Climate Change, Bank Stability and Green-financial Policies

M. Tavoni, with F. Lamperti, V. Bosetti, A. Roventini, T. Treibich
1. How do economic impacts reflect on the financial system?

2. Can monetary policies reduce the financial risks?
An history of financial crises

Financial crises and their costs

Fiscal costs (% GDP) vs. Year

Output loss (% GDP) 25 50 75

Income class H UM LM L
Climate change and financial stability: mechanisms

- Labour productivity and capital stock matter for financial stability.
- Climate change will affect both labour and capital.
- Climate change impacts will be transmitted to the banking and financial system, and if this is not sufficiently resilient, financial instability might result.
- This will have economic consequences which are both short term (e.g. GDP level) and long term (Debt, growth).
Climate change and finance: a nascent literature


- **Systemic risk and climate change**: Battiston et al (2016, NCC), Stolbova et al (2018, ECOLEC),...

DSK model

Agent based integrated assessment macro model

- 1 world region
- 10 banks
- 200 consumption good firms
- 50 capital good firms
- 1 Central Bank
- 400 periods, quarters from 2000 to 2100
- Climate can impact labour and/or capital productivity
- Calibrated to SSP5 and stylized facts
DSK model: the financial system

(largely based upon Dosi et al. 2015, 2018)

- Banks gather deposits from households and provide credit to firms

- Banks are heterogeneous in terms of their fundamentals, their client portfolio, as well as their supply of credit, which is a function of their equity and capital/liquidity requirements (Basel framework)

- Banks take allocation decisions by ranking the applicants in terms of their credit worthiness, defined by the ratio between past net worth and past sales

- Loan losses (bad-debt) represent a negative shock to bank profits

- If the net worth of the bank is not sufficient to cover such losses, the bank goes bankrupt

- If a bank shows negative equity, the government steps in, bails it out and refinance the bank
Climate impacts

Three impact scenarios

• Temperature lowers labour productivity
• Temperature lowers capital stock
• Both

• Model calibrated to match Nordhaus (PNAS 2017 DICE) in terms of impact (i.e. size of climate damage suffered – on average – by agents in a given year). Once aggregated, climate impacts are much higher than in Nordhaus and similar to Burk et al. 2015
Bank Bail-outs

Average number of bailouts in each scenario

- Capital Stock damages
- Labour and Capital damages
- Labour Productivity damages
- No Climate Change

Number of bailouts

Year

2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
Debt over GDP (labour+capital scenario)

- Average over 500 runs + CI
- Simulation average: 1.77
- + 200% wrt to the «No Climate Change» Scenario
The GDP losses due to financial instability
Sensitivity of bailouts to temperature and policy variables (capital adequacy ratio)
Green financial policies
Policy effects (labour productivity damages)

- GB+CE+RA: 0.024
- CE+RA: 0.025
- GB+RA: 0.036
- GB+CE: 0.024
- RA: 0.031
- CE: 0.026
- GB: 0.034
- BAU: 0.031

Labour productivity damages

- GB+CE+RA: 3.04
- CE+RA: 2.81
- GB+RA: 2.94
- GB+CE: 2.94
- RA: 2.6
- CE: 2.89
- GB: 2.6
- BAU: 2.6

Average GDP growth rate (%)
Policy effects (labour productivity damages)

Importance of the combination of
• Credit allocation
• Regulation
• Disclosure

Labour productivity damages

Policy mix
- GB+CE+RA: 1.77
- CE+RA: 1.99
- GB+RA: 2.01
- GB+CE: 1.86
- RA: 1.86
- CE: 2.16
- GB: 2.08
- BAU: 1.86

Debt to GDP ratio
Conclusions

• Bank failures have not been infrequent in the past, and the social costs of bail outs have been significant.

• Climate change might exacerbate financial instability by propagating the shocks to the real economy to the financial sector.

• Results reveal increase in bail outs, linearly in temperature increase, with significant economic repercussions.

• Financial policy instruments might be play a role, their interactions are relevant.

• However, coupling with other policies (C tax; fiscal policy; ...) needed to compensate negative climate impacts.

• Next steps: additional types of climate impacts, financial contagion, energy-finance nexus.
thanks

The public costs of climate-induced financial instability

Francesco Lamperti, Valentina Bosetti, Andrea Roventini & Massimo Tavoni

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Abstract

Recent evidence suggests that climate change will significantly affect economic growth and several productive elements of modern economies, such as workers and land\textsuperscript{1,2,3,4}. Although historical records indicate that economic shocks might lead to financial instability, few studies have focused on the impact of climate change on the financial...