

Too Levered for Pigou: Carbon Pricing, Financial Constraints, and Leverage Regulation

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July 8, 2023 @ CICF

General Research Agenda

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This paper is great for analyzing all the above elements in a unified framework.

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- ▶ So why not combine "financial tools"? Certainly a good idea!
 - ▶ Leverage regulation: OCT + LR could be constrained-efficient (PB).
 - ▶ Climate risk hedging: OCT + CRH could restore the first best (FB).
 - ▶ "Financial tools directly relax the financial constraints caused by OCT".

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A very interesting and insightful paper (the message is very clear)!

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Carbon Tax (OTC)	*****	*	*	*
Cap-and-Trade	***	***	***	***
OTC + Leverage Regulation	***	***	***	***
OTC + Green Subsidies	*	*****	*****	***
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- ▶ Tools that are most efficient in theory may be (likely) harder to execute in reality. For instance, smaller firms probably cannot afford to enter the hedging market. These firms are likely the dirtiest firms.

Comment 2: Rethink the role of tax plegeability

The authors emphasize three key elements related to financial constraints:

- ▶ Tax plegeability (ψ); Physical risk (γ_s^p); Tech obsolete risk (in the intro.).
- ▶ The paper focuses much on the "collateral externality" of physical risk:

$$\frac{\partial I_{1s}^*}{\partial \tau_s} = \frac{\overbrace{(1 - \psi)E(X_s^*, I_{1s}^*)}^{\text{Direct effect}} + \overbrace{(\theta\gamma_s^p - \psi\tau_s)\frac{\partial E_s^a}{\partial X_s^*}\frac{\partial X_s^*}{\partial \tau}}^{\text{Collateral externality}}}{\tilde{r}(\tau_s(1 - \psi) + \theta\gamma_s^p, X_s^*, I_{1s}^*)}$$

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My Comments:

- 1 Should emphasize more: At the core is the **direct effect**.
Since most firms are constrained: "too levered for Pigou" is the key. (in the title)
- 2 Each individual firm fully understands that its carbon tax is fully reimbursed.
The only burden of the carbon tax is on the collateral constraint.

$$c_{2s}^b = R(I_{1s}, E_s^a) - \tau_s E(X_s, I_{1s}) - d_{1s} + T_s \geq 0,$$

$$d_{1s} \leq \tilde{R}(I_{1s}, E_s^a) - \tau_s E(X_s, I_{1s}) + \psi T_s,$$

This assumption seems really strong, especially considering that firms are heterogeneous. This will be directly fiscally subsidizing dirty firms since they get larger transfer T_s .

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In other words, physical risk ($-\gamma_s^p E_s^a$) is irrelevant to individual firm's action.

- 2 To the contrary, tech obsolete risk seems more relevant to each individual firm. Say, if a firm's abatement could keep the assets clean, o/w assets become tech obsolete.

This way, we would have tech obsolete risk ($-\gamma_s^p E_s^a$) relevant: $\frac{\partial \gamma_s^p}{\partial X_s^*} \neq 0$.

Other Comments and Conclusion

Other Comments: Today and the far away tomorrow

The biggest issue that humans started combat global warming just recently is that:

- ▶ The consequences of emission come in long lags (no action until you feel it).
Maybe consider discount factors (how much physical risk is valued today) in the model.
- ▶ Policy coordination across countries/institutions/departments is hard.
Policy tools with more degree of freedom may suffer other sufficient hidden costs.
- ▶ Firms are significantly different in size, FCs, cleanness,.....
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Conclusion

It is a great paper with clean execution!

It could be even better if the model setups were more united with data facts.