European Stability Mechanism

Broadening the scope of risk sharing through a European backstop for natural catastrophes

An increased frequency and intensity of climate-related natural catastrophes has created significant challenges for both the private and the public sector. Existing risk-sharing approaches are reaching their efficacy limits, pushing governments to take on an increasing share of the burden as private-sector solutions become less affordable or available.

This paper outlines how adding a European loan-based backstop facility to the risk-sharing hierarchy can contribute to a more efficient solution and why it may enhance private insurers' risk-taking capacity. We elaborate on the mechanics of such an approach and show how it could increase private sector insurance capacity without additionally burdening the public.

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Acronyms

CAT bond	Catastrophe bond
ESM	European Stability Mechanism
GDP	Gross domestic product
NPC	Net present cost
NUTS 2	Nomenclature of territorial units for statistics level 2
USD	United States dollar

Introduction

As climate change-related natural catastrophes increase in frequency and intensity, losses become a growing challenge to society. According to a Swiss Re (2024a) study, economic losses from natural catastrophes reached USD 280 billion worldwide in 2023, of which USD 108 billion were insured. In the same period, Italy, Slovenia, and Greece experienced their costliest-ever natural catastrophe events. The corresponding losses become an increasing burden for affected economies, while insurance protection levels remain or fall relative to the experienced economic losses. Increases in frequency and severity of climate-related events become a growing challenge for adequate risk pricing and reserving. Local insurers may also face a concentration of risks with little room to diversify beyond reinsurance and may have limited interest in and capacity for providing small-scale, high-risk insurance.

While low insurance protection levels are not a new phenomenon, measures to address this issue have recently gained more traction due to an increased focus on climate change. Most current proposals agree on the need for a solution that involves both the public and the private sector, given that the losses from natural catastrophes stretch the limits of insurability. Nevertheless, as a recent World Bank report highlights, disaster risk management currently relies too heavily on retention and more needs to be done to incentivise risk transfer to the private sector. This paper provides one proposal to strengthen private sector participation through public intervention at the European level.

In this paper, we elaborate on how a European backstop facility for natural catastrophes could work in practice, particularly in the context of a broader risk-sharing framework. An ESM blog published in November 2023 sketches how a (loan-based) public backstop to natural catastrophe risks could mitigate the risk of an increasing insurance protection gap, while ensuring that private sector contributions are not curtailed. This paper provides more detailed insights into some of the crucial elements of this proposal, while also noting that it needs to be embedded in a broader framework of climate risk adaptation and mitigation.

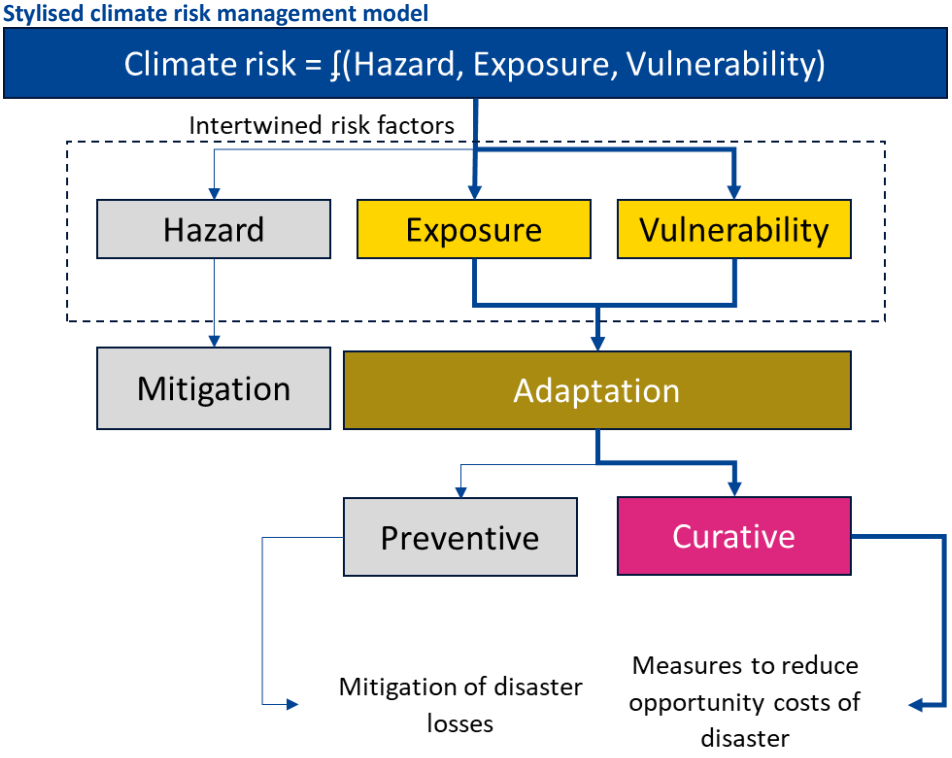
The proposed measure has a functioning private-sector insurance framework at its core. Research indicates that higher levels of insurance penetration, and consequently a lower protection gap, positively impact governmental budgets and can reduce economic contractions that follow a disaster (see Fache-Rousova et al., 2021; Von Peter et al., 2024; Melecky and Raddatz, 2011). Insurance is a measure to strengthen disaster recovery by reducing vulnerability and potentially promoting resilience through impact underwriting, i.e. charging risk-based premia that account for adaptation measures taken by policyholders. The presence of insurance can also reduce the opportunity costs of disasters by freeing up resources that would otherwise be used to deal with any aftermath.

Despite being a supply-side measure, an effective backstop requires demand-side initiatives be rolled out in tandem. Insufficient risk awareness and financial literacy are some of the main factors behind the lack of insurance protection. Another important driver is the expectation of government interventions in the event of a major disaster (see European Insurance and Occupational Pensions Authority, 2024). Relatedly, insurers face reputational risks if they do not honour claims to the extent expected by policyholders or the public, or where public interventions appear more generous, resulting in both demand and supply

implications. Raising risk awareness, including the promotion of adaptation measures to reduce vulnerabilities, addressing any time inconsistency challenges of "no government bailout" clauses, and ensuring reliable consistency of government intervention policies amidst catastrophe events are crucial for the success of efficient natural catastrophe solutions.

While preventive adaptation measures are crucial to ensuring the proper functioning of a catastrophe-related insurance market, we focus on strengthening resilience. As climate-related events continue to become more frequent and more damaging, there may be a point at which some will be unwilling or unable to pay for coverage and insurers will be unwilling to charge less than the actuarially sound price. Risk reduction measures, be it by households and corporates themselves, through governmental investments (e.g. flood barriers), governmental policies (e.g. building codes, zonal restrictions), information initiatives (e.g. websites including locational information on hazard vulnerability), or through insurance support, could lead to lower premia or at least dampen the expected increase due to climate change. Such measures lower vulnerability[1] and/or exposure to risks, thus reducing the likelihood of a backstop being triggered and the amount that it may have to pay out. These measures may also contribute to an increased demand for insurance because they allow for lower premia to cover risks. Nevertheless, for the purpose of this paper and to remove one layer of complexity, we treat preventive adaptation measures as independent or as given and focus primarily on the curative side, strengthening resilience post disaster through improved risk transfer mechanisms (see Figure 1).[2]

Figure 1
Stylised climate risk management model



Source: Authors

[1] Put simply, vulnerability represents the likelihood that assets will be affected when exposed to a hazard.

[2] Adaptation is used here in a broad sense and covers measures to enhance both physical and financial resilience.

Organisation of the note

This paper will discuss why a loan-based backstop could contribute to reducing the insurance protection gap. We investigate how such an approach could work in practice, how it needs to be set up, and what is required to achieve an efficient and effective solution. We note that this is only one aspect of a broader adaptation policy. The expanded risk-sharing policy needs to be duly embedded in a more holistic framework, covering all aspects of climate risk.

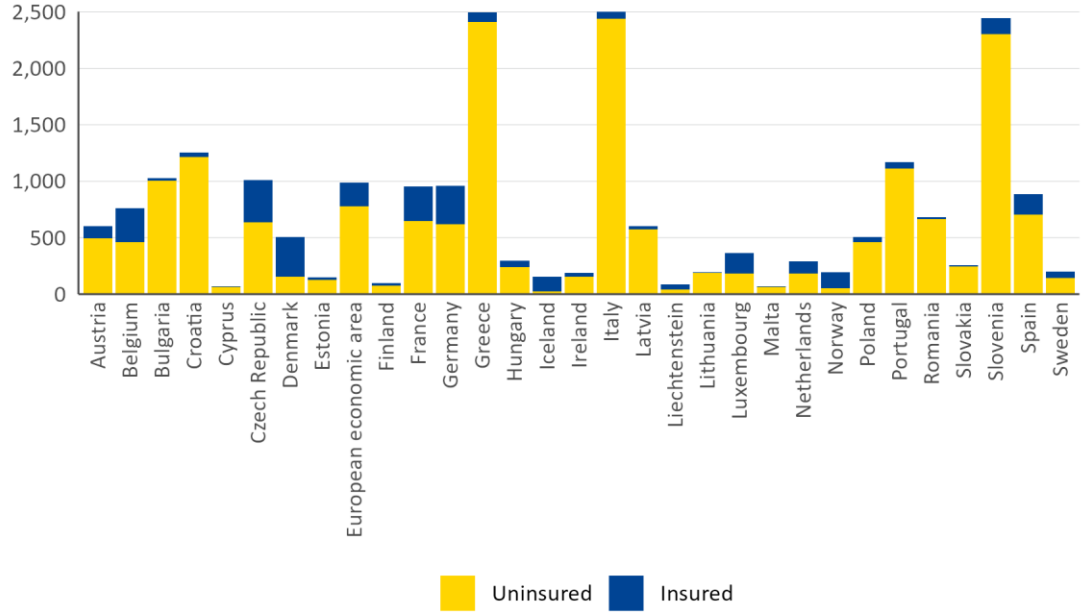
Broken down into three main sections, we emphasise the relevance of reforming existing risk-sharing approaches and suggest one solution to reduce uninsured natural catastrophe losses. As a first step, we briefly describe the scale of the protection gap followed by a discussion of the current setup of risk sharing in many countries. Next, we propose a European extension to the existing risk-sharing framework through the introduction of a private-sector insurance pool backstopped by a public facility. This loan-based facility is then introduced in more detail. We also introduce an additional solution via a capital market structure, akin to catastrophe (CAT) bonds. We then simulate different scenarios with such a backstop solution to show how a loan-based backstop can contribute to an efficient market solution. The public sector involvement is inherently linked to the question of capacity, of both the insurance sector and the backstop, which we subsequently elaborate on. Finally, we discuss next steps in the concluding section.

1. Growing natural catstrophe risks and prevalent risk sharing approaches

The scale of the issue

Economic losses from natural catastrophes have become an increasing concern for most countries. Earthquakes have traditionally caused the biggest losses, but other hazards, such as floods, windstorms, and wildfires, are becoming increasingly worrisome (see Figure 2, which is normalised by gross domestic product (GDP) to allow for better comparability).[3] Climate change plays an important role as it increases the frequency and intensity of such cataclysmic events.

Figure 2
Economic loss for all perils
(in €, per million GDP)



Source: European Insurance and Occupational Pensions Authority

Insurance protection levels tend to be very low. Even if differences exist by type of hazard, overall protection levels remain relatively low across Europe, with both supply and demand factors causing low coverage. Over the last 40 years, on average around 30% of total economic losses from natural disasters have been insured,[4] with considerable variation between hazard types. For instance, 80% of flood losses remain uninsured, while storms have a comparatively higher coverage of 50% (see Figures 3 and 4) These are European averages, but insurance protection levels can be considerably lower for some countries.

[3] Figure 2 combines several perils, namely earthquakes, coastal and non-coastal floods, windstorms, and wildfires.

[4] Depending on the data source, figures can vary somewhat. In all cases, though, they show a sizable protection gap.

Figure 3
Share of uninsured climate-related economic losses by hazard type
(in %, 1980–2021)

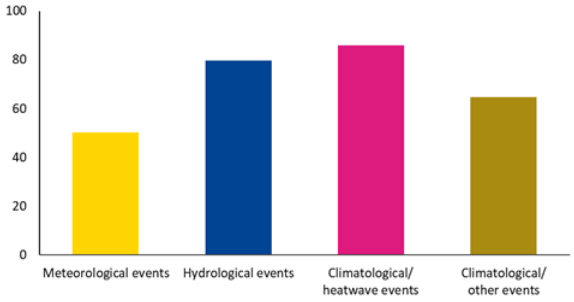
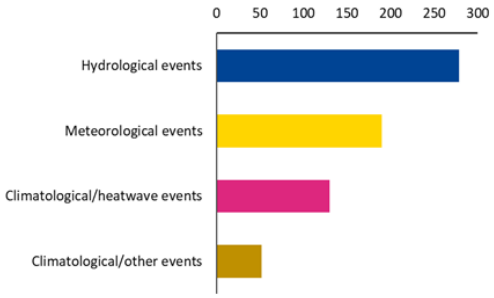


Figure 4
Climate-related economic losses
(in € billion, 1980–2021)



Notes: Meteorological events: storms, mass movements (e.g. landslides, subsidence); hydrological events: floods; climatological events: heat waves, cold waves, droughts, forest fires. The data cover the 27 countries of the European Union.
Source: European Environment Agency

While both demand and supply factors and their interaction significantly impact these low protection levels, it is less clear which is the more dominant driver. Events that happen on a very regular, frequent basis start to become uninsurable as the required premium approaches the actual event's losses. Similarly, an increase in the severity, or even a combination of frequency and severity, of events can result in a strong increase in premia that make an event uninsurable.

Existing risk-sharing approaches

Approaches vary across Europe (see Organisation for Economic Co-operation and Development, 2021) but the government usually plays an important role. Public entities may serve as a catastrophe insurer, as is the case in Spain, act as the reinsurer, as in France, or provide explicit excess of loss coverage beyond existing private insurance protection through a tax-funded catastrophe fund. In addition, there is a broad expectation that the government will intervene when a disaster strikes, providing not only for emergency measures but also eventually supporting the uninsured. Uncertainty about government intervention, however, negatively affects insurers' risk assessment and hinders the development of a private insurance market. At the same time, businesses and households may also be less willing to seek insurance if they expect a government bailout (see De Nederlandsche Bank, 2022).

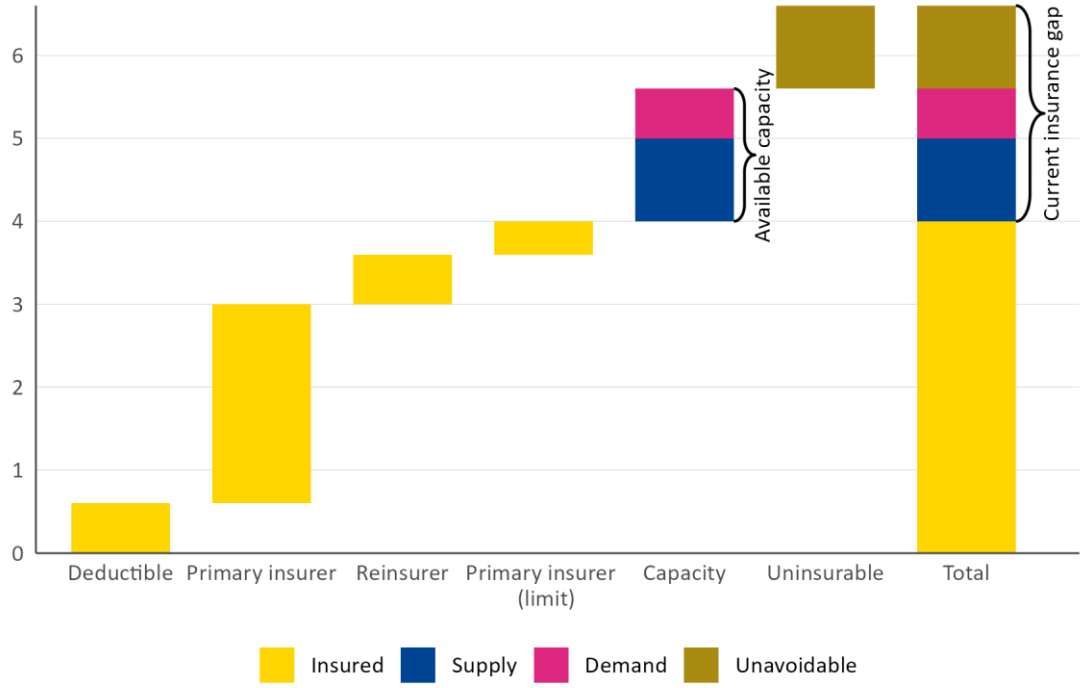
In most countries, catastrophe insurance is voluntary, though can sometimes include quasi-mandatory elements. Catastrophe insurance coverage is either automatically included in the policy, e.g. through a mandatory surcharge to the insurance premium of particular lines of business, or it is attached to one line of business that has a high penetration, such as fire insurance. Being attached to a line of business can lead to higher coverage against disaster risk than if policyholders would have to opt in.

Current risk-sharing models enhance insurance capacity but not enough to address increasing severity and/or frequency of natural catastrophe events. Ignoring any ex-post government intervention, risk sharing generally involves three or four layers. First, policyholders (corporates, in particular) may have to contribute via a deductible or excess.[5] By

[5] A deductible is the amount of loss retained by the policyholder while the insurer will contribute up to the remainer of the sum insured. The excess is similar to the deductible but does not reduce the sum insured.

retaining a small amount of the overall losses, insurers intend to increase policyholders' risk awareness and encourage adaptation. Second, the primary insurer provides the risk coverage but may cede some of risk to the third tier, the reinsurer. In a non-proportional reinsurance contract, the reinsurer covers up to a certain level. Above this exhaustion point, the risks are again borne by the primary insurer (typically up to a contractually agreed limit, which may be exactly at the exhaustion point of the reinsurer). Further diversification can be achieved using retrocession or through the issuance of capital market instruments, such as CAT bonds. This risk-sharing approach enables the primary insurer to underwrite more business than would be within its capacity or risk appetite. However, it leaves a significant gap between insured and total economic losses. These losses are a combination of supply-side and demand-side factors, as well as avoidable risks due to lack of insurability. Parts of these losses can be reduced through capacity enhancement (see Figure 5).

Figure 5
Current risk sharing categorisation
(in monetary units)



Source: Authors

2. New proposal to expand private-public risk sharing

Enhancement of the risk-sharing mechanism

One way to strengthen the supply side is to add another predefined layer to the risk-sharing structure. As explored in a November 2023 ESM blog, a backstop facility at the European level could foster insurance sector participation. Clear communication of the backstop facility's role and coverage is key to reducing uncertainty for insurers' risk assessments. By providing protection against tail risks, it is similar to a reinsurer of last resort at the European level, albeit with some relevant differences in its financing structure. Nonetheless, it should be underscored that the supply side can only be strengthened for non-frequency driven events because a rise in frequency increases insurance premia,[6] rendering such events uninsurable. Protection gaps in such situations can only be minimised by means of other risk mitigation techniques.

Any additional layer to the risk-sharing hierarchy should be set up to also ensure the other layers remain intact. The established structure involving policyholders, primary insurers, and reinsurers should be retained. Reinsurance is key in providing national insurers with increased diversification potential and, as such, an important vehicle in increasing insurance capacity. An increased use of CAT bonds can provide further room for diversification through capital markets. Relative to the reinsurance sector, the CAT bond market is still comparatively small and dominated by the US,[7] but 2023 marked a significant increase in CAT bonds in Europe, with outstanding notional bonds more than doubling compared to previous years as flooding in Germany was a named peril for the first time.[8] Another recent development to extend risk sharing is parametric insurance,[9] which has the advantage of enabling fast payouts.

The introduction of an insurance pool beyond the exhaustion point of reinsurance is required to enable interaction with a European backstop facility. First, it enables national insurers to reap the benefits of diversification beyond reinsurers' exhaustion point. Second, it serves as the counterpart to the European backstop facility because it receives any loan the backstop provides in the event of a sufficiently large disaster and is ultimately responsible for the repayment. Third, it may act as a special purpose entity for the issuance of CAT bonds for events beyond insurance and reinsurance capacity.

Figure 6 illustrates the different impact and loss frequency levels for each layer of the risk-sharing approach.

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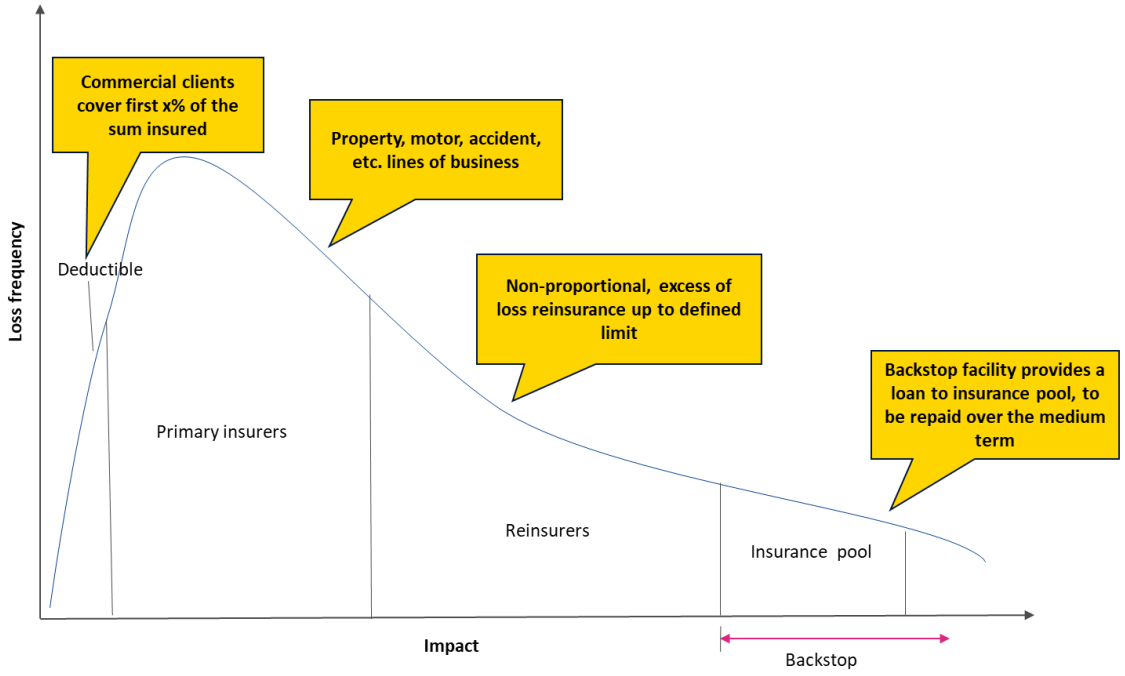
[6] Unless adaption improves at a comparable speed.

[7] According to Artemis, a media service devoted to alternative risk transfer, the size of property CAT bonds outstanding is USD 47.5 billion in 2024, with the majority related to risks or perils in the United States. See Artemis Catastrophe bond and insurance-linked securities market dashboard: https://www.artemis.bm/deal-directory.

[8] See Swiss Re (2024b). According to their report outstanding notional in Europe in 2023 was USD 1,900 million relative to USD 860 million in 2022 and USD 960 million in 2021.

[9] Payouts are based on a parametric trigger rather than a specific indemnity, i.e. payouts are subject to an event meeting pre-defined conditions such as strengths of windstorm, amount of precipitation in specific area, etc. So, technically given the basis risk, one may argue it is not insurance.

Figure 6
Risk-sharing approach



Source: Authors

A European solution offers benefits beyond what national solutions can. Contributions to the insurance pool at the European level reduce concentration risks for the local insurer, increase diversification potential, and leave room for capacity enhancement. Local insurers may be strongly exposed to a particular hazard, but may have limited options to diversify against other hazards that are less common in its jurisdictions.[10] By covering several climate-related (e.g. floods, windstorms, inundations, wildfires, etc.) and other natural hazards (e.g. volcanoes, earthquakes) in Europe, the insurance pool can optimise their diversification potential across time, geography, and risk type relative to national solutions. This way, cost of capital falls significantly and the centralised organisation enables significant efficiency gains in operating costs for the involved insurers. Such a European scheme fosters the increase of (national) insurance capacity, thus broadening the scope of what are considered insurable risks.

A broad coverage of hazards across Europe reduces adverse selection for all involved parties due to different exposure levels for particular hazards. Such an approach would reduce the risk of only a small set of countries benefiting, i.e. those exposed most to a particular hazard, which could foster its acceptance across members states. Enabling the insurer to contribute to a European insurance pool increases its potential to benefit from a more diverse pool of policyholders and less concentrated risk exposure. The diversification gain may feed into the risk pricing and will positively affect its reserving, which in turn frees up further insurance capacity.

[10] CAT bonds could be an option in such cases, but the market is still highly illiquid, with respective impact on price, volatility, and availability.

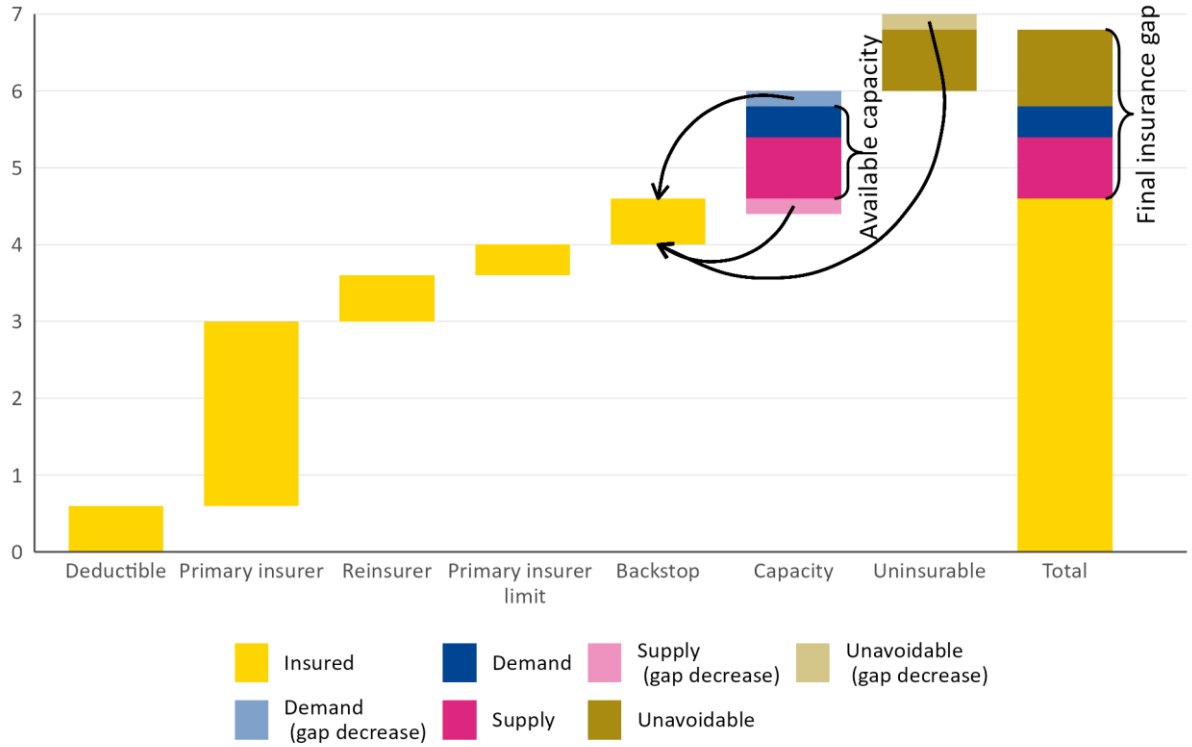
A backstop based on medium-term fiscal neutrality

A loan-based solution ensures that insurers bear both upside and downside risks of the capacity enhancement. When a catastrophe event exceeds the reinsurance limits, the insurance pool bears the losses. To cover the losses and enable fast payouts to policyholders and beneficiaries, a backstop facility would provide a loan to the insurance pool. The individual insurers would contribute to the loan repayment of the pool relative to their market share of catastrophe risk underwriting in the overall European market. In this way, the insurance pool is similar to an additional layer of reinsurance. The primary insurer both pays a premium in to the (re)insurance pool and is able to participate in the insurance pool, allowing primary insurers to further diversify and thus write more business. In addition to covering the costs and expenses of the pool, the premia could (partially) be used to build up an equalisation reserve or rainy-day fund that could be tapped when a disaster hits and thereby reduce the sum of the required loan from the backstop facility.

The backstop facility would provide a loan to the insurance pool to cover risks that exceed the exhaustion limits of reinsurance and primary insurers. The loan is provided at arm's length, at predetermined conditions at a rate that enables the backstop's fiscal neutrality in the medium term. The cost structure should be fully transparent and publicly communicated.

The loan needs to be repaid in the medium term. Fiscal neutrality in the medium term means that the insurers must eventually bear their share of the loan costs. This repayment can be spread over several years, allowing for inter-temporal cost smoothing, and should ensure that costs are not borne by the public.

Figure 7
Risk sharing with backstop facility
(in monetary units)



Notes: Size of layers do not represent actual risk coverage. The backstop acts on capacity and uninsurable risks. It will increase the capacity by mitigating risks for insurers, hence potentially leading to lower premia, and it decreases the amount of uninsurable risk by providing also non-refundable loans.
Source: Authors

Even though a nominal cost to the insurance sector, a loan-based backstop provides net benefits relative to the counterfactual. Insurers will be able to increase their capacity beyond current limits or provide coverage for risks that they would otherwise not have insured, narrowing the gap caused by lack of supply and lack of insurability. Taking the likelihood of the event into account, an actuarially fair premium necessarily accounts for the potential costs related to the crisis loan provided by the backstop facility. Nevertheless, the cost of the loan is likely to be significantly lower than the cost of capital for the insurer, without the pooling solution, while the expected benefits from capacity enhancement will be the same in both scenarios.

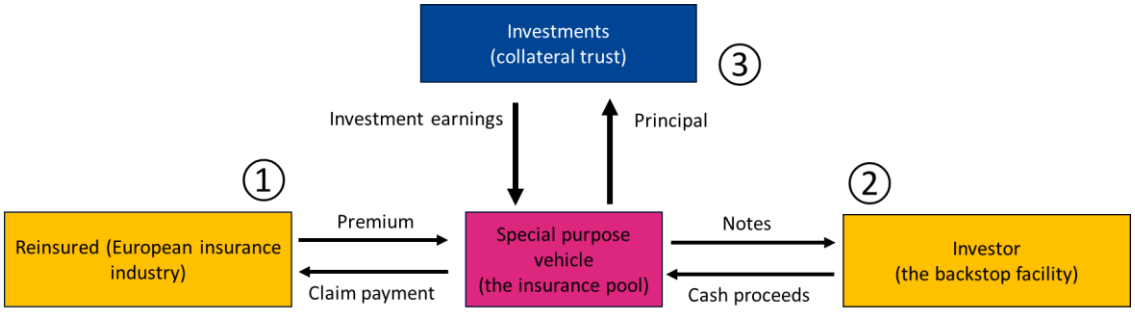
Cheap funding conditions explain the superiority of the backstop solution. A public European backstop facility with a high credit standing can fund itself cheaply on the market, allowing the possibility to pass on cost savings to the insurance pool with a comparatively small markup. Given the expected negligible impact of the disaster event on the credit standing of the backstop facility, significant post-disaster cost increases can be avoided. This enhances the predictability of costs to the insurance pool and, eventually, to the individual insurers.

The proposed backstop scenario would "create" capital that the insurer can use for capacity expansion or other efficiency purposes, a possibility lacking in the current structure. The backstop would be able to provide loans to the insurance pool at conditions that are not profit-oriented and based on the risk-free rate plus a spread covering commissions and other expenses. Furthermore, while future reinsurance premia are expected to increase substantially after an event of a size that triggers a backstop loan, the future backstop loan charges are less immediately affected, even if a higher intensity of events needs to be accounted for. In addition, relative to the currently available options, the backstop's ability to pay out quickly to the insurance pool significantly reduces the individual insurer's liquidity risk, which may stem from time lags ("coordination failure") between claim settlements and loan payouts.[11]

In addition to the loan-based solution, one could consider a capital instrument-based solution. The insurance pool, as a special purpose vehicle, issues CAT bonds, which are bought by the backstop facility (see Figure 8). These CAT bonds are issued at a rate covering the risk-free rate plus a markup reflecting the risk of being triggered, i.e. a function of probability and impact of the covered natural catastrophe events. They could cover parts of the expected losses and reduce the required loan after a catastrophe event. In calm periods, the backstop facility earns the coupon but foregoes the principal when a sufficiently large disaster strikes. If calibrated well, the long-term expected value of such a CAT bond is zero. In contrast to the ex-post funding in the loan-based arrangement, the backstop facility invests in advance in the targeted capital markets product, while the loan is only issued after the event. It earns the coupon but at the risk of loss in the short term or if the product is not well calibrated.

[11] Enhanced data sharing between the backstop facility and the insurance pool is a prerequisite.

Figure 8
Insurance capacity enhancement via CAT bond type structure



Notes: The European insurance industry enters into a reinsurance contract with the insurance pool (1). The pool issues notes to the backstop facility against regular coupon payments (2). Proceeds from the notes are invested in (high quality) securities, held in a collateral trust (3).
Source: Authors

Comparing insurers' cost of capital against to backstop solution

In many economic situations, a backstop solution could prove more capital-efficient than raising capital on financial markets. A severe natural catastrophe event can require an insurer to raise additional capital to re-establish a sufficient level of solvency. Capital can be raised in various forms, e.g. with debt instruments or equity instruments. However, for solvency purposes, insurers need capital of sufficient quality.

Equity-type capital can be quite costly. The individual costs for an insurer depend not only on the quality of the instrument, but also on various other circumstances. Under the Solvency II framework, cost of capital is currently set at 6%, although proposals to lower it to 4.75% have been under consideration.[12] The United Kingdom, for instance, lowered their cost-of-capital rate to 4% from 6%.[13] A recent study by Swiss Re (2023) finds the cost of equity capital for European insurers to lie between 9.4% and 12.2%.

To compare the costs between a loan provided by a backstop facility and equity capital from financial markets, we can compare the net present cost for the insurer for these two approaches. For the simulations, we assume the following parameters:

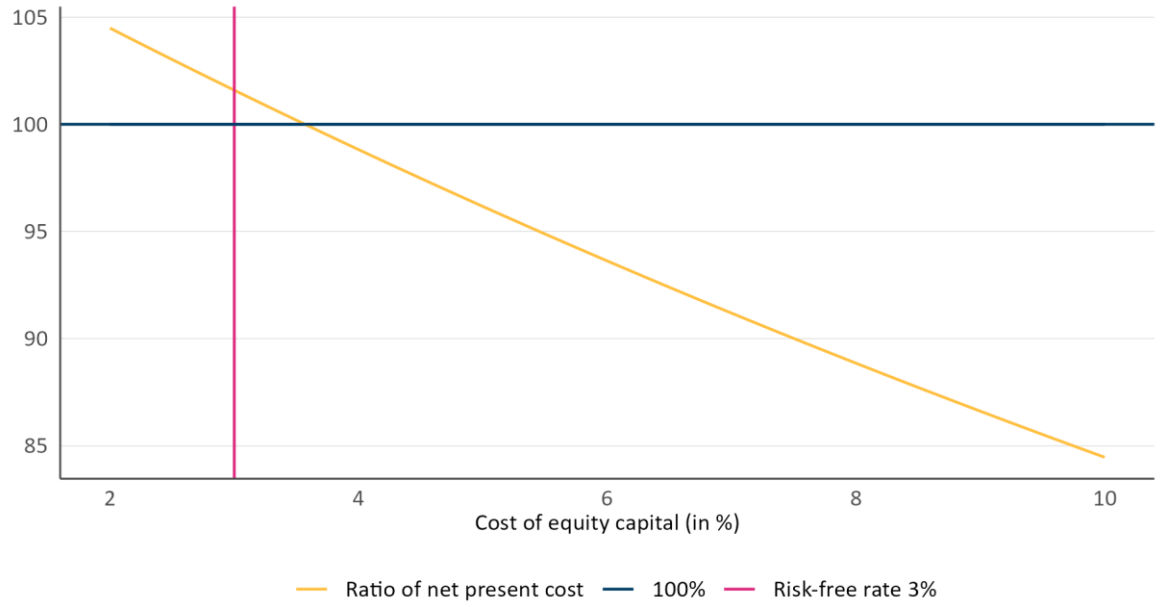
- Upfront fee 0.25%
- Margin rate 0.35% for the first three years, 0.5% thereafter
- Annual service fee 0.1%
- Risk-free rate (five years) 3%

Figure 9 shows the ratio of the costs of the two approaches. A ratio greater than 100% implies that raising money on the capital market is more efficient than using the loan, and vice versa. Even for cost of equity capital below 4%, the backstop solution has the potential to be more cost efficient. More information on the methodology and additional simulations can be found in the Annex.

[12] Amendments to the Solvency II Directive (milliman.com)

[13] Solvency II Review – considerations for year-end 2023 (bankofengland.co.uk)

Figure 9
Comparison of net present costs
(as ratio of net present costs, in %)



Source: Authors

Capacity and breadth of coverage of a backstop facility

A public backstop could support both private and public sector losses, so long as it ensures clear loss attribution. In Europe, the European Union Solidarity Fund was set up as a means-tested vehicle[14] to address short-term budgetary bottlenecks for countries affected by a natural catastrophe or a public health emergency.[15] The fund is limited to uninsurable damage and does not compensate private losses. With different beneficiaries and time horizons, the two models complement each other, and one could consider combining them under one joint umbrella. Trigger levels may, however, be different, and repayments need to be separated into a public and a private part.

To the extent a backstop supports uninsurable risks, costs should not be borne by the insurer nor, ultimately, the policyholder. As the backstop offers a loan-based solution, the insurance industry should only bear costs related to insurable exposures. The uninsurable insurance protection gap, to the extent covered by the backstop, needs to be financed from different sources. This excludes, for instance, the aforementioned post-disaster public expenditures, damages to public buildings – which are usually not privately insured, or events so frequent that they are simply uninsurable. Potential claims could also become so high as to

[14] The European Union Solidarity Fund regulation identifies thresholds for major disaster, which determine eligibility. The event represents either 0.6% of the affected Member State's gross national income, or €3 billion in 2011 prices, whichever is lower. Regarding regional disasters, the total direct damage must exceed 1.5% of regional GDP (at NUTS 2 level). Where the natural disaster concerns several regions, the threshold shall be applied to the average GDP of those regions, weighted according to the share of total damage in each region.

[15] The total fund size is €500 million in 2011 prices plus any amount not spent during the preceding year. Up to a limit, the payments are means tested, as they are linked to the gross national income. For further details see Inforegio - EU Solidarity Fund (europa.eu) or An overview of the EU Solidarity Fund - 2002-2022 | Data | European Structural and Investment Funds (europa.eu).

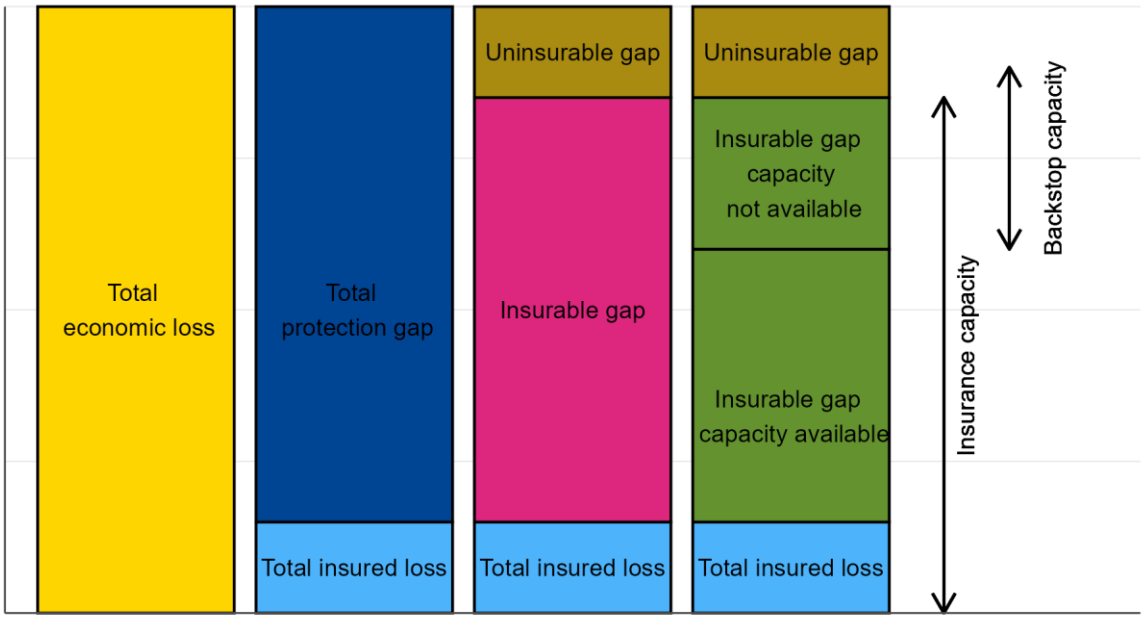
overburden the insurance industry, despite the backstop loan. An insurer should, hence, not be required to bear losses beyond their (extended) capacity limits.

To identify the optimal size of a backstop facility, the maximum industry capacity needs to be identified and a decision taken on the appropriate exhaustion point. Identifying the exhaustion point is not a purely technical decision. Full coverage is likely not socially desirable and may also be counterproductive to the promotion of adaptation measures. Hence, one could limit the backstop to a confidence level that is considerably above the level to which European insurers are required to hold capital against (one-in-200 years) and reinsurance available.

Given current climate change dynamics, the size of the backstop facility may have to grow over time, to keep the confidence level unchanged. In other words, return periods of climate-related events are expected to change. An event that is currently expected to happen once in a century, may arise more often. Adaptation measures may mitigate the impact, but sums insured may still increase (e.g. because more residential and commercial developments are being built in areas prone to natural disasters).

Insurers' capacity to insure disaster losses exceeds current coverage levels. Currently, only a small share of natural catastrophe losses is insured. The largest part remains uninsured. This insurance protection gap can itself be broken down into two main elements (see Thorburn, 2023): an insurable and an uninsurable part. The insurable protection gap includes losses that could have been insured but are currently not. Low insurance provision may be the result of capacity limitations but may also be driven by other factors. Understanding the capacity constraints, is particularly relevant for the appropriate calibration of the required capacity of the backstop facility.

Figure 10
Building blocks of the insurance protection gap and backstop capacity



Source: Building on Thorburn (2023)

The boundaries between available and unavailable capacity are blurred. For our purposes, available capacity is defined as insurance that would be accessible without further (regulatory or other) interventions, but remains idle mostly due to demand factors such as insufficient risk awareness, premium costs, bailout expectations, etc. Unavailable capacity, instead, relates to insurance that cannot be accessed without additional interventions, including adaptation and

other measures that reduce the insurer's risk exposure. In that sense, unavailable capacity can become available with targeted policy interventions.

A backstop could be one important measure to unleash otherwise unavailable insurance capacity. Apart from adaptation measures, the backstop facility's main contribution, as a supply-side measure, is the reduction of uncertainty and, to some degree, lower costs compared to an insurer's cost of capital. This would free up capital for insurers to underwrite business that they would otherwise have been more reluctant to cover.

A loan-based backstop increases insurance capacity, while ensuring that the downside risks are not entirely borne by the public. The fee structure of the backstop should reflect costs of the loan plus maintenance and a small margin. Fees should accurately reflect the costs and not lead to an undue subsidy of private insurance, while cost savings through cheap funding and synergies can be passed on. The aim is to avoid capacity extension with the downside risks being borne by the public.

3. Conclusions and further areas of research

Introducing a loan-based backstop solution to catastrophe risk sharing provides an efficient way to enhance insurance capacity. We show that a loan-based European backstop can contribute to increasing insurance capacity, while also ensuring that fiscal neutrality is preserved. This can reduce significantly the burden on government's budgets, but it also enables additional business opportunities for the insurance sector. However, such a policy can only work if it is part of a broader, more holistic framework.

The backstop solution needs to be embedded in a broader adaptation policy. Adaptation consists of both preventive and curative elements. Effective risk sharing addresses risks once they have materialised. To maintain effectiveness in the long run, it is crucial to combine it with measures that aim at reducing disaster losses. These can include measures such as infrastructure investments, new building codes, adapted zoning and land-use policies, etc. Insurers can also contribute through impact underwriting and incentivising corporates and households to invest in risk mitigation measures.

Appropriate safeguards against moral hazard need to accompany the implementation of a European catastrophe risk backstop facility to be successful. Businesses and households may insufficiently engage in adaptation measures if they perceive their risks fully covered. Furthermore, the perception of continued post-disaster government interventions may hinder the incentive to seek out insurance. If the backstop is not adequately priced, insurers may increase their capacity at the cost of the public. Finally, governments may be inclined to postpone costly adaptation measures and mitigation policies. Several such guardrails against moral hazard by European Union Member States are briefly introduced by the European Insurance and Occupational Pensions Authority and the European Central Bank in their 2023 discussion paper. One of which is making the access to the backstop contingent on the implementation of agreed adaptation strategies and including obligations to curb climate change.

Supply-side measures can only be effective if accompanied by demand-side initiatives. The protection gap is the result of a combination of insufficient demand and supply. Improving the availability of insurance needs to be matched by an increase in demand by prospective policyholders. This requires initiatives to strengthen risk awareness and reduce charity hazard, the inclination to assume that the public will bear the losses.

This paper provides an economic rationale for the establishment of a European backstop facility but leaves some details for further research. Three aspects, only briefly referred to in here, deserve further in-depth elaborations:

1. **Regulatory treatment of an insurance pool**: Depending on how the insurance pool is structured, it may fall under the remit of Solvency II, with corresponding capital requirements and treatment. It also depends on whether it acts as a special purpose vehicle and whether the backstop facility issues letters of credit.
2. **Integration of existing national solutions into broader European scheme**: Further work is required to identify how to best incorporate existing national solutions into a broader European approach. European Union Member States have very different approaches to deal with natural catastrophe financing, including what the role of the government entails. Political buy-in for a European backstop facility necessitates – to the extent possible – the integration of existing regimes. Public catastrophes could become parts of the insurance pool set up to centralise natural catastrophe risks beyond the reinsurance limit (reinsurance exhaustion point). Public reinsurers may continue their role but some alignments in coverage limits may be needed. Unfunded catastrophe funds may be fully absorbed into the

backstop or alternatively be repurposed to cover against losses that are outside the new scheme, for instance emergency measures by public authorities.

3. **Capacity enhancement following the introduction of a European backstop**: Once all details of the approach are settled, it will be possible to estimate the extent of potential capacity enhancement following the introduction of an additional element to the risk-sharing framework, the insurance pool backstopped by a European public facility.

As a direct follow up to this paper, we will assess the potential impact of such a backstop model on insurance capacity. Having established that under most economic scenarios, a loan-based backstop can be a viable and attractive solution to improve insurance coverage levels, we plan to assess the effectiveness such a solution. Concretely, in the next paper we plan to simulate the impact of the backstop on insurance coverage under different scenarios of natural catastrophe events. From this, we can infer the net benefit of such a scheme.

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Annex

Methodology

The methodology used to compare the cost for an individual insurer of raising capital on the market (which possesses characteristics of own funds, i.e. it can be used to cover costs from a catastrophic event) against the cost of a backstop facility is based on a comparison of the net present costs (NPCs) for both elements. We denote the costs for raising money on the market and through a loan from the backstop facility NPC_M and NPC_B, respectively.

The cost of raising amount A on the financial market is assumed to be equal to the cost of equity. Therefore, if we use the cost of equity to determine the discount rate, the NPC will be equal to the raised amount, i.e., i.e. $NPC_M = A$.

For raising money via the backstop facility, we obtain the following

$$NPC_B = uA + \sum_{t=1}^{T} \frac{i\left(A - \frac{t-1}{T}A\right)}{(1+c)^t} + \sum_{t=1}^{T} \frac{L}{(1+c)^t}$$

In this formula, the first part reflects the upfront costs for providing the loan, while the second term represents the interest-rate payments, and the third term represents the repayment of the loan. We have u as the ratio of upfront costs, i as the interest rate charged (i.e. sum of risk-free rate, margin rate, and service fee), T is the maturity of the loan, c the cost of equity of the insurer, and L the constant repayment rate.

Because L are constant amounts, we get that $L = \frac{A}{T}$. Consequently, the above formula simplifies to

$$NPC_B = A\left(u + \sum_{t=1}^{T} \frac{i\left(1 - \frac{t-1}{T}\right) + \frac{1}{T}}{(1+c)^t}\right)$$

A is a factor in both NPC_M and NPC_B and can therefore be assumed to be equal to one. Consequently, the loan is more cost efficient than issuing a capital instrument for an insurer, if

$$\left(u + \sum_{t=1}^{T} \frac{i\left(1 - \frac{t-1}{T}\right) + \frac{1}{T}}{(1+c)^t}\right) < 1$$

holds.

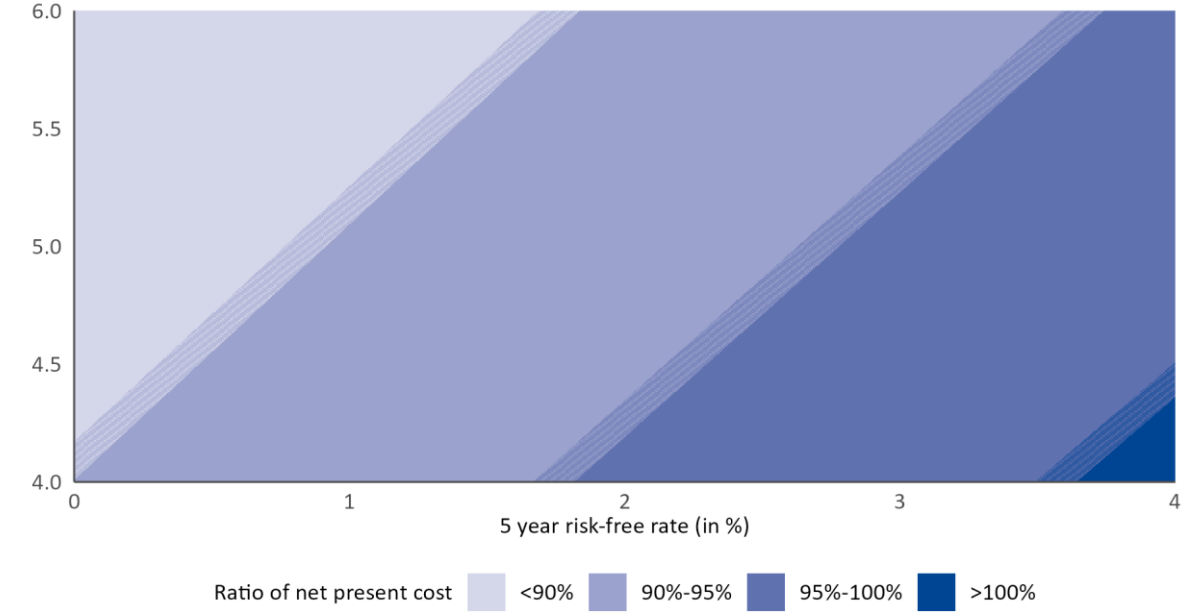
Simulations were run for pairs of risk-free rates and cost of equity.

The analysis for various pairs of risk-free rates and cost-of-equity capital is presented in Figure 11. Like above, the loan provides a more capital efficient solution if the ratio is below 100%. For most scenarios the loan solution is more efficient than raising capital on financial markets. The regions represent the following. The colouring of the respective region indicates by how much the two NPCs differ. The bottom right region is the only region in which raising capital on financial markets is more capital efficient than using the backstop

loan.

Shaded areas indicate that differences are extremely small and are close to the borderline between the two regions. Similar results, though not shown here, have been found for loan maturities of three and 10 years.

Figure 11
Comparison of net present costs
(as ratio of NPC)



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