University of St.Gallen

Insurability of Pandemic Risks

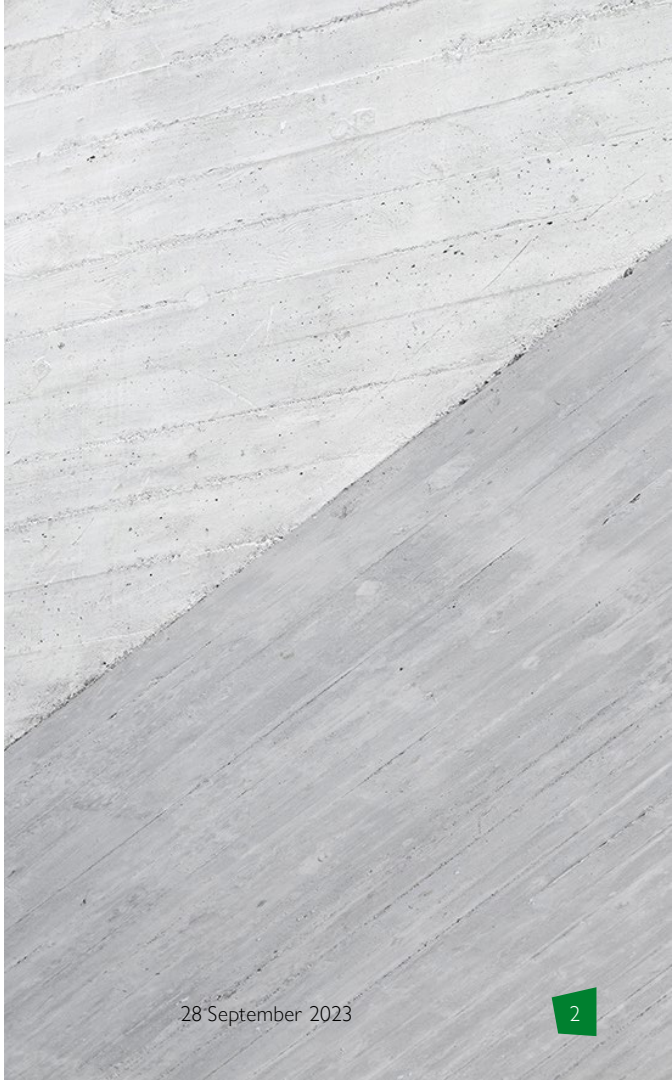
Hannover, 28 September 2023

Anastasia Kartasheva

From insight to impact.

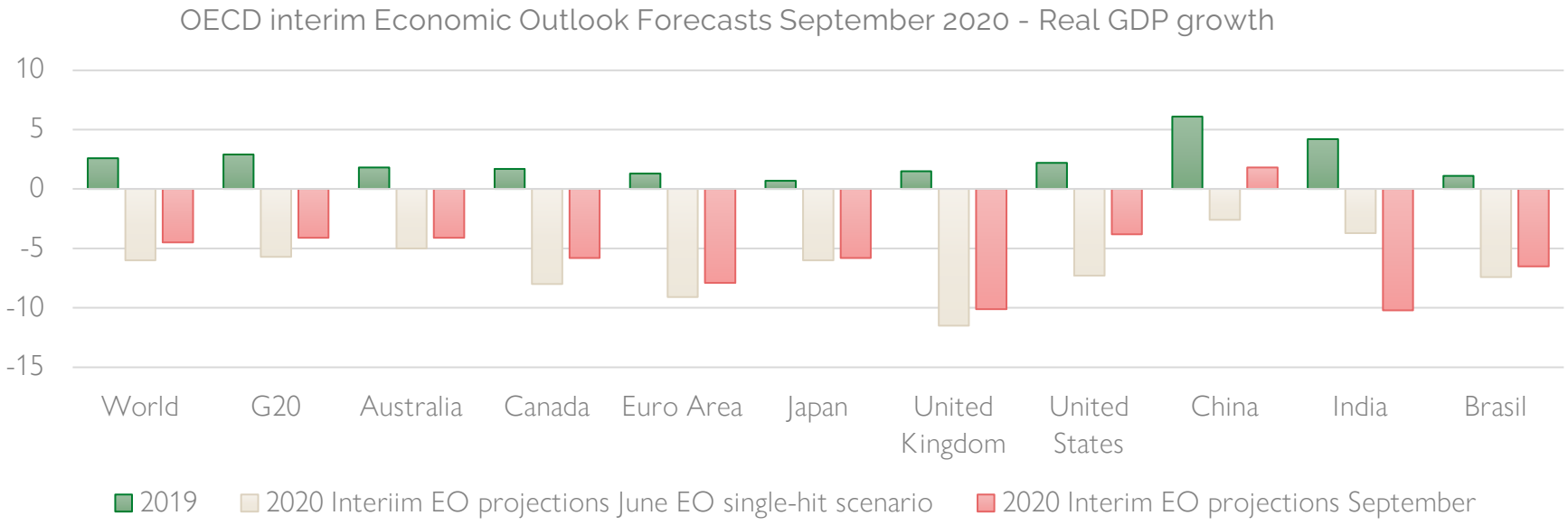
Agenda

1. Covid-19 economic impact and the response to it
2. Is there scope for pandemic insurance
3. Remedy for business interruption: insurance or credit access
4. How should future intervention be structured



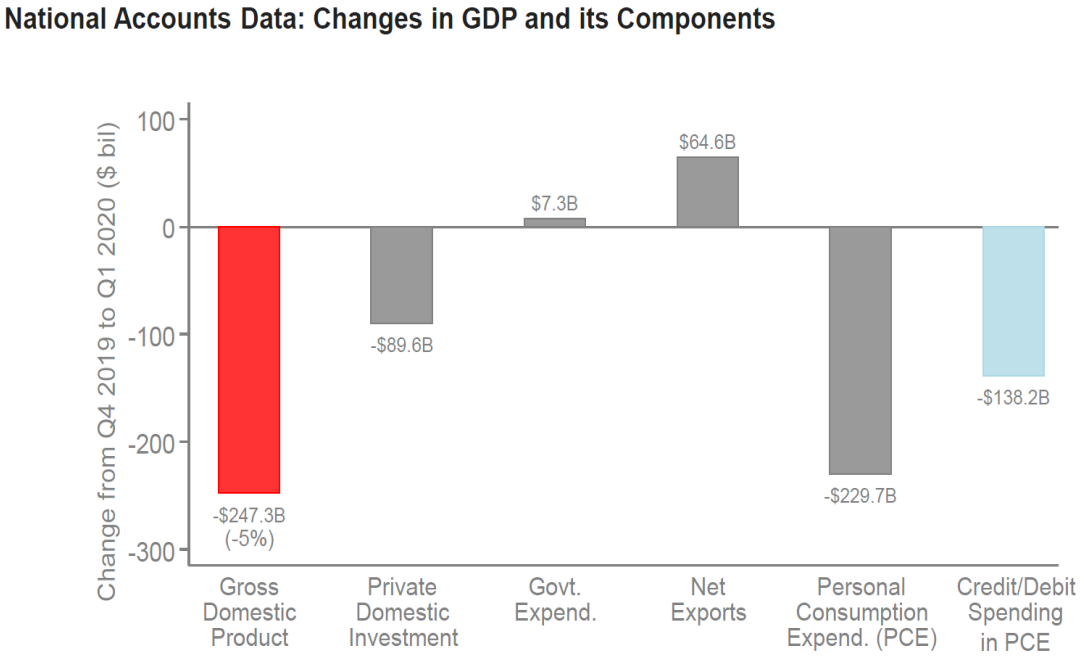
Economic impact of Covid-19

Economic impact of COVID-19



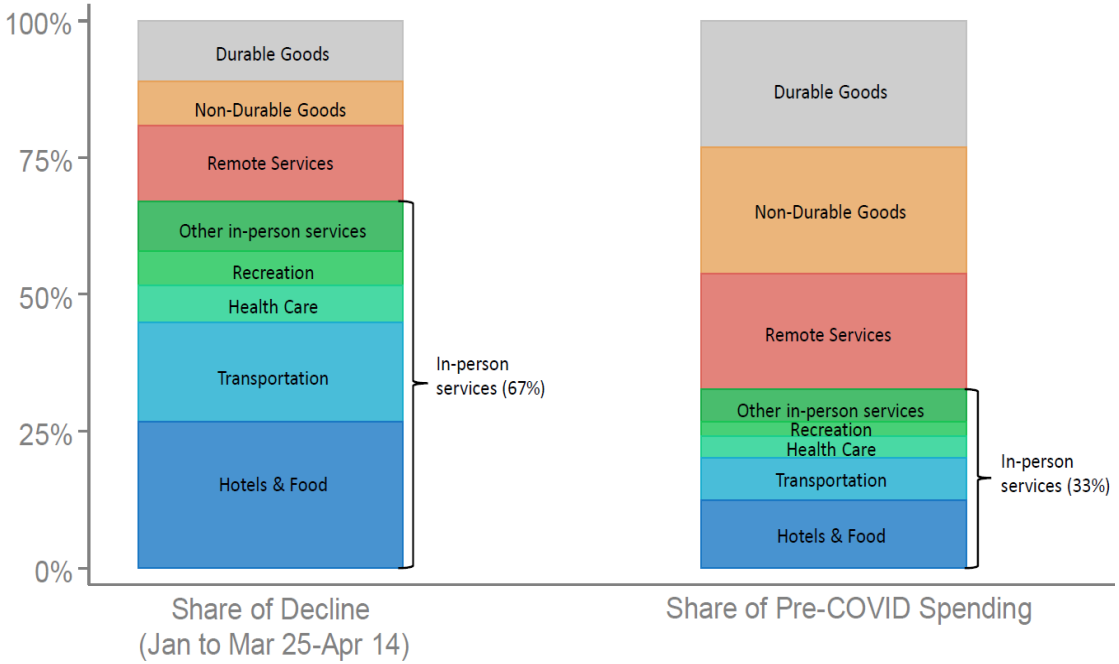
Source: OECD. (2020). OECD Economic Outlook, Interim Report September 2020. OECD Publishing.

Economic impact of COVID-19 on US GDP



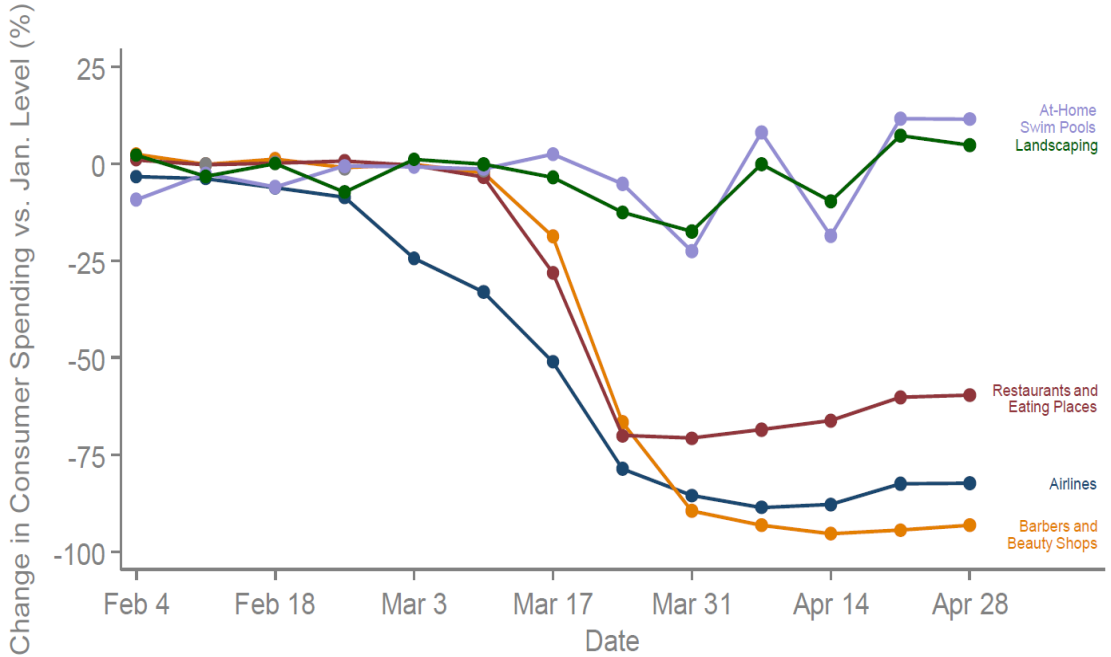
Source: Chetty et al, How did COVID-19 and stabilization policies affect spending and employment? A new real-time economic tracker based on private sector data, June 2020 @MarcusAcademy

Changes in consumer spending by sector



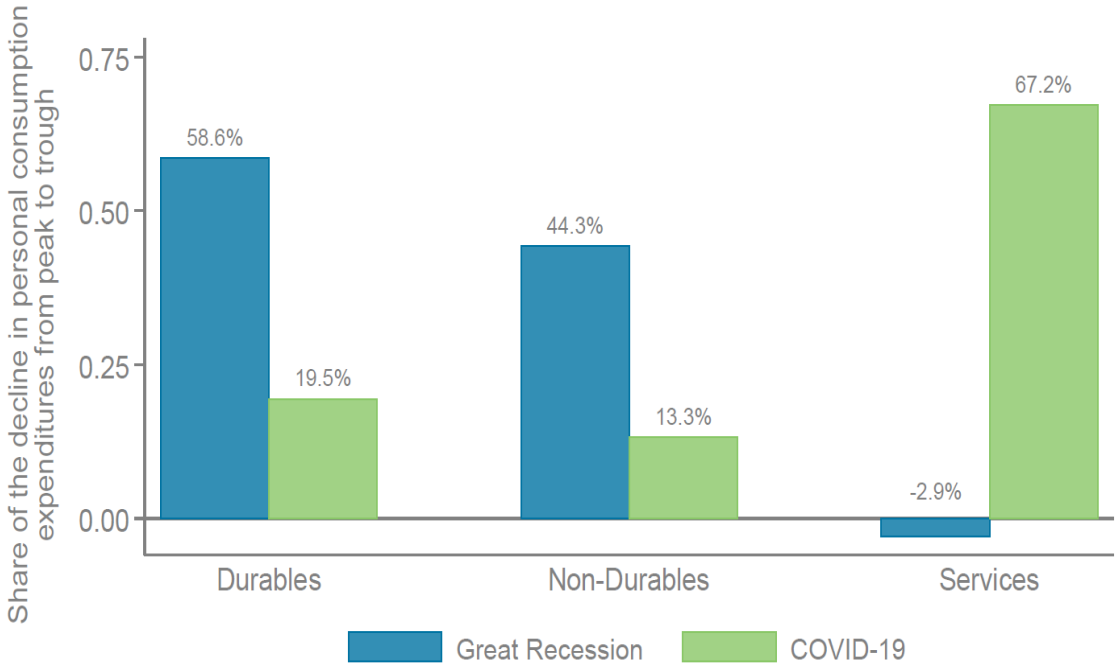
Source: Chetty et al, How did COVID-19 and stabilization policies affect spending and employment? A new real-time economic tracker based on private sector data, June 2020 @MarcusAcademy

Changes in consumer spending by sub-category



Source: Chetty et al, How did COVID-19 and stabilization policies affect spending and employment? A new real-time economic tracker based on private sector data, June 2020 @MarcusAcademy

Covid-19 vs Great Recession



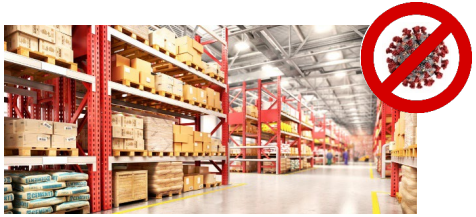
Source: Chetty et al, How did COVID-19 and stabilization policies affect spending and employment? A new real-time economic tracker based on private sector data, June 2020 @MarcusAcademy

Insurance industry reaction to Covid-19

Which areas had been hit by Covid-19?

Travel insurance

Business interruption



Credit Insurance

Event insurance

Health insurance

Life insurance

Legal situation and its discussion in Switzerland and DACH

- Business interruption insurance usually only covers physical damage
- Policies without this requirement (Non-Physical Damage Business Interruption) are rare and usually have a pandemic exclusion clause
- However, an expert opinion by the ombudsman for private insurance comes to the conclusion that “various contractual clauses that provide for an exclusion of benefits in the event of a pandemic are unusual and/or unclear”
- Industry often offered voluntary compensation payments despite the pandemic exclusion clause (e.g. Bavarian solution in Germany or voluntary payments from Helvetia to catering companies)

«Exclusion is not an attempt by the insurer to shirk a payment that is owed to it. Rather, the fact that risks must be excluded corresponds to the legal concept of the Insurance Contract Act. However, according to Art. 33 VVG, the exclusion of a risk is only valid if it is excluded 'in a specific, unambiguous version'»

(Walter Fellmann in a media release on a legal opinion he prepared on exclusions from epidemic insurance, which was commissioned by the ombudsman for private insurance companies)

How did Swiss insurance companies react?

- Swiss insurers faced a significant drop in profit in 2020
- A big part of covid-19- related claims stem from business interruption and travel insurance
- In some cases, e.g., Mobiliar, catastrophe provisions were used

Der Schweizer Versicherer Helvetia hat im letzten Jahr einen deutlichen Gewinneinbruch hinnehmen müssen. Am Jahresende 2020 stand unter dem Strich ein IFRS-Ergebnis nach Steuern von 281,7 Mio. Franken (2019: 538,1 Mio. Franken). Die Netto-Schadenbelastung durch Corona lag bei der gesamten Helvetia Gruppe bei insgesamt 97,5 Mio. Franken.

Ein Großteil der coronabedingten Schäden basiert laut Helvetia vor allem aus Betriebsunterbrechungen und der Reiseversicherung. Darin eingeschlossen sei auch der im Mai vorgestellte Vergleich mit den Schweizer Gastro-Unternehmen mit Pandemie-Ausschluss in der Epidemieversicherung.

Mobiliar schreibt trotz massiver Corona-Kosten hohen Gewinn

Die Mobiliar-Versicherung hat im letzten Jahr wegen der Pandemie unter einer ausserordentlich hohen Schadensbelastung gelitten. Trotzdem ist der Gewinn nur leicht zurückgegangen.

Agentur sda vor 6 Tagen in Wirtschaft Merken

Mobiliar erleidet trotz hoher Corona-Kosten nur leichten Gewinnrückgang (Archivbild)
KEYSTONE/LUKAS LEHMANN

Unter dem Strich verdiente die Versicherung 437,8 Millionen Franken, wie sie am Dienstag mitteilte. Das ist zwar eine Abnahme um 10,4 Prozent zum Vorjahr. Angesichts der hohen Zahlungen für Epidemie- und Reiseversicherungen hielt sich der Rückgang jedoch in Grenzen.

Die Mobiliar beziffert die Covid-Schadensaufwendungen im vergangenen Jahr konkret auf 530 Millionen. Die genossenschaftlich organisierte Gruppe hatte im Gegensatz zur Konkurrenz von Beginn weg keinen Unterschied gemacht, ob es sich bei Corona um eine Pandemie oder Epidemie handelt.

Gemildert wurde der Covid-Effekt - wie schon bei der Vorlage der Halbjahreszahlen angekündigt - durch die Auflösung von Katastrophenrückstellungen in Höhe von 200 Millionen. Diese Rückstellung sei in schadenarmen Jahren gebildet worden, um Belastungen von solch aussergewöhnlichen Ereignissen abzufedern, so die Mitteilung. Ohne diesen Effekt hätte sich der Gewinn also etwa halbiert.

Insurers response: Key insights

- Typically, insurers were not exposed to pandemic business interruption
- The contracts where coverage of pandemic induced business losses were in grey area ended up in litigation
- Insurers rushed to exclude pandemic and communicable disease risks from their policies

Questions

- **Is this a suitable long-term response of the insurance industry?**
- **Should the insurance industry attempt to offer some coverage for non-damage business interruption losses in future pandemics?**

Insurability of Covid-19 claims (I)

	Insurability criteria	Comments	Assessment
1	Randomness and independence of loss occurrence	Losses are neither random nor independent • Policy decisions to lock entire economies are deliberate and intentional. This means that loss amounts and risk loadings cannot be set • There are no historical data for the policy responses witnessed during COVID-19 • The strong interrelations among individual risks render efficient risk pooling impossible	
2	Maximum possible loss	The maximum possible loss is not manageable for the insurer • The uncontrollable aggregation of losses could be ruinous to the risk pool	
3	Average loss per event (severity)	It is very difficult to keep the average loss amount per event at a moderate level • The average loss for pandemic risk needs to be managed to an accepted level by cover limits and exclusions, as adopted after previous pandemics • In light of current political discussions and stakeholder expectations, the broader acceptability of cover limits post COVID-19 is questionable	
4	Exposure units	The number of independently exposed policyholders (exposure units) is too small • As the economy as a whole is affected simultaneously by a pandemic, insurers cannot build risk pools that are large enough and that diversify the losses. The law of large numbers does not work	
5	Information asymmetries	Information asymmetries limit insurability • Insurers are likely to face higher demand from exposed sectors (adverse selection) and have to expect less risk-conscious behaviours (moral hazard) • The mitigation potential (e.g. through contract wordings) is limited	

In principle, a large market could emerge for insurance against consequential damage caused by a pandemic or by the risk management measures taken (lockdown)

Insurability of Covid-19 claims (II)

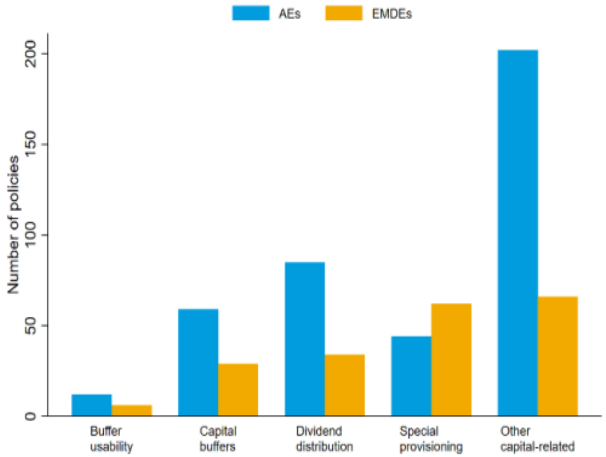
6	Insurance premiums	Insurance premiums are not economically viable • As pandemics threaten most, if not all, members of the risk pool at the same time, the probability of loss (in addition to severity) is very high	
7	Cover limits	Cover limits present challenges of complexity • Non-physical trigger definitions create complexity (compared with clearly describable property damage events) which can be problematic for both the insurer and the insured	
8	Public policy	Pandemic risk coverage should be in the public interest • Issues could arise from certain government interventions (e.g. compulsory insurance requirements)	
9	Legal restrictions	Pandemic risk coverage should be compliant with existing legal and regulatory restrictions • There might be a 'risk of change'[25] or a 'warlike' scenario of the public sector 'taking over' and rewriting the rules that underpinned pricing and risk assessment during 'peace times'	

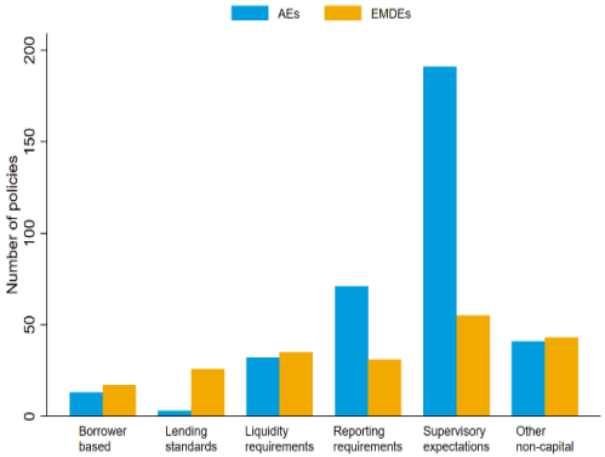
- *Highly problematic*
- *Problematic*

Government intervention amid Covid-19

Policy measures during Covid-19 – prudential policies

Advanced economies (AE) versus emerging and developing economies (EMDE)



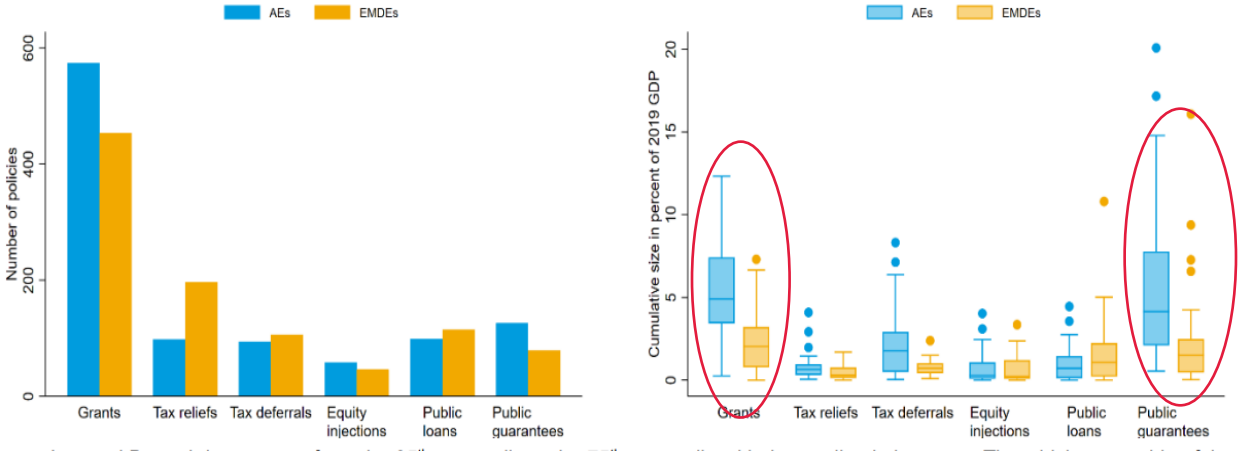


A variety of prudential policies were used

Source: Kirti, M. D., Liu, Y., Peria, S. M., Mishra, M. P., & Strasky, J. (2022). Tracking Economic and Financial Policies During COVID-19: An Announcement-Level Database (No. 17879). International Monetary Fund.

Policy measures during Covid-19 – fiscal policies

Advanced economies (AE) versus emerging and developing economies (EMDE)

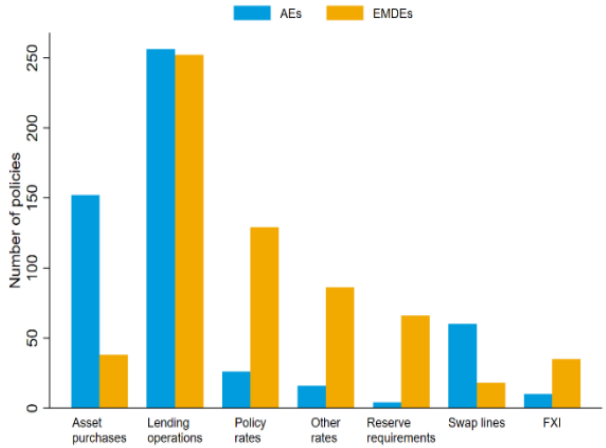


Grants and public guaranties were the predominant form of fiscal intervention.

Source: Kirti, M. D., Liu, Y., Peria, S. M., Mishra, M. P., & Strasky, J. (2022). Tracking Economic and Financial Policies During COVID-19: An Announcement-Level Database (No. 17879). International Monetary Fund.

Policy measures during Covid-19 – monetary policies

Advanced economies (AE) versus emerging and developing economies (EMDE)



Lending operations were the predominant form of monetary intervention.

Source: Kirti, M. D., Liu, Y., Peria, S. M., Mishra, M. P., & Strasky, J. (2022). Tracking Economic and Financial Policies During COVID-19: An Announcement-Level Database (No. 17879). International Monetary Fund.

Government response: Key insights

- The government policies employed focused primarily on providing liquidity support.

- Grants & tax reliefs were also employed frequently in 2020, providing some kind of de facto coverage for incurred losses.

COVID-19 State Loan Guarantee Programs

France, Germany

Key features of selected bank guarantee programmes — Table 1

Jurisdiction[6]	Beneficiary	Coverage ratio/ maximum loan size	Closing date	Terms	Loan maturity
France *(Bpifrance)*	All types of company[9]	70–90% (higher for smaller firms); cap of 25% of 2019 revenue or two years of payrolls	31 Dec 2020	No payment in the first year; interest rate set by the bank, guarantee cost ranging over 25–200 bp	Can repay by end-2020, or extended by a maximum of 5 years
Germany *Bundesregelung Kleinbeihilfen 2020*	SMEs	100% for loans up to: EUR 500,000 for firms with 50 employees; EUR 800,000 for others[10]	31 Dec 2020	Loan rate to be determined for each company by the bank	n/a
Germany *(Kreditanstalt für Wiederaufbau (KfW))*	Companies of all sizes	90% for SMEs, 80% for others;[11] EUR 1bn per company	31 Dec 2020	Loan is subsidised (lower interest rate range for SMEs)	Up to 5 years

Source: BIS (2020). Public guarantees for bank lending in response to the Covid-19 pandemic. Financial Stability Institute (FSI) Brief No. 5 2020.

COVID-19 State Loan Guarantee Program

US & UK

Key features of selected bank guarantee programmes — Table 1

Jurisdiction[6]	Beneficiary	Coverage ratio/ maximum loan size	Closing date	Terms	Loan maturity
USA *Paycheck Protection Program (PPP) – CARES Act*	SMEs	100% to end-2020;[19] up to the lesser of USD 10m or a payroll-based amount	20 June 2020	1% interest rate; optional interest payment holiday for first 6 months	2 years
United Kingdom *Coronavirus Business Interruption Loan Scheme (CBILS)*	SMEs	100% up to GBP 250,000, 80% above GBP 250,000; up to GBP 5m	n/a	Interest holiday in first 12 months;[18] guarantee fee waived, lenders pay a fee; loan terms set by each lender	Up to 6 years
Switzerland	Companies with turnover below CHF 500m	100% up to CHF 500,000, 85% up to CHF 20m; cap of 10% of annual turnover and never above CHF 20m	30 July 2020	0% interest rate up to CHF 500,000; portion over CHF 500,000: 0.5%, plus a premium on the remaining 15% of the loan	Up to 5 years

Source: BIS (2020). Public guarantees for bank lending in response to the Covid-19 pandemic. Financial Stability Institute (FSI) Brief No. 5 2020.

Empirical Evidence

Firms' participation in the COVID-19 loan programme*

Lucas Marc Fuhrer, Marc-Antoine Ramelet and Jörn Tenhofen

December 28, 2020

Abstract

This paper analyses the determinants of firm participation in the Swiss COVID-19 loan programme, which aims to bridge firms' liquidity shortfalls that have resulted from the pandemic. State guaranteed COVID-19 loans are widely used by Swiss firms, with 20% of all firms participating, resulting in a sizeable programme of 2.4% of GDP. We use a complete firm-level dataset to study the determinants of firm participation. Our results can be summarised as follows. First, participation was largely driven by the exposure of a firm to lockdown restrictions and to the intensity of the virus in the specific region. Second, we show that less liquid firms had a significantly higher probability of participating in the programme. Third, we find no clear evidence that firm indebtedness affected participation in the programme and no evidence that pre-existing potential zombie firms participated more strongly in the loan programme. Fourth, we show that the programme reached younger and smaller firms, which could be financially more vulnerable as they are less likely to obtain outside finance during a crisis. Overall, we conclude that given its objective, the programme appears to be successful.

Source: https://www.snb.ch/de/mmr/papers/id/working_paper_2020_25

Empirical Evidence

Journal of Financial Economics
Available online 12 August 2020
In Press, Journal Pre-proof

Loan Guarantees and Credit Supply ☆

Natalie Bachas [a], Olivia S. Kim [b], Constantine Yannelis [c]

Abstract

The efficiency of federal lending guarantees depends on whether guarantees increase lending supply or simply act as a subsidy to lenders. We use notches in the guarantee rate schedule for Small Business Administration (SBA) loans to estimate the elasticity of bank lending volume to loan guarantees. We show significant bunching in the loan distribution on the side of the size threshold that carries a more generous loan guarantee. The excess mass implies that increasing guarantee generosity by one percentage point of loan principal would increase per-loan lending volume by $19,000. Excess mass increases in periods with guarantee generosity, and placebo results indicate that the effect disappears when the guarantee notch is eliminated.

Source: Bachas, N., Kim, O. S., & Yannelis, C. (2020). Loan guarantees and credit supply. *Journal of Financial Economics*.

Is there scope for pandemic insurance?

H Gründl, D Duxha, A Kartasheva, H Schmeiser, “Insurability of Pandemic Risks”, ***Journal of Risk and Insurance*** *2021, 88:863-902*

Research approach

Analyze a hypothetical insurance contract that provides income in the event of business closures due to a pandemic

- Use a novel dataset developed by Chetty et al and Opportunities Insights Team
- The data uses private sector data on consumer spending, small business revenues, employment, job postings, and education

Compare the pricing of a hypothetical insurance contract to insurance pricing of natural catastrophe risks

- Model insurance supply of catastrophe risks
- Estimate the model using the actual prices of catastrophe risk insurance in the US
- Compare the price markups of the existing NatCat insurance and of the pandemic insurance contract

Evaluate the factors driving pandemic insurance prices and possible public policy and financial market solutions

- Consider an intertemporal risk-sharing mechanism

Data to model the loss distribution of a hypothetical NDBI during COVID-19

Our objective is to model the impact of infection rates on economic activity

- For this purpose, we link two types of data
  - the transaction data on consumer spending, small business revenues, employment and job postings in the US on zip code level reported daily
  - daily information on the new COVID-19 infections at the zip code level

- Data sources
  - Opportunities Insight Team data: Uses the transaction data from several private data partners, anonymizes them and combines the series from different sources on a single platform
  - CDC data on daily infection rates

Pandemic insurance contract

- A contract designed to compensate the loss of income to individuals employed in sectors that require in-person physical interaction

- **Contract terms**

  - up-front premium P
  - trigger: declaration of an epidemic/pandemic by a national or a supranational authority, or a shut-down mandated by the government
  - Payout: a monthly payment of C for T months

- **Hypothetical contract calibration**

  - C equals to $2000, $1500 and $1000
  - T is 12 month

Pandemic insurance pricing: Theoretical framework

Framework: three-moment CAMP model of Kraus and Litzernberger (1976)

«in a two-point in time setup with t=0, 1, the insurance premium $P_{o,j}$ of policyholder j for (pandemic) claim payments $S_{1,j}$ is determined by the three factors,

$$P_{o,j} = \frac{1}{1+r_f}\left[E(S_{1,j}) - b_1 P_{0,j}\beta_{S_{1,j}} - b_2 P_{0,j}\gamma_{S_{1,j}}\right]$$

- First term is the expected claim payment: insurance premium is given by the discounted certainty equivalent
- Next two terms are adjustments for systematic risk
- The first factor/adjustment reflects the systematic risk and has the market risk premium denoted by b1
- The second factor/adjustment reflects systematic coskewness and b2 stands for the market coskewness premuim

What determines insurance price in a three-moment CAMP framework?

$$P_{o,j} = \frac{1}{1+r_f}\left[E(S_{1,j}) - b_1 P_{0,j}\beta_{S_{1,j}} - b_2 P_{0,j}\gamma_{S_{1,j}}\right]$$

- A systematic risk premium charge resulting from a negative systematic risk comes into play
  (a) if the pandemic loss tends to be above average in times of below-average capital market returns
  (b) if the pandemic loss to be insured tends to be above average when the pandemic loss rate is above average, too

- A premium charge resulting from the last loading factor takes place if above average loss payments prevail in situations of large deviations of the market portfolio return from its mean

- The more severe the losses are in situations of extreme capital market returns, the higher the markup on the insurance premium losses becomes

Pricing model for catastrophe insurance market

$$\ln(1+\lambda)_{it} = \beta_{vol} \ln\left(\sigma^2_{vol}\right)_{it} + \beta_{FT} \ln\left(\sigma^2_{FT}\right)_{it} + \beta_M \ln R_{it} + \gamma_i + \theta_t + \varepsilon$$

Variables

- $(1+\lambda)_{it}$ the markup of insurer *i* in year *t*
- σ^2_{vol} the volatility of the loss distribution of insurer *i* in year *t*
- σ^2_{FT} the fatness of tail of the loss distribution of insurer *i* in year *t*
- R_{it} the rating of insurer's *i* in year *t*;
- γ_i insurer fixed effect
- θ_t year fixed effect

Data on the US catastrophe insurance market

- NAIC annual regulatory filings
  - Direct premiums written in NatCat exposed lines of business at the state level
  - Schedule P data on losses paid on NatCat lines of business
- Frequency and severity of natural catastrophes across regions in the US
  - Aggregated using SHELDUS data on losses caused by natural hazards
- Market data from Bloomberg
  - insurers' stock return, stock market indices and interest rates
- Rating data from A.M. Best
  - Insurers' financial strength ratings during 2001-2010

Pricing of Catastrophe Insurance

	Ln (Markup)
Ln ($ES_{1\%}$)	0.1451***
	(0.0022)
Ln (Rating)	0.0385
	(0.0272)
Constant	-2.1198***
	(0.1495)
R^2	0.41
N	60,167

- Markup for NatCat coverage is higher for losses with higher expected shortfall
- A 10% increase in expected shortfall translates in 1.5% increase in markup

Pricing of Catastrophe Insurance by line of business

Ln (Markup)	(1)	(2)	(3)	(4)
Ln ($ES_{1\%}$)	0.0904***	0.0853***	0.0834***	0.1612***
	(0.0030)	(0.0059)	(0.0050)	(0.0047)
Ln (Rating)	0.0535*	0.1312**	-0.0461	0.1041**
	(0.0309)	(0.0648)	(0.0511)	(0.0482)
Constant	-0.7095***	-2.3710***	-1.2469***	-2.7699***
	(0.1448)	(0.3119)	(0.2578)	(0.2889)
R^2	0.68	0.55	0.70	0.51
N	20,938	11,214	9,527	18,488

Note: (1) Auto physical damage; (2) Commercial MP; (3) Homeowner/ Farmowner; (4) Special property.

- Markup for NatCat coverage is higher for losses with higher expected shortfall for all line of businesses

Estimating the loss distribution of the pandemic insurance contract

- **Severity of losses**

  - Model the impact of infection rates on economic activity, using county level infection rates and the data on economic activity in 2020
  - Estimate the predicted new unemployment cases caused by the rise of the infection rate in each county in the US
  - Estimate the total new claims and the claim costs as a function of the infection rate

- **Frequency of losses**

  - Growing frequency of emerging infection diseases that originate in wildlife and enter human population
  - Ebola, HIV/AIDS, SARS
  - In terms of the global impact, COVID-19 has 1-in-100-year frequency

Impact of infection rates on initial unemployment insurance claims

	[01.02 -28.03]	[29.03 -27.06]	[28.06 – 30.09]	[01.02 -30.09]
Covid-19 New Case Rate weekly	29.0734***	0.9153***	-0.0536	0.6937***
	(6.2932)	(0.2834)	(0.0738)	(0.1511)
R^2	0.27	0.78	0.91	0.62
N	10,779	17,974	16,538	45,291

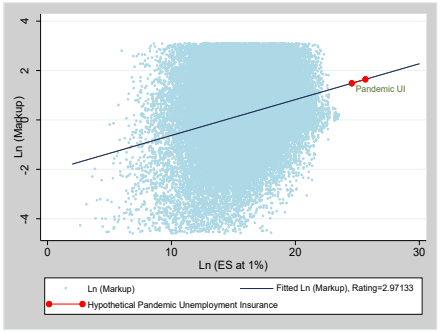
- Higher infection rates lead to a rise of new unemployment claims.
- Economically significant effect: the rise of the infection rates similar to the New York first wave of COVID-19 in March-April 2020 leads to around 1.2 million new unemployment claims and reduces employment in the bottom quantile by 7%.

Expected shortfall of the hypothetical insurance contract

The expected shortfall of calibrated pandemic insurance loss distribution is about 50-100 times higher than the expected shortfall of a NatCat event estimated in any of the regions on industry aggregate level

Contract Payout	industry level $ES_{1\%}$	1% market share $ES_{1\%}$
$2,000	$ 4.6 trillion	$46 billion
$1,500	$ 3.5 trillion	$35 billion
$1,000	$ 2.3 trillion	$23 billion

Estimated pandemic insurance markup compared to NatCat markup



- Expected shortfall of the pandemic insurance contract is higher than for NatCat risks
- The markup of an insurer that covers 3% of the market is between 4.5-5 times the expected loss
- The estimated markup correspond to the top 20% of the markup in the NatCat market
- **There is scope for private market but it may be limited**

Intertemporal Risk Sharing Mechanism

- Insurability of pandemic risk is limited by:
  - High accumulation risk of pandemic losses
  - Lack of geographical diversification
  - High prices reduce affordability of pandemic insurance coverage
- Diversify risk over time
  - 50 years, all insurers selling pandemic coverage are mandated to participate
  - An intermediary accumulates a fund by charging reinsurance premiums
  - Funds are disbursed in the years of the pandemic
  - In case the fund is insufficient (pandemic occurs in yearly years), the intermediary can borrow from the financial market to replenish the deficit
  - Analogous to Arrow-Debreu complete market environment

Impact of the risk-sharing mechanism on the loss distribution

- The risk-sharing mechanism replaces the loss distribution $\tilde{L}_t$ in year t with an average loss distribution across 50 years,

$$\tilde{L}_A = \frac{1}{50}\sum_{t=1}^{50} \tilde{L}_t$$

- Impact on the expected shortfall and pandemic insurance markup: 50% reduction in the expected shortfall

Market share	$ES_{1\%}$, $ billion	Est markup (1+λ)	Quantile
3%	69.3	4.68	21.58%
2%	46.2	4.41	22.75%
1%	23.1	3.99	24.91%

- Implementation challenges: entry and exit, insurers' incentives to price risk, public authorities; incentives for preparedness and actions during the outbreak

Remedy for business interruption: insurance or credit access?

Remedy for business interruption in case of a pandemic

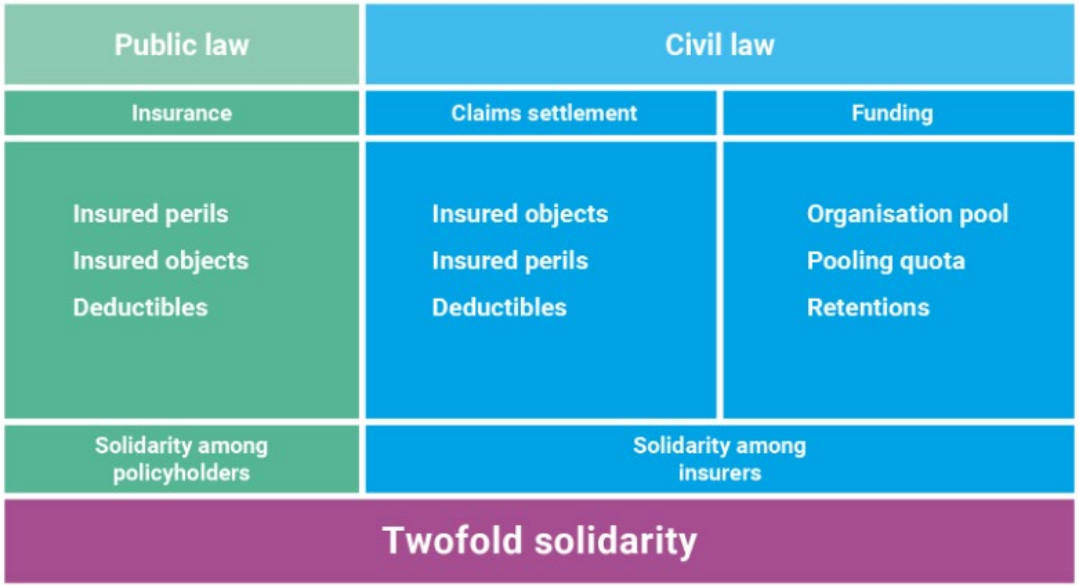
- Combination of monetary and fiscal policy design and implementation can prove successful, yet….
- Ad hoc policy design amid the crisis unavoidably creates:
  - Moral hazard issues
  - Capital allocation inefficiencies
  - Cost of grants or government guarantees is ultimately borne by taxpayers
- The frequency of epidemics and pandemics is expected to increase in the coming decades
- **Design of the explicit ex-ante rules and instruments for the resilience to future pandemics can be beneficial**

How should future intervention be structured?

Swiss natural perils pool

- A joint enterprise by the 12 private insurers that cover over 90% of the natural perils market.
- No inter-temporal risk sharing

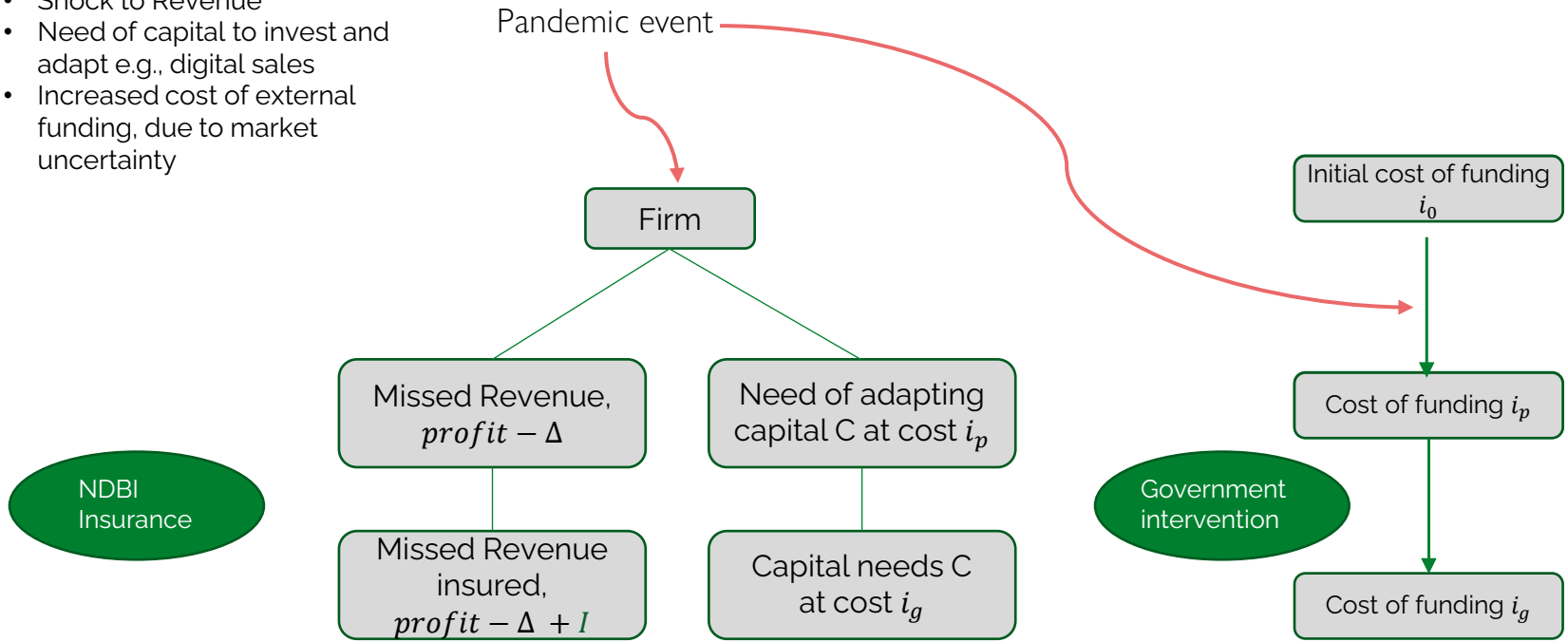
New proposal for addressing earthquake risks through a capital pool



Source: Affordable natural perils insurance thanks to the ES pool | SIA (svv.ch)

Addressing non-damage business interruption (NDBI) risk

- Shock to Revenue
- Need of capital to invest and adapt e.g., digital sales
- Increased cost of external funding, due to market uncertainty



Challenges in designing a pandemic insurance structure

- Claim pools vs capital pool
- Sectors in the scope of BI insurance : mandatory participation
- The trigger to start the coverage and moral hazard of the authorities imposing the policies
- Insured perils: fixed costs (rental, leasing, license and patent payments) or lost revenue
- Solidarity of the insurance premiums
- Differential participation across insurers: ability to very exposure to risk across insurers and providing compensation for bearing the risk
- Information issues in the implementation of public-private partnerships

Vielen Dank.

Anastasia Kartasheva
Associate Professor
+41 71 224 79 95
anastasia.kartshaeva@unisg.ch

University of St.Gallen

University of St.Gallen
Dufourstrasse 50
9000 St.Gallen

unisg.ch

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