Compound Risks

Combining COVID-19 and Climate Shocks in Macroeconomic Models for Stronger Financial Resilience

October 28, 2020

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Compound risks are happening

The New York Times

Tropical Storm Delta Strikes a Louisiana Region That Was Already Reeling

Delta made landfall as the 10th named storm to hit the United States this year, and six weeks after Hurricane Laura hit Cameron Parish.

Coronavirus, climate and locusts

East Africa's children face multiple crises

UNICEF

© FAO/Sven Torfinn

A swarm of desert locusts

Vietnam floods and landslides displace 90,000 people as new cyclone nears

More than 100 so far reported dead or missing after two storms destroy homes and leave trail of destruction

▲ Residents have been shocked by the scale and speed of this year's flooding. Photograph: Manan Vatsyayana/AFP/Getty

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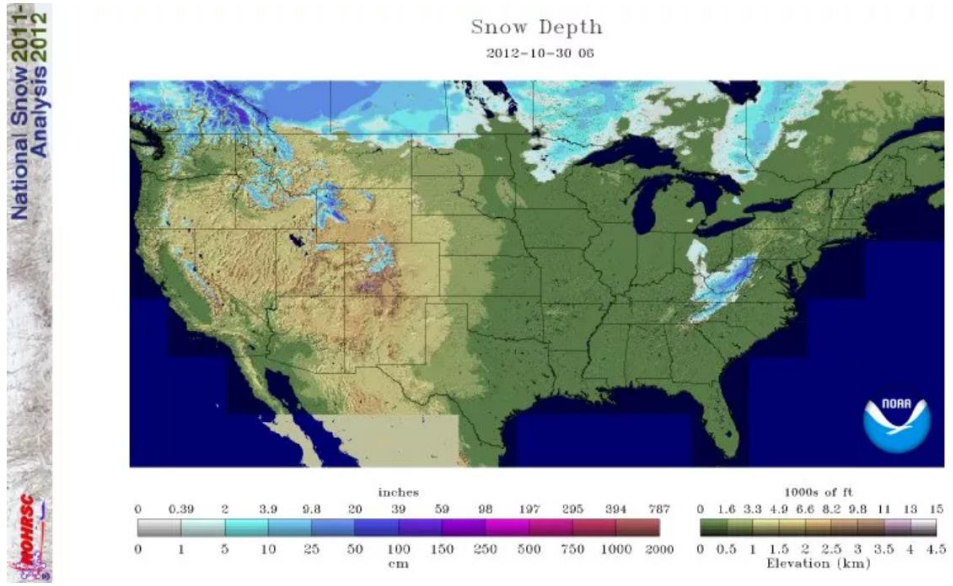
Compound risk is not new

How Superstorm Sandy Became a Snowstorm

By Stephanie Pappas October 30, 2012



Snowfall amounts from Superstorm Sandy as of Oct. 30, 2012.
(Image: © NOAA)

Chile earthquake of 2010

WRITTEN BY
John P. Rafferty

Chile earthquake of 2010, severe earthquake that occurred on February 27, 2010, off the coast of south-central Chile, causing widespread damage on land and initiating a tsunami that devastated some coastal areas of the country. Together, the earthquake and tsunami were responsible for more than 500 deaths.

Chile earthquake; Concepción
The remains of a destroyed building, Concepción, Chile, Feb. 28, 2010.
Natacha Pisarenko/AP Images

The Global Food Crisis

NATIONAL GEOGRAPHIC

The End of Plenty

BY JOEL K. BOURNE, JR.

PHOTOGRAPHS BY JOHN STANMEYER

EGYPT

Stung by soaring food prices, angry Egyptians throng a kiosk selling government-subsidized bread near the Great Pyramid at Giza. Across the globe, rising demand and flat supplies have rekindled the old debate over whether production can keep up with population.

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OPENING REMARKS

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KEYNOTE SPEAKER

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Compounding COVID-19 and climate risks: implications for macro-financial risk assessment and policy preparedness

Authors: Irene Monasterolo (WU, IIASA), N. Dunz (WU), A. Mazzocchetti, M. Mistry and A. Essenfelder (UNIVE)
Project coordinated by I. Monasterolo and M. Billio (UNIVE)
Supported by: Marco Raberto (UNIGE), Stefano Battiston (UZH, UNIVE)

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Understanding compound risk: issues at stake

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- **Climate** risks for **financial stability** (Battiston ea 2017)
- Climate change doesn't happen in isolation: **it can compound with other risks (COVID-19, finance)**
- Our understanding of how risks compound is very **limited**
- Yet it is crucial to **avoid underestimating risks:** non-linear dynamics amplify losses and delay recovery
- **Implications** for recovery policy, World Bank operations:
  - disaster risk financing and fiscal management of climate risks
  - compound risk consideration in financial risk management

IMF Will Include Climate in Country Analysis, Georgieva Says
bloomberg.com

11:58 AM · Oct 17, 2019 · Twitter Web App

What will you learn

- Why understanding compound risk is crucial to **correctly assess risk**
- What do **macroeconomic models** can/cannot tell you about compounding
- How COVID-19/climate risk interact: **risk transmission channels**, direct/indirect impacts, drivers of results
- Implications for designing **financial preparedness** to compound risks:
  - fiscal risk management and macro-financial risk management

Power of compounding

What do we mean with compound risk?

- 2 or more risks of different nature that occur in the same time and trigger non-linear effects

Non linearity: the output does not change in direct proportion to a change in any of the inputs

-> magnitude of shock is not proportional to the outcome of the sum of individual shocks

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It could be worse

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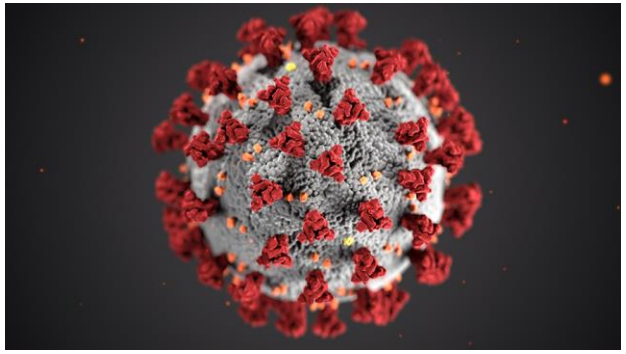
S: WB

COVID-19 crisis (today)



S: WIKI

S: ADB

Global financial crises

S: Investopedia

Current and future climate

Climate change

'Sleeping giant' Arctic methane deposits starting to release, scientists find

Exclusive: expedition discovers new source of greenhouse gas off East Siberian coast has been triggered

Jonathan Watts
Global environment editor

@jonathanwatts

Tue 27 Oct 2020
15.40 GMT

Objective: assess compound risk scenarios and impacts

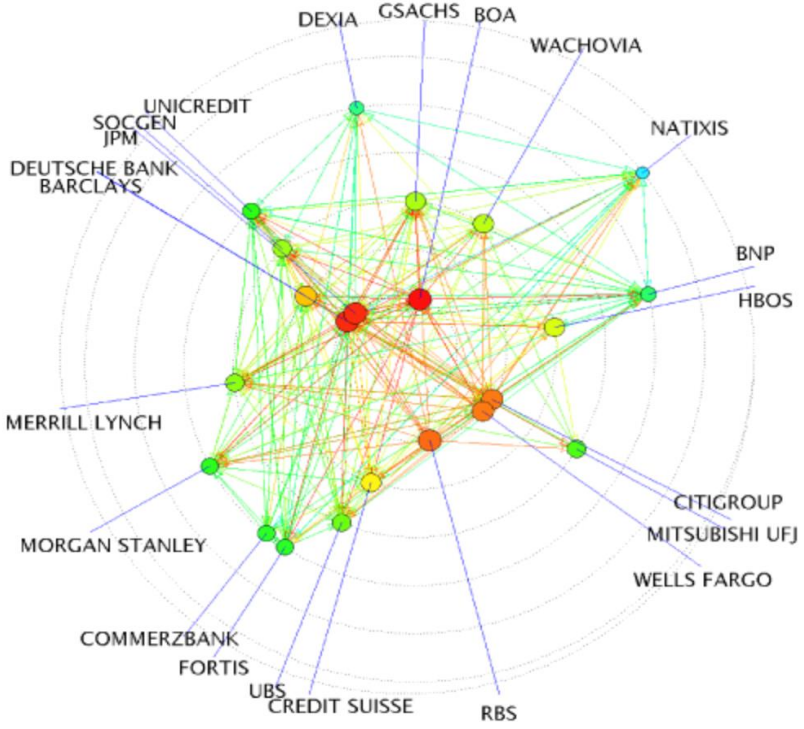
1. **Understand how COVID-19 and climate change interact** and affect a country's socio-economic development and financial stability
   - 4 countries: Jamaica, Philippines, Kenya, Indonesia

2. Analyse **risk transmission channels**, **reinforcing feedbacks**
   - **Focus** on tourism, remittances, export, FDI, government and central bank's responses: analysis of demand/supply side interactions

3. **Inform** COVID-19 recovery measures to build socio-economic and financial **resilience** to compound risk

Nature of risks relevant for today's risk management

- **Deep uncertainty:** tipping points, domino effects not. Vs:*constrained to aggregate averaged impacts on GDP*
- **Non-linearity:** historical data poor proxy of future risk. Vs: *perfect foresight, fast return to equilibrium*
- **Forward-looking** nature of risk: *time horizon* of policy/investment decisions vs models (>2050)
- **Complexity:** financial interconnectedness can amplify shocks and lead to systemic losses (Battiston ea 2012, Billio ea 2012). *Vs: market clearing prices, perfect competition*
- **Endogeneity:** agents' **adaptive expectations** about future risk lead to long term effects
- **In these conditions: *second best world vs optimal policy***



Battiston ea (2012)

Main results

1. **Nature of compound risk** challenges traditional macroeconomic models:
   - *risk characteristics vs model assumptions*
2. Compounding COVID-19/climate risks induce non-linear, long term effects
3. Risk transmission channels and drivers of impacts (**expectations**) matter
4. **Immediate fiscal and monetary response is crucial** to signal investors and support economic recovery
5. Policy response may not be enough alone and can have **unintended effects**

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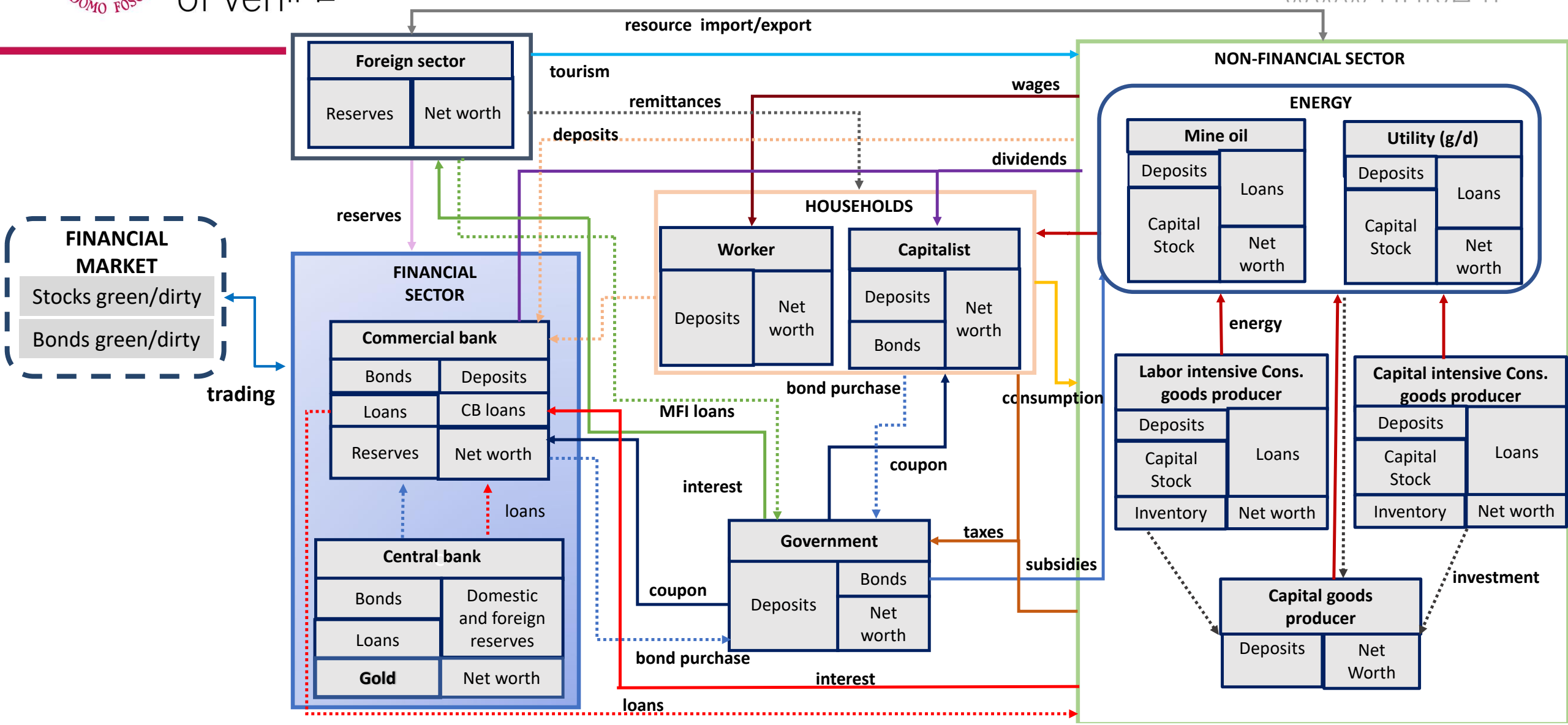
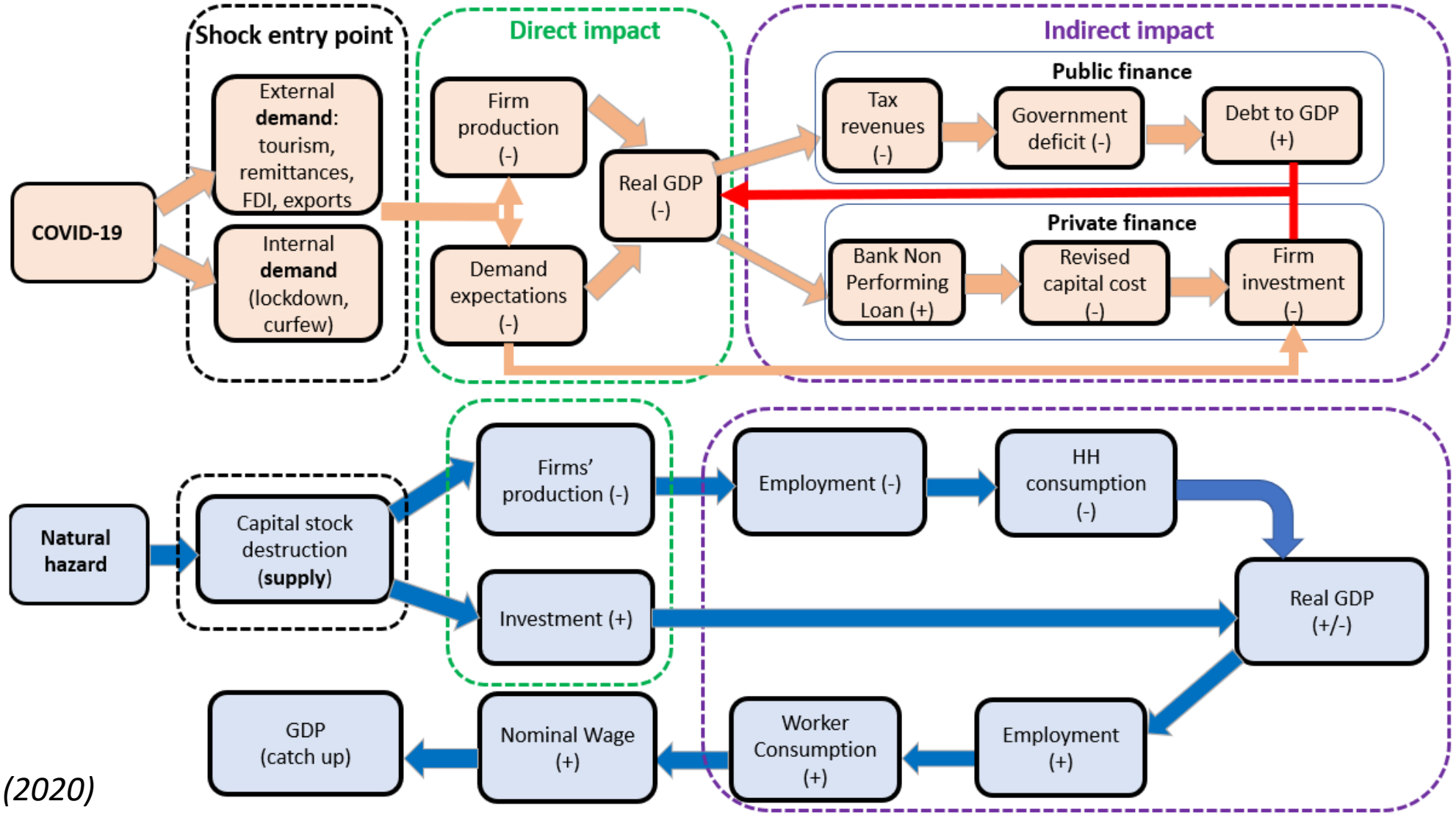
How do we get there: EIRIN model



EIRIN to assess individual risk transmission channels



Source:
Dunz ea (2020)

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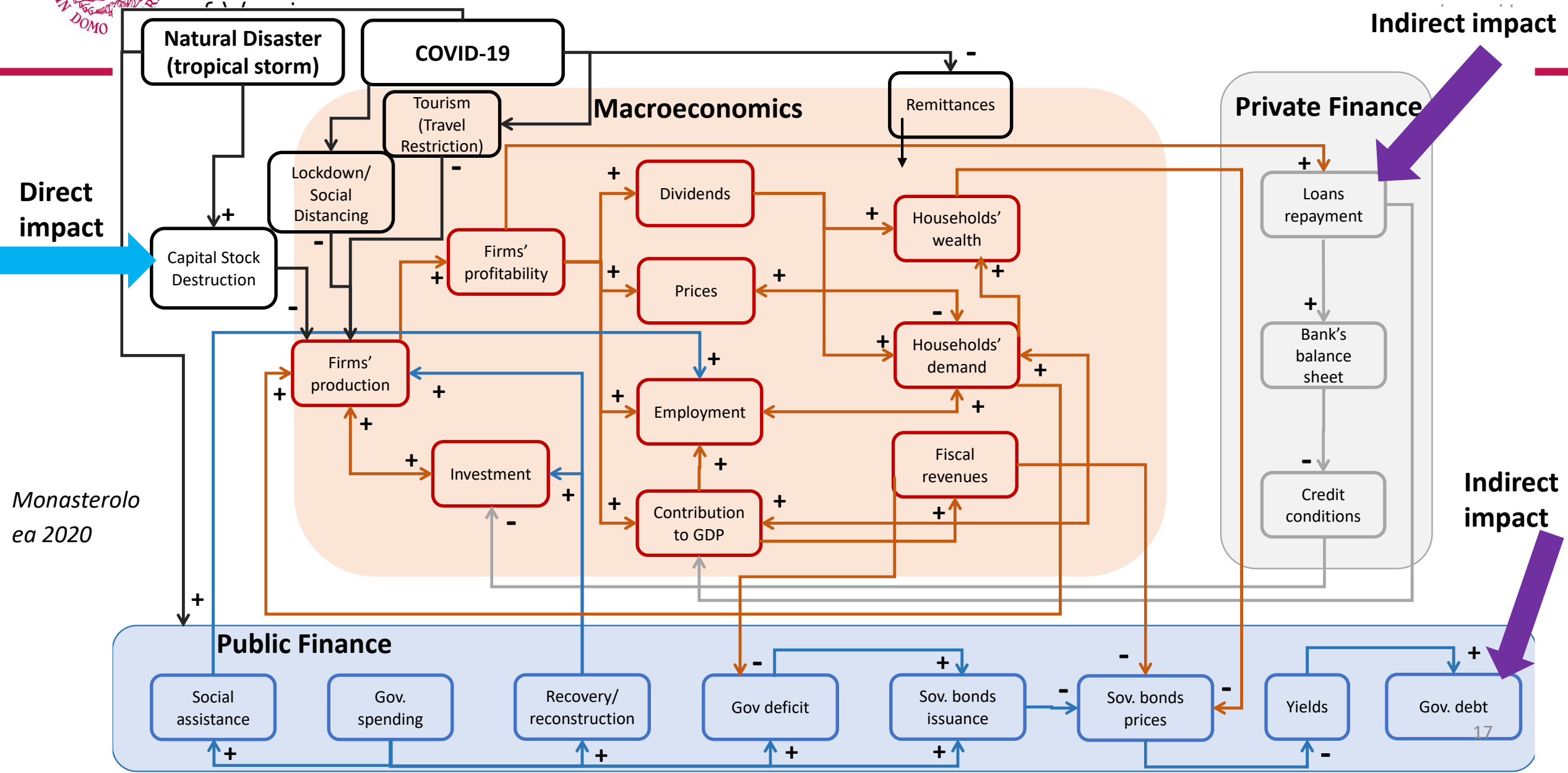
And compound risk transmission



Monasterolo ea 2020

Jamaica and Indonesia: key drivers of results

- Differences in pre-shock **economic structure and GDP drivers**:
  - **Jamaica**: external consumption (tourism, commodity) and remittances
  - **Indonesia**: external demand for investments affecting domestic investment
- Differences in **climate** risk exposure, **COVID-19** entry points, government's **response** (public spending, lockdowns, etc)
- Thus, same exogenous COVID-19 shock leads to **different performance**
- Importantly, non-linearity of compounding emerges **endogenously** from model simulations, not by construction (same model, different initialization)

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How to design COVID-19 and climate scenarios: Jamaica

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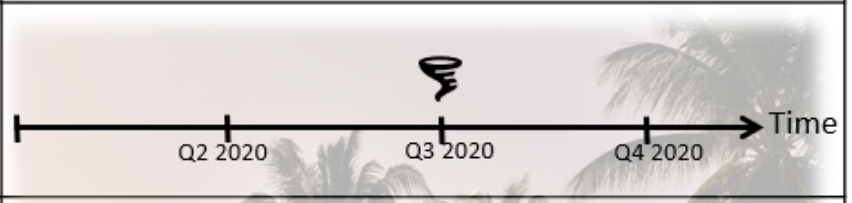
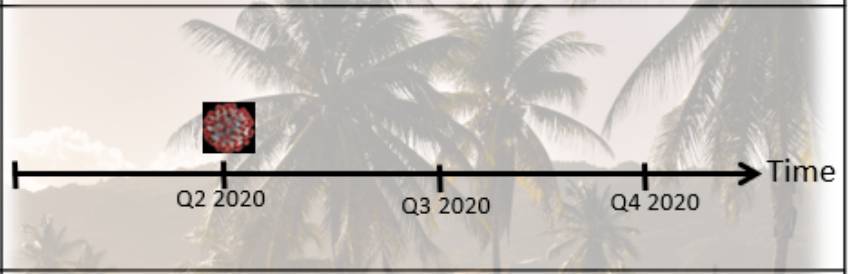
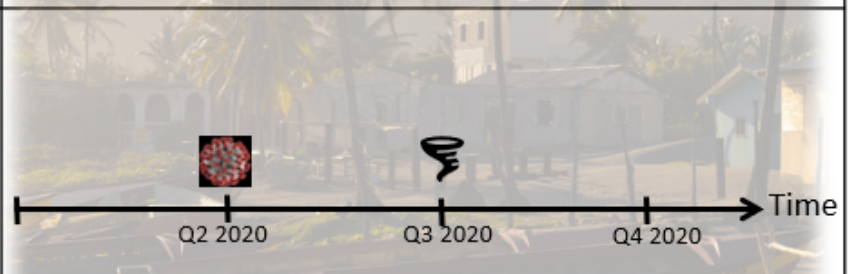
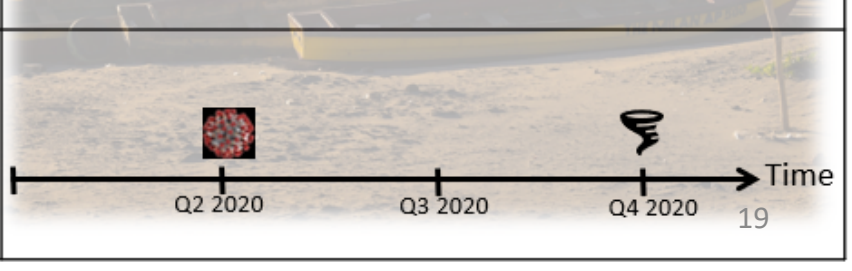
Scenario No	COVID-19 Lockdown and Policy-response measures	Natural Hazard Occurrence	Graphical Representation
1 Strong hazard (hurricane)	No	Timing: Q3 2020 Impact Size[6,7]: ς_H = 5.35%	
2 COVID-19 emergency	**Impact from RoW:** • Aluminum revenues: -20% price decrease (World Bank commodity price data)[1] • Remittances: -20% (World Bank & KNOMAD)[2] • Tourism: -67% (Dukharan, 2020)[3] **Impact from domestic economy:** • Lockdown: Consumption –34%[4] **Gov response measures** (IMF Policy Tracker)[5] : *Fiscal:* • Targeted measures: 0.5% of GDP • Tax cuts: 0.6% of GDP *Monetary* • J$57 billion liquidity injection (3% of GDP	No	
3 Compound COVID-19 and strong early hazard		Timing: Q3 2020 Impact Size[6,7]: ς_H = 5.35%	
4 Compound COVID-19 and strong late hazard		Timing: Q4 2020 Impact Size[6,7]: ς_H = 5.35%	

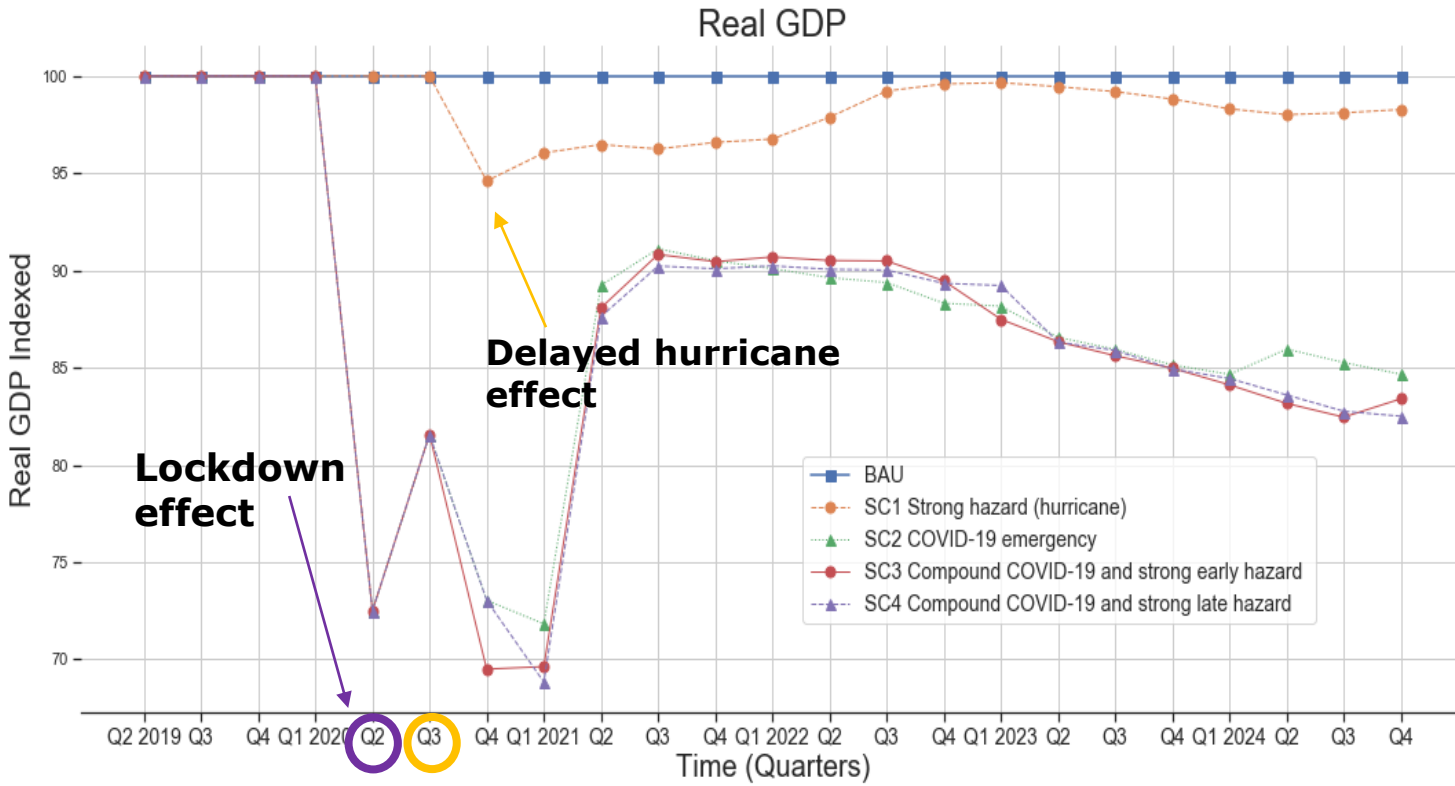
Macroeconomic impact: real GDP

Hurricane: initial shock (capital stock destroyed) but fast recovery (no fundamentals affected)

COVID-19: direct impact on GDP via shock on tourism, export of aluminum

Compound risk: worst cases

- Shock on export, tourism and hazard trigger supply and demand dynamics that reverberate the shock
- Limited recovery (Q3/2020) due to gov. intervention and end of lockdown
- Small difference across compound scenarios: predominance of COVID-19 shock; assumptions on recovery of external demand; stabilized expectations



Real GDP *(5 years time). x-axis: timeline of simulation until 4th quarter in 2024 on quarterly basis. y-axis: Real GDP indexed against BAU (COVID-19 nor disaster), BAU = 100).*

Stronger government spending allows faster recovery

Stronger government intervention (0.5 to 3%) during the crisis allows faster and **long lasting GDP recovery:**

- Signal agents' expectations
- avoid loss of productive capital

		2020	2024
BAU		100	100
COVID-19	Decrease (0% of GDP)	78.85	84.37
	Baseline (0.5% of GDP)	79.54	84.86
	Increase (3% of GDP)	**81.95**	**86.21**
COMPOUND: STRONG EARLY HURRICANE	Decrease (0% of GDP)	77.59	82.87
	Baseline (0.5% of GDP)	78.26	83.16
	Increase (3% of GDP)	**80.76**	**84.81**
COMPOUND: STRONG LATE HURRICANE	Decrease (0% of GDP)	78.17	82.94
	Baseline (0.5% of GDP)	78.84	83.18
	Increase (3% of GDP)	**81.18**	**84.73**

Yearly real GDP level across scenarios characterized by different government spending during the crisis (0, 0.5, 3% of GDP). Real GDP values are indexed against the BAU scenario (BAU = 100).

5 take home messages

1. **COVID-19**: long negative effects on GDP (expectations affect ext./int demand)
2. When COVID-19/strong disasters **compound**, negative GDP shock amplified
3. **Dependence of the economy on external demand** affects magnitude and persistence of the economic shock
4. **Public spending** contributes to smooth COVID-19 impact by partially replacing domestic consumption
5. Increasing public spending challenges debt sustainability in a context of prolonged low fiscal revenues: **quality and targeting of spending matter**

➢ *Risk channels and response is very different across countries (see next): country specific conclusions*

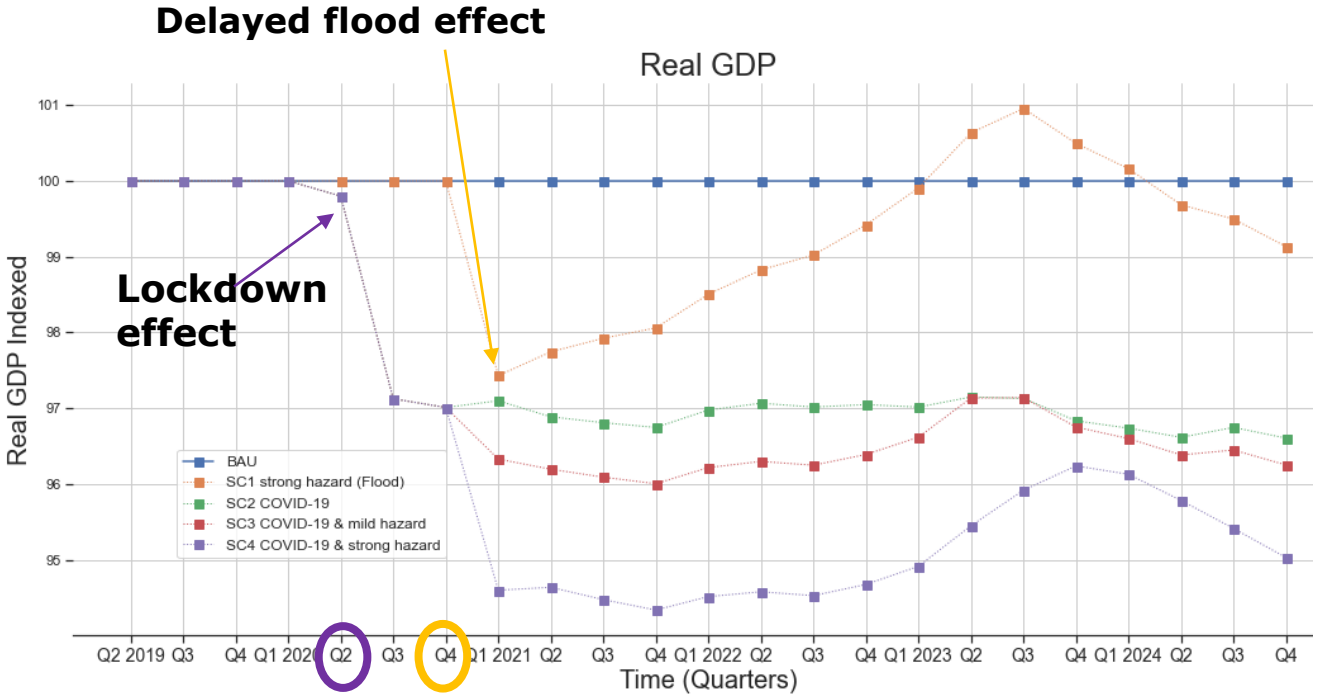
Compound risk in Indonesia: Macroeconomic impact

Hazard: Negative GDP impact (capital destruction). Q12021: recovery (no revision of firms' expectations)

COVID-19: high public spending, lower dependence on foreign demand mitigate initial shock (Q2 2020)

Negative expectations lead firms to revise investment decision downwards, affecting unemployment, wages, public debt to GDP ratio.

Compound COVID-19/strong flood: capital stock destruction hits production and GDP. Recovery stimulus from investment in 2023 dampened by **deteriorated economic conditions** due to COVID-19



Real GDP *(5 years time). x-axis: timeline of simulation until 4th quarter in 2024 on quarterly basis. y-axis: Real GDP indexed against BAU considering no COVID-19 nor disaster (BAU = 100).*

Cross-country comparison: risk transmission and drivers

Country	Main risk drivers	Heterogenous risk transmission channels
Jamaica	• **Foreign demand (tourism)** • **Domestic consumption**	Foreign demand shock (**tourism and remittances**) affects labor market Unemployment triggers lower domestic consumption Lower internal demand -> lower GDP and tax revenues, higher public debt
Philippines	• Foreign demand • **Firms' investment (sentiments)**	Foreign demand (**tourism, export, remittances**) affects firms' investments Higher unemployment srinks domestic consumption, GDP, public debt
Kenya	• **Tourism** • Food commodity price	Foreign demand (**tourism, export**), domestic (lockdown) Fall in export triggers commodity price volatility Higher unemployment -> Lower domestic consumption, GDP, public debt
Indonesia	• Foreign demand • **Firms' investment (sentiments)**	Foreign demand (**exports, FDI**), domestic demand (**lockdown**) Reduced firms' investment (negative expectations) -> higher unemployment , lower internal demand Worsened Economic and Public Finance Conditions

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Cross-country comparison: Largest macro-financial shocks

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Key messages:

Largest short-term **negative impacts** on GDP, unemployment, debt to GDP, occur in **compound risk scenarios** for all countries

Shocks led by **country specific** supply/demand side dynamics, previous structural, fiscal and financial characteristics

(Values in brackets: outcomes of BAU scenario, i.e. no shock occurs. Debt to GDP at 2024 to avoid distortions from inflation, bonds' price, etc)

COUNTRY	SCENARIO	YEAR	MIN GROWTH RATE	UNEMPLOYMENT RATE	YEAR	MAX DEBT TO GDP RATIO
JAMAICA	*HURRICANE*	*2020*	-0.74% (1.23%)	11.52% (9.98%)	*2024*	134.32% (131.18%)
	COVID-19	*2020*	-19.48% (1.23%)	11.92% (9.98%)	*2024*	166.89% (131.18%)
	COMPOUND	*2020*	**-20.77%** (1.23%)	**12.8%** (9.98%)	*2024*	**171.66%** (131.18%)
KENYA	*DROUGHT*	*2020*	4.70% (5.07%)	1.18% (1.12%)	*2024*	75.89% (72.58%)
	COVID-19	*2020*	-1.63% (5.07%)	7.00% (1.12%)	*2024*	88.84% (72.58%)
	COMPOUND	*2020*	**-4.01%** (5.07%)	**3.72%** (1.12%)	*2024*	**93.26%** (72.58%)
PHILILPPINES	*TYPHOON*	*2021*	4.05% (6.21%)	2.77% (0.46%)	*2024*	54.02% (52.57%)
	COVID-19	*2021*	1.84% (6.21%)	5.77% (0.46%)	*2024*	64.24% (52.57%)
	COMPOUND	*2021*	**-0.27%** (6.21%)	**7.64%** (0.46%)	*2024*	**66.48%** (52.57%)
INDONESIA	*FLOOD*	*2021*	3.34% (5.69%)	5.47% (3.83%)	*2024*	22.49% (22.59%)
	COVID-19	*2021*	4.01% (5.69%)	6.03% (3.83%)	*2024*	26.19% (22.59%)
	COMPOUND	*2021*	**2.08%** (5.69%)	**7.43%** (3.83%)	*2024*	**26.47%** (22.59%)

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Cross-country comparison: short (2020) mid-term (2024) impacts

Table shows results of endogenously generated dynamics of GDP and unemployment 2020-2024 across scenarios

It is a simulation model: focus on trend (not on specific value)

How to read the table:

- Values to be compared with GDP=100 in 2019
- Real GDP values indexed against BAU value 2019 (=100). Unemployment rate (%)

COUNTRY	SCENARIO	YEAR	REAL GDP (INDEXED)	UNEMPLOYMENT (%)
JAMAICA	*BAU*	2020	101.23	9.96
		2024	106.00	10.06
	HURRICANE	2020	98.80	11.88
		2024	104.09	11.54
	COVID-19	2020	75.63	12.38
		2024	90.00	24.51
	COMPOUND	**2020**	**74.10**	**12.91**
		2024	**87.90**	**25.34**
KENYA	*BAU*	2020	105.07	1.19
		2024	128.08	2.55
	DROUGHT	2020	104.69	1.35
		2024	127.18	3.06
	COVID-19	2020	98.37	4.95
		2024	114.30	11.06
	COMPOUND	**2020**	**95.99**	**5.07**
		2024	**111.75**	**12.28**
PHILIPPINES	*BAU*	2020	106.22	0.12
		2024	135.07	1.37
	TYPHOON	2020	104.78	0.80
		2024	132.15	2.90
	COVID-19	2020	103.29	1.62
		2024	120.46	9.86
	COMPOUND	**2020**	**102.33**	**2.00**
		2024	**116.84**	**11.99**
INDONESIA	*BAU*	2020	105.64	3.85
		2024	131.08	4.40
	FLOOD	2020	104.94	4.32
		2024	130.13	4.89
	COVID-19	2020	103.25	5.75
		2024	126.54	7.42
	COMPOUND	2020	102.57	6.22
		2024	124.81	8.47

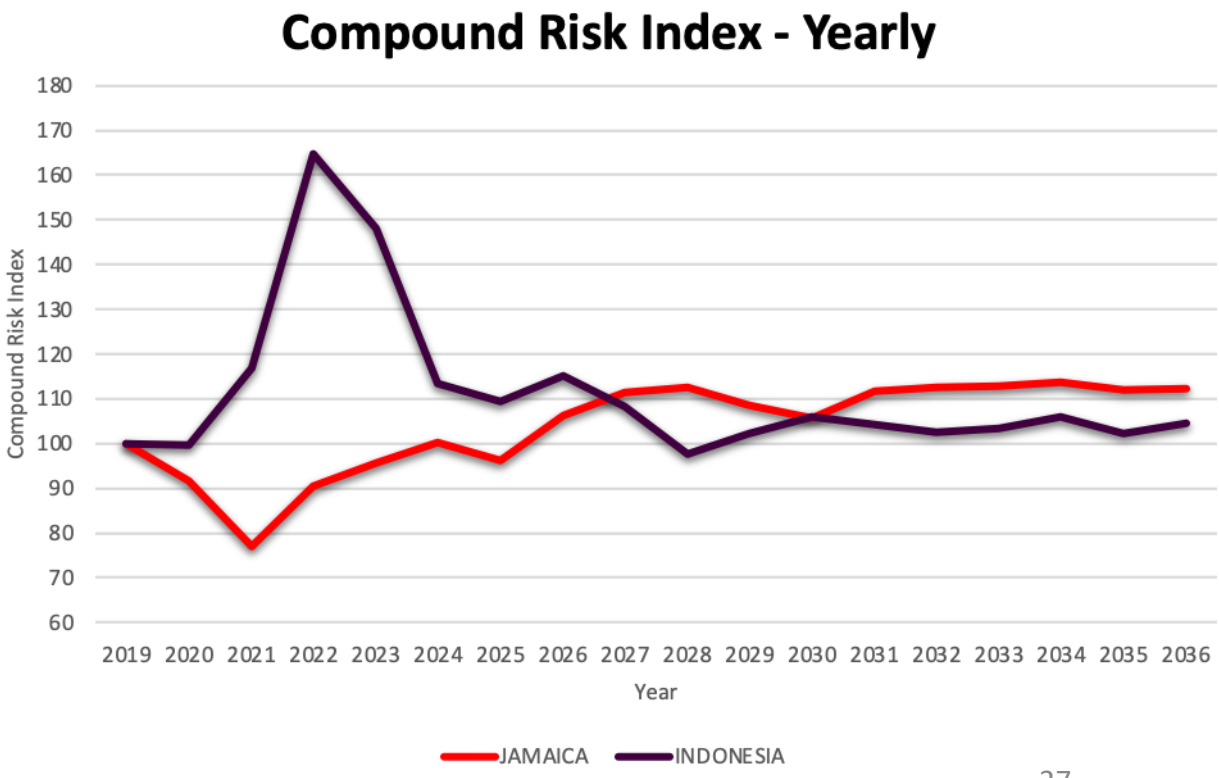
Non-linear impacts of compounding risks

$$\frac{shock_{compound}}{shock_{COVID-19} + shock_{hazard}} * 100$$

- **Compound Risk Index**: Non-linear effect. Greater (>100), smaller (<100), equal (=100) the sum of individual risks

- **Indonesia**: **Investment-driven economy**
  - Shock directly impacts investment decision but fast reaction when recovery (investments > flexible than consumption) **(Index > 100)**
- **Jamaica: tourism/export-led economy**
  - Fall in foreign demand affects domestic demand leading to > unemployment and <GDP **(Index > 100)**
  - But amplification effects takes time (firms still invest in the short term) **(Index < 100)**

Different countries' economic characteristics and shocks vulnerability explain non-linearity



Conclusion

- Understanding compound risk impact is crucial to **avoid** misunderstanding risk drivers and channels, and thus **underestimating risks**
- When risks compound, they give rise to **non-linear macroeconomic effects**
- Structural conditions and agents' expectations, public finance conditions, vulnerability to hazards matter in explaining **magnitude/persistence of shocks**
- Policies supporting a business as usual recovery are **double-edged sword**: short term recovery but could conditions for increasing vulnerability
- **Assessing compound risk is crucial for better risk pricing:** internalization in financial risk management, sustainable fiscal policies

Useful readings

- Battiston, S., Billio, M., and Monasterolo, I. (2020). Pandemics, climate and public finance: how to strengthen socio-economic resilience across policy domains. In: A New World Post COVID-19 Lessons for Business, the Finance Industry and Policy Makers. ISBN 978-88-6969-443-1
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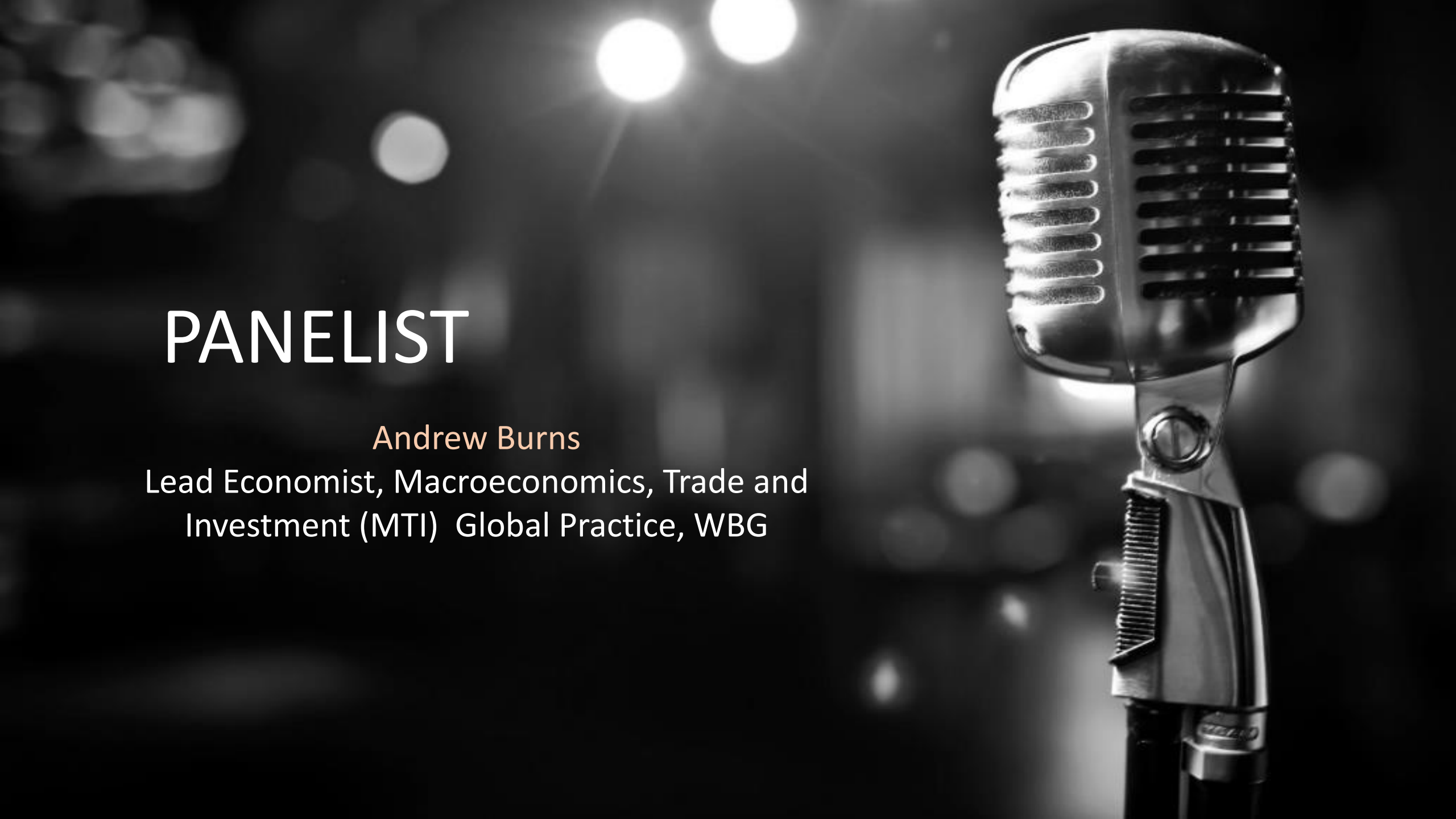

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Modelling Covid-19, and natural disasters through the eyes of MFMod and EIRIN

Andrew Burns

Global Lead Macroeconomic modelling

The World Bank

The MFMod system

- MFMod is a large-scale macrostructural econometric model comprised of 140 individual country models including Jamaica
- Is the main tool used by WB economists for the twice annual Macro Poverty Outlook forecast exercise and is used for country forecast work
- Most recent update (October 2020) https://www.worldbank.org/en/publication/macro-poverty-outlook

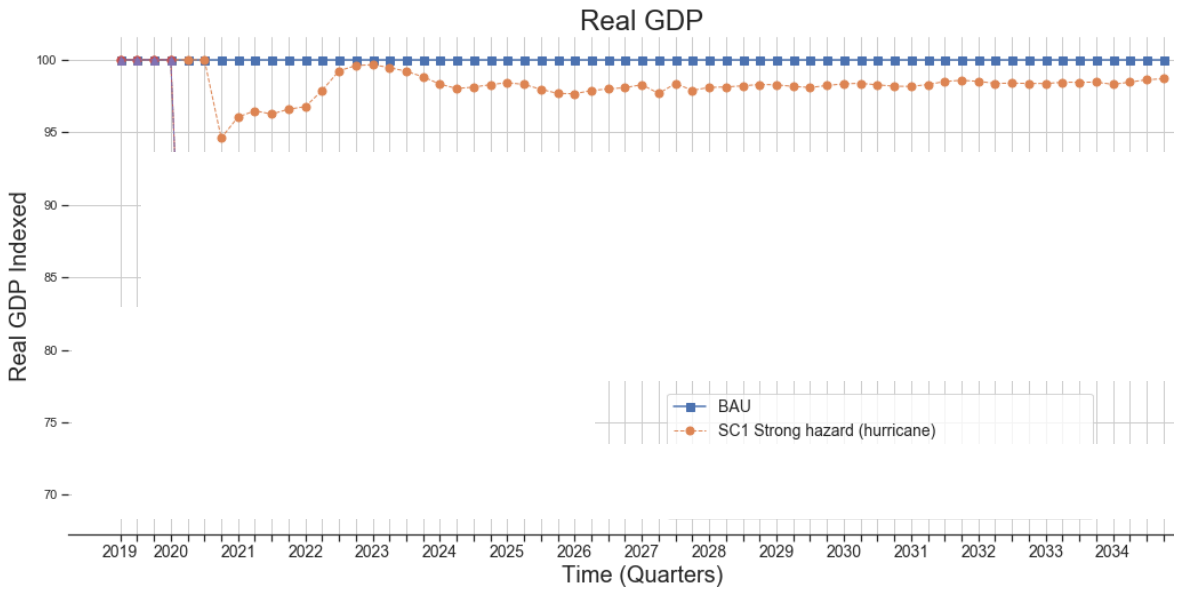
The MANAGE system

- Dynamic Computable General Equilibrium system, off shoot of the global ENVISAGE model (covering 121 countries, including Jamaica), and natural disasters notably earthquakes (Turkey, Haiti)
- Has been used within the Bank to understand the implications of Ebola and Covid in Africa, and Covid in East Asia & Pacific; with single country applications for DRC, Chad, Rwanda, Ethiopia, Mongolia, Vietnam

Comparison hurricane responses: EIRIN and MFMod models

1. **Hurricane responses broadly similar**: large initial impact, recovery over time, but long-term output does not recover to no hurricane baseline

EIRIN scenario

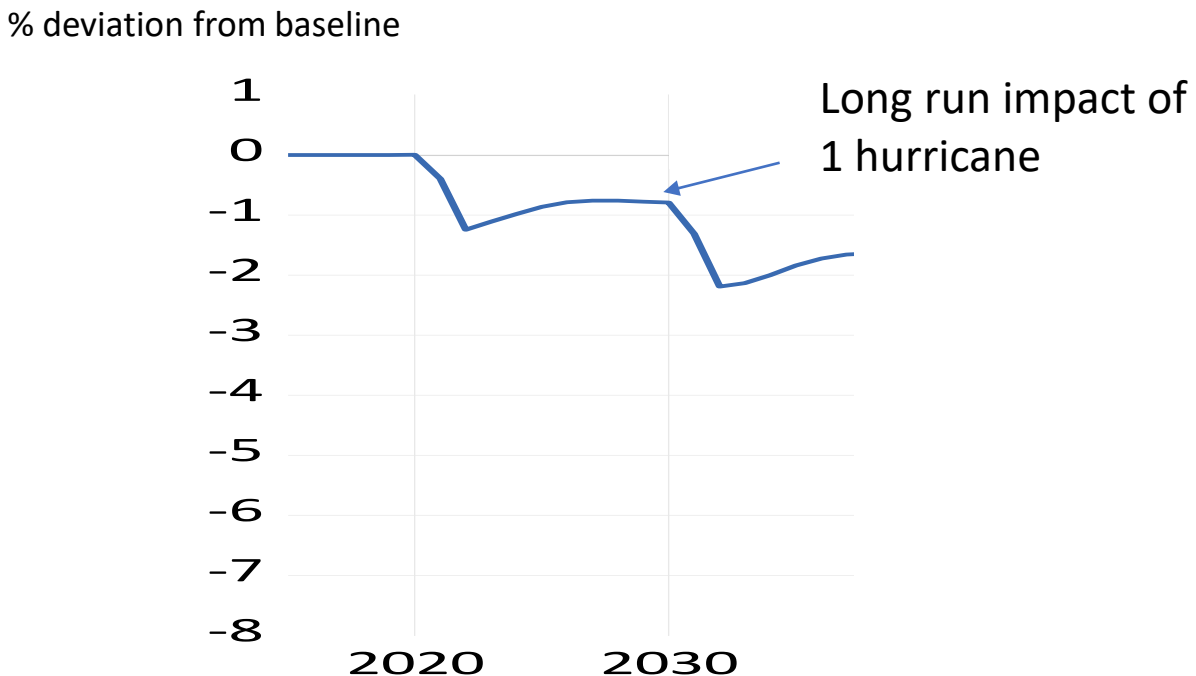


- Impact by 2034 is to reduce GDP by about 1 percentage point
- Only one hurricane in this scenario in 2020
- Mechanism at work:
  - initial destruction of capital and economic downturn
  - followed by increased investment
  - Higher debt raises interest rates
  - Higher rates crowds out supply reduce potential output and GDP in long run

Comparison of hurricane responses: EIRIN and MFMod models

1. **Hurricane responses broadly similar**: large initial impact, recovery over time, but long-term output does not recover to no hurricane baseline

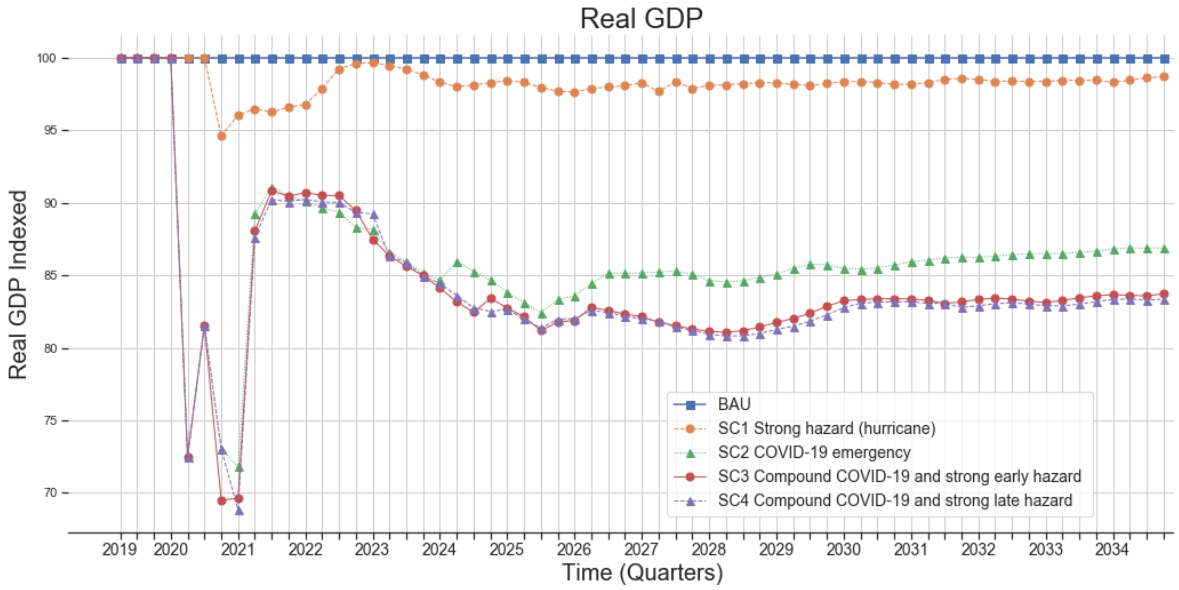
MFMOD scenario



- Impact by 2030 is just shy of 1 percent of GDP
- Similar mechanism at work:
  - initial destruction of capital and economic downturn
  - followed by increased investment
  - higher debt and capital destruction reduce potential output and GDP
- Subsequent hurricanes compound effect

EIRIN covid scenario (green line) demand recover is partial

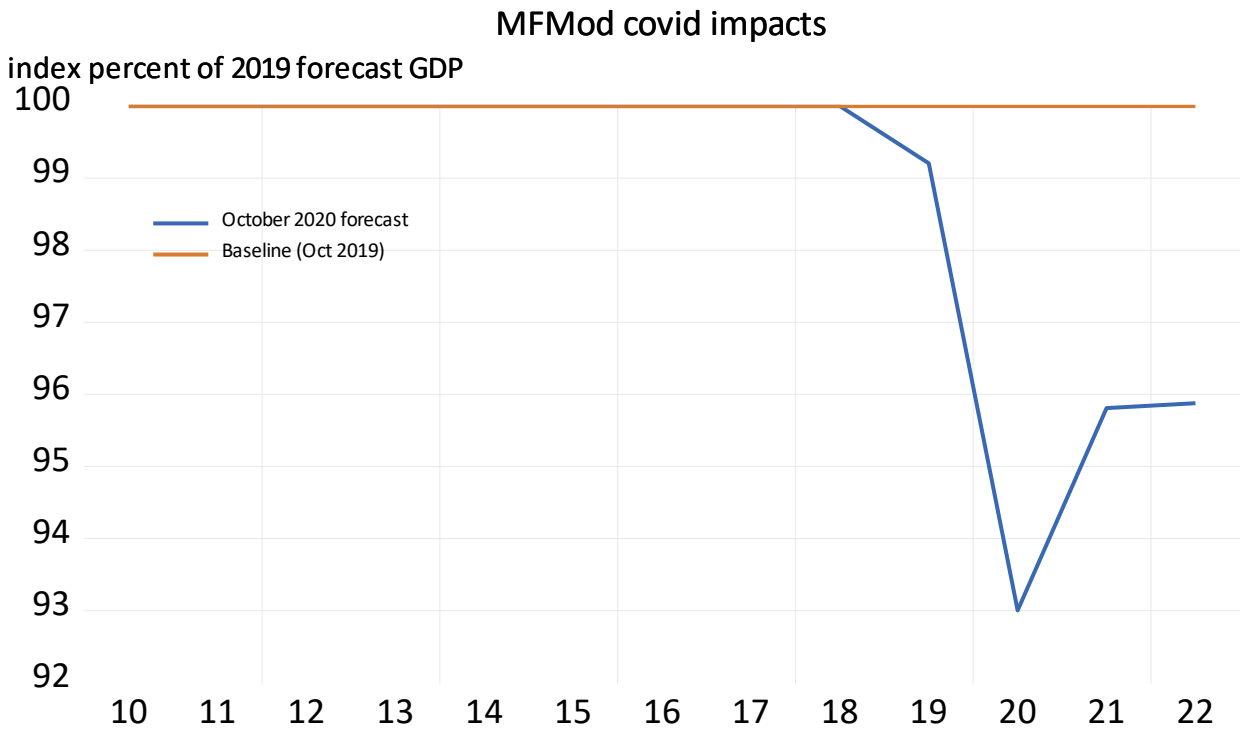
Initial demand recovers partially in 2022 but then deteriorates further



- Very large initial impact (much larger than forecast by WBG (next slide) or IMF
- Double dip post 2022 is marked, doubles the extent of GDP loss (as compared with 2022

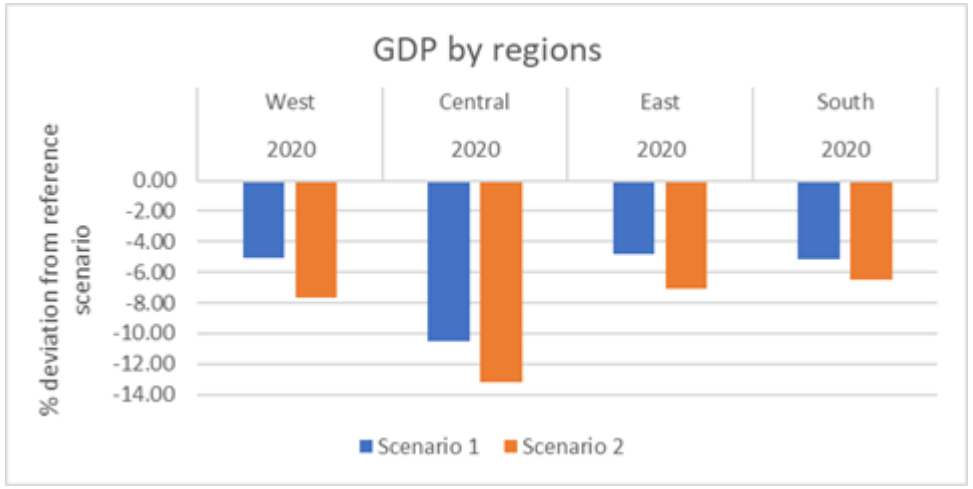
Comparison of covid responses: EIRIN and MFMod models

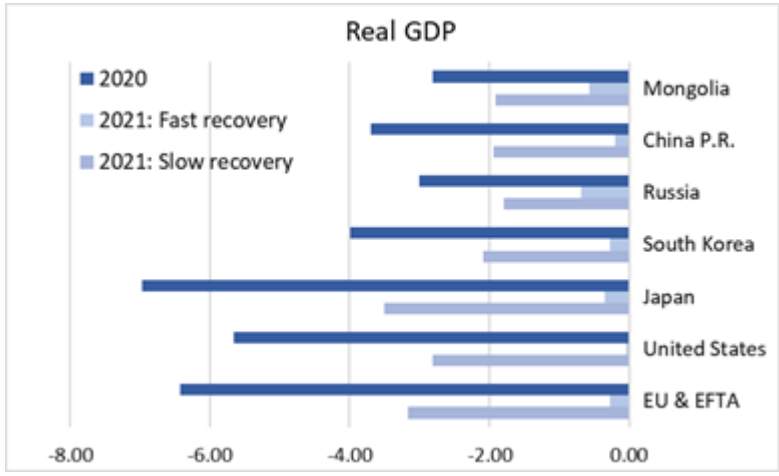
World Bank scenario is shorter (ends in 2022)

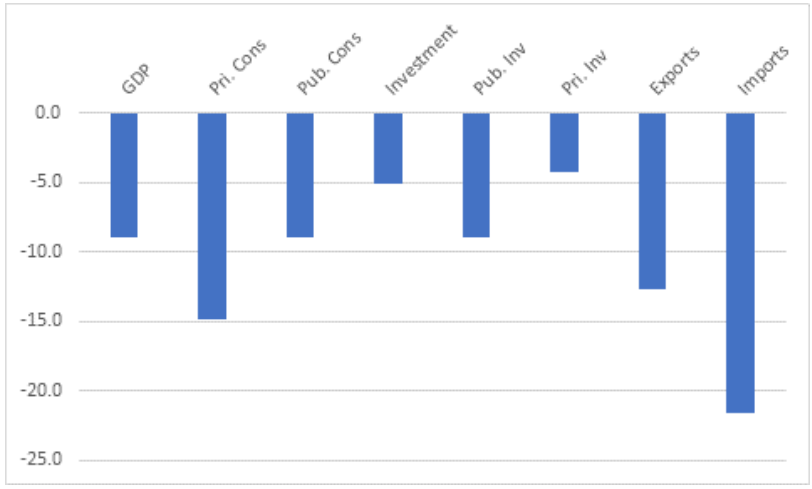


- Much more muted initial impact of around 7 percent (vs about 25% annualized in EIRIN)
- Rebound is relatively quick, but only partial as of 2022
- MFMod has not done a longer-term forecast as yet
- Supply response in MFMod was similar to EIRIN as well c. -2 % by 2022

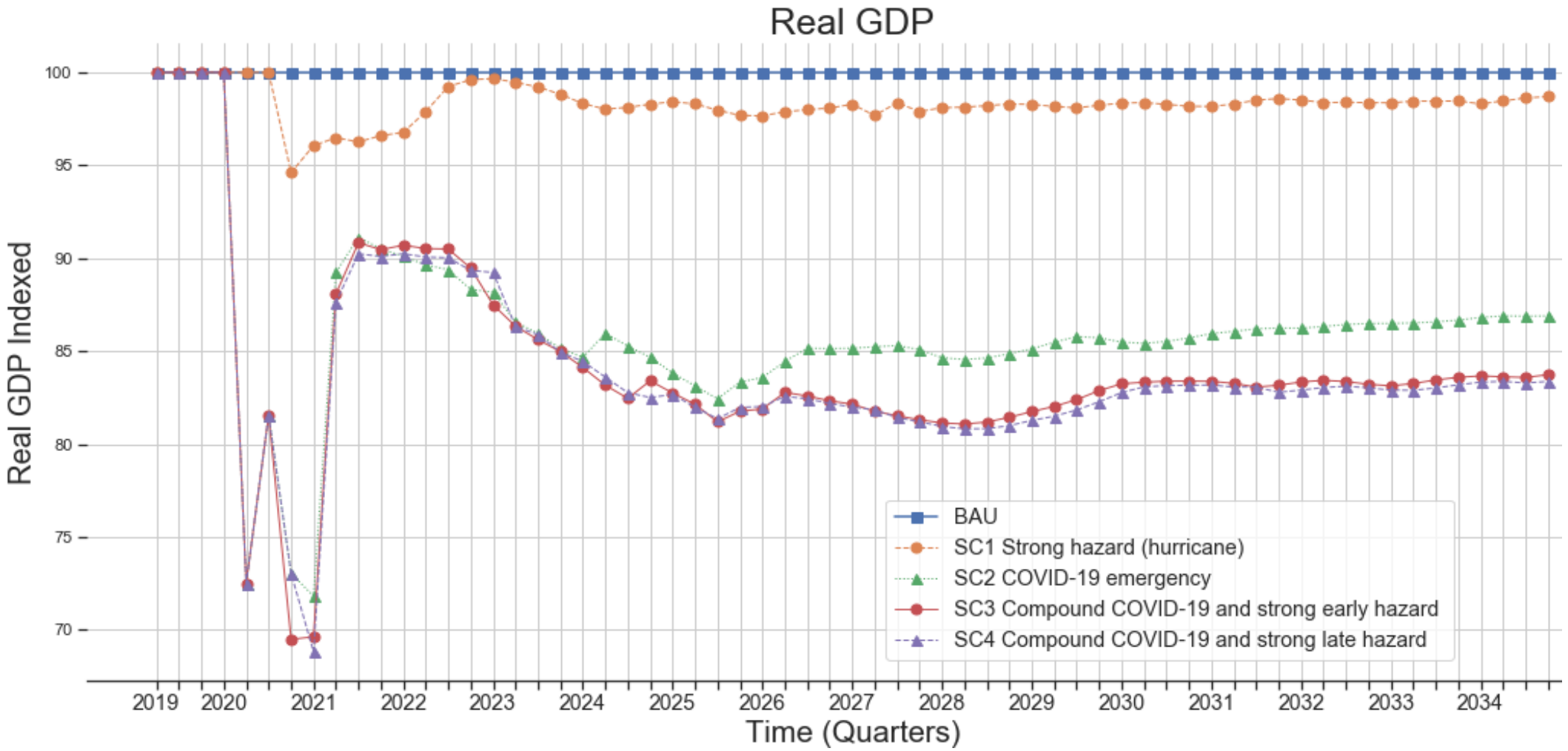
CGE Estimates of covid impacts from a range of other countries



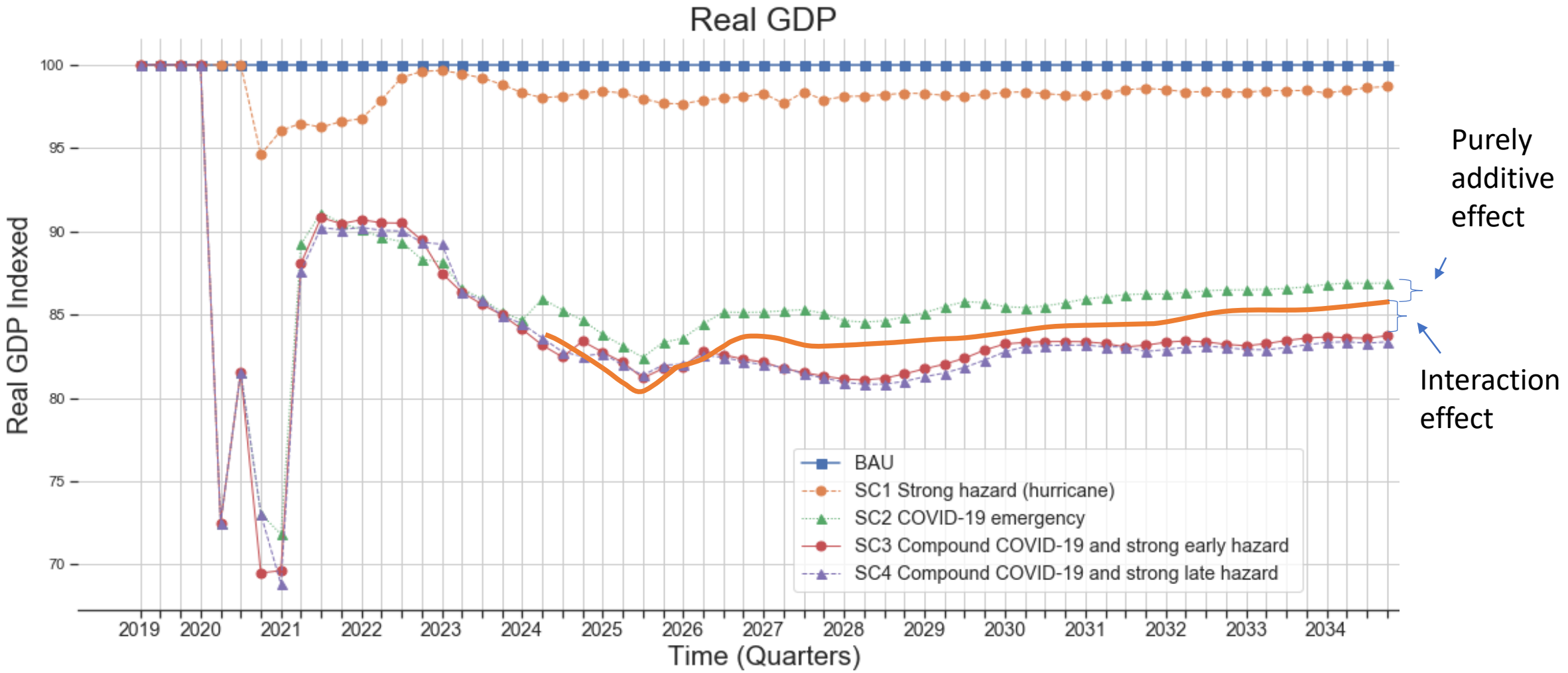




Interaction effect is small compared to covid effect



Interaction effect is small compared to covid effect



Some final thoughts

1. Despite some (important) differences in design and conception, MFMod and EIRIN are generating similar results at least for the hurricane scenario
2. Very large initial covid impacts may need to be looked at (in both methodologies the depth of the immediate shock has big implications for long term run result)
3. Interaction effect (over and above the additive effect) is important and would exist in both models reflecting supply-side crowding out induced by additional debt
4. Extent of the interaction effect will be decline in line with size of initial shock

PANELIST

Jan Rielaender
Head, Multidimensional Country Review (MDCR), OECD

Covid, Climate and Natural hazards: Multi-dimensional Assessment of Compound risks in Pilot Countries

26th October 2020

Basic impacts of Covid

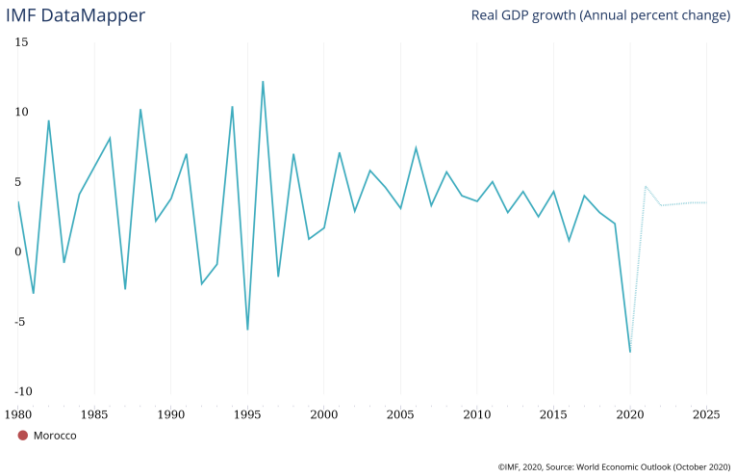
- Hitting the most vulnerable
  - Unemployment
  - Informal workers often without any social insurance coverage
  - Small firms
- Weakening resilience to climate risks
  - Poverty → food security
  - Evacuations, refugee movements
- But also, driving creation of new support systems
  - Much more comprehensive registration of the vulnerable, often digital
  - Creation of new cash transfer mechanisms that can serve as automatic stabilisers in the future

→ Question for support: to households or to firms?

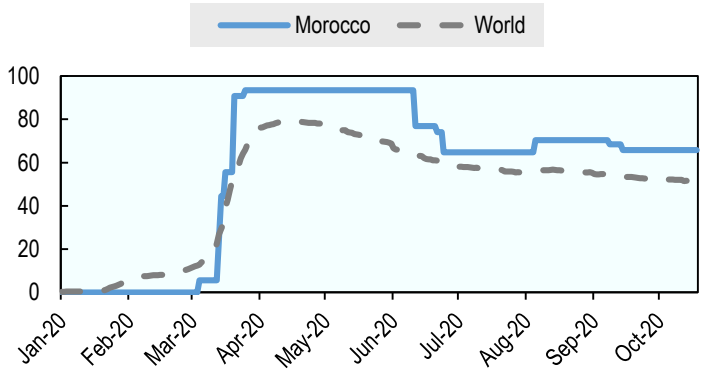
The COVID outlook: situation in Morocco

Insights on Moroccan exposure and resilience

GDP Growth [1]

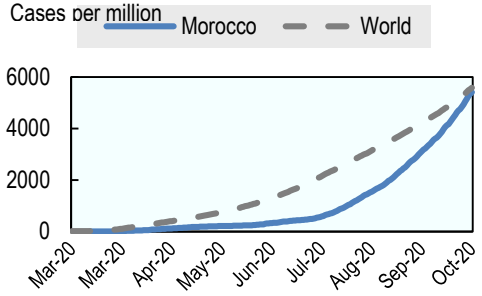


Oxford restrictiveness measures

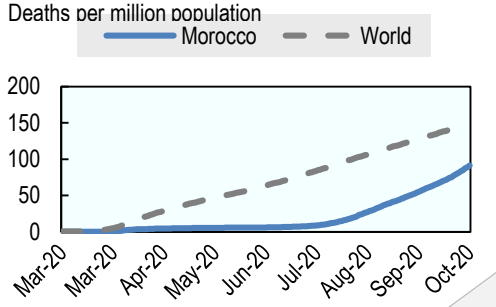


Evolution of COVID-19 pandemic

Evolution of cases (number)

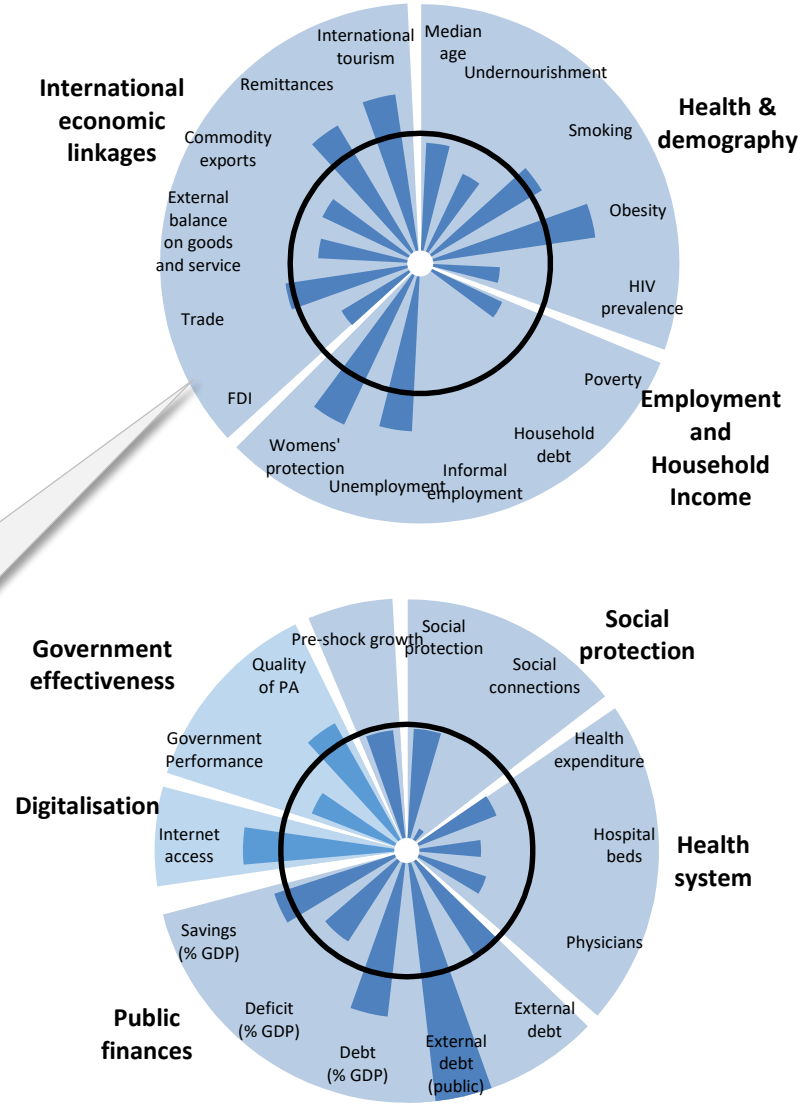


Evolution of deaths (number)



- Tourism sector: visitors dropped by 100,000 in March alone, a decline of 54% representing a decrease of 46,2% of the revenues associated for a total loss of MAD 7.1bn
- Agriculture: Morocco is facing a drought year and a decline of the export values of agricultural commodities due to the health crisis, as production was cut by 54%

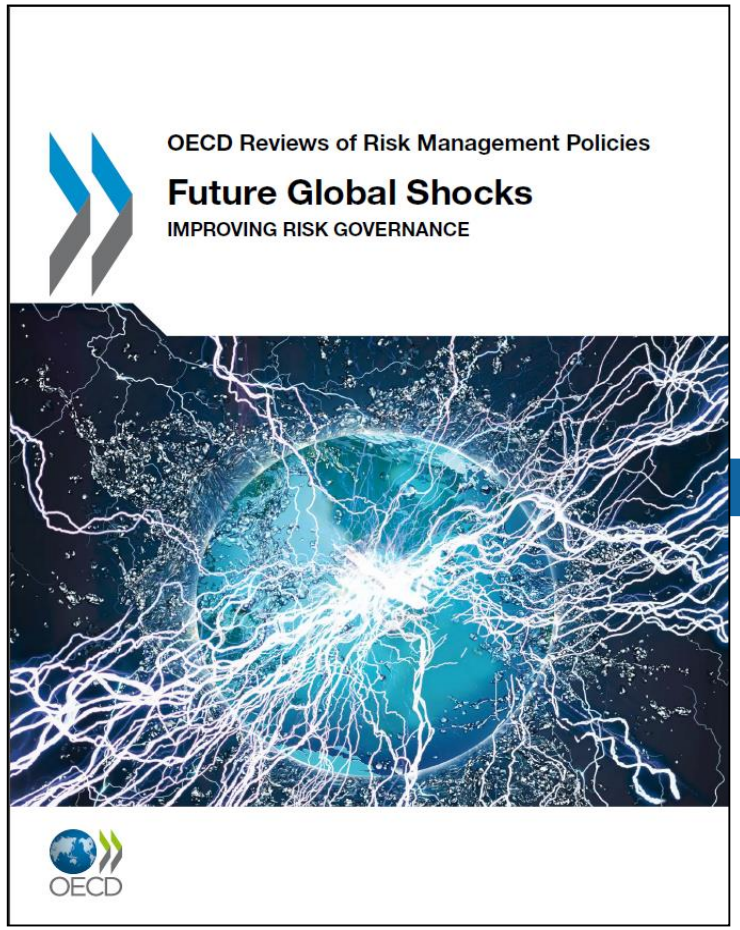
Exposure and Resilience[]

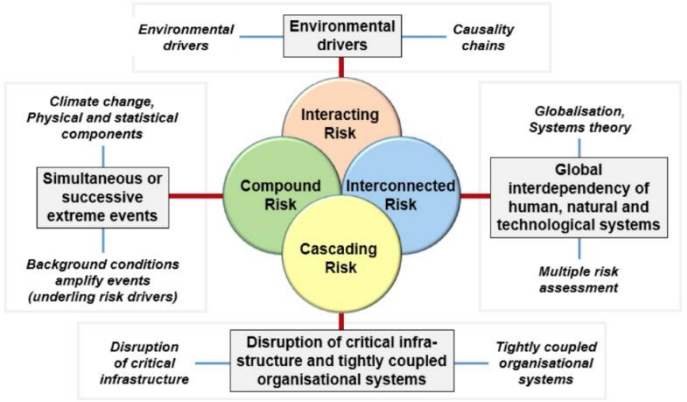


Defining compound risks

Key characteristics

A major concern for OECD risk managers





Defining compound risk

1. **Extremes that occur simultaneously or successively,**
2. **Extremes combined with background conditions that amplify their overall impact,**
3. **Extremes that result from a combination of "average" events.**

Source: (1): https://www.oecd.org/coronavirus/en/
(2) Center for Systems Science and Engineering (CSSE) at John Hopkins University

Modelling compound risks

A hybrid approach built on GE modelling

Abstract of the model

OECD: DSGE for compound risks problems

OECD intern team

October 2020

In this short and very preliminary paper, we define the main equations that characterize our economy and that will potentially enable us to assess two consecutive shocks. There are five distinct agents: two types of households, two types of firms and a government. We decided to design a two-sector model to account for the plurality of the firms' situations after the impact of the Covid-19. The first shock corresponds to a Covid-type epidemic shock, and will be modeled as a total shutdown of the firms of sector A. The second shock, probably a flooding, will impact both firm sectors and could be modeled as a capital destruction. Some aspects of the model remains to be confirmed, regarding both technical issues (whether or not we include stochastic terms and hence we work with the expected utility, how to properly introduce the incomplete market idea in the model, and also the implementation of the second shock). We need also to match the model to the countries we interested in, Morocco and Tunisia at this time.

1 Households

Let us consider two households sectors A and B, sector A households will work in sector A firms and sector B households will work in sector B firms. However, households can invest in capital in both sectors.

1.1 Households A

Households of sector A want to maximize the following intertemporal utility function:

$$maxU = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u(C_{A,t}, C_{B,t}, L_t) \quad (1)$$

where:

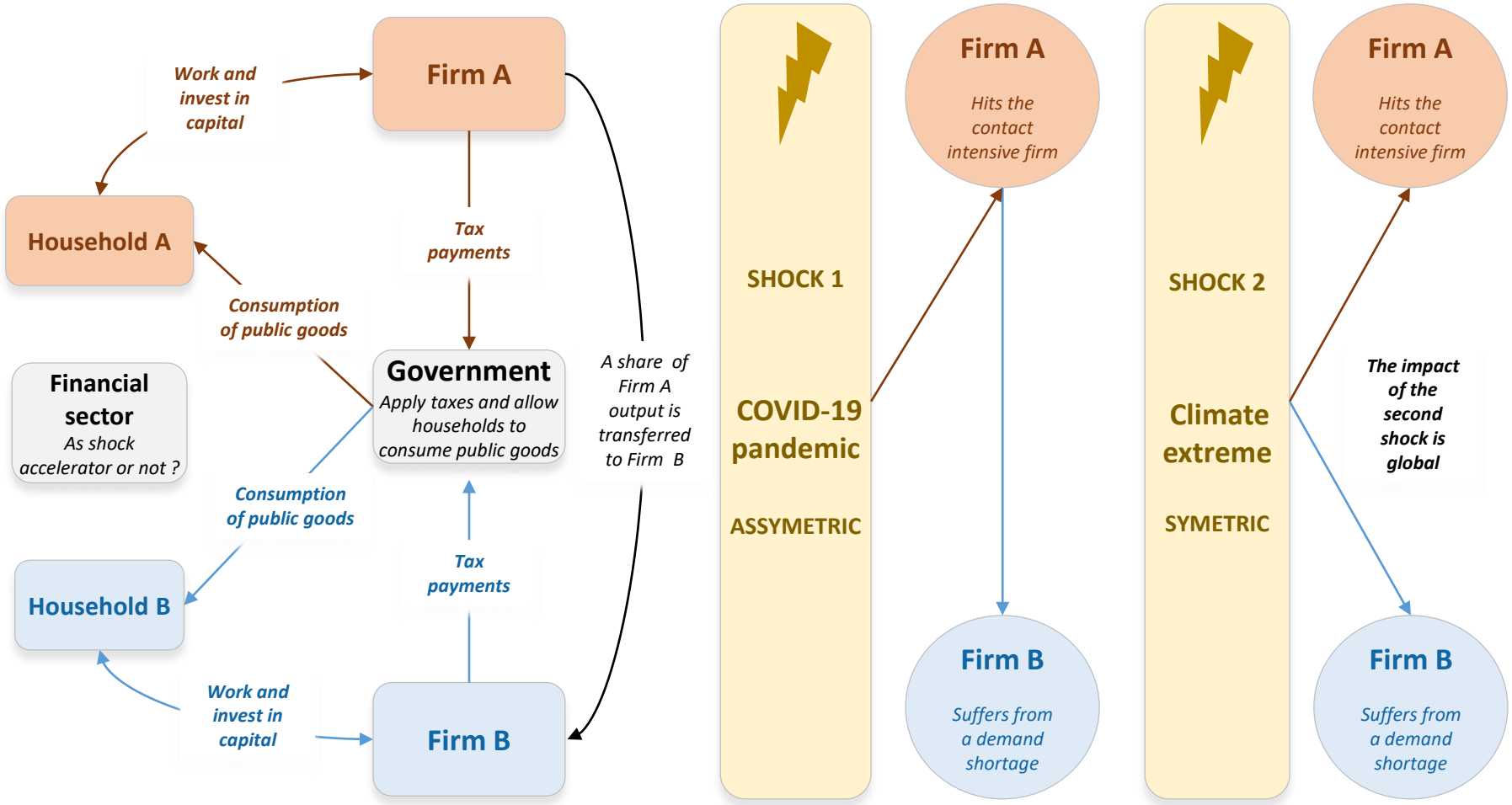
$$U(C_{A,t}, C_{B,t}, L_t) = \frac{1}{1-\sigma}\left((\eta)^{\kappa}(C_{A,t})^{(1-\kappa)} + ((1-\eta))^{\kappa} C_{B,t}^{(1-\kappa)}\right)^{\frac{1-\sigma}{1-\kappa}} - \theta\frac{1}{1+\chi}L_t^{1+\chi} \quad (2)$$

under the following budget constraints:

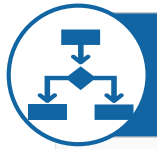
$$\begin{cases} P_A C_A + P_B C_B + B_t^{PA} + B_t^{PB} + B_t^G \leq (1+r_A)B_{t-1}^{PA} + (1+r_B)B_{t-1}^{PB} + (1+r^*)B_{t-1}^G + w_A L_A + T_A \\ B_t^{PA} \geq 0 \\ B_t^{PB} \geq 0 \end{cases}$$

(3)

Model flowchart



Way forward



- Finalising the model set-up
- Feeding in country data for calibration and shock scenarios
- Policy interventions to be tested: large scale public interventions to support wages, or to invest in firms.

- Combining with a structural analysis of exposure and resilience towards multiple risks
- → Decision aid for the design of resilience strategies:
    - Support to households or firms? To which within these groups?
    - What automatic stabilisers to set up that would kick-in during a crisis?

PANELIST

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Theresa Lober

Head of Climate Hub, Bank of England

AUDIENCE QUESTIONS

Please use the Q/A Chat Function

Please Address your questions to a specific speaker (when possible) or indicate to ‘all speakers’

Scan the QR Code to join the DRF Community of Practice

CLOSING REMARKS

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