Discussion:
Environmental Policy with Financial Frictions
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MAIN MESSAGE

▶ If environmental policy is confined to a **CO2 emission tax** and firms are **financially constraint** a CO2 emission tax **higher** than the **Pigovian** level can be optimal

▶ Reasoning:
  ▶ More elevated CO2 tax reduces product supply and increases product price
  ▶ This increases green firms margin and expected cash flow alleviating particularly their fin frictions
  ▶ Clean firms can increase market share and average pollution declines

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SUMMARY

▶ As in Holmström Tirole agency problem requires a minimum IC residual cash flow right retained by owner
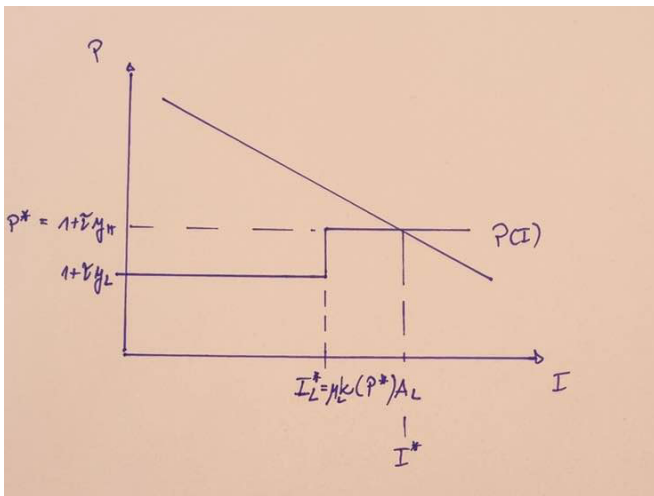
▶ Leads to an equity multiplier k_l:

$$I_l = \mu_l \cdot k_l \cdot A = \mu_l \cdot \underbrace{\frac{1}{\underbrace{(1 + \tau y_l)}_{\text{unit prod costs}} - \underbrace{(P(I^*) - b/q)}_{\text{unit extern fin}}}}_{\text{per unit internal financing}} \cdot A \qquad (1)$$

▶ As τ increases k_l and I_l declines

▶ As $P(I^*)$ increases k_l and I_l increases
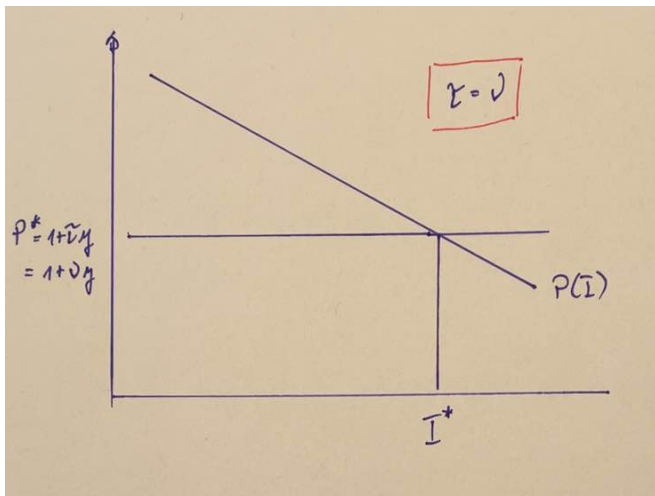
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SUMMARY: FINANCIAL FRICTION NOT BINDING

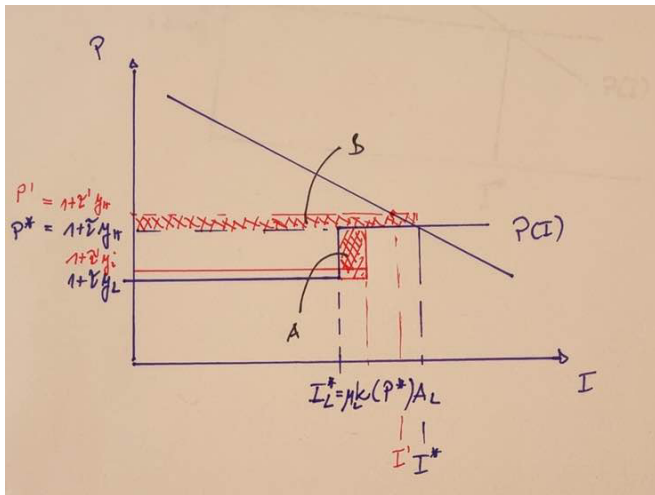Market equilibrium when friction not binding in aggregate

SUMMARY: FINANCIAL FRICTION NOT BINDING

Optimal CO2 tax for homogeneous firms (= Pigouvian tax)
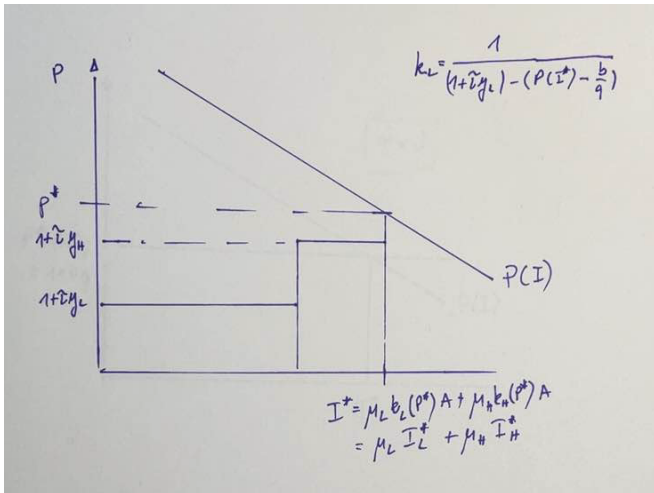
SUMMARY: FINANCIAL FRICTION NOT BINDING

Optimal CO2 tax with heterogeneous firms: $A = B$
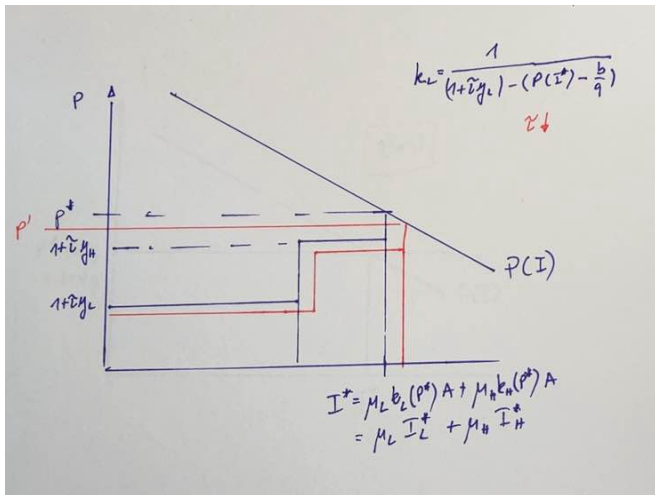
SUMMARY: FINANCIAL FRICTION BINDING

Quantity constraint at maximum capacity

Social production costs lower than willingness to pay for product
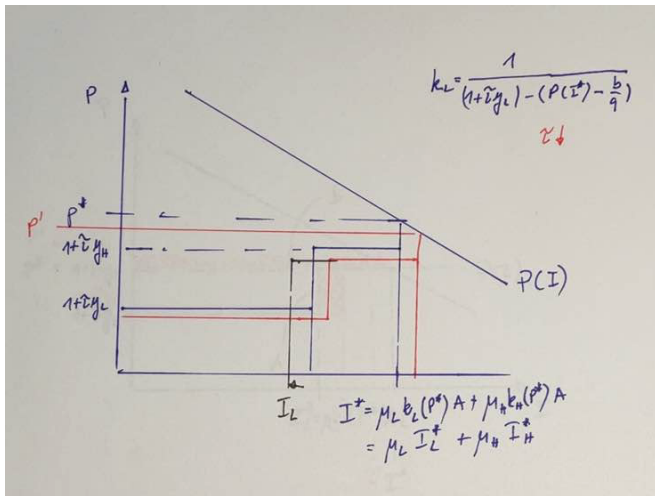
SUMMARY: FINANCIAL FRICTION BINDING

Reduction in CO2 tax increases production capacity

SUMMARY: FINANCIAL FRICTION BINDING

With heterogeneous firms composition effect can lead to too large emission increase

SUMMARY

- ▶ With financial frictions a higher CO_2 tax (can) increase the profit margins and thus the market share of green firms
- ▶ This compositional effect can imply that an optimal CO_2 tax goes beyond Pigouvian level
- ▶ Also holds with convex abatement technologies
- ▶ BUT: With heterogeneous industries homogeneous CO_2 tax/price cannot achieve second best

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COMMENT: DYNAMIC CONSIDERATION

- ▶ Green firms earn a (higher) margin
- ▶ A_l will increase (relative to A_h)
- ▶ **Financial constraint** of green firms become **less binding** over time

- ▶ Today's CO_2 tax affects tomorrow's market share of green firms
- ▶ Taking this **dynamic consideration** into account the compositional effect might call for **even higher CO_2 tax today**

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COMMENT: DYNAMIC CONSIDERATION II

- ▶ Existing (brown) firms might already be leveraged and have ongoing projects
- ▶ CO2 tax increases the price level (inflation) and reduces debt burden of existing (brown) firms

COMMENT: DISTRIBUTION OF TAX REVENUES

- ▶ Paper does not consider the efficient use of the tax revenues
- ▶ What about a revenue neutral VAT reduction?
- ▶ In case of no aggregate constraints this leads to inefficiently high demand and thus pollution

- ▶ **But** in case of an **aggregate financial constraint** a VAT reduction might alleviate particularly the financial constraints of green firms

- ▶ **Especially** with **heterogeneous industries** product specific VAT cut might allow to implement second best

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COMMENT: GENERAL EQUILIBRIUM

- ▶ Firms only compete in product market
- ▶ **Competition** between green and brown firms for **inputs** (labor) also relevant
- ▶ Optimal CO2 tax for single industry might carry over to case with multiple industries considering joint labor market

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COMMENT: INFORMATION REQUIREMENT

▶ Obviously, combining CO2 tax and **specific subsidy** to green firms can implement **first best**

▶ But this requires that **greenness** of firms' (future) investment is **observable**

▶ Considering also the compositional effect when choosing optimal CO2 tax requires no information about greenness of specific firm by investors or regulators

▶ BUT: With heterogeneous industries info on industry specific ratio of green firms needed

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CONCLUSION

- ▶ Well polished paper: nice to read
- ▶ Handy model lends itself to various extensions
- ▶ Particularly a dynamic extension seems promising

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