

Climate policy enhances efficiency:  
A macroeconomic portfolio effect  
“Pigou and Piketty play on Feldstein’s stage”

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# Climate policy's effect on rents may improve efficiency

- Climate policy creates and shifts rents.

(Fullerton and Metcalf 2001, Bauer et al. 2013)

- Traditionally: rent taxation neutral, rents a distributional issue.

(Ricardo, George)

- But collecting rents (and redistributing them) *does* impact efficiency and may actually *improve* it...

(Feldstein 1977, Edenhofer et al. 2013)

- ...and this also applies to carbon pricing!

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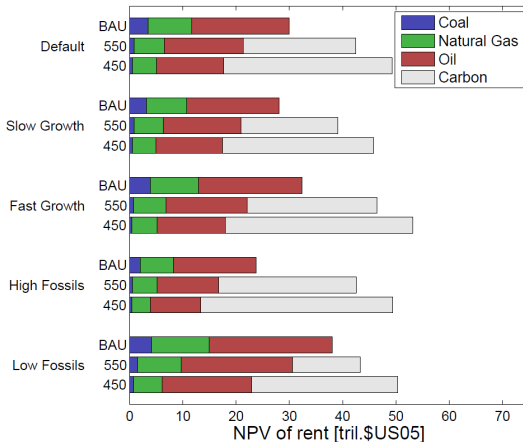
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# Climate policy shifts and creates significant rents



Net present value (2010-2100) of global fossil fuel rents and the global carbon permit rent. (Bauer et al. 2013)

## These rents can be used to improve social welfare

- Redistribution:
  - Empirically, rising share of non-labor income, and rising inequality in wealth.
  - Addressing intergenerational inequality may improve efficiency.
- Support for resource efficiency improvements, since climate policy restricts resource supply.
- Public goods provision, e.g. low-carbon infrastructure.

# Collecting rents may itself induce beneficial distortions

## “Macroeconomic portfolio effect”:

- Two revenue-generating assets as alternative investments.
- Taxing returns from asset A shifts investment towards asset B.
- Dynamic effect is *unambiguously beneficial* if asset A is fixed and asset B is undersupplied.
- Efficiency argument for taxation *in addition* to distributional or Pigouvian motives!

## Examples:

- Land and capital, land rent tax. (Feldstein 1977, Edenhofer et al. 2013)
- Here: Fossil resource and capital, carbon pricing. (Siegmeier et al. 2015)

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# Analyzing the effect of rent collection via climate policy

## Continuous overlapping generations (OLG) model:

- Individuals invest in capital  $K$  or fossil resource stocks  $S$  (at price  $p$ ).
- Uncertain lifetimes (birth & death rate  $\phi$ ), no bequests
  - wealthy agents die and are replaced by fundless newborns
  - capital underaccumulation.

Production with constant returns to scale from capital, labor and extracted resources  $E$ :

$$Y = F(K, L, AE).$$

# Government: Carbon pricing and technological progress

## Climate policy:

- Simplest case: Upstream emission trading scheme, short permit lifetimes.
- Resource owners may extract an *exogenously fixed fraction* of their stock,  $\bar{E} = \sigma S$  (sold at price  $b$ ).
- No analysis of the optimal choice of the extraction rate  $\sigma$  and the total resource stock  $S(t=0)$ .
- Crucial policy parameter: Auctioning rate of permits  $T$ .

## Public investment in R&D:

- Investment  $I_A$  in resource efficiency improvements (exogenously fixed at  $I_A^*$  so that  $A\bar{E} = \text{const.}$ ).
- Two cases: Financing by auction revenues, or lump-sum tax.

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## Aggregate dynamics

$$\dot{S} = -\bar{E}$$

$$\dot{A} = I_A A$$

$$\dot{K} = F(K, L, A\bar{E}) - \delta K - I_A - C$$

$$\frac{\dot{p}}{p} = r + \frac{p - (1 - T)b}{p}\sigma$$

$$\frac{\dot{C}}{C} = r - \rho - (\rho + \phi) \frac{\phi(K + pS)}{C}$$

Assumptions leading to  $A\bar{E} = \text{const.}$  establish balanced path:

$$\{K^*(T), C^*(T), p_0(T)e^{\sigma t}, S_0e^{-\sigma t}, A_0e^{\sigma t}\}$$

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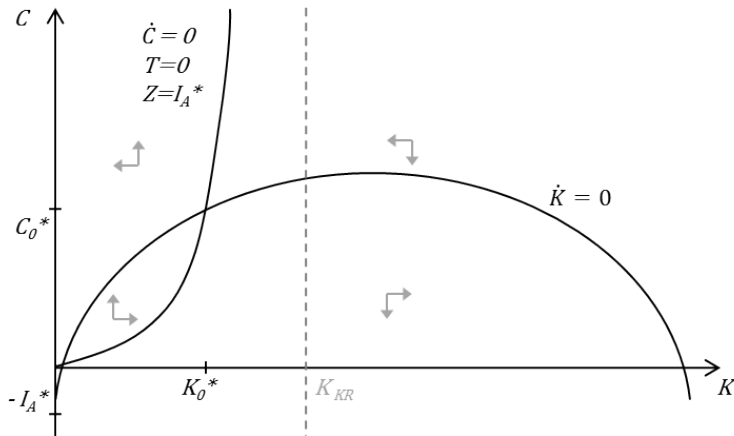
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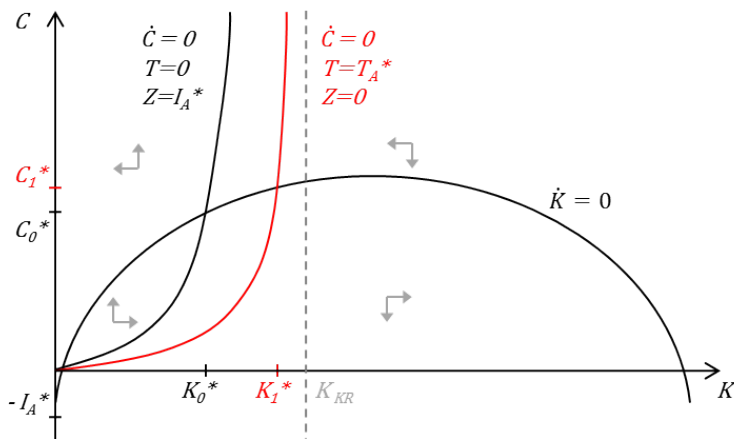
# Result: Macroeconomic Portfolio Effect of Climate Policy

Lump-sum funding of resource efficiency improvements...



# Result: Macroeconomic Portfolio Effect of Climate Policy

...vs. funding R&D by rent collection (permit auctioning)



Auctioning short-term emission permits leads to higher aggregate consumption than lump-sum taxation.



# What to do with additional funds?

## Reaching the Social Optimum

Edenhofer et al. (2013)

Suppose appropriating the climate rent generates higher revenues than needed for financing technological progress ( $Tb_0E_0 > I_A^*$ ).

### The social optimum

- In a continuous OLG (Calvo and Obstfeld 1988): equivalent to Keynes-Ramsey levels.
- Sufficient condition:  
Only newborns obtain remaining funds (distribution effect), and enough revenues to fully compensate newborns' missing capital.

## Other policy instruments

### Other paths for mitigation and R&D:

- Analysis unaffected as long as  $AE = \text{const.}$

### Long permit lifetimes or carbon tax:

- Endogenous extraction path, but intuition is the same.
- Long-term permits: Choose  $S(0)$  for mitigation,  $T(t)$  for rent collection.
- Carbon tax: One policy parameter less, choice of  $\dot{T}(t)$  affects mitigation.
- Constant tax: Only indirect mitigation via portfolio effect (lower interest rate).

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## Policy implications

1. Efficiency argument for carbon taxation (permit auctioning) *in addition* to distributional or Pigouvian motives.
  - The higher the tax / auctioning rate, the better.
  - Fossil fuel subsidies should be phased out.
  - Collecting rents may be *necessary* for social optimality.
2. Unlike a permit scheme, carbon tax faces trade-off between climate change mitigation and rent collection.

### Caveats / conditions

- Fossil fuel reserves as tradable assets?
- Undersupply of alternative asset (capital)?
- Magnitude of the effect, relative to other investment determinants?

## An alternative policy instrument

### Private property rights to the 'stock of atmosphere':

- Right to annually receive emission permits as tradable asset.
- Closed economy, homogenous agents: same formal results - but may improve real-world robustness of portfolio effect?
- 'Renewable permits' may be traded more than fossil stocks.
- Enhance environmental awareness, direct expression of social preferences.
- Related to the idea of 'Personal Carbon Trading'.

## Summary

- Climate policy provides a non-environmental benefit if it induces a portfolio effect and capital is underaccumulated.
- This implies an *efficiency* reason for resource rent taxation, additional to environmental and distributional motives.
- Permit schemes can optimize rent collection and mitigation separately. Carbon taxes face a trade-off.
- Social optimality requires intergenerational redistribution towards the young.

# Thank you for your attention!

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