

Pricing Climate Emissions

Efficiency and fairness
of policies to deal with climate change.

Innsbruck Dec 2021

Thomas Sterner
Gothenburg, Sweden

Happy if the oil prices are high?



Low prices **BAD** because:

- Stop renewables research and deployment
- Stop Efficiency investments
- Encourage waste,
- Stop insulating houses
- Encourage fertilizers, aluminium, gasguzzlers, sprawl

- Frighten solar investors

Low prices **good** because:

- Keep oil and gas in the ground
 - Don't build Xcel pipeline
 - Don't develop heavy tarsands,
 - Stop fracking and drilling...
-
- Frighten investors with stranded assets

What is best for climate?

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- Low producer prices
- AND
- High consumer prices
-

What is best for climate?

- Low producer prices
- AND
- High consumer prices
- → carbon pricing

Why is Carbon price best?

- Obvious
- Economics theory says so
- Economists say so

Economists' Statement on Carbon Dividends

The Largest Public Statement of Economists in History

SIGNATORIES INCLUDE

3623

U.S. Economists

4

Former Chairs of the Federal Reserve

28

Nobel Laureate Economists

15

Former Chairs of the Council of
Economic Advisers

Why is Carbon price best?

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Economists' Statement on Carbon Dividends

“Command and control” is so inflexible

- Most regulations are **toothless**
- Companies get around them without sanction

- Or they are so **draconian** (FORBID OIL) that $P \rightarrow \infty$
- (Either way we dont like regulations)

Take care

- We dont just want to be free market apologists
- //(why not just electric cars and insulated homes)
- What are best reasons for a carbon **price**?
- How should it be implemented?

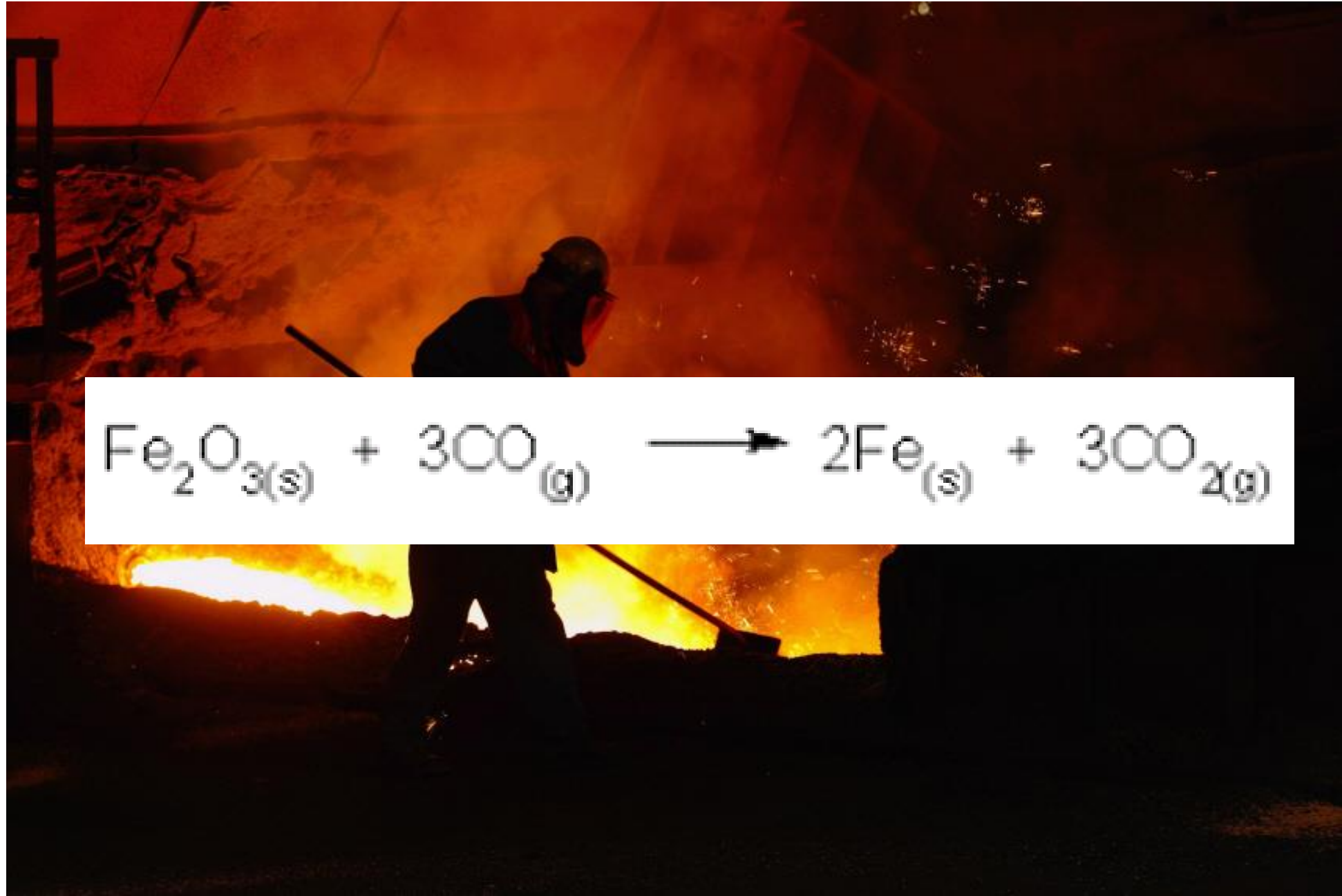
What needs to be done:

- Energy sector
- Transport sector (cars and busses, lorries)
- Industry
- Buildings
- Ships
- Aeroplanes
- Food / farming
 - Mining, greenhouses, fishing boats, waste treatment, water supply, railways, cooling, fertilizer production

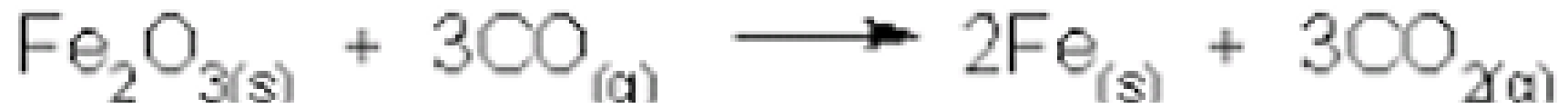
STEEL: THE ICONIC I NDUSTRY



STEEL: THE ICONIC INDUSTRY



STEEL: THE ICONIC INDUSTRY



Iron ore pellets

+



Hydrogen

=



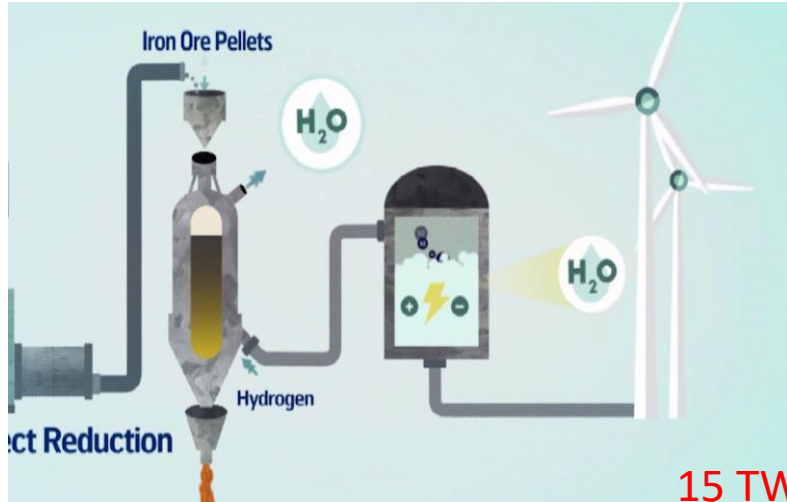
Sponge iron

+



Water

Hybrit Fossil free steel!



15 TWh !

Volvo Group is proud to reveal the world's first vehicle made of fossil-free steel from SSAB – made in Volvo Construction Equipment's facility in Braås, Sweden. During today's green steel collaboration event, it was announced that more vehicles will follow in 2022 in what will be a series of concept vehicles and components using fossil-free steel from SSAB.

Why HYBRIT?

HYBRIT will make a unique contribution to a fossil-free society by enabling a steel production process that emits water instead of carbon dioxide. This can be a reality when the use of coal and coke in steel production is replaced by hydrogen produced using fossil free energy sources.

[Read more](#)



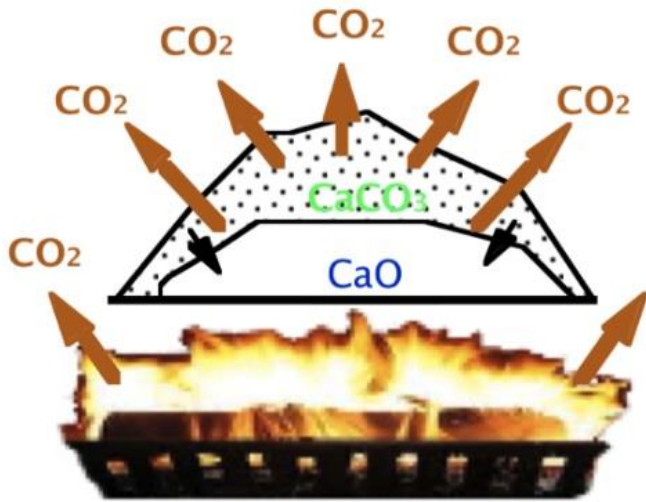
 **LKAB**

SSAB

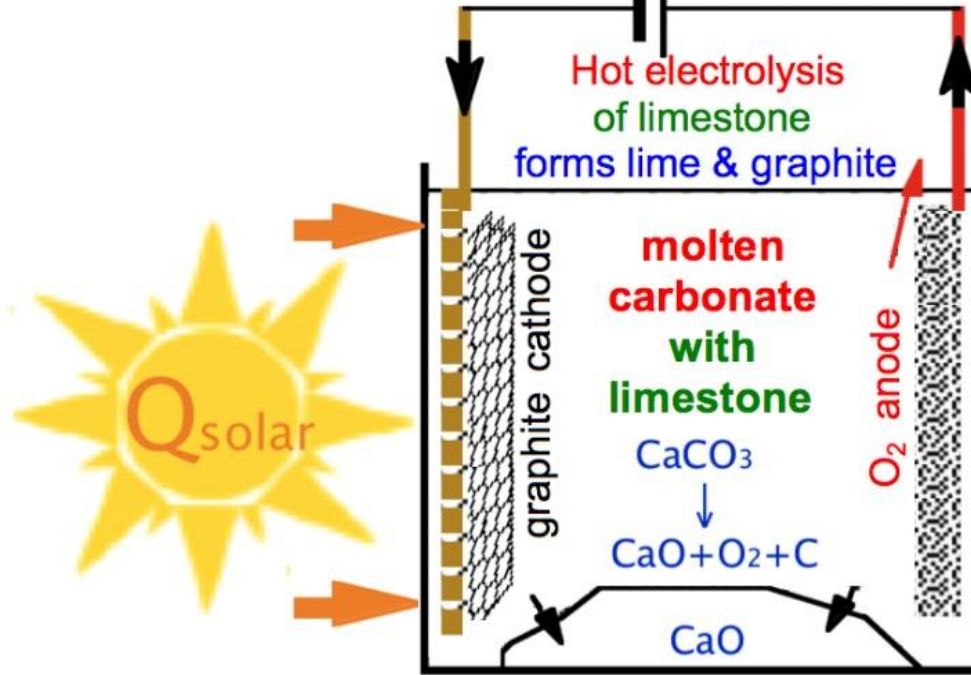
VATTENFALL



Conventional Cement



CO₂-free STEP 1 Cement





TRICORONA
TRICORONA CLIMATE PARTNER



ERICSSON



BILLERUDKORSNÄS



axfood



SCANIA



Kramfors kommun



POWER CIRCLE
Electricity for sustainable energy



Göteborgs Stad



Cell | Solar
Solceller till villa

SIEMENS



SVENSKA SPEL



HÖGANÄS KOMMUN



CHALMERS

QualiFare



WWF

ABB

FORTLAX datacenter



SKS
SVERIGES KÄRNTEKNISKA SÄLLSKAP
SWEDISH NUCLEAR SOCIETY

TESLA



SEI

Folkhem



storaenso



ENERGIGAS SVERIGE



AkzoNobel



Solelia
GREENTECH

H&M

AP FJÄRDE AP-FONDEN

ICA



CASTELLUM

Uppsala KOMMUN



LANTBRUKARNAS RIKSFÖRBUND

e.on

OX2

mobil samåkning



Svensk Vindenergi



Regeringskansliet



telenor



Lantmännen

Suppose we succeed with that list

- Sing Halleluja, become vegetarian and solve climate?



What happens when we made cement and steel fossil free?

~~• People get inspired and solve climate change once and for all~~

• The price of fossil fuels fall and people find new ways to use more

Who doesn't need a heated outdoor pool ?



The ONLY policy that will deal

TAX the ONLY policy that will deal with **new** uses



So Dealing with new uses is ONE REASON

- Cost heterogeneity is another reason!

Political Scientists:



MAKING
CLIMATE
POLICY
WORK

DANNY CULLENWARD
DAVID G. VICTOR



Lobbying obvious..

- Fortune 500 1980

Rank	Company	Revenues (\$ millions)	Profits (\$ millions)
1	Exxon Mobil	79,106.5	4,295.2
2	General Motors	66,311.2	2,892.7
3	Mobil	44,720.9	2,007.2
4	Ford Motor	43,513.7	1,169.3
5	Texaco	38,350.4	1,759.1
6	ChevronTexaco	29,947.6	1,784.7
7	Gulf Oil	23,910.0	1,322.0
8	Intl. Business Machines	22,862.8	3,011.3
9	General Electric	22,460.6	1,408.8
10	Amoco	18,610.3	1,506.6
11	ITT Industries	17,197.4	380.7
12	Atlantic Richfield	16,234.0	1,165.9
13	Shell Oil	14,431.2	1,125.6
14	U.S. Steel	12,929.1	-293.0
15	Conoco	12,648.0	815.4
16	DuPont	12,571.8	938.9
17	Chrysler	12,001.9	-1,097.3
18	Tenneco	11,209.0	571.0

- Oil/coal countries

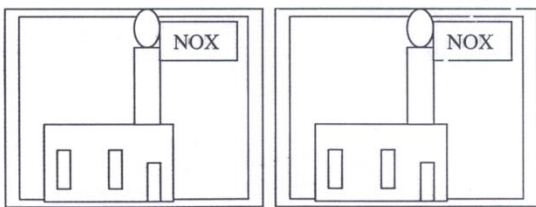
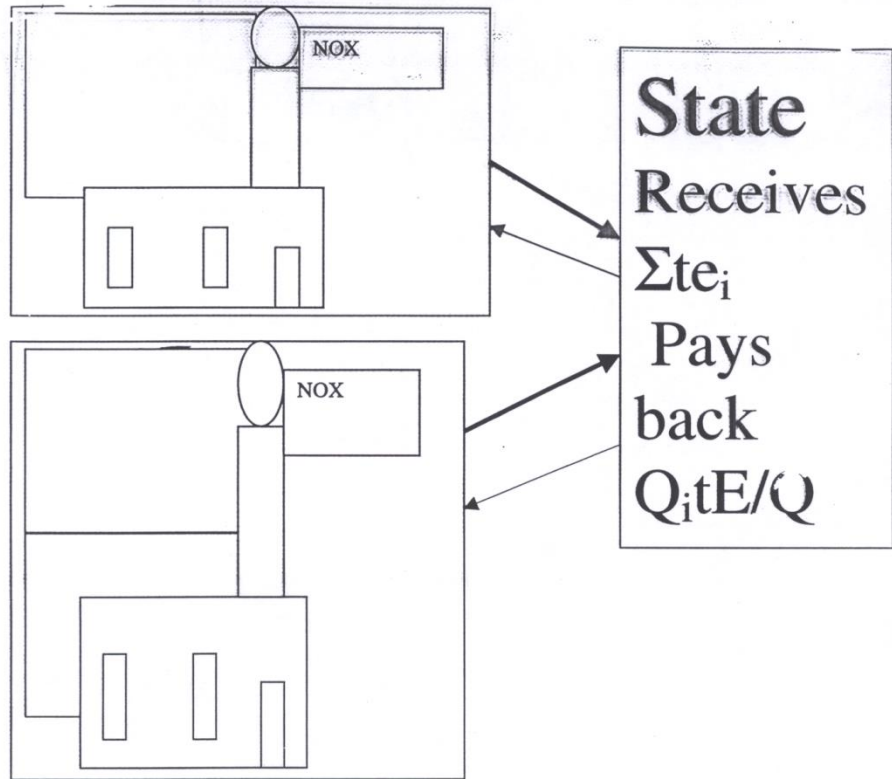
- USA
- CHINA
- Russia
- S Arabia
- Rest of OPEC,
- South Africa
- Australia

Pol Scientists: Carbon pricing will not work

- Nobody votes for taxes
- Tradable permits → more acceptable for business
- Risk is : **too generous** to business
- Large scale **corruption in offsets**
- Overly **generous allocation** of permits
- Complimentary policies take over
- Linking will be a race to the bottom

REFUNDING:

NO_x Abatement, REP in Sweden and Norway



Small companies too small to warrant monitoring, measurement and other costs.

Administration REP: 0,5%

anlnr	Verksamhet	Produktionsenhet	NOX	MWh	FEE	REFUND	Net Fee		Panntyp	Reningstek
7	Kraft- och	Panna 3	123421	593335	4936840	5532128	-595288		Brännare	SCR
7	Kraft- och	Panna 4	411219	2338216	16448760	21801023	-5352263		Brännare	SCR
8	Massa- oc	Barkpanna	103440	274082	4137600	2555482	1582118		Roster	
9	Massa- oc	SMW	129394	466200	5175760	4346749	829011		Brännare	
10	Kemiindus	Heater 3	21227	54668	849080	509713	339367		Brännare	
10	Kemiindus	Ångpanna	24292	74090	971680	690799	280881		Brännare	
11	Kemiindus	Panna 3	37976	204991	1519040	1911292	-392252		Brännare	
12	Kraft- och	HVP 2844	29251	129964	1170040	1211756	-41716		Roster	SNCR
12	Kraft- och	HVP 3344	19476	110656	779040	1031733	-252693		CFB	SNCR
13	Avfallsförbr	P1	38494	60373	1539760	562905	976855		CFB	
13	Avfallsförbr	P2	31262	51737	1250480	482385	768095			
14	Avfallsförbr	P6	41387	82562	1655480	769790	885690		Rörlig roster	
19	Kraft- och	HVCB2	33628	155008	1345120	1445261	-100141		Brännare	
32	Avfallsförbr	P1	78790	241099	3151600	2247955	903645		Rörlig roster	SNCR
32	Avfallsförbr	P4	59554	416740	2382160	3885594	-1503434		Rörlig roster	SNCR
			SUMS	5253721	47312440	48984565	0			
				Refund:	9,005511					
				SEK/MWh						

REP

- Each company pays 5 €/kg
- Money refunded to same industries
- ***Don't get back what you paid!***
- Refund= output share in total fees
- Much like a tax: Lets explore differences
- But no Output effect.

Economics of REPs (comp. Tax)

$$Pq_i - c_i(q_i, a_i) - Te_i(q_i, a_i) + \sigma_i T[\Sigma_i e_i(q_i, a_i)]$$

q output, c prod cost, a abat. Te charge,
 σ share and $\sigma T \Sigma e$ is the refund.

$$c'_a = -Te'_a (1 - \sigma_i)$$

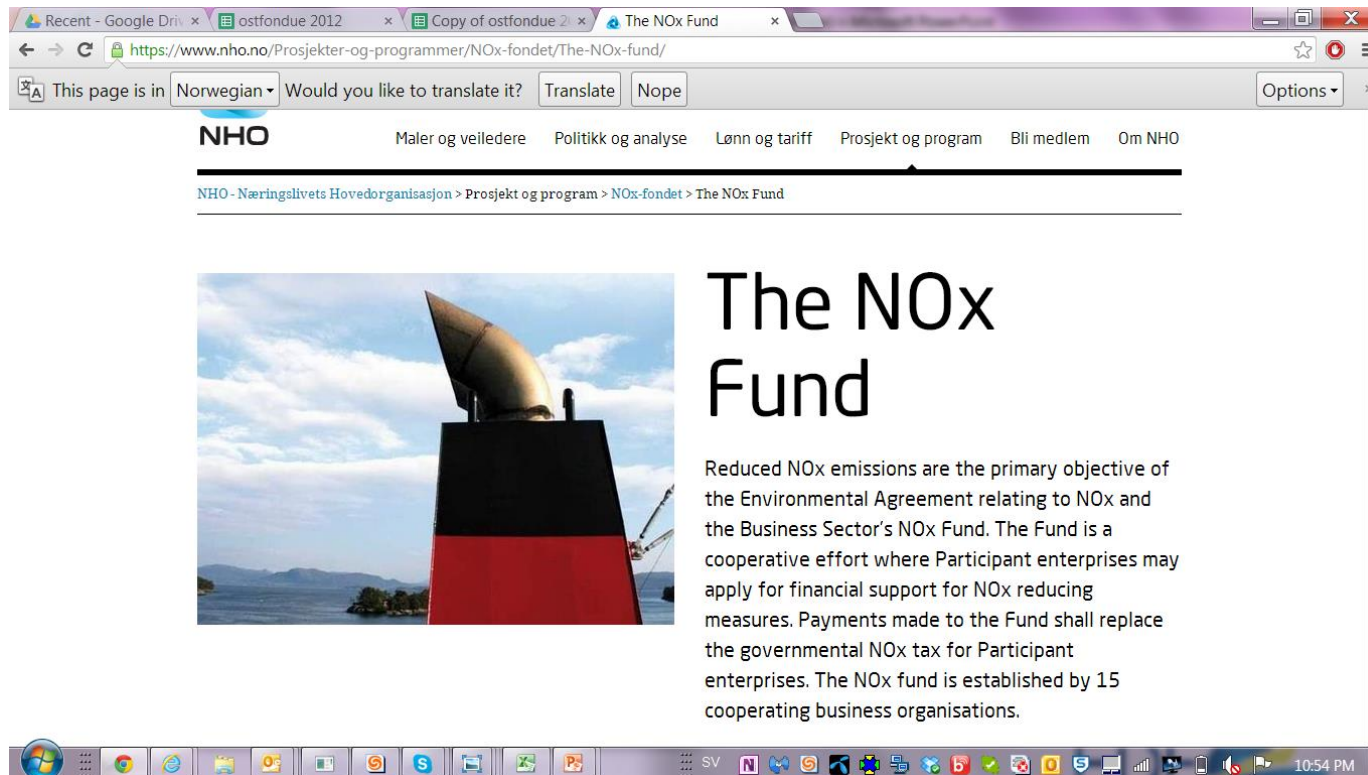
$$P = c'_q + Te'_q (1 - \sigma_i) - T(E/Q)(1 - \sigma_i)$$

Conclusions

- Abat. Incentives same
- Average payment 0 --> no output effect
- No effect on competitiveness, targetting of subsectors easier.
- **Inoptimal: marginal firms not bankrupt**
- However Acceptability higher --> **Fee T higher**
- **Less lobbying against instrument**

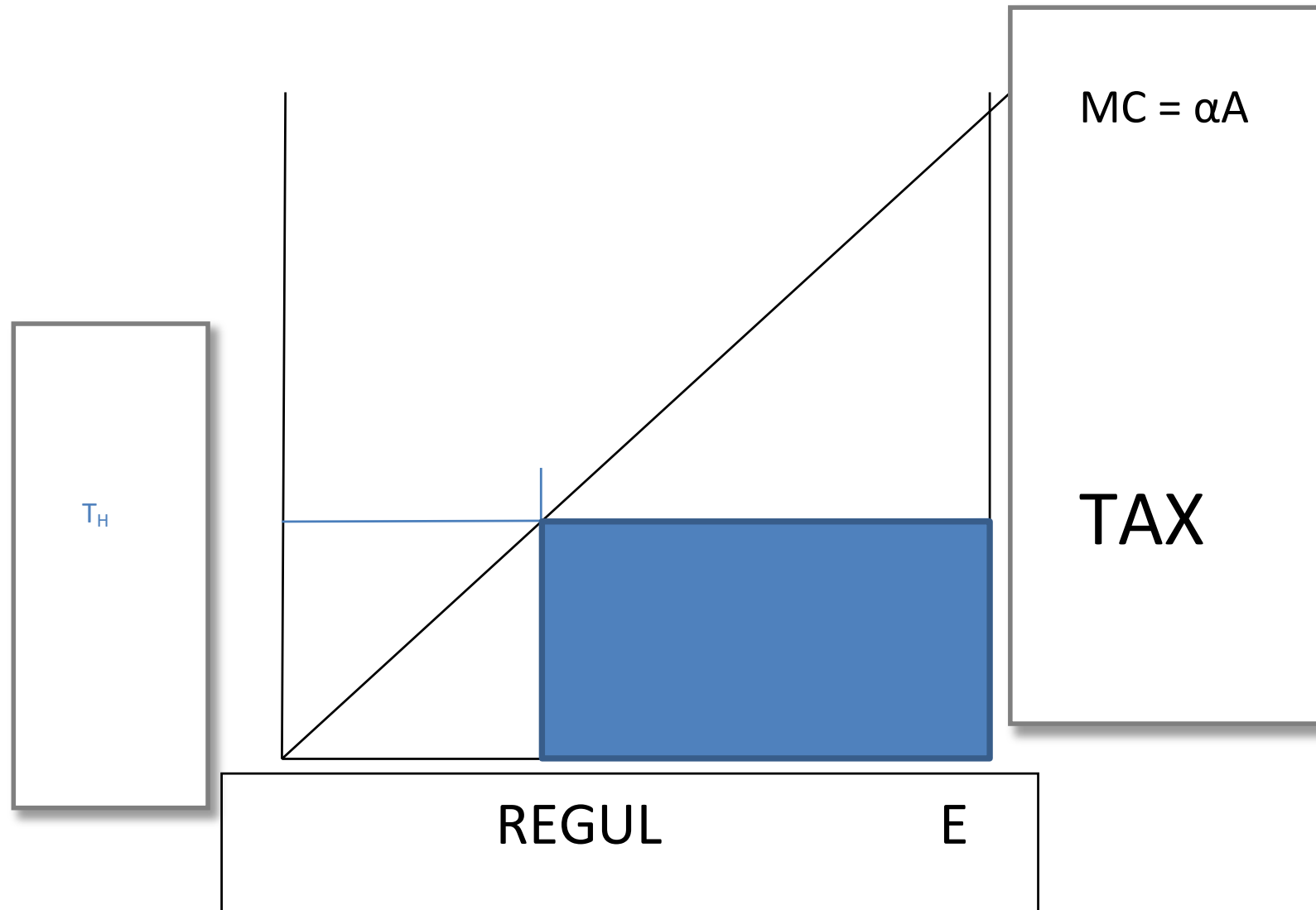
Norway's NO_x Fund

- - 4 NOK /kg NO_x for other industries.
- Fund subsidises No_x abatement investments.

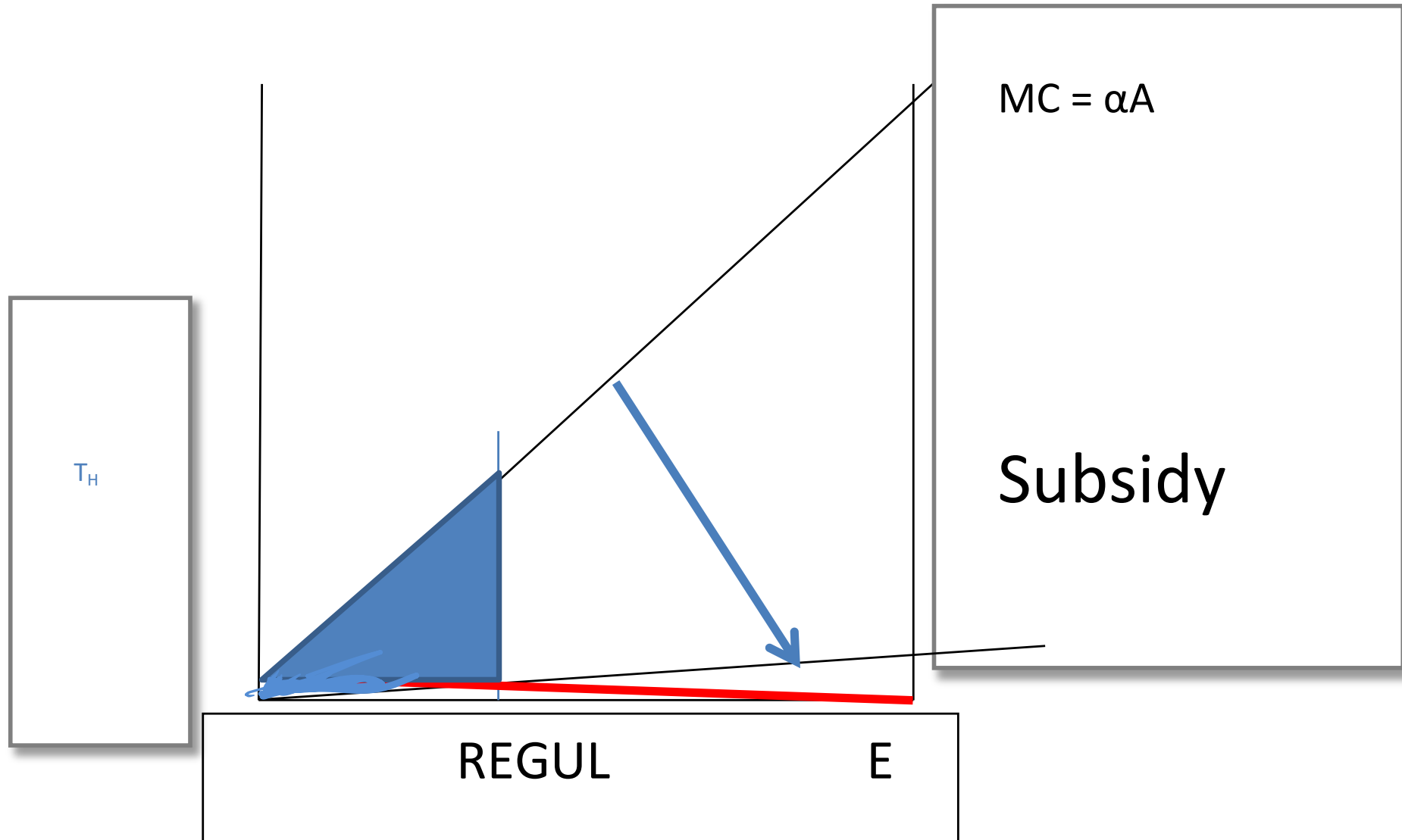


The screenshot shows a web browser window displaying the NHO website. The address bar shows the URL: <https://www.nho.no/Prosjekter-og-programmer/NOx-fondet/The-NOx-fund/>. The page features a navigation menu with links: "Maler og veiledere", "Politikk og analyse", "Lønn og tariff", "Prosjekt og program", "Bli medlem", and "Om NHO". Below the navigation is a breadcrumb trail: "NHO - Næringslivets Hovedorganisasjon > Prosjekt og program > NOx-fondet > The NOx Fund". The main content area includes a photograph of a ship's funnel and a large heading "The NOx Fund". The text below the heading states: "Reduced NOx emissions are the primary objective of the Environmental Agreement relating to NOx and the Business Sector's NOx Fund. The Fund is a cooperative effort where Participant enterprises may apply for financial support for NOx reducing measures. Payments made to the Fund shall replace the governmental NOx tax for Participant enterprises. The NOx fund is established by 15 cooperating business organisations."

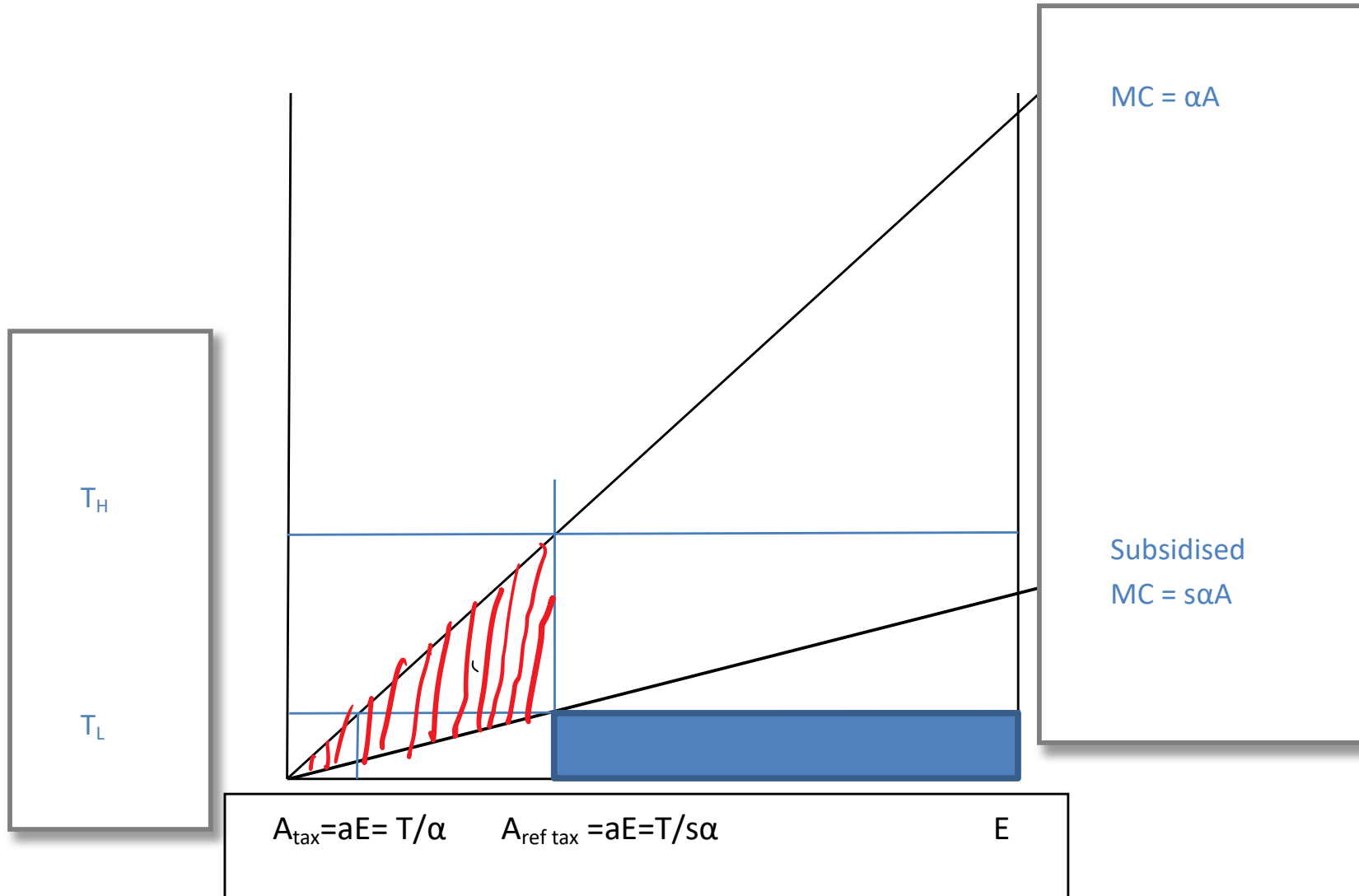
High tax not popular



Subsidy is expensive...



Fees used to finance subsidy



Output based Refunding (OB):

$$\pi_i = p_i q_i - c_i(q_i) - A_i - te_i(q_i, A_i) + \sigma_i tE. \quad (1)$$

$$\sigma_i = \frac{q_i}{Q}. \quad (2)$$

$$\mathbf{EB} \quad \pi_i = p_i q_i - c_i(q_i) - (1-s)A_i - te_i(q_i, A_i), \quad (8)$$

problematic that s endogenous; (9) necessary for budget constraint:

$$s = \frac{tE}{A}, \quad (9)$$

So economic theory: Tax revenue → Budget

- How important is this?
- Why not refund?
- **Suppose optimal T is not acceptable?**
- Why not use money to subsidize abatement?

- Other policy instruments: **Tradable Performance standards**

How actually implement a global carbon price

- Global ETS
- Fairness in allocation
- Start with one country.
- Tax in Sweden, Finland... 1990
- Exempt shipping
- Exempt Air travel
- Exempt competitive sectors
- Remove exemptions when all countries have carbon pricing.

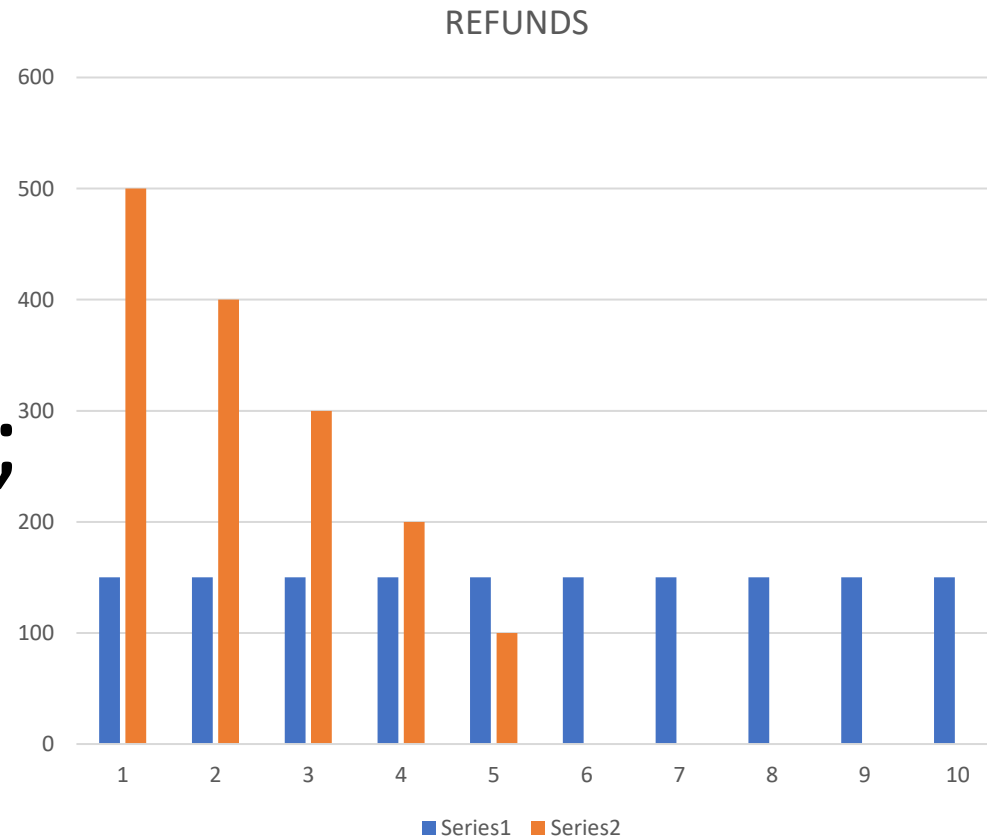
How make Carbon pricing **ACCEPTABLE**?

REFUNDING TAXES/ equal/progressive

150€ to all?

Or

500€ to decile 1;
400 to decile 2;
100 to decile 5.

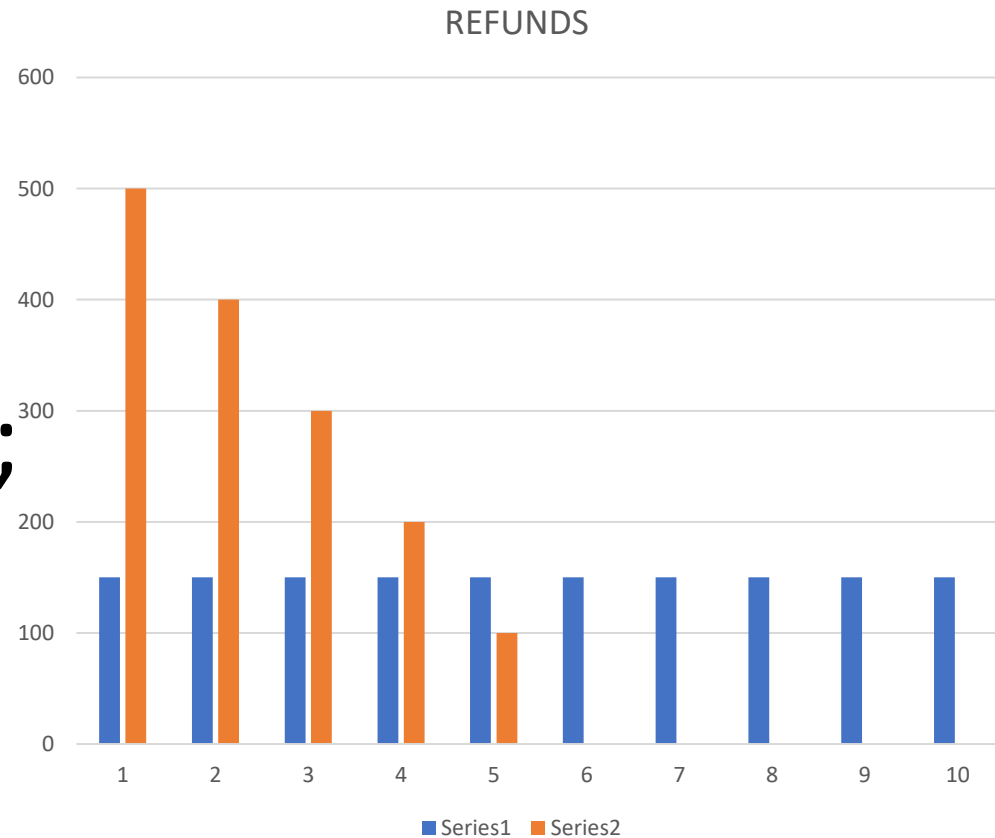


REFUNDING TAXES

150€ to all?

Or

500€ to decile 1;
400 to decile 2;
100 to decile 5.



Or Using Revenue?

FUEL TAXES AND THE POOR

THE DISTRIBUTIONAL EFFECTS OF
GASOLINE TAXATION AND THEIR IMPLICATIONS
FOR CLIMATE POLICY

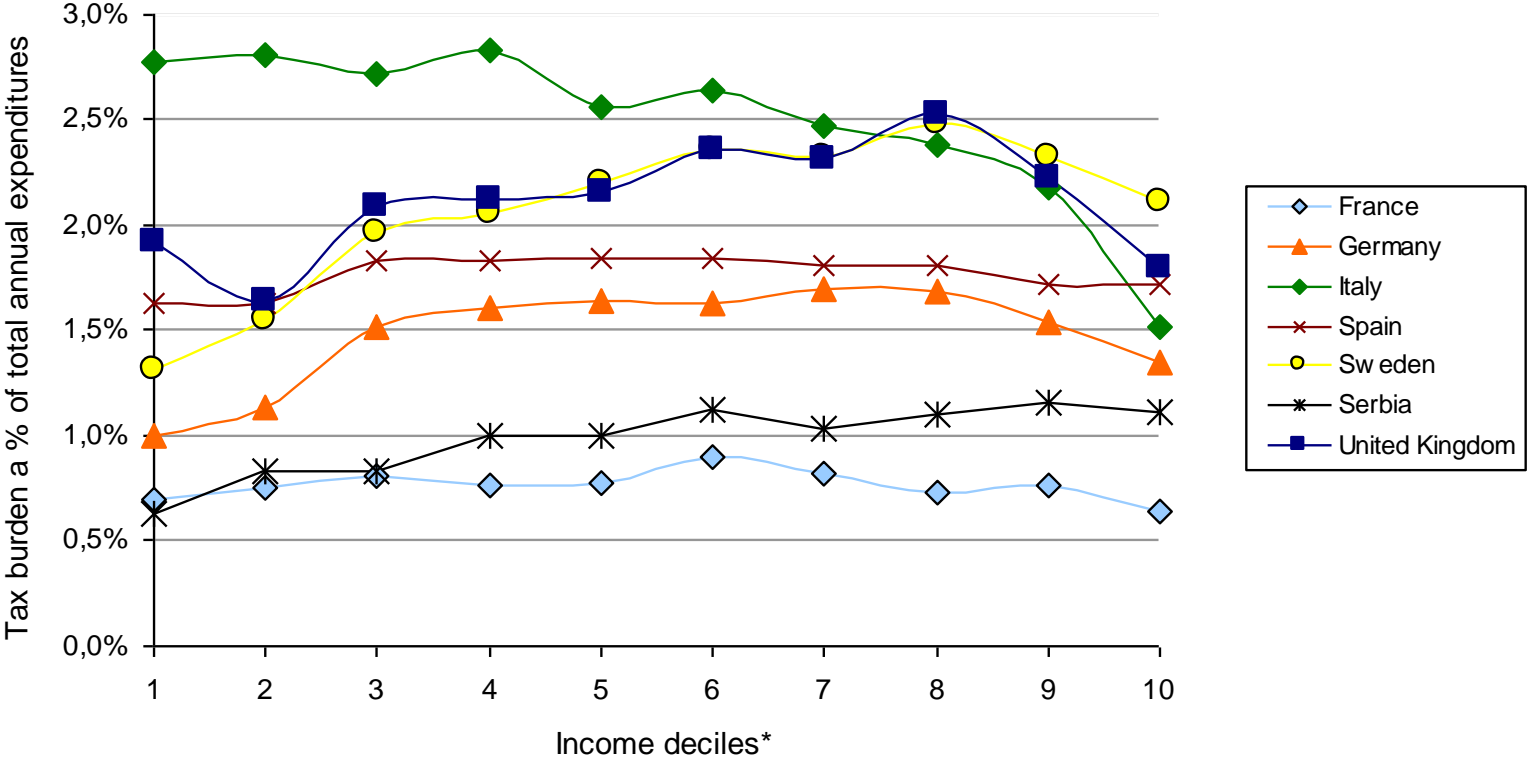
EDITED BY
THOMAS STERNER



- Actual Fairness/
- Perceived Fairness

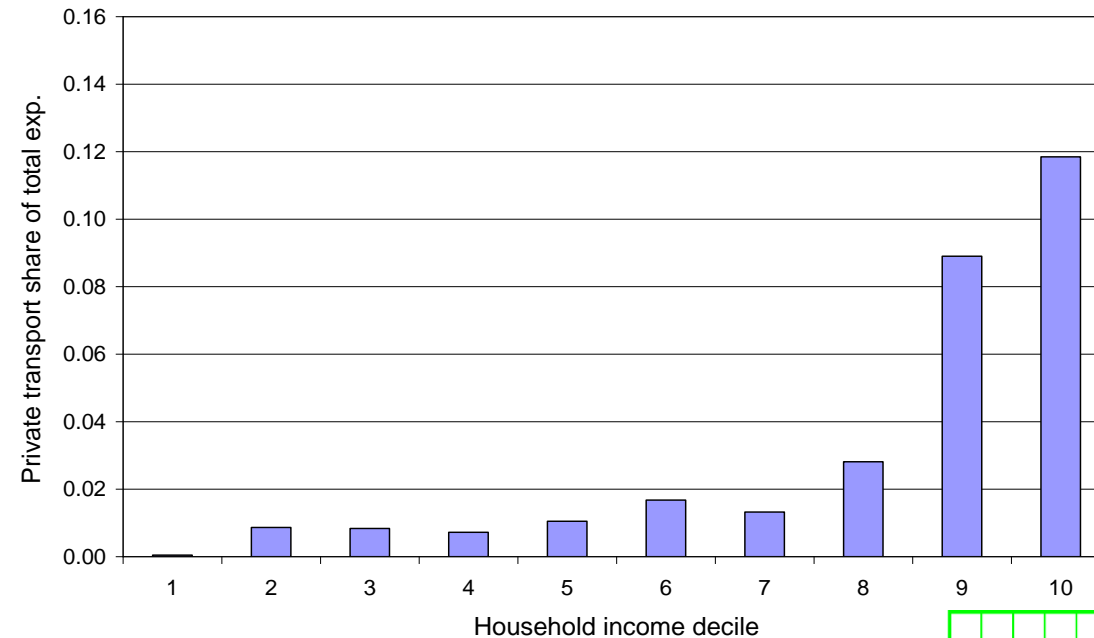
- Distributional issues

Using Expenditure



Presenting the paper

In LOW income countries gasoline tax progressive



BACK TO PERCEIVED FAIRNESS
Representative vs. Swedish Yellow Vests (XR?)



BENSINUPPRORET 2.0

12 KR/L

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Klicka här.**

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Presenting the paper

If we must have a CO2 tax...

Investment type	Sweden	Protesters
Invest in clean energy, technology and infrastructure that reduces emissions	60%	51%
Use the revenues to improve health, social care and education	24%	30%
Provide support to research on climate change	34%	28%
Equal transfers or monetary refunds to all citizens.	18%	18%
Larger transfers or refunds to those with low income	8%	15%
Use the revenues where they are the most needed in the government budget	11%	10%

Note: Numbers do not add to 100% since the respondents were asked to choose up to two alternatives.

Summary

- Carbon **taxes are polarizing**
- **Trust** very important
- Even petrol protesters **want climate** policy
- **Support increases if revenues refunded**
- Support increases more **if revenues used**
- **FAIRNESS paramount. C tax ok if all pay!**

Thank you

- Thomas Sterner
- Based on several research articles that i will send.