

Credit Supply and Green Investments

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Discussion

by

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Research Topic

- How to harness finance for climate? Several financiers can be important (stock markets, VC, PE, governments, individual investors, banks).
- This paper focuses on **banks** as external financiers and addresses the question:
 - Does an increase in bank credit supply affect firms' likelihood to invest in green technologies?
 - Not clear ex-ante;
 - if financial reasons, then green investments may not react to credit supply if there is no profit-motivation
 - If pro-social reasons – probably positive effect of credit supply if borrower internalizes some of the externalities

Research Topic

- Why relevant?
 - SMEs around the world are mainly dependent on bank finance for financing their investments
- Focus on Italian firms:
 - ‘representative country’ with many SMEs
 - firms are particularly bank-dependent
 - mostly multiple lending relationships – might affect the impact of credit supply shocks
 - You may want to study effect whether effect of credit supply shocks is different with multiple relationships.

Contribution and novelty

- *Textual analysis to identify* green investments by *SMEs* – following the literature on analyzing conference calls for publicly listed firms <-> self-reported commitments through CDP or Science Based Target Initiative
- Combined with banking literature on identifying credit supply shocks allows to establish the link between credit supply and green investments.
- Speaks and contributes to several strands of literature
 - Green finance
 - Credit supply
 - Subsidies and government support
 - Environmental preferences
 - Political economy
- Brings *a positive message of banks fostering green investments (but mostly when subsidies are around and environmental preferences)*

Main Findings

- A large **positive elasticity** of green investments to credit supply.
 - a one standard deviation increase in credit supply induces
 - a 1.9 to 3.4 percentage points increase in the likelihood of green investments, which is roughly equivalent to 14% of its standard deviation
 - is the correct standard deviation for credit supply not the one of CSI *first stage coefficient*coefficient on Δ Loan (0.3 percentage points)
 - no effect on other regular investments (but also with similar investment peaks?)
 - Positive elasticity concentrated among larger, older, more liquid, and more profitable firms, and coincides with investment peaks
 - Complementarity with government subsidies and environmental preferences as elasticities are larger in the regions with greater subsidies and environmental preferences

Main Findings (2)

- Positive effect is concentrated in areas with higher preferences for environmental protection
 - Driven by entrepreneurs' preferences, rather than clients' preferences
- Competition can spur green investments if combined with environmental awareness.
- Do not find a differential elasticity of green investments to credit supply across sectors with high and low GHG emissions
 - limited effect of changes in regulatory risk

Methodology

- Identifying green investments through textual algorithms
- $\text{Green}_{it} = 1$ when at least one “word in the dictionary” is used, and the firm has positive capital expenditure

$$\text{Green}_{it} = \mathbb{1}_{D \cap W_{it} \neq \emptyset} \cdot \mathbb{1}_{\text{Capital Expenditure}_{it} > 0}$$

- Around 6% of firm-year observations have green investments
- Around 10% of firms have at least once a green investment in 5-year window covered
- Regression model (includes firm fixed effects)

$$\text{Green}_{it} = \beta \Delta \text{Loan}_{it} + \delta X_{it} + \mu_i + \tau_t + \gamma_{s(i) \times \tau_t} + \eta_{c(i) \times \tau_t} + \theta_{p(i) \times \tau_t} + \epsilon_{it}, \quad (1)$$

- So captured variation comes mostly from firms “not always doing green investments” – those always doing may also be of interest?

Methodology (2)

- Regression model

$$\text{Green}_{it} = \beta \Delta \text{Loan}_{it} + \delta X_{it} + \mu_i + \tau_t + \gamma_{s(i) \times \tau_t} + \eta_{c(i) \times \tau_t} + \theta_{p(i) \times \tau_t} + \epsilon_{it}, \quad (1)$$

- $\Delta \text{Loan}_{i,t}$ is endogenous so they instrument it with a firm-specific credit supply shock

$$\Delta \text{Loan}_{bpst} = \delta_{bt} + \gamma_{pst} + \epsilon_{bpst}.$$

$$\Delta \text{Loan}_{it} \leftarrow \text{CSI}_{i,t} = \sum_b w_{b,i,t_0} \times \hat{\delta}_{bt},$$

$$w_{b,i,t_0} = \frac{\text{Loan}_{i,b,2014}}{\sum_b \text{Loan}_{i,b,2014}}.$$

- $\Delta \text{Loan}_{i,t}$ is Davis-Haltiwanger growth rate and encompasses intensive and extensive margin, **but shock is measured at intensive margin – credit supply shocks may also spur new lending which is not captured**

Comment (1) – firm-specific credit supply measure

- Empirical model to identify supply effects

$$CSI_{i,t} = \sum_b w_{b,i,t} \times \hat{\delta}_{bt},$$

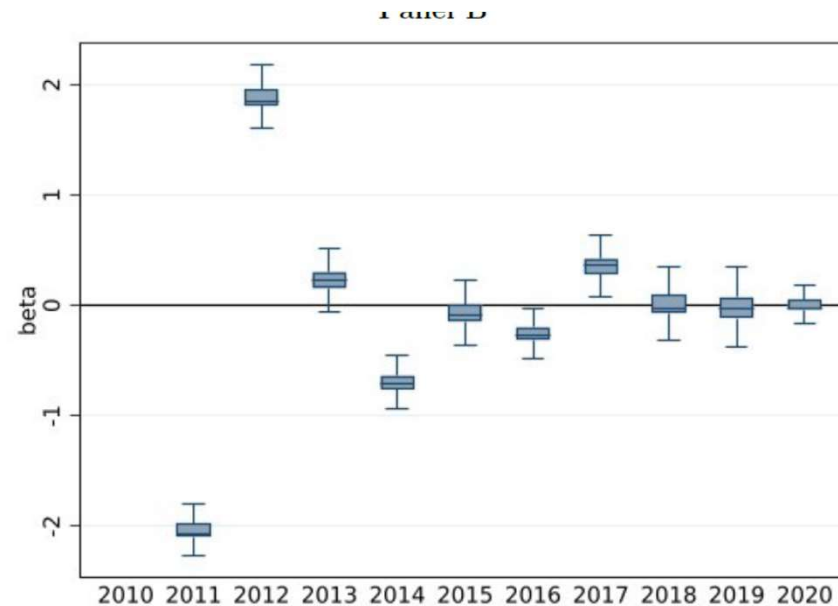
$$\Delta Loan_{bpst} = \delta_{bt} + \gamma_{pst} + \epsilon_{bpst}.$$

$$w_{b,i,t} = \frac{Loan_{i,b,2014}}{\sum_b Loan_{i,b,2014}}.$$

- Identification for local banks versus global banks is quite different
 - Local banks: only cross-sectoral
 - Global: cross-province and cross-sectoral
- Implications for analysis of credit supply as firms dealing with global banks get similar shocks across provinces versus local banks have more local shocks.
- Credit supply shocks may be correlated with firms teaming up with smaller, local banks with specific business model?
- Extensive margin results: are firms more likely to be green when they start borrowing from a bank with a positive credit supply shock (i,b,t)

Comment (1) – firm-specific credit supply measure (2)

- Can we compare bank-supply shocks across periods? There is no comparable numeraire across periods.



- Shocks are quite mild during time window 2015-2019
- Are the same banks persistently in the tails of the distribution?

Comment (2) – textual analysis

- Authors gather information from notes to balance sheets and search for instances regarding words related to “green technologies”
 - Dictionary seems based on publicly listed firms

Panel A: Composition by size category

Large	2,691	469	3,160	14.8
Medium	13,956	1,691	15,647	10.8
Small	8,087	597	8,684	6.9
Micro	1,752	119	1,871	6.4

- Distinguish between tangible and intangible assets?
 - Banks typically care about collateral
- Are banks or auditors behind this type of reporting? Are you capturing banks or auditors’ incentives?

Comment (3) – OLS versus 2SLS; green versus regular

- Would want to understand a bit more on different results

Table 4: Main results: Credit supply and green investments

Panel A - OLS				
	(1)	(2)	(3)	(4)
Δ Loan	-0.0001 (-0.136)	-0.0001 (-0.234)	-0.0001 (-0.201)	-0.0002 (-0.267)
Observations	113,841	113,841	113,841	113,841
R-squared	0.743	0.743	0.743	0.795
Panel B - IV				
	(5)	(6)	(7)	(8)
Δ Loan	0.0264* (1.694)	0.0272* (1.702)	0.0286* (1.775)	0.0482** (2.320)
Observations	113,841	113,841	113,841	113,841
R-squared	0.738	0.739	0.738	0.782
Firm controls	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Province-Year FE	Y	Y	Y	.
Sector-Year FE	.	Y	Y	.
Size-Year FE	.	.	Y	.
Province-Sector-Size-Year FE	.	.	.	Y
First-stage:				
CSI	0.285*** (8.276)	0.280*** (8.077)	0.279*** (8.028)	0.252*** (6.612)
F-statistic weak instruments	178.4	170.4	168.4	114.8
Observations	113,841	113,841	113,841	113,841
R-squared	0.276	0.279	0.279	0.403

Table 5: Credit supply and the propensity to invest in capital expenditures

Panel A - OLS				
	(1)	(2)	(3)	(4)
Δ Loan	0.0885*** (15.39)	0.0888*** (15.28)	0.0777*** (12.98)	0.0742*** (11.73)
Observations	113,841	113,841	113,841	113,841
R-squared	0.446	0.448	0.449	0.559
Panel B - IV				
	(5)	(6)	(7)	(8)
Δ Loan	0.00967 (0.347)	0.00847 (0.297)	0.0105 (0.366)	0.0190 (0.560)
Observations	113,841	113,841	113,841	113,841
R-squared	0.446	0.448	0.449	0.557

Concluding remarks

- There are many things to like in this paper as they combine recent methods to learn something about green investments for a set of firms we know little about.
 - Employing textual analysis, the authors identify green investments – having data on this is already a contribution
- What are these green investments (tangible, intangible)?
- Speaks to various literatures and is consistent with many
- Some suggestions to think about a deeper interpretation
- Good luck in the publication process