



Mercator Research Institute on
Global Commons and Climate Change gGmbH

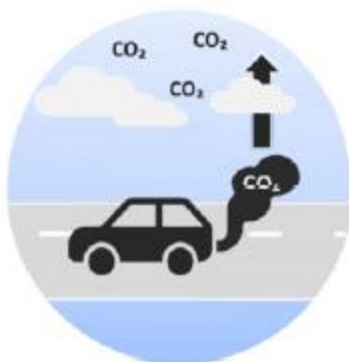
Die Verkehrswende im Geflecht aus nationalem Emissionshandel, regulatorischen Vorgaben und Infrastrukturbedarf

Dr. Nicolas Koch

Virtuelle Loccumer Finanztage Mai 2020

28. Mai 2020

Die Nebenwirkungen des Straßenverkehrs



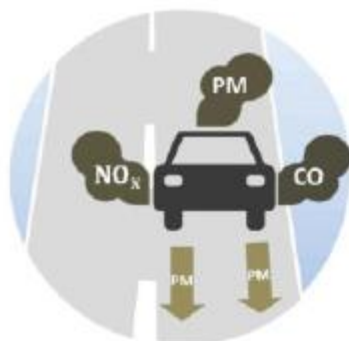
Klimawandel

Der Straßenverkehr erzeugt ein Fünftel der CO₂-Emissionen in der EU.



Staus

Massiver Zeitverlust, Planungsunsicherheit und mehr Spritverbrauch.



Luftverschmutzung

Erhebliche Gesundheitsschäden durch Stickoxide, Feinstaub und Kohlenmonoxid.



Unfälle

EU-weit jährlich rund 25 000 Tote und 135 000 Schwerverletzte.

Welche Politikinstrumente stehen zur Verfügung?

CO₂-Preis



Standards



Kfz-Steuer

BAREME BONUS-MALUS 2013	
EMISSIONS CO ₂ (g/km)	BONUS-MALUS
20 et - (électriques)	-7 000 €
21 à 50	-5 000 €
51 à 100	-4 500 €
Hybrides	-4 000 €
101 à 120	-550 €
121 à 140	-200 €
141 à 160	0 €
161 à 175	300 €
176 à 180	400 €
181 à 185	1 000 €
185 à 190	1 500 €
191 à 200	2 000 €
201 et plus	2 600 €
	3 000 €
	5 000 €
	6 000 €

Mautsystem



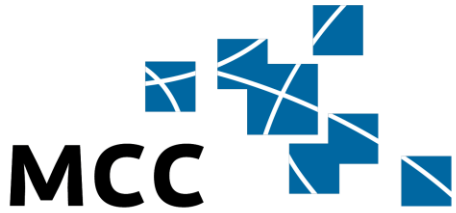
verbote



ÖPNV



Bündel sich ergänzender Maßnahmen notwendig

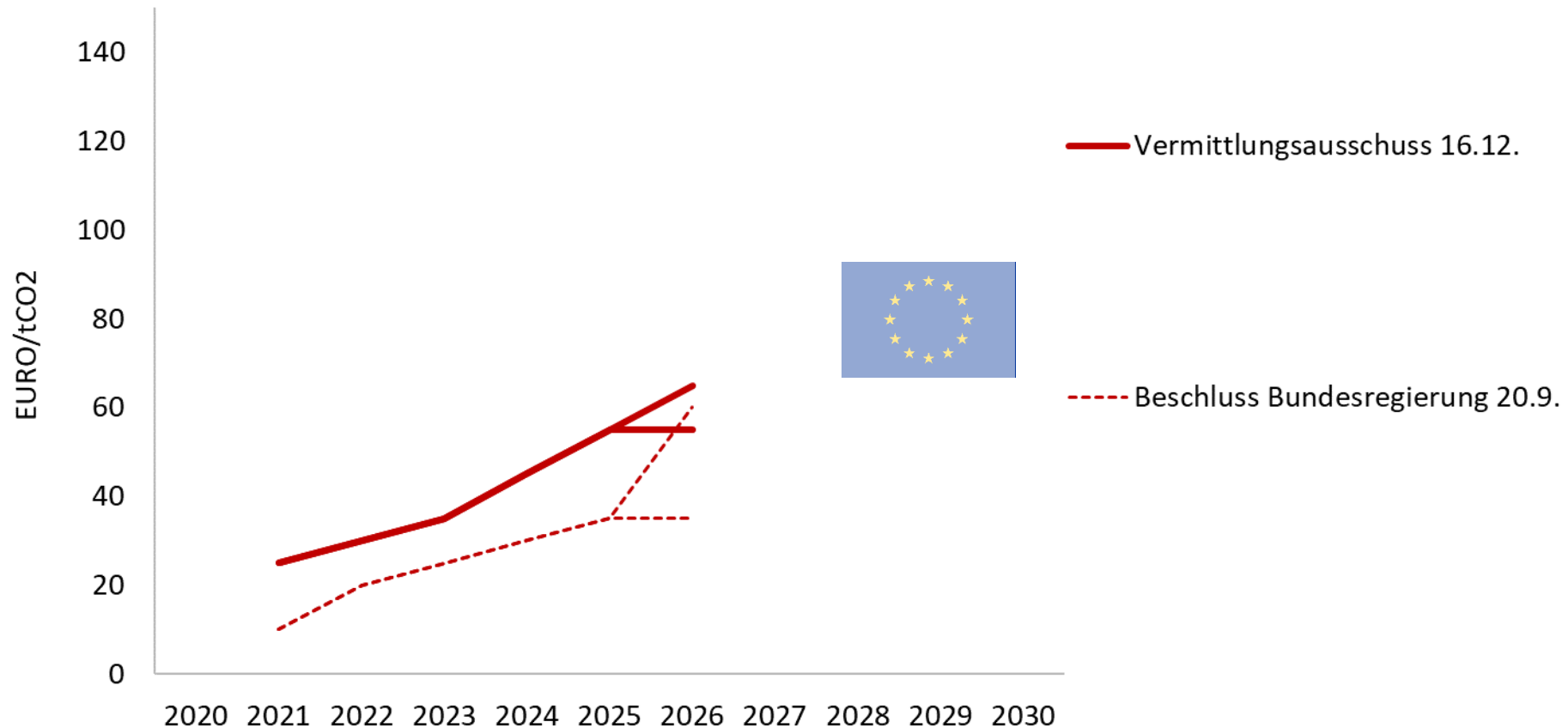


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CO₂-Bepreisung im nationalen Emissionshandel – Klimapolitischer Anker der Verkehrswende

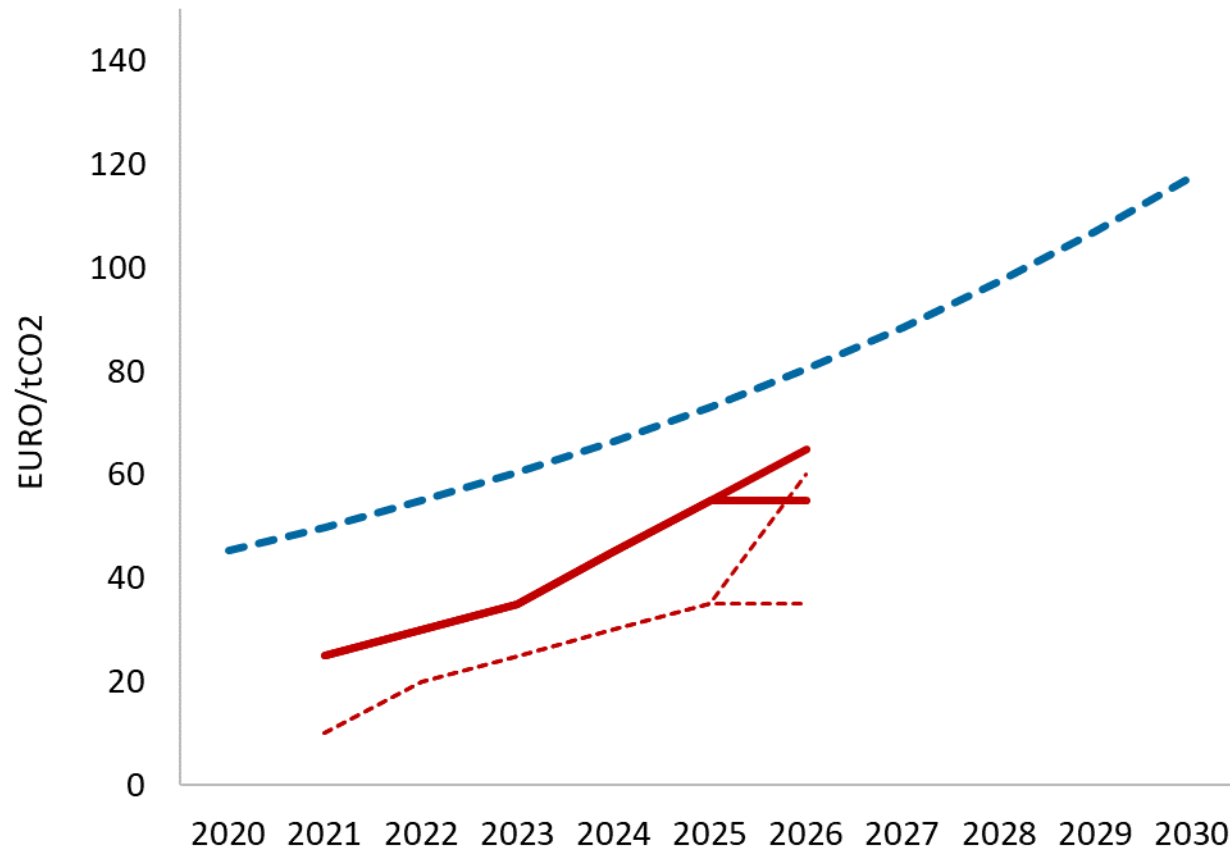
Der CO₂-Preis im Klimapaket:

Gute Architektur, aber der Pfad reicht nicht weit genug in die Zukunft



Der CO₂-Preis im Klimapaket:

Gute Architektur, aber der Pfad reicht nicht weit genug in die Zukunft



--- MCC-PIK-Expertise

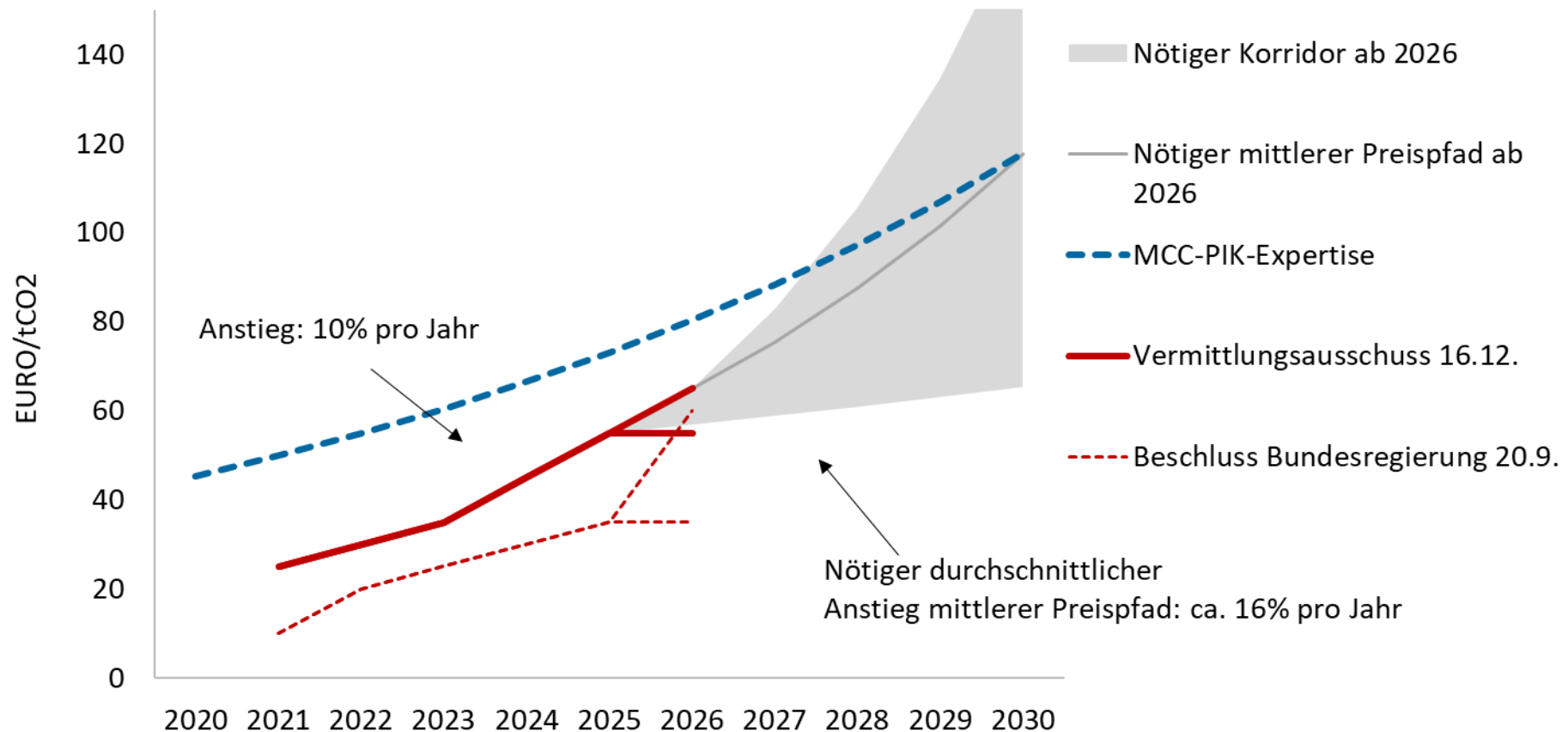
— Vermittlungsausschuss 16.12.

--- Beschluss Bundesregierung 20.9.

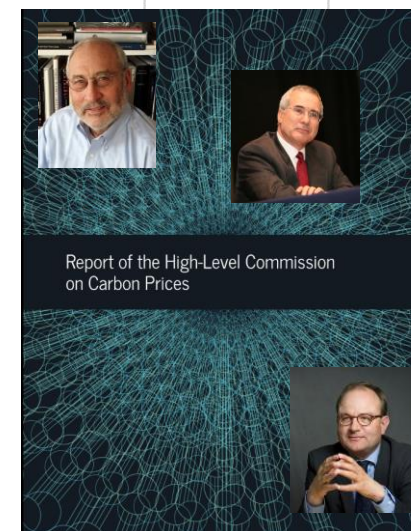
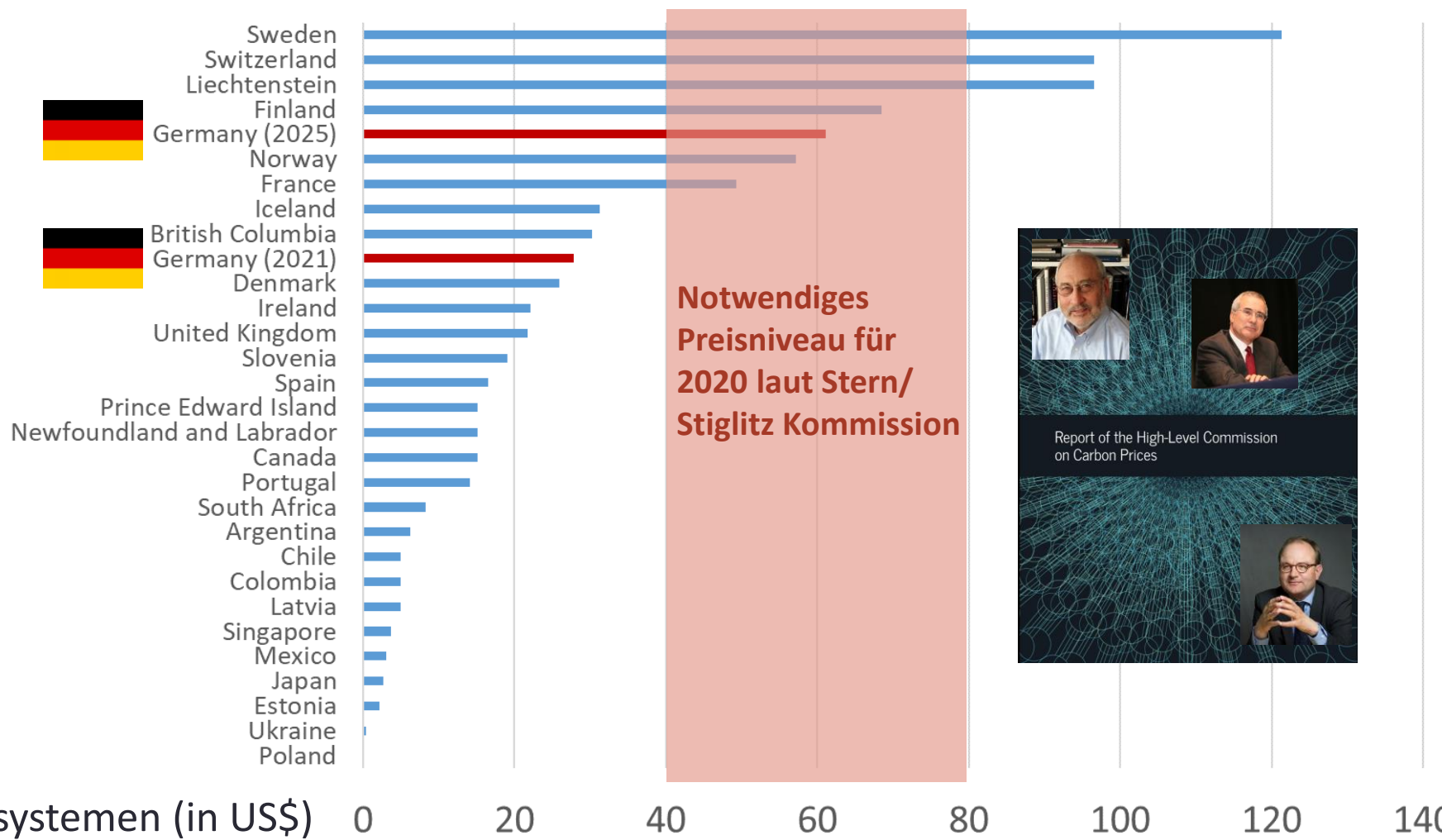


Der CO₂-Preis im Klimapaket:

Gute Architektur, aber der Pfad reicht nicht weit genug in die Zukunft

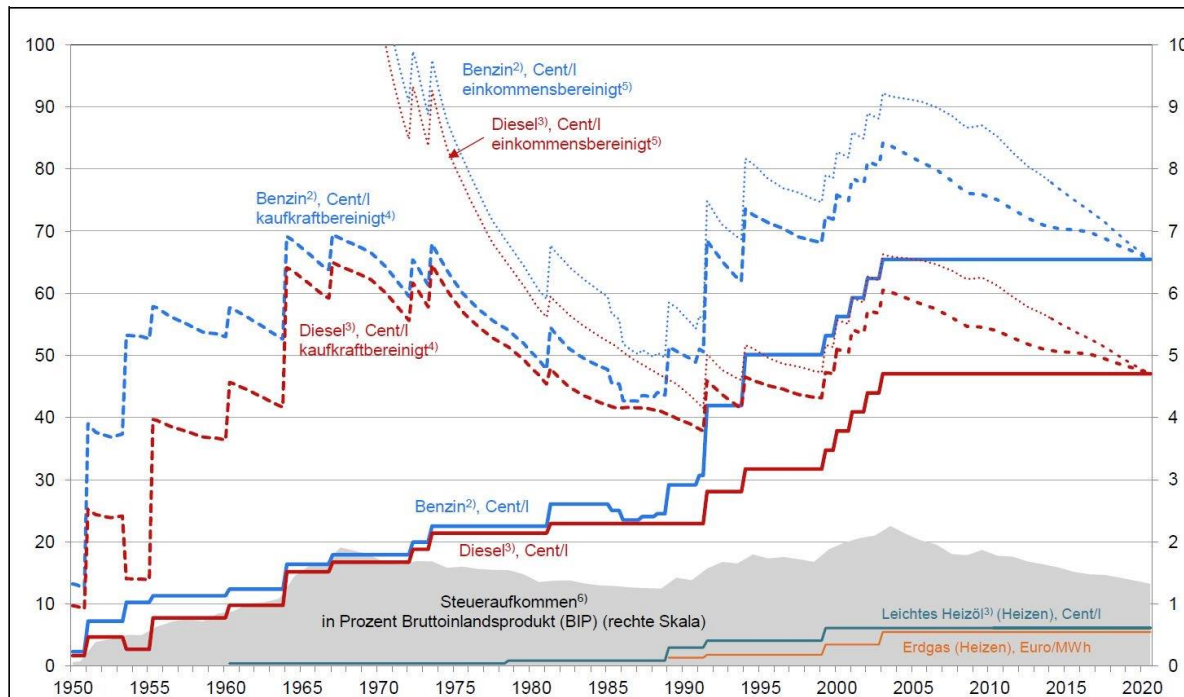


CO₂-Preise im internationalen Vergleich



Warum Kraftstoffsteuern bisher kaum gewirkt haben

Energiesteuersätze und Energiesteueraufkommen 1950 bis 2020¹⁾



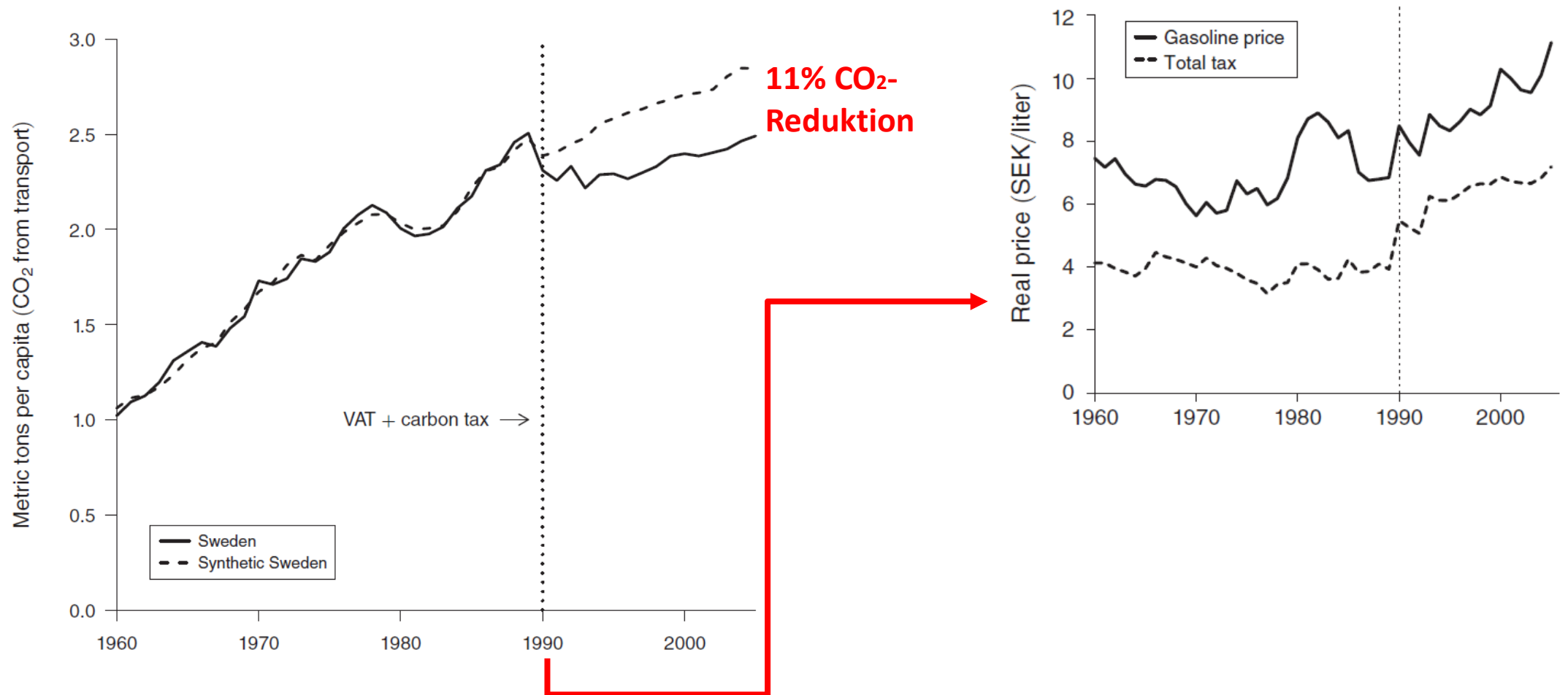
- Kaufkraftbereinigt sind die Benzin- und Dieselsteuern in Deutschland seit 2003 kontinuierlich gesunken
- Gemessen am Einkommen waren die Steuern auf Benzin in den 1970er Jahren sogar noch höher als heute

1) Bis 2005: Mineralölsteuer. Bis 1990: früheres Bundesgebiet.
 2) Unverbleites und schwefelarmes bzw. -freies Benzin.
 3) Schwefelarmer/s bzw. -freier/s Diesel und leichtes Heizöl.
 4) Bereinigt mit dem Verbraucherpreisindex (1962-1999: Preisindex für die Lebenshaltung aller privaten Haushalte; 1950-1961: Preisindex für die Lebenshaltung von 4-Personen-Haushalten von Arbeitern und Angestellten mit mittlerem Einkommen).
 5) Durchschnittliche Bruttojahresarbeitsentgelte Gesetzliche Rentenversicherung, Anlage 1 zum SGB VI.
 6) 2018 bis 2020: Prognose der Gemeinschaftsdiagnose, September 2018.

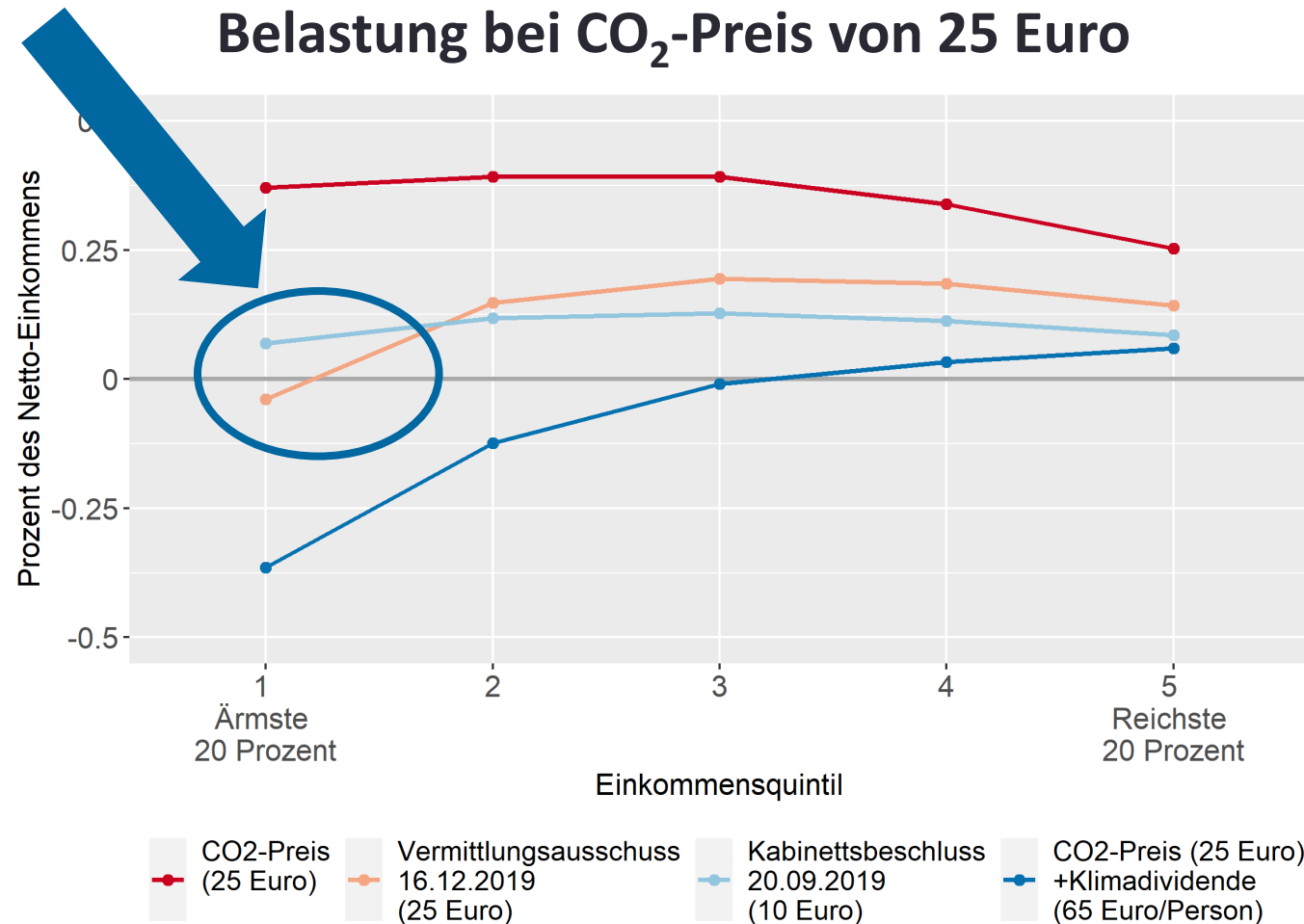
Quellen: Bundesfinanzministerium, Statistisches Bundesamt, Deutsche Rentenversicherung, eigene Berechnungen.

Beispiel Schweden:

CO₂-Steuer im Verkehr kann starke Wirkung entfalten

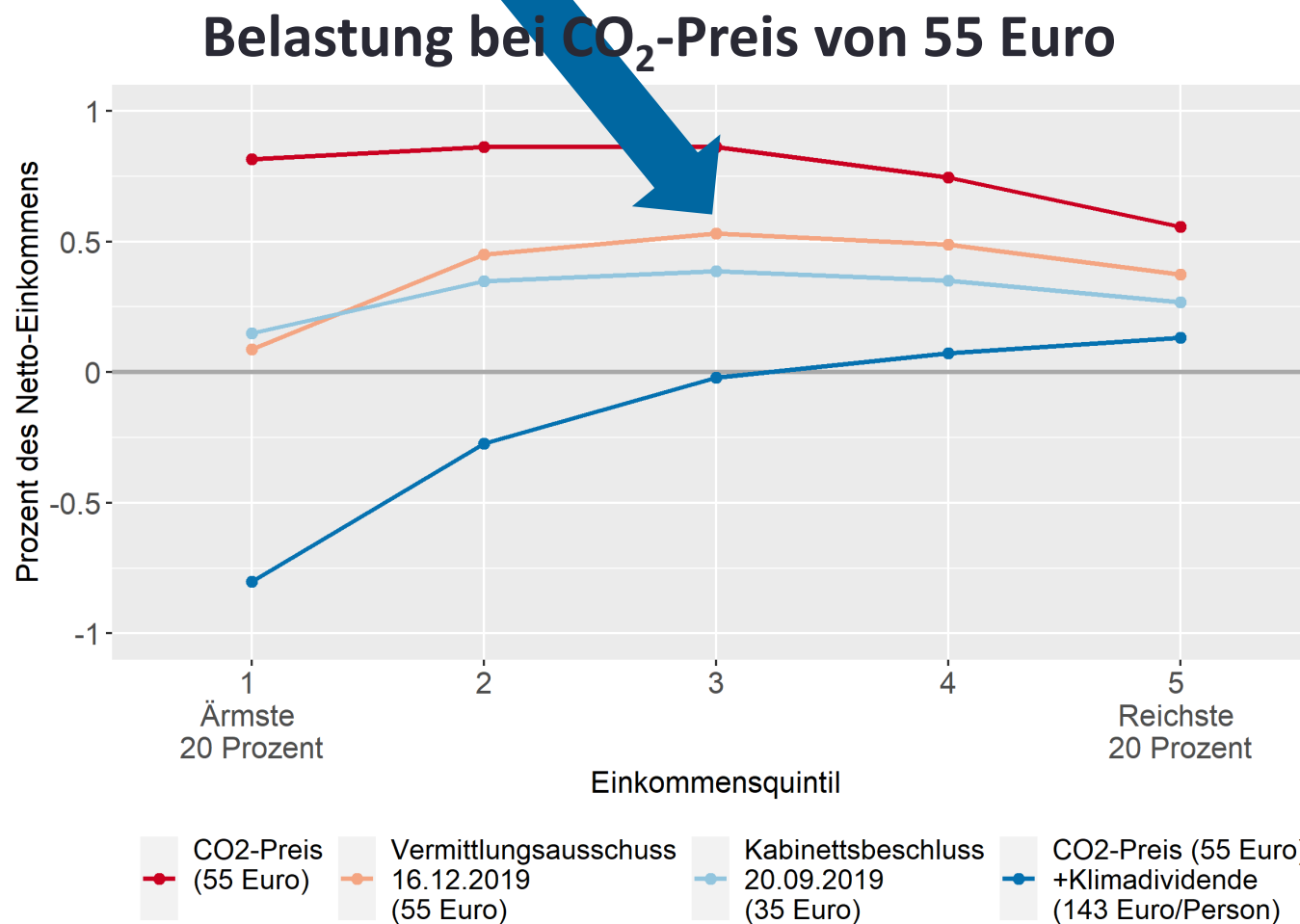


Verteilungswirkung kurzfristig (2021): Entlastung der ärmsten Haushalte, trotz wesentlich höherem Preis



Haushaltseinkommen äquivalenzgewichtet; basierend auf EVS 2013

Verteilungswirkung mittelfristig (2025): Höhere Belastung der Mittelschicht ist langfristig problematisch



Haushaltseinkommen äquivalenzgewichtet; basierend auf EVS 2013



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Was ist zusätzlich notwendig?




1. Emissionsstandards und Kfz-Steuer

- Sind notwendige weitere Politikelemente, wenn Konsumenten beim Kauf neuer Fahrzeuge die Spritersparnisse von effizienteren Autos unterschätzen (Evidenz: Allcott & Wozny 2014)
- Entfalten eine Wirkung:
 - CO₂-Orientierung der Kfz-Steuern in EU haben CO₂ Emissionsintensität von Neufahrzeugen um 1,3% gesenkt (Gerlagh et al. 2018)
 - Emissionsstandards in EU haben neue Technologien in Markt gebracht und umsatzgewichtete CO₂ Emissionen von Neuwagenverkäufen um mehr als 14% reduziert (Reynaert 2017)

Quellen:

- Allcott, Wozny (2014). Gasoline prices, fuel economy, and the energy paradox. *The Review of Economics and Statistics* 96(5): 779-795.
- Gerlagh, van den Bijgaart, Nijland, Michielsen (2018). Fiscal Policy and CO₂ Emissions of New Passenger Cars in the EU. *Environmental and Resource Economics* 69: 103–134.
- Reynaert (2017). Abatement Strategies and the Cost of Environmental Regulation: Emission Standards on the European Car Market. R&R at *The Review of Economic Studies*.

1. Emissionsstandards und Kfz-Steuer: Nebenwirkungen, die der nationale Emissionshandel nun adressiert

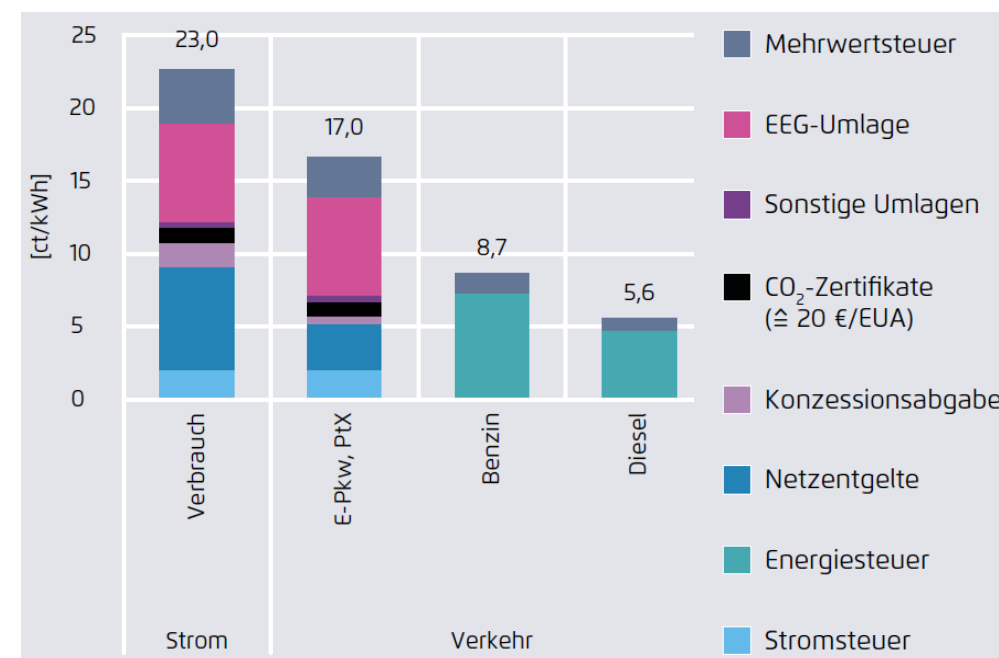
	Sprit-Effizienz 	Fahrleistung 	Umstieg auf ÖPNV 
Spritsteuern	↑	↓	↑
Standards	↑	↑	•
Kfz-Steuern	↑	↑	•
Mautsysteme	•	↓	↑

Rebound Effekt

5–30% der Energieeinsparungen gehen verloren weil Konsumenten ihre effizienten Autos mehr fahren (Gillingham et al. 2013)

2. Reform der Energiesteuern und –abgaben

- Abschaffung der Stromsteuer
- Reform der Netzentgelte und des EEG
- Reform von Diesel- und Benzinsteuern
- Langfristige Reform des Steuersystems



2. Reform der Energiesteuern und –abgaben: Schrotflintenprinzip funktioniert nicht

- Kraftstoffsteuer ist ausschließlich für CO₂-Externalität optimal
- Während CO₂-Emissionen proportional zum Spritverbrauch steigen, variieren sozialen Kosten von Luftverschmutzung, Staus & Unfällen stark mit Fahrleistung, Zeit und Ort
- Gezielte und ausdifferenzierte Bepreisung der lokalen Externalitäten nötig

Adjust urban and rural road pricing for fair mobility

Synergistically addressing local and global environmental damages rather than optimizing a specific aspect of the policy conundrum helps to effectively foster climate action in road transport while maintaining public acceptance and socially fair outcomes.

Felix Creutzig, Aneque Javaid, Nicolas Koch, Brigitte Knopf, Giulio Mattioli and Ottmar Edenhofer

Decarbonizing the transport sector is widely seen as a huge challenge for climate policy making. In some developed countries, emissions from the electricity sector have started to decline, but transport emissions have stalled or even increased. Transport climate policy has so far been treated as technological regulation in terms of fuel efficiency standards, more recently combined with non-binding adoption goals for electric vehicles. While relevant, such measures alone remain inconsistent with the ambition of the Paris agreement, are compromised by rebound and leakage effects, and are subject to gaming by the automobile industry. As an alternative, fuel taxes have been identified as a key and effective strategy, and economists and other academics have persistently argue in favour of pricing strategies, such as air carbon or fuel taxes. Carbon pricing puts a price tag on contributing to dangerous climate change, installs the polluter pays principle and incentivises the reduction of GHG emissions. Politically, however, this strategy is risky. A fuel price increase was recently tested in France and met a huge backlash, as signified by the 'yellow vest' protests. How then can policy makers effectively address GHG emissions in road transport without eliciting social protests and adversely affecting the socially vulnerable? Here, we argue that a geographically differentiated point of view, respecting both the location-specific environmental costs of road transport, such as congestion and local air pollution, and the opportunities of modal shift, offers a way out of this dilemma (see pdf.). Underlying this argument is recent evidence demonstrating that (1) fuel and road pricing have heterogeneous distributional consequences across geography; (2) car transport has higher external costs in dense urban settings, reflecting both congestion and air pollution, compared to rural areas; and (3) fuel and road pricing have a stronger steering effect in urban settings, as public

transit and short distances enable a modal shift to alternatives (see below) and Fig. 1). Together, these insights strongly point to the need for differentiated pricing of car-related externalities across geographical settings. To further improve social acceptability and fair outcomes, we propose that revenues raised are spent impartially and used to improve the infrastructure of environmental modes, especially in sub- and peri-urban settings (Table 1).

Vulnerability to fuel price rises
The yellow vest protests in France originated in rural and peri-urban middle-class areas. One significant area of discontentment was the rising fuel taxes that hit car-dependent commuters most, coupled with a perceived disadvantage vis-à-vis urban populations who are wealthier and have better access to services and opportunities. The protests point to a problematic dilemma between effective climate policies and social inclusion, and, more specifically, car-related economic stress, defined as having disproportionately high motoring costs on low incomes¹. Research from countries including Australia, New Zealand, Canada, France, Germany and the UK shows that vulnerability to fuel price hikes is higher in suburban, peri-urban and rural areas as a result of greater expenditure on fuel (higher exposure) and lack of viable modal alternatives (lower adaptive capacity) (Fig. 1a). In many (but not all) metropolitan areas around the world, this is worsened by the 'suburbanisation of disadvantage': low

income households, who are more sensitive to fuel price increases, are pushed to outer car-dependent areas by the lack of affordable housing in core cities². These observations point to a stark dilemma between effective climate policy and social inclusion emerging from the rural-urban divide. However, geographic differentiation not only harbours the problem, but also the solution.

City driving is most harmful
The effect of GHGs is mostly independent from its location of emission, suggesting the need for universal and equal pricing. However, other external costs of car use, such as air pollution, congestion, noise and accidents, strongly depend on location. For example, in urban areas of the United States, people inhale at least 10 times more motor vehicle exhaust fumes than their rural counterparts³. This so-called 'inhaler fraction' increases by yet another factor of 10 in global megacities⁴ (Fig. 1b). Congestion is also most problematic in large urban areas, increasing in more densely populated 'inner cities' (Fig. 1b). In 2016, economies such as the US, the UK, and Germany occurred economic losses equivalent to nearly US\$1,000 per capita due to time spent in urban congestion⁵.

In large cities, other costs can often equal or surpass the social costs of CO₂ emissions. The example of Beijing demonstrates that local environmental and congestion costs can be equal to the social costs of CO₂ emissions⁶. While often carbon prices of only US\$20 tCO₂e are

Table 1 | Differentiating pricing of road transport to address environmental and social costs of car use

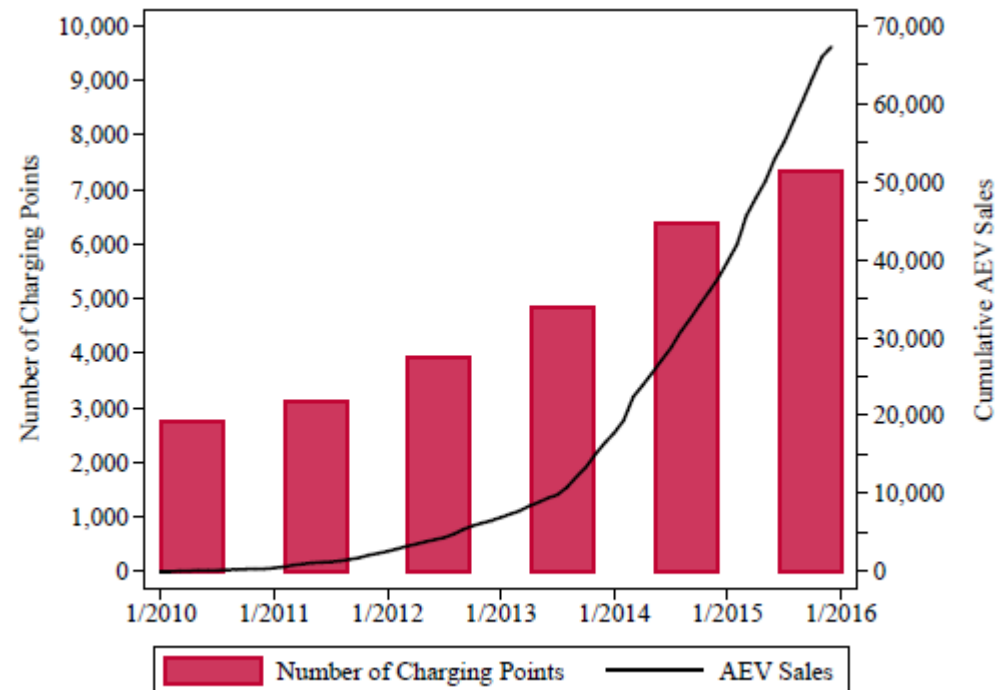
Carbon price	Geographical differentiation		Other differentiation
	No	Yes	Fuel
Congestion charge	Yes	Yes	Time
Pollution charge	Yes	Yes	Fuel and vehicle

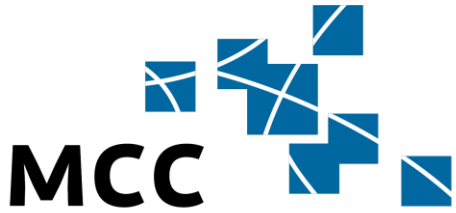
NATURE CLIMATE CHANGE | www.nature.com/natureclimatechange

Dynamische Stadtmaut und eine dafür geringere landesweite CO₂-orientierte Kraftstoffsteuer kann Stadt-Land Gefälle adressieren & politische Akzeptanz erhöhen

3. Infrastrukturförderung

- Anzahl der Ladestellen und kumulierte Verkäufe von reinen Elektrofahrzeugen in Norwegen
- Evidenz Norwegen: Jede ausgegebene Krone für Ladeinfrastruktur führte zu mehr als doppelt so vielen zusätzlichen Anschaffungen von Elektrofahrzeugen als derselbe Betrag für eine Kaufprämie.





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Die nächsten Schritte auf der europäischen Ebene in der Post-Corona Zeit

Stabilisierung der Erwartungen ist wichtig

- Ziel eines **EU-weiten Emissionshandels** für alle Sektoren weiter vorantreiben
- Möglichst schnell einen **Mindestpreis** im Emissionshandel festlegen
- European **Green Deal** sollte fortgeführt werden, auch die Debatte um die Verschärfung der 2030 Ziele



PIW-CHEF IM INTERVIEW

Klima-Ökonom Edenhofer fordert europäischen Fonds für Klimaschutz-Investitionen nach der Krise

Der Direktor des Potsdam-Instituts sieht keinen Zielkonflikt zwischen einem Post-Corona-Aufschwung und kluger Klimapolitik. Eine pauschale Abwrackprämie lehnt er ab.



Silke Kersting



Klaus Strømman

26.04.2020 - 15:50 Uhr • 10 x geteilt



Vielen Dank!

Dr. Nicolas Koch

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MCC was founded jointly by Stiftung Mercator and
the Potsdam Institute for Climate Impact Research

Weitere Informationen



Die Zukunft der Straße umweltfreundlich sichern

Wie sich die Nebenwirkungen des Autoverkehrs effizient und sozialverträglich verringern lassen

Der Straßenverkehr hat unbestreitbaren Nutzen – und steht zugleich massiv in der Kritik. Um die Mobilität von morgen zu sichern, ist Kluge- und vorausschauende Regulierung gefragt. Ein Überblick über die Politik-Instrumente und den Stand der Forschung zu ihrer Wirkung.

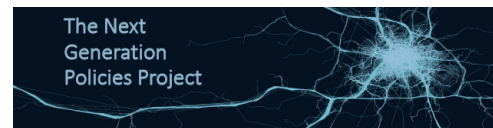
1. Das Problem

In keinem Bereich hat das Bemühen, die Treibhausgas-Emissionen zu senken, so wenig Erfolg wie im Verkehrssektor. In Deutschland etwa stiegen sie von 1990 bis 2017 um 2 Prozent – die Gesamtmissionen dagegen sanken immens um 28 Prozent. Das weitaus größte Gewicht innerhalb des Sektors hat der Straßenverkehr. Bei der Entscheidung des Einzelnen über das Ob und Wie des Fahrens wird dieser „externe Effekt“, wie es Ökonomen ausdrücken, nicht angemessen berücksichtigt. Ebenso wie andere Effekte, vor allem die Kosten von Staus, lokaler Luftverschmutzung und Unfällen.

 <p>Klimawandel Der Straßenverkehr erzeugt ein Fünftel der CO₂-Emissionen in der EU.</p>	 <p>Staus Massiver Zeitverlust, Planungsunsicherheit und mehr Spritverbrauch.</p>
 <p>Luftverschmutzung Erhebliche gesundheitlichen Schäden durch Stickoxide, Feinstaub und Kohlenmonoxid.</p>	 <p>Unfälle EU-weit jährlich rund 25.000 Tote und 1.350.000 Schwerverletzte.</p>

E-Mobilität: Wie man die Nachfrage nach sauberen Autos ankurbelt

Verbraucher reagieren 1,5- bis 20-mal stärker, wenn der Staat Elektroautos über die Umsatz- oder Zulassungsteuer statt über die Einkommensteuer fördert. Das zeigen empirische Studien aus den USA. Die Erklärung liegt auf der Hand: Eine Umsatzsteuer-Behaftung wirkt unmittelbar auf die Kaufentscheidung im Autohaus, wie ein Händler-Rabatt. Eine Einkommensteuer-Gutschrift aber muss man erst beantragen, und das Geld kommt erst im nächsten Jahr. Um Mitnahmeeffekte zu mindern, ist es optimal, die Förderung auf Einkommensschwächere auszurichten.



Designing Policies to Green Road Transportation

Nicolas Koch, Hannah Klauber, Alexander Rohlf, Nolan Ritter

Key Points

- Only a set of complementary policies can address traffic externalities. There is no silver bullet.
- The prevailing set of policies places too much emphasis on fuel efficiency and too little on cutting mileage.
- Fuel taxes and road pricing strongly affect driving.
- Progressive tax credits at the point of purchase can help overcome barriers to electric vehicle adoption.
- Recycling revenues from fuel and road pricing for public transport multiplies the impact of policies.

1. Externalities: The unintended side effects of road traffic. While undeniably beneficial for society, road transportation also has significant social costs that are ignored by private users when deciding if, where, how, and at what time to travel. Policymakers are mainly concerned about four sizeable externalities from road transportation:

1. **Climate change.** Road transportation causes carbon dioxide (CO₂) emissions. In Europe, transport is responsible for 26% of total CO₂, two thirds of which stem from cars and vans [1]. The social costs of carbon are borne globally.
2. **Road congestion.** Each vehicle on the road contributes to congestion and slows traffic. In heavy traffic, additional vehicles can reduce throughput. The social costs of congestion consist of increased travel time and decreased reliability of travel times.
3. **Local air pollution.** Fuel combustion results in emissions of carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM). Wheel-to-road contact, as well as brake, tire, and gear wear contribute to PM emissions. There is ample evidence that these pollutants cause harm to public health [2] [3] [4] [5] [6], even at low levels [7].
4. **Accidents.** Each vehicle on the road increases the probability of accidents. The social costs of this externality include loss of life, property damages and physical injuries resulting in medical expenditures.

Externalities reinforce another, e.g., congestion may increase air pollution and CO₂ emissions [2] [8] because stop-and-go traffic reduces fuel efficiency and increases travel times [9].

Fuel taxes are an efficient policy measure because fuel consumption perfectly correlates with CO₂ emissions. Because the relationship between fuel consumption, local pollution,



Policies to enhance vehicle fleet modernization

Nicolas Koch, Nolan Ritter, Alexander Rohlf, Hannah Klauber (MCC)
Andreas Nitzad, Christian Bauer, Chris Mutel (PIK)

Key Points

- There are environmentally effective policies to retire old vehicles and promote clean cars.
- Low emission zones (LEZ) improve air quality because drivers adopt low-emission vehicles to be able to access city centers.
- Even moderate reductions in air pollution caused by LEZs have meaningful long-term health benefits.
- Prudent scrappage subsidies improve local air quality by targeting owners of emission-intensive cars who would not purchase new vehicles without incentives.
- Scrappage programs have no major adverse CO₂ effects from a life-cycle perspective.
- Cost-effective greenhouse gas reductions require scrappage in favor of public transit, car-sharing or biking.

1. Clean cars for a healthy environment

Air pollution in EU Member States exceeds the EU's strict pollution limits, especially in larger cities. The European Commission has taken legal action against 13 Member States because of too high nitrogen dioxide concentrations and 16 Member States because of too high concentrations of particulate matter (European Commission 2016). In densely populated urban areas, road traffic is the major contributor to these ground-level emissions that are particularly harmful to human health and well-being (Guerre and Walker 2013; Knefel et al. 2016; Landrigan et al. 2018).

Major efforts to accelerate clean car roll-out across Europe

Because older vehicles, especially if powered by diesel, are more emission-intensive than new ones, getting such "dunkers" off the road has become a widespread policy target. Two policy measures have gained prominence in the concerted effort to accelerate vehicle fleet modernization, which is ultimately tied to the goal of improving ambient air quality but also the transition to low-carbon road transportation (see figure). At the national level, various governments provide subsidies to buy environmentally friendly cars conditional on scrapping an old one. At the local level, many European cities implement low emission zones (LEZ) that limit access to vehicles meeting certain pollution standards. For instance,

Athens, Brussels, Madrid, Milan and Paris either already ban older diesel cars or have pledged to ban diesel cars altogether in the near future. In 2018, Germany's Federal Administrative Court has confirmed that city councils have the right to ban diesel cars from city centers. To alleviate the burden of such restrictions, scrappage programs can help households to upgrade to cleaner cars.



1. Clean cars for a healthy environment

Policy effectiveness is unclear

Policymakers' enthusiasm for these two policies and their widespread use raise the question as to whether they are effective at meeting their economic and environmental goals. Both policies are controversial, mainly because of the costs imposed on drivers required to upgrade their vehicles in the case of LEZs and the large fiscal costs in the case of scrappage programs. The policies' controversial effectiveness makes informed decisions among policy options difficult. Against this



Bewertung des Klimapakets und nächste Schritte

CO₂-Preis, sozialer Ausgleich, Europa, Monitoring

Ottmar Edenhofer
Christian Flachsland
Matthias Kalkuhl
Brigitte Knopf
Michael Pahle



POTS DAM- I N S T I T U T F Ü R
K L I M A F O L G E N F O R S C H U N G E V.

<https://www.mcc-berlin.net/next-generation-policies/publications.html>

<https://www.mcc-berlin.net/forschung/kurzdoessier/strassenverkehr.html>

<https://www.mcc-berlin.net/politik-dialog/co2-preis.html>