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The carbon content of Italian banking loans

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Motivation

- Lagarde (2019): include climate change in 1) modelisation of the economy; 2) supervision of banks; 3) investment operations.

- Schnabel (2020): COVID exposed two major risks for the global economy: 1) damages due to lack of prevention and early actions; 2) repercussions of failure to act collectively; pandemic as a warning for climate change.

- European Renewed Sustainable Finance strategy, the European Green Deal Investment Plan + the Sustainable Europe Investment Plan require at least €1 trillion over the next decade

- The Green deal should be at the core of the EU's Covid-19 recovery package (30% for climate protection).

Research questions

1. What is the exposure of the Italian financial system towards transition risks?

2. Which sectors/bank are particularly at risk?

Literature review

- **Battiston et al (2017)**
  - map NACE (4-digit) classes into 5 climate-policy-relevant sectors (CPRSs); equity exposure for banks, pension funds, individuals…from all EU/US listed companies; second round / indirect effects matter!
- **ECB, Financial Stability Review, May 2019**
  - based on Battiston et al (2017), equity and bond exposure (not loans!) via the SHSS db; investment and pension funds reducing their exposure, banks and insurances increasing;
- **DNB (2016)**: survey banks/insurances/pension funds: 9% assets in carbon-intensive sectors;
- **Vermeulen et al (2018, 2019)**
  - forward-looking climate stress test on the Dutch financial system (it includes loans, equity, and bonds); losses could reach, in the worst-case scenario, potentially up to 11% of all assets, or EUR 159 billion.
- **The Bank of England (2019)**
  - BoE will use its 2021 biennial exploratory scenario (BES) to sizing the financial risks posed by climate change; British banks and insurances companies will analyse their exposure under 3 scenarios up to 2050.

Data

1. **Air emissions accounts (Eurostat):** GHG emissions for 6 gases (CO2, N2O, CH4, HFCs, PFCs, and SF6) from human activity; residence principle; direct and indirect emissions from energy use (i.e. scope 1 + scope 2); no product-level emissions (very important but no up-to-date official estimates available plus issues with complexity and quality)

2. **Gross value added (Eurostat);**

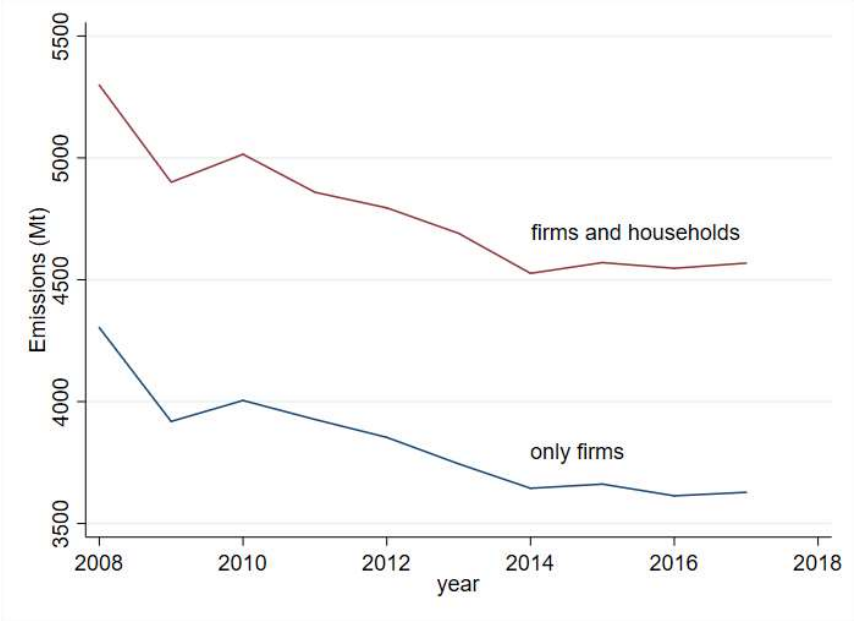
3. **Central Credit Registry (Banca d'Italia):** granular data on all loans (including syndicated loans) to any institutional units (households and firms) operating in Italy from any bank (including > 80 foreign banks) or financial institutions operating in Italy (<> insurances, pension and investment funds);

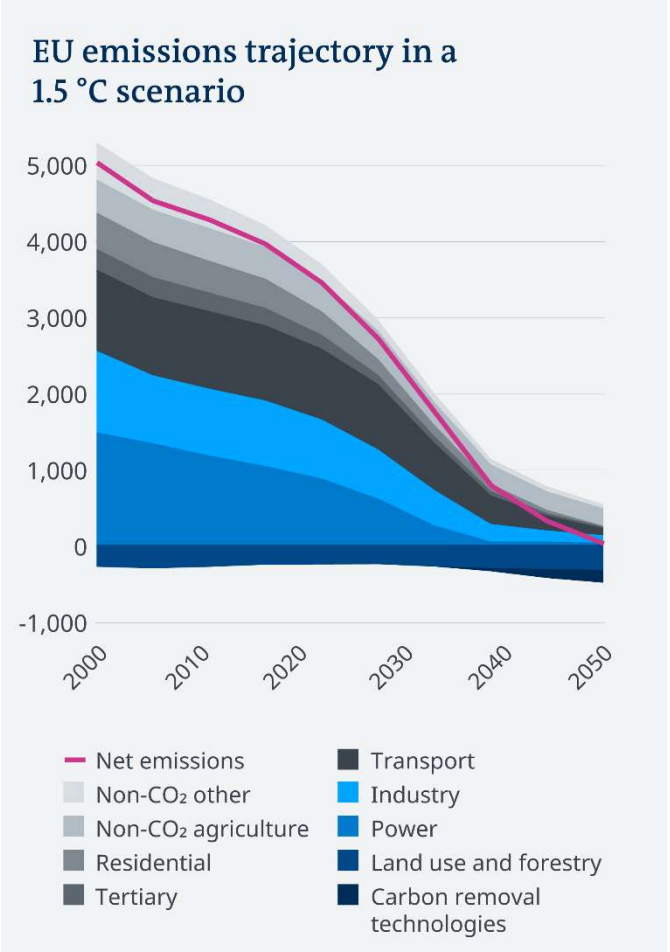
4. **Consolidated banking data 2 (ECB):** aggregate consolidated balance sheets of all EU banks, with details per NACE 1-digit sector

Some descriptive evidence…

GHG emissions are falling … but they are far off from the climate neutrality target

Evolution of GHG emissions in EU-28
(millions of tonnes of CO2 equivalents)





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As expected, emissions are concentrated in a few sectors…

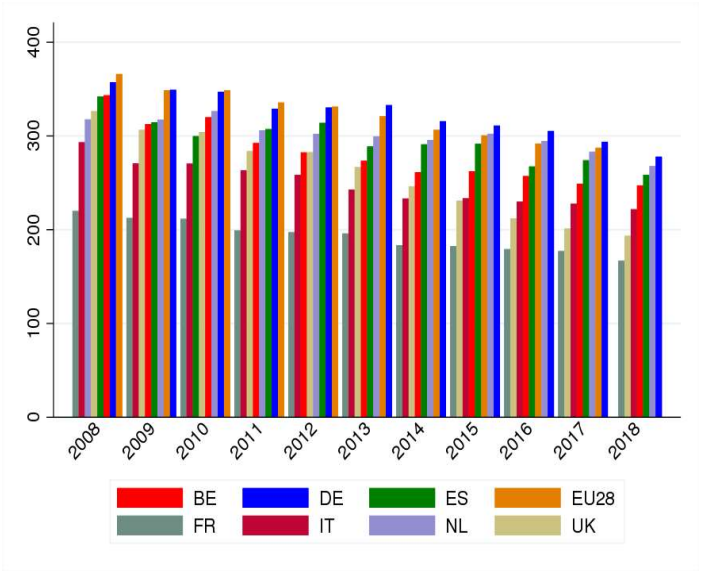
Descriptive statistics on the first 10 sectors by GHG emissions in 2018

Sector	Cum. growth 2008-18 %	Δ GHG 2008-18 Mt	Share of GHG %	GHG intensity of the value added (2016 at the sector level) gCO2e/€
Electricity, gas, steam and air conditioning supply (D)	-32.2	-44.1	28.4	4,941
Crop and animal production, hunting and related service activities (A01)	-5.0	-2.0	11.8	1,471
Manufacture of other non-metallic mineral products (C23)	-49.7	-23.5	7.3	2,664
Sewerage, waste collection, treatment and disposal activities; materials recovery and Remediation activities and other waste management services (E37-E39)	-11.3	-3.0	7.2	3,515
Water transport (H50)	-13.8	-2.9	5.5	4,675
Manufacture of coke and refined petroleum products (C19)	-35.3	-9.4	5.3	11,904
Land transport and transport via pipelines (H49)	-23.8	-4.7	4.6	417
Manufacture of chemicals and chemical products (C20)	4.9	0.7	4.3	1,316
Manufacture of basic metals (C24)	-43.2	-9.9	4.0	1,245
Wholesale trade, except of motor vehicles and motorcycles (G46)	8.3	0.9	3.6	134
Total economy	**-26.1**	**-115.2**	**100**	**221**

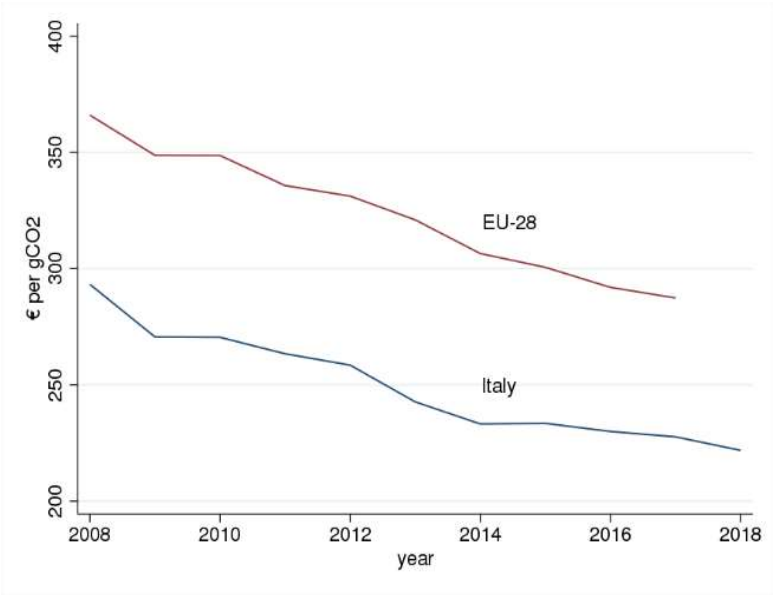
On the bright side, «carbon efficiency» is steadly increasing

Emissions per unit of value added
(gCO2e/€, chain linked prices, base year 2010)

(a) By country



(b) EU-28 vs. Italy



- EU-28 average 2008-18: **~ 324 gCO2e/€**
  - **FRA** (~193 gCO2e/€), **ITA** (~249 gCO2e/€), **UK** (~260 gCO2e/€), **ES** (~295 gCO2e/€); **DE** (~323 gCO2e/€);
- Italy in 2018: 221 gCO2e/€, always lower than the EU-28 avg

Three methods to assess the exposure of loans to transition risk

1. loan carbon intensity (LCI);
2. carbon-critical sectors (CCrS);
3. climate-policy-relevant sectors (CPRS): see Battiston et al. (2017).

Loan carbon intensity (LCI)

LCI answers a simple question:

"How many emissions are embedded in each euro that an average bank lends to a specific industry?"

$$\mathrm{LCI}_{s,t} = \frac{E_{s,t}}{L_{s,t}}$$

where

$E_{s,t}$ Emissions of sector *s* at time *t*

$L_{s,t}$ Outstanding loans of sector *s* at time *t*

Btw 2010 and 2018, industries with an above-the-median LCI accounted for 34 per cent of all loans and 93 per cent of all emissions

LCI varies greatly across industries…

Carbon intensity of the loans' portfolio of the 10 most emitting sectors

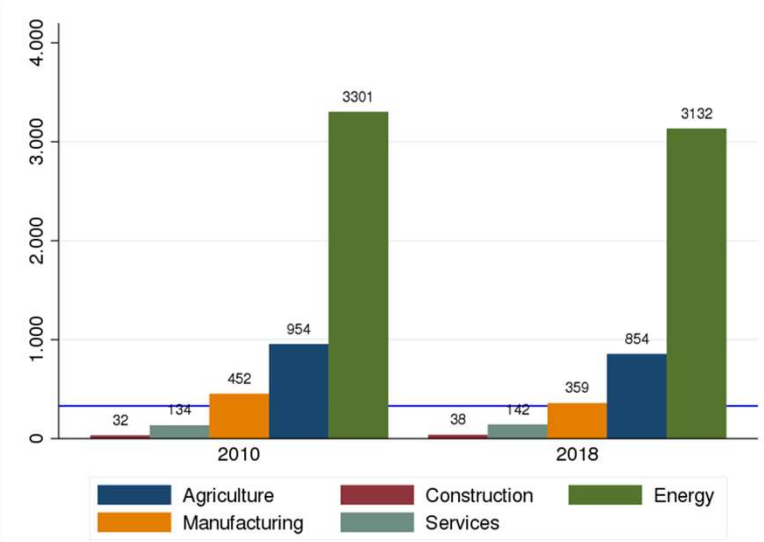
Sector	2010	2014	2018
Electricity, gas, steam and air conditioning supply (D)	3.773	2.510	3.444
Crop and animal production, hunting and related service activities (A01)	960	867	860
Manufacture of other non-metallic mineral products (C23)	2.307	2.082	1.914
Sewerage, waste collection, treatment and disposal activities; materials recovery and Remediation activities and other waste management services (E37-E39)	3.120	2.920	3.069
Water transport (H50)	1.851	1.562	2.831
Manufacture of coke and refined petroleum products (C19)	2.080	3.023	2.788
Land transport and transport via pipelines (H49)	910	973	792
Manufacture of chemicals and chemical products (C20)	1.340	1.351	1.411
Manufacture of basic metals (C24)	1.110	882	747
Wholesale trade, except of motor vehicles and motorcycles (G46)	118	135	126
Total economy	**351**	**318**	**327**

…and it is easy to compute and communicate

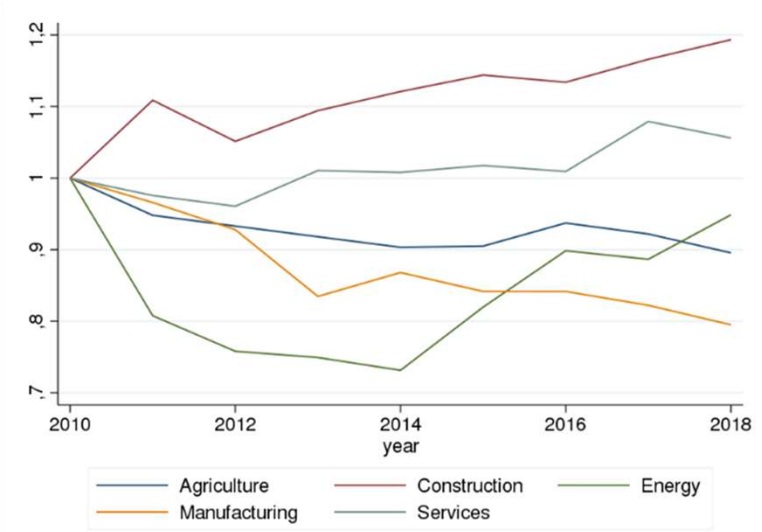
LCI per main economic sector in Italy

(gCO2e/€, base year 2010)

a) LCI in selected years



b) Trend 2010-18



Sources: Based on Eurostat and Bank of Italy's Central Credit Register data.

LCI average in Italy between 2010-2018: **330 gCO2e/€**

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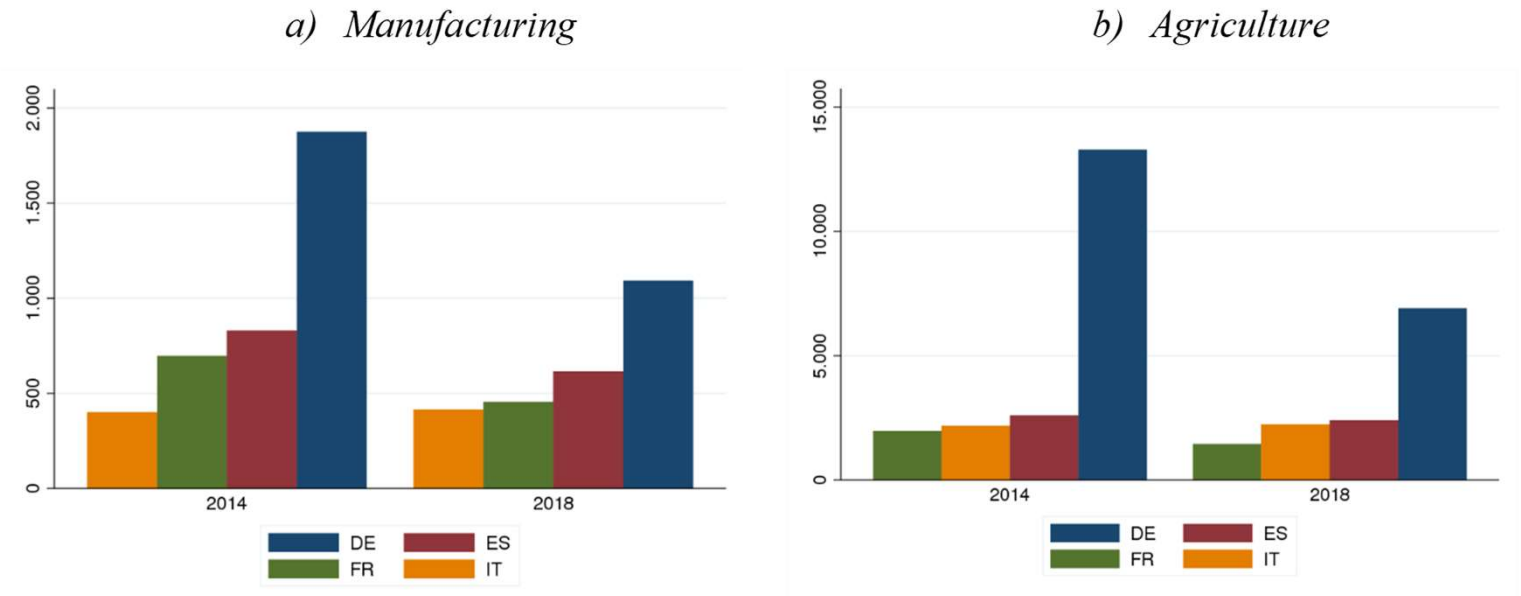
… allowing also international comparisons

LCI of manufacturing in selected European countries

(gCO2e/€, base year 2010)

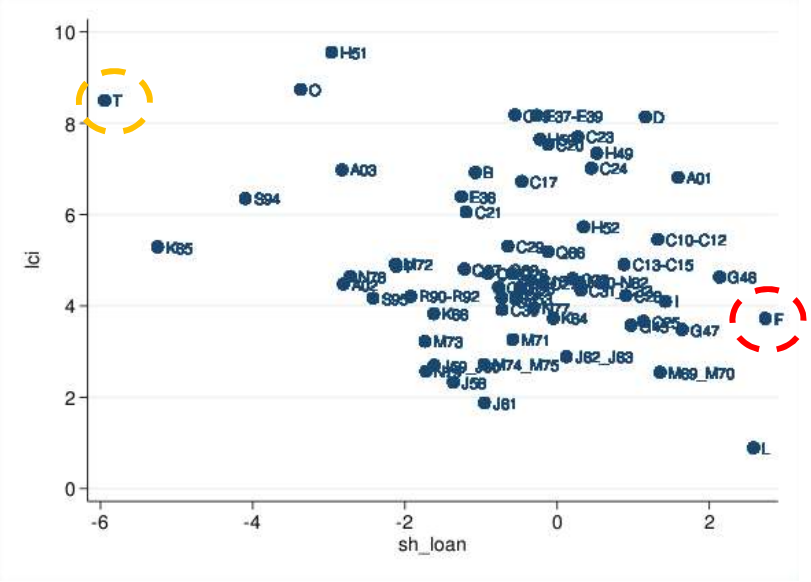


Sources: Based on Eurostat and ECB data

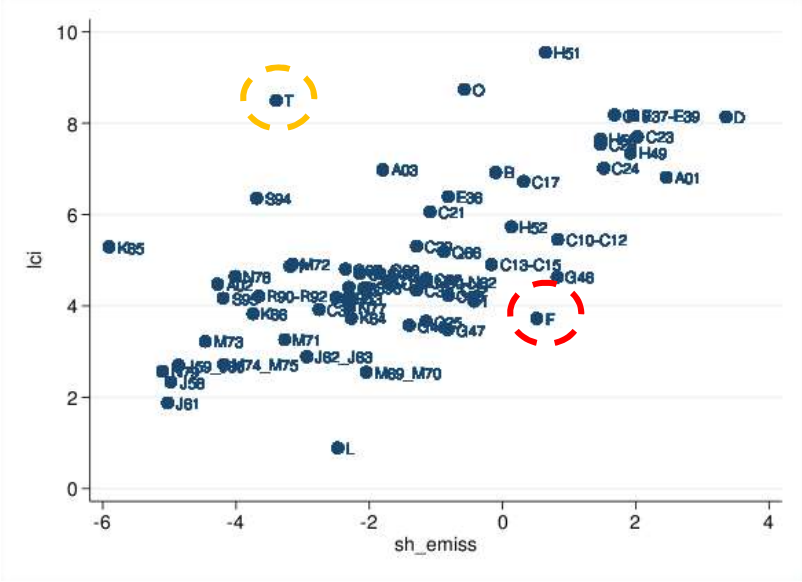
- the LCI of German manufacturing: 2X Spain, 4X Italy.
- differences decreasing due to a steep reduction of the LCI in Germany
- Similar evidence for the agricultural sector

… but it is far from perfect

a) Log LCI vs. log share of emissions



b) Log LCI vs. log share of loans



- Not all countries/sectors rely on loans in the same way
- it mixes up two phenomena (e.g. HHs as employers – T and construction - F)

A possible alternative: carbon-critical sectors (CCrS)

1. Create two separate **rank variables** that provide information on sectors' share of total emissions $(E_{s,t})$ and on the share of total loans $(L_{s,t})$.

2. Take the **simple average** of these ranks $(avg\_rank_{s,t})$, obtaining a measure of the relevance of each sector in terms of emissions and exposition to the financial sector.

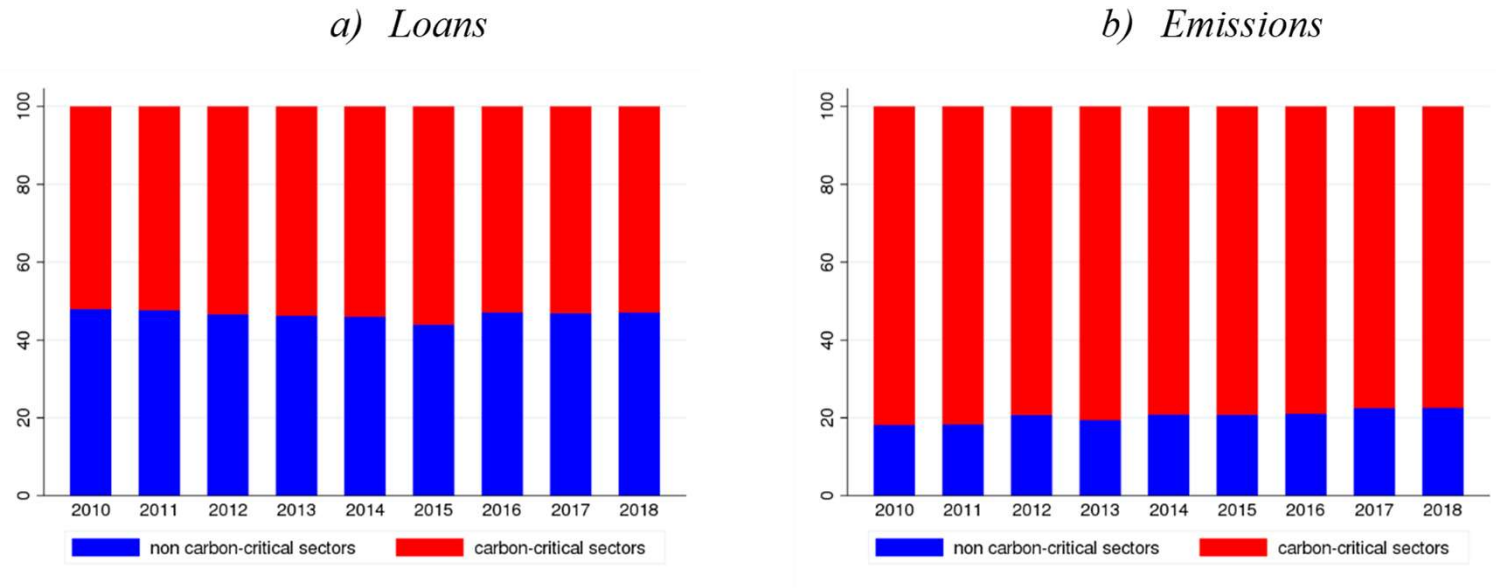
3. Define as carbon-critical sectors (CCrS) those whose average is in the **first fifth** (q_1) of the distribution of $avg\_rank_{s,t}$

$$\mathrm{CCrS}_s = \mathrm{I}\{\mathrm{average}\left[rank_t\left(\frac{E_{s,t}}{E_t}\right), rank_t\left(\frac{L_{s,t}}{L_t}\right)\right] < q_1\}$$

CCrS account for a sizable part of loans and emissions

Loans and emissions: CCrS vs. non-CCrS

(billions of euro and millions of tonnes of CO2 equivalent)



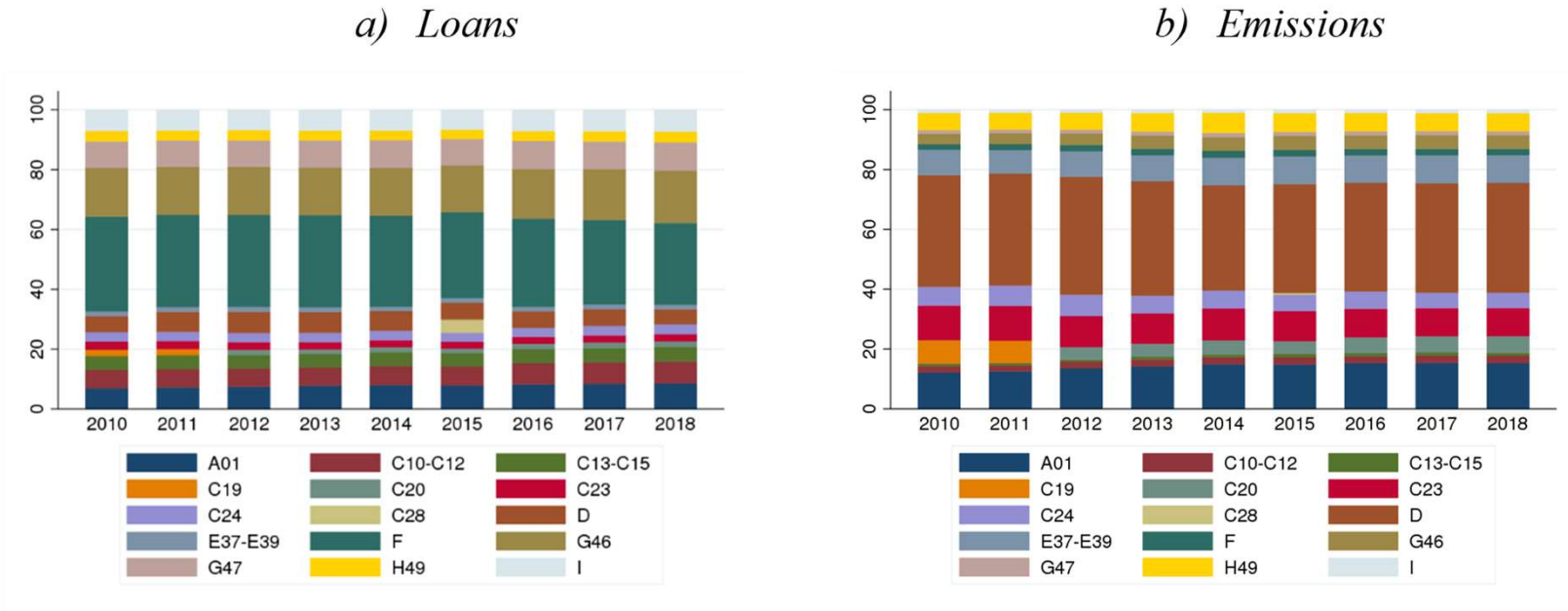
Sources: Based on Eurostat and Bank of Italy Central Credit Register data.

- Concentration: CCrS capture 53% of the loans and 80 per cent of emissions
- Analogue results using carbon GHG per unit of value added for ranking the emissions

CCrS exposure by detailed sectors

Loans and emissions: CCrSin detail

(percentage points)



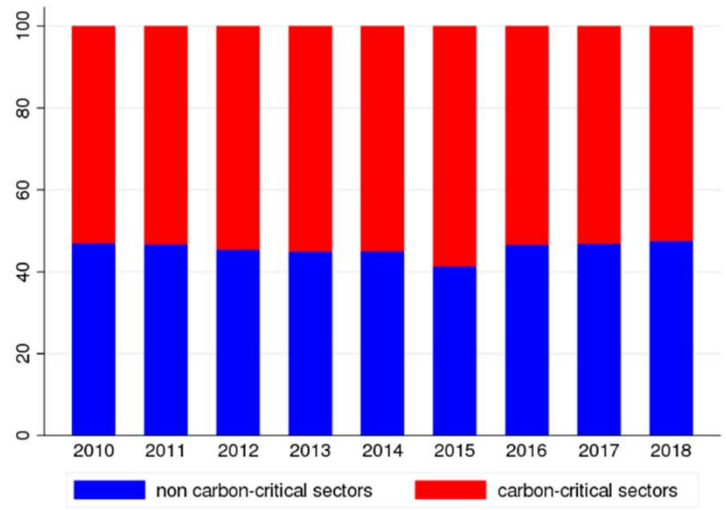
Sources: Based on Eurostat and Bank of Italy Central Credit Register data. The legend of the sectors is in the Appendix.

- Construction (F), Wholesale and retail trade (G46+G47) account for one-third of the loans but less than 6 per cent of GHG emissions
- the three most emitting sectors, i.e. energy (D), agriculture (A01) and the manufacture of other non-metallic mineral products (C23), account for half of the emissions but only a tenth of loans.

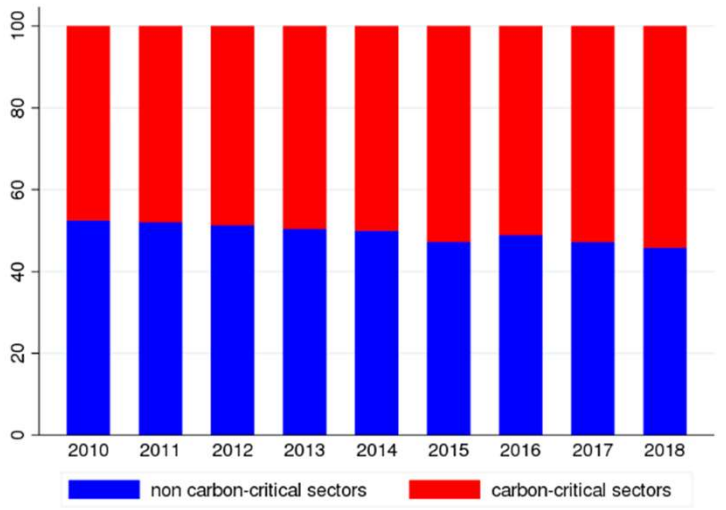
CCrS sector exposure by type of intermediary

Exposure of the Italian financial system towards CCrS – by type of intermediary
(percentage points)

a) Banks



b) Other financial intermediaries



Sources: Based on Eurostat and Bank of Italy Central Credit Register data.

- Slightly decreasing share for banks, increasing for other FIs
- No difference between the 5 biggest groups and other banks or financial institutions

Results

Carbon exposure of the Italian financial system at the end of 2018
(billions of euros and percentage points)

	Outstanding loans		Share of total loans		Loans as a share of total assets
Method	Total	Banks only	Total	Banks only	
CPRS	473.9	323.9	47.5	45.6	12.9
LCI > median	364.2	273.4	36.5	38.5	9.9
CCrS	528.0	372.8	52.9	52.4	14.4

Summing up…

- Existing literature focuses on equity and bonds; **our work focuses on loans**
- We have devised a simple and transparent method to define an industry-level indicator for the exposure of firms' credit to transition risk.
  - **cons**: sectoral data is a second best;
  - **pros**: most of GHG; dynamic classification, includes loans, scalable to other countries, useful for modelling.
- Results:
  1. Avg. Exposition btw 38% (LCI) and 53% (CCrS);
  2. No difference between 5 biggest banking groups and other banks (or FIs) on average;
  3. sectors more exposed (CCrS): construction, machinery, wholesale and retail trade;
  4. Italy less exposed than other countries (partic. DE);

Thank you

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Climate-policy-relevant sectors (CPRS)

Loans to Climate-policy-relevant sectors (CPRS) in the Italian financial system

((billions of euros, current prices))