The cost of climate policies
DØRS miljøøkonomisk konference, 25. august 2016

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The major points

- The cost of unilateral ”fossil free energy” i 2050 is highly uncertain, but potentially very high
- Political goals should be reached by the least costly instruments, wiz a uniform GHG price/Pigou tax
- Climate change is a global externality problem – should be starting point of national policy
- There is no ”special economics” for the green sector, but huge potential rent-seeking costs

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The social cost of ”fossil free energy”

Technology neutrality	
bottom-up approach	154 bn.kr.
top down approach	116 bn.kr.
Technology favors green tech	
IPCC	30 - 263 bn.kr
Klimakommissionen	10 bn.kr.
Energistyrelsens energiscenarier	6-29 bn.kr
(DØRS update	15 bn.kr)

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Why so large differences?

- Assumptions about technology: Will green tech lead black tech? (ENS/DØRS huge lead)
- Exogenous versus endogenous technological progress
- Economic versus technical substitutes
- Assumptions about international energy policies (ETS prices, oil prices, biofuel etc.)
- Cost effectiveness
- Transition costs and costs of premature changes

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Costs and benefits per ton CO2e

	Kr/ton CO2e
Social Cost of Carbon (186-597 kr./ton)	285
Danish shadow price, ETS	775
Danish shadow price, non-ETS	1.476
Danish average shadow prices, fossil free	2.500
ETS	35

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Major conclusions

- Potentially high cost of Danish policies
- Global benefits will probably be smaller
- Cost effectiveness is crucial
- Cost reductions by trade, flexibility and using the ETS
- ETS cost probably lower than global benefits at the moment

Cost-effective energy policy

- Single price/Pigou tax on GHG emissions
- Single price is the most efficient way to (indirectly) subsidize renewable energy and energy savings
- If second best direct subsidies: Technology neutral tender system (like the Norwegian-Swedish renewable electricity system)

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Present policies far from cost effective

- Shadow prices (main excise duties) range from 35-3.988 kr./ton CO2e. Welfare cost of kr. 7½ bn.
- Non-technology neutral un-uniform subsidies (mainly offshore wind).
- Highly distortionary earmarked tax (PSO) for financing renewable energy is a far cry from a true cost (and against the EU Treaty)
- Un-focused against binding EU constraint: 39 per cent non-ETS GHG emissions by 2030

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No case for green industrial policies

- Externalities should be priced e.g. by taxes
- Weak case for industrial policies in general
- Spill over-effect seems weaker in the green sector (DØRS 2014)
- Un-uniform subsidies and taxes encourage rent-seeking

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De nye reduktionskrav for drivhusgas

Mål	2020	2030
EU kollektivt		
Total GHG-udledning	- 20 pct. ift 1990	- 40 pct. ift 1990
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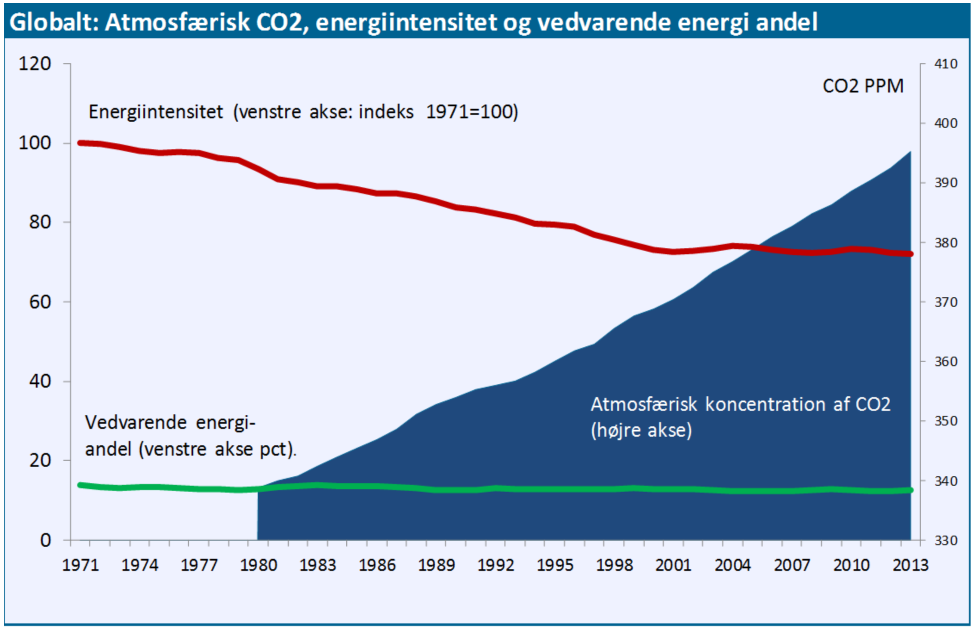
Den globale klimaudfordring

- Vanskeligt at nå en global løsning
- Ensidige, ubetingede danske mål risikerer at give ”sucker’s prize”



Anm.: BNP er målt i konstante priser, verdensbankens basis år, men ikke købekraftskorrigeret.

Kilde: Earth System Research Laboratory - NOAA Research, Verdensbanken, IEA og egne beregninger

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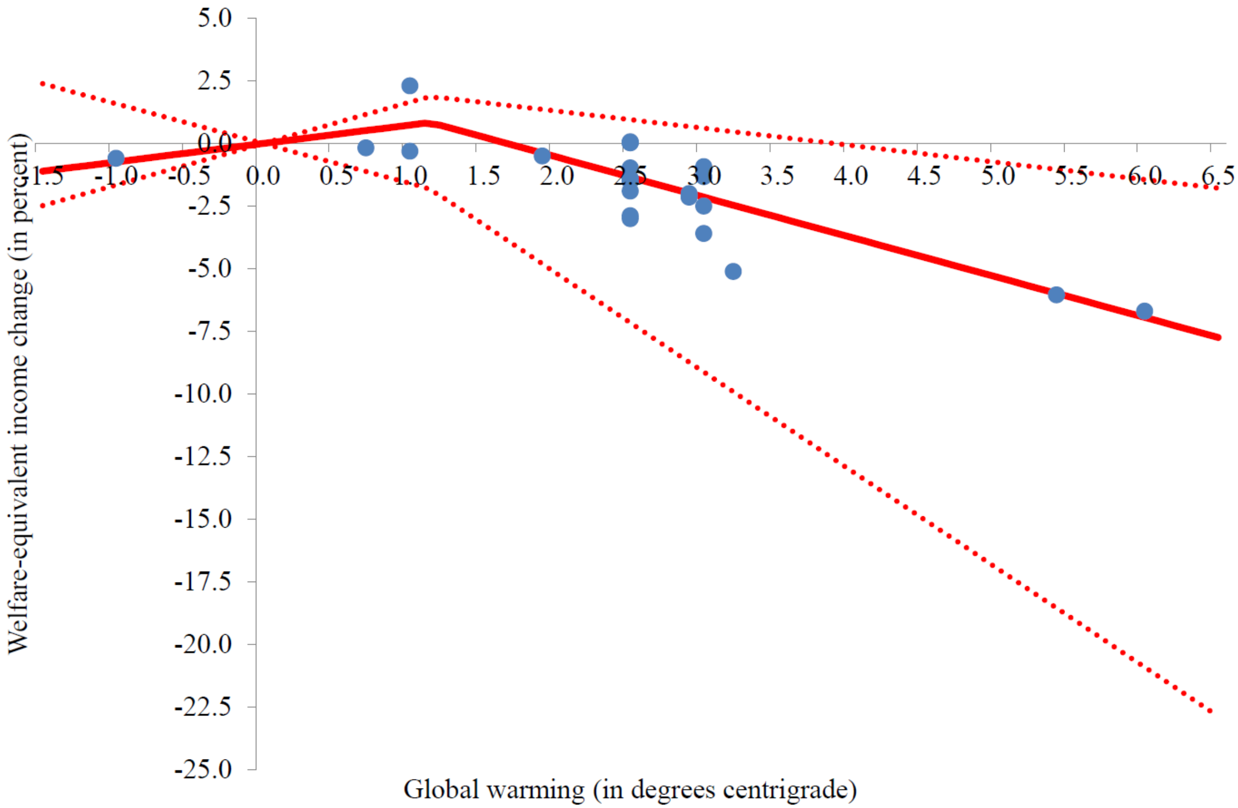
Hvad koster global opvarmning (Litteraturstudie Tol (2015))?



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Hvad koster klimapolitik? (Litteraturstudie IPCC(2013))

	Consumption losses in cost-effective implementation scenarios				Increase in total discounted mitigation costs in scenarios with limited availability of technologies				Increase in mid- and long term mitigation costs due delayed additional mitigation up to 2030			
	[% reduction in consumption relative to baseline]			[percentage point reduction in annualized consumption growth rate]	[% increase in total discounted mitigation costs (2015–2100) relative to default technology assumptions]				[% increase in mitigation costs relative to immediate mitigation]			
2100 Concentration (ppm CO_2eq)	2030	2050	2100	2010-2100	No CCS	Nuclear phase out	Limited Solar / Wind	Limited Bio-energy	≤55 $GtCO_2$eq		>55 $GtCO_2$eq	
									2030–2050	2050–2100	2030–2050	2050–2100
450 (430–480)	1.7 (1.0–3.7) [N: 14]	3.4 (2.1–6.2)	4.8 (2.9–11.4)	0.06 (0.04–0.14)	138 (29–297) [N: 4]	7 (4–18) [N: 8]	6 (2–29) [N: 8]	64 (44–78) [N: 8]	28 (14–50) [N: 34]	15 (5–59)	44 (2–78) [N: 29]	37 (16–82)
500 (480–530)	1.7 (0.6–2.1) [N: 32]	2.7 (1.5–4.2)	4.7 (2.4–10.6)	0.06 (0.03–0.13)								
550 (530–580)	0.6 (0.2–1.3) [N: 46]	1.7 (1.2–3.3)	3.8 (1.2–7.3)	0.04 (0.01–0.09)	39 (18–78) [N: 11]	13 (2–23) [N: 10]	8 (5–15) [N: 10]	18 (4–66) [N: 12]	3 (-5–16) [N: 14]	4 (-4–11)	15 (3–32) [N: 10]	16 (5–24)
580–650	0.3 (0–0.9) [N: 16]	1.3 (0.5–2.0)	2.3 (1.2–4.4)	0.03 (0.01–0.05)								

Notes: [1] Cost-effective scenarios assume immediate mitigation in all countries and a single global carbon price, and impose no additional limitations on technology relative to the models' default technology assumptions. [2] Percentage increase of net present value of consumption losses in percent of baseline consumption (for scenarios from general

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Hvad skader et ton drivhusgas (SCC)?

- Stern-Dietz (2014): USD 32-103
- EU (2012): USD 64
- US (2012): USD 33
- DØRS (2016): USD 68
- Litteraturstudie (2012): USD 49

Table 2. Selected characteristics of the 2010 social cost of carbon and its growth rate.

	All	3%	1%	0%		rate
Mean	196 $/tC	25 $/tC	105 $/tC	296 $/tC		2.3%
Mode	49 $/tC	19 $/tC	55 $/tC	144 $/tC		2.0%
Median	135 $/tC	23 $/tC	83 $/tC	247 $/tC		2.2%
Standard deviation	322 $/tC	22 $/tC	128 $/tC	309 $/tC		1.3%

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Store forskelle i CO_2-reduktionsomkostninger

Figur 2. Skyggepriser (afgifter fratrukket eksterne omkostninger) pr. ton CO2 fra forskellige emissionskilder

Kilde: SAU Alm.del endeligt svar på spørgsmål 369 2013-14 og egne beregninger

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Ineffektivitet koster 7½ mia.kr. i dag (2012-niveau)

(a) Borgernes omkostninger	**71,2**
(b) Statens nettoprovenu	44,0
(c) Faktisk dødvægtstab (a)-(b)	27,1
(d) ”Nødvendigt” dødvægtstab	19,6
(e) Unødvendigt dødvægtstab (c) –(d)	**7,5**

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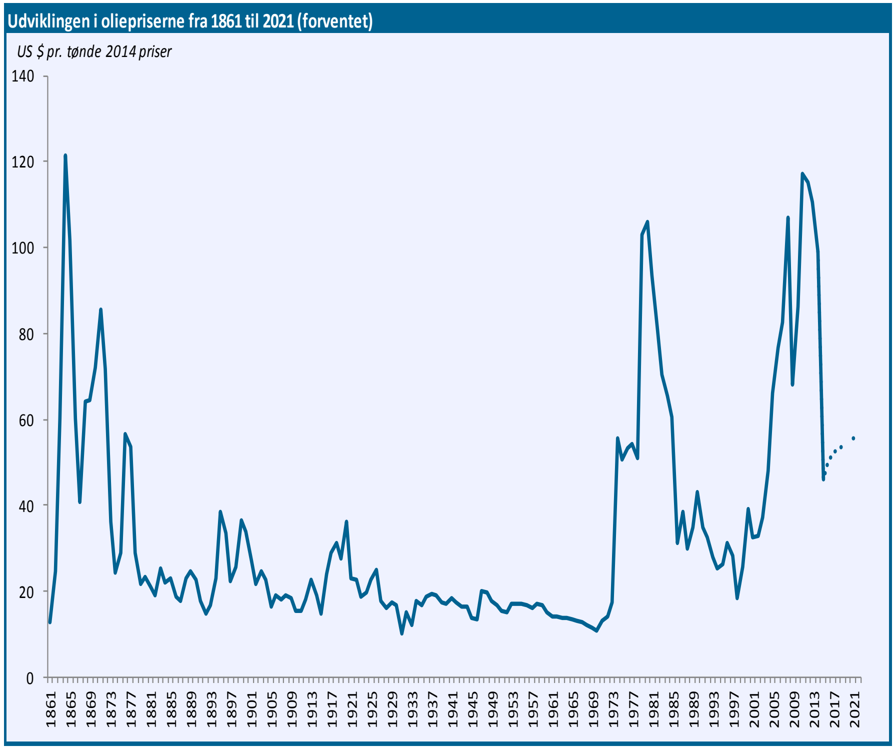
Og det bliver dyrere hvis de fossile priser bliver ved at være lave

20 pct. lavere fossil energipris

- øger den samfundsøkonomiske omkostning med 10,4 mia. kr.
- Eller øger CO_2-udledning 8 pct.



Anm: Der er anvendt en inflation på 1 pct. for 2015 og 2 pct. for 2015 og frem, for at omregne til 2014 priser

Kilde: BC statistical review of worl energy 2015, Crude Oil Futures Prices

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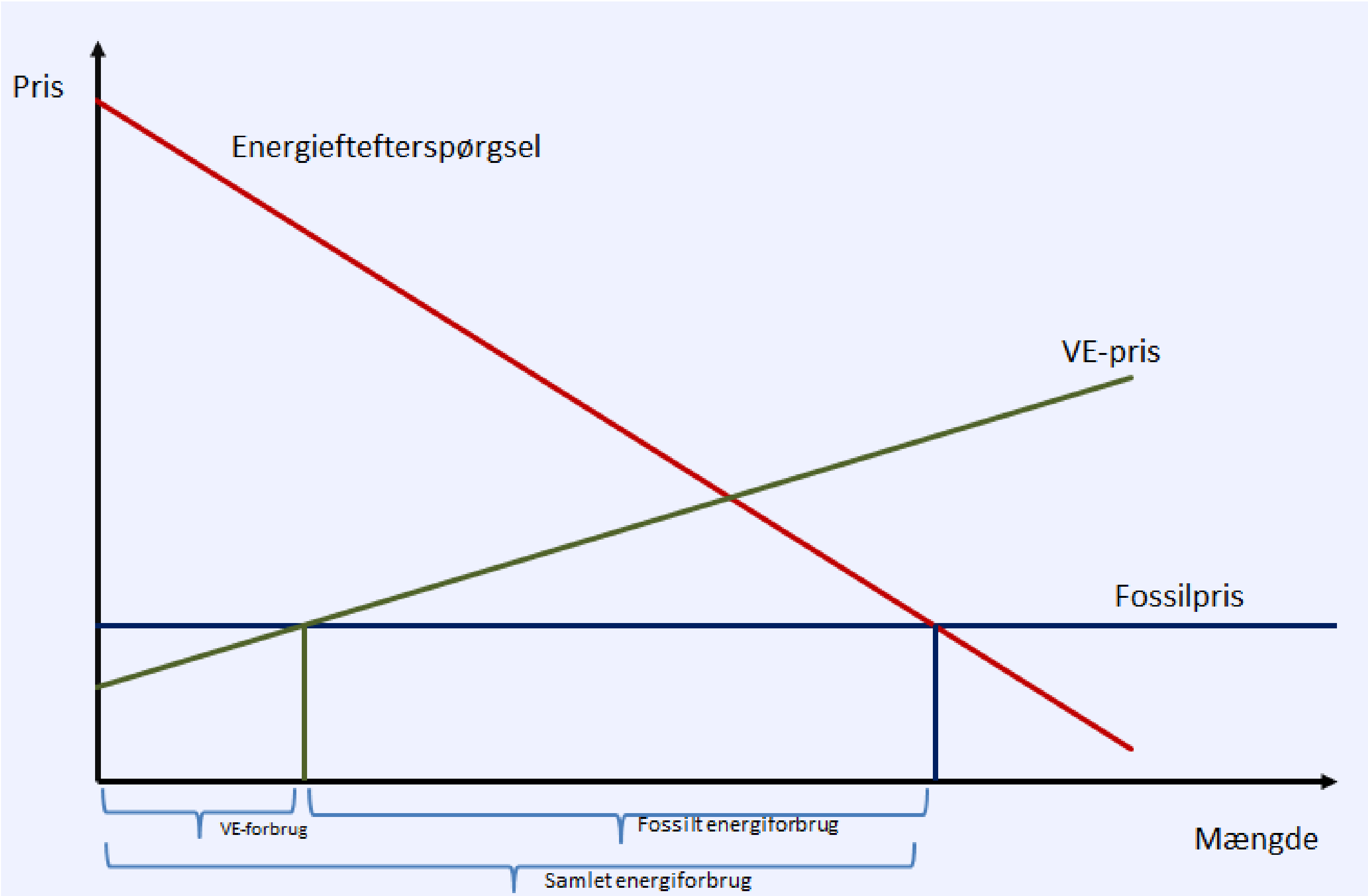
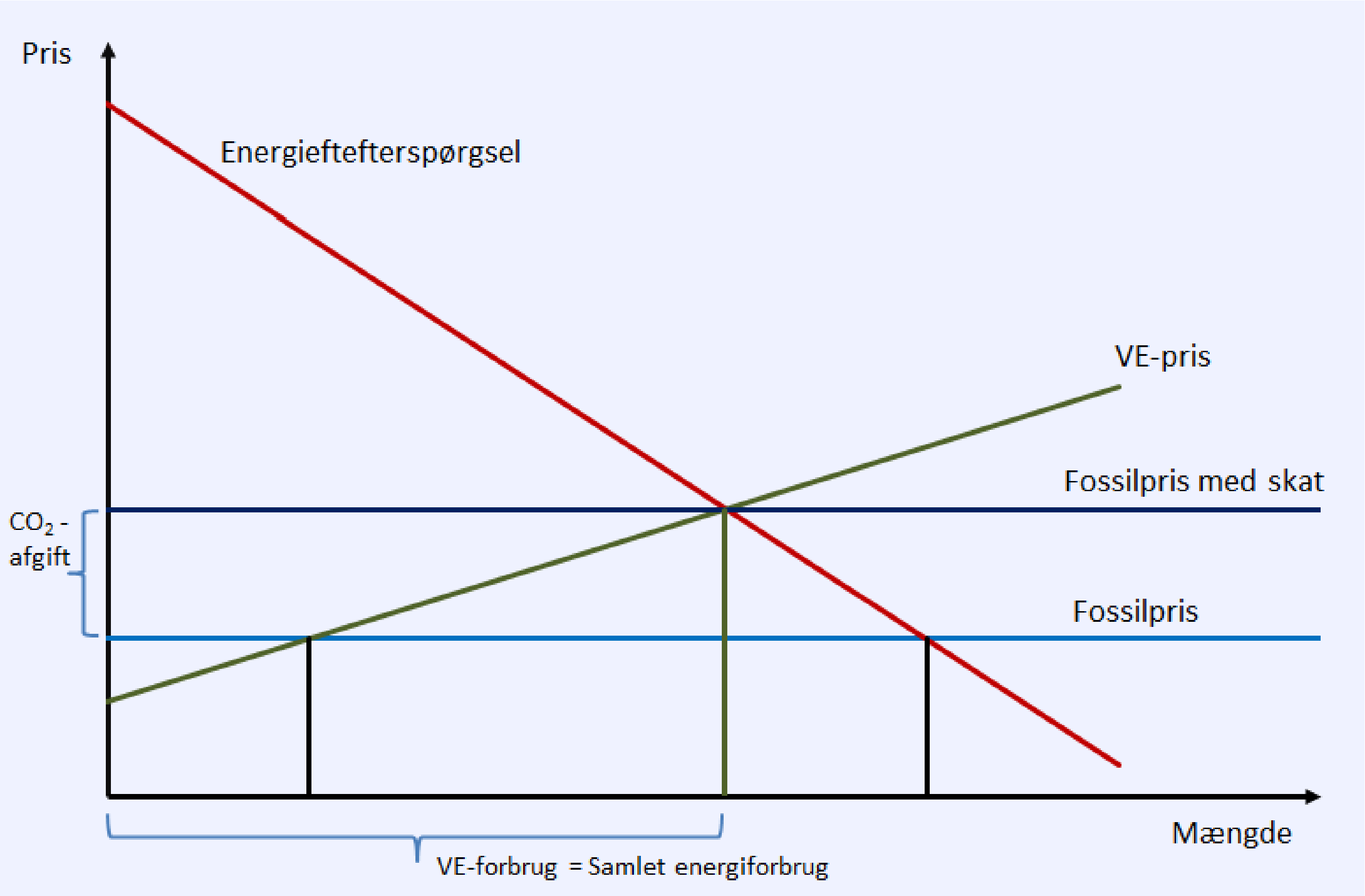

Pris
Energiefterspørgsel
VE-pris
Fossilpris
Mængde
VE-forbrug
Fossilt energiforbrug
Samlet energiforbrug



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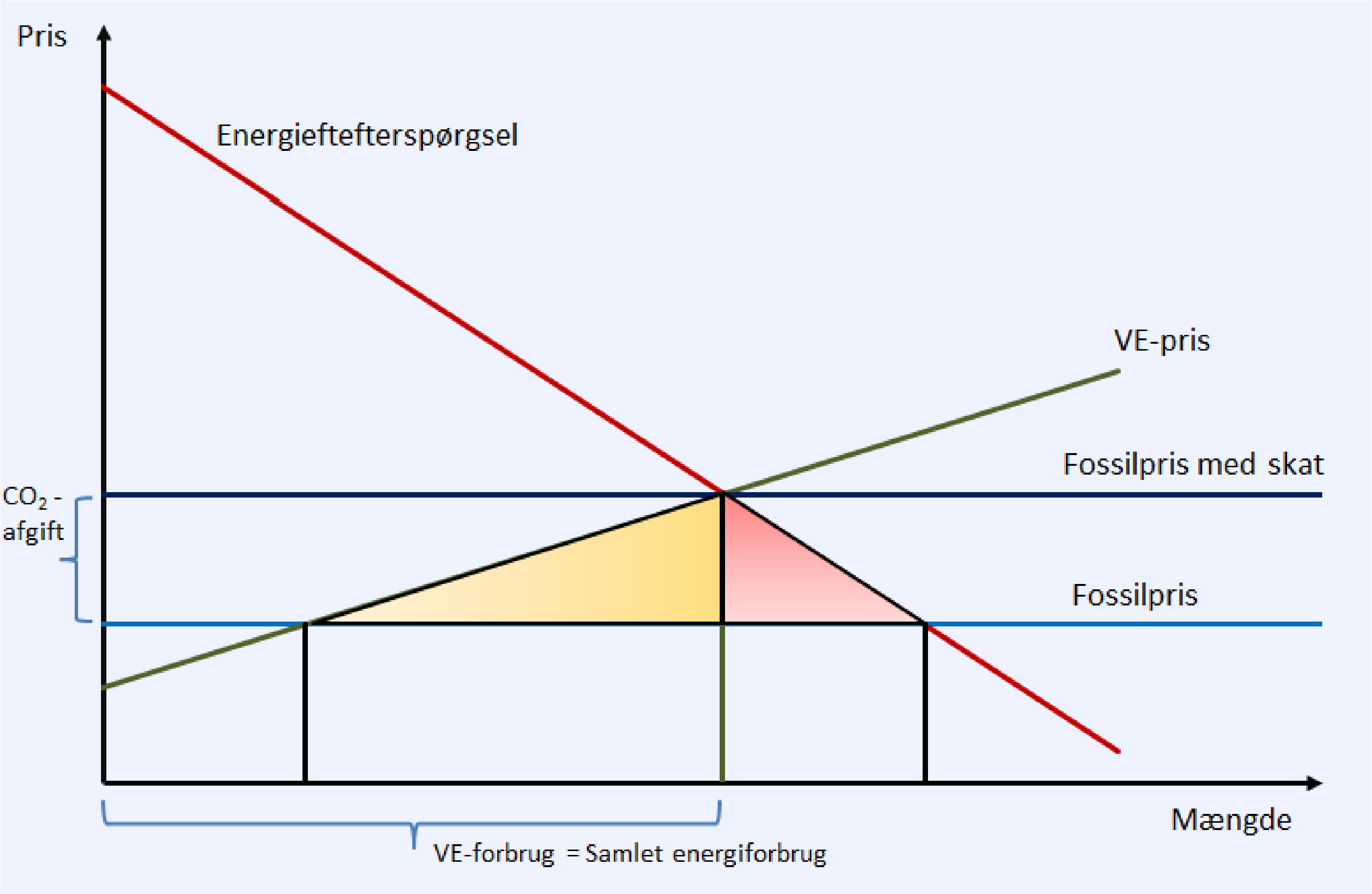

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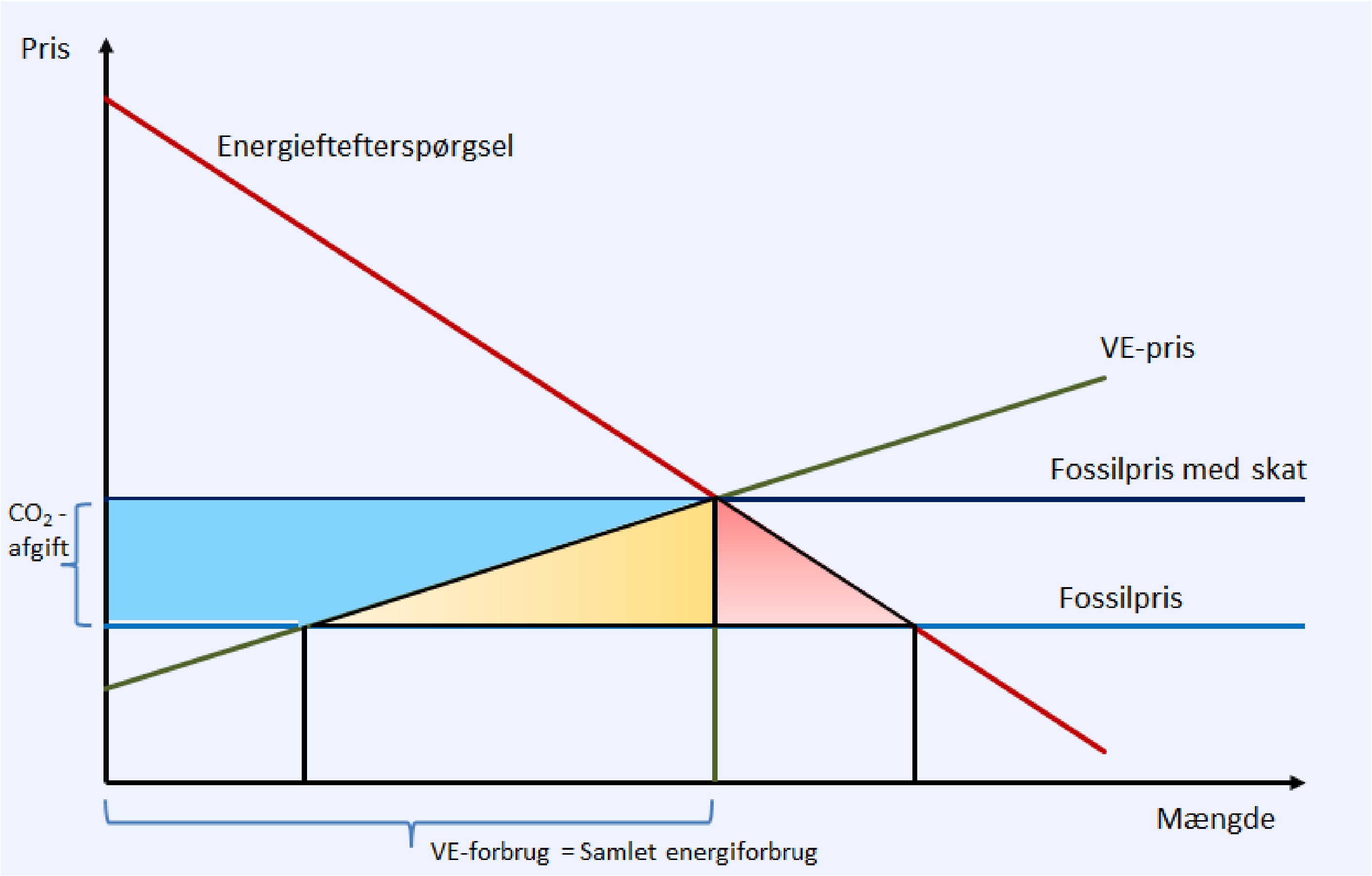

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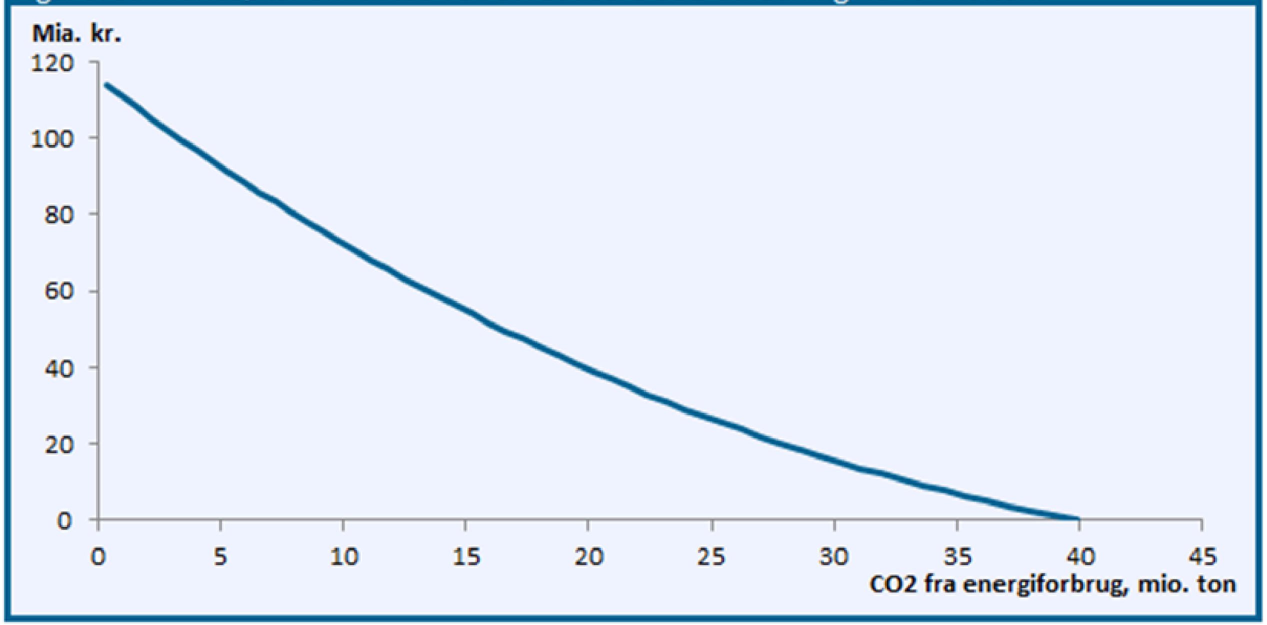
Hvad koster fossilfrihed i 2050? – top down-metode

Figur 3. Samfundsøkonomisk tab ved at reducere CO_2-udledning fra 40 mio.ton.



Anm. Der udledes knap 40 mio. ton (2012) fra energiforbruget. En halvering til 20 mio. ton vil koste ca. 40 mia.kr. om året i rent dødvægtstab. En fjernelse vil koste over 100 mia.kr.

Kilde: egne beregninger

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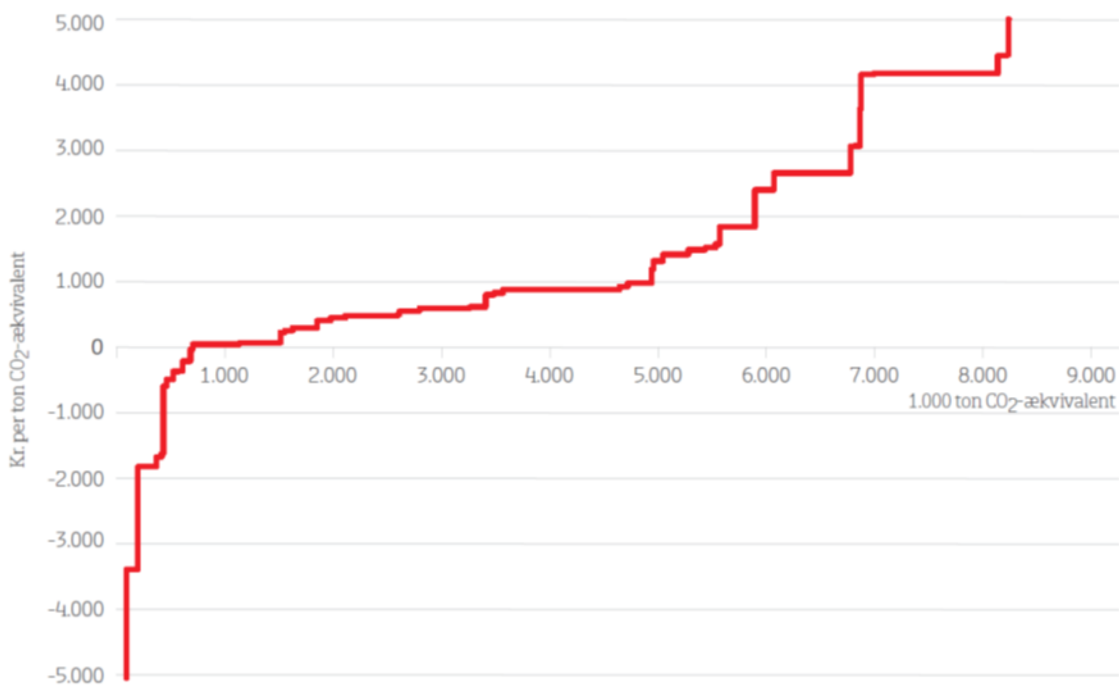
Stigende marginale reduktionsomkostninger - Klimaplanen



Figur 15. Potentialekurve med marginale reduktionsomkostninger

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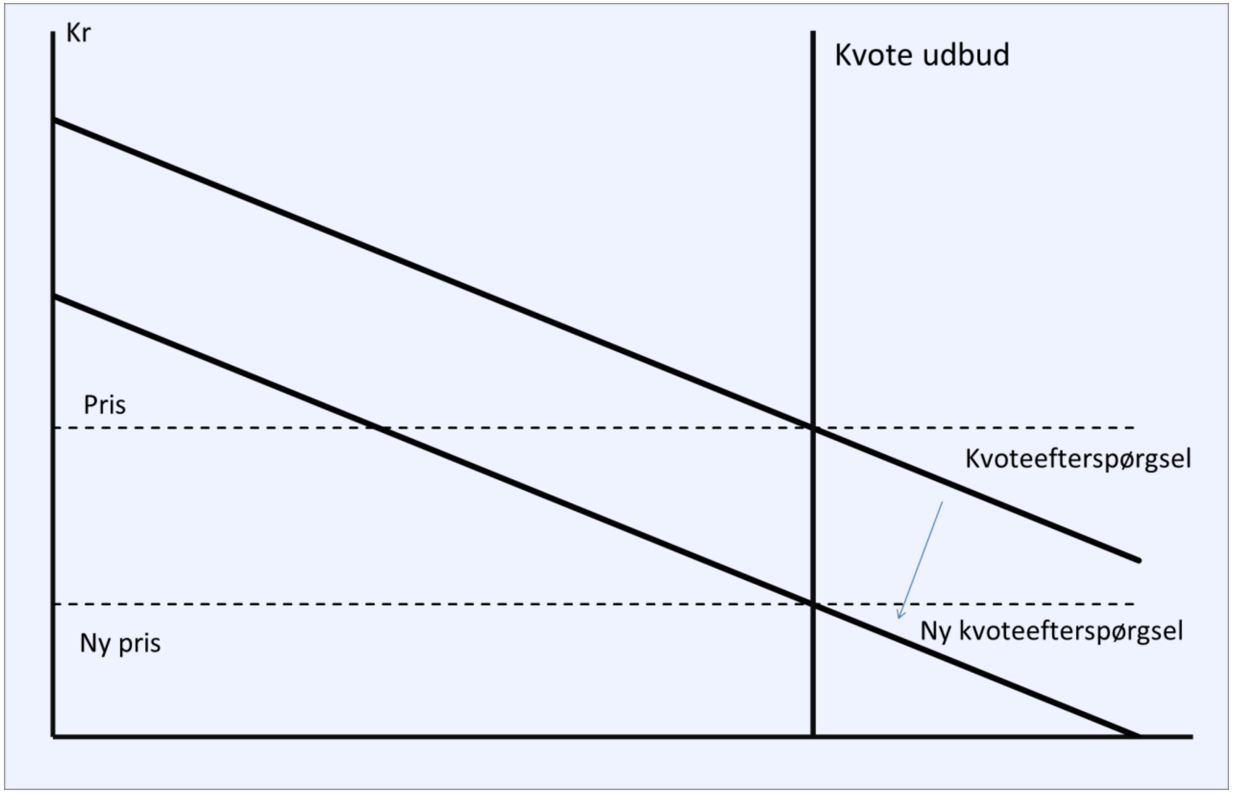
Lavere dansk udslip i kvotesektoren påvirker kun kvoteprisen, ikke klimaet



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Er ETS (kvotesystemet) brudt sammen?

- Kvotepris bestemmes af:
  - Efterspørgsel til produktion nu og her
  - Forventet fremtidig kvotepris
- Lav aktuel efterspørgsel bl.a. på grund af krisen
- Hvad betyder den lave forventede fremtidige pris?

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Grøn selektiv energipolitik øger den samfundsøkonomiske omkostning

- Måles ikke ved erhvervsøkonomiske gevinster, men samlet samfundsøkonomi
- ”Rents” fra afgifter/tilskud er ikke samfundsøkonomiske gevinster
- Spill overs af forskning *mindre* i VE-sektor end industrien generelt (DØRS 2011)
- Negative varige beskæftigelseseffekter (FM 2012)
- Rent seeking-tab ved lobbyisme

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Gevinster og omkostninger i perspektiv

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Dansk reduktionsomkostning non-ETS	1.476
Fossilfrihed (gennemsnit)	2.500

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