

The Dynamics of Linking Permit Markets

Investments and Public Goods Provision

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International common goods

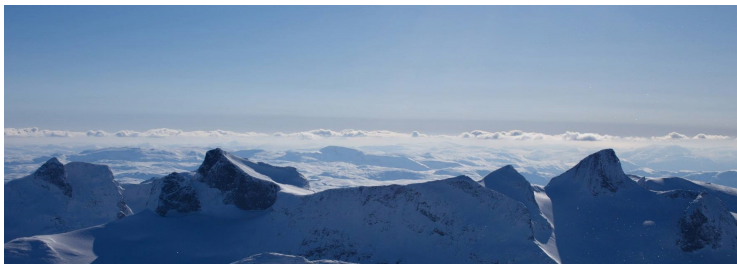


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- ▶ International cooperation difficult to achieve.
- ▶ What determines the outcome when there is no cooperation?

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 - ▶ The dynamics of substitute goods often not taken into account.
- ▶ How does trade in allowances to exploit the common good affect the outcome?
 - ▶ It depends on the dynamics of the substitute goods.
 - ▶ If substitute goods are durable, trade may have a substantial positive effect on the outcome.

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- ▶ We look at the effect on emissions and welfare of introducing non-cooperative permit trade.

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 - ▶ Marginal utility of consumption equal to total marginal damage.
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- ▶ No cooperation, no trade:

- ▶ Marginal utility of consumption equal to own marginal damage.
- ▶ Marginal cost of investment equal to present value of own marginal damages.
- ▶ Implemented by a price on emissions:

$$p_i^{Aut} = D_i$$

Trade in a static framework (Helm, 2004)

- ▶ Timing:

- ▶ Each country issues permits: ω_j .
- ▶ Renewables producers make investment decision: $r_i(p)$.
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- Countries determine the number of permits by solving the maximization problem:

$$\max_{\omega_i} u_i(e_i(p)) - c_i(r_i(p)) + p \cdot (\omega_i + r_i(p) - e_i(p)) - D_i \sum_j \omega_j$$

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- ▶ Market clearing: $p_t \left(\sum_j \omega_{jt} | R_{1t}, \dots, R_{Nt} \right)$
- ▶ Governments take the effect of their issuance on the price - and hence the effect on the future renewables stocks - into account.

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- ▶ The dynamic optimization problem of country i :

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Benchmarks:

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- ▶ If countries are very patient, and renewables are strongly durable, emissions will be close to the first best level:

$$\lim_{\beta\delta \rightarrow 1} \Delta = N \quad \Rightarrow \quad \lim_{\beta\delta \rightarrow 1} p^{trade} = \bar{D} \cdot N$$

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The last effect dominates, countries with low marginal damage gains the most from permit trade.

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- ▶ Convex damages: Does not change *the effect of introducing permit trade*.

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- ▶ Permit trade creates strategic complementarity in emission levels over time.
- ▶ The strategic complementarity leads to lower emissions under trade, compared to autarky.