Effects on sectors and regions of a carbon tax increase in Sweden – Analysis with a SCGE model

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Agenda

- Previous studies of CO2 tax changes in Sweden using CGE models
- STRAGO – a SCGE model for Sweden
- Effects of a 100 percent increase in the CO2 tax in Sweden
- Conclusions

Table 1 Swedish CGE models for analysis of energy taxation, added by the SCGE model STRAGO
Source: Based on Bohlin (2010)

	HK	***Hill***	***EMEC***	***SAINT***	***STRAGO***
Activities	88	17	26	27	26
Commodities	88	20	33	27	26
Labour categories	11	2	2	1	1
Households	30	1	6	1	1
Number of regions	1	1	1	1	9
Energy substitution	Limited	Medium	Medium	High	Limited
Labour supply	Depends on real wage	Depends on real wage	Constant	Constant	Constant
Scale economies and agglomeration effects	No	No	No	No	Yes, by monopolistic competition
Emissions	CO_2	CO_2, NOx, SO_2	CO_2, CO, CH_4, NOx, N_2O, CO_2, Particulate matter	CO_2	CO_2
Energy tax rates	1995	1995	2007	2001	2010
Dynamics	No	No	No	No	No*

* STRAGO has both a dynamic and a static model, in this context the static model has been applied

Table 1 100-percent increase in CO2 tax in different models
Source: Based on Bohlin (2010), own calculations.

	HK	***Hill***	***SAINT***	***SAINT***	***STRAGO***
Tax rates from year	1995	1995	1995	2001	2010
Welfare [EV as percentage of national income]	-0,3	-0,9	-0,9	-1,5	-1,3
Emission [% change]	-1,7	-11	-20	-21	-13

Figure 1 Schematic illustration of a region in STRAGO.

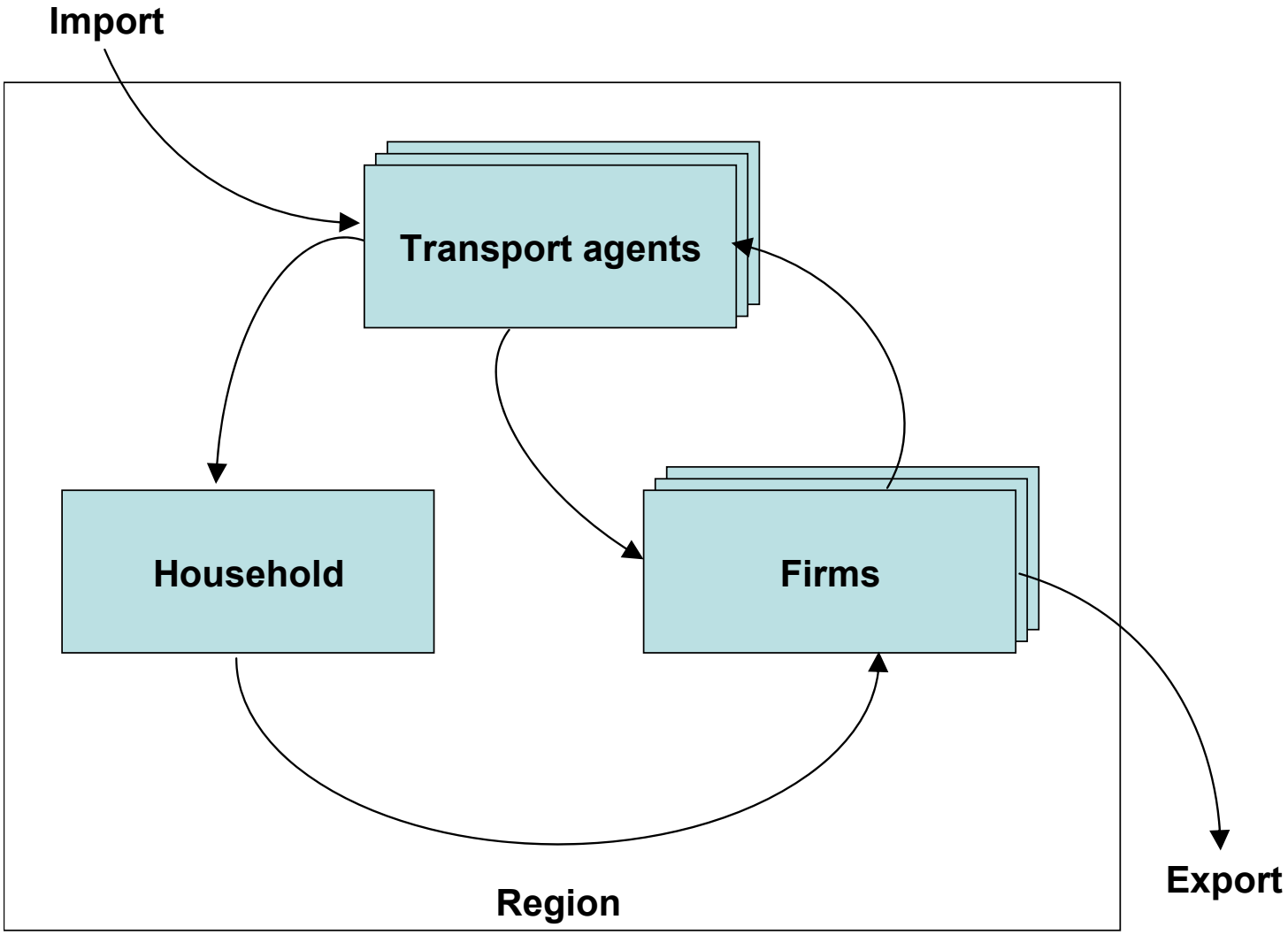


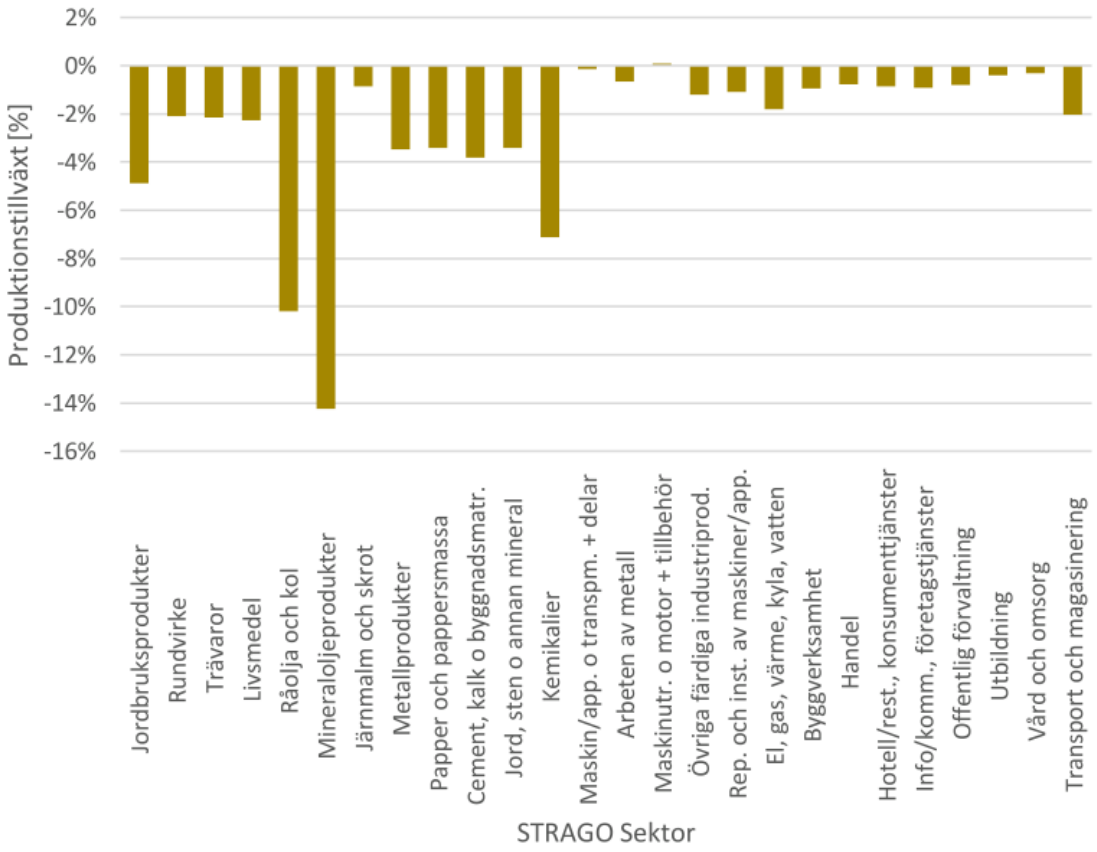
Table 1 Per STRAGO-sector 2010: (A) IO-coefficient Refined petroleum products, (B) Production MSEK, (C) Emissions of greenhouse gases, 1000 ton CO2-equivalents, (D) Carbon tax, MSEK. Source: Statistics Sweden (MiR) and own calculations

		(A)	(B)	(C)	(D)
1	Products of agriculture	0.0455	49 187	8 698	1815
2	Round wood	0.0195	43 681	967	202
3	Products of wood	0.0064	41 164	182	49
4	Food products, beverages	0.0094	139 854	656	180
5	Crude oil	0.0239	1 798	196	35
6	Refined petroleum products	0.0555	98 818	3 009	110
7	Metal ore	0.0221	38 746	952	128
8	Basic metals	0.0230	127 767	5 735	309
9	Paper and paper products	0.0121	140 316	1 919	512
10	Cement, building materials	0.0449	14 142	1 535	121
11	Other non-metallic mineral products	0.0309	16 696	1 812	142
12	Chemicals	0.0576	129 706	1 784	66
13	Machinery and equipment, motor vehicles	0.0025	155 213	111	58
14	Other fabricated metal products	0.0058	106 951	231	12
15	Machinery and equipment n.e.c.	0.0035	335 227	239	126
16	Furniture; other manufactured goods	0.0088	163 228	83	31
17	Rep. and install. of machinery and equipm.	0.0070	44 748	23	9
18	Electricity, gas, steam, water	0.0202	199 472	13 507	1943
19	Constructions and construction works	0.0130	379 941	2 064	2034
20	Wholesale and retail trade, consumer services	0.0062	568 456	1 551	1418
21	Transportation, support services	0.0421	458 073	14 528	5902
22	Accommodation and food services	0.0027	277 995	312	218
23	Business services, Real estate services	0.0028	1 898 288	1 572	1254
24	Public administration	0.0039	222 044	866	490
25	Education services	0.0008	247 068	72	17
26	Human health services	0.0012	438 633	197	32
	Sum		**6 337 212**		**17213**

Figure 1 NUTS 2 regions in Sweden

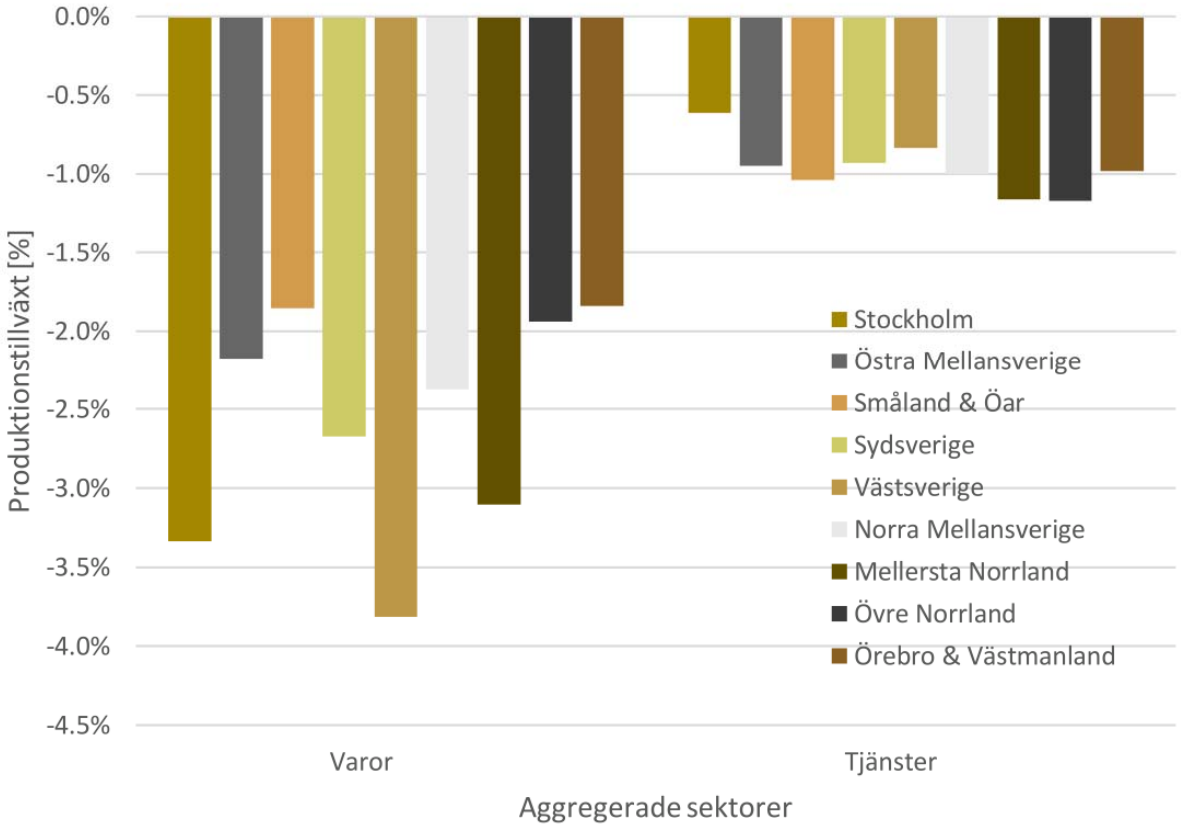
Effects on production per sector from an increase of carbon tax on fossil fuels with 100 percent

Figur 2 Beräknad produktionstillväxt per STRAGO-sektor till följd av en fördubblad koldioxidskatt.



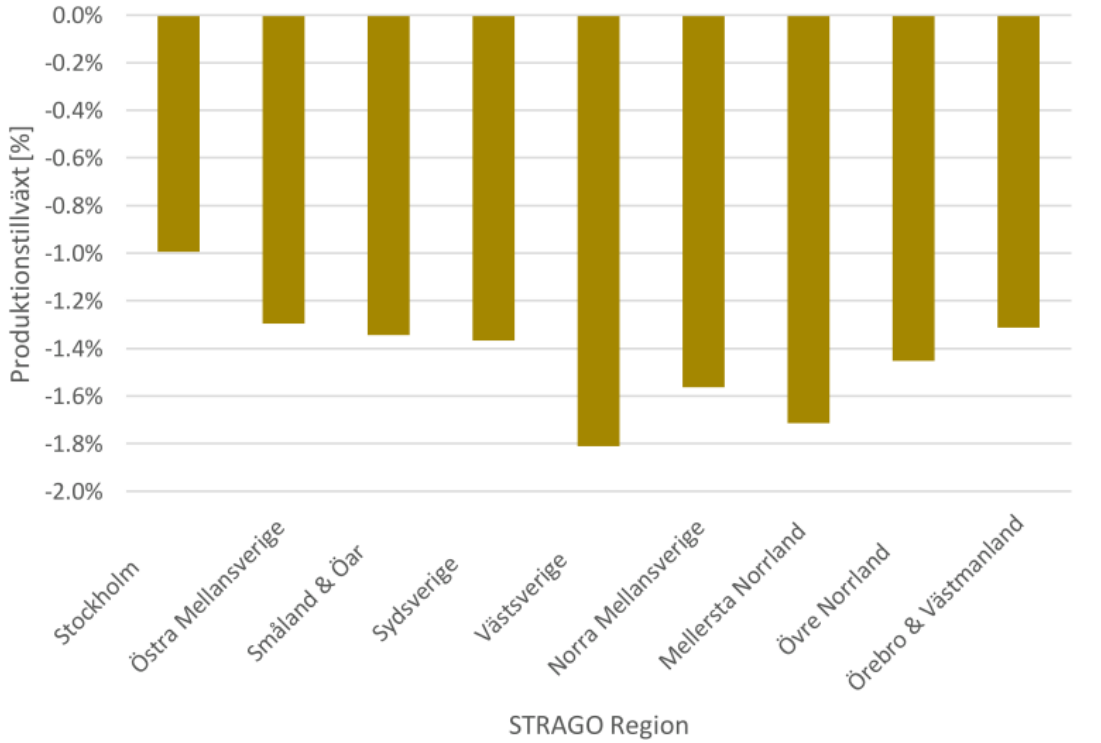
Effects on production of gods and services per region from an increase of carbon tax on fossil fuels with 100 percent

Figur 4 Beräknad produktionstillväxt för varor respektive tjänster per STRAGO-sektor till följd av en fördubblad koldioxidskatt.



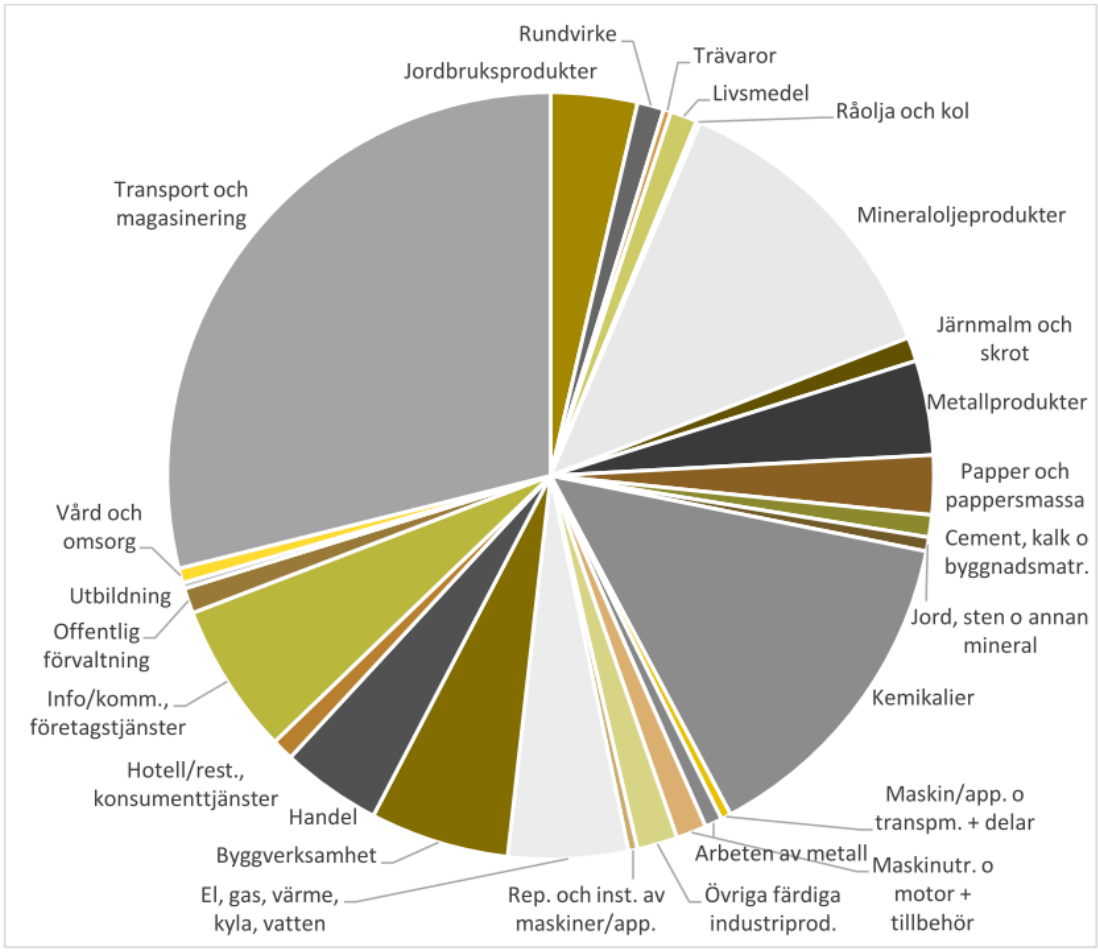
Effects on production per region from an increase of carbon tax on fossil fuels with 100 percent

Figur 3 Beräknad produktionstillväxt per STRAGO-region till följd av en fördubblad koldioxidskatt.



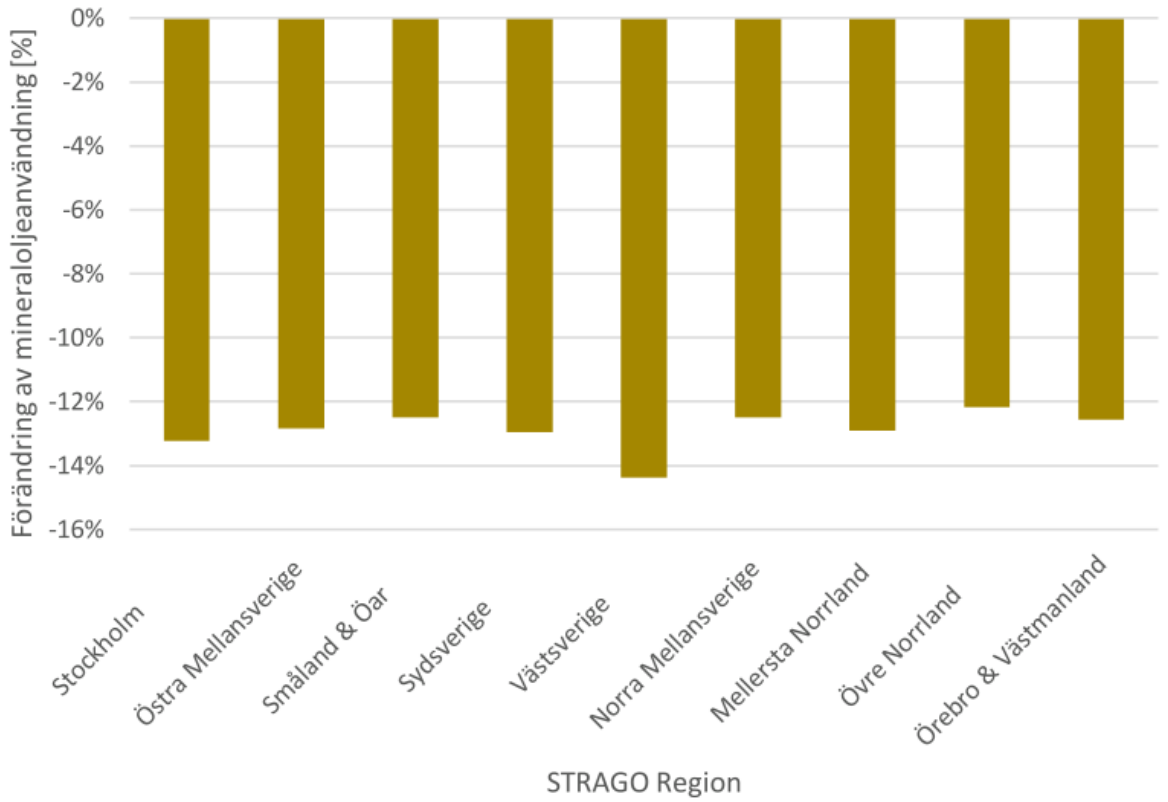
Effects on usage of refined petroleum products per sector from an increase of carbon tax on fossil fuels with 100 percent

Figur 7 Minskad mineraloljeanvändning i riket fördelad på sektorer



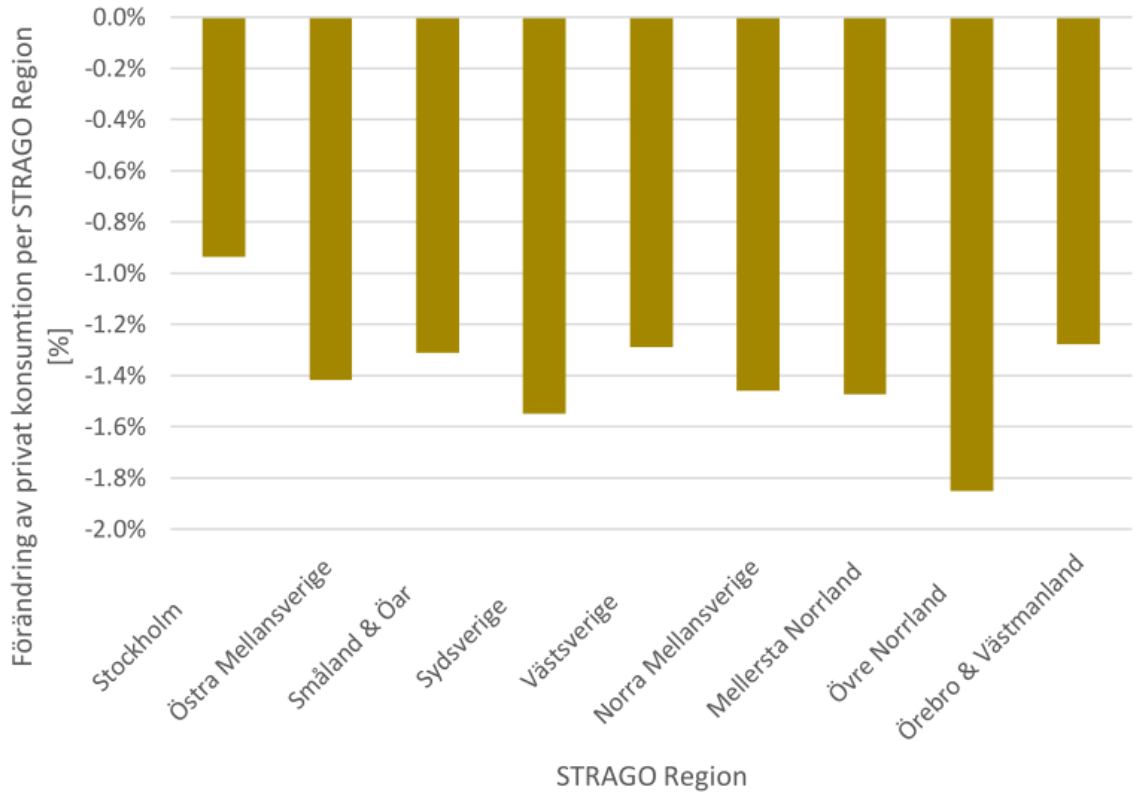
Effects on usage of refined petroleum products per region from an increase of carbon tax on fossil fuels with 100 percent

Figur 6 Beräknad förändring av mineraloljeanvändningen per STRAGO-region till följd av en fördubblad koldioxidskatt.



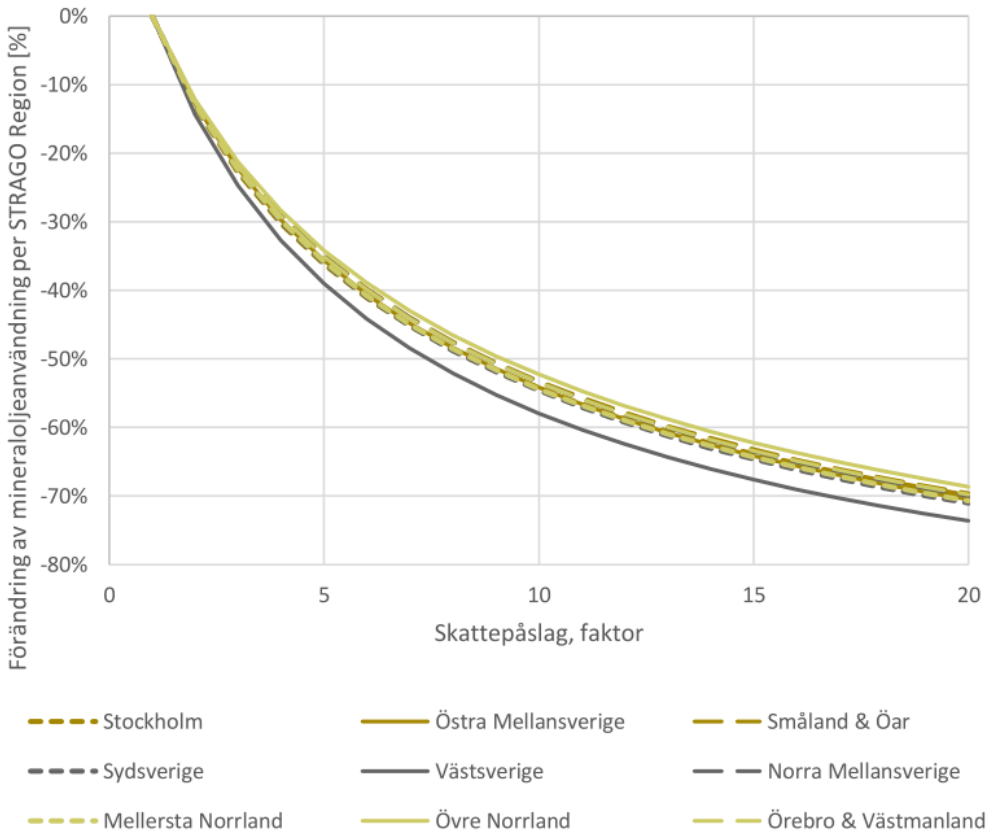
Change in private consumption per region (Equivalent Variation, EV) from an increase of carbon tax on fossil fuels with 100 percent

Figur 8 Beräknad förändring av privat konsumtion (Equivalent Variation, EV) per STRAGO-region till följd av en fördubblad koldioxidskatt.



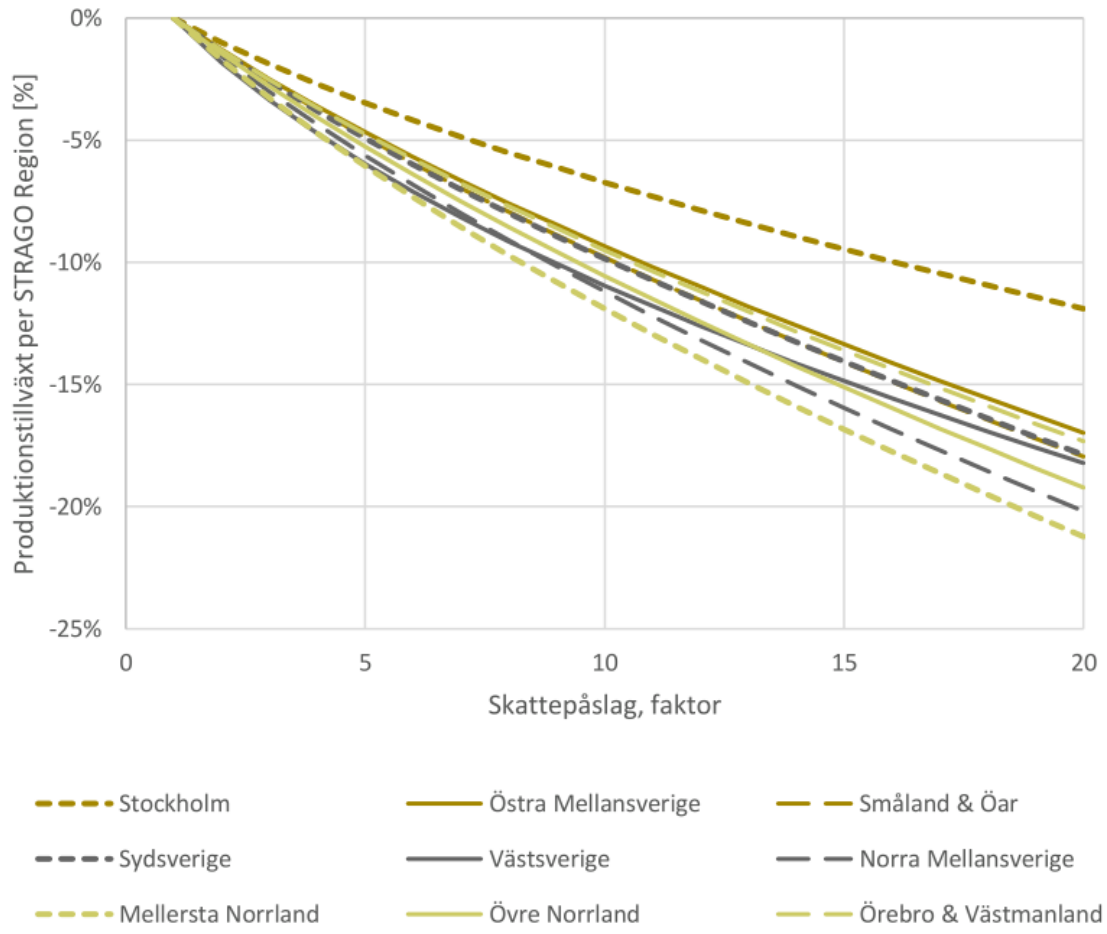
Change in usage of refined petroleum products per region as a function of the carbon tax on fossil fuels

Figur 12 Beräknad förändring av mineraloljeanvändningen per STRAGO-region vid successivt ökad koldioxidskatt.



Effects on production per region as a function of the carbon tax on fossil fuels

Figur 10 Beräknad produktionstillväxt per STRAGO-region vid successivt ökad koldioxidskatt.



Conclusions

- Results from STRAGO are in line with previous studies in Sweden
- Effects from an increase in the carbon tax on fossil fuels are larger on goods than services, and thus larger in region producing large amounts of goods
- A model taking fuel substitution between fossil fuels and biofuels into account would desirable

Tack för er uppmärksamhet!

- Frågor?