## MAGDALENA ROLA-JANICKA
**DEPARTMENT OF FINANCE, TILBURG UNIVERSITY**
M.A.ROLA-JANICKA@UVT.NL

## TOO LEVERED FOR PIGOU
A MODEL OF ENVIRONMENTAL AND FINANCIAL REGULATION

## INTRODUCTION

In the absence of other economic frictions the problem of **externalities can be resolved using Pigouvian taxation**.

In reality, **financial constraints can limit firms' ability to decrease emissions** (Bartram et al., 2022; Xu and Kim, 2022). This paper studies the implication of such financial frictions for **the optimal design of environmental and financial policy**.
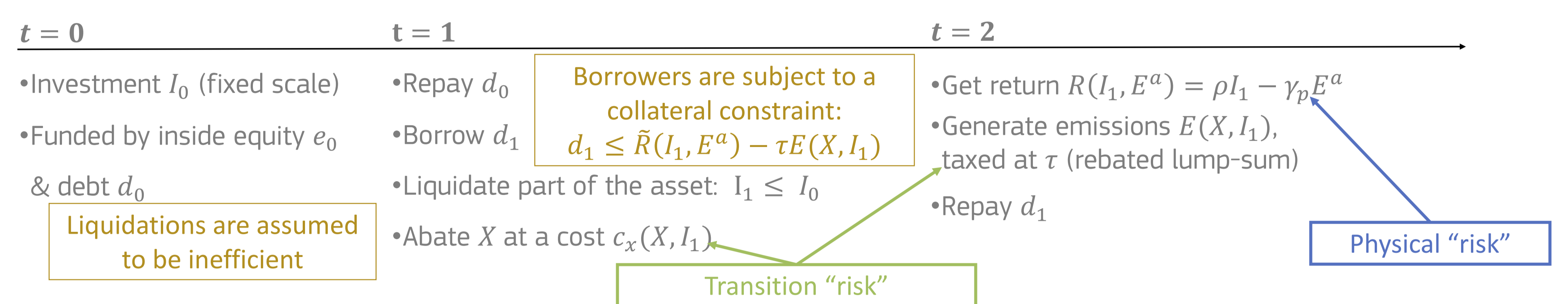
Research questions:

1. What is the optimal **emissions tax in the presence of financial frictions**?

2. Is there a scope to **complement emissions tax with financial regulation**?

3. How do the answers to 1. and 2. depend on the relative importance of the **transition and physical climate risks** in the economy?

## RESULTS

**Model outline**

- Borrowers need to fund a project, which generates return $R(I_1, E^a)$ and pollution $E(X, I_1)$
- Aggregate pollution imposes an externality on all agents equal to $-\gamma_u E^a = -\gamma_u \int E(X, I_1)$
- The timeline of the project is:

$t = 0$
- Investment $I_0$ (fixed scale)
- Funded by inside equity $e_0$ & debt $d_0$

Liquidations are assumed to be inefficient

$t = 1$
- Repay $d_0$
- Borrow $d_1$
- Liquidate part of the asset: $I_1 \leq I_0$
- Abate $X$ at a cost $c_x(X, I_1)$

Borrowers are subject to a collateral constraint:
$d_1 \leq \bar{R}(I_1, E^a) - \tau E(X, I_1)$

Transition "risk"

$t = 2$
- Get return $R(I_1, E^a) = \rho I_1 - \gamma_p E^a$
- Generate emissions $E(X, I_1)$, taxed at $\tau$ (rebated lump-sum)
- Repay $d_1$

Physical "risk"

**Emissions tax under a binding collateral constraint**

The socially optimal tax is **different from the Pigouvian benchmark** (= direct social cost of carbon = $\gamma_p + \gamma_u$), it is:

- **lower** than Pigouvian if **physical risk is low**

if physical risk is **low**: higher tax → more liquidations ➡ regulator trades off: ↓ emissions vs. ↑ liquidations

- **higher** than Pigouvian if **physical risk is high**

if physical risk is **high**: higher tax → less liquidations ➡ regulator sets a high tax

**Policy mix under a binding collateral constraint**

because ↓ $E^a$ implies ↑ collateral values

Under the optimal emissions tax, the regulator can improve welfare by **introducing leverage regulation**. The regulator should impose either **a leverage ceiling or a floor**, depending on the sensitivity of emissions and abatement costs to liquidations.

optimal tax ≠ social cost of carbon + equity **affects** emissions ➡ motive for financial regulation

## CONCLUSIONS

We **contribute** to the recent literature on the interaction of environmental policy with financial frictions (Hoffman et al., 2017, Oehmke and Opp, 2022, Heider and Inderst, 2022) by studying:

- jointly optimal **emissions taxes** and **financial regulation**

- under endogenous climate **transition** and **physical "risks"**

Our analysis shows that:

- In the presence of financial constraints **the optimal emissions tax ≠ Pigouvian**

- Physical risk generates a collateral externality
  → may **reverse relationship between taxes and liquidations**

- There is a case to complement **environmental policy with financial regulation** (using either a leverage ceiling or a leverage floor)

## ACKOWLEDGEMENTS

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