The case against carbon pricing

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Two theoretical models for how to best mitigate climate change.

They play out over different time scales

They are good at achieving different aims

This presentation is based on these publications:

Patt & Lilliestam (2018), *Joule*
Lilliestam et al. (2012), *Climate & Development*
Ellenbeck & Lilliestam (2019), *Energy Research & Social Science*
The neo-classical model

Marginal utility of demand

Marginal cost of production

Production cost increases with quantity

Utility decreases with quantity

Equilibrium

If away from intersection: self-correct to intersection
Adam Smith

(The invisible hand)
External costs: pricing in the cost of pollution

- Marginal cost of production
- Marginal cost of pollution
- Total marginal cost to society

Through carbon tax or emissions trading

Less production/emissions
Increase carbon price over time

Start low, pick low-hanging fruit

Increase economy-wide, sector-spanning carbon price over time

...until optimal pollution level is reached!

Picture source: Climateworks Australia
This model fits the knowledge, expectations of the Kyoto world:

if we need to stop growth in emissions and then reduce a bit, carbon pricing is just the right instrument
In a Paris world, the need is different: we do *not* need to reduce emissions, but **completely eliminate** them.

This requires us to create an entirely new, renewables-based energy system.
The transition model: based on evolutionary economics

Production costs decrease with quantity

Utility increases with quantity

Supply → Demand

Price

Quantity
Decreasing PV costs

Learning Rate:
Each time the cumulative production doubled, the price went down by 24% for the last 38 years.

Source: Fraunhofer ISE (2019)
The global weighted-average installed costs of onshore wind have declined by 71% in 35 years, from around USD 5000/kW in 1983 to USD 1500/kW in 2018. This was driven by declines in wind turbine prices and balance of project costs.

Source: IRENA (2019)
Decreasing battery costs

The transition model: evolutionary economics

- Production costs decrease with quantity
- Utility increases with quantity
- Demand
- Supply
- Price
- Quantity

Utility increases with quantity
Production costs decrease with quantity
Gadu-gadu
Polski komunikator internetowy
Technology:
Cost and performance

New infrastructure:
adapted to the needs of the new technology

New institutions:
Rules and norms based on the needs of the new tech
The transition model: consequences

If Q left of intersection: self-correct to zero
The transition model: consequences

If Q right of intersection: self-reinforced expansion to saturation
The transition model: consequences

![Diagram showing supply and demand with a tipping point.]
Technology adoption: all or nothing

Source: BlackRock
The transition model is consistent with the Paris world
Two different tasks to solve

Task 1: Increase Q

Task 2: Adapt regime

This is largely ignored by the carbon price discourse, but there’s not (necessarily) a contradiction
Example: Supporting PV through an economy-wide carbon price

Start (very) high and decrease over time

700 €/tCO2 to all ETS sectors in 1990: ~€500 billion per year

Source: Patt & Lilliestam (2018), Joule
Technology-specific support reduces total cost

Source: BMU (2019), Erneuerbare Energien in Zahlen
(economy-wide) **carbon pricing** will be extremely expensive, if it works at all, to increase the amount of still immature, carbon-neutral technology. Tech-specific **market introduction instruments** (can) work, and keep costs under control as deployment and cost are negatively correlated.
Carbon price: leading to deployment and lower costs?

**Deployment** triggers economies of scale and learning
- by doing
- by using
- by interacting

If a carbon price does not trigger deployment, it’s of no use.
If we get deployment, renewables will tend to become cheaper with deployment, or at least not more expensive.

Fossil fuels tend to become more expensive, or at least not much cheaper.
Carbon price → deployment, cost reduction of zero-carbon tech?

If renewables are cheaper than fossil fuels, a carbon price is meaningless.

- Fossil fuels
- Renewables
Renewable kWhs often cheaper than fossil kWhs

Source: IRENA (2019)
At some time, renewables become cheaper than fossil fuels.
Carbon price $\rightarrow$ deployment, cost reduction of zero-carbon tech?

With a carbon price, the break-even point comes earlier

- Fossil fuel plus increasing carbon price
- Fossil fuel
- Renewables

Diagram:
- Time
- Cost
Carbon price – useful only for a short time for each technology

If we are here, this carbon price will achieve **faster switch**

- If we are here, this carbon price will achieve **nothing:**
  - *carbon price too low*

- Fossil fuel plus increasing carbon price

- Fossil fuel

- Renewables

If we are here, this carbon price will achieve **nothing:**

- *renewables already cheaper*
For each specific technology, a carbon price will be useful for a short time:

Before that time, the price is **too low**

After that time, the price is **too high**
Carbon price – useful over time in one case

Maybe renewables get cheaper over time, but not cheaper than fossil fuels

Decreasing differential ⇒ decreasing – *not increasing* – carbon price needed
The main barrier is not cost, but the regime
A carbon price addresses the wrong barrier – cost – and when cost is still a barrier, it is addressed in the wrong way; it ignores the main barrier – the regime.

Technology-specific market schemes and (or) regime adaptation, sector by sector, addresses the actual barriers.
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Sources

Peer-reviewed

• Patt & Lilliestam (2018), *The case against carbon pricing*, **Joule** 2 (12), pp. 2494-2498. (open access)
• Lilliestam et al. (2012), *An alternative to a global climate deal may unfolding before our eyes*, **Climate & Development** 4 (1), pp-1-4. (open access)

Some further fun things to read

• Lilliestam (2019), *Die CO2-Steuer ist das falsche Instrument*, **Tagesspiegel**
• Patt & Lilliestam (2019), *Eine Alternative zu CO2-Steuern*, **Neue Zürcher Zeitung**
2018: 95% of all new capacity in Europe was renewable

Source: WindEurope 2019