

# Environmental Economics

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EPFL ENAC LEUrE

ENV-471

Master semester 2 or 4

Exercises

# ABATEMENT

# Reducing emissions in the face of a tax (1)

The owner of a building had an energy consultant evaluate the costs of reducing his heating oil consumption. The consultant delivered the following table:

Measures	Annual oil consumption (m <sup>3</sup> )	Cost of measures (CHF)
None	10	0
A	9	6 000
A + B	8	16 000
A + B + C	7	30 000
A + B + C + D	6	48 000
A + B + C + D + E	5	70 000
A + B + C + D + E + F	4	95 000

This table means, for example, that oil consumption could be reduced from 10 m<sup>3</sup> to 7 m<sup>3</sup> per year by implementing the package of measures A, B and C, which would cost a total of CHF 30 000

Suppose that fuel oil costs CHF 800/m<sup>3</sup> and that the owner makes his calculations over 20 years without interest and assuming a constant oil price.

- 1) What is the package of measures chosen by the owner to maximize his profit? Justify your answer

# Reducing emissions in the face of a tax (2)

The owner of a building had an energy consultant evaluate the costs of reducing his heating oil consumption. The consultant delivered the following table:

Measures	Annual oil consumption (m <sup>3</sup> )	Cost of measures (CHF)
None	10	0
A	9	6 000
A + B	8	16 000
A + B + C	7	30 000
A + B + C + D	6	48 000
A + B + C + D + E	5	70 000
A + B + C + D + E + F	4	95 000

This table means, for example, that oil consumption could be reduced from 10 m<sup>3</sup> to 7 m<sup>3</sup> per year by implementing the package of measures A, B and C, which would cost a total of CHF 30 000

Suppose now that a constant CO<sub>2</sub> tax of CHF 200/m<sup>3</sup> is added on top of the price. We assume that this does not modify the pre-tax price of heating oil, as it depends essentially on the price of crude oil on world markets.

- 2) What is the package of measures chosen by the owner to maximize his profit under these new conditions?

# Reducing emissions in the face of a tax (3)

A farmer had an agricultural engineer assess the consequences for his corn production of reducing his use of fertilizer. The specialist gave him this table:

This table shows that production declines from 60 to 58 tons when the use of fertilizer is reduced from 6 to 5 tons.

The ton of fertilizer costs 300 USD for the farmer. He can sell his production at the price of 60 USD per ton of corn.

1. What is the quantity of fertilizer that maximizes the farmer's profit?

Suppose now that the farmer must pay 200 USD for every ton of fertilizer he pours on his fields, on top of the fertilizer's price.

2. What is the quantity of fertilizer that maximizes the farmer's profit under these new conditions?

Utilisation of fertilizer (tons)	Production of corn (tons)
6	60
5	58
4	54
3	46
2	36
1	24
0	10