market penetration, financial market development and other structural elements in our macroeconomic resilience index.⁶⁸



There are four transmission mechanisms whereby insurance benefits economic growth.

The discussion of how insurance contributes to the resilience of a society builds on prior theoretical and empirical evidence of the economic benefits of insurance, and the transmission mechanisms between insurance and resilience. This research dates back to the 1950s when a solid theoretical understanding of the benefits such as a lesser need for contingency reserves or the role of insurance in “greasing” the credit mechanism was built.⁶⁹ As early as 1964, the United Nations Conference on Trade and Development asserted that “a sound national insurance and reinsurance market is an essential characteristic of economic growth.”⁷⁰ In 1997, Skipper developed the first rigorous framework to show how insurance contributes to economic growth,⁷¹ from which we derive a modified set of four different transmission mechanisms (see Figure 15).

⁶⁵ This is driven by a significant impact in emerging economies. When splitting the sample into emerging and developed markets, the impact for developed markets is not significant in some model specifications.

⁶⁶ P.M. Sub Choi et al, “Does Insurance Hedge Macro Volatility? Global Evidence” *Investment Management and Financial Innovations*, vol 14, no 2, 2017, pp 307–315.

⁶⁷ A similar result for developed markets was reached by M. Breckner, et. al., 2016, op. cit.

⁶⁸ The remainder of the differences in terms of underlying metrics used between that index and the analysis here is due to the more limited availability of data for the larger panel data set used in this section.

⁶⁹ R. Lester, *Insurance and Inclusive Growth: Policy Research Working Paper 6943*, World Bank, 2014.

⁷⁰ Quoted in H. Skipper, *Foreign insurers in emerging markets: Issues and concerns*, International Insurance Foundation, 1997.

⁷¹ Ibid

The aggregate of micro-level insurance decisions make the overall economy more resilient.

Insurers are long-term investors, which adds to financial stability.

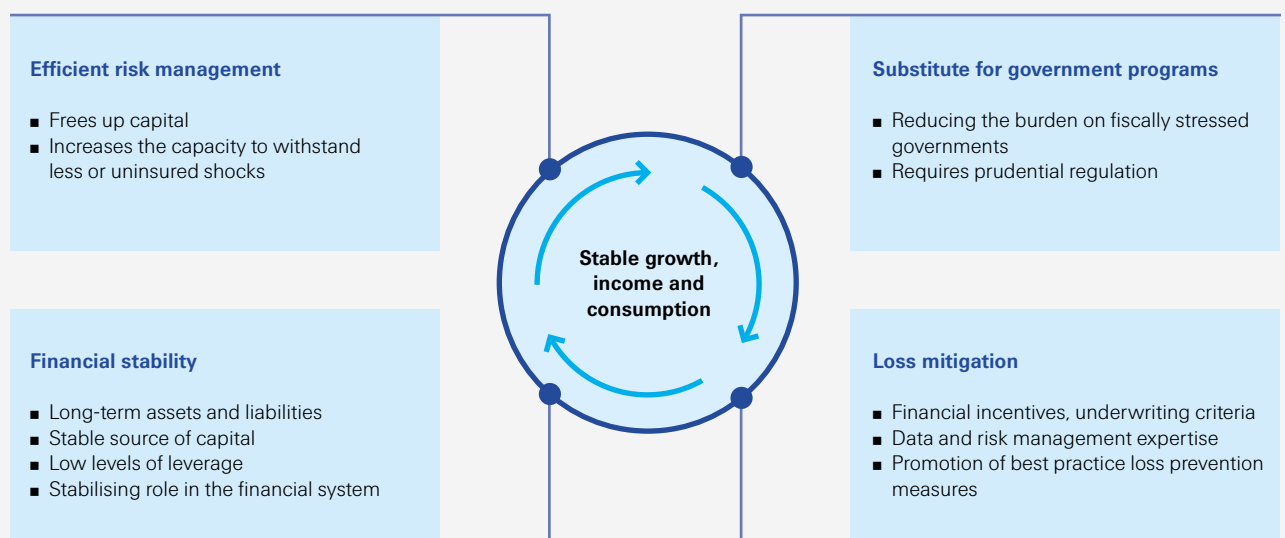
Private insurance can substitute for government spending, relieving fiscal stress.

First, insurers enhance the efficiency of risk management through risk pricing, transformation and pooling. This includes risk management in the corporate sector, where commercial insurance helps firms better withstand external shocks (see *Commercial insurance: No index, but integral to global resilience*). Ex-ante risk management enables entrepreneurship and supports more efficient resource allocation. Through ex-post financial protection, insurance accelerates recovery. These micro-level impacts aggregate to build overall economic resilience.

Second, insurance promotes financial stability by providing a stable source of long-term capital. Life insurers in particular are long-term institutional investors, a role that is important in stabilising financial markets and improving macro resilience. Insurers are able to do this because of their illiquid liabilities (there can be no run on insurers in the same way there can be a run on banks) and low capital leverage.

Third, private insurance can complement or even substitute for government programmes, reducing the burden on taxpayers. In the US, for example, insurance payments from annuities and disability policies represent about 20% of total Social Security payments and private health insurers cover 35% of total healthcare expenditures.⁷² The relief offered by insurers is of particular relevance to fiscally-stressed governments, provided prudential regulation ensures the performance of the insurance sector during times of external shock.

Figure 15
How insurance benefits macro resilience of societies



Source: Swiss Re Institute

Insurance also incentivises best practice in loss mitigation.

Lastly, re/insurers provide economic incentives to facilitate loss mitigation, benefiting policyholders and society at large. Insurance can provide financial incentives and risk management expertise that promote best practice loss prevention measures, such as building standards and fire protection. In catastrophe scenarios, the aggregate level of individual mitigation measures becomes part of static resilience on a macro level.

⁷² Data from US Department of Health and Human Services, and Centers for Medicare & Medicaid Services; calculations by Swiss Re Institute.

How insurance promotes macro resilience

The commercial sector is also a key component of the overall resilience equation.

Corporate risk transfer reduces the costs associated with financial distress.

Despite increasing efforts of securing networks, exposure to cyberattacks is growing.

Commercial insurance: no index, but integral to global resilience

The SRI Insurance Resilience Indices are based more on personal lines insurance for households. Another area of insurance opportunity is protection for the risk exposures that businesses face in their commercial activities. These risks are diverse, complex and difficult to model for the purposes of an index, and we make no attempt to do so in this *sigma*. Instead, we provide here a qualitative overview of the commercial insurance sector, which today is a USD-800-billion global premium market. The sector is a key component of the overall resilience equation and an opportunity that will grow as new exposures emerge.

A main motivation for risk transfer by corporates is access to funds when they need it most, reducing the risks of bankruptcy and costs associated with financial distress.⁷³ These financial distress costs include poorer terms on future loans; strained relationships with suppliers and clients; departure of key personnel, or a need to pay a high retention wage; and a fall in the company's stock price, which limits the ability to withstand other external shocks. Companies also buy commercial insurance to cover traditional property and liability risks. With the digital transformation of life, new areas of protection gap in business have emerged. Here commercial insurance, with innovative solutions, can help build corporate and de facto socio-economic resilience. Here we look at the opportunities in three areas of emerging risks.

Cyber risk: Digitisation is contributing increasingly more to global wealth creation. As a flipside, cyber risk is rising rapidly too. The latest "economic impact of cybercrime" study calculates the global cost of cybercrime to have been 0.6% to 0.8% of global GDP in 2017, or USD 445–608 billion.⁷⁴ This encompasses direct losses due to cyber-crime, the cost of securing networks, "reputational damage and liability risk for the hacked company and its brand", opportunity costs, and the cost of associated insurance. Separately, the latest Cambridge Global Risk Index ranks cyber at 6th among key risks, with an annual loss estimate of USD 40 billion for the aggregate of large 279 cities, which account together for 41% of global GDP.⁷⁵ This suggests a global loss estimate of less than USD 100 billion if we assume a smaller per-GDP exposure for the rest of the world.

⁷³ K. A. Froot, D. S. Scharfstein and J. C. Stein, "Risk management: Coordinating corporate investment and financing policies", *Journal of Finance*, vol 48, no 5 1993, pp 1629–1658; B. Caillaud, G. Dionne and B. Jullien, "Corporate insurance with optimal financial contracting", *Economic Theory*, vol 16, no 1 2000, pp 77–105.

⁷⁴ *Economic impact of cybercrime – no slowing down*, Center for Strategic and International Studies (CSIS), February 2018.

⁷⁵ Cambridge Centre for Risk Studies, op. cit.

A large systemic cyber risk event could generate huge losses, mostly uninsured.

The cyber insurance market is still small, but is set to grow rapidly.

The nature of value creation in business has moved on from the production of physical assets.

The rising value of intangibles is leading to increased demand for insurance solutions for risks that were previously considered uninsurable.

Among the major cyber risks are a large data breach and a catastrophic event like outage of a major cloud service provider, or a global malware event. A recent study analyses the cloud as a source of systemic risk. It estimates a cyber incident that takes a top three cloud provider in the US down for 3–6 days would result in total losses of USD 6.9–14.7 billion. The associated insurance losses, however, would be just USD 1.5–2.8 billion: in other words, around 80% of the losses would be uninsured.⁷⁶ Another study estimates that a wide-reaching malware event would generate insurance losses of USD 10–27 billion, just 9–14% of the total losses.⁷⁷

With a growing catalogue of cyber incidents and increasing exposures, there is high demand for associated insurance solutions. Even so, the stand-alone cyber market is still comparably small, with global premium income estimated to be around USD 4.5 billion in 2017, of which the US accounted for 80–90% and the EU for 5–9%.⁷⁸ This market segment is set for solid double-digit growth for the next five to 10 years and is forecast to reach USD 20–25 billion by 2025.⁷⁹

- **Exposures stemming from intangible business value:** Today the value of firms derives mostly from intangible assets such as intellectual property, networks, platforms, data and customer relationships. As companies have shifted from making physical things to providing information and services, the composition of companies' balance sheets has shifted too. Tangible assets like property, plants and equipment (PPE) currently account for 19% of the enterprise value of the non-financial S&P 500 companies. In 1995, the share was at around 48%.⁸⁰ In a study this year, the Ponemon Institute estimates the total value of corporate intangibles in the US to be USD 20–25 trillion.⁸¹ Globally, we roughly estimate double that size. The same study also says companies value information assets 12% higher than PP&E assets, and estimates probable maximum losses from intangibles 35% higher than from tangibles. Extent of insurance cover, however, is much lower: on average, 16% for intangibles versus 60% cover for PP&E assets.

As "intangibles" business value grows, demand for insurance solutions is moving to protection for business risks that were previously uninsurable like earnings and cash flow losses. Sources of these losses include cyber, business disruption, product recall, reputation, weather and commodity price risks. Most innovative insurance solutions are currently custom-made and include the use of parametric triggers, double triggers and structured solutions. All these new areas of risk transfer require modelling or underwriting expertise, which is enabled by the growth in data and advanced data analytics. With digital transformation, the opportunity is to develop innovative solutions into mainstream products, and thus further close protection gaps.

⁷⁶ *Cloud Down: Impacts on the US economy*, Lloyd's and AIR Worldwide, January 2018.

⁷⁷ *Bashe attack: Global infection by contagious malware*, Cambridge Centre for Risk Studies, Lloyd's of London and Nanyang Technological University, 2019.

⁷⁸ *EU-U.S. INSURANCE DIALOGUE PROJECT – the cyber insurance market*, European Insurance and Occupational Pensions Authority, October 2018.

⁷⁹ An internet search reveals a number of studies and projections by insurance companies and brokers which foresee compound average growth rates of between 25 and 35% for this segment.

⁸⁰ Swiss Re Institute calculations, based on data from Bloomberg.

⁸¹ *2019 Intangible Assets Financial Statement Impact Comparison Report*, Ponemon Institute, 2019.

How insurance promotes macro resilience

With more complex value chains, demand for business interruption risk covers has also grown.

More and more, commercial insurance demand has detached from asset-related property risks.

- **Business interruption:** Globalisation has resulted in more complex value chains, with many companies now connected to a number of suppliers across the world. This has increased firms' focus on business interruption (BI) risk. Almost all large property insurance claims now include a major BI element, and these typically account for a majority of the loss.⁸² Alongside standard BI insurance, which is triggered in the event of an insured's own-property losses when business is disrupted, there has also been growth in demand for contingent business interruption (CBI) insurance, which covers for property losses at an external party such as a supplier that result in a business disruption for the policyholder even without own-property loss.⁸³

The next stage in the evolution of innovative insurance products is the development of non-physical damage business interruption (NDBI) covers, in some cases called "named-peril earnings insurance". Here the insured risk is detached from asset-related property risk, as the cover protects earnings even absent physical damage at an insured's own or a third-party property. Examples of NDBI events include electricity blackouts, strikes, government actions like a withdrawal of regulatory approval or product license, and bankruptcy at a key supplier. According to the annual *Allianz Risk Barometer*, BI ranks as the biggest risk facing business for the seventh year in a row. Within BI, cyber ranked as the main concern.⁸⁴ The potential market for business continuity risks is huge, making this another area where insurers can make the global economy more resilient.

⁸² According to the analysis of large claims (>EUR 100 million) by Allianz Global Corporate & Specialty, BI accounts for 58% of the claims costs. See *Global Claims Review – 2018*, Allianz Global Corporate & Specialty, 2018.

⁸³ Covers for BI were already developed at the beginning of the 19th century; see *History of Business Interruption Insurance*, LMI Group.

⁸⁴ *Allianz Risk Barometer: Top Business Risks 2019*, Allianz Global Corporate & Specialty, 2019.

Capturing the full potential of insurance

In terms of total expected insurance claims payments, we estimate the untapped resilience potential from the three (micro) risk areas in focus to be more than USD 1 trillion per year. To fully capture this potential, a number of supply and demand side barriers to increase uptake of insurance need to be overcome. These include economic factors, financial and institutional developments, and risk and insurance perceptions. They need to be addressed through cooperation among multiple stakeholders.

The untapped resilience potential: > USD 1 trillion

The global protection gaps in premium equivalent terms add up to more than USD 1.2 trillion...

The estimated global protection gaps in 2018 premium equivalent terms for the three areas in focus at the micro level of this study were USD 222 billion for natural catastrophe perils, USD 386 billion for mortality risks, and USD 616 billion for healthcare spending risks. As these estimates capture only three areas, we can assume the combined more-than USD 1.2 trillion gap represents the lower bound of total untapped risk pools in the world today. For example, the large protection gaps for motor and general property risks in emerging economies, which we have not quantified due to a lack of data, are not included. Nor are known and emerging risks pools such as business interruption and cyber threats.

...and yield an annual profit opportunity for the insurance industry of USD 60-80 billion.

As Table 4 shows, we estimate that closing the coverage gaps for the three main areas in focus would improve global financial resilience by increasing the average expected claims payments to cover for insured events by more than USD 1 trillion per year.⁸⁵ Closing the protection gap is a significant premium growth and profitability opportunity for the insurers too. Based on conservative assumptions of industry profit margins, our model estimates that the business volume needed to close these gaps represents an additional profit opportunity of between USD 60–80 billion per year for the insurance sector as a whole.

The largest untapped profit margin is in natural catastrophe insurance.

The assumed profit margin is highest in the natural catastrophe sector due to higher capital costs, followed by mortality and health. For the global P&C insurance industry, closing the natural catastrophe protection gap would bring around USD 20–24 billion in additional profit, equivalent to 20% of the 2018 profit pool. Our estimate is based on a 56% increase in property premiums, with a corresponding increase of the industry profit pool. For L&H, we estimate that closing the mortality and health protection gaps would increase premium volumes and profit pools by around 14% in life and by 46% in health insurance.

Table 4

Global protection gaps in 2018 (in terms of USD billion premium equivalent), and profit margins and pools

	Natural catastrophe	Mortality	Health
Protection gap 2018, USD bn	222	386	616
As % of current premiums ⁸⁶	56	14	46
Additional claim payments, USD bn	177	309	560
Assumed profit margin, % of premiums	9–11	5–7	3–5
Additional profit potential, USD bn	20–24	19–27	18–31

Source: Swiss Re Institute

⁸⁵ The USD 1 trillion figure is derived by adding up the additional claims payments from Table 4. The claims payments are estimated based on the protection gap in premium terms and an assumed typical expense ratio.

⁸⁶ For natural catastrophes, we compare the protection gap with total property premiums, for mortality with total life premiums including savings products.

Capturing the full potential of insurance

A number of barriers hold back take up of insurance and contribute to the untapped resilience gaps.

Filling the untapped resilience gaps and accessing the profit potential requires an increase in the global uptake of insurance. Numerous supply and demand barriers currently hold back consumer uptake and prevent insurance from fully contributing to economic resilience at both the micro and macro levels (see *Reasons people don't buy insurance*). Recent research provides useful insights on these barriers, which need to be tackled by cooperation between multiple stakeholders: governments, regulators, insurers, individuals and businesses.

Reasons people don't buy insurance

A number of supply and demand side barriers hold back greater uptake of insurance.

Too-high cost is a main reason for underinsurance.

Economic factors: Affordability is a main reason for underinsurance, particularly for lower-income households and small and medium-sized firms. For example, research on the impact of hurricane Katrina in New Orleans shows that neighbourhoods with high poverty levels also had low flood insurance penetration.⁸⁷ On the supply side, traditional insurance contracts cannot be scaled down efficiently for lower-income customers due to transaction costs. This is where innovative, cost efficient products are necessary to open up risk transfer for underserved markets.

Access to a well-functioning financial sector increases insurance penetration.

Financial and institutional developments: The degree of financial sector development strongly affects insurance penetration. The insurance industry is highly interdependent with financial markets, and a well-functioning banking system increases consumer confidence in financial transactions.⁸⁸ We find that access to the formal financial sector is correlated with insurance penetration.⁸⁹ Credit drives the financing of insurable assets. And credit itself may require insurance to protect collateral, such as when property insurance is needed for mortgages. Policies that promote financial inclusion therefore may also benefit insurance penetration.

Weak property rights and corruption may reduce demand.

Weak property rights, often prevalent in emerging economies in particular, may limit insurance demand for property insurance. Homes may be uninsurable without legal title or official recognition. Corruption and political risk may reduce insurance demand given uncertainty regarding the enforcement of insurance contracts.

Insurance market competitiveness can affect product attractiveness.

The competitiveness of insurance markets can further affect product attractiveness for consumers. Open markets and the presence of foreign competitors often increases competition and insurance product variety, which helps boost penetration. A supportive regulatory environment bolsters the development of the industry while protecting customers and promoting trust in insurance products. The opposite is the case for closed markets with weak regulations.

⁸⁷ M. Masozera, M. Bailey, and C. Kerchner. "Distribution of impacts of natural disasters across income groups: A case study of New Orleans." *Ecological Economics* 63, 2007.

⁸⁸ See chapter 3 of this *sigma* for more on the relevance of category "financial market development" contributing to the SRI-LSE Macroeconomic Resilience Index.

⁸⁹ Holzeu, Thomas, and Ginger Turner. "The natural catastrophe protection gap: Measurement, root causes and ways of addressing underinsurance for extreme events." *The Geneva Papers on Risk and Insurance-Issues and Practice* 43(1), (2018): pp. 37–71.

Behavioural factors can lead to under-insurance, in particular for low-probability, high-loss events.

Misperceptions around the role of government in post-disaster assistance also play a role.

Limited financial literacy and trust in insurance holds back uptake...

...while easier purchasing processes encourage buyers.

Trust and risk perceptions: Behavioural research indicates that people make choices contrary to expected utility theory and take a heuristic approach in their decision making. Also, people often under-estimate the risk of low-probability, high loss events such as natural catastrophes, and often fail to purchase related insurance cover even when it is offered at favourable premiums.⁹⁰ One reason for this is lack of experience with rare events. On the other hand, consumers are likely to over-insure to minimise out-of-pocket costs⁹¹ and for high-probability, low-consequence risks.⁹²

Many households do not fully understand the cover provided by their insurance policies. There is also misperception about the availability of government post-disaster assistance. Most individuals expect some form of state funding after occurrence of a disaster event. However, the majority of federal post-disaster assistance goes to emergency relief services and rebuilding public infrastructure, rather than to compensate household and business losses.

Financial literacy and consumer education about insurance are critical to increase uptake. Insurance is an abstract product that often requires customised explanation. In emerging economies in particular, many potential customers have no experience of insurance. For example, the experience of a large microinsurance provider that operates in Africa and Asia shows that three quarters (75%) of customers never had insurance before.⁹³ Uptake is also dependent on trust that an insurer will pay claims. Research suggests that lack of trust holds back insurance purchases, particularly among low income and risk-averse households which stand to benefit most.⁹⁴

Ease of purchase may also impact insurance buying behaviour. In a global survey, 50% of consumers reported buying insurance policies based on cost. However, nearly 30% reported that frequency of communication with their insurer was an important factor, and 30% cited the quality of service.⁹⁵

⁹⁰ H. Kunreuther, and M. Pauly, "Neglecting Disaster: Why Don't People Insure Against Large Losses?" *Journal of Risk and Uncertainty* 28(1), 2004, pp. 5–21.

⁹¹ N. Kettlewell, "Policy choice and product bundling in a complicated health insurance market: Do people get it right?" *Journal of Human Resources*, 2018.

⁹² M. Browne, C. Knoller and A. Richter, "Behavioral bias and the demand for bicycle and flood insurance", *Journal of Risk and Uncertainty* 50.2, 2015, pp. 141–160.

⁹³ Interview with Bima's deputy CEO Mathilda Strom. I. Lundgren, "Bima raises \$97M from Allianz for microinsurance aimed at emerging markets", *techcrunch.com*, 19 December, 2017.

⁹⁴ S. Dercon, J. Gunning, and A. Zeitlin, *The demand for insurance under limited trust: Evidence from a field experiment in Kenya – Working Paper*, 2015.

⁹⁵ *Global Consumer Insurance Survey*, Ernst & Young, 2014.

Boosting uptake of insurance

Reducing or eliminating the above-discussed barriers to insurance take-up is key to closing protection gaps. This will require specific measures by insurers and governments to change buying behaviours and market structures.

Product innovation can extend industry reach to underserved markets and new areas of insurability.

Product and process innovation

Technology and digitisation can enable advanced, customised and more efficient products and underwriting methods (eg, usage-based insurance, wearables, smart home devices), expand distribution channels (online sales) and improve claims settlement (eg, self-claim video and photos). Some insurers have started using advanced data analytics to obtain deeper insight into the risks covered, thus helping with the submission and claim processes, and allowing insurers to offer individualised quotes. By fostering trust between policyholder and insurer, blockchain can be used to increase transparency and speed up payment of claims. Coverage can also be broadened by the development of innovative index-based coverages and different types of parametric triggers.

Microinsurance makes coverage more affordable.

Microinsurance

Microinsurance can make affordable and efficient insurance products available to low-income households through unconventional product design, and distribution and claims management processes. The use of microinsurance has increased in recent years, particularly for life, property and agricultural exposures. The Microinsurance Network's World Map of Microinsurance shows that over 280 million people worldwide are covered by at least one microinsurance policy.⁹⁶ Leveraging digital and mobile technologies can lower the cost of insurance and leapfrog access in markets where a traditional distribution system does not yet exist. Many successful insurance partnerships with mobile network operators are already in place, such as Bima's multitude of partnerships with mobile operators and microfinance entities across Africa and Asia.⁹⁷ Insurers can also collaborate with companies in other sectors that already have close contact with potential customers, such as pharmacies or agricultural supply companies, as is the case in several countries in sub-saharan Africa.

Regulatory flexibility can be important to stimulate market development for microinsurance.

Regulatory flexibility can be important to stimulate market development and extend the reach of microinsurance. This can include less stringent licensing and prudential requirements, allowing electronic enrolment and administration of policies, removing taxes, and permitting distribution through non-traditional channels. The Access to Insurance Initiative reports that in 2018, eighteen countries across Africa, Asia and Latin America had adopted a microinsurance regulatory framework, and that 23 countries were in the process of doing so, up from just six in 2009.⁹⁸

⁹⁶ As cited in *Background on: microinsurance and emerging markets*, Insurance Information Institute, 15 October 2018; see also <http://worldmapofmicroinsurance.org/#>.

⁹⁷ See the "About Us" and "Where We Operate" portions of their website, <http://www.bimamobile.com/about-bima/about-us-new/>.

⁹⁸ *State of microinsurance regulation 2018*, Access to Insurance Initiative, 2018, <https://a2ii.org/en/our-work/results-and-learning>.

Insights from behavioural economics help explain consumer buying decisions.

Broadening default cover options or adopting an opt-out approach can increase insurance uptake.

Life insurers are using behavioural economics and accelerated underwriting to reach more customers.

Alternative distribution channels are instrumental in providing efficient customer service.

New technologies and changing customer preferences are shifting the distribution landscape.

Digital distribution can make insurance accessible to those in remote areas.

Behavioural economics and choice architecture

Building an understanding of the behavioural barriers to insurance uptake provides insights into how to address them. For instance, the findings from behavioural economics research facilitates improvement in product design such as better policy wording, different coverage defaults and product bundling, that can lead to more insurance purchases. The design of default options insurance can also be important. For example, in countries where standard homeowners' policies cover all hazards, flood insurance penetration is higher.⁹⁹

An alternative design option would be to adopt an opt-out approach, such that a property owner or renter would be insured unless they explicitly decline the cover. Meanwhile, product bundling can reduce distribution and underwriting costs as well as the decision-making efforts for a household if the catastrophe cover is added to a larger purchase. To reach farmers in rural or remote regions in emerging markets, insurers are exploring bundling agricultural insurance products, either as an add-on to existing products and services or through already-existing distribution networks.

Life insurers are already deploying innovative solutions to increase coverage and reduce the mortality gap. Three major opportunities for insurers include the use of behavioural economics to better understand the drivers of customer behaviour, accelerated underwriting to facilitate access and reduce the frictional costs of purchasing life insurance, and improved customer experience to enhance the perceived value of life insurance. New technologies and data analytics are being leveraged to this end, to use as much available data as possible and avoid costly and time-consuming medical testing as part of life insurance underwriting procedures.

Developing new distribution channels

Insurers are introducing market-specific products with greater use of alternative channels such as utility and remittance companies, cellphone networks, cooperatives, financial institutions and insurance aggregators. These distribution channels can target potential customers that have not had insurance before.

New technologies and changing customer preferences are shifting the distribution landscape. As traditional channels become saturated and the emergence of digital technologies becomes the norm, those who embrace change will have a competitive advantage. According to participants in the Insurance Governance Leadership Network, the need for insurance to be sold via more direct channels and at a lower cost is greater today than ever, since the relative share of expenses related to distribution has actually been rising since the early 2000s.¹⁰⁰

The robust upsurge of mobile technology penetration in emerging markets is also increasing access to insurance products. Digital distribution will make insurance accessible to those who live in remote areas and will improve the purchasing process for both the consumer and the insurer. For example, in Chile customers in remote areas are able to purchase the mandatory motor cover online.

⁹⁹ *Prioritizing financial protection in the face of extreme weather*, McKinsey & Company, 25 June 2019.

¹⁰⁰ *The future of distribution: insurers grapple with a rapidly changing landscape*, Ernst & Young, 2017.

Governments and regulators have the political and legal power to set rules to support a stable insurance market.

Mandating coverage in some lines of business can help improve financial resilience.

Governments can offer tax benefits to promote insurance...

...and actively promote insurance as a risk transfer mechanism.

Encouraging financial literacy is also helpful.

The role of governments and public institutions

Governments and regulators set rules that enable the insurance market to develop and expand the availability of risk transfer solutions. They share responsibility for establishing a transparent and reliable legal structure, including efficient tort liability laws, a functioning court system, effective law enforcement and adequate minimum insurance cover for compulsory lines. In addition, a sound regulatory framework regarding capital requirements, reserving standards and risk management is vital to support a stable insurance market and protect consumers. Ideally, the regulatory system will also foster innovation through, for example, supporting the use of new technologies in insurance products and distribution.

Governments can expand risk transfer by introducing compulsory insurance schemes. Compulsory insurance is used in virtually all countries, mostly as part of social security schemes related to health, old age and unemployment, or as compulsory liability insurance (eg, motor liability insurance). The main advantage of mandatory schemes is that they form the widest possible risk pools and eliminate adverse selection. Mandatory insurance schemes for property cat perils have a significant impact on RI scores but are rare (eg, France, Spain, Switzerland and Turkey). Nevertheless, mandatory insurance beyond health and motor third-party liability may be useful in improving financial resilience for households and enterprises.

Governments can promote purchase with insurance vouchers¹⁰¹ or offer tax benefits for low-income households. Many countries have beneficial tax rules for life and health insurance. There are also government programmes to support agro insurance. On the other hand, property and motor insurance is frequently exposed to premium taxation, reducing the economic benefits to policyholders.

Governments can actively promote the recognition of insurance as a risk transfer mechanism. For example in China, the government is proactively encouraging provinces to use part of their budget to buy insurance. In a programme launched in 2016, Swiss Re supports a natural disaster insurance scheme in Heilongjiang province which covers 28 counties against flood, excessive rain, drought and low temperatures. It is the first of its kind in China and uses satellite and weather data to allow for quick payouts. The scheme is a good example of how a public-private partnership can address government-assisted poverty alleviation.

Finally, governments and other stakeholders need to encourage financial literacy through education and outreach programmes.

¹⁰¹ Kousky, Carolyn, and Howard Kunreuther. "Addressing affordability in the national flood insurance program." *Journal of Extreme Events*, 2014.

Conclusion

Our new indices measure the role of insurance in mitigating mounting risks to society.

Global record protection gaps of USD 1.2 trillion outline the great potential for risk transfer.

Insurance resilience has improved in most regions.

Insurance promotes macro resilience.

Operating at full potential to close protection gaps, insurers could pay out an additional USD 1 trillion to policyholders each year.

This *sigma* shows that the world economy has become less resilient, but that the insurance industry is keeping pace with changes in the risk landscape. Against this background, we have developed two new sets of indices. The SRI-LSE Macroeconomic Resilience Index shows that the shock absorption capacity of the global economy is weaker now than in 2007. To strengthen macro resilience, monetary policy space needs to be improved and fiscal space safeguarded by tackling current excessive debt levels. Countries should also take societal and environmental sustainability into account, and work to increase insurance penetration. Importantly, high resilience scores do not necessarily mean that a country can withstand any type of shock, come what may. Resilience starts domestically but is a shared, global responsibility.

Since the turn of the century, the aggregate protection gap for catastrophic health, mortality and natural catastrophe risks more than doubled to a record high of USD 1.2 trillion in 2018, equivalent to a quarter of all premiums written by the global insurance industry. This demonstrates that the industry is operating far below potential, a state of affairs which can burden governments, households and businesses with large financial losses in the event of a catastrophe or shock.

The composite SRI Insurance Resilience Indices and most sub-indices have improved for both the advanced and emerging markets since the turn of the century. However, average RIs are much lower for emerging economies, and there has been a marginal decline in the global all-peril insurance index. This is because the fast-growing emerging regions, with lower levels of insurance penetration, have garnered a higher weight in the world economy, which has dragged on the global index. A key driver for global resilience lies in the potential for emerging economies to catch up in the development of their public welfare systems and private insurance markets.

In this *sigma*, we demonstrate a positive relationship between insurance penetration and the resilience of economies as measured by the steadiness of economic growth. We also show that higher levels of property catastrophe insurance coverage accelerate economic recovery after a disaster event. Even so, numerous supply and demand barriers prevent insurance from fully contributing to growth and economic resilience. Tackling these barriers requires cooperation from a number of stakeholders: governments, regulators, insurers and businesses alike.

Our research offers food for thought for insurance executives, public policy makers and other stakeholders to explore new ways of harnessing insurance-based risk transfer for reducing growing vulnerabilities at the household and macroeconomic levels. With this edition of *sigma*, we hope to kick off what could turn out to be a “1 trillion dollar debate”: the amount of additional potential yearly claims payments made by insurers operating at their full potential. Closing protection gaps also makes commercial sense, translating into an estimated additional profit pool of USD 60–80 billion annually for the global insurance industry.

SRI–LSE Macroeconomic Resilience Index

Scores and rankings

Rank	Country	Fiscal space	Monetary policy space	Low-carbon economy	Insurance penetration	Financial market development	Human capital	Economic complexity	Labour market efficiency	Banking industry backdrop	2018 Resilience Index	2007 Resilience Index	Average ranking, 2007–2011	Average ranking, 2014–2018
1	Switzerland	0.99	0.1	1	0.72	1	0.86	1	1	0.91	0.84	0.89	1	1
2	Canada	0.99	0.18	0.29	0.61	0.85	0.93	0.55	0.94	1	0.81	0.83	2	2
3	US	0.95	0.21	0.21	0.57	1	0.74	0.93	1	0.77	0.79	0.85	9	4
4	Finland	0.99	0.12	0.73	0.89	0.57	1	0.91	0.69	1	0.77	0.80	7	4
5	Norway	0.98	0.15	1	0.26	0.73	0.71	0.57	0.79	0.87	0.75	0.83	3	4
6	UK	0.95	0.15	0.86	0.97	0.72	0.76	0.81	0.92	0.67	0.74	0.82	14	8
7	Netherlands	1	0.12	0.5	0.82	0.59	0.89	0.68	0.86	0.7	0.73	0.82	7	9
8	Denmark	0.99	0.11	1	0.95	0.16	0.8	0.6	0.98	0.79	0.72	0.81	11	11
9	Japan	0.88	0.11	0.56	0.77	0.83	1	1	0.7	0.77	0.72	0.69	18	11
10	Sweden	0.99	0.11	1	0.53	0.54	0.71	0.96	0.7	0.73	0.71	0.83	4	7
11	Germany	1	0.12	0.62	0.44	0.58	0.87	1	0.82	0.56	0.70	0.80	12	10
12	Australia	0.87	0.19	0.15	0.39	0.9	0.84	0.01	0.59	0.98	0.70	0.68	20	14
13	New Zealand	0.87	0.2	0.92	0.34	0.08	0.79	0.23	1	0.89	0.67	0.68	16	9
14	South Korea	0.95	0.19	0.27	1	0.99	1	0.95	0.33	0.42	0.66	0.66	20	17
15	Austria	0.99	0.12	1	0.26	0.28	0.79	0.86	0.54	0.68	0.66	0.78	8	16
16	Chile	1	0.39	0.73	0.28	0	0.28	0	0.37	0.97	0.65	0.72	9	13
17	France	0.95	0.12	0.93	0.77	0.45	0.71	0.73	0.3	0.73	0.64	0.75	12	16
18	Ireland	0.99	0.12	0.97	0.54	0.43	0.91	0.74	0.93	0.1	0.62	0.70	24	20
19	Belgium	0.96	0.12	0.54	0.45	0.13	0.8	0.47	0.42	0.58	0.57	0.72	17	21
20	China	1	0.3	0.04	0.23	0.58	0.24	0.35	0.21	0.29	0.55	0.51	19	18
21	South Africa	0.78	0.56	0	1	0.18	0	0.11	0.28	0.54	0.53	0.66	14	16
22	Spain	0.76	0.12	0.77	0.35	1	0.69	0.39	0.21	0.37	0.53	0.70	22	25
23	Hungary	0.86	0.29	0.56	0.02	0	0.69	0.73	0.14	0.52	0.51	0.67	22	27
24	Mexico	0.85	0.34	0.66	0	0	0.05	0.57	0	0.67	0.51	0.48	25	22
25	India	1	0.29	0.37	0.17	0.03	0	0.16	0.16	0.34	0.50	0.58	18	25
26	Turkey	0.96	0.25	0.62	0	0.24	0.34	0.06	0	0.34	0.48	0.18	29	23
27	Russia	0.97	0.29	0	0	0	0.76	0.44	0.21	0	0.44	0.54	22	24
28	Portugal	0.74	0.12	0.89	0.49	0.39	0.71	0.11	0.43	0	0.41	0.58	26	29
29	Brazil	0.32	0.24	1	0.2	0.24	0	0.3	0	0.75	0.34	0.25	27	27
30	Italy	0.33	0.12	0.78	0.71	0.78	0.69	0.58	0.15	0	0.30	0.44	28	29
31	Greece	0	0.12	0.49	0	0.21	0.42	0.03	0	0	0.06	0.29	30	31

Note: The table below shows the unweighted scores of all components. The ultimate resilience score and rank is determined by weighting the scores according to Table 1 in the main text. On the right, we show average rankings for different periods.

Data curation

Adjustment for outliers and missing values were computed. We imputed missing values using either lagged values or averages for highly time-invariant indicators such as the low-carbon economy, economic complexity and the human capital index. We excluded observations above the 90th and below the 10th percentile. We forced these observations to be equal to the 90th and 10th percentile, respectively, for the majority of the indicators to avoid distorting the 0–1 scores through the “min-max” standardisation approach.

Fiscal space methodology

Fiscal space measures the room a country has to implement policy without facing a sovereign distress situation.¹⁰² We estimate the fiscal space in two steps. (1) Using annual data from 1995 to 2018, we estimate distress probabilities through a panel-probit estimation following previous works.¹⁰³ Our approach uses traditional economic variables such as public debt and current account imbalances, but also takes into account the under/overvaluation of currencies¹⁰⁴ as this is a key adjustment valve for the real economy. Furthermore, we separate and adapt the methodology to advanced¹⁰⁵ and emerging economies.¹⁰⁶ (2) We construct the fiscal space by taking the inverse of the fiscal distress probabilities. Following our analysis of previous fiscal distress episodes, we consider that countries with probabilities of around 30% or higher have de facto no fiscal space. At these levels, distress likelihoods become highly non-linear and exposed to shifts in economic growth momentum and sentiment, as evidenced during the euro area sovereign debt crisis, for example. For the fiscal space indicator, this means that countries with a fiscal distress likelihood of 30% or higher get a zero score, while countries with likelihoods of 0% get a score of 1.

Monetary policy space methodology

The monetary policy space indicator is a completely novel approach which measures the ability to ease or tighten monetary policy, depending on whether the central bank policy rate is below (ease) or above (tighten) the estimated neutral policy rate.¹⁰⁷ This symmetry is important for resilience, because a very high policy rate does not mean more resilience: it could also mean destabilisation as is often witnessed in emerging markets. Given the vast differences in economic and political environment of advanced and emerging economies, we take different approaches for the two segments (see table on next page).

¹⁰² Fiscal distress is defined as a period of extreme government funding difficulty, including credit events associated with sovereign debt, recourse to large-scale multilateral financial support, implicit domestic default (eg. via high inflation rates) and/or loss of market confidence in the sovereign.

¹⁰³ Gerling et al. *Fiscal Crisis, 2017 and Fiscal Space Across the Euro Area*, Goldman Sachs, 2019.

¹⁰⁴ Our approach uses public debt to GDP, the current account and primary balance, GDP growth, the average sovereign debt rating, a measure of government effectiveness and the metric of foreign exchange (FX) pressure. We exclude CDS prices in our analysis since we use a fundamental macroeconomic approach.

¹⁰⁵ For advanced economies we add a cubic spline element to account for the non-linear relationship between debt levels and distress probabilities. Some papers find that low debt levels are beneficial for GDP growth and that they become detrimental at higher levels (Grennes et al. *Finding the tipping point-when sovereign debt turns bad*, 2010; Baum et al. *Debt and growth: new evidence for the euro area*, 2013; Reinhart and Rogoff, *Growth in a Time of Debt*, 2010).

¹⁰⁶ For emerging markets, the debt variable is considered only linearly because our estimation shows a linear relationship between debt levels and fiscal distress. Furthermore, we include FX reserves in months of imports since it is a key metric used by the IMF and the World Bank to assess reserve adequacy in emerging economies.

¹⁰⁷ The domestic neutral policy rate is the central bank interest rate at which it is neither expansionary, nor contractionary for the economy and inflation. We estimate this rate as the long-term real GDP trend growth rate plus the domestic central bank inflation target.

Broadly speaking, the ability to ease in advanced economies is the distance of short and long-term interest rates to the zero lower bound, as well as the US policy stance given its global relevance. This de facto captures the ability and effectiveness of rate cuts and quantitative easing.¹⁰⁸ The closer interest rates are to zero, the lower the resilience score. For emerging markets, the ability to ease is determined by the distance to the zero lower bound, and also by the interest rate differential versus the US and, most importantly, central bank independence.¹⁰⁹ We believe these are key determinants for emerging markets' central banks to conduct monetary policy effectively. The ability to tighten in advanced economies would be to measure how far away the short and long-term interest rates are from the neutral rate and fair value, respectively, though no country falls into this category currently. For emerging markets, it is again most dependent on central bank independence, the policy differential versus the Fed, and the discrepancy of the central bank rate vs neutral.

Since the sub-components of the monetary policy space indicator are already standardised to a 0–1 value range, we do not standardise the ultimate index again to a 0–1 range. Hence, the final score is only 1 if all sub-components are at 1. Since this has never been the case, the highest value in the panel is 0.72. In any case, robustness checks show that applying this approach would only very slightly change the overall macro resilience score of a country, for example by well below 0.01 ppt in 2018 for most countries.

Methodology for advanced economies	Methodology for emerging markets
The ability to ease consists of three sub-components: ■ The CB policy rate buffer: This is the domestic policy rate at a given point in time – 0% as lower bound (50% weight). ■ The 10-year yield buffer: This is the domestic 10-year yield at a given point in time – 0% as the lower bound (10% weight). ■ US policy space: This is a 50%/50% average of the US central bank rate buffer and the US 10-year yield buffer (40% weight). The ability to tighten consists of two sub-components: ■ Central bank rate versus neutral: This is the domestic central bank rate versus a neutral estimate (potential growth rate plus inflation target); (60% weight). ■ Domestic 10-year yield versus fair value: This is the domestic 10-year yield versus a measure of its fair value (potential growth rate plus inflation plus historical domestic term premium); (40% weight).	The ability to ease consists of three sub-components: ■ The CB policy rate buffer: This is the domestic policy rate at a given point in time – 0% as lower bound (20% weight). ■ Policy rate differential versus Fed: This is the z-score of the current policy differential of the domestic central bank vs its historical policy differential versus the Fed (30% weight). ■ Government effectiveness: This is a proxy for central bank independence. (50% weight). The ability to tighten consists of three sub-components: ■ Central bank rate versus neutral: This is the domestic central bank rate versus a neutral estimate (potential growth rate plus inflation target); (20% weight). ■ Policy rate differential versus Fed: This is the z-score of the current policy differential of the domestic CB vs its historical policy differential versus the Fed (30% weight). ■ Government effectiveness: This is a proxy for central bank independence. (50% weight).

¹⁰⁸ Quantitative easing aims to decrease the term premium and lower long-term funding costs. When long-term rates are close to zero, the effectiveness of quantitative easing decreases as funding costs are already very low.

¹⁰⁹ Central bank independence is proxied by the World Bank's worldwide governance measure of government effectiveness, which considers among other elements, how free public institutions are from political interference.

Index weights and empirical relevance

The weights and relevance of the index¹¹⁰ are tested for robustness through various econometric analyses.¹¹¹ The methodology consists of two parts. (1) We identify shocks on GDP growth experienced by a majority of countries at the same time and independent of shock origin (eg, external shocks, credit burst, etc). (2) We undertake empirical testing of whether higher resilience levels are statistically significant in explaining higher shock absorption capacity. Given the data restrictions, the only major common shock across the 31-country sample was the global financial crisis. This tilts the weights of the index that ensure statistical significance disproportionately towards financial indicators, such as the soundness of banks.¹¹² We correct for this bias by adjusting the weights because our intent is to measure an economy's resilience against a broader variety of shocks that are not necessarily financial in nature. Adjusting weights slightly does not change the overall country ranking dynamics substantially, but it can lead to marginally better or worse rankings for individual countries.

¹¹⁰ The weights of the index were proposed and vetted by more than a dozen economists at the Swiss Re Institute and the London School of Economics and Political Sciences. The weights are supported by academic literature

¹¹¹ We follow Sondermann, *Towards more resilient economies: the role of well-functioning economic structures*, 2016, and Blanchard and Wolfers, *The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence*, 2000, to identify common shocks across a panel of countries and to test whether higher scores in the SRI–LSE Macroeconomic Resilience Index are associated with higher shock absorption capacities

¹¹² We increase by 12 ppt the soundness of banks, by 2 ppt labour market efficiency and the financial markets development. We decrease by 10 ppt fiscal space, by 5 ppt monetary policy score, and the human capital score by 1ppt.

SRI Insurance Resilience Indices: data and empirical framework

Natural catastrophe resilience model

Swiss Re's natural catastrophe risk model MultiSNAP generates expected loss distributions for the three major perils: earthquakes, windstorms and floods. These probabilities, along with estimated market portfolios of economic and insured values, are used to estimate the current annual expected economic and insured loss caused by each peril in a particular country. Based on these simulations, expected losses in 34 selected countries were calculated.

Data inputs are GDP by country (or GDP by province for countries where provincial data is available), insurance take-up rate by country and peril, and risk exposure and property concentration by locality. Insurance take-up rate by country and peril are our best approximations given knowledge of each country's insurance markets and regulatory frameworks. Property concentration and risk exposure by locality are based on data collected on insured asset portfolios and natural science-based risk factors, which are proprietary data to Swiss Re.

These proprietary model results are complemented with expected loss estimates for another 120 countries from the United Nations Office for Disaster Risk Reduction's (UNISDR) *Global Assessment Report*. Insurance coverage rates for these countries are based on average historic catastrophe loss data or modelled in relation to GDP per capita for a few countries without sufficient historic data.

Regional index values are derived by back-casting the current model-based estimates based on changes in the share of average historic insured vs economic losses for a region as per our catastrophe loss database.

Mortality resilience index model

To measure the evolution of resilience over time, we measure the development of insurance protection in relative terms (ie, we define mortality resilience indices as the financial protection available divided by the financial protection needed):

- Protection available: the financial resources available include: (1) financial assets (we assume 50% are relevant while the rest is saved for retirement); (2) survivor benefit payments from social security (and other government-sponsored programs); and (3) proceeds from existing life insurance coverage.
- Protection needed: the financial resources needed by surviving dependents is calculated as the sum of: (1) household's income replacement need (we assume 10 times annual household income as adequate); and (2) debt repayment (eg, mortgages).

We measure the mortality I-RI for the working population with dependents (ie, households which have a need for financial protection).

Health insurance resilience index model

To track how the resilience with respect to health care spending has evolved over time, we apply the same concept as for the mortality I-RI (ie, we divide covered healthcare spending by total healthcare spending):

- Protection available: the protection available is the sum of actual health care spending paid by (1) public / compulsory schemes; (2) private health insurance; and (3) “non-stressful” (ie, desired OOP spending on health).
- Protection needed: the total healthcare expenditure regardless of financing mode.

We therefore need to estimate “non-stressful” OOP expenditures. For this purpose, we first perform a cross-country panel analysis regressing the “total” share of household consumption spend OOP on health on country characteristics (explanatory variables) such as income level, healthcare financing system,¹¹³ total healthcare expenditure and the population share (as reported by the WHO) facing catastrophic OOP spending on health. The model allows us to estimate what the country-specific “total” share of household consumption spend OOP on healthcare is under an international benchmark.

However, to calculate the protection available, we are interested in the “non-stressful” part only (ie, excluding the “stressful” part). In the regression model, two explanatory variables drive the stressful part. The first is the healthcare financing system. We assume that with a national health service, OOP expenses mainly exist to steer consumer behaviour. Thus we create a benchmark for non-stressful OOP spending by using the regression model results to predict the counterfactual “what if” outcome of all countries having a national health system. The second is the population share with catastrophic OOP spending, where a higher WHO estimate for that variable is associated with high OOP expenses. Thus in total, to derive “non-stressful” OOP spending, we deduct from the “total” the country-specific OOP spending attributable to the absence of a national health service under the benchmark regression results above, and adjust for a high population share facing catastrophic OOP spending in WHO data, defined as a spending more than 10% of household income OOP on health.

¹¹³ Defined by four groups using 25%, 50% and 75% of total healthcare expenditure paid through government or compulsory schemes as thresholds.

Micro-macro connection models

For this section of the analysis, we constructed two different data sets for two types of models.

For the first set of models, we constructed a panel data set with data for 55 countries with significant natural catastrophe events (economic losses > 1% of GDP) for the period 1990 to 2017. In these models, GDP growth was the dependent variable, modelled as an autoregressive (AR) process. Other explanatory variables were added in different specifications to explore the impact of the shock and recovery from natural catastrophes on GDP growth. Similar AR models were analysed for government expenditure and credit-to-private-sector responses to catastrophe events.

For the second set of models, we constructed a panel data set with annual data for 165 countries for the period 1990 to 2017. For these models, volatility of GDP growth was the dependent variable, also modelled as an AR process, with other growth and volatility-related explanatory variables added to control for the volatility process, including dummies for bank or financial crises. In a number of specifications, the impact of non-life insurance penetration, quality of institutions and a number of other explanatory variables on GDP volatility was explored.

For both models, data on insurance penetration (non-life direct premiums as % of GDP) come from Swiss Re. Real GDP growth, GDP per capita, inflation, gross domestic savings (% of GDP) and other macro series are taken from Oxford Economics. Government expenditure data come from the IMF and domestic credit to private sector (% of GDP) from the World Bank. A set of bank crisis dummies comes from a dataset by Laeven and Valencia,¹¹⁴ in other specifications, dummies for the Asian Financial Crisis, GFC and others, were determined by the authors. The institutional quality dataset is from Aljaz Kuncic.¹¹⁵ Data on natural catastrophes comes from the Swiss Re Institute proprietary natural catastrophe database. We extracted a sub-set of data with information on the economic and insured losses of natural catastrophes of so-called primary perils (earthquakes, storms and floods).

¹¹⁴ F. Valencia and L. Laeven, *Systemic Banking Crises Database: An Update*, IMF Working Papers No 12/163, 1 June 2012.

¹¹⁵ A. Kuncic, *Institutional Quality Dataset 1990–2010*, available at <https://sites.google.com/site/aljaskuncic/research>.

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Swiss Re Management Ltd
Swiss Re Institute
Mythenquai 50/60
P.O. Box
8022 Zurich
Switzerland

Telephone +41 43 285 2551
Email institute@swissre.com

Swiss Re Institute has a global presence with offices in New York, London, Bangalore, Beijing, Hong Kong and Singapore

Authors

Dr Thomas Holzheu
Patrick Saner
Kulli Tamm
Dr Maurus Rischatsch
Roman Lechner

The authors thank the following contributors for their significant support:

Lucia Bevere
Xin Dai
Caroline De Souza Rodrigues Cabral
Simeon Djankov
Jürgen Dornigg
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Andrés Hernandez Cardona
Mayank Raturi
Kai-Uwe Schanz
Rajeev Sharan
Daniel Staib

sigma editor
Paul Ronke

Managing editor
Dr Jerome Jean Haegeli
Swiss Re Group Chief Economist

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Swiss Re Management Ltd.
Swiss Re Institute
Mythenquai 50/60
P.O. Box
8022 Zurich
Switzerland

Telephone + 41 43 285 2551
[swissre.com/institute](https://www.swissre.com/institute)