35TH ECBC PLENARY MEETING

EMF-ECBC ACADEMY TRAINING & MARKET UPDATE

CLIMATE RISK: PHYSICAL RISK & EXPECTED LOSS

EVIDENCE FROM THE USA

Gianluca Mattarocci
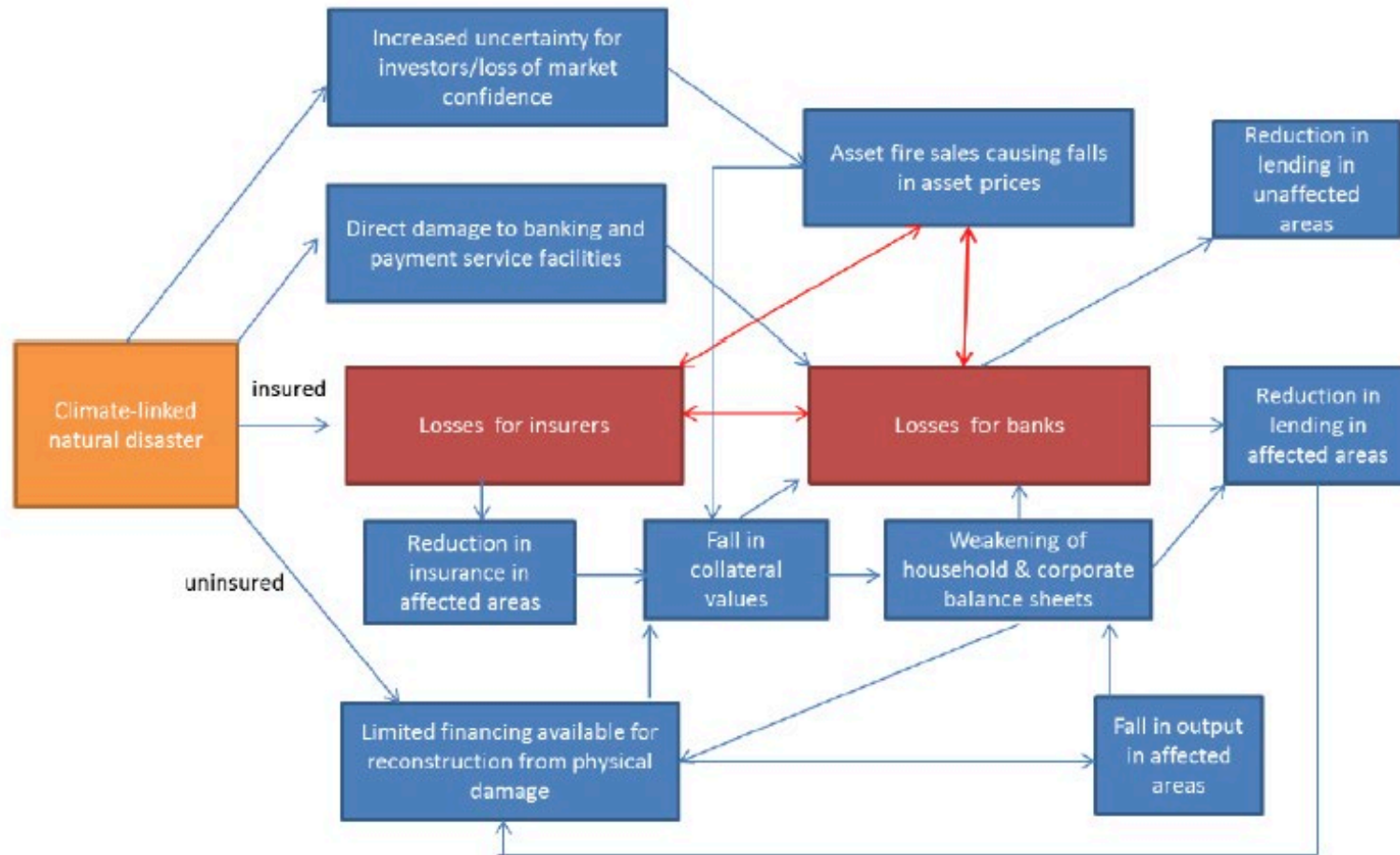
Tor Vergata University of Rome

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Introduction

Batten et al. (2016)

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- Introduction

- Literature on credit risk and climate risk

- Evidence from United States

- Conclusion

Literature on credit risk and climate risk

| Topic	Reference
Corporate loans pricing and climate risk	Huang et al. 2022
Firms' loan availability and climate risk	Ginglinger and Quentin, 2021
Banks' climate stess testing	Hyeyoon et al. 2021
Climate risk mapping and loan availabilty	Faiella and Malvolti, 2020
Bank resolution risk and climate risk	Chabot and Bertrand, 2023

Our topic

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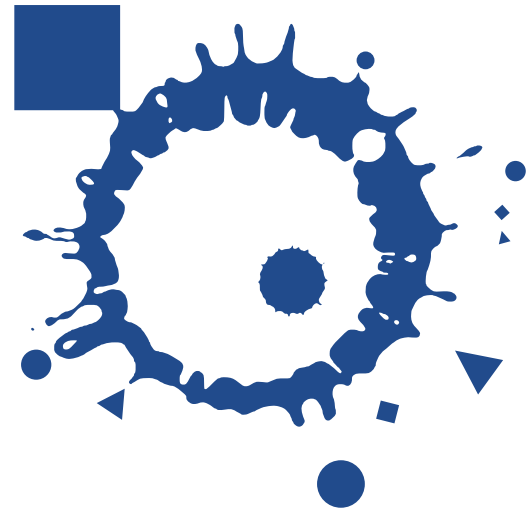
Disaster database

Time trend of disaster events in USA

Phisical risk events in USA
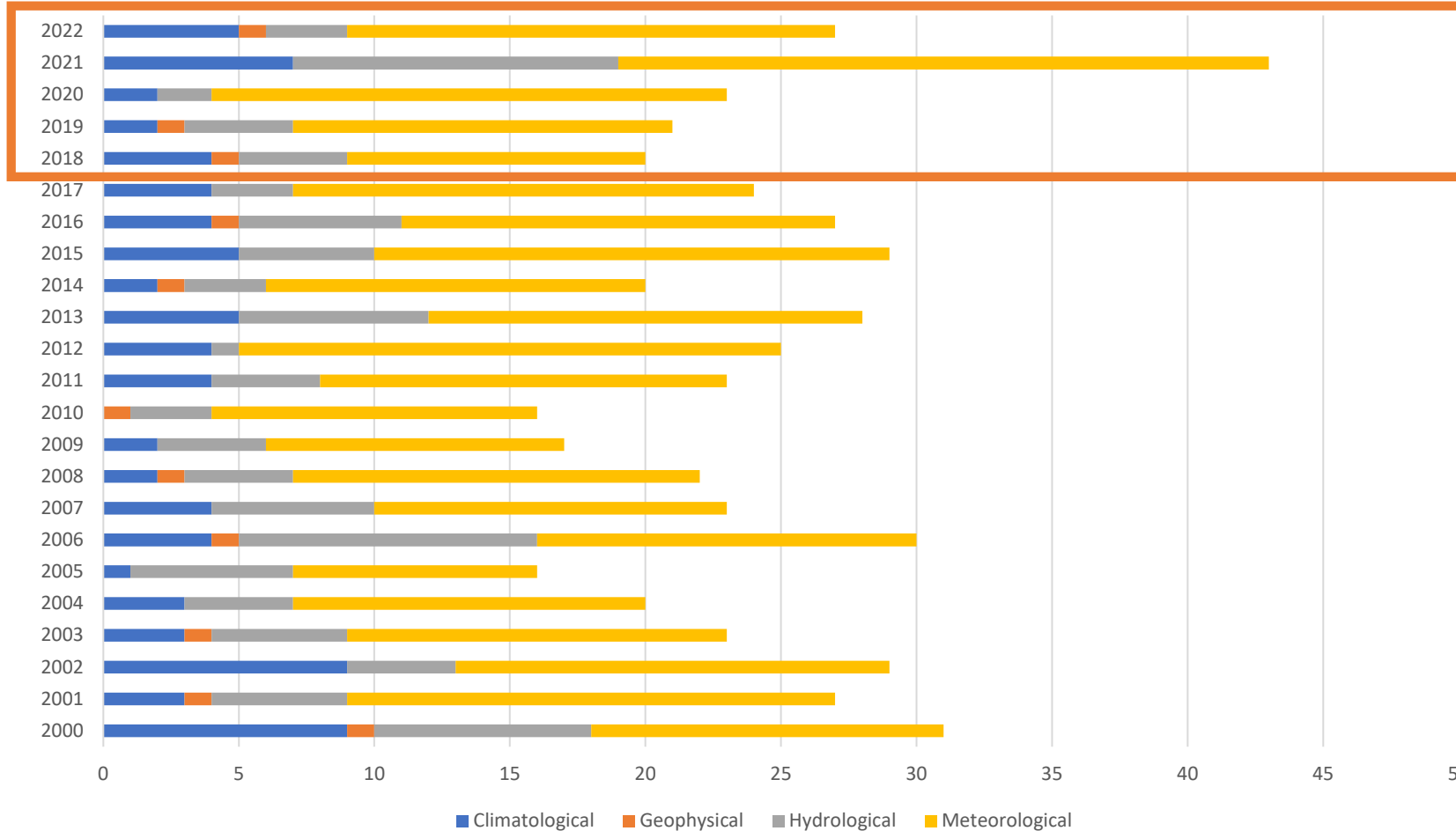
Disaster maps – Overall number
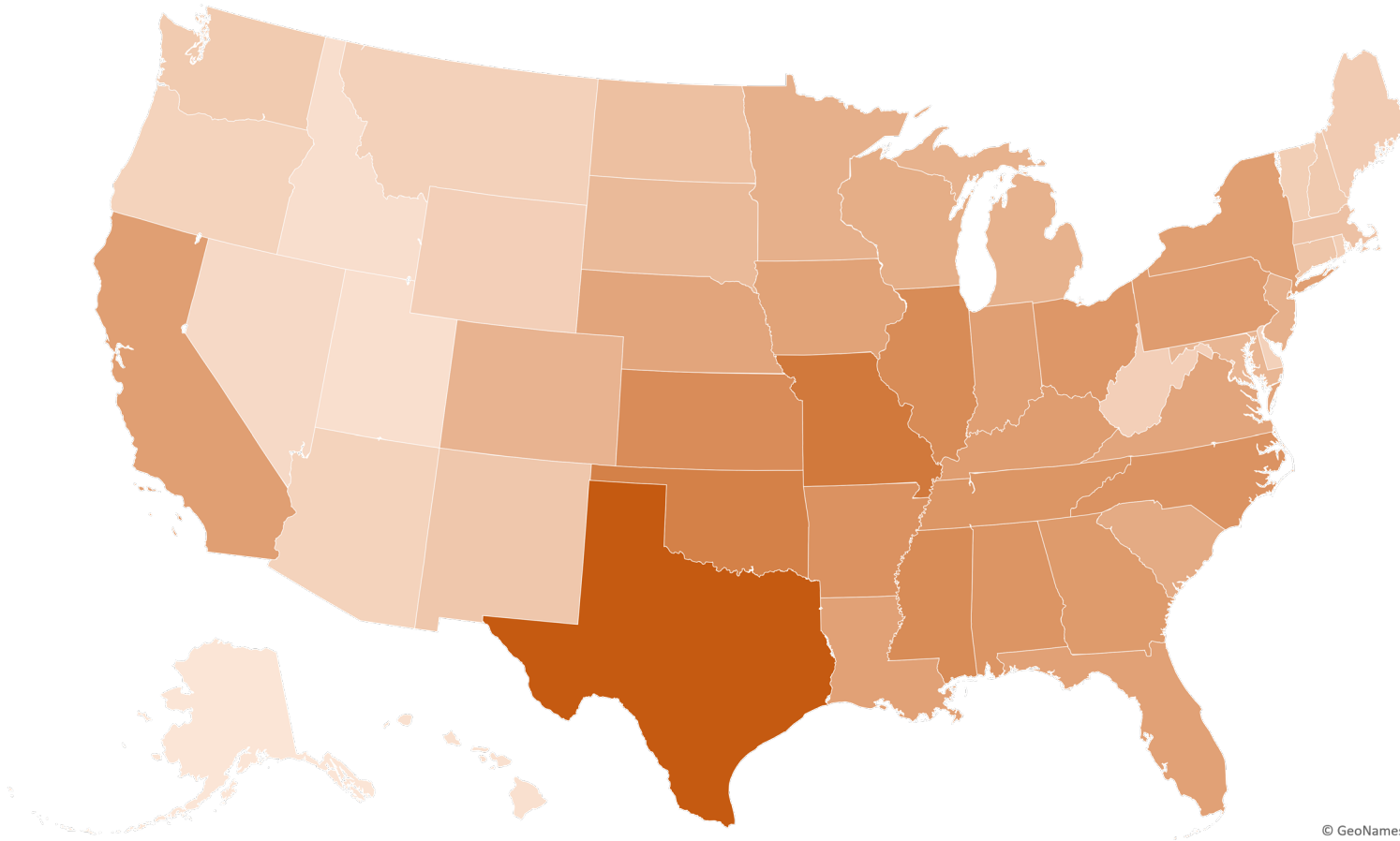
County	N° events
Texas	174
Missouri	137
Oklahoma	127
Illinois	114
Mississippi	114
Kansas	113
Arkansas	106
North Carolina	105
Alabama	103
Tennessee	102
Ohio	100

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Mortgages database

The sample considers all the loans included in the single-family loan-level dataset provided by Freddie Mac for the period 2018-2022
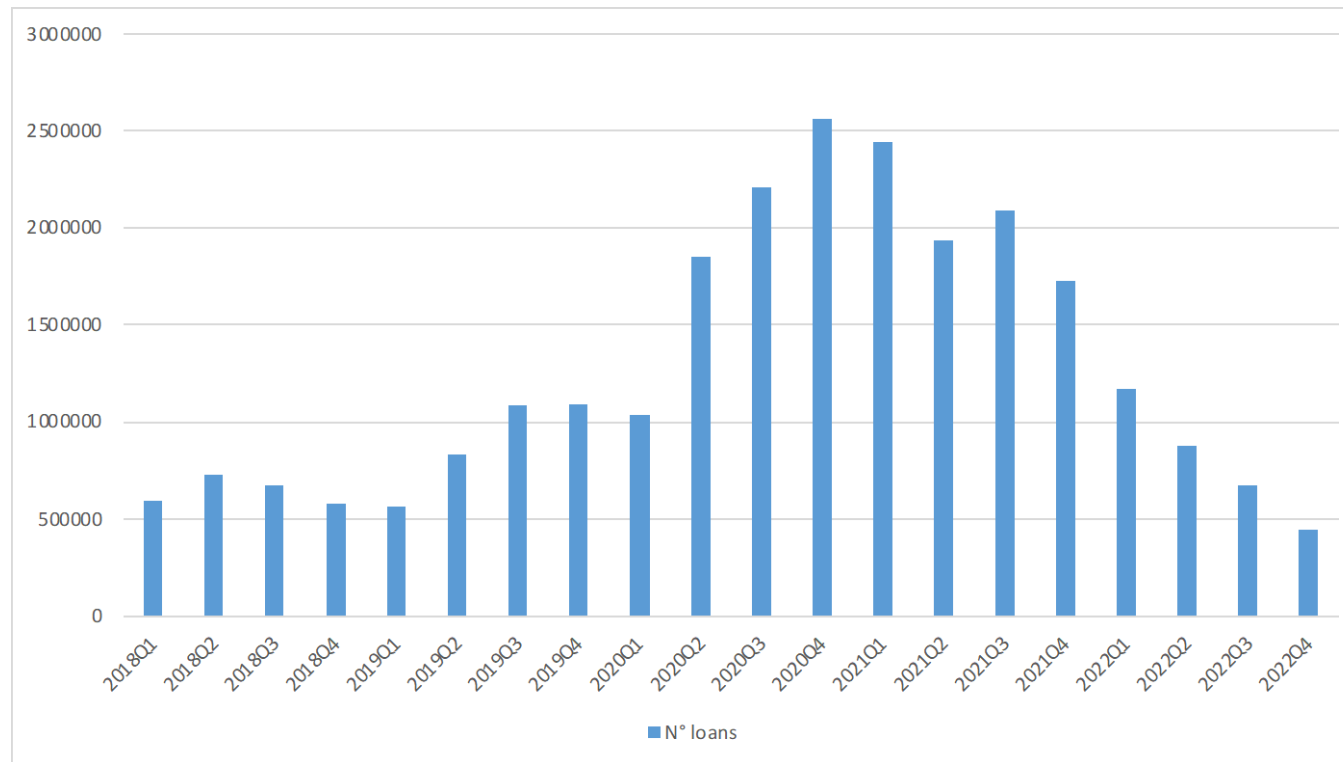
Research design

Step 1 - Loans supply features and climate risk for new loans

Control variables

Areas less exposed to climate risk	Areas more exposed to climate risk

Events

Areas before being more exposed to climate risk	Areas after being more exposed to climate risk

- Credit score
- Loan to Value
- Interest rate
- Debt to income
- Term
- N° borrowers

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Results

Step 1 - Loans supply features and climate risk for new loans

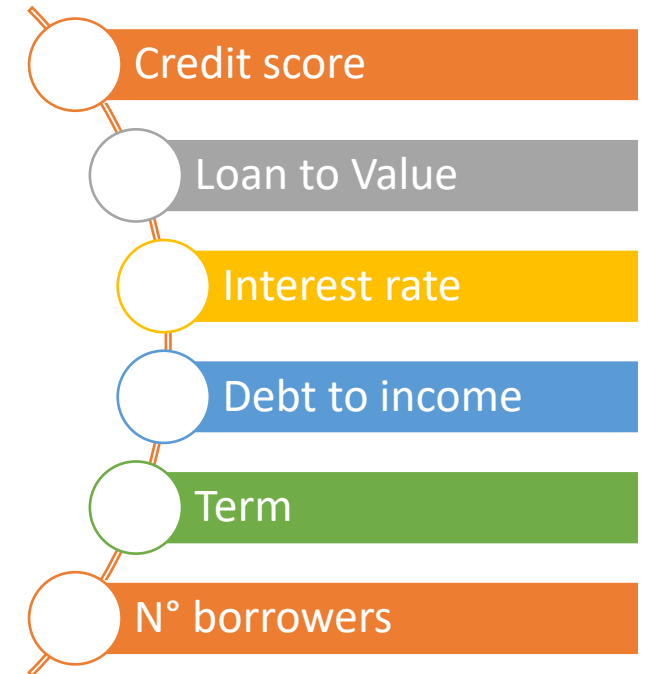|	Areas less exposed to climate risk	Areas more exposed to climate risk	Areas before being more exposed to climate risk	Areas after being more exposed to climate risk
Credit score	+	−	+	−
Loan to Value	+	−	−	+
Interest rate	−	+	−	+
Debt to income	+	−	−	+
Term	=	=	+	−
N° borrowers	=	=	=	=

Research design

Step 2 – Climate risk and Probability of Default and Loss given default of new loans

Areas less exposed to climate risk	Areas more exposed to Climate risk

Areas before being more exposed to climate risk	Areas after being more exposed to climate risk

$$PD_i = \begin{cases} 1 \; if \; past \; due \geq 90 \; days \\ 0 \; otherwise \end{cases}$$

$$LGD_i = \frac{Net \; sales \; proceeds_i}{Deferred \; UPB_i}$$

Results

Step 2 – Climate risk and Probability of Default and Loss given default for new loans
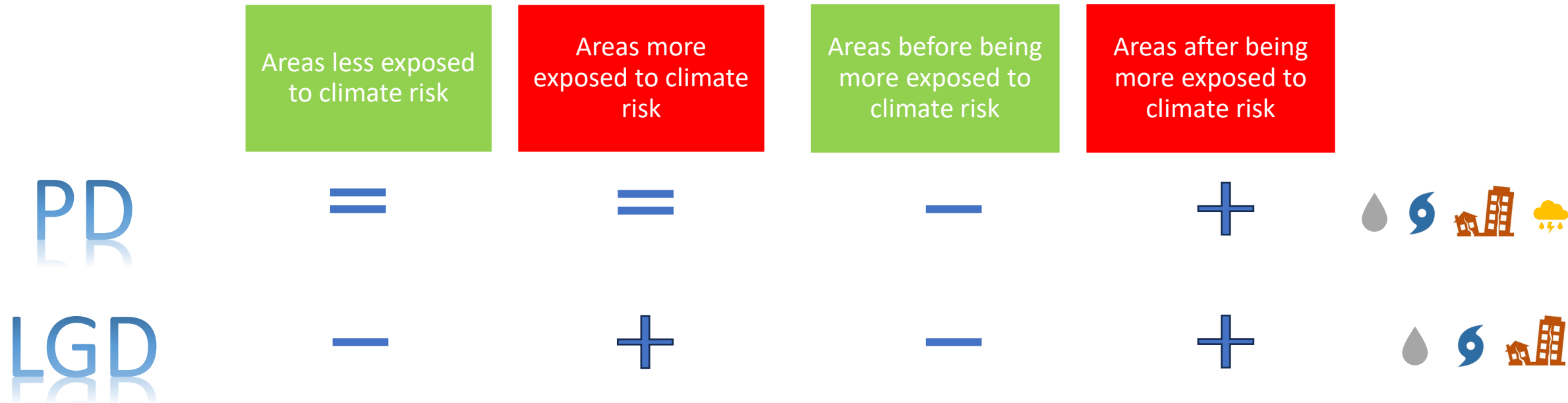
	Areas less exposed to climate risk	Areas more exposed to climate risk	Areas before being more exposed to climate risk	Areas after being more exposed to climate risk
PD	=	=	−	+
LGD	−	+	−	+

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- Evidence from United States

- Conclusion and perspectives

Conclusion and perspectives

Climate risk influence the risk management strategies adopted by a bank and the policies adopted in riskier and safer area may be different.

Climate events could significantly affect household lending, and PD and LGD may be modified by these new events when they happen in a market.

More detailed measures on expected loss under extreme climate events are necessary for a proper stress testing of the credit portfolio in the medium-long term.

Contacts

Gianluca Mattarocci

Professor of Banking

Tor Vergata University of Rome

E-mail: gianluca.mattarocci@uniroma2.it