POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

Pigou in the Post-Covid-19-Era - A Tribute on the occasion of the 100th Anniversary of the Publication of *The Economics of Welfare*

Prof. Dr. Ottmar Edenhofer

IIPF-Congress Reykjavik
19 August 2020

Leibniz Association

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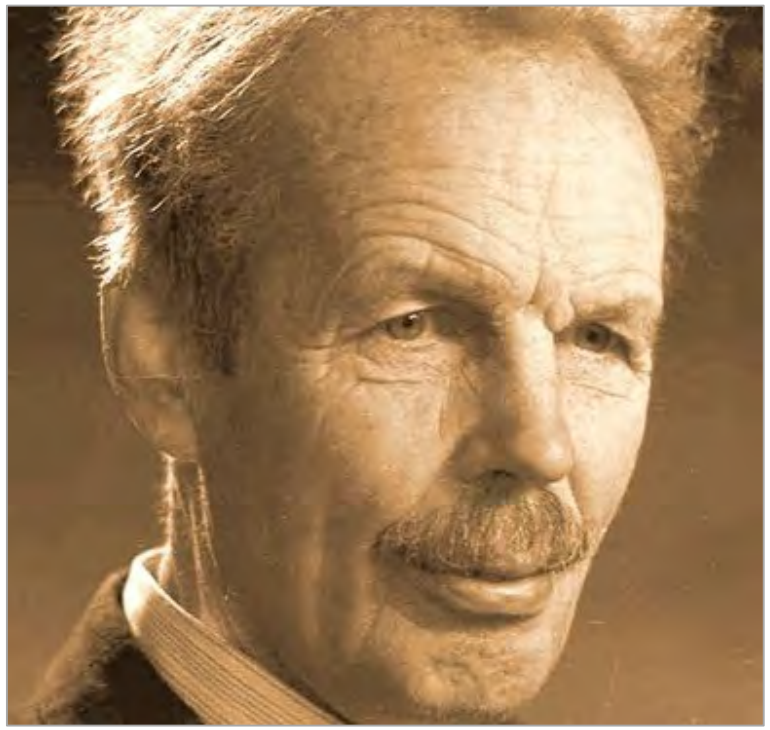
Pigovian Tax – 100th Anniversary

„The Economics of Welfare“ (1920)



Arthur Cecil Pigou
(1877-1959)

Despite Coase, there is a (theoretical) consensus that Pigovian Taxes are a good idea

"It follows that, under conditions of simple competition, for every industry in which the value of the marginal social net product is greater than that of the marginal private net product, there will be certain rates of bounty, the granting of which by the State would modify output in such a way as to make the value of the marginal social net product there more nearly equal to the value of the marginal social net product of resources in general, thus—provided that the funds for the bounty can be raised by a mere transfer that does not inflict any indirect injury on production—increasing the size of the national dividend and the sum of economic welfare; and there will be one rate of bounty, the granting of which would have the optimum effect in this respect.

If **marginal private benefits are lower than social benefits**, there is too little production. A **subsidy** (bounty) is needed.

In like manner, for every industry in which the value of the marginal social net product is less than that of the marginal private net product, there will be certain rates of tax, the imposition of which by the State would increase the size of the national dividend and increase economic welfare; and one rate of tax, which would have the optimum effect in this respect."

Arthur Pigou,
The Economics of Welfare, 1920 (Ch. XI, §11)

In the **opposite case**, a **tax** is needed. We refer to the ‚optimal' Pigovian tax that maximizes welfare.

There is a diverse group of supporters of Pigovian taxation

Joseph Stiglitz
(1943)

Not paying the cost of **damage** to the environment is a **subsidy**, just as not paying the full costs of workers would be.

Pope Francis
(2013)

Yet only when "the economic and **social costs of using up shared environmental resources** are recognized with transparency and fully **borne by those who incur them**, not by other peoples or future generations",[138] can those **actions be considered ethical**.

The way to do it [controlling emissions] is to impose a tax on the cost of the pollutants emitted […].

Milton Friedman
(1912-2006)

Greg Mankiw
(1958)

Nicholas Stern
(1946)

Fossil fuels must be confronted with their **real costs**, and polluters must pay if markets are to work […].

The problem is that **those who produce the emissions do not pay for that privilege**, and those who are harmed are not compensated.

Bill Nordhaus
(1941)

For **believers in Pigovian taxation** such as myself, the primary task ahead is one of **education**.

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… Yet, they doubt the political viability of Pigovian Taxation

I will use the term Pigovian Taxation in the following sense: With **taxation**, I refer to **direct pricing** – in contrast to **indirect pricing** via **emissions trading**. A **price collar** is subsumed under **direct pricing**.

In what follows, I will defend two claims:

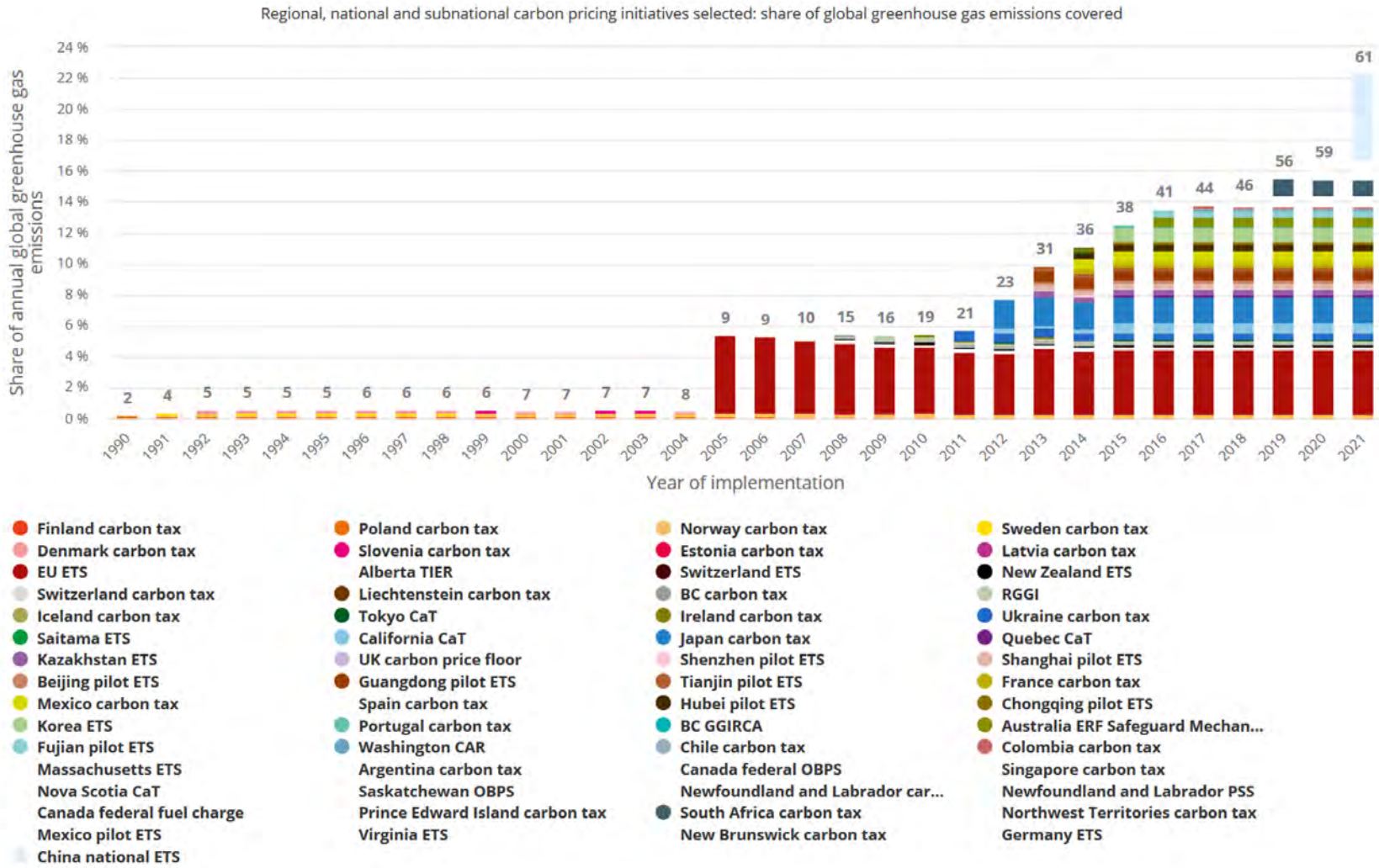
(i) There are sound theoretical reasons for calling the **feasibility** of Pigovian taxation into question.

(ii) The consensus is somewhat spurious in that the **political success** of Pigovian taxation **is higher** than a single-minded focus on the reasons elaborated in (i) would suggest.

The sound part of the consensus: Some reasons for the difficulty of implementing Pigovian taxation

- **Uncertainties** about **marginal benefits**, e.g. the **social costs of carbon.**
- **Regressive distributional** impacts on poor households.
- **Fragmented responsibilities** of ministries lead to excessive focus on **sector-specific policies** and/or **technology policies.**
- **Committment problems** might require **sector-specific** and/or **technology policies.**
- **Lack of acceptance/commodification objection**: e.g. carbon pricing and carbon markets are perceived as repugnant by some environmental groups.
- **Incomplete** international **cooperation.**

Beware: The consensus only partially reflects reality



https://carbonpricingdashboard.worldbank.org/map_data

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Pigovian taxation in the wild: A brief history in three acts

1) National policies: The German Case

2) EU Climate Policy: Transformation of the energy and transport sectors

3) International Climate Policy: Coal, Capital and Cooperation

Pigovian taxation in the wild: A brief history in three acts

1) **National policies: The German Case**

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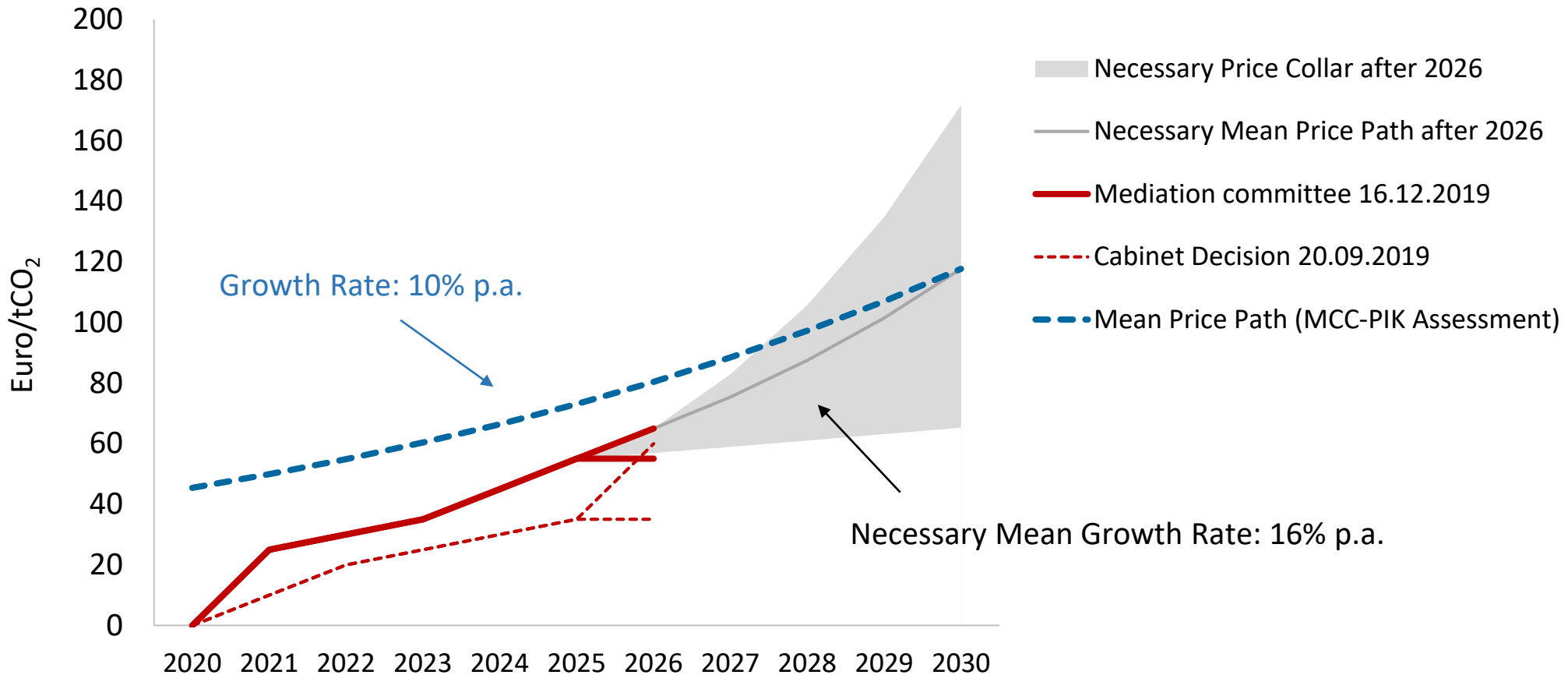
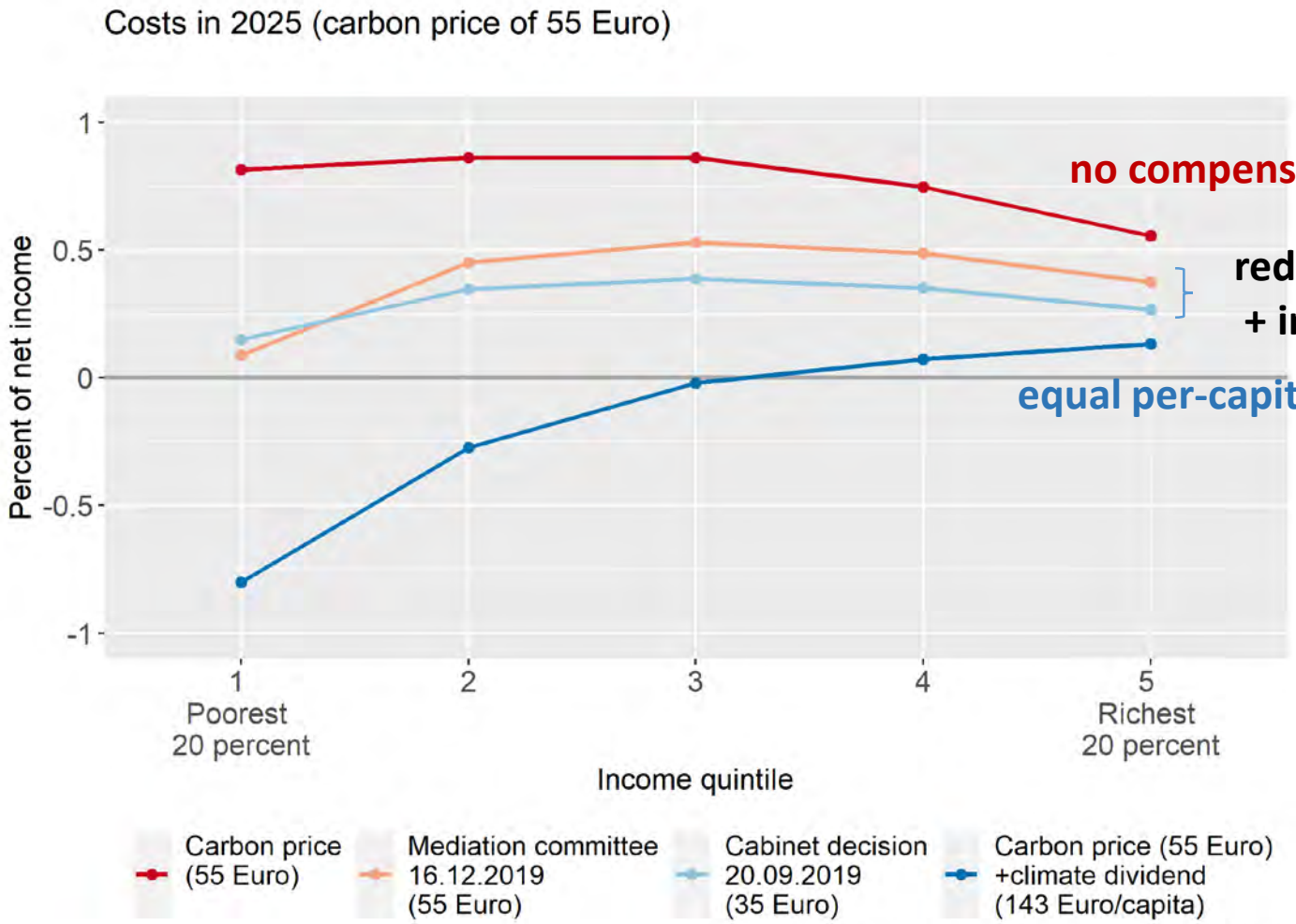
The German National Emission Trading Scheme



Adopted from: Edenhofer, Kalkuhl, Ockenfels (2020)

Distributional concerns are addressed



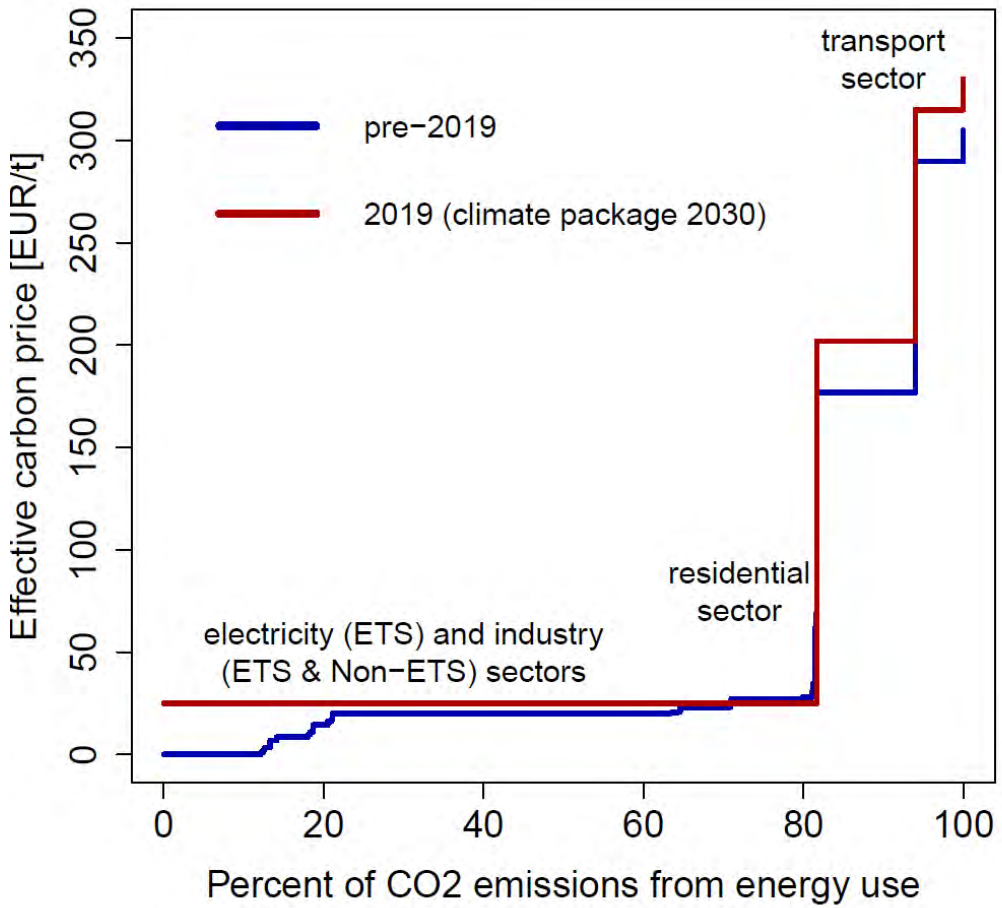
no compensation

reduced electricity prices
+ increased social transfers

equal per-capita recycling

Adopted from: Edenhofer, Kalkuhl, Ockenfels (2020)

Inefficient sector-specific policies



Source: Edenhofer et al (2018), based on OECD data

Direct pricing and the virtuous cycle of moral crowding in: Some experimental evidence

nature sustainability

ARTICLES

https://doi.org/10.1038/s41893-020-0554-1

Check for updates

Pricing externalities and moral behaviour

Axel Ockenfels[1], Peter Werner[2] and Ottmar Edenhofer[3]

To measure how moral behaviour interacts with pricing regimes, we conduct highly controlled experiments in which trading creates pollution. We compare indirect pricing (here, a cap and trade mechanism) and direct pricing (a tax) in an otherwise equivalent setting in which 'producers' are incentivized to emit CO_2. 'Judges' decide on central trading parameters that may restrict socially harmful activities. Profit maximization predicts the same producer behaviour in either setting in the absence of regulation, yet we find a substantial share of producers refraining from emitting CO_2 at all. Although judges restrict behaviour in similar ways across mechanisms, direct pricing more effectively accommodates moral behaviour than the quantity policy.

Pigou is the Winner: Direct pricing increases voluntary abatement

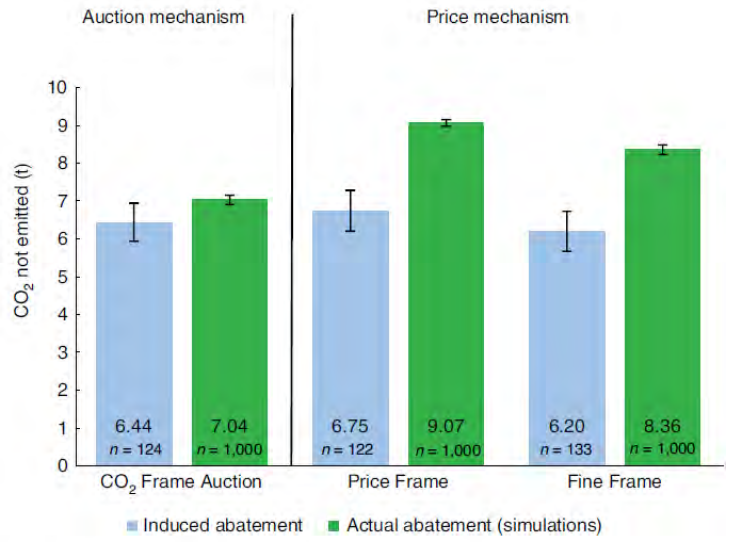


Fig. 3 | Induced and actual abatement in number of CO_2 tonnes not emitted. Blue bars indicate mean values for the induced abatement (in tonnes of CO_2 not emitted) by the judges' decisions under the assumption of profit-maximizing producers. Green bars indicate mean values for the actual abatement in 1,000 simulated markets based on observed judges' and producers' decisions. The mean value is displayed in each bar. Errors bars represent 95% confidence intervals.

Table 1 | Average outcomes of market simulations per treatment

	Market price (€)	Efficiency of ex ante abatement: share of inefficient producers that abated	Producer welfare: share of maximum achievable payoffs
	(s.d.)	(s.d.)	(s.d.)
CO_2 Frame Auction	2.59 (2.74)	0.717 (0.169)	0.251 (0.223)
Price Frame	8.46 (2.79)	0.979 (0.104)	0.051 (0.119)
Fine Frame	7.85 (3.13)	0.912 (0.139)	0.068 (0.176)

“The world is second best, at best” (Dani Rodrick)

Problem	Steps towards a solution
Uncertainty about Social Costs of Carbon	Setting prices which are consistent with quantity targets
Distributional concerns	No per-capita recycling, but reduction of regressive energy taxes
Repugnant markets	Price floor mimicks direct pricing
Inefficient sector-specific policies	„Climate Cabinet“ - instead of fragmented responsibilites of ministries
Commitment device	The BEHG + EU Green Deal

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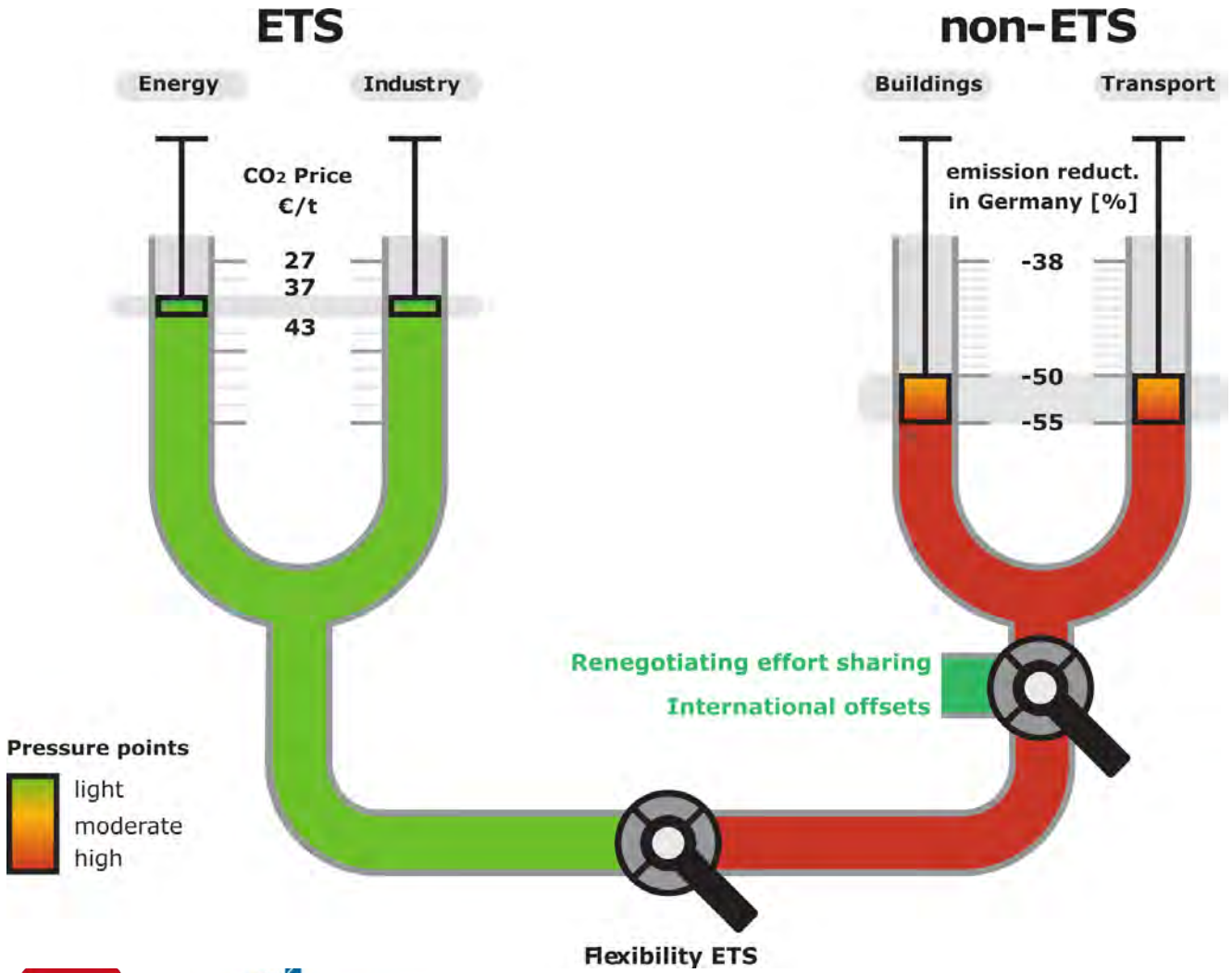
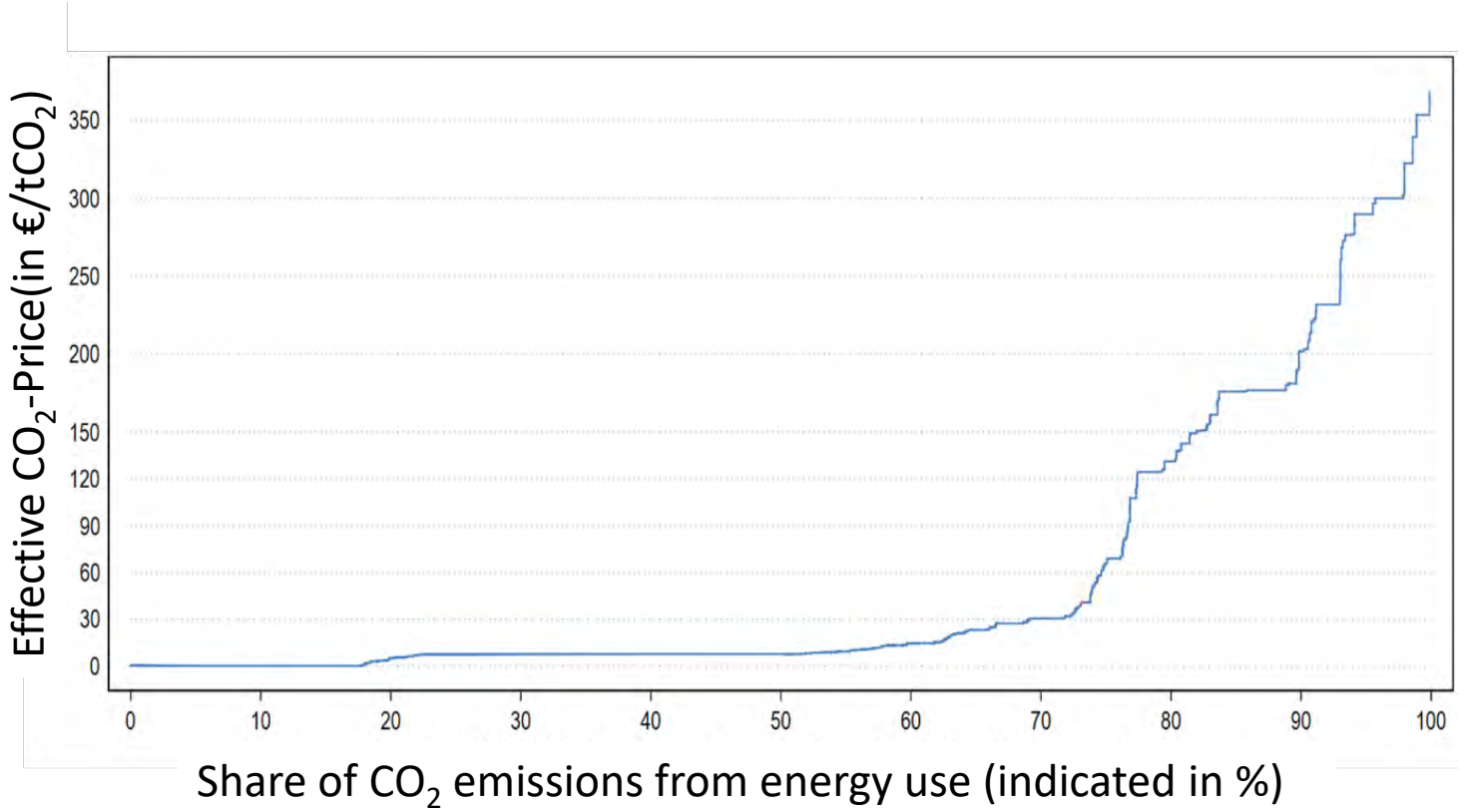
The European Green Deal – Muddling through



- EU Commission will tighten the emission target to 50-55 %.
- Then, Germany has to increase its emission reduction target in the non-ETS sector from 38 % to 50 %, compared to the 2005 level.

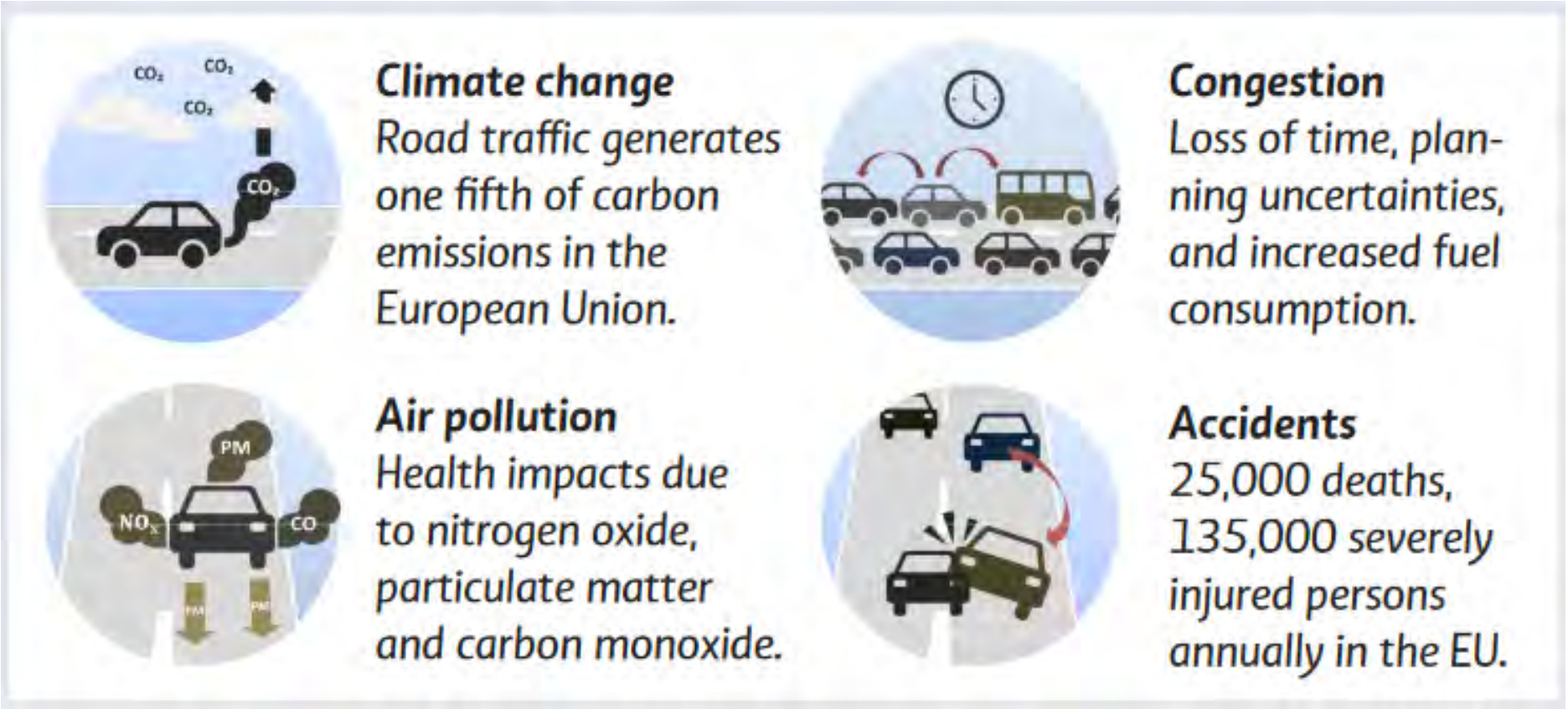
Source: Pahle et al 2020

Enormous inefficiencies due to sector-specific policies



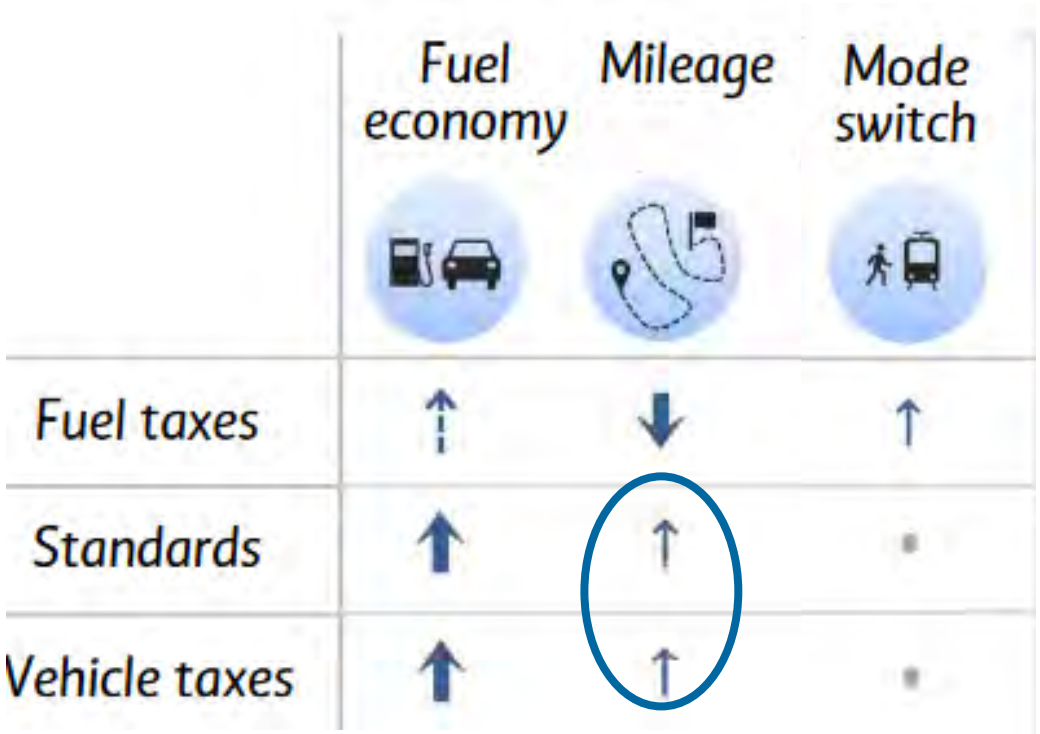
Data based on OECD (2018)

Multiple externalities – multiple instruments



https://www.mcc-berlin.net/fileadmin/data/C18_MCC_Publications/Policy_brief_Road_Traffic_EN.pdf

Which instruments work and how?

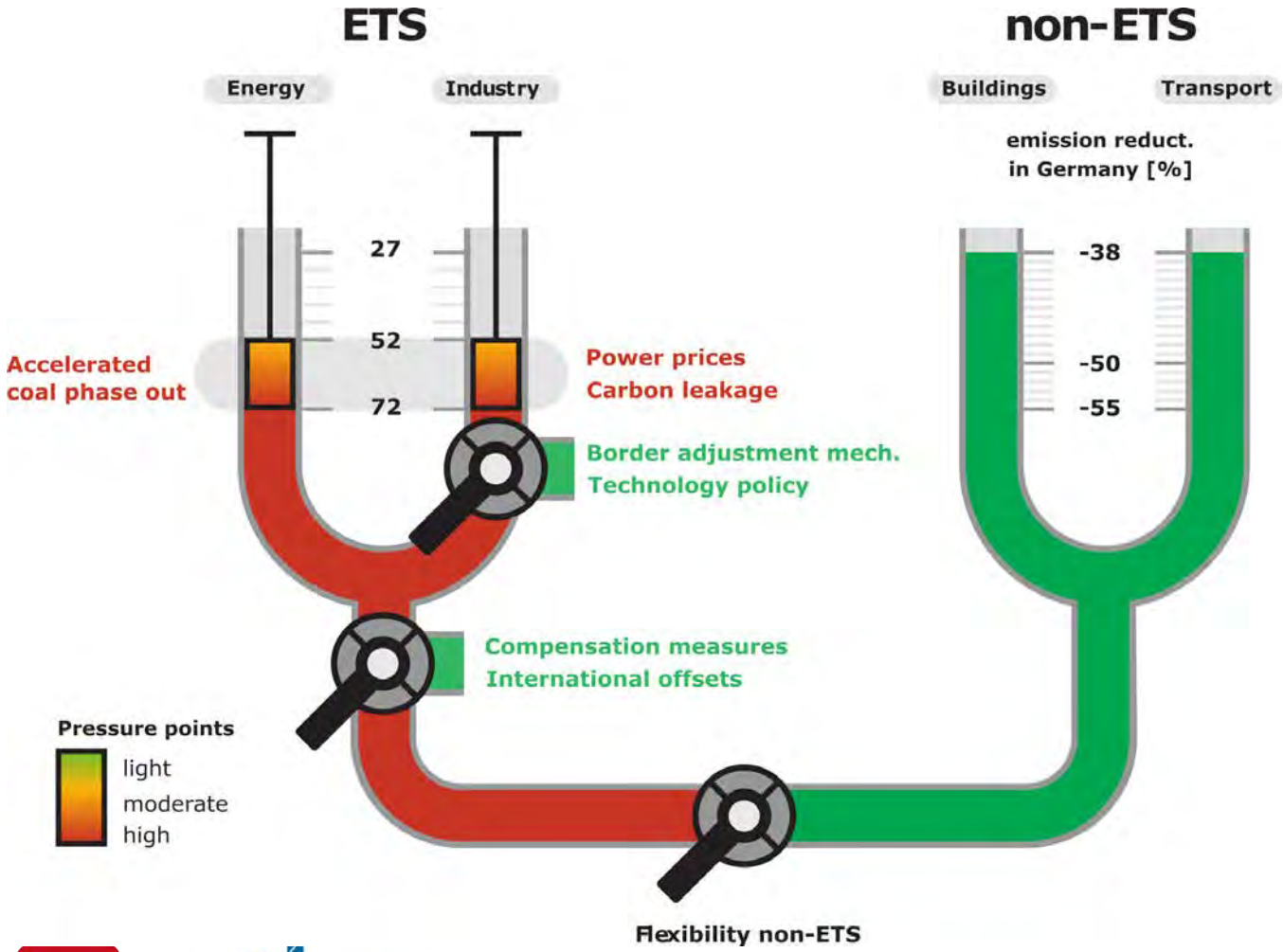


Rebound Effect

5–30% of the energy savings are lost because consumers drive their efficient cars more frequently

Gillingham, Rapson & Wagner (2013). The rebound effect is overplayed. *Nature* 493: 475-476.

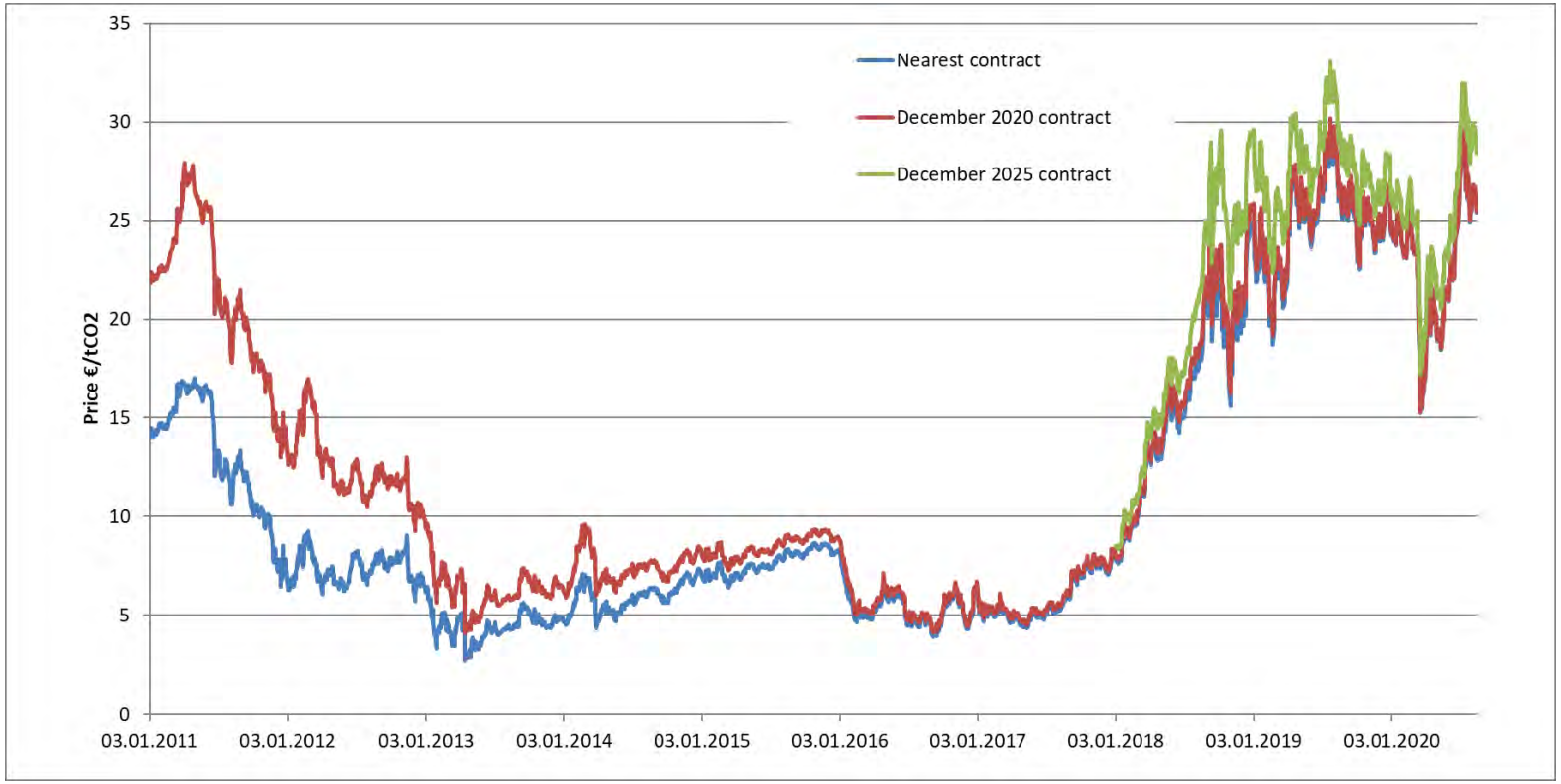
The European Green Deal – A Pigovian Moment?



- EU Commission will tighten the emission target to 50-55 %.
- All additional emission reductions necessary to tighten target in EU-ETS.

Source: Pahle et al 2020

EU ETS lack dynamic cost efficiency



- Market Stability Reserve works in the short term, but may destabilize allowance market in the long-term (Friedrich et. al. 2020)
- "Minimum"-Price might stabilize prices in the long-term!

The EU is the archetypal second-best institution

Problem	Steps towards a solution
Uncertainty about carbon prices	Price floor, Market Stability Reserve
Distributional concerns	Coordinated national tax reform
Repugnant markets	Price floor mimicks direct pricing
Inefficient sector-specific policies	Incremental integration of EU ETS and Non-ETS
Commitment device	Still missing
Cooperation	Explicit and implicit transfers

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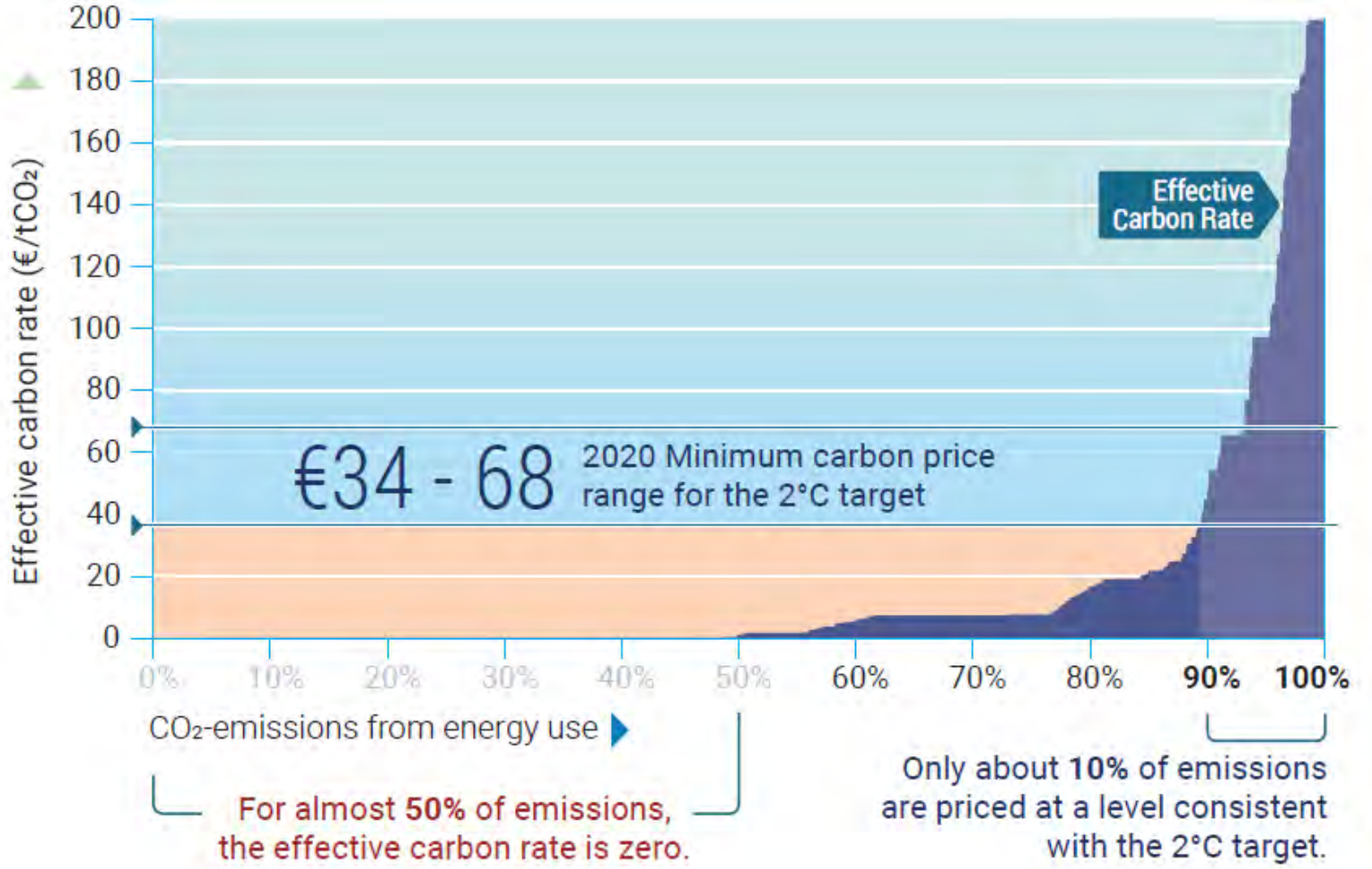
Carbon Pricing on a global scale



Widespread lockdowns have reduced emissions – but only to 2006 levels

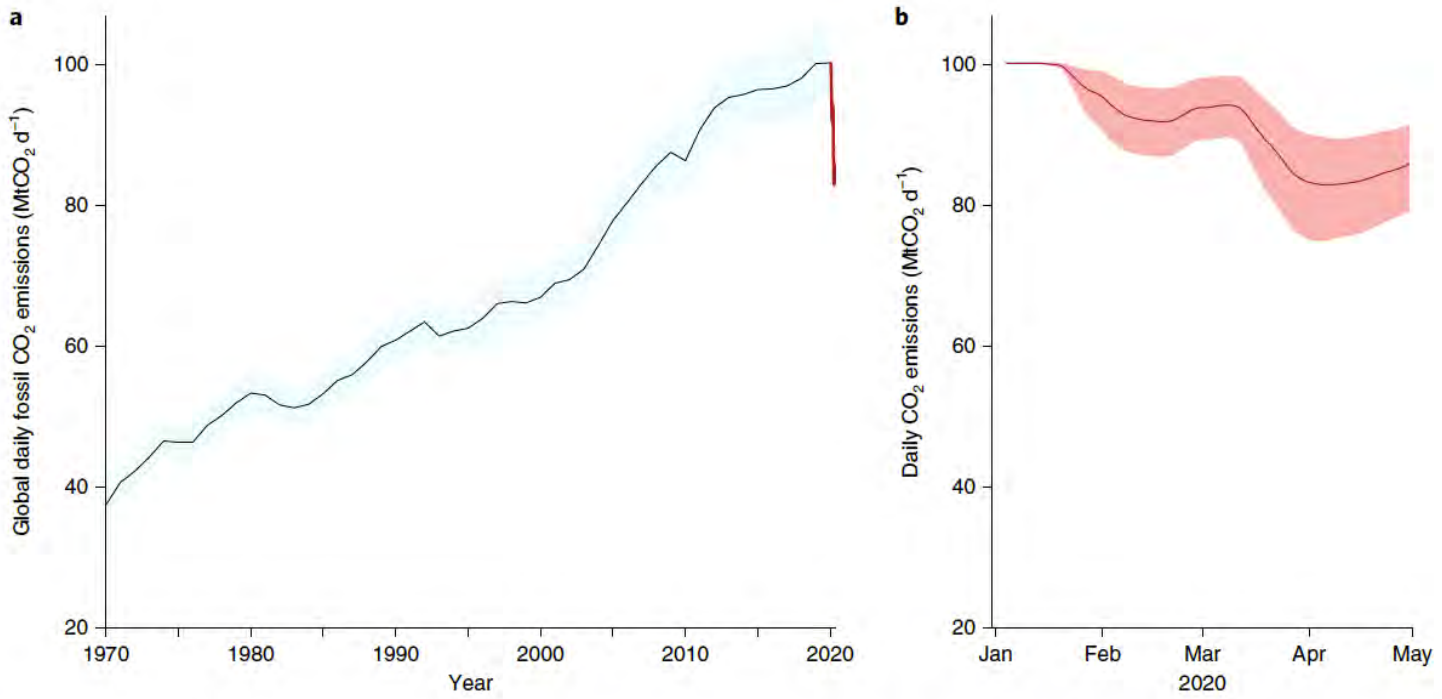
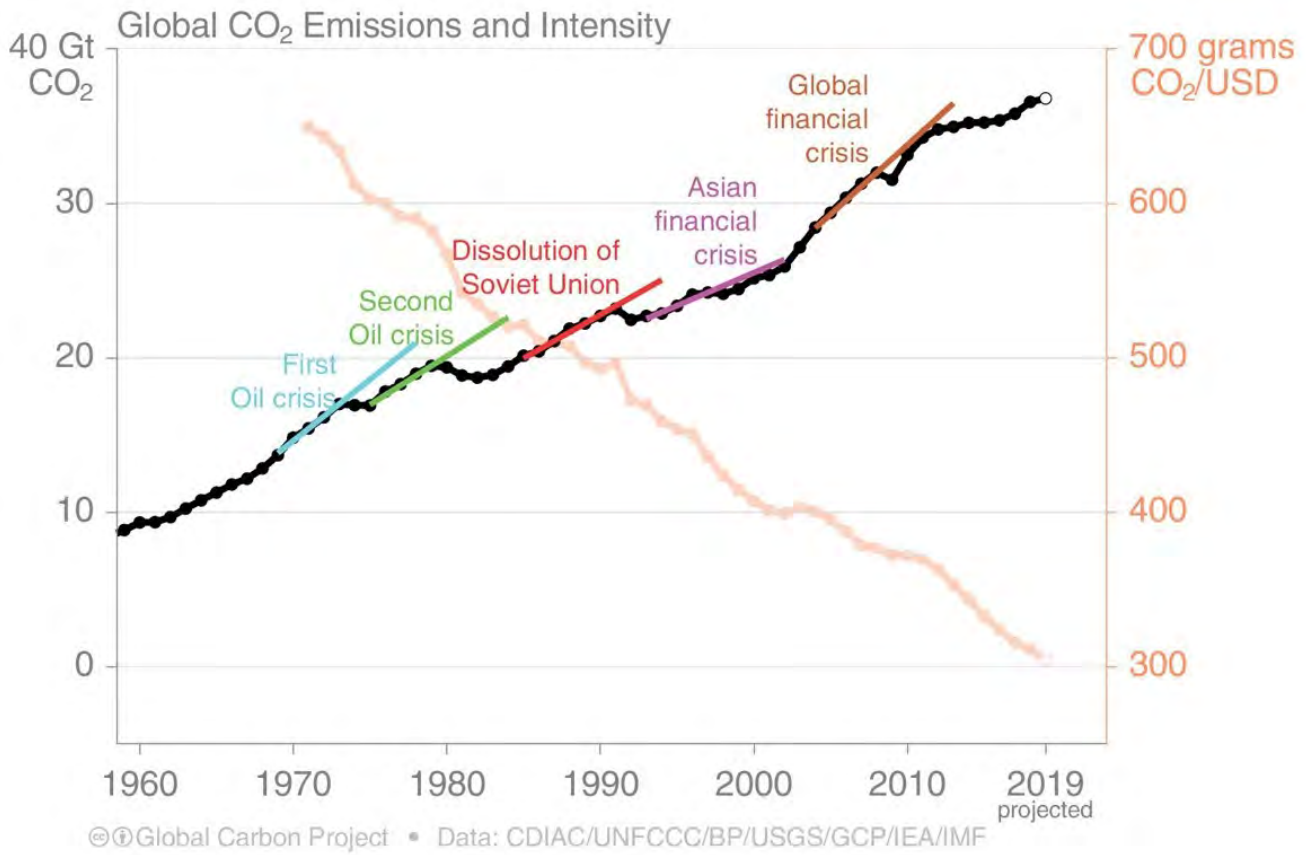


Fig. 3 | Global daily fossil CO_2 emissions ($MtCO_2$ d^{-1}). a, Annual mean daily emissions in the period 1970–2019 (black line), updated from the Global Carbon Project[1,3] (Methods), with uncertainty of ±5% (±1σ; grey shading). The red line shows the daily emissions up to end of April 2020 estimated here. **b**, Daily CO_2 emissions in 2020 (red line, as in **a**) based on the CI and corresponding change in activity for each CI level (Fig. 2) and the uncertainty (red shading; Table 2). Daily emissions in 2020 are smoothed with a 7-d box filter to account for the transition between confinement levels.

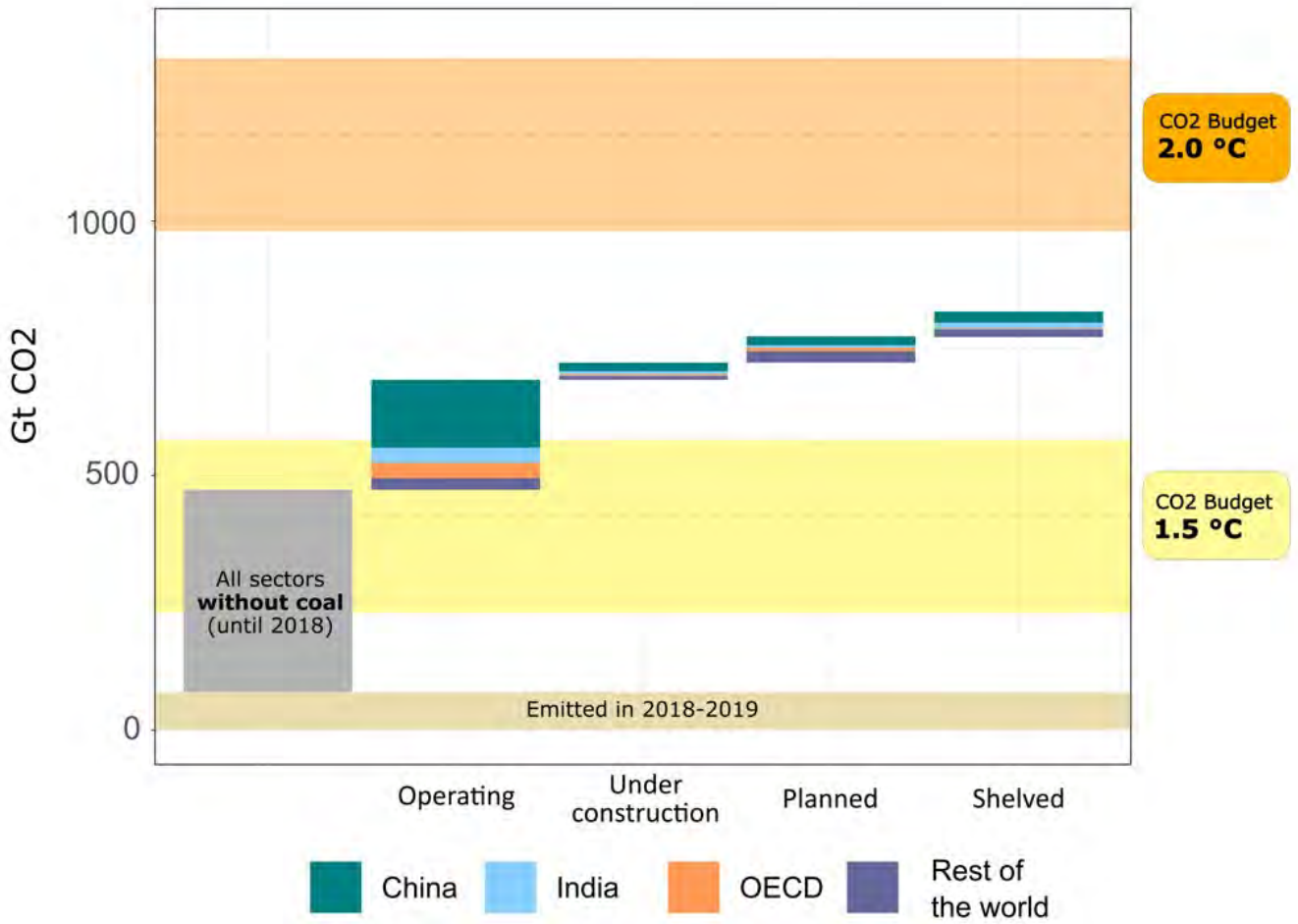
Le Quéré et al (2020), NCC

Post-Covid-19 emissions will continue to rise, unless…



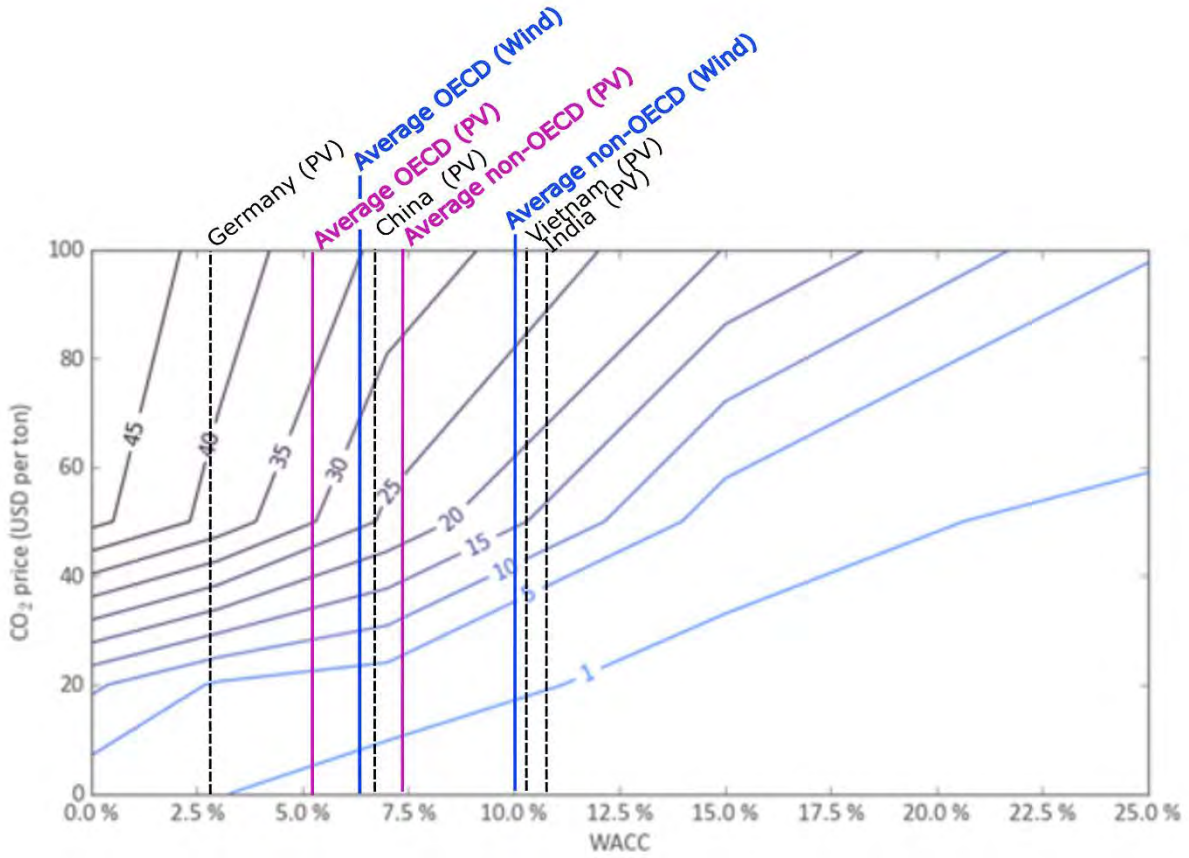
Peters (2020)

Coal-fired plants – large fiscal multiplier?



Steckel et al (2020)

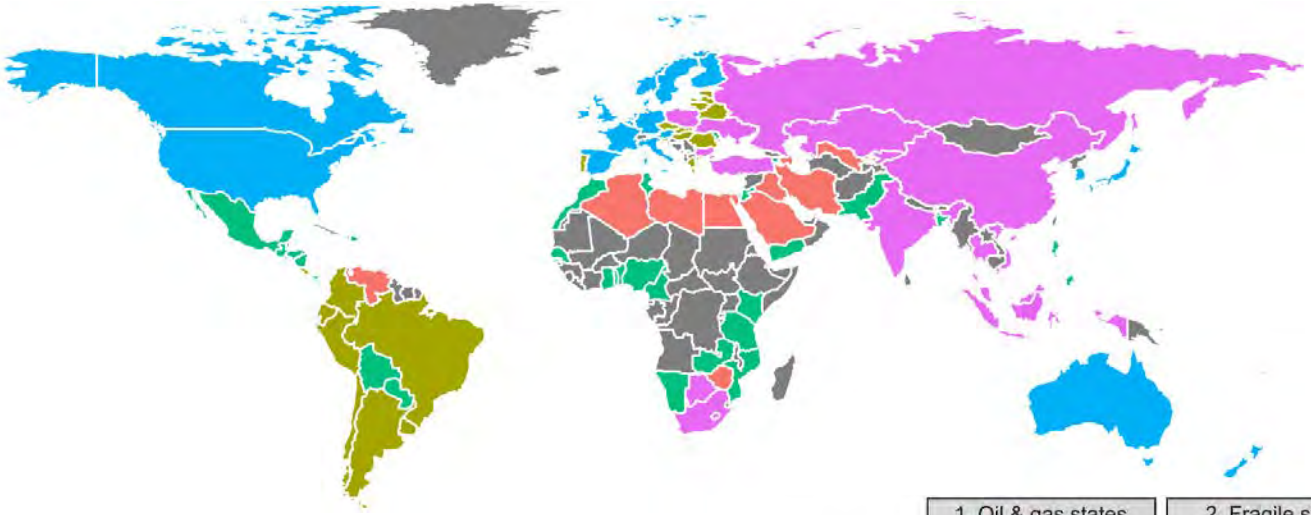
The problem of the cost of capital

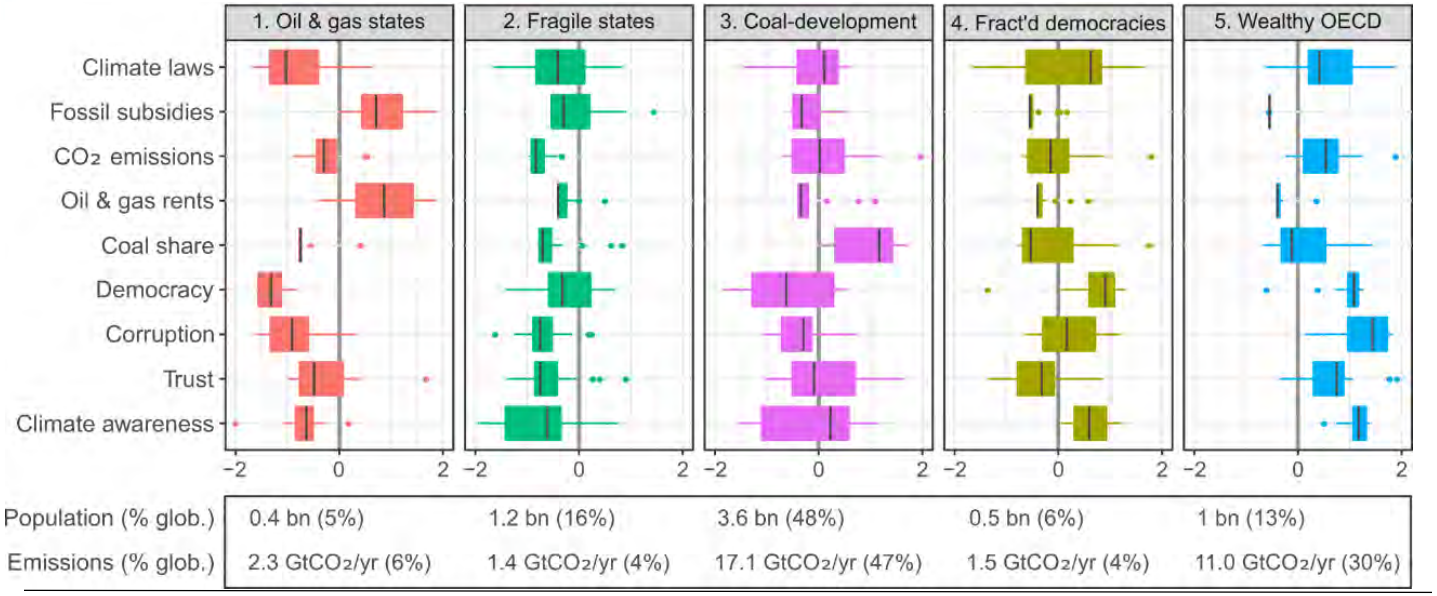


- Contour lines show the expected **share of renewable energies,** given a certain CO_2-price and certain capital costs (WACC).
- Vertical lines show the **average capital costs** for investments in renewables in selected countries and regions.
- Capital costs affect the effectiveness of a CO_2-price!

Note: Underlying model calculation (Hirth and Steckel 2016) is calibrated for a typical emerging market.

The international coal problem at a glance





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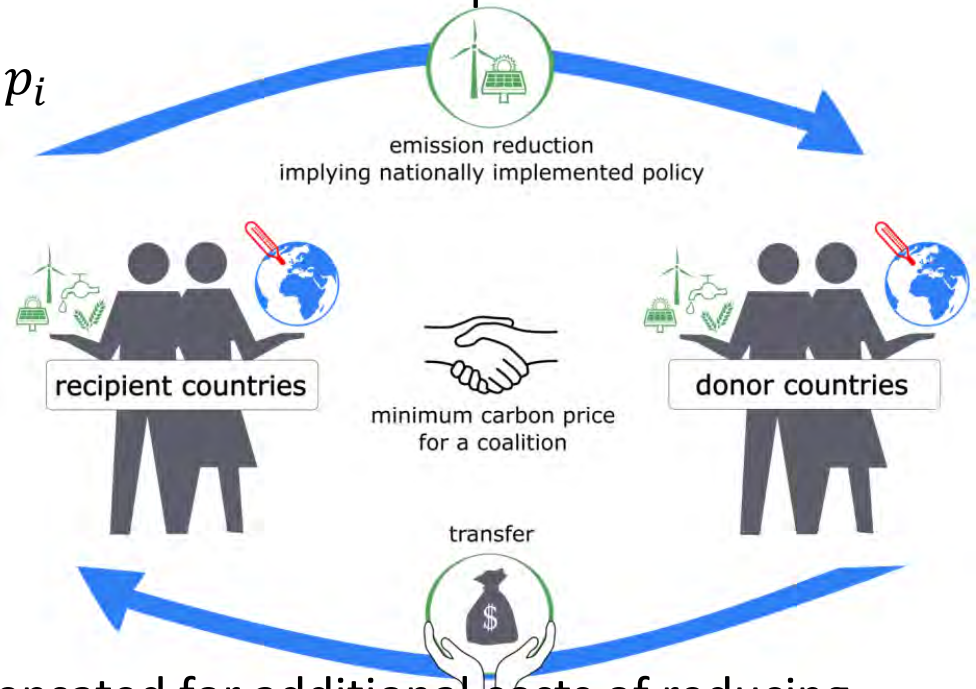
Counteracting free-riding via conditional transfers

Reciprocity through national carbon prices + transfers establishes cooperation

- Transfers conditional on carbon pricing level p_i

- Compensating differences in mitigation costs:

$$\mathcal{T}_i = \underbrace{T}_{\text{Magnitude of compensation}} \cdot \underbrace{\left(C(p_i) - \frac{1}{N}\sum C(p_j) \right)}_{\text{Differences in costs } C \text{ between countries}}$$



- Cooperation established: a member is compensated for additional costs of reducing emissions
  - → Free-riding addressed: voluntary targets are ambitious
  - → Reward for joining: all other countries increase provision

How an investment fund can be used for transfers

- Example $r_b = 8\%$ bonds issued by Bangladesh; $r_f = 1\%$ (no arbitrage!)
- The risk premium of the country is: $r_b - r_f = 7\%$. Who pays for it?
- The investment fund could finance the risk premium and the costs of **capital market frictions**; this would require additional tax revenue.
- Despite the risk for the country, investments in green technologies are becoming profitable! In addition to projects, the fund could also finance the **introduction of CO_2-prices**.
- "Green" guarantees (e.g. Hermes guarantees) or insurance schemes for high-risk loans.

Paradigm shift in international climate policy is necessary!

ELSEVIER

European Economic Review

Available online 20 March 2020, 103423

In Press, Corrected Proof

The strategic dimension of financing global public goods

Ulrike Kornek [a], Ottmar Edenhofer [a, b, c]

https://doi.org/10.1016/j.euroecorev.2020.103423

DE GRUYTER Perspektiven der Wirtschaftspolitik 2020; aop

Aus aktuellem Anlass

Ottmar Edenhofer, Matthias Kalkuhl und Axel Ockenfels*

Das Klimaschutzprogramm der Bundesregierung: Eine Wende der deutschen Klimapolitik?

https://doi.org/10.1515/pwp-2020-0001

Zusammenfassung: Das Klimaschutzgesetz hat einen Paradigmenwechsel eingeleitet: den Einstieg in eine CO_2-Bepreisung als künftiges Leitinstrument der Klimapolitik. Auf den ersten Blick ist der CO_2-Preis unter einer Fülle von Fördermaßnahmen und ordnungsrechtlichen Regelungen verschüttet, deren Wirksamkeit und Kosten höchst unsicher sind. Der CO_2-Preis ist aber so angelegt, dass er langfristig das dominante Instrument einer europäisch harmonisierten Klimapolitik werden kann. Der angedeutete Paradigmenwechsel der deutschen Klimapolitik öffnet damit die Tür, die europäische und internationale Kooperation zu stärken. Dazu ist es aber notwendig, neben der europäischen auch die globale Klimapolitik neu auszurichten. Auch dort sollten sich die Verhandlungen statt auf nationale Mengenziele auf CO_2-Preise konzentrieren. Die erforderliche Kooperation wird möglich, wenn die Regierungen Transferzahlungen strategisch und reziprok nutzen. So könnte die Effektivität der Klimapolitik erhöht werden und es ließen sich die entstehenden Verteilungskonflikte entschärfen.

JEL-Klassifikation: H23, H41, H77, Q54, Q58

Schlüsselwörter: Klimaschutzgesetz, CO_2-Preis, Emissionshandel, internationale Kooperation, Klimawandel, Klimapolitik, EU, Deutschland

1 Vom Klimastreik zum Klimakabinett

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PERSPEKTIVEN DER WIRTSCHAFTSPOLITIK PWP

https://www.degruyter.com/downloadpdf/j/pwp.ahead-of-print/pwp-2020-0001/pwp-2020-0001.pdf

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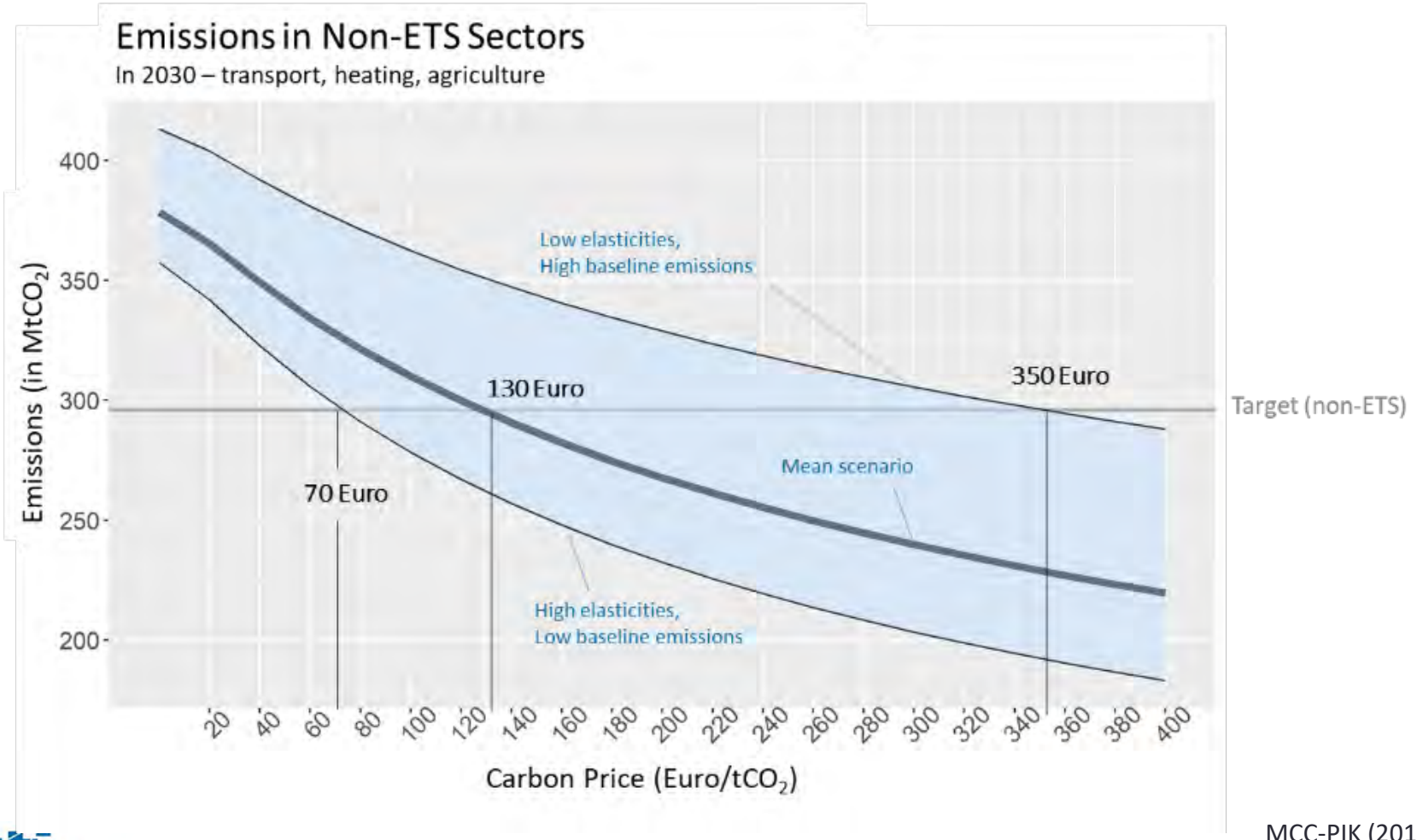
Key messages

- Coal is a burden on the global carbon budget, as is the expansion of infrastructure.
- The high cost of capital prevents the expansion of renewable energies and favors coal-fired power plants.
- International Cooperation is needed and – if designed properly – possible!

Challenges ahead of us

Problem	Steps towards a solution
Uncertainty about SCC and Carbon Prices	Rule-based adaptive learning process + risk premium

Uncertainty about price elasticities



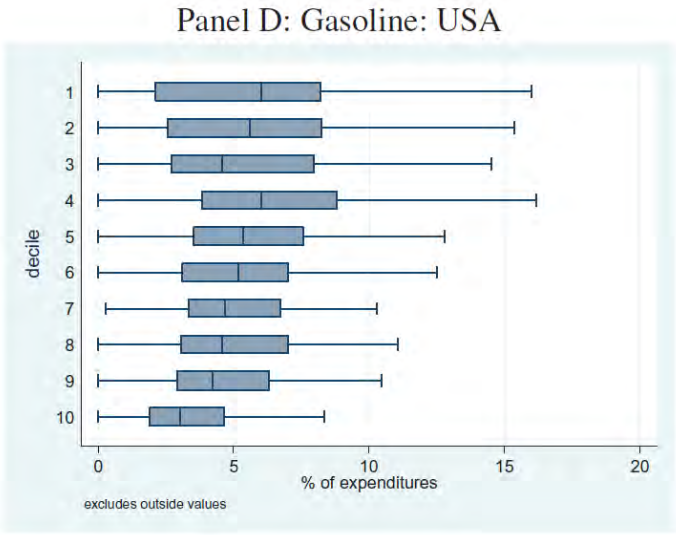
MCC-PIK (2019)

Challenges ahead of us

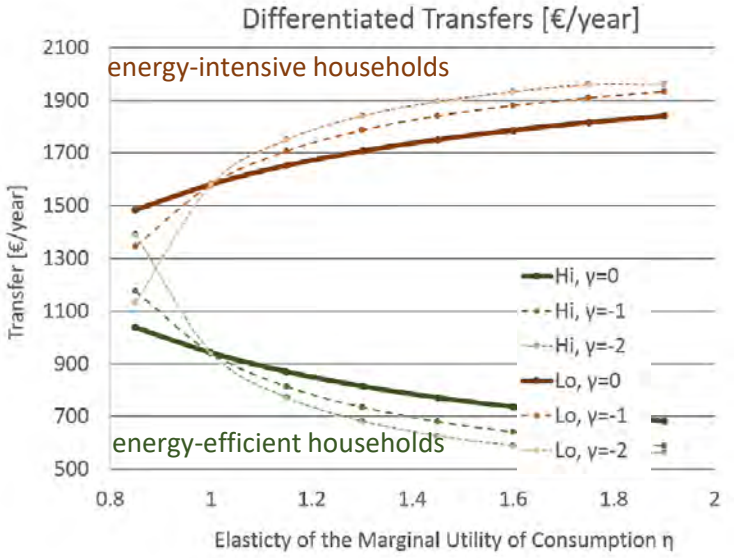
Problem	Steps towards a solution
Uncertainty about SCC and Carbon Prices	Rule-based adaptive learning process + risk premium
Horizontal equity	Need for better models, overcoming the rural-urban divide

Horizontal Equity

- Previous work has focused on vertical equity effects of environmental taxes (costs are negatively correlated with income)
- Policy-makers and public debates concentrate more on horizontal effects and hardship cases (who faces particularly high policy costs) (Pizer & Sexton 2019, Fischer & Pizer 2019)
- Research on optimal policy design (differentiated transfers/taxes or non-linear taxes) with horizontal heterogeneity needed (Hänsel et al. 2020)



Pizer & Sexton 2019



Hänsel, Franks, Kalkuhl, Edenhofer 2020

Challenges ahead of us

Problem	Steps towards a solution
Uncertainty about SCC and Carbon Prices	Rule-based adaptive learning process + Risk premium due to macroeconomic risks
Horizontal equity	Need for better models, overcoming the rural-urban divide
Incentives and moral behavior	Crowding in of intrinsic motivations
Inefficient sector-specific policies	Integration of trading schemes + national tax reform + reform of complementary policies
Commitment device	Independent European Carbon Bank
Cooperation	Conditional transfers, negotiation on carbon prices
Political Economy	Compensation schemes because of concentrated costs and benefits versus dispersed costs and benefits

Pigou is alive!

- The consensus is not entirely misleading: There are, indeed, thorny problems, casting doubt on the political feasibility of Pigovian taxation. But the consensus unjustly disregards the political successes of the latter.
- Today, 100 years after the publication of Pigou's *opus magnum*, we see remarkable success stories, even under second-best conditions.
- There is a Pigovian moment within the EU because of its ambitious targets.
- Economists can help significantly to enhance the implementation of the idea. We have to provide more sophisticated research, which goes beyond the obvious.