Climate supervisory shocks and bank credit lending: Empirical evidence from microdata*

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* The views expressed herein are those of the authors and do not necessarily represent the views of the Bank of Italy or the Eurosystem.

Motivation

- No regulatory requirements for climate-related financial risks
  - ✓ Supervisory efforts by the ECB have intensified

- 2 policy shocks: ↑ Awareness of supervisors to climate-risk
  - ✓ Supervisory expectations on climate risk (Nov-2020)
  - ✓ Announcement of the first Climate Stress Test in 2022 (Nov-2021)
  - ✓ Treated banks: ALL Euro Area Significant Institutions (SIs), incl. Italian SIs

- Partial quantification on banks' credit supply in literature
  - ✓ Data gaps on SMEs and non-listed firms
    - ◦ IT: 47% of loans to firms, 67% of Value Added, 79% of employment
  - ✓ Under/Overestimation?

2020 ECB Supervisory expectation

Expectation 8
In their credit risk management, institutions are expected to consider climate-related and environmental risks at all relevant stages of the credit-granting process and to monitor the risks in their portfolios.

Box 2
Example of observed practice: Climate-related and environmental key performance indicators

The ECB observed an institution which had integrated the following climate-related and environmental key performance indicators (KPIs) into its strategic framework with a view to making its

strategy of reducing exposure to transition risks measurable: i) the carbon emission footprint of its assets; ii) the average energy label of its mortgage portfolios; and iii) the number of homes that saw an energy label improvement thanks to its financing. In addition to these KPIs, the institution stresses

This paper

Short-term effect on credit supply, policy shock, bank and firm emission reduction targets

1. Did the shock(s) lead to banks' reallocation of credit to less polluting (multi-bank) firms?
   - Quantity-channel
   - YES. After the expectations, SIs with climate targets reallocated credit compared to LSIs
   - Supervision effective for banks with decarbonization policies of lending portfolios
   - Robust results controlling for the presence of COVID-19 guaranteed loans

2. Did IT banks apply a different cost of lending post-shock?
   - Price-channel
   - NO. Predominance of credit reallocation

3. Are these results the same for brown firms with emission reduction targets?
   - Information-channel
   - *Focus on Large and Listed firms*: NON-unique evidence on the role of forward-looking info in the credit process
   - Difficulty for banks in assessing the reliability of this information

⇒ Contribution
- NEW policy shocks directly impacting banks (vs Paris): CLIMATE RISK IN SUPERVISION
- Complete assessment of the *whole* banks' credit portfolio, incl. SMEs and non-listed firms

(Micro) Data

- **Sample**: All *performing* credit lines granted by multi-banks to non-financial firms
  - Loan-level data from AnaCredit for Italian banks
  - Firm-level and bank-level emission reduction targets from Refinitiv
- **Monthly data**: 6 months time-window
  - Shock 1: September 2020 - February 2021
  - Shock 2: September 2021 - February 2022

Green and brown firm-level classification

Imputation Procedure for obtaining CO2 emissions at firm-level (as in Faiella et al., 2022)

1. Estimate firm-level energy consumption ($e_{f,t}$): $e_{f,t} = L_{f,t}\frac{E_{s,z,t}}{L_{s,t}}$

   $L_{f,t}/L_{s,t}$: number of employees for firm f/sector s at time t (INPS, ISTAT)
   $E_{s,z,t}$: energy consumption for sector s, energy source z, time t (EUROSTAT)

2. Estimate Scope1-Scope2 emissions (ton of oil equivalent, toe) through carbon emission factors

⇒ Strong correlation btw the classification of firms' brownness by banks and this research

Identification

2 banks (b): SI (treated), LSI (control)

2 firms (f): Brown, not Brown

2 time periods (t): t=0 (before), t=1 (after)
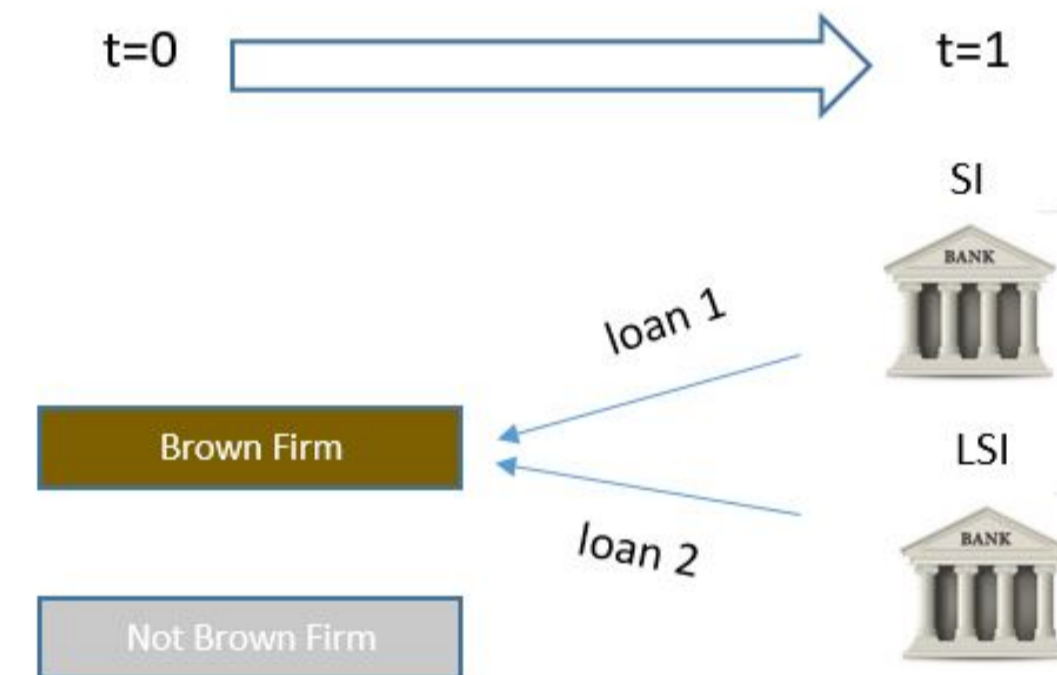
Empirical strategy

Quantity and price-channel

$$Y_{b,f,t,l} = \alpha_1(Brown_f \times Post_t \times Tre_b) + \alpha_2(Brown_f \times Tre_b) + \alpha_3 Covid_{b,f,t,l} + \\ + \delta_{b,t} + \omega_{f,t} + \eta_{l,t} + X_{b,t-1} + K_{f,t-1} + \epsilon_{b,f,t,l}$$

α_1: impact on credit after the shock of treated banks exposed to multi-bank brown firms

Information-channel

$$Y_{b,f,t,l} = \beta_1(BrownComm_f \times Post_t \times Tre_b) + \alpha_2(BrownComm_f \times Tre_b + \\ + \alpha_3 Covid_{b,f,t,l} + \delta_{b,t} + \omega_{f,t} + \eta_{l,t} + X_{b,t-1} + K_{f,t-1} + \epsilon_{b,f,t,l}$$

β_1: impact on credit after the shock of treated banks exposed to multi-bank brown firms with emission targets

- $Y_{b,f,t,l}$: log of stock of credit granted/average credit spread
- $Brown_f \in [0,1]$, if firm-level CO2 emissions are $\geq$ median of sectoral pre-shock distribution
- $Post_t \in [0,1]$, 1 after the introduction of the ECB Guide / Climate Stress Test
- $Tre_b \in [0,1]$, 1 SI bank 0 LSI bank
- $BrownComm_f \in [0,1]$, 1 if the firm is brown and committed (Refinitiv)
- $Covid_{b,f,t}$: log of credit backed by Italian Covid-19 guarantees
- **Fixed effects**: bank-time FE, firm-time FE, loan type-time FE

Testable hypothesis H0: insufficient incentives for banks to mitigate transition risk ⇒ α_1=0 ∧ β_1=0

1) Did SIs reallocate credit to less brown firms after the shock(s)?

YES: SIs reallocated credit (-2.5%) compared to LSIs after the 2020 sup expectations
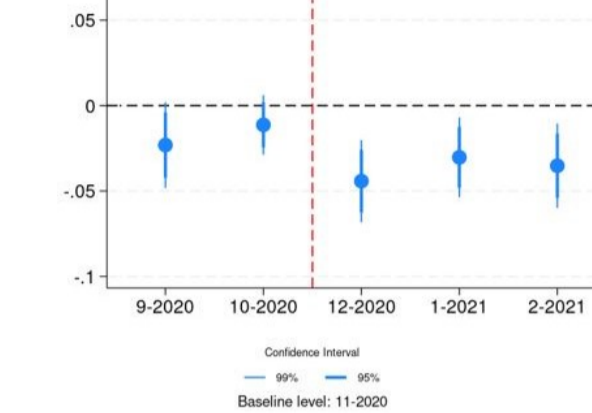
Which treated banks reallocated?

⇒ GREEN banks reallocated credit (-3.6%), i.e. SI banks with emission reduction targets set in the year before the shock compared to banks with no targets

Banking supervision impacted for banks with decarbonization policies of credit portfolios

		log(credit$_{b,f,t}$)	
	if SI	if SI with targets	if SI with no targets
$Tre_b = 1$	if SI	if SI with targets	if SI with no targets
$Tre_b = 0$	if LSI	if LSI	if LSI
$Brown_f \times Post_t \times Tre_b$	-0.0249***	-0.0364***	-0.011
	(0.00752)	(0.0098)	(0.0091)
Observations	754,479	442,221	487,676

2) Did SIs apply a different cost of lending post-shock?

NO EFFECT in terms of differences in the price charged by SIs for high-emitting borrowers compared to LSIs, neither for green banks

3) Are these the same for brown firms with emission reduction targets?

- ✓ Mixed results for listed firms: forward-looking info played a role only after the launch of the 2022 CST: SIs reallocated credit and charged higher credit spreads compared to LSIs
- ✓ Why? Related emissions of these large firms fed in the data collected by the SSM during the exercise with supervisory implications (SREP)

	Sup expectations		Climate ST	
	log(credit$_{b,f,t}$)	spread$_{b,f,t}$	log(credit$_{b,f,t}$)	spread$_{b,f,t}$
$BrownComm_f \times Post_t \times Tre_b$	1.325	-145.9*	-2.074**	81.73**
	(1.179)	(80.00)	(0.899)	(35.53)
Observations	5,020	5,020	4,951	4,951

Conclusions

- Novel evidence on the effect of increased awareness of climate banking supervision on credit supply with a complete assessment of banks' portfolio

- The SSM expectations led SIs to reallocate credit toward less polluting firms: the effect is entirely driven by banks with decarbonization policies

- Policy implications: supervision should both provide incentives for banks to manage climate-related risks and avoid unintended consequences, i.e. banks cut credit to firms needing more resources to support the transition (browner firms with transition plans)

References

Faiella, I. and Lavecchia L. and Michelangeli V. and Mistretta A. (2022). *A climate stress test on the financial vulnerability of Italian households and firms.* Journal of Policy Modeling Volume 44, Issue 2, 396-417