Carbon Pricing, Credit Reallocation and Real Effects

Discussant: Tim Eisert

Erasmus University Rotterdam, CEPR

3rd Finance and Productivity (FINPRO) Conference

June 2023

Summary and Research Question

- How does an exogenous increase in carbon-prices affect a firm's investment and emission intensity?
- This paper proposes a debt channel $\rightarrow$ firms facing higher carbon prices increase their demand for credit
- Identification: European Commission reform to reduce carbon emission permits, leading to a significant increase in the price of permits
- Average price rose from 5 EUR to 20 EUR within a year
- Implies that the expected cost of permits rise from about 0.5% of revenue to 2% of revenue

This Paper: Firm demand side

- Firms highly exposed to the carbon price surge (above median shortage of free permits) experience demand-driven expansion in credit (by roughly 10%)
- Increased loan amounts mainly in the forms of term loans
- This leads to
  - an increase in total indebtedness (without affecting leverage)
  - an increase in size and investment level
  - a reduction in relative carbon intensity
- Effects stronger in green sectors

This Paper: Bank supply side

- No overall credit supply effects: banks more exposed to firms affected by the carbon price increase do not adjust their credit supply on average
- In the cross-section of borrowers, affected banks slightly cut lending towards brown sectors

Taking stock

- Two separate analyses (demand vs supply) in the paper
  - Affected firms increase their bank borrowing
  - Banks exposed to affected firms do not adjust their credit supply on average
  - Banks exposed to affected firms reduce lending to brown firms (which are likely exposed firms)
- How do we square these results?

Taking stock

- Two separate analyses (demand vs supply) in the paper
  - Affected firms increase their bank borrowing
  - Banks exposed to affected firms do not adjust their credit supply on average
  - Banks exposed to affected firms reduce lending to brown firms (which are likely exposed firms)
- How do we square these results?
- Who is providing credit to affected firms if banks exposed to these firms do not adjust their credit supply?
- Consider combining the demand and supply side analysis into a single framework

$$Y_{f,b,t} = \beta_1 Exposure_b \times Post_t \times HighShortage_f + \eta_{bt} + \nu_{ft} + \epsilon_{f,b,t}$$

- How do exposed banks adjust their credit supply to high shortage firms?
- Control for bank-time *and* firm-time fixed effects

Why are banks willing to lend more?

Crucial assumption for the demand side: *"we identify [our coefficient] through variations in credit due to firm-demand shocks, under the assumption that banks do not ex-post alter credit standards differently across firms"*

Why are banks willing to lend more?

Crucial assumption for the demand side: *"we identify [our coefficient] through variations in credit due to firm-demand shocks, under the assumption that banks do not ex-post alter credit standards differently across firms"*

- ▶ Mirror image of KM identification assumption: no change in bank-specific credit demand of firms → seems like a strong assumption
- ▶ Higher carbon emissions expenses (if meaningful) likely increase credit risk of borrowers → banks might prefer lower risk borrowers

Why are banks willing to lend more?

Crucial assumption for the demand side: *"we identify [our coefficient] through variations in credit due to firm-demand shocks, under the assumption that banks do not ex-post alter credit standards differently across firms"*

- ▶ Mirror image of KM identification assumption: no change in bank-specific credit demand of firms → seems like a strong assumption
- ▶ Higher carbon emissions expenses (if meaningful) likely increase credit risk of borrowers → banks might prefer lower risk borrowers
- ▶ What happens to pricing of loans?
- ▶ Do banks adjust internal ratings?
- ▶ How do bank portfolio risk and NPLs change?

Why are banks willing to lend more?

Crucial assumption for the demand side: *"we identify [our coefficient] through variations in credit due to firm-demand shocks, under the assumption that banks do not ex-post alter credit standards differently across firms"*

- ▶ Mirror image of KM identification assumption: no change in bank-specific credit demand of firms → seems like a strong assumption
- ▶ Higher carbon emissions expenses (if meaningful) likely increase credit risk of borrowers → banks might prefer lower risk borrowers
- ▶ What happens to pricing of loans?
- ▶ Do banks adjust internal ratings?
- ▶ How do bank portfolio risk and NPLs change?
- ▶ More discussion needed as to why (and which) banks are willing to provide more credit
- ▶ Expecially since increase does not seem to be driven by ex-ante exposed banks
- ▶ Do these firms get more loans from banks with ex-ante greener portfolios?

Which firms are driving the effect?

	(3)	(4)	(5)	
	Log(TermLoans)	*Log(1 + TermLoans)*		
	0.0573	0.0861***	0.0670***	
	(0.94)	(3.26)	(3.11)	
	Yes	Yes	Yes	
	Yes	Yes	Yes	
	Yes	Yes	Yes	
	Yes	Yes	Yes	
	33741	33802	33792	
	0.897	0.937		
	OLS	OLS	Poisson	

▶ Credit demand effect only significant when using Log(1+Term Loans)?

▶ Likely driven by non-linear effects, particularly for smaller loans?

Real Effects - How do firms respond?

- ▶ Firms with a shortage of emission permits
  - ▶ receive more total credit, without increasing their leverage
  - ▶ increase (long-term) assets and have a higher wage bill
  - ▶ show no change in total or relative emissions
- ▶ Authors argue effects are driven by firms with a high shortage of emission permits that invest in green projects

"We ask whether firms undertaking green investment drive our findings. This would suggest that the debt channel documented so far is aimed at financing investments for improving firms' environmental performance. Results in Table 7 provide strong evidence in favor of this conjecture."

Real Effects

	(1) Log(Credit)	(2) Log(Liab)	(3) Leverage
Panel A: Debt Channel			
Post*HighShort	0.0508	0.0745	0.209
	(0.50)	(1.46)	(0.65)
Post*HighShort*GreenI	0.335+	0.191	0.291
	(1.48)	(1.10)	(0.62)
N	2836	707	707
Firm Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Sector*Year FE	-	Yes	Yes
Sector*Year-Quarter FE	Yes	No	No
p-value	0.07	0.12	0.20

- Firms with green investments do not have a significantly higher credit growth *relative* to firms without green investments
- Total effect on total liabilities insignificant
- Overall credit allocation does not seem to be different across firms with green vs. non-green investments

Real Effects

Panel B: Real Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log(LT Assets)	Log(wage bill)	Liquid/TA	Log(TA)	Log(Rev)	Log(Emis)	Log(Emis/Rev)	Log(Emis/TA)
Post*HighShort	0.0779	0.0484	-0.00435	0.0402	0.0447	-0.0131	-0.0292	-0.0466
	(1.40)	(1.63)	(-0.34)	(1.24)	(0.92)	(-0.24)	(-0.48)	(-0.75)
Post*HighShort*GreenI	0.166	0.212*	0.00914	0.202*	0.125	-0.217	-0.337+	-0.4275**
	(1.19)	(1.87)	(0.45)	(1.63)	(0.91)	(-1.17)	(-1.60)	(-1.97)
N	707	703	707	707	707	685	684	684
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector*Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
p-value	0.06	0.02	0.77	0.05	0.18	0.21	0.08	0.03

- No differential growth in long-term assets (investments)
- Only wage bill and emissions over total assets affected
- Lack of significant real effects consistent with overall credit growth results
- I would caution to conclude that there is strong evidence that credit is aimed at financing investments for improving firms' environmental performance

Conclusion

- Interesting setting to answer a highly important question
- Some open questions on exact mechanism and interpretation of results
- Very much looking forward to reading the next version of this paper