

# Implications of climate-related financial shocks for the financial system

## *Overview and modelling*

5<sup>th</sup> Summer School on Sustainable Finance

**Lucia Alessi**

**Erica Francesca di Girolamo**

**Dominik Hirschbuehl**

*European Commission – Joint Research Centre*

The content of this presentation does not necessarily reflect the official opinion of the European Commission. Responsibility for the information and views expressed therein lies with the presenter.

# Two major types of climate-related shock categories

- **Physical risks** (e.g. extreme weather) less likely to pose systemic risks for larger economies, but dependent on geography.
- An economy under structural transformation (green transition) might experience **transition risks**:
  - Not credible to have short-term climate-related shocks spreading via the real economy hitting the financial sector.
  - **Those could be modelled with purely financial dynamics ...**

# Three main challenges

1. Need for complementary exercises (*climate risk assessment toolkit*) that guide intuition concerning the short, medium and long run.
2. Climate stress testing intends to evaluate potential adverse short-run financial system dynamics implied by long-run risks.
3. Firm-level data would be needed, but not available.

# 1. Climate risk assessment toolkit

## Climate stress test

**Short-term:** 3-5 years

**Objective:**

Assess short-term vulnerabilities of the financial system.

Rest of the presentation

## Efficacy / feasibility assessment

**Medium-term:** 5-8 years

**Objective:**

Identify bottlenecks to the green transition.

Efficacy of the financial system to finance green transition

HH constrained in undertaking investment?

Are climate-risks macro-critical factors?

## Scenario analysis

**Long-term:** 30 years

**Objective:**

Structure thought on implications of policy-induced emission pathways.

How might policy-induced climate paths impact the fin. system?

Provide forward-guidance to financial sector

# 2.1 Financial shocks related to climate

**Portfolio reallocation:** *Monasterolo and De Angelis (2020), Alessi et al. (2021)*

- After Paris Agreement markets have considered low-carbon indices as less risky and hence more appealing for investment opportunities.
- Evidence that investors have reduced their exposures to carbon-intensive assets after the PA.

**Asset repricing:** *Alessi et al. (2021), Alessi et al. (2022)*

- If investors fail to price climate-transition risks would imply losses at the global level.
- Losses when transition risks are material and not fully incorporated, under a scenario of fire-sale dynamics triggered by a small depreciation of fossil-fuel and high-carbon assets.

**Credit crunch:** *Kacperczyk and Peydro (2022)*

- Firms with higher carbon footprint receive less bank credit once banks made a commitment to decarbonize subsequently.

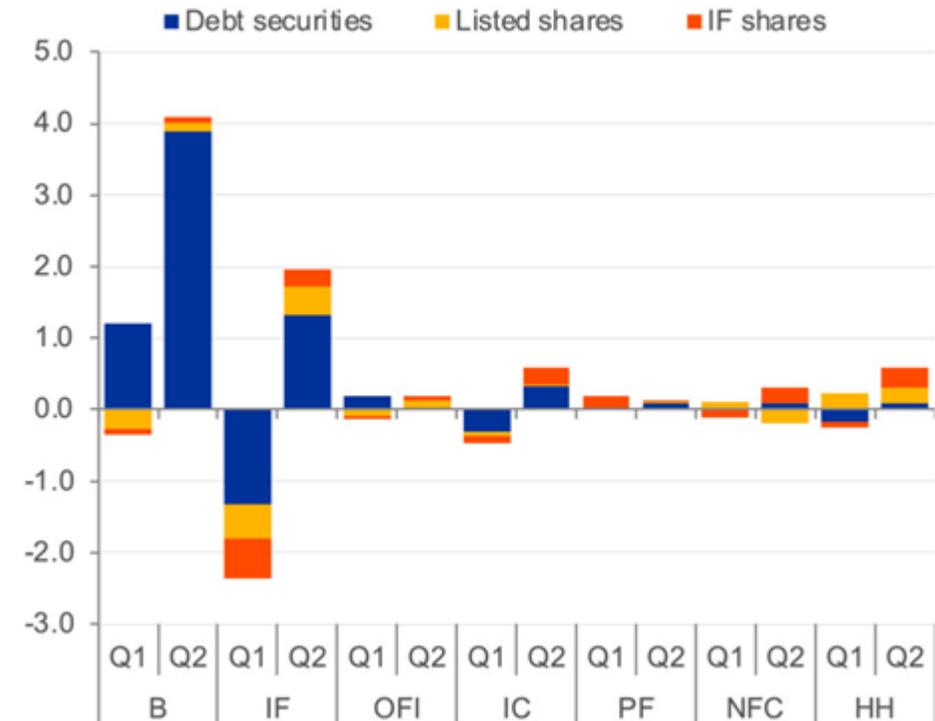
**Systemic financial impacts:** *Caporin et al. (2022)*

- Oil and natural gas companies have become more systemic.

## 2.2 Financial market stress during Covid

- “Pro-cyclical” deleveraging (2020Q1) and rebound due to policies (Q2).
- Investment funds lead selling debt securities, listed shares and fund shares.
- Importance of fund connectedness.

Chart 1: Total asset portfolio flows 2020Q1:Q2 per EA GDP



Source: Carvalho and Schmitz (2021).

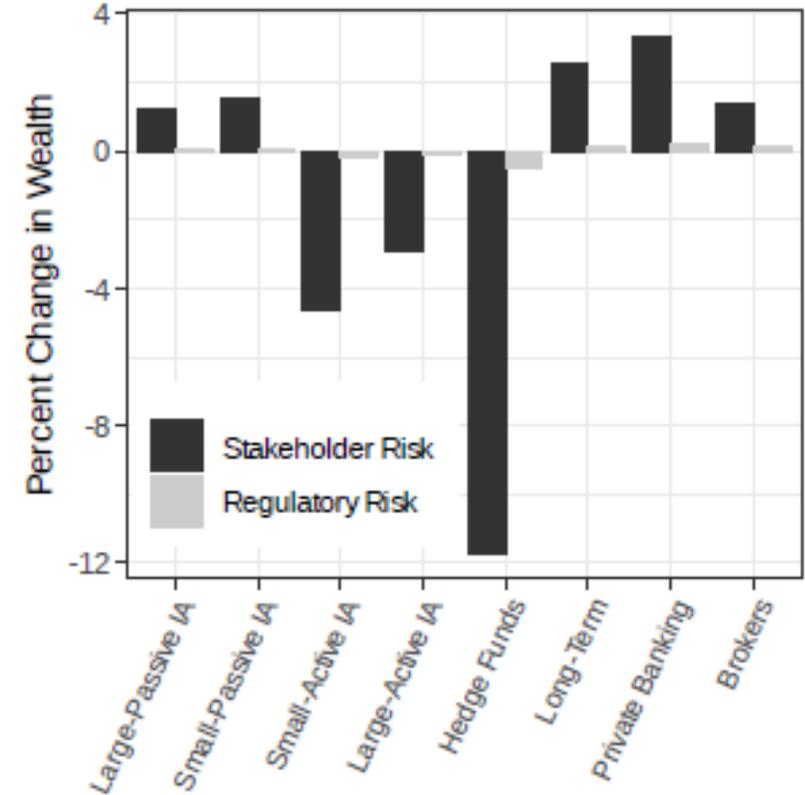
## 2.3 Green taste shock to portfolio allocation

### **Counterfactual scenario on equity prices**

assuming preference for green assets increases by 10% (5 to 5.5% wealth):

- **Stakeholder risk:** all investors shift to green assets.
  - Hedge funds loose almost 12% of their assets under management
  - Can be input to a more comprehensive representation of the financial sector....

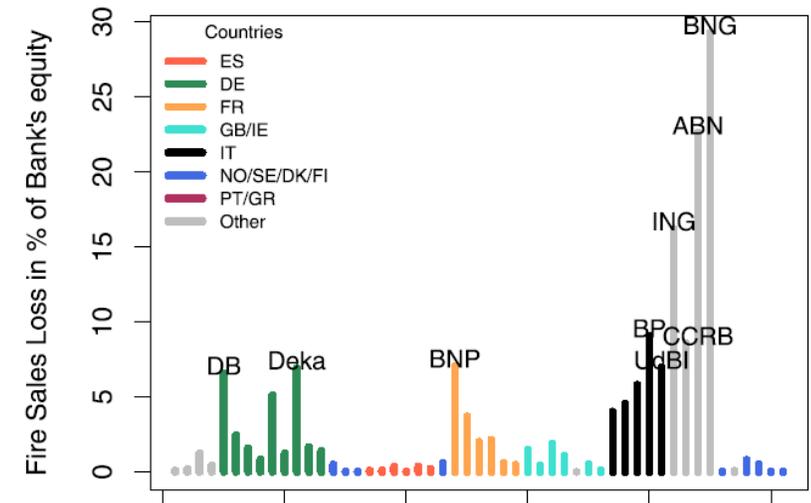
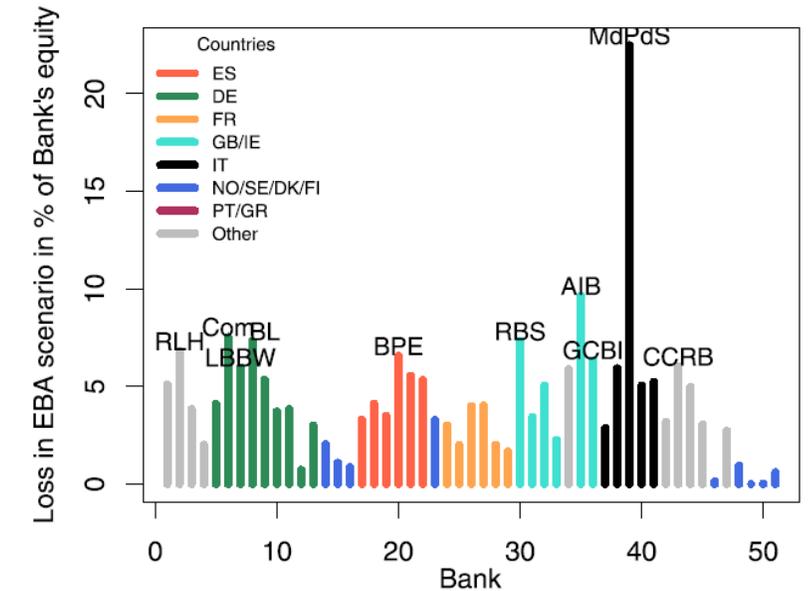
Chart: Impact of green taste shock on wealth of investor types



Source: Kojen, Richmond and Yogo (2022)

## 2.4 Contagion and second-round effects

- Green taste shock scenario, prices of some securities decline.
- Shock spillover due to common asset holdings (indirect contagion).
- FIs might have to deleverage:
  - trigger fire sales and further price declines.
  - credit crunch impacting the real economy.
  - potential of direct contagion within FI.
  - Increased exposure concentration can lead to amplification, e.g. funds sector.



Source: Cont and Schaaning (2021).

# 3.1 Sector-level data not granular enough

- Approximations are needed.
- In the case of climate risks, working at the sectoral (NACE) level can be misleading.
  - High risk related to communicating the wrong message (that sectors might be at risk), which would be also a very strong assumption.
  - Not credible that policymakers will allow entire sectors to default.
    - In the EU taxonomy, a steel producer can be fully green.
    - No sector fully at risk, taking approximations of entire sectors risky route.
    - Not even very polluting companies fully at risk, when they have credible transition plan.
  - Working at sector level might hide risk concentration.
- Estimation methodologies soften these problems

## 3.2 Data requirements

### Financial data:

- Asset holdings (bond, listed & fund shares)
- Loans
- Transition risk:
  - Firms:
    - Disclosure requirements on qualitative and quantitative transition plan
    - Production process / greenhouse gas emissions
    - Specific sector classification and size of business segments
  - Economy:
    - Energy certificates of buildings
- Physical risk:
  - Data on natural disasters and risk assessments
  - Locational data (incl. resid. buildings and plant-level assets per business seg.)
  - Granular insurance data

# Literature: climate risk assessments

## *Review on academic literature:*

Acharya, V., Berner, R., Engle, R., Jung, H., Stroebe, J., Zeng, X. and Zhao, Y. (2023). Climate Stress Testing.

Reinders, H.J., Schoenmaker, D., and van Dijk, M. (2023). Climate risk stress testing: A conceptual review.

## *Summary on EU institutional exercises:*

Walther, U. (2023) Climate stress tests: Are banks fit for the green transition? *SUERF Policy Note, Issue No. 305*.

## *How to model short-run portfolio reallocation shocks:*

Koijen, R.S., Richmond, R.J. and Yogo, M. (2023). Which investors matter for equity valuations and expected returns? *RFS forthcoming*.

## *Short-term portfolio flows in the euro area during Covid:*

Carvalho, D. and Schmitz, M. (2021). Shifts in the portfolio holdings of euro area investors in the midst of COVID-19: Looking-through investment funds. *Review of International Economics*.

# Thank you



© European Union 2023

Unless otherwise noted the reuse of this presentation is authorised under the [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/) license. For any use or reproduction of elements that are not owned by the EU, permission may need to be sought directly from the respective right holders.