From Flood to Fire: Is physical climate risk taken into account in banks' residential mortgage rates?

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Research question

- Do banks charge a **physical climate risk premium** for mortgages collateralised by residential real estate?[a)]
- Are there **significant differences across banks** that take climate into account adequately and those that don't according to the SSM classification?[b)]

Data

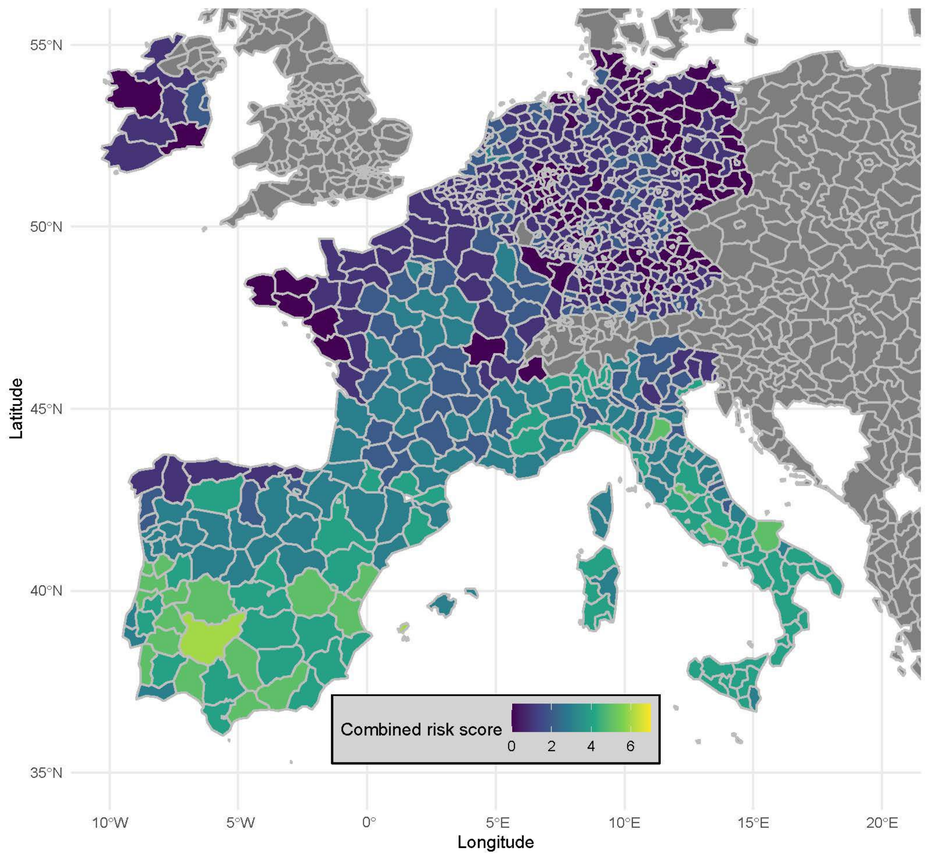
Loan-level data (European Data Warehouse, EDW)**:**

- Series of cross-sections (2010-2023) containing borrower, collateral and loan characteristics for 8 EA countries.
- Limited to securitised loans.

Climate data (Moody's 427)**:**

- Provides time-invariant risk scores for 6 different hazards (floods, heat, wildfire, sea level rise, windstorms & water stress).

→ Use sum of risk score over hazard types as **aggregate physical risk indicator** for a certain location (truncated zip code or NUTS3).



Methodology

Pooled cross-sectional regressions on loan-level:

$$Y_i = \boldsymbol{\beta_1} \times Risk_r + X + \varepsilon$$
$$Y_i = \boldsymbol{\beta_2} \times Time \times Risk_r + \boldsymbol{\beta_3} \times Risk_r + X + \varepsilon$$

Y_i - mortgage interest rate at origination of loan *i*
$Time$ – dummies for time-periods (2010-2012; 2013-2015; 2016-2019 and 2020-2023)
$Risk_r$ - the climate risk score in region r
X- a set of micro (loan-level) and macro control variables
$\boldsymbol{\beta_1}$ - captures the physical risk impact on mortgage interest rate
$\boldsymbol{\beta_2}$ + $\boldsymbol{\beta_3}$ - checks if the physical risk impact on mortgage rate is time varying

Results

- Higher **exposure to physical climate risk is associated with higher interest rates**, and **coefficient increases over time**.
- Based on stylized, backward-looking assumptions a **lower bound** of the expected physical Climate Risk Premium would be **40 bp** (compared to estimated difference of 7 pp between areas with low risk and 2 sd over median (based on coefficient in column (1)).

	Interest Rate (pct)		
	Country FE	Country FE	Lender FE
	(1)	(2)	(3)
Climate risk	0.02***	-0.09***	-0.09***
Climate risk × Loan issued (2013-2015)		0.10^{***}_{xx}	0.10***
Climate risk × Loan issued (2016-2020)		0.18^{***}_{xxx}	0.18^{***}_{xxx}
Climate risk × Loan issued after 2021		0.20^{***}_{xxx}	0.20^{***}_{xxx}
Controls	✓	✓	✓
Standard-Errors		Area	
R^2	0.44524	0.45246	0.53962
Observations	6,390,326	6,390,326	6,219,462
Country fixed effects	✓	✓	✓
Year of origination fixed effects	✓	✓	✓
SI or Lender fixed effects			✓

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*
Joint-Signif. Codes: xxx: 0.01, xx: 0.05, x: 0.1

Notes: Period of 2010-2012 is the baseline level in the regressions. Controls contain employment status, time to maturity of loan, LTV and DTI at origination and HH cost of borrowing (MIR). Standard errors are clustered by area.

- **Analysis of Banks Heterogeneity** by splitting the sample according to the extent to which banks were assessed to consider climate risk in their credit activities by the SSM.
- **Significant institutions (SIs)** that **'adequately'** consider climate risks reveal **sizable & growing climate premia.**
- SIs with 'inadequate' practices show no climate risk premia.

	Interest Rate (pct)			
	All SIs	Adequate	s Inad	Inad
	(1)	(2)	(3)	(4)
Climate risk	-0.11***	-0.12***	-0.06***	-0.05*
Climate risk × Loan issued (2013-2015)	0.10***	0.13***	0.06***	0.07^{***}_{x}
Climate risk × Loan issued (2016-2020)	0.19^{***}_{xxx}	0.21^{***}_{xxx}	0.13^{***}_{xxx}	0.02_{xx}
Climate risk × Loan issued after 2021	0.22^{***}_{xxx}	0.34^{***}_{xxx}	0.10^{***}_{xxx}	0.01_{xx}
Controls	✓	✓	✓	✓
Standard-Errors		Area		
R^2	0.55052	0.63058	0.49622	0.63602
Observations	4,839,053	1,617,868	2,950,041	271,144
Country fixed effects	✓	✓	✓	✓
Year of origination fixed effects	✓	✓	✓	✓
SI fixed effects	✓	✓	✓	✓

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*
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Policy Recommendations

- Especially negligent **banks to incorporate climate risk** into their day-to-day operations, and generally all banks should price in this risk more.
- Improve the **availability of granular data** on climate risks and location of buildings.

References:
a) For an overview of the impact of climate risk on banks see de Bandt, O., Kuntz, L.-C., Pankratz, N., Pegoraro, F., Solheim, H., Sutton, G., Takeyama, A., and Xia, D. (2023). The effects of climate change-related risks on banks: a literature review. *Basel Committee on Banking Supervision Working paper*.
Notes:
b) SSM : ECB Banking Supervision.